



REPORT
OF THE
OPERATIONAL SAFETY REVIEW TEAM
(OSART)
MISSION
TO
CHOOZ
NUCLEAR POWER PLANT
FRANCE
17 JUNE - 4 JULY 2013
AND
FOLLOW UP MISSION
1 – 5 JUNE 2015

DIVISION OF NUCLEAR INSTALLATION SAFETY
OPERATIONAL SAFETY REVIEW MISSION
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PREAMBLE

This report presents the results of the IAEA Operational Safety Review Team (OSART) review of Chooz Nuclear Power Plant, France. It includes recommendations for improvements affecting operational safety for consideration by the responsible French authorities and identifies good practices for consideration by other nuclear power plants. Each recommendation, suggestion, and good practice is identified by a unique number to facilitate communication and tracking.

This report also includes the results of the IAEA's OSART follow-up visit which took place 23 months later. The purpose of the follow-up visit was to determine the status of all proposals for improvement, to comment on the appropriateness of the actions taken and to make judgements on the degree of progress achieved.

Any use of or reference to this report that may be made by the competent French organizations is solely their responsibility.

FOREWORD

Director General

The IAEA Operational Safety Review Team (OSART) programme assists Member States to enhance safe operation of nuclear power plants. Although good design, manufacture and construction are prerequisites, safety also depends on the ability of operating personnel and their conscientiousness in discharging their responsibilities. Through the OSART programme, the IAEA facilitates the exchange of knowledge and experience between team members who are drawn from different Member States, and plant personnel. It is intended that such advice and assistance should be used to enhance nuclear safety in all countries that operate nuclear power plants.

An OSART mission, carried out only at the request of the relevant Member State, is directed towards a review of items essential to operational safety. The mission can be tailored to the particular needs of a plant. A full scope review would cover nine operational areas: management, organization and administration; training and qualification; operations; maintenance; technical support; operating experience feedback; radiation protection; chemistry; and emergency planning and preparedness. Depending on individual needs, the OSART review can be directed to a few areas of special interest or cover the full range of review topics.

Essential features of the work of the OSART team members and their plant counterparts are the comparison of a plant's operational practices with best international practices and the joint search for ways in which operational safety can be enhanced. The IAEA Safety Series documents, including the Safety Standards and the Basic Safety Standards for Radiation Protection, and the expertise of the OSART team members form the bases for the evaluation. The OSART methods involve not only the examination of documents and the interviewing of staff but also reviewing the quality of performance. It is recognized that different approaches are available to an operating organization for achieving its safety objectives. Proposals for further enhancement of operational safety may reflect good practices observed at other nuclear power plants.

An important aspect of the OSART review is the identification of areas that should be improved and the formulation of corresponding proposals. In developing its view, the OSART team discusses its findings with the operating organization and considers additional comments made by plant counterparts. Implementation of any recommendations or suggestions, after consideration by the operating organization and adaptation to particular conditions, is entirely discretionary.

An OSART mission is not a regulatory inspection to determine compliance with national safety requirements nor is it a substitute for an exhaustive assessment of a plant's overall safety status, a requirement normally placed on the respective power plant or utility by the regulatory body. Each review starts with the expectation that the plant meets the safety requirements of the country concerned. An OSART mission attempts neither to evaluate the overall safety of the plant nor to rank its safety performance against that of other plants reviewed. The review represents a 'snapshot in time'; at any time after the completion of the mission care must be exercised when considering the conclusions drawn since programmes at nuclear power plants are constantly evolving and being enhanced. To infer judgements that were not intended would be a misinterpretation of this report.

The report that follows presents the conclusions of the OSART review, including good practices and proposals for enhanced operational safety, for consideration by the Member State and its competent authorities.

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INTRODUCTION AND MAIN CONCLUSIONS

INTRODUCTION

At the request of the government of France, an IAEA Operational Safety Review Team (OSART) of international experts visited Chooz Nuclear Power Plant from 17 June to 4 July 2013. The purpose of the mission was to review operating practices in the areas of Management, organization and administration; Training and qualification; Operations; Maintenance; Technical support; Operating experience feedback; Radiation protection; Chemistry; Emergency planning and preparedness; and Severe accident management. In addition, an exchange of technical experience and knowledge took place between the experts and their plant counterparts on how the common goal of excellence in operational safety could be further pursued.

Chooz Nuclear Power Plant is located in the French Ardennes department, a few kilometers away from the Belgian border, about an hour away from Brussels or from Luxembourg. Chooz NPP is one of the 19 nuclear power plants in France owned by the EDF Group.

Chooz NPP has two PWR N4 type units in operation with rated power 1500 MWe. The units were connected to the grid in 1996 and 1997. Start of commercial operation was in 2000 for both units. The plant employs 700 EDF staff and 200 permanent contractors.

The Chooz OSART mission was the 175th in the programme, which began in 1982. The team was composed of experts from Switzerland, Belgium, Germany, China, India, United Kingdom, Czech Republic, Canada, Hungary, together with the IAEA staff members and observers from United Arab Emirates and Russian Federation. The collective nuclear power experience of the team was approximately 317 years.

Before visiting the plant, the team studied information provided by the IAEA and the Chooz plant to familiarize themselves with the plant's main features and operating performance, staff organization and responsibilities, and important programmes and procedures. During the mission, the team reviewed many of the plant's programmes and procedures in depth, examined indicators of the plant's performance, observed work in progress, and held in-depth discussions with plant personnel.

Throughout the review, the exchange of information between the OSART experts and plant personnel was very open, professional and productive. Emphasis was placed on assessing the effectiveness of operational safety rather than simply the content of programmes. The conclusions of the OSART team were based on the plant's performance and programmes compared with the IAEA Safety Standards.

The following report is produced to summarize the findings in the review scope, according to the OSART Guidelines document. The text reflects only those areas where the team considers that a Recommendation, a Suggestion, an Encouragement, a Good Practice or a Good Performance is appropriate. In all other areas of the review scope, where the review did not reveal further safety conclusions at the time of the review, no text is included. This is reflected in the report by the omission of some paragraph numbers where no text is required.

MAIN CONCLUSIONS

The OSART team concluded that the managers of Chooz NPP are committed to improving the operational safety and reliability of their plant. The team found good areas of performance, including the following:

- The plant has adopted a programme for crossover professional development as part of a joint employment scheme shared by the plant and its contractors. This enables the trainees to carry out numerous activities, develop professional capability, understand practices and gain experience of different plants in terms of work planning and coordination;
- The plant has produced a humorous movie explaining the advantages of reporting low level events to ensure that operating experience is captured in a comprehensive manner;
- The Operations Department has set up self-assessment groups to discuss and resolve specific issues within operations. This has empowered the operations personnel and developed ownership for the improvement programmes;
- The plant has introduced enhancements for identification of ‘orange zones’ in radiation controlled area. ‘Orange zones’ are areas of elevated dose rates that require specific authorization for people to enter. In order to prevent inadvertent access the plant has established enhanced warnings at the entry to all orange zones.

A number of improvements in operational safety were offered by the team. The most significant proposed improvements include the following:

- The plant should review its process for the management of corrective maintenance and leak repair and implement it so that backlogs are minimized and the plant safety is maintained;
- The plant should more rigorously reinforce the safety related behavior of individuals in line with established management expectations and promote individual ownership of safety;
- The plant should enhance the process of root cause analysis of safety significant events to improve the depth of analysis of such events;
- The temporary modification process should be improved to ensure all changes to the plant are identified, evaluated, controlled along their lifetime and closed out in a timely manner.

Chooz management expressed a determination to address the areas identified for improvement and indicated a willingness to accept a follow up visit in about eighteen months.

CHOOZ FOLLOW-UP MAIN CONCLUSIONS (Self-Assessment)

In 2013, Chooz NPP was audited for the first time since it was built.

For the plant, this OSART mission represented the opportunity to compare our organisations and safety level to the IAEA baselines. Now, we have an encouraging vision on the management of the safety, and some areas for improvement which the management of the site seized.

The OSART mission was held at the same time as the plant worked on the strategic 4-year plan 2013-2017: in this way, we included the main recommendations and suggestions in the strategic plan 2013-2017. The macro-processes leaders, members of the plant executive committee, were

in charge of the improvement actions coordination, and a yearly status was done during the annual strategic review of the site (end of 2013 and end of 2014). This organization allows us to approach this follow-up with a level of progress in compliance with our initial ambition.

According to the 23 recommendations or suggestions, some have been addressed through national plans: for example, the revision of the root cause analysis process of significant events, the improvement of the chemistry control programme, or the procedures to manage fuel uncover in an open reactor pressure vessel. But, most of them needed to define the solutions with the management. Two examples illustrate the management involvement in the resolution of the problems:

- Recommendation R1.3(1), about compliance to established management expectations and promoting individual ownership of safety, brought us to review safety management on the site. Revision of the field observations programme, refurbishment of the slogan to promote the good behaviours (“Nuclear attitude”), the process for promotion of nuclear safety, safety, environment “professional standards” programme, and the launching of the “leadership” programme are improvement actions which show our involvement.
- Recommendation R1.1(1) according to the management of equipment anomaly work request needed to have a review of the maintenance processes, with the reinforcement of the fix-it now team, the set up of a coordination of the work request quality for equipment anomaly work request and processing capacities.
- Suggestion 8 about maintenance work, brought us to request for a TSM to WANO, mission occurred in third quarter 2014.

During EDF Corporate OSART, Chooz NPP was one of the EDF plant to be audited.

This follow up will allow us to have an update of the progress for this important action plan, launched about 18 months ago.

OSART FOLLOW-UP MAIN CONCLUSIONS

An IAEA Operational Safety Review Follow-up team visited the Chooz NPP from 1 to 5 June 2015. There is clear evidence that the plant management has gained significant benefit from the OSART process. The IAEA Safety Standards, benchmarking activities with other NPPs were used during the preparation and implementation of the corrective action programme.

The plant thoroughly analyzed the OSART recommendations and suggestions and developed appropriate corrective action plans. These corrective actions, in some cases, cover a broader scope than was intended with the OSART recommendations and suggestions. The willingness and motivation of plant management to use benchmarking, consider new ideas and implement a comprehensive safety improvement programme was evident and is a clear indicator of the potential for further improvement of the operational safety of the Chooz NPP.

The plant has fully resolved the issues regarding management of leaks and corrective maintenance, human performance training by simulator trainers, storage of non-fixed equipment and materials in the field, fire prevention and related work practices, control of foreign material exclusion, conduct of root cause analysis, and control of contamination in the radiation controlled area.

In the area of management, organization and administration, the plant has made effort in addressing the issue related to management expectation. They have established missing standards and expectations in areas such as control room access control and operator aids control. All managers in the plant were trained on how to conduct effective observation and coaching, and are frequently presented in the field to reinforce the standards and expectations. A monthly focus area has been defined and is being communicated consistently to the plant staff; the focus area is also clearly visible on the plant calendar. Contractor involvement is being improved with nuclear safety considerations written into the contract agreement. The total number of management field observations has increased from about 1650 to 2000 within the time frame of 2013 to 2015. However, field visits identified a few deviations not meeting management expectations, such as two containers in the turbine without proper storage permit and identification of associated risk.

Another issue in management, organization and administration is industry safety, and the plant has identified the root causes of the issue, and has been reinforcing its industry safety expectations by more frequent field observation and coaching. Campaign on promoting safety aware, particularly with regard to life-saving rule is visible in the plant, and consistently communicated to the plant staff via different means. Industry safety meeting were held with the contractor senior managers every quarter. However, in 2014, there were two serious industry safety events, which indicated weaknesses in the recognition of safety hazards. The plant has strengthened the measures taken, and there is a sign of improvement. There was no major loss time accident during the first outage in 2015, which was an improvement compared to previous outages.

In response to the suggestion made by the OSART team, development of quality OJT programme has been identified as one of the priorities at the plant. In the training department a position dedicated to OJT has been created. The plant is committed to produce OJT material which is in compliance with systematic approach to training. An action plan was set up to meet this commitment which is expected to be completed by end 2015. A site memo defining the OJT process and role and responsibility of each individual in this area is under

preparation. In addition a standard template for OJT handbook has been developed. As of now around 50% of departments have OJT handbooks.

In response to the recommendation made by the OSART team the plant has identified a root cause of the deficiency in managing operator aids and has initiated a corrective actions plan. A procedure for managing operator aids has been considerably updated and clearly states its definition, template, respective qualities and preferable placements. Since the OSART mission the plant has identified more than 700 non-compliant operator aids, 120 of them have been implemented into operation according to the new approach, more than 500 are being processed for appropriateness and applicability and about 150 still need to be registered and processed. The plant plans to finalize handling of all identified inappropriate operator aids by the end of 2015.

In response to the suggestion made by the OSART team the plant has identified a root cause of the deficiencies in the behaviours and working environment in the control rooms and has initiated a project to improve control room environment. The main objective of the project was to minimize distractions to the shift personnel and enable the crew to remain alert to any changes in plant conditions. The project includes arrangements to change the control room layout to ensure a disruption-free environment, to minimize the number of personnel in the control room in different operating modes and to screen calls during the start-of-shift brief. Some of the actions have already been introduced into routine practice such as limitation of personnel in the control room and are reviewed periodically to ensure that expectations are met. Some of the arrangements such as changing the control room layout and the control room monitoring system are in progress and will be finalized in the near future.

In response to the suggestion identified by the OSART team the plant has undertaken an action plan that aims to improve the plant practice in identifying and handling deficiencies in the field. A sophisticated software has been developed and used together with reliable hardware – a tablet computer, to register and handle deficiencies. The tablet computer is subsequently connected to the plant-wide database to transfer information on deficiencies identified by the plant personnel in the field. Identification of defects in the field is not provided. The plant has started application of a new system for registering defects with two tablet computers used by the plant housekeeping group personnel. Further 28 additional tablet computers will be provided for the plant personnel including shift operators, maintenance personnel and line managers. The plant will review the new process for registering and handling defects in the field during trial application by the shift personnel and then decide if the new system is effective and undertake respective corrections, if necessary.

To address this issue, the plant has created a new post at Director level whose one of the responsibility is to be in charge of planning and monitoring of maintenance defects. An elaborate action plan has been developed to enhance the quality of maintenance work. Implementation of these actions is in progress and work is planned to be completed by end of 2015. Maintenance work request backlog has been further divided into equipment defects and minor defects. As of May 2015 equipment defects have been reduced from more than 1500 in March 2014 to 705 (50% reduction). However minor defects are showing an increasing trend and as of May 2015 stand at 1134 against a target of 850. In 2014, 17 significant events were caused by defects in maintenance quality. The plant has fixed a target of less than 7 events for 2015 and by end April 5 events have occurred due to defects in maintenance.

As for the temporary modification, the plant has improved the coordination of temporary modification by assign a dedicated person to lead the temporary modification reduction actions. Each temporary modification was evaluated to identify the method for its resolution,

and medium-term temporary modification reduction plan was developed. Coordination with Corporate office has been improved. Frequent field and document checks were applied to ensure administrative compliance. The number of temporary modification is closely monitored by the plant, and it is also being reflected into the system health report. The number of temporary modification was stable in 2013 and 2014, and has decreased from 185 to 147 from January 2015 to May 2015.

In response to this recommendation the plant management directed the OE coordinator to monitor the effectiveness of OE programme and conduct annual effectiveness review. Meanwhile directive DI 135 on OE was issued by the Corporate in July 2014. One of the requirements of this directive was to conduct an annual effectiveness review of the OE programme. The plant carried out self-assessment to identified gaps between what existed at the plant and requirements provided by DI135 and an action plan was developed to address these gaps. The plant has developed 8 performance indicators for conducting the annual effectiveness review of the OE programme. While few of these PIs were tracked in 2014 development of all these PIs has been completed by May 2015. Based on these PIs the plant is planning to issue the first annual comprehensive effectiveness review report by the end of 2015.

In response to the suggestion, the plant performed an analysis and an action plan was drawn up. This action plan includes the setting up of strict storage arrangements of radioactive material and waste. The plant modernized the compacting press and signed a contract with contracting firm to ensure regular preventive service and maintenance of the compacting press, for reliable processing of solid waste. The plant also purchased a new X – ray system giving information on the actual content of waste drums. This system also enables better waste sorting. Strict deadlines were set up for processing and shipment of waste. The correction actions regarding to identification of waste are still on-going.

The plant has updated its current chemistry requirements to comply with the suggestion for plant systems regarding organic compounds, corrosion products, oil and control of resins. Enhanced control is performed for aggressive inorganic impurities in plant systems. The method for analysing corrosion products present in the primary circuit is now tested and verified. Instructions for the periodicity of control chart evaluation have been added to the chemistry control programme. The system for oil checks at the warehouse is not fully implemented yet.

In response to the suggestion the plant is currently in the process of revising its entire procurement process and quality control of chemicals and other substances by clearly defining the responsibilities and authority of different departments within this process. The chemistry department has developed a dedicated software for labelling and tracking the compatibility of chemicals until their disposal. The plant provides chemical risk–awareness coaching during newcomer training and refresher training. Also, contractors undertake to comply with requirements for bringing chemicals onto the plant.

The emergency preparedness and response arrangements were upgraded at the plant in 2014. According to the recent procedure, the shift manager has access to all communication equipment to reach the on-call plant emergency director. The team acknowledges all the efforts done to improve the human redundancy and to minimize or even eliminate any potential delays for the declaration of an emergency.

The current IAEA standard still formally requires a person on-site at all times with the authority to declare an emergency without consultation. The new version of the relevant agency's safety standard is to be published soon that would contain refined formulation of the requirement and the plant is going to review and ensure full compliance with the restated requirements.

The plant has also reviewed its arrangements for informing the public in case of different types of emergency. Different facilities equipped with proper telecommunication systems could be used for press briefings. The coordination of all information released is properly ensured by the telephone conference call system operated between different locations. The plant is going to prove with targeted emergency exercises, involving all respective organisations, that the public information given from different locations are coordinated properly and never confusing.

The accident prevention procedure for the spent fuel pool accidents has recently been updated. This procedure now incorporates all the plant modifications that were carried out in order to improve the reliability of the spent fuel long-term cooling.

The plant has also considered the extension of SAMG coverage to mitigate severe accidents occurring in different operation modes. An integrated guideline has been developed to give mitigative advice of an event involving fuel damage either in the open reactor vessel or in the spent fuel pool. The implementation process of this guidance at the plant will be initiated by the end of this year after the proper training has been conducted.

The plant has properly considered the assessment of the hazard resistance of the equipment used for accident management and mitigation. The necessary modifications are already planned and will be carried out soon.

Several emergency response exercises simulating severe external events that affect both units simultaneously were already carried out. The plant is devoted to run such "multi-unit" type exercises in a regular manner. The emergency response plans were also upgraded with the actions carried out by the rapid action force operated by EdF.

The second phase of ongoing post-Fukushima action plan will give the definitive resolution of this issue, when the plant is going to create a so-called "hardened safety core" with equipment that are designed for extreme hazards.

The original OSART team in June - July 2013 developed eight recommendations and fifteen suggestions to further improve operational safety of the plant. As of the date of the follow-up mission, some 23 months after the OSART mission, 30% of issues were fully resolved and 70% were progressing satisfactorily. There was no issue which was considered as having made insufficient progress. These results are very good.

The team received full cooperation from the Chooz NPP management and staff and was impressed with the actions taken to analyse and resolve the findings of the original mission.

The team was allowed to verify all information that was considered relevant to its review. In addition, the team concluded that the managers and staff were very open and frank in their discussions on all issues. This open discussion made a huge contribution to the success of the review and the quality of the report.

1. MANAGEMENT, ORGANIZATION AND ADMINISTRATION

1.1 ORGANIZATION AND ADMINISTRATION

The organization of the plant is well embedded into the Department for Nuclear Production, an organizational unit of the corporate Electricite de France (EDF). Several activities at the plant are strongly linked to the corporate level (e.g. engineering, training, emergency preparedness, finance, etc.). The corporate level imposes many organizational requirements on the plant, however there is sufficient autonomy on essential issues on a local level.

The organization of Chooz NPP is headed by the plant manager and a senior management committee who define the strategy and the daily work and monitoring of performance of the plant according to the so called “macro processes” (MP). Department heads control the different services to run and to maintain the plant. Certain departments, such as training, are linked to the plant at the functional level, however they report to corresponding units at the corporate level.

Functions and duties of the different organizational units are described in “organizational notes”. Annual contracts between different organizational levels, as well as between individuals and their superior, define the annual objectives to be achieved according to the strategic plan.

Financial resources are provided according to an annual budget. In the case of an urgent additional need (e.g. for a safety-related repair) the plant can apply to increase the annually agreed numbers.

Human resources are established according to a plan which describes the necessary staff for the individual organizational units. If certain activities require more staff (e.g. new programs required from the corporate) the plant is free to allocate them within the organization.

At EDF it is usual that managers change their position every 4-6 years. This implies a high fluctuation on the managerial level. The plant has implemented a special program that accompanies new managers during their first months at the plant with the additional support of managers already at the site.

Chooz, being in a remote area at the far north of France, is not very attractive to people from other sites. So, the plant experiences problems in recruiting new people. A working group is dealing with this problem by analyzing the reasons and looking for options to improve the situation.

During its review the team recognized a large backlog in work requests and in the detection and treatment of leaks. Different contributors to this fact were identified by observations and discussions with representatives of the plant. The team has made a recommendation to the plant to strengthen the program on work requests to reduce this backlog.

1.2 MANAGEMENT ACTIVITIES

Apart from the regular management meetings and meetings of several committees, the plant has developed additional tools to improve top-down and bottom-up communication.

The monthly information on plant status and other important issues to first line managers (KIT R'FLEX) is found to be a good practice and the collection and systematic analysis and follow-up of small disturbances and concerns are found to be a good performance.

In order to be informed about the current status and concerns at the plant, the plant manager invites the Shift Manager, Shift Supervisor and Operators to a meeting every 7 weeks.

The Operations Manager presents good and bad results on management expectations (fundamentals), reliability of competences, reliability of the organization and reliability of equipment as well as on a special issue. This gives the plant manager the opportunity to be informed about the daily life on shift, and concerns of the staff. At the same time he may express his expectations directly.

After the meeting the plant manager invites the participants for lunch which gives an opportunity to exchange information in a more informal way.

In addition the plant manager meets every month with representatives of the safety engineers. This allows him to be informed directly on the performance of the plant and safety concerns of the safety engineers. The team has found these two meetings to be a good performance.

1.3 MANAGEMENT OF SAFETY

Many activities at the plant are in place to foster a good safety culture. For example, the plant has put in place a comprehensive "Managers in the Field" (MIF) program. The basis is a booklet containing the so called fundamentals, the expected behaviors. These expectations are translated into observables. These help the employees to easily perceive what behavior is expected and they can also be used by the managers in the field to do observations. The team found this collection of expectations, especially the translation into observables, to be a good performance.

It is expected that managers, after performing an observation, debrief the facts with the observed persons. The observations are fed into a database for statistical evaluation, control of the number of visits by managers and for the follow-up of the findings.

Each manager is expected to do 40 visits per year which adds up to a total of about 2400 visits per year. When this programme was extended to more specific areas, the number of visits per manager dropped. However, the plant is aware of the situation and enforces the program.

Although this program is in place and applied, the team observed several cases when employees or contractors did not behave as expected. The team has made a recommendation to reinforce the safety related behavior of individuals according established management expectations.

During the mission, the team observed practices and behaviours of the plant staff in comparison to the safety culture attributes promoted in the IAEA Safety Standards and has made a number of observations related to strengths and weaknesses that could assist the management efforts to improve safety culture at the plant.

Examples of observed strengths relevant to safety culture:

- Presence of managers in the field is valued by plant employees. Such presence makes managers' involvement in day-to-day activities visible and provides an opportunity for feedback on employees' performance (both positive and negative) to be given without delay.
- Contractor personnel do appreciate the feedback from the plant personnel on the gaps identified in their performance. It is important from the point of view of continuous improvement of individual performance and attitudes.
- Individuals are assigned responsibility for housekeeping in certain areas. This becomes important during scheduled maintenance when equipment and materials are brought into plant premises and can accumulate.
- There is a booklet on 30 operations fundamentals. The booklet helps expectations to be easily understood and includes a short description of items to observe in the field for enhanced relevance of the observations.
- A safety engineer takes part in the daily work request meeting. It provides him with an opportunity to contribute to proper work prioritization and to emphasize importance of correcting safety related deficiencies.
- Supervisors from different contractors expressed the good relationship and trust maintained with the plant in terms of infrastructure support and communication. This supports the fulfilment of the goal that contractors should adopt the same practices and attitudes as plant staff.
- During the OSART mission counterparts demonstrated openness and readiness to share more information, and in this way actively contributed to the joint search for opportunities for improvement.

However, the team also identified areas that could be strengthened to improve the safety culture and encourages the plant to consider these aspects:

- The fire chief mentioned the poorly installed temporary fire hose near the transformer and this was presented as an issue to risk prevention department, but no action was taken to correct the situation. This is an indication that commitment to safety is not consistently demonstrated.
- The procedure modification process is too long. This is not in line with the management expectation that procedures should be as precise and up to date as possible and does not support procedure use to be seen as a human performance improvement tool.
- The Human Performance champions expressed the opinion that the concept of Human Performance is not sufficiently "alive" and it depends whether the manager believes in it or not. This may result in an inconsistent application of the concept across the plant and in different performance standards of staff.

- Many examples of storage permits being out of date or illegible indicate that temporary storage is not seen as receiving sufficient attention and may convey the message that not all expectations and rules are to be followed.

1.4 QUALITY ASSURANCE PROGRAMME

The integrated management system is defined by the corporate level (DPN) and translated to the local needs of the plant. The quality manual lists the 8 Macro Processes under plant internal documents (Organizational arrangements, descriptions of process and subprocesses including indicators and procedures). The team observed in different management meetings that the processes are part of the daily life of the staff. The outcome of processes is monitored by using an appropriate display of the set of indicators for each process and subprocess.

Audits are performed according an annual audit plan and external independent verifications are performed by the corporate level. In order to assure the necessary competence of auditors, an audit group was set up in order to firstly review the findings after an audit in order to make the assessment less dependent on the lead auditor, second, to allow new auditors to become acquainted with evaluation methods and procedures. The team found that establishing such a group is a good performance.

1.5 INDUSTRIAL SAFETY PROGRAMME

The industrial safety programme is well established at the plant. Structured and comprehensive training is performed for employees as well as for contracted personnel.

Nevertheless the team recognized several deviations from the expected behavior in the area of industrial safety and has made a suggestion to the plant to put more emphasis on the rigorous enforcement of industrial safety rules.

DETAILED MANAGEMENT, ORGANIZATION AND ADMINISTRATION FINDINGS

1.1. ORGANIZATION AND ADMINISTRATION

1.1(1) Issue: The plant's process for the management of corrective maintenance and leak repair is not being implemented in a way such that backlogs are minimized and plant safety is maintained.

When a defect on a component, or a leak, is identified on the plant, a work request (DI) is raised in order to repair the defect or leak. The work requests are prioritized at a daily multi-department meeting. The priorities which can be assigned to a work request are:

- P1 defect/leak must be fixed immediately or within 1 day
- P2 defect/leak must be fixed within a period up to 15 days
- P3 defect/leak must be fixed within a period up to 16 weeks
- P4 defect/leak can only be fixed in a refueling outage
- P5 defect/leak can be fixed whenever possible as it has no impact
- P8 defect/leak can only be fixed in a planned outage
- P9 defect/leak can only be fixed in a refueling outage (low significance)

Once the work request has been prioritized it must be processed into a Work Order (OI) before the work can be carried out. The current practice at the plant is to only engineer those work orders (OI) which can be completed with the resources which are available.

Currently (at 24 June 2013) there are 1608 work requests outstanding. This figure is made up of the following:

- P1 7
- P2 165
- P3 877
- P4 192
- P5 53
- P8 12
- P9 294
- No priority specified 8

Included within the total number of 1608 are 353 work requests which have been raised to address identified leaks on the plant. Currently the plant is identifying approximately fifty new leaks per month and is also repairing leaks at a rate of approximately fifty per month.

In addition to the numbers above, the OSART team observed a number of unidentified leaks during its review. By extrapolation of the number observed, it is estimated that the number of unidentified leaks on the plant is approximately 40 – 60.

The plant has a target in place to reduce the number of active work requests. Additional human resources have been allocated to leak repair and to the 'fix it now' team. This has resulted in a reduction of the total number of open work requests as follows:

- In 2011 total No. active DI is 2000,
- 03/2012 – 06/2013 active DI is 1500-1600,
- the target by end of 2013 is 1250,
- the target by end of 2014 is 1050

The OSART team observed on 24 June 2013 the following status of work requests for corrective maintenance not implemented in the timeframe determined by the priority assigned to them during the daily prioritization meeting:

- P2 priority not resolved after 1 month: 87
(should be resolved within 15 days)
- P3 priority not resolved after 6 months: 431
(should be resolved within 16 weeks)

Compared to a total number of 1608 work requests.

As can be seen, a high number of overdue work requests relates to those assigned a priority of P3. The ratio of P3 work requests not treated within the assigned deadline is approximately 40-70% during the last two years. For P2 work requests the ratio of items not treated within the assigned deadline was about 40-50% in 2011 and about 20-40% in 2012 and 2013.

In discussions with managers the team identified the following contributing factors:

- new corporate requirements and local actions on the reliability of equipment led to more maintenance routines
- ageing components need replacing (e.g. fire detectors). Additionally the unavailability of certain components and equipment lead to an increase in the workload of the maintenance department
- priority is not properly assigned. Following fault diagnosis the priority may be reduced but remains unchanged.
- availability of maintenance resources
- the level of experience of recently recruited maintenance staff
- operations staff are now more aware of the detection of deficiencies than in the past
- there is a plant objective to reduce the number of LCOs that can be caused by maintenance activities (no more than four LCOs of type 2 and no more than one LCO of type 1). This means that equipment cannot be released for maintenance/repair if it results in entry into an LCO action.

In addition the team observed the following:

- once a work request gets processed into a work order, execution is generally in line with the goals set; the execution rate of work (preventive and corrective) planned for implementation is 86,2% for the last 3 months, above the target of 85%
- Despite the fact that measures are implemented to follow the trend of delayed work requests, the backlog of work requests remains high and the plan to reduce the backlog appears not to be effective

- The reported number of outstanding work requests is under-estimated as it does not include unidentified leaks
- Due to the high number of work requests the visibility on priorities is reduced
- The plant implemented a leak management organization note in 2012 which describes the roles and responsibilities of the different departments regarding leak management and the expected methodology for identifying, collecting, reporting and solving leaks in order to reduce the number of leaks to less than 50 per unit. However no deadline has been set by the plant for when this target should be reached
- The current backlog of work requests addressing leaks not addressed in the timeframe determined by the priority assigned to them is as follows:
 - P2 (to be treated in 15 days) not resolved after 1 month: 19
 - P3 (to be treated in 16 weeks) not resolved after 6 months: 89

There were 2 leaks at the restart of unit 1:

- One of the turbine seal system. Correction of the leak needs the turbine dismantling. The repair is scheduled for 2014.
- A leak on the primary circuit. Despite the search during the outage, the leak was not identified.

Unit 1 restarted with a balance of primary leak higher than when it was stopped for the outage. However, this daily balance was ever under LCO maximum limit and was not evolutionary. A specific round was performed on valves, but no leak was identified. This balance was specifically followed by safety engineers.

Connection to the grid was performed on April 15, 2013. A hydrogen leak occurred after the connection to the grid.

A high number of outstanding work requests increases the safety risk as the plant is operating with some components which have defects. It also reduces the motivation of staff to raise new work requests when a defect/leak is identified, if it is perceived that actions are not taken to rectify the problem in a timely manner.

Recommendation: The plant should review its process for the management of corrective maintenance and leak repair, and implement it so that backlogs are minimized and the plant safety is maintained.

IAEA Basis:

SSR 2/2

REQUIREMENT 31: Maintenance, testing, surveillance and inspection programmes

The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented.

GS-R-3:

Resources, 4.1 Senior management shall determine the amount of resources necessary and shall provide the resources to carry out the activities of the organization...

GS-G-3.1:

4.1. Senior management should ensure that the resources (including individuals, infrastructure, the working environment ... as well as material and financial resources) that are essential to the implementation of the strategy for the management system and the achievement of the organization's objectives are identified and made available.

4.17 Specific requirements for qualification should be established for critical or unique jobs if highly technical, specialized skills are necessary or if the job has a potential impact on safety and quality, and if it is necessary to ensure that the individual is competent prior to performing the task. Such jobs should be identified by the organization and the qualification requirements that are established should be satisfied.

5.32 Performance indicators should ... be monitored so that changes can be recorded and trends can be determined

GS-G-3.5:

5.6 ... Operation processes describe how the organization:

Operates equipment and systems:

- To meet planned operational needs;
- To respond to off-normal conditions;
- To prepare equipment for maintenance.

Monitors (including sampling and testing) equipment and systems (including system fluids) to confirm that they are performing as expected.

Develops monitoring programmes, analyses the results and makes adjustments as necessary.

3.25 ...

“Senior management shall ensure that measurable objectives for implementing the goals, strategies and plans are established through appropriate processes at various levels in the organization.

6.3...

Reviewing the achievement of goals, strategies, plans and objectives: A series of planned and systematic reviews (sometimes referred to as accountability reviews) should be carried out to assess the progress of individuals or functional units in their achievement of the goals, strategies, plans and objectives relevant to them. Managers at an appropriate level should review the effectiveness of the performance of each individual or functional unit. The reviews should be carried out to a predetermined frequency and schedule to enable a continuous view of performance to be obtained and communicated to individuals. Such reviews should cover historical performance and future plans relating to the goals, strategies, plans and objectives that are described in each department's plan. Such reviews will commonly address the following:

6.8.

Examples of self-assessment techniques for managers and personnel include the following:

(b) Reviews of work backlogs

NS-G-2.4

5.20. To monitor safety performance in an effective and objective way, wherever possible and meaningful, the relevant measurable safety performance indicators should be used. These indicators should enable senior corporate managers to discern and react to shortcomings and early deterioration in the performance of safety management within the train of other business performance indicators.

Plant Response/Action:

A – Causal analysis

The facts observed highlight two main issues:

- Absence or lack of coordination of the equipment anomaly work request backlog and prioritisation of emergent work within the framework of power operations modular planning,
- Organisation of leak management and responsibilities are not clearly defined.

B – Strategy adopted to resolve the recommendation or suggestion

The strategy adopted to resolve the recommendation is based on the following points:

- Set up a coordination of the equipment anomaly work request backlog
- Clarification of the organisation of leak management

C – Method used to check that the action plan is appropriate

Weekly report on work request indicators (total number of work requests and by department)

Monthly report on the fix-it-now team

Monthly leak report

Tracking of the actions concerning leaks by the upkeep of improved plant material condition committee for adjustment if need be

D – Scheduling of the actions taken and added value for problem solving

- Set up a coordination of the equipment anomaly work request backlog
 - Setting up of the post of power operations liaison engineer to liaise between Operations and the power operations project, and especially to coordinate the equipment anomaly work request backlog: closed out
 - Definition of work request quality requirements (3-point work requests) so as to obtain initial diagnostics of a good level: closed out
Redefinition of the types of work request in compliance with the corporate baseline:
 - The equipment anomaly type is used in the event of partial or complete failure of a plant component fulfilling generation aims, in completely safe conditions and respecting the environment.
 - Setting up of a new type of work request, called “GP” (meaning Planning Management), to process the following requests:
 - ✓ Diagnostics, checking and analysis further to a finding, specific request or operating experience
 - ✓ Tracking of changes in an equipment parameter or reliability over time as far as it remains available

- ✓ Modification of equipment, excluding the case of raising of a temporary modification work request
- ✓ Resolution of an anomaly on equipment that is not part of the means of generation

Training in work request quality, type and priorities (ongoing) and drafting of the work request handbook (ongoing)

- Determination and allocation of the targets in terms of the number of work requests to be met by every department and on the site scale: closed out
- Compiling of a weekly report on the work request backlog: tracked
- Setting up of the weekly power operations work request meeting so as to ensure the following conditions for the work requests of equipment anomaly, planning management (GP) and industrial safety type: closed out
 - Quality of the work request backlog, with reminders of requests for closing out, cancellation, reprioritisation or change of type sent to the power operations specialisation representatives,
 - Prioritisation and definition of the maintenance window for priority 3 and 5 work requests within the framework of modular planning
 - Tracking of processing of the work requests prioritised during the past week,
 - Sending to the work request committee of the work requests requiring arbitration between the power operations and outage projects.
- Improved effectiveness of the fix-it-now team, significant contributor to clearing off of the work request backlog, mainly of priority 1 and 2:
 - Conduct of a peer review and benchmarking at Gravelines NPP: closed out
 - Compiling and application of an action plan to improve effectiveness of the fix-it-now team: closed out
- Safety benefits procured with the action plan:
The action plan applied by the site contributes to safer plant operation due to:
 - reduction in the total number of equipment anomalies,
 - effective and reactive processing of emergent work, especially of priority 1 and 2,
 - priorities of processing of emergent work consistent with safety impacts.

- Clarification of the organisation of leak management

- Appointment of a leak expert: closed out
- Updating of the leak management organisation procedure: closed out
Compiling of a leak management flowchart and reflex action sheet recapping the main principles and the roles of every person in leak identification and tracking
- Communication
 - Implementation of communication actions in the departments concerning the organisation defined, management of signs, identification of leaks and collection in the field: ongoing

- Distribution of the leak fundamentals handbook: closed out
 - Determination of the targets to be met in terms of the total number of leaks and active leaks:
 - Fewer than 260 leaks in total for the site by the end of 2015
 - Fewer than 50 active leaks per unit (i.e. 150 for the site)
 - Compiling of a monthly leak report based on the leak tracking indicators: closed out
 - Coordination of the leak work request backlog: Ongoing
 - Compiling of a flowchart for prioritising processing of the leaks: closed out
 - Identification of the work requests to be processed as a priority (TOP TEN):
 - Participation of the leak expert in the weekly power operations work request meetings so as to prioritise the leak work requests within the framework of power operations modular planning
 - Setting up of a link between leak management and fire prevention: closed out
 - Appointment of the fire expert as a member of the upkeep of improved plant material committee since the end of 2014
 - Validation with the fire prevention expert of the list of fluids incurring fire risks (oily leaks)
 - Monthly tracking of the trends in the number of oil leaks recorded in the leak indicators and in the performance indicators for the upkeep of improved plant material condition
 - Strengthened coordination of corrective leak processing to increase effectiveness: Ongoing
 - Monitoring of the contract by management of maintenance department with involvement of the Director in charge of Industrial Policy
 - Setting up of performance indicators to monitor the contractors
 - Experience sharing: closed out
 - The purpose of this experience sharing was to identify the good practices of the other French site and the Belgian sites.
 - 1 dedicated field team walkdown over 2 days is planned on the topic of upkeep of improved plant material condition in 2015 to focus on leaks
- Safety benefits procured with the action plan:
 - Oily leaks cause a risk for nuclear safety, unit capability, worker health and safety and the environment. Reduction in the number of oily leaks contributes to fire risk management, safe operation and more reliable plant.
 - Reduction of water leaks limits:
 - Release of chemicals into the environment,
 - Deterioration of equipment further to rapid corrosion of metal parts,

E – State of action plan progress and reporting procedure

Most of the actions for managing the equipment anomaly work request backlog have been completed. Several actions still have to be carried out for leak management.

As at 01/06/15, the following actions still had to be carried out:

- Training of the departments in work request quality and compiling of the work request handbook: Due date: 31/08/2015
- Communication action on the organisation defined for leak management: Due date: 31/08/2015
- Set up of coordination of the leak work request backlog: Due date: 30/04/2015
- Strengthened coordination of corrective leak processing to increase effectiveness: Due date: 30/06/2015

These actions are integrated in the overall site action plan, with reporting to the relevant committee.

- Management of the equipment anomaly work request backlog: reports compiled for reviews of the power operations subprocess and the macro-process Generate
- Leak management: reports compiled for upkeep of improved plant material condition (MEEI) committee meetings dedicated to leaks and for reviews of the MEEI subprocess and the macro-process Generate

F – Evaluation of action plan effectiveness

Action plan effectiveness is assessed within the framework of reviews of the power operations and MEEI subprocesses and macro-process Generate

IAEA comments:

With the recommendation of OSART mission in 2013, the plant has identified the root causes of the issue as lack of coordination of the equipment defect backlog and prioritization of emergent work request, and lack of a clear definition of responsibility for leak management.

The plant has established a dedicated post working for coordination of equipment defect backlog and another subject matter expert for the leak management.

Relevant plant procedures have been changed to provide clear requirement on the quality of work request, the classification of work requests and the division of responsibility. Directive on leak management was issued as well.

These requirements and changes were communicated to the plant staff via training, departmental meetings, operation daily meetings and internal shift meetings etc. Specific training materials were developed for the equipment defects and leak management.

Equipment defects and leak management performance indicators were established, and weekly and monthly meeting were held to review the trending of these performance indicators, and the effectiveness of equipment defects reduction and leaks reduction campaign. The results were reported to plant senior management.

The number of equipment defects was reduced from about 1400 to 700 within the time frame of December 2013 to May 2015. The number of leaks was reduced from about 400 to 290 within the time frame of April 2014 to April 2015, with the plant target of 260.

The number of work requests with the category of planning management (GP) has increased to about 1300 with the plant target of 850. The plant is monitoring the trend closely and will adjust accordingly after the first trial period.

A field visit confirmed that many of significant leaks have been eliminated, and the housekeeping and material condition improved markedly in the field. While in one case, a steam leak was noticed and water was dripping on the equipment underneath. Proper protection of a motor underneath was not provided with the risk of water dropping on the motor.

Conclusion: Issue is resolved

1.2. MANAGEMENT ACTIVITIES

1.2(a): Good Practice: Information document on plant's performance and emergent issues.

The plant uses an information document with details of the plant's performance and emergent issues, which is sent once a month to the first line managers and they in turn, keep their staff informed.

Efficient top down communication is essential to keep the staff aware of important ongoing activities and to make them feel part of the organization.

The information document KIT R'FLEX provides information on station results in the areas of nuclear safety, production, industrial safety, environmental safety, radiation protection, human resources and financial performance. These topics are complemented with a new item of general and current interest. The document is made up of eight pages with associated comments.

First line managers use this information for briefing their teams in a consistent and structured manner.

The benefit of this document is to promote management alignment by facilitating dissemination of a common message to the whole workforce and to ensure consistency of messages conveyed by management. Timely, consistent and comprehensive information makes the workforce feel part of the organization and promotes ownership of individuals in the plant.

The first line managers appreciate this information transfer and valued it as a good tool to support them in briefing their teams.

1.3. MANAGEMENT OF SAFETY

1.3(1) Issue: The management expectations related to safety related behavior of individuals are not sufficiently enforced in order to make them part of the plant's culture and of the common behavior of individuals.

Management expectations are clearly formulated and communicated to the staff and to contractors (fundamentals) and their application is observed and corrected, if necessary, within the Managers in the Field program. However during the review the team observed deviations from expected behavior in the following areas:

- Industrial Safety
 - The access gate to a ladder (1JSLCOSWL) is defective and does not close properly leading to a falling from height risk.
 - Loosely laid electrical cables were seen at BAN +7.02m, NB0725.
- Operator aids
 - Uncontrolled and unauthorized drawings of the fuel route (CIM DPS 50015) dating back to 27.06.2003.
 - In procedure 12COF PIL0, page 9, concerning power variations, 3 handwritten entries are made, none of them authorized.
- Control room working environment
 - 6 field operators were seen sitting and talking at the MCR meeting table for at least 30 minutes, while waiting for the operations shift crew to finish their turnover.
 - There is no expectation concerning the maximum number of people who can have access to the control room at the same time. The number of people allowed in the MCR is not limited.
- Storage of equipment
 - Two temporary storage permits had expired by more than 4 months (NB1014, level 22 m).
 - Unsecured heavy trolley (2DMR001PR001).
- Fire prevention
 - Hose connected temporarily to hydrant is unfolded in a manner preventing water flowing through in case of need;

- A number of cigarette butts were found in different rooms, including the room containing lubricating oil systems (turbine hall, unit 1), the combustion turbine building, and the ventilation chamber for the pumping station and essential component cooling water system(unit 1).
- Preparation, control and implementation of maintenance works
 - On 27 March 2013, during a unit 1 outage, the turbine was disassembled, which resulted in a pipe support failure due to an insufficient risk-assessment. Originally, the weight of the pipe had been supported by both the pipe support and the turbine.
 - On the jobsite for 1 JPT 013 BA, bolts, nuts and tools were found on the grating of the scaffolding, with no measures in place to ensure that the grating was properly covered.
- Contamination control programme
 - Individual observed leaning over barrier to place source movement box/container onto shelf on controlled side of barrier.
 - MIP 10 frisker in Unit 2 female change area was out of service due to it having been unplugged.
- Control of chemicals
 - A number of drums containing unknown oils and liquids were stored in the Unit 2 auxiliary building.
 - Resin Lewatit was stored in drum for resin Purolite;

Applying management expectations is a proactive means for minimizing the likelihood of people contributing to weaknesses in nuclear safety, radiological protection, industrial safety as well as housekeeping. Without strong adherence to fundamentals on safety focused behaviors, nuclear safety and safety of individuals may deteriorate. If management does not strongly enforce expectations (fundamentals), there is little chance that they may become part of the plant's culture.

Recommendation: The plant should more rigorously reinforce the safety related behavior of individuals in line with established management expectations and promoting individual ownership of safety.

IAEA-Basis:

GS-R-3

3.2. Senior management shall develop individual values, institutional values and behavioural expectations for the organization to support the implementation of the management system and shall act as role models in the promulgation of these values and expectations.

3.3. Management at all levels shall communicate to individuals the need to adopt these individual values, institutional values and behavioural expectations as well as to comply with the requirements of the management system.

SSR-2/2:

Requirement 5: Safety policy

The operating organization shall establish and implement operational policies that give safety the highest priority.

GS-G-3.1

Management Commitment

3.2. Senior managers should provide the individuals performing the work with the necessary information, tools, support and encouragement to perform their assigned work properly.

GS-G-3.5

2.9. Safety culture should be based on a set of safety 'beliefs' (assumptions) and on a code of conduct that reflects the right attitude to safety which is held in common by all individuals in the organization. Ultimately, the safety culture is manifested in individual and collective behaviour in the organization.

Accountability for safety is clear

2.16. Accountability means that all individuals should know their specific assigned tasks (i.e. what they have to accomplish and by when, and how to recognize good results)....

Plant Response/Action:

A – Causal factor analysis

The facts observed have highlighted 3 types of issue:

- **Setting of standards and expectations:** While our set of fundamentals does specify a large proportion of station standards, it did not stipulate the rules for managing control-room environment. In addition, operator aids were tolerated by management.
- **Management reinforcement of standards and expectations:** In 2013, the number of management observations in the field was not up to standard. Not all leaders had been trained to perform these observations, the guidance for performing them had only been recently issued, and leaders were not driving sufficiently high standards.
- Individual **behaviours** were not being embedded through proper coaching: the main rules were described during training and reinforced by management, but their purpose was not always understood. While safety culture does form part of newcomer training, it was not being sufficiently fostered within the different work groups.

B - Strategy adopted to address the recommendation/suggestion

The 3 issues were addressed concurrently:

- Missing standards were set
- Efforts were undertaken to drive up management standards
- Steps were undertaken to make rules clearer and stimulate discussion on the topic of safety culture.

C – Method used to verify adequacy of the action plan

The recommendation was discussed by station management on a number of occasions, thus enabling us to confirm our assessment and agree on corrective actions. These actions were added to the station's business plan for year 2013, based on a similar assessment, thus enabling us to lay down a line of action spanning a number of years. Every year, when preparing the annual safety analysis and the site strategic review, results are re-examined and discussed with management.

D – Action plan

Setting of missing standards:

- Improved control-room environment: see suggestion specific to this topic
 - Role of lead operators in controlling access to the main control room: completed
 - Field operator shift turnover conducted outside the main control room: completed
 - Modification of control-room layout and entrance: in progress
- Unauthorised operator aids removed from plant: see specific recommendation
 - Officially authorized template for operator aids: completed
 - Identification of all operator aids on plant: completed
 - Removal of all unauthorised operator aids and replacement with official operator aids: in progress

Reinforcement of management standards and expectations:

- Management training in field observations:
 - Request for WANO TSM: completed
 - Appointment of a field observation lead: completed
 - Management training: completed
 - Establishment of a management coaching programme: completed
- Management alignment:
 - Establishment of field observation team: completed
 - Involvement of subject-matter experts in field observations: completed
 - Field observations together with contractor supervisors: completed
- Resolution of behavioural gaps:
 - Senior management workshop held to discuss requisite actions: completed
 - Session at training mock-up facility whenever a C2 portal monitor is set off: completed
- Leadership programme:
 - Definition of a site-specific leadership programme: completed
 - Management self-assessment: completed
- Promotion of nuclear safety among the workforce:
 - Deployment of the safety management guide: completed
 - Monthly "1st-line leader" meetings to discuss safety issues: in progress

- Definition of safety initiatives to be included in team performance agreements: completed
- Meeting with contractor supervisors on safety management: in progress
- Refresher training on high professional standards, left to the initiative of the different work groups: in progress
- Work groups provided with a perpetual safety calendar: completed

Improving individual behaviours:

- Deployment of the Safety Culture Guide
 - EDF staff self-assessment: completed
 - Identification of areas for improvement within each team: completed
 - Identification of station-wide areas for improvement: completed
- Station's "professional standards" programme reviewed and updated
 - "Nuclear Attitude" initiative (renewal of badge): completed
 - Safety day 2015 focusing on "nuclear attitude": completed
 - Communication on one fundamental per month: completed
- Implementation of life-saving rules: see suggestion on industrial safety
- Promotion of good practices
 - Contractor human performance award: completed
 - EDF human performance award: being prepared
- Revision of fundamentals guide (format and accessibility): in progress
- Contractor involvement:
 - Nuclear safety considerations written into the GIMEST (Contractors of Eastern France) agreement: in progress
 - More aggressive promotion of human performance tools by HU leads: in progress
 - Involvement of permanent contractors in safety days: completed
 - Overhaul of contractor safety/quality training course (corporate level): completed

E – Progress of action plan and reporting methods

Most actions have been completed. As at 30/04/15, the following actions were still outstanding:

- Changes to control-room layout: in progress, due for completion by end 2015
- Revised format of fundamentals guide: in progress, due for completion in May 2015
- EDF human performance award: planned for the outage in September 2015
- Contractor involvement: in progress, planned for 2015 and 2016
- Removal of unauthorised operator aids from plant: due for completion by June 2015
- Refresher training on high professional standards: in progress, due for completion by end 2016
- Ongoing efforts with first-line leaders: long-term action

These actions have been incorporated into the station business plan with progress reported to each respective committee.

F – Action plan effectiveness review

While we were preparing the action plan, our focus was on the alignment of all managers with station expectations: since January, all managers have been aligned around a common

set of standards, making it easier for leaders to reinforce them and underscoring the messages being conveyed to our workforce. We also focused on driving higher management standards and expectations: managers now have all the tools they need to do this and the leadership programme is helping them to discharge this role more effectively. As far as these 2 objectives are concerned, results have been positive and action plans have achieved their goal.

Nevertheless, the issue of behavioural gaps cannot be said to be fully resolved. The corrective action programme is still routinely highlighting behavioural gaps that we are continuing to analyse and address. Safety management is still an abstract and long-term initiative that has to be sustained over time. This role is now becoming embedded with station leadership but still remains weak within contractor leadership: we are working together with our permanent contractors (GIMEST) in order to bring about improvements.

IAEA comments:

The plant has conducted detailed analysis of this recommendation, and they have identified three root causes of the issue: missing of standards and management expectations in some areas, lack of reinforcement of standards and expectations by management, and insufficient coaching program in the plant.

When developing the action plan, considerations were given to have extensive discussion with relevant stakeholders, link with the action plan with plant business plan, and use of performance indicators.

Missing requirements in areas, such as control room access control and operator aids control, were established, and implemented. Physical modifications; such as improvement to the main control room entrance, are being implemented to have better access control.

All managers in the plant were trained on how to conduct effective observation and coaching, and plant senior management team members, parried with department managers, section managers and subject matter experts, are conducting focus observation in the field on a bi-weekly basis. Contractor supervisors and managers were required to be part of the observation program. Coaching program was established and is being implemented.

Various initiatives have been taken to enhance the awareness of safety culture and nuclear attitude. A monthly focus area has been defined and is being communicated consistently to the plant staff; the focus area is also clearly visible on the plant calendar. Contractor involvement is being improved with nuclear safety considerations written into the contract agreement.

The total number of management field observations has increased from about 1650 to 2000 within the time frame of 2013 to 2015. There is no significant event due to human error in the last 10 months.

A field visit identified two plastic containers, each with 1260kg of unidentified content in the turbine building without proper storage permit and identification of associated risk. It was

later confirmed that the content is sludge water and the containers have remained in the place for about one week.

Conclusion: Satisfactory progress to date

1.5. INDUSTRIAL SAFETY PROGRAMME

1.5(1) Issue: The plant's industrial safety rules are not sufficiently enforced in order to ensure compliance and to encourage the necessary ownership of industrial safety issues with individuals.

The plant has clear Industrial Safety Rules and provides appropriate training in their application. During the review the team identified challenges associated with several aspects of industrial safety as follows:

Falling From Height

- The platform giving access to tank JPT021BA (fire water supply to step-down-transformer) was only secured with plastic chain, which is not sufficient to prevent falls. The risk assessment does not reflect this danger of falling or that of material falling on the workplace below
- Unsafe working arrangements were seen in the Fuel Storage Building of Unit 1. Removal of a slab had left a drop of approximately 40 cm directly behind a desk where people were working. The tape barrier that was in place was both ineffective and poorly positioned.
- A Contractor working standing with one leg on a handrail;

Slips, Trips and Falls

- A loose cable was lying through the door 1YSN961OP.
- A water hose was loosely laid on the floor of an access route (1CRF002PO). There was no warning and protection for pedestrians.
- Condensation from the chillers (BL 12-06LC0806) was falling onto the floor below.
- Loose hoses, which were part of an operator workaround, were lying on the floor (Unit 1 Turbine Hall EL -4.0m)
- Temporary laying of electric cable next to rotating equipment (1CRF002PO)
- At access turnstiles near "Tour d'accès LE TR 1", hoses connected to spray washer were running across the entrance to turnstiles without any warning signs. A warning sign was subsequently posted was not secured and had fallen over. On inspection, the warning was for slippery surface and not trip hazard as it should have been.

Hot Working

- The pipe 1SVA in Unit 1 Turbine Hall at EL +16m was stripped of its thermal insulation, which could cause incident injury to people. There were no warning signs and the area had not been barriered off.
- The pipe 1GSS342CR in Unit 1 Turbine Hall at EL -4.0m was stripped of its thermal insulation, which could cause incident injury to people. There were no warning signs and the area had not been barriered off.

Rotating Plant / Explosion

- There were no protective guards around rotating shaft of pumps which were being close to pedestrians and a transport route (CRF001/002PO).
- Nitrogen gas cylinder and trolleys at EL +7.02m in the BAN are not secured.
- The gas storage area next to the lube oil store contained large numbers of gas bottles (>50) of different types. Not all of these were secured by chain and some did not have caps to protect the valve.

Chemical Hazard

- In the case of a hydrazine spill (the plant stores 2 m³ of hydrazine hydrate at 55% concentration in the turbine building), there is no procedure to protect the workers and first responders over and above the toxicity datasheet kept in a binder in the mobile command post.

The number of industrial safety accidents with lost working time increased during the last two years. In spite of this fact, the objective set for the number of accidents with lost working time in 2013 is higher than the actual number in 2011.

Without strict adherence to the industrial safety rules and respective control and enforcement by the plant management, the personal safety of staff can be compromised.

Suggestion: The plant should consider more rigorous enforcement of its industrial safety rules to encourage ownership of industrial safety issues with individuals.

IAEA Basis:

GS-R- 3:

Requirement 4.5: Infrastructure and the Working Environment.

Senior management shall determine, provide, maintain and re-evaluate the working environment necessary for work to be carried out in a safe manner and for requirements to be met.

SSR-2/2

Requirement 23: Non-radiation-related Safety.

The operating organization shall establish and implement a programme to ensure that safety related risks associated with non-radiation-related hazards to personnel involved in activities at the plant are kept as low as reasonably achievable.

ILO-OSH 2001,

3.10. Hazard prevention

3.10.1. Prevention and control measures

3.10.1.1. Hazards and risks to workers' safety and health should be identified and assessed on an ongoing basis. Preventive and protective measures should be implemented in the following order of priority:

(a) eliminate the hazard/risk;

(b) control the hazard/risk at source, through the use of engineering controls or organizational measures;

(c) minimize the hazard/risk by the design of safe work systems, which include administrative control measures; and

(d) where residual hazards/risks cannot be controlled by collective measures, the employer should provide for appropriate personal protective equipment, including clothing, at no cost, and should implement measures to ensure its use and maintenance.

NS-G-2.14

7.36. The operations manager should also analyse industrial safety related events in the operations department so as to be aware of the direct and root causes of such events. The operations manager should analyse trends in the occurrence of industrial accidents relating to poor industrial safety in the operations department and should take action to reduce the number of events relating to industrial safety.

Plant Response/Action:

A – Causal analysis

Behaviours/Risk awareness

Lack of awareness with regard to certain risks → insufficient awareness of consequences for the health and safety of individuals (gaps in ability to spot deficiencies)

Insufficient involvement in the industrial safety continuous improvement programme.

B - Strategy adopted to address the recommendation/suggestion

Stronger reinforcement of our industrial safety standards in the field, through intensified management presence and reinforcement of expectations in the field.

Raising awareness of risks, particularly with regard to life-saving rules.

C – Method used to verify adequacy and effectiveness of the action plan

Tracking the number of field observations carried out by management

Capture and monitoring of observations into the CAP (Corrective Action Programme) database

Monthly performance indicators:

- Slips, trips and falls & critical hazards
- Hazardous conditions/near-miss accidents

D – Action schedule and contribution of each action to resolution of the issue

- 1- Implementation of industrial safety charter within each team (since 02/2015)
- 2- Specific field observations conducted by managers (senior management, department managers, first-line leaders) accompanied by experts (since January 2015) to reinforce expectations in the field. These are performed in addition to existing management walkdowns.
- 3- Weekly industrial safety walkdowns during outage run by the industrial safety engineer with the involvement of senior management and the GIMEST engineer (since 27/01/15) – post-observation debrief conducted with all contractor representatives.
- 4- Station enrolment in the MASE Est users' group (occupational safety improvement guide)/ station involvement in steering committees responsible for the certification of this guide (since 03/02/15)
- 5- Implementation of life-saving rules (since the summer of 2014) – distribution of leaflets and posting of signs at the site entrance; individuals in breach of these rules interviewed by management.
- 6- Industrial safety round table sessions between the industrial safety director and department leaders, in order to discuss the reinforcement of industrial safety standards (since end 2013).
- 7- Good practices in the area of industrial safety management are discussed by the senior management team; the station director submits any industrial safety queries to department managers (since 2014)
- 8- During outage (since unit-2 maintenance outage 2014), supervision is provided over two 8-hour shifts for work involving industrial safety/RP/fire hazards.
- 9- Weekly industrial safety tours during normal operations. Workshops held to educate personnel about slipping/tripping hazards and critical hazards.
- 10- Attendance of risk prevention personnel (engineers and outage coordinators) at pre-outage project reviews to reinforce industrial safety standards (since 2013)

- 11- Revised version of the weekly report produced by the risk prevention department (since start of 2015) to make it a more effective communication/coaching tool for leaders and their teams.
- 12- Nuclear fundamentals guide (risk assessment, PPE, worksite controls, manual material handling, critical hazards).
- 13- Weekly circulation of "4S" newspaper during outages.
- 14- Stop & Go deployed within all EDF and contractor teams.
- 15- Reinforcement of industrial safety standards at contractor induction sessions.
- 16- Corrective action programme to include industrial safety suggestions made by contract companies in the CAP (Corrective Action Programme) database.

E – Progress of action plan and reporting methods

The industrial safety charter is signed by personnel and signposted in each department.

Findings raised during the various observations are documented and addressed via the corrective action programme.

Findings raised during management field tours are discussed at senior management team meetings.

Findings raised during outage industrial safety tours are discussed with contractor representatives and the outage organisation.

F – Action plan effectiveness review

With the exception of 2014, the EDF and contractor accident rate (lost time and non-lost-time) has been constantly decreasing since 2009.

There have been improvements in the wearing of safety goggles on plant.

Deviations from life-saving rules are systematically addressed.

For many of the jobs performed during the unit-2 maintenance outage in 2014, industrial safety issues (asbestos, working at height, etc.) were identified during the planning phase; mitigations were discussed with the risk prevention department prior to implementation; these controls were monitored during work execution.

Department leaders discuss good industrial safety practices.

CAP findings are used as input for the annual industrial safety improvement review.

IAEA comments:

As for the suggestion in industry safety, the plant has identified the root causes of the issue as insufficient awareness of certain risks, and lack of involvement in continuous improvement initiatives focusing on industry safety.

The plant has been reinforcing its industry safety expectations by more frequent field observation and coaching, and increase of field presence by managers.

Focused observations of industry safety issue were conducted with the subject matter experts and relevant managers. Campaign on promoting safety aware, particularly with regard to life-saving rule is visible in the plant, and consistently communicated to the plant staff via different means, such as pocket size card, handbook, meetings, walk downs, and trainings etc.

The number of field observations and coaching were tracked, together with the track of findings in the corrective action program.

Industry safety meeting were held with the contractor senior managers every quarter. During outage weekly industrial safety observations were conducted together with contractor representatives in the field. Post-observation debriefs were conducted with all contractor representatives.

In 2014, there were two serious industry safety events involving electrical induced burns when working on defect equipment. It indicated weaknesses in the recognition of safety hazards. The plant has strengthened the measures taken, and there is a sign of improvement. There was no major loss time accident during the first outage in 2015, which was an improvement compared to previous outages.

Field visits during the follow-up mission indicated improvement on elimination of industry safety hazards. However, a steam leak in the turbine building of Unit 1 was noticed and was not properly fenced off, and a few bumping hazards were noticed, and the plant is taking prompt actions on addressing them.

Conclusion: Satisfactory progress to date

2. TRAINING AND QUALIFICATIONS

2.1 TRAINING POLICY AND ORGANIZATION

The overall professionalization needs of the plant are obtained by the skills mapping and succession planning (GPEC) processes in place. These activities are yearly performed by management for a 3 years period and presented to the unions to improve transparency and visibility of competency programme. The individual skills mapping makes the real professionalization needs in the departments visible. Changes on the professionalization level in the skills mapping are done using the input of task observations (OST). Management anticipates on changes in human resources, based on using these processes. Due to the high staff turnover (11% per year) at the plant, these processes are needed to avoid skills and resource gaps in the departments. The OSART team has recognized this as a good performance.

Since the beginning of 2013, 177 training committees at several levels (site, department, teams) have been created at the plant to discuss local professionalization needs. These committees, which include people from management, training and departments, meet every 3 months to discuss new professionalization needs, to evaluate training actions and to set up action plans.

Examples of good initiatives taken by the committees:

- Mock ups on flow loop simulator to practice entering reservoirs.
- Mock ups to do surveillance tests in Maintenance I&C departments.

The committees are seen by the OSART team as a good performance.

2.3 QUALITY OF THE TRAINING PROGRAMS

The plant should consider developing On The Job training material which would be guide for technical experienced people, who are occasionally OJT trainers, to deliver adult training in accordance with training standards. The plant should also consider setting up a general guideline for performing OJT. The team has made a suggestion in this area.

2.4 TRAINING PROGRAMS FOR CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

Simulator trainers are qualified in adult training but had no additional training in Human Performance focused on how to deliver training in this specific area. Human Performance training is different than usual simulator training because it places the emphasis on human behavior. These behavioral aspects demand specific additional training for human performance trainers. The team has developed a suggestion in the area of human performance training.

DETAILED TRAINING AND QUALIFICATION FINDINGS

2.3. QUALITY OF THE TRAINING PROGRAMME

2.3(1) Issue: On the Job Training materials are not sufficient and there are no requirements to give OJT trainers guidance on adult learning.

The following observations were made:

- OJT trainers are experienced people who are experts in their technical field but they are not trained on adult learning as there is no initial or refresher training foreseen.
- There is no requirement which states when an OJT trainer can become a part-time trainer.
- There is a procedure which describes the roles and missions of “tutors” and “OJT trainers”. However there is no plant requirement which describes the process of On the Job Training.
- There are some deficiencies in the OJT training material:
 - The OJT training material only contains training objectives and a checklist to help the manager assessing the trainee.
 - The OJT training material does not describe “how” the OJT trainer has to deliver his training. There is no guide describing how to deliver the OJT training keeping in mind the standards of adult learning.
 - There is no formalized OJT template which gives guidance to the OJT trainer for processing the training.
 - A maintenance manager, responsible for training, declared that the main weakness on training is not having enough OJT trainers and not having good training documents to enhance OJT.

Without having well designed On the Job Training material, an OJT trainer has no guide to facilitating adult learning, deficiencies in the quality of training could exist, leading to performance problems at a plant.

Suggestion: The plant should consider improving On the Job Training materials and provide OJT trainers guidance on adult learning.

IAEA Basis:

SSR-2/2

4.23. All training positions shall be held by adequately qualified ...persons, who provide ... skills. Instructors ... shall have the necessary instructional skills.

NS –G–2.8;

4.15 (b) “On the job training should be conducted in accordance with prescribed guidelines provided by incumbent staff who have been trained to deliver this form of training. Progress should be monitored and assessments should be carried out by an independent assessor”.

4.45 “The operating organization should maintain adequate records of the training of individuals (including on the job training), of the performance of individual trainees (including a list of main activities performed on the job) and of any formal authorization given. The main purposes of these records are:

- to provide evidence of the competence of all persons whose duties have a bearing on safety;
- to provide evidence of authorization;
- to enable line managers to deploy their staff effectively, ensuring that only suitably qualified and experienced staff are assigned to safety related tasks;
- to provide the information necessary for reviews of the training programme and for corrective actions, if necessary;
- to provide the documentation necessary to meet regulatory requirements (in the granting or renewing of authorizations).”

5.2. “Formal on the job training provides hands-on experience and allows the trainee to become familiar with plant routines. However, on the job training does not simply mean working in a job/or position under the supervision of a qualified individual; it also involves the use of training objectives, qualification guidelines and trainee assessment. This training should be conducted and evaluated in the working environment by qualified, designated individuals.”

5.31. “Training instructors, on and off the site, should have the appropriate knowledge, skills and attitudes in their assigned areas of responsibility. They should thoroughly understand all aspects of the contents of the training programmes and the relationship between these contents and overall plant operation. This means that they should be technically competent and show credibility with the trainees and other plant personnel. In addition, the instructors should be familiar with the basics of adult learning and a systematic approach to training, and should have adequate instructional and assessment skills.”

Plant Response/Action:

A – Causal analysis

On-the-job training at Chooz NPP is not structured enough, or sufficiently formalised for all the specialisations. There is insufficient coordination at site level (framework, support and checking).

OJT was incorporated in the HR skills development activities without being prioritised. Certain departments have a structured OJT booklet and others use specialisation professional development guidelines to monitor and condition skills acquisition. The on-the-job trainers are not only part time instructors, trained in the pedagogical aspect of transmission of skills. Every authorised employee can be an on-the-job trainer in an activity. The role of the on-the-job trainer and the training objectives may not be properly known and understood.

In addition, lack of standardisation across the NPPs is observed. The Division memo dates back to 2005 (a draft Division framework instruction with a standard OJT booklet is being prepared).

B – Strategy adopted to resolve the suggestion

Development of quality OJT has been adopted as one of the priorities of the project for reaching the level of good for the skills development programme at Chooz.

Within the framework of the setting up of a skills development team, a change in the delivery of OJT has been decided upon.

- A site coordinator has been appointed.
- A series of deliverables has been scheduled.
- A communication and awareness raising plan has been compiled.

Development of on-the-job training is related to the Systematic Approach to Training (SAT), deployed at Chooz NPP as from the end of 2014, for the operations specialisations of field operators and control room operators, I & C maintenance specialisations and mechanical, boilermaking, valve and electricity maintenance specialisations.

Based on a strategy of baseline consistency, compiling of OJT booklets (or updating of those already existing) is aligned on site deployment of the SAT baselines.

Several specialisations have OJT booklets that are used (chemistry and field operations) or that were set up in 2014 (testing, mechanical, boilermaking, valves, electricity and Safety Engineers).

These OJT booklets have been or will be updated to be consistent with the SAT baselines.

C – Method used to check that the action plan is appropriate and to check effectiveness

The action plan has been discussed and validated:

- at the review of the project for reaching the level of good for the skills development programme at Chooz
- at the skills development and recognition committee meetings (discussions with the departmental skills development support functions)
- at the site training committee (CF3) meetings
- with the management of change representative

D – Action plan

The action plan, initially scheduled for 2014, was partly postponed to 2015, to be aligned on deployment of the SAT baselines and setting up of the skills development team.

1 – Objectives and actions for success

Objective: Optimise the organisation of on-the-job training at Chooz NPP

- Coordinators and points of contact identified to provide method support to the departmental skills development support functions and first line managers for deployment of the SAT baselines and OJT booklets
→ effective since the end of 2014
- Inventory of OJT in the I & C and Testing, Electromechanical, Technical and Environment, Operations and Industrial Safety and Radiation Protection Departments (existing OJT booklets used and integrated in the individual training records, link to the SAT baseline, identification of on-the-job trainers, good practices, etc)
→ closed out in the first quarter of 2015
- Gathering of good practices from other Nuclear Power Generation Division (DPN) sites
→ closed out in the first quarter of 2015

Objective: Provide the on-the-job trainers with the means of fulfilling their remit

- Compiling of a site OJT instruction, defining the OJT process and everybody's roles and responsibilities, with a standard template of the OJT handbook to be adapted to job-specific features
→ draft version of the instruction prepared as at 31/03/2015
→ discussion with the skills development support functions, first line managers and specialisations in April and May 2015
→ due date for senior management approval at the macro-process MP6 committee meeting of 3/6/2015 and at the site training committee (CF3) meeting of 19/06/2015
- Training support and information provided to the OJT participants with materials, such as the on-the-job trainer memo, and occasional observation by the coordinator during OJT interventions in the field
→ due date for observation of OJT interventions = throughout 2015
→ due date for approval of the training materials at the macro-process MP6 committee meeting of 3/6/2015 and at the site training committee (CF3) meeting of 19/06/2015
→ due date for communication: 30/09/2015

2 – Communication and awareness raising plan

- Information and awareness raising of the managers at the monthly first line manager meetings (presentation of the action plan, inventory of OJT, draft version of the instruction and on-the-job trainer memo)
→ due date: 14/04/2015 (sending of the documents in advance to the departmental skills development functions for comments)
- Information of the second line managers (Department Heads) at the management team operational meetings
→ scheduled on 13/04/2015 (sending of the documents by e-mail in advance)
- Awareness raising of the new recruits with the nuclear core knowledge training programme (AKSCPN) as to their role in their own professional development (new recruits participate in their professional development)

- ➔ scheduled on 30/04/2015 (then slot to be integrated in the scheduling of the next nuclear core knowledge training programmes)
- Information at the skills development and recognition committee meeting: Reminder of the link between deployment of the SAT and setting up or updating of the OJT booklets and presentation of the final draft of the site instruction
- ➔ committee meeting of 28/5/2015

The following actions are outstanding as at 30/04/2015:

- Senior management approval of the site OJT instruction, defining the OJT process and everybody's roles and responsibilities, with a standard template of the OJT handbook to be adapted to job-specific features
- ➔ due date: 30/06/2015 by the latest
- Training support and information provided to the OJT participants with materials such as the on-the-job trainer memo
- ➔ due date for approval of the training materials: 30/06/2015 by the latest
- ➔ due date for communication and recurrent integration in the training programme schedule: 30/09/2015

The end of the action plan is planned for 30/09/2015.

Meetings for reporting changes in the action plan:

- at the review of the project for reaching the level of good for the skills development programme at Chooz (10 times a year)
- skills development and recognition committee meetings (3 times a year)
- macro-process MP6 committee meetings (5 times a year)

E – Evaluation of action plan effectiveness

- Checking plan for 2015: Check the existence and use of the OJT booklet for the specialisations whose SAT baseline has been deployed in the field and consistency of the OJT booklet with the SAT baseline
- ➔ due date: 31/12/2015
- ➔ to be rolled out in 2016
- Checking plan for 2015: The OJT booklets are incorporated in the individual training records at the end of the professional development period
- ➔ due date: 31/12/2015
- ➔ to be rolled out in 2016
- Survey of the specialisations with OJT booklets to compile operating experience on OJT (viewpoints of the on-the-job trainer and the new recruit)
- ➔ in the first half of 2016
- ➔ to be rolled out in 2017, and then study relevance of sustaining this survey
- Assessment performed with the departmental skills development support functions at the skills development and recognition committee meetings (3 times a year)

IAEA comments:

Subsequent to the OSART mission development of quality OJT programme has been identified as one of the priorities at the plant. In the training department a position dedicated to OJT has been created. The plant is committed to produce OJT material which is in compliance with systematic approach to training (SAT). An action plan was set up to meet this commitment which is expected to be completed by end 2015. Coordinators and point of contacts to support this action plan have been identified in each department. A site note defining the OJT process and role and responsibility of each individual in this area is under approval. In addition a standard template for OJT handbook has been developed. As of now around 50% of departments have OJT handbooks (for field workers). Presently each first line manager based on his experience is expected to select OJT trainers. However no written guidelines/ criteria exist to support the first line manager to make this selection.

Conclusion: Satisfactory progress to date

2.4 TRAINING PROGRAMMES FOR CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

2.4(1) Issue: Simulator trainers are not sufficiently trained and qualified as human performance coaches and training scenarios do not always emphasize human performance standards.

Trainers had initial training on Human Performance.

A Human Performance leader, who is a volunteer for this task, was appointed in the training department at the beginning of 2013. This Human Performance leader will coach his colleagues by observations during training and by the organization of trainers' meetings on Human Performance.

However, the following observations were made:

- Refresher training on the flow loop simulator for 13 trainees, divided in 4 groups, was conducted by 2 trainers.
 - The first trainer on the flow loop simulator had to combine the task of observing the training from a distance (camera) and playing the role of the “warehouse” manager. Due to this double role and his attention being divided between 4 different groups, the trainer could not observe all the actions.
 - The second trainer on the flow loop simulator had different roles at the same time: observer, coach, participant in the exercise (role as manager, other departments). The trainer could not coach every group at the same time. The trainer could not collect all the information from the 4 groups at the same time because he was too busy playing the different roles.
- Assessment and training are done during the same exercise. Feedback is given during the debriefing and not on the spot.
- Having half a day of practical training on the flow loop simulator every 2 year, trainees can only do one practical exercise and perform one role (work leader, technician or observer).
- The Pre Job Briefing was not directly corrected by the trainer.
- During a human performance exercise, where communication was an important theme, the trainer did not correct on the spot the non systematic use of 3 way communication.
- During an initial Human Performance training on the flow loop simulator the trainer did not directly correct and coach during the practical exercise.
- At the beginning of the full scope simulator session (refresher training with a whole shift team, including the shift supervisor and shift manager), there was no shift briefing. The instructor gave some information on the plant status and asked the shift crew to go to their workstations. Neither the instructor nor the management (shift manager – shift supervisor) pointed out expectations at the beginning of the simulator session.

- Human Performance-specific scenarios are not regularly used on the full scope simulator.
- There is no regular training on specific human performance scenarios on the simulator. The last full scope simulator scenario 100% dedicated to Human Performance was more than 3 years ago.
- The instructor said that there is no shift briefing because it is not in the corporate specifications to do a shift briefing.
- The Just In Time Trainer for outages was not qualified and trained to reinforce the Human Performance standards as there is no initial or refresher training foreseen.
- Simulator trainers had initial training on Human Performance. The content of the training is not specific to teach trainers to become Human Performance coaches.
- Refresher training on Human Performance for trainers is not foreseen. Some trainers had their initial training 2 years ago without any specific refresher training.
- Simulator trainers do not follow the 2-yearly “PARQ” training (refresher training on Human Performance for all Chooz staff) on the flow loop simulator.
- Simulator trainers are not regularly observed by colleagues and management on their performance as a (Human Performance) trainer and there is no requirement for observations on the simulator.
- The Human Performance expert of the Operations Department stated that at the moment the plant reached 50% of the maturity target level of Human Performance.
- A training expert declared that the level of Human Performance remains stagnant.

Not having well trained simulator trainers in the area of Human Performance and not regularly training the plant staff on specific Human Performance scenarios are a missed opportunity to enhance the Human Performance skills and to bring the plant to a higher Human Performance standard.

Suggestion: The plant should consider providing training for simulator trainers to become human performance coaches and placing more emphasis on human performance in the simulator scenarios.

IAEA Basis:

NS-G-2.8;

5.17 “Control room operators should also be trained in plant diagnostics, control actions, administrative tasks and human factors such as attitudes and human–machine and human–human (teamwork) interfaces. Shift supervisors should additionally be trained in supervisory techniques and communication skills. Their training should, in general, be more broadly based than that of other operators”.

4.18. “The training of control room operators should include, as a minimum, classroom training, on the job training and simulator training. The classroom training and on the job training should be planned and controlled to ensure that all necessary objectives are achieved during the training period. Simulator sessions should be structured and planned in detail to ensure adequate coverage of the training objectives and to avoid possible negative training due to the limits of simulation. The sessions should include preliminary briefings and follow-up critiques”.

3.23. “Training instructors should ideally have an academic background in an education related subject, in addition to a degree in an appropriate discipline in their area(s) of responsibility.”

5.31. “Training instructors, on and off the site, should have the appropriate knowledge, skills and attitudes in their assigned areas of responsibility. They should thoroughly understand all aspects of the contents of the training programmes and the relationship between these contents and overall plant operation. This means that they should be technically competent and show credibility with the trainees and other plant personnel. In addition, the instructors should be familiar with the basics of adult training.”

Plant Response/Action:

A – Causal analysis

The facts observed highlight the following issues:

- **Training of the instructors in error reduction tools:** Training of the instructors in this topic was not standardised. There was no specific training course in this topic for the instructors. The Training Department did not have a cascade trainer in error reduction tools capable of training his colleagues. The master subject matter experts in error reduction tools never observed the instructors on the job.
- **Specific simulator scenarios:** Even if the instructors observe application of the error reduction tools by the trainees during every simulator training session, there was no specific scenario to this theme. Feedback was only provided during debrief.
- **Refresher training in error reduction tools was not always consistent with the trainees’ specialisations.** There was only one type of refresher training in error reduction tools at the worksite training facilities.

B – Strategy adopted to resolve the recommendation or suggestion

The issues were processed in parallel:

- Specific training in error reduction tools has been developed for the instructors. All the simulator instructors have attended this training.
- Simulator specific scenarios to the error reduction tools have been developed.
- Refresher training in error reduction tools tailored to every specialisation is being designed.

C – Method used to check that the action plan is appropriate

The OSART suggestion corresponds to diagnostics already performed since the end of 2012: the issue of inappropriate training as it was too standardised was regularly reported by the trainees. Added value of the new formula is regularly discussed with management.

D – Action plan

1/ INSTRUCTOR TRAINING IN ERROR REDUCTION TOOLS

- Development of instructor training for subject matter experts in error reduction tools. **Closed out**
- All the simulator instructors have attended this training. **Closed out**
- Training of a cascade trainer in error reduction tools within the department (1-week specific training course (PAPF) + doubling up + validation by an expert). **Closed out**
- Setting up of specific refresher training in error reduction tools for instructors every 2 years. **Closed out**
- Observations of the instructors by the site master subject matter experts during training in error reduction tools + feedback. 4 times a year **Ongoing**

2/ SETTING UP OF SIMULATOR SCENARIOS SPECIFIC TO ERROR REDUCTION TOOLS

- 2 simulator scenarios specific to error reduction tools have been developed and run for control room operators. **Closed out**
- All the control room operators will have performed these training scenarios between September 2014 and June 2015. **Ongoing**.
- Deviations in application of the error reduction tools during these scenarios can be corrected by the instructors in real time. **Ongoing**

3/ DEVELOPMENT OF REFRESHER TRAINING IN ERROR REDUCTION TOOLS TAILORED TO EVERY SPECIALISATION

- Safety day in 2014 dedicated to error reduction tools. **Closed out**
- Consideration given by every work team to define the topics, scenarios and training resources tailored to their day-to-day activities. **Closed out**
- Support for consideration provided by the site operational coordinator of error reduction tools and the Safety Director for all the managers. **Closed out**
- Setting up annual refresher training (half a day) run by the manager and subject matter expert in error reduction tools for every work team based on the topics selected. Period of 2015-2016. **Ongoing**.

E – State of action plan progress and reporting procedure

Most of the improvement actions have been taken. 3 actions are still ongoing (see the results & D).

These actions are integrated in the overall site action plan, with reporting to the relevant committee. Refresher training of the teams in error reduction tools has been adopted as a safety priority action for 2015.

F – Evaluation of action plan effectiveness

The WANO Peer Review in 2014 observed improved reinforcement of the error reduction tools by the instructors. The peer audit on operating and maintenance quality deficiencies highlighted the definition of scenarios specific to every specialisation as a strength.

IAEA comments:

The plant has developed a training course on error reduction tools. All the 12 simulator instructors have undergone this course. Records of this training are maintained by the training department. Refresher course on this subject with a frequency of every 2 years has also been formalized. Two simulator scenarios specific to error reduction tools have been developed for control room operators. One of these scenarios pertains to collapsing of bubble in the pressuriser while the other scenario handles starting of PCPs. All the control room operators will be completing training on these two scenarios by the end of this month. A simulator training session involving four trainees was witnessed and trainees were found to be using a number of error reduction tools like two way communication and peer check. The instructor was correcting the trainees when error reduction tools were not applied.

Conclusion: Issue is resolved

3. OPERATIONS

3.1 ORGANIZATION AND FUNCTIONS

In addition to the 7 shift crews, there is a well-staffed off-shift and outage structure. A competence matrix allows checks to be carried out to ensure that the competences are in place compared to the predefined competence target diagram for each of the teams. A succession and training programme makes use of this tool to hire people in time and to avoid major gaps in the required competence mix. This is considered a good performance.

Four new functions (shift supervisor (CED), security manager (DSE), control room senior operator (OP pilote), senior field operator (HMT)) were recently created to make the organization more robust. A ninth shift manager makes it possible to replace shift managers to enable them to spend time with the crewmembers in the field when they are on duty. These new functions allow the plant organization to be more resilient in normal operations as well as in the case of abnormal operating conditions (fire, other incidents). The team considers this as a good performance.

A booklet summarizes the expectations of the Operations Department in 9 fundamental themes so that each employee can perform a self-assessment. These expectations are regularly assessed in the team and observed by the Operations managers during observations. This is considered a good performance.

The OSART team encourages the plant to continue using the human performance tools, as a lack of systematic use of error reduction tools has been observed in the main control room (MCR) as well as in the field. This is particularly the case in the area of place keeping, self-checking and pre-job-briefing which need further attention.

Several self-assessment groups regularly discuss and propose enhancements in existing work methods (reactivity, alignments, error reduction tools). All crew teams are involved and measures are taken to allow all members of the shift to attend. This approach leads to empowerment and is considered as a good practice.

The plant is open-minded and often uses external expertise to analyze and enhance its processes. This is considered a good performance.

3.2 OPERATIONS FACILITIES AND OPERATOR AIDS

System and equipment status is clearly indicated in the MCR. All standing alarms were documented and had been subject to a risk analysis. For each alarm occurring, a constantly updated information sheet gives clear and comprehensive instructions.

The plant does not have a system in place for managing operator aids and ensuring that unauthorized and uncontrolled operator aids are not used by operators in the MCR and throughout the plant. Therefore, the team has made a recommendation in this area.

3.4 CONDUCT OF OPERATIONS

The team found many examples of avoidable disturbances in the MCR. The team has made a suggestion to enhance plant expectations with respect to behaviors related to the MCR working environment which are considered to be not adequately developed or reinforced enough to provide a distraction-free environment.

Over the last two years, there have been several reactivity events. Together with Civaux NPP, a working group has been created to look at all reactivity events. The plant has an action plan in place to improve reactivity awareness of the crews which includes simulator and classroom training on reactivity management. The team encourages the plant to analyze the root causes of recent events in depth to avoid recurrence.

The team noted some deviations in the area of key management in the MCR. The actual arrangements do not allow a consistent check of safety related keys. The plant is encouraged to ensure that the control of safety related keys provide a robust barrier to maintaining plant configuration.

The team noted that there are a number of missing and broken labels in the plant. Lack of good labeling can lead to mistakes in executing local manipulations. The team encourages the plant to check labeling in a systematic way.

Not all leaks in the installation are marked in a consistent way. During the plant tour, the team observed more than 20 shortcomings in identifying leaks with correct leak tags. An estimated 10 to 20% of all leaks are not correctly identified. The team encourages the plant to identify all leaks in the plant in a timely manner.

Field operators use an ultra sonic detector for detecting different types of air, hydrogen, steam leaks etc. The team considers this as a good practice.

Storage of non-fixed equipment and materials in the field is not sufficiently managed to minimize the risks to the plant in case of internal and external events. The team has made a suggestion in this area.

Deficiencies in equipment on the plant are not clearly identified in the field. The field operators have no straightforward way of identifying which deficiencies have already been reported in the work order system when conducting their plant rounds. The team has made a suggestion in this area.

The plant has implemented an ergonomically designed lay-out board for tags on safety related valves in the tagging office to allow a quick check. This is considered as a good practice.

3.5 WORK AUTHORIZATIONS

In a face-to-face meeting, the operations tagging officer discusses with the team leader of the maintenance crew carrying out the work, the status of the tag-outs required to be in place for performing the work in a safe manner. A tag-out review Aide Memoire is used. This is considered a good performance.

The plant has a multidisciplinary “fix it now team”, consisting of an operation representative and an expert from I&C, mechanical and electrical divisions. During a daily meeting early in the morning, led by the shift supervisor, they discuss the new urgent work requests of the last

day and evaluate which ones they can resolve themselves. This separate team helps to resolve problems quickly without putting a burden on the regular maintenance teams that are mainly dedicated to scheduled work. This is considered as a good performance.

3.6. FIRE PREVENTION AND PROTECTION PROGRAMME

The team found examples of plant arrangements in the field and of worker practices which were not sufficient to ensure that fire prevention provisions are effective, and therefore has made a suggestion in this area.

The timely response of the second line response team during training exercises does not always meet requirements. The team noted that the members of the onsite response team do not use special professional fire fighting protective clothing and there are indications that the main means of raising the alert and communicating i.e. the DECT-telephone, does not always work reliably. The plant is encouraged to maximize the effectiveness of training exercises and the condition of equipment used for fire fighting.

DETAILED OPERATIONS FINDINGS

3.1. ORGANIZATION AND FUNCTIONS

3.1(a) Good Practice: Self-assessment groups to discuss enhancement plans within Operations.

The Operations Department has set up self-assessment groups to discuss and resolve specific issues within Operations. Topics considered by these groups include:

- Optimizing staffing within operations,
- Improving control room serenity,
- Improving configuration management,
- Sharing operating experience,
- Improving waste management,
- Improving effective plant rounds,
- Improving documentation management

The operations department also participates in 3 cross-departmental self-assessment groups to address such topics as:

- Improving the temporary modifications process,
- Improving the work authorization process
- Improving reactivity management

Each of these groups has at least 1 member of each shift crew and the groups meet at least 4 times a year. The meetings are chaired by Operations management. To allow all members to attend, measures are taken to replace shift crew members when on duty.

These self-assessment groups benefit from sharing good practices or problems encountered between the various shift teams. The involvement of management ensures that action plans are produced as agreed in a timely manner.

The plant indicates that the creation of these self-assessment groups has empowered the Operations personnel.

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

3.2(1) Issue: The plant does not have a system to manage operator aids and ensure unauthorized and uncontrolled operator aids are not used.

The plant does not have written guidance to authorize and control operator aids posted in the plant. Observations by the team include uncontrolled warning instructions, handwriting on schematics and supplementary information.

Examples of uncontrolled aids are listed below:

- Uncontrolled postings on the back panel of the unit's 2 main control room regarding an attention-notice on reactor coolant system RCP211RS
- Handwritten notes on Control Panel 1LHP220CR, 1LHP005AR and 1LHP220CR, diesel generator train A on unit 1
- Cabinet PME251AR in the Fuel Pool Room has a flow diagram. Unauthorized hand written information (2 valves added, 2 system connections indicated)
- Non authorized Operator Aids in LC710 on heavy duty circuit breakers (6KV) e.g. on 2CEV002PD, 2LGB001JA, 2LGE001JA 2LGE002JA 2LGE004JA
- On door 2JSL001PD a sign indicating some "Detection of Freon 2DELCO2SZ Out of Service" without authorization or date
- Unauthorized Operator Aids on cabinet 1DTV101CR in Emergency Shutdown Panel LC0706, train A. Same applies to adjacent train B
- 3 unauthorized instructions on panel 0LHT00210
- On panel 2DMK003CR a handwritten instruction "to deduct 0,4m" from the value indicated

Having unauthorized and uncontrolled operator aids may lead to human error and improper safety system operation.

Recommendation: The plant should establish a system to manage operator aids and to ensure that operator aids are authorized and controlled.

IAEA Basis:

SSR-2/2

7.5. A system shall be established to administer and control an effective operator aids programme. The control system for operator aids shall prevent the use of non-authorized operator aids and any other non-authorized materials such as instructions or labels of any kind on the equipment, local panels, boards and measurement devices within the work areas. The control system for operator aids shall be used to ensure that operator aids contain correct information and that they are updated, periodically reviewed and approved.

NS-G-2.14

6.15. Operator aids [13] may be used to supplement, but should not be used in lieu of, approved procedures or procedural changes. Operator aids should also not be used in lieu of danger tags or caution tags. A clear operating policy to minimize the use of, and reliance on, operator aids should be developed and, where appropriate, operator aids should be made permanent features at the plant or should be incorporated into procedures. [13] Operator aids include sketches, handwritten notes, curves and graphs, instructions, copies of procedures, prints, drawings, information tags and other information sources that are used by operators to assist them in performing their assigned duties.

6.16. An administrative control system should be established at the plant to provide instructions on how to administer and control an effective programme for operator aids. The administrative control system for operator aids should cover, as a minimum, the following:

- The types of operator aid that may be in use at the plant;
- The competent authority for reviewing and approving operator aids prior to their use;
- Verification that operator aids include the latest valid information.

6.17. The system for controlling operator aids should prevent the use of unauthorized operator aids or other materials such as unauthorized instructions or labels of any kind on equipment, local control panels in the plant, boards and measurement devices in the work areas. Operator aids should be placed in close proximity to where they are expected to be used and posted operator aids should not obscure instruments or controls.

6.18. The system for controlling operator aids should ensure that operator aids include correct information that has been reviewed and approved by the relevant competent authority. In addition, all operator aids should be reviewed periodically to determine whether they are still necessary, whether the information in them needs to be changed or updated, or whether they should be permanently incorporated as features or procedures at the plant.

NS-G-2.4

6.61. A suitable working environment should be provided and maintained so that work can be carried out safely and satisfactorily, without imposing unnecessary physical and psychological stress on personnel. Human factors which influence the working environment and the effectiveness and fitness of personnel for duty should be identified and addressed. The operating organization should establish an appropriate programme for these purposes. Examples of areas or activities to be reflected in this programme should include, but are not limited to the following:

- adequacy of the resources, support and supervision provided to manage and perform the work;
- adequacy of lighting, access and operator aids;
- adequacy of alarms, considering factors such as their number, position, grouping, colour coding and prioritizing for audibility;
- frequency and clarity of communications;
- availability of suitable tools and equipment;
- duration of work time for personnel;
- the attention needed to be given to other factors, in particular for control room staff, including well-being, psychological and attitudinal problems, shift patterns and meal breaks;
- the availability of procedures that take into account human factor considerations.

Plant Response/Action:

A – Causal analysis

Within the framework of good working order of plant and smooth running of the organisations, every department may have to affix signs concerning technical instructions, explanatory documents, regulations to be applied, information to be distributed and identification.

The OSART recommendation highlights the absence of an administrative system laying down the requirements to be implemented for signs.

The following root causes explain the presence of a large number of technical signs not covered by the QA process:

- Lack of integration of technical signs on site in the site sign management organisation memo ref D5430-NTDR-056030.
- Lack of clarification concerning management of non-compliant signs in the procedure for detecting and processing plant deviations D5430NTDR08100.

B – Strategy adopted to resolve the recommendation or suggestion

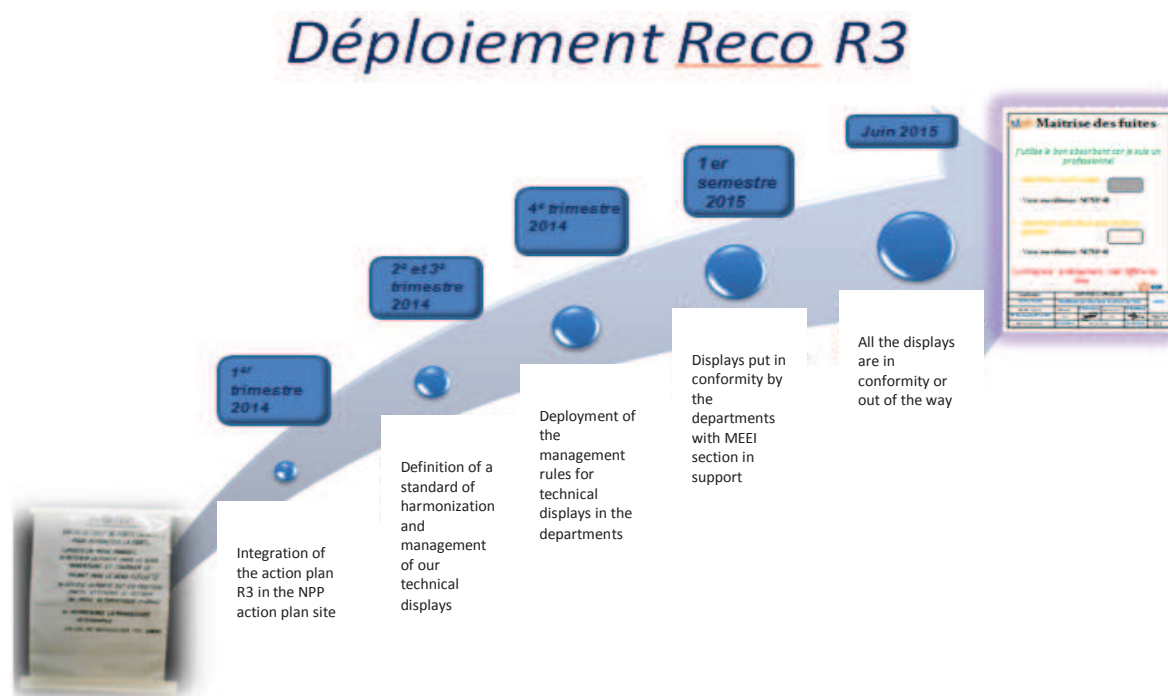
- Integrate the OSART recommendation in the action plan for the site subprocess concerning housekeeping (MEEI), managed with the macro-process Generate.
- Define a standard with the departments to standardise all the site signs as stipulated by the regulatory authorities.
- Set up a protocol for layout, distribution and recording of the technical signs displayed at Chooz NPP in application of the quality assurance rules that are known and mastered by everybody.
- Align the technical signs displayed on industrial plant.

C – Method used to check that the action plan is appropriate and to check effectiveness
 State of progress is coordinated by the improved plant material condition (MEEI) structure.
 Field rounds are carried out on a regular basis and alignment is tracked.

D – Action plan

The following actions have been adopted to resolve this recommendation:

- Definition of a standard for standardising and managing technical signs
- Application of the rules by the departments
- Alignment/compliance in the field



E – State of action plan progress and reporting procedure

Actions	Duty holder	Deadline	Status	Comments
Integrate the recommendation in the site action plan	Nuclear Safety, QA and Audit Department (SQA)	1 st quarter of 2014	Closed out	The action is recorded in the database for macro-process MP2
Appoint a coordinator	Senior management	1 st quarter of 2014	Closed out	The MEEI project is appointed as the coordinator for OSART Recom R3

Actions	Duty holder	Deadline	Status	Comments
Take an inventory of the signs displayed on site	MEEI	2 nd quarter of 2014	Closed out	Available Chooz database
Define with the departments a standard for standardising and managing plant technical signs and validate an official instruction recorded in the electronic document management system	MEEI & departments	3 rd quarter of 2014	Closed out	The specialisations have appointed a representative in charge of signs, with the list available in the Chooz database Technical sign management document recorded in the electronic document management system under ref D5430NTDR14-087
Application of the sign management rules	Departments	As from the 4 th quarter of 2014	Ongoing	Tracking of progress by the MEEI project: available in the Chooz database

Progress report presented to the MEEI committee	MEEI	10 Feb 2015	Closed out	The committee confirmed the fact that non-compliant signs still present on site will be removed by the MEEI project team, communicated to the specialisations, presented at the weekly management team operational meetings and recorded in Chooz database
Progress report presented to the generation committee	MEEI	11 March 2015	Closed out	

F – Evaluation of action plan effectiveness

Progress is assessed with tracking at the management team operational meetings. Annual reviews assess sustainability of the actions taken.

IAEA comments:

In response to the issue identified by the OSART team the plant has identified a root cause of the deficiency in managing operator aids and has initiated a corrective actions plan. A procedure for managing operator aids has been considerably updated and clearly states its definition, template, respective qualities and preferable placements. Following that the plant has imposed particular actions to implement new requirements and put required operator aids in order. During the post OSART period the plant has identified more than 700 non-compliant operator aids, 120 of them have been implemented into operation according to the new approach, more than 500 are being reviewed for appropriateness and applicability and about 150 still need to be registered and processed. The plant plans to finalize handling of all identified inappropriate operator aids by the end of 2015.

Conclusion: Satisfactory progress to date

3.4. CONDUCT OF OPERATIONS

3.4(a) Good Practice: Ergonomically designed lay-out board for tags on safety related valves in the tagging office

Depending on plant status, certain safety related valves have to be positioned in a pre-defined position in the field to guarantee the correct plant configuration. These valves are locally locked with a padlock. A red tag indicates the safety position of the valve. The position of these valves however is not indicated visually in the main control room.

The plant has developed a clear procedure on how and when the position of the locked-out valves can be changed. The position of the valves can only be changed after performing a risk analysis which has been approved by the shift manager. When the valve position is changed from the locked-out position, the associated tag is stored in the tagging office.

The plant has implemented an ergonomically designed lay-out shadow board in the tagging office for setting aside the tags for safety related valves. This allows the shift manager to carry out a simple, visual check of which safety tags have been issued and if the safety tags deployed on plant correctly match current plant status. This check is carried out at least once per shift. Since the introduction of this innovation there have been considerably fewer instances of safety related valve misalignment.



3.4(b) Good practice: Air- and hydrogen leak detection using an ultra-sonic detector

The operations department purchased an ultrasonic leak detector in order to have a reliable, user-friendly and quick detection tool for different types of leaks, such as for example, air leaks, steam leaks, air ingress and hydrogen leaks. It can also be used to monitor passing drain valves, which cannot be done with bubble-type liquid leak detectors.

The results achieved show that numerous leaks have been quickly and safely identified, thereby bringing improvements in the area of industrial safety, radiological protection, technical and economic performance.

As an example, the air system for the diesel generators used to be operated over several cycles with air-leaks that were difficult to pinpoint. This over-burdened the compressors and caused premature ageing. This ultrasonic leak detection device has made it possible to locate a leak quickly, to map the leaks and to conduct targeted repairs.

In order to ensure that all shift teams can make full use of this device, training has been begun to be delivered to individuals across all teams, in line with corresponding training specifications.



3.4(1) Issue: Plant expectations with respect to behaviours related to the main control room working environment are not adequately developed or reinforced so as to provide a distraction-free environment.

- During a shift-turnover on Unit 1, up to 16 people were seen at the same time in the Main control room (MCR), 3 of which were I&C-staff performing testing. This did not support a professional shift turnover being carried out.
- Serenity in the MCR is not maintained at all times during shift turnovers, as field operators conduct their turnovers inside the MCR rather than in their respective offices.
- There is no demarcation of areas inside the MCRs of both units to indicate where non-control-room staff is not allowed (e.g. in front of desks and panels).
- A field operator was using a workplace in the MCR Unit 1 to raise a condition report, instead of using the field operator's dedicated office.
- On numerous occasions during the visit of the OSART-team, it was noted that the entrance door to the main control room was standing open.

Unnecessary distractions can reduce the level of alertness of the crew to changes in plant conditions.

Suggestion: The plant should consider improving expectations and reinforcing behaviours related to the Main Control Room in order to provide a distraction free working environment for shift personnel.

IAEA Basis:

SSR-2/2

3.12. Distractions to control room operators shall be minimized.

NS-G-2.14

4.3. The management should ensure that distractions to the shift personnel are minimized to enable the crew to remain alert to any changes in plant conditions. Examples of distractions that should be minimized are excessive administrative burdens and excessive numbers of people allowed entry to the main control room. In particular, the need to minimize such burdens should be taken into account in shift arrangements for accidents and emergencies. This will facilitate maintaining the situational awareness of operators.

4.13. Shift turnover should be carried out in accordance with a formal procedure. The procedure should identify the persons involved and their responsibilities, the locations, times and conduct of shift turnovers and the methods of reporting the plant status, and should include provisions for special circumstances such as abnormal plant status and unavailability of staff. The procedure should provide for a clear declaration of acceptance of duty from the incoming operator before the outgoing operator is released.

4.15. Non-routine operating activities should be prohibited in the main control room during shift turnover. Access of non-shift personnel to the main control room during the shift turnover should be prohibited or minimized.

Plant Response/Action:

A – Causal factor analysis

Based on an analysis of the facts, we have identified the following main causes:

- Control-room layout does not support a disruption-free environment: no physical barrier at control-room entrance.
- The maximum number of people allowed in the control room at a given time is not defined.
- Field operator shift turnovers take place in the main control room.
- No means of screening calls during the start-of-shift brief.

B - Strategy adopted to address the recommendation/suggestion

Even before the OSART mission, the station was already planning to modify the control-room layout: issues raised at the time have been incorporated into the project.

The project consists of the following:

- Establishment of a physical barrier to control access at MCR entrance (counter + automatic door)
- Video display inside the waiting area to inform workers of conditions inside the MCR (e.g. complex evolutions)
- Tools to improve effectiveness of head-up monitoring (video display, shift table)
- Improved lighting and soundproofing.

As part of our efforts to improve control-room monitoring as part of our operator fundamentals initiative, we have also identified the need to modify the process for reducing the number of people inside the MCR at a given time:

- Only control-room operators and lead operators conduct their turnovers in the MCR.
- Field operator turnovers are conducted in the BW building (operations personnel offices)
- Standards amended to stipulate the maximum number of people allowed inside the MCR at a given time.

We have also decided to improve arrangements for avoiding disruptions during the start-of-shift brief:

- Screening of phone calls using an answering machine

C – Method used to verify adequacy of the action plan

As part of our operator fundamentals programme, specific observations are conducted on the subject of control-room monitoring. Findings will be analysed on the occasion of the end-of-year sub-process review.

D – Action plan

Changes to control-room layout:

- Unit 1: In progress, due for completion on 20 May 2015
- Unit 2: Schedule, due for completion on 15 November 2015

Field operator turnover moved to BW building → completed

Phone calls screened during start-of-shift brief → due for completion on 15/05/15

Revision of "control-room monitoring" procedure → due for completion on 30/06/15

E – Action plan effectiveness review

Relocation of field operator turnovers to the BW building has reduced the number of people in the MCR while also reducing disruptions during this period. The other actions will be assessed once the MCR layout has been changed.

IAEA comments:

In response to the suggestion made by the OSART team the plant has identified a root cause of the deficiencies in the behaviours and working environment in the control rooms and has initiated a project to improve control room environment. The main objective of the project is to minimize distractions to the shift personnel and enable the crew to remain alert to any changes in plant conditions. The project includes arrangements to change the control room layout to ensure a disruption-free environment, to minimize the number of personnel in the control room in different operating modes and to screen calls during the start-of-shift brief. Some of the actions have already been introduced into routine practice such as limitation of personnel in the control room and are reviewed periodically to ensure that expectations are met. Some of the arrangements such as changing the control room layout and the control room monitoring system are in progress and will be finalized in the near future. The control room personnel expressed their satisfaction with the changes in the working environment and noted tangible improvements.

Conclusion: Satisfactory progress to date.

3.4(2) Issue: Deficiencies in equipment on the plant are not clearly identified in the field.

There is no requirement and practice to tag deficiencies in equipment on the plant once identified to make them readily apparent to the operations personnel who conduct plant rounds. Leaks and temporary modifications are the only exception and were marked with a leak tag or modification tag.

Examples of deficiencies with missing traceable local indication:

- Deficient manometers 1/2SRI041LP , 2CTE041LP
- Deficient fire damper DVV006RA
- Deficient cable penetration DO1TL0375
- Broken air cooling grill on main turbine floor (generator side)
- Electrical cables without any support or protection (penetration TW059, BAN 7.02m)
- Electrical cables resting on sharp edges of cable tray (room MA0410, MC402)
- Missing bolts (pump casing CEX003PO)
- Missing, broken or difficult to read labels
- White powder deposits at 1SRP010PO

Without clearly identifying deficiencies in the field, field operators do not have a straightforward way of identifying which deficiencies have already been reported in the work request system when conducting their plant rounds, and deficiencies with possible safety significance could therefore be overlooked and not get reported.

Suggestion: The plant should consider putting a system in place that allows clear identification of deficiencies in the field once they have been recognized.

IAEA Basis:

SSR-2/2

7.10. Equipment that is degraded (owing to leaks, corrosion spots, loose parts or damaged thermal insulation, for example) shall be identified, reported and corrected in a timely manner

NS-G-2.14

5.50 Deficiencies in equipment should be clearly identified to make them readily apparent to the operations personnel who conduct plant rounds and make observations. A system of tagging for deficiencies and/or cautions should be implemented to mark problems with equipment. Deficiencies that are identified should be assessed for their safety significance and should be prioritized for their correction.

Plant Response/Action:

A – Causal analysis

During the OSART mission in 2013, only leaks and temporary modifications (of DMP/MTI type) were identified in the field.

The site has an organisation to identify in the field external leaks affecting equipment. The management rules are specified in instruction D5430NSCO11023 rev 01 - Organisation of leak management at Chooz NPP.

Due to related impacts, an organisation has also been set up to identify temporary modification in the field.

However, other plant deficiencies were not identified in the field, as no effective system had been found to provide up-to-date information.

B – Strategy adopted to resolve the suggestion

It is now possible for the site to review this matter at the housekeeping (MEEI) committee meetings, managed with the macro-process Generate, and significant progress has been made:

- At the start of 2014, it was decided to identify deficiencies on the access signage boards in the rooms (Neter boards) by affixing stickers. The presence of this sticker shows that this deficiency has already been taken into account.
- In March 2015, a computer application known as TOTEM was adopted so that portable tablet computers fitted with a foolproofing system could be taken into the field to prevent duplications. This system is deployed by housekeeping (MEEI) team for field walkdowns and is planned to be rolled out to all the area owners by the end of 2015. This action is recorded in the MEEI action plan for 2015.

C – Method used to check that the action plan is appropriate

Site key performance indicators have been set up to track the results stemming from the actions decided upon:

- Number of MEEI deficiencies
- Number of field walkdowns
- Number of leak work requests

In addition, manager field walkdowns, setting up of the dedicated field team and organisation of the corrective action programme measure effectiveness of the action plan set up and detect the points to be strengthened in the systems adopted.

D – Action plan

The actions described above provide a better view in the field of the deficiencies already reported thus significantly improving effectiveness.

E – State of action plan progress and reporting procedure

State of progress of the targets and actions is assessed at every generation committee meeting. An action tracking sheet consultable in the action tracking database is allocated to every action coordinator.

F – Evaluation of action plan effectiveness

Action plan effectiveness is assessed within the framework of reviews of the subprocess and the macro-process Generate.

IAEA comments:

In response to the suggestion identified by the OSART team the plant has undertaken an action plan that aims to improve the plant practice in identifying and handling deficiencies in the field. A sophisticated software has been developed and used together with reliable hardware – a tablet computer, to register and handle deficiencies. The tablet computer is subsequently connected to the plant-wide database to transfer information on deficiencies identified by the plant personnel in the field. Identification of defects in the field is not provided. The plant has started application of a new system for registering defects with two tablet computers used by the plant housekeeping group personnel. Further 28 additional tablet computers will be provided for the plant personnel including shift operators, maintenance personnel and line managers. The plant will review the new process for registering and handling defects in the field during trial application by the shift personnel. The plant will then decide if the new system is effective and undertake respective corrections, if necessary.

Conclusion: Satisfactory progress to date

3.4(3) Issue: The plant expectations for storage of non-fixed equipment and materials in the field are not sufficient to minimize the risks to the plant in case of internal and external events.

The expectations for storage of non-fixed equipment and materials in the field are unclear. There are no dedicated locations for storing temporary, loose equipment and materials. There is also no consistent authorization system in place for allowing storage. The reason for the temporary storage and the allowable period are not always locally indicated. Additionally, where the period for storage is indicated, examples were seen of this period being exceeded.

- A sump pump with temporary water hoses on the floor of the turbine hall which was used during the outage (ending on 16th April 2013) was still in place (1CFR002 PO).
- Temporary storage of an empty oil container was found without permit (NA0505).
- Trolley badly secured to cable tray in non-dedicated location (MG0804).
- Trolley badly secured to a 3” stainless steel instrument air pipe (Auxiliary building).
- “TEBETRONIC” equipment was not stored in a designated area and the four wheels were unsecured, although the wheels were fitted with brakes.
- Loose equipment and ladder with a storage permit which expired on 31/02/13 (Auxiliary Building)
- Used paint tin and some instruments in a cable tray (22NB1014).
- Three long ladders were stored in a vertical position away from the designated, permanent storage location (22NB1014).
- A ladder was found with a “to be removed” tag, dated 5/12 (Auxiliary building).
- Temporary storage of materials with no label or information regarding potential radiological contamination (Auxiliary Building (1ZFAN0S01)).
- Inconsistent use of “Temporary Storage Forms”. Some items had the correct form attached and some did not. Many of the “Temporary Storage Forms” attached to items were out of date.

Without clear expectations in place for storing non-fixed equipment and materials in the field, risks to the plant are not sufficiently minimized in case of internal and external events.

Suggestion: The plant should consider clarifying and reinforcing the expectations for storing non-fixed equipment and materials in the field to minimize the risks in case of internal or external events.

IAEA Basis:

SSR-2/2

7.10. Administrative controls shall be established to ensure ... that temporary storage is controlled and limited.

NS-G-2.6

8.49. ... The accumulation of defective components in work areas should not be allowed.

NS-G-2.14

4.36. Factors that should typically be noted by shift personnel include:

...

The proper authorization for, and the condition and labelling of, temporary modifications in the field (e.g. the presence of blind flanges, temporary hoses, jumpers and lifted leads in the back panels);

Deviations in fire protection, such as deterioration in fire protection systems and the status of fire doors, accumulations of materials posing fire hazards such as wood, paper or refuse and oil leakages, or industrial safety problems such as leakages of fire resistant hydraulic fluid, hazardous equipment and trip hazards;

Deviations in other installed safety protection devices, such as flooding protection, seismic constraints and unsecured components that might be inadvertently moved.

Plant Response/Action:

A – Causal analysis

At the time of the review, no operating baseline had been defined to prevent the risk of projectiles in the event of earthquake especially during the activities: no rule had been defined for the maintenance workers to minimise the risk related to storage and temporary storage of equipment. The risk of seismic event was not reinforced by site management and nobody had been assigned to have an overview of management of this risk and contribute to personnel skills development in this matter. Awareness of the personnel and the site industrial partners as to proper consideration of this risk had not been raised. Tracking and checking of site temporary storage areas were not assigned sufficient resources and appropriate managerial reinforcement was not ensured.

B – Strategy adopted to resolve the recommendation or suggestion

A site inventory of factoring in of the risk of seismic event was initiated in 2013 (D5430NTSQ13138) and an action plan was defined accordingly (actions ongoing up to the end of 2015). The processing strategy was based on the following priorities:

- Definition of the rules to be applied especially for storage and temporary storage of equipment.
- Setting up of a network of seismic event experts, attachment of the topic to the subprocess dealing with hazards (connected to the safety macro-process Nuclear Safety) and conduct of an annual improvement review.
- Integration of the requirements during risk assessment of the activities (incorporated in the risk assessment guidelines).
- Skills development of the personnel.
- Field walkabouts focused on this topic.

In more general terms, managerial reinforcement of the storage requirements has been strengthened. Resources dedicated to management of the theme and checking of compliance

with these requirements in the field have been strengthened. The practices for temporary storage forms have been standardised.

C – Method used to check that the action plan is appropriate

Setting up of a storage tracking file and updating of the overall plant drawing on a regular basis.

Weekly checking of all the site temporary storage areas with a section of the checking procedure focused on seismic event. Tracking of storage deviations.

Integration of the themes of seismic event and storage in the site internal checking programme.

Field walkabouts focused on the topics of seismic event and storage.

Checking on the topic of seismic event by the Independent Safety Branch.

D – Action plan

The following actions have been implemented based on transposition of the corporate baselines:

- A site seismic event coordinator has been appointed and trained. Representatives have also been appointed in the operational departments and trained. Closed out
- Definition of the requirements to be fulfilled in the field in the site baseline (D5430NTDR12076) and drafting of a support document to help workers building a risk assessment integrating seismic risk (D5430DRFRX12056). Closed out
- Systematic stowage of the equipment to limit the consequences of projectiles during earthquake is not a requirement stipulated in the EDF baseline. The purpose of the baseline is to prevent the risk of damage to safety-related and seismically classified equipment. Separation countermeasures may mainly be applied. Stowage shall be considered as one of the possible countermeasures to prevent the risk of damage.
- An operating discipline observables sheet has also been integrated for the topic of seismic event.
- Definition of the list of rooms housing safety-related and seismically classified equipment, at maintenance workers disposal. Closed out
- Modification of the risk assessment guidelines to integrate earthquake. Closed out
- Ongoing impact analysis of seismic event related to use of the storage, dedicated temporary storage and permanent temporary storage areas (updating of the list of these areas by May 2015).
- Impact analysis of seismic event for a temporary storage area (capability of the temporary storage area to incur damage) before its setting.
- Development of storage culture: training of all the departments at the start of 2014, awareness raising of the site industrial partners during welcoming sessions. Communication campaigns were also run on site in 2014 and 2015 (examples: seminar on unit 2 outage 14, storage and seismic event stand during the safety day in January 2015). The topic has also been incorporated in the site new recruit training programme and in nuclear safety and QA refresher training since the start of 2015.
- Modification of the pre-requisites template so that this matter is discussed with the site industrial partners prior to the start of their activity in the field. Closed out
- Precise inventory on a unit of existing stowage points for the sensitive rooms. Further to these findings, a project for installation of additional points is being implemented. Deployment is expected in 2016.

- Planned updating of the instructions for site transposition of the storage baseline (organisation memo and storage plan instruction for CHOOZ NPP D5430NTDR11177)

E – State of action plan progress and reporting procedure

Most of the actions planned have been implemented. Some documents still need to be updated and work is still ongoing on the stowage points. Development of seismic event culture shall nevertheless be continued with site training, refresher training and other forms of stimulation.

This action plan is reported on at 2 levels:

- About storage: at the MEEI committee and generation committee meetings
- About seismic event: at the hazard management committee and nuclear safety committee meetings.

F – Evaluation of action plan effectiveness

Factoring in of the risk of seismic event and of storage baselines is tracked with coordination of the subprocesses dealing with hazards and MEEI. The conclusions are as follows:

- the increased number of findings shows better attention paid by management to these 2 issues
- running of the packaging team results in better management, especially during outage
- Factoring in of the risk of seismic event has improved for certain activities, such as erection of scaffolding.

Seismic event culture still has to be improved to guarantee thorough integration in the field.

IAEA comments:

The plant has analysed the suggestion made by the OSART in respect of risk related to storage and temporary storage of equipment and identified a root causes for the deficiency. A respective action plan has been initiated and implemented. A new plant regulation related to permanent and temporary storage of non fixed equipment has been developed and is now used at the plant. It includes a requirement to conduct a comprehensive safety assessment when specific criteria are met and arrange a storage place accordingly. The plant has identified and designated a number of permanent storage places in the industrial area and arranges temporary ones, when needed, according to the new standard. The team has conducted a plant tour to observe the storage places in the industrial area and have found no deviations from the standard.

Conclusion: Issue is resolved

3.6. FIRE PREVENTION AND PROTECTION PROGRAMME

3.6(1) Issue: Some plant arrangements in the field of fire prevention and workers practices are not sufficient to ensure that fire prevention provisions are effective.

Maintenance of fire barriers and interim measures put in place to compensate for tag-outs in fire related systems were found not to be adequate in some instances. Some examples of poor personal behaviour with respect to fire prevention were noted.

Examples include the following:

- Mitigating measures for impairment of fire zoning LC0811 due to cable work (DI 529564) were not adequately implemented. The isolation material inside the duct to prevent a spread of fire to the room below was not complete.
- Mitigating measures for impairment of fire zoning LC0908 due to cable work (DI 531193) were not adequately implemented. There was no isolation material in the penetration.
- During replacement of fire fighting water tank 1JPT021BA due to corrosion, which is used in case of a fire on the main transformer, a foam unit was placed outside in close proximity to the main transformer as a mitigating measure. The foam unit was placed too close to the transformer with the risk of not being safely operable in the event of a real fire.
- Furthermore, the hoses connecting the foam unit to a water supply were laid in such a manner as to inhibit the flow of water to the foam unit.
- Door 1JSL9E2PD giving access to turbine hall U1, which should be kept closed due to ventilation issues in case of fire was found open. One person was seen walking through this door but did not check it had closed properly behind him. The door remained open.
- The closing mechanism of fire door 1JSL513QP in the auxiliary building did not ensure that the door was closing correctly.
- Oil absorption mats had been discarded along with regular waste in a waste bin in BAN building unit 2 (LC0507)

Not maintaining at all times the highest level of professionalism in mitigating arrangements and worker practices might lead to a reduced margin in fire prevention.

Suggestion: The plant should consider reinforcing arrangements and improving worker practices in the field of fire prevention.

IAEA Basis:

SSR-2/2

5.21. The arrangements for ensuring fire safety made by the operating organization shall cover the following:

(b) Control of combustible materials and ignition sources,

(c) Inspection, maintenance and testing of fire protection measures.

NS-G-2.1

3.2. Responsibilities of site staff involved in the establishment, implementation and management of the programme for fire prevention and protection, including arrangements for any delegation of responsibilities, should be identified and documented. The documentation should identify the posts, specific responsibilities, authorities and chain of command for personnel involved in fire safety activities, including their relation with the plant organization. The areas of responsibility identified should include:

- control procedures for combustible materials and ignition sources;
- inspection, maintenance and testing of fire protection measures;
- manual fire fighting capability;
- emergency plans, including liaison with any off-site organizations that have responsibilities in relation to fire fighting;
- integration of plant fire safety arrangements and liaison between parties involved;
- review of plant modifications to evaluate effects on fire safety;
- training in fire safety and emergency drills;
- quality assurance in relation to fire safety issues;
- a records management system, including means for documentation and analysis of records of fire incidents;
- review and updating of the fire hazard analysis;
- follow-up of recommendations resulting from investigations of fire incidents.

5.6. If a modification necessitates the removal from service of any of the fire protection features, careful consideration should be given to the consequent reduced level of protection of the safety system(s), and appropriate temporary arrangements should be made to maintain adequate protection against fires. On completion of the modification, the plant as modified should be inspected to confirm its compliance with the modified design. In the case of an active system, the plant as modified should be commissioned and placed into or returned to normal service, as applicable.

Plant Response/Action:

A – Causal factor analysis

Many of the findings raised by the OSART team relate to worker behaviours on site (compensatory measures moved from their proper location, closure of fire doors, saturated oil pads). The lack of a clearly defined process for dealing with certain issues has also been identified as a cause of certain deficiencies (monitoring of compensatory measures).

B - Strategy adopted to address the recommendation/suggestion

Improvements to the process and work practices in the area of fire protection are being effected through the fire safety (MRI) sub-process, attached to the nuclear safety macro-process (Integrated Management System). The results of the OSART were examined at the MRI 2013 sub-process review and actions were defined as part of the 2014 action plan or as part of the actions being tracked by the fire protection sub-committee.

Some of the OSART findings were supported by our own conclusions. By aligning the OSART findings with our own, we were able to agree on the appropriate actions.

C – Method used to verify adequacy of the action plan

The fire safety action plan is agreed on the occasion of a fire safety review, attended by representatives of the various departments. This plan is then approved by the safety review committee, at a meeting attended by station senior management. Actions to be tracked by the various fire safety committees are defined at these meetings and approved by station senior management (nuclear safety director).

Improvements in behaviour and in the management of compensatory measures have been monitored on the occasion of observations in the field conducted by leaders and fire safety leads.

Lastly, a review of low-level trends has been performed as input for the 2014 sub-process review.

D – Action plan

Fire zoning:

Since 2013, control of the fire zoning process has been improved by assigning more people to this role. The person in charge of the fire zoning process now has at least one permanent assistant. This additional back-up provides continuity and steps up presence in the field.

As far as 90-min rated fire stops are concerned, these are regularly installed to mitigate fire integrity breaches, which are then no longer considered as breaches but rather as impairments. These compensatory measures (Hilti plugs) are installed by the department whose work has resulted in a breach of integrity. When a compensatory measure is installed for a class-1 breach (between 2 redundant trains), a field operator from the off-shift structure verifies that the compensatory measure is in place, thus confirming that it is properly installed and allowing the breach to be downgraded to a class-2 impairment.

➔ Actions completed in the field and currently being embedded in the process.

While the OSART team was conducting their field observations, they noted that workers were not always closing doors properly. The station ran a communication campaign on this point in 2013 and has added this requirement to the fire safety observation checklist.

➔ Action completed; requirement added to the fire safety observation checklist.

Fire load:

In 2014, the station established a process for the control of temporary storage (see suggestion on expectations for storage of mobile equipment). A temporary storage team comprising two people deals with temporary storage requests from contractors and carries out checks in the field. When dealing with these requests, consideration is given to other jobs in the vicinity, to fire protection standards, and to seismic hazards. Contractors have been regularly briefed on this issue, either on the occasion of safety days or during site induction sessions.

➔ Actions completed. In addition, the station is considering the use of an "impoundment" system (when rules are breached).

Compensatory measures:

While the OSART team was conducting their field observations, 2 findings were raised on the subject of compensatory measures that were installed on the main transformer to compensate for the functional loss of tank 1JPT021BA (1st stage of the fire protection system). The measures in place (foam spray truck with hose) were placed too close to the transformers and were not in operating condition. Since these findings were raised, the

compensatory measures have been modified. The aim of any compensatory measures installed to deal with similar equipment issues is to mitigate the risk of a transformer fire spreading to the turbine hall, the gas storage yard or to an auxiliary transformer, thus limiting the effects of heat radiation. These measures do not need to be moved in the event of a transformer fire, thus averting risks for the fire response team. The system simply needs to be connected to a fire hydrant.

➔ Action completed in the field. Procedure currently being incorporated into the process.

A further issue highlighted by the OSART team was the degraded condition of these compensatory measures. They had been moved for various reasons (access to gas storage yard, access to turbine hall handling bay) without notifying the risk prevention department and without returning them to position after use. As of now, once a compensatory measure is installed for a significant period of time, a specific instruction is automatically issued to operations, ensuring that the compensatory measures are regularly checked during field operator rounds.

➔ Action completed. Process defined (ref. D5430NTSR14057) and specific instruction issued when required.

Fire safety behaviours:

Numerous findings are related to worker behaviours. In order to improve fire safety culture, a number of actions have been taken:

- Fire safety stand set up on "nuclear attitude" day (8 January 2015)
 - In early 2015, a team of station leaders spent 2 days identifying areas for improvement in the field and during the work planning phase. They also identified deficiencies and good practices in the area of fire protection.
 - Focus on fire safety as part of the "professional standards" programme over a 1-month period: Posters at site entrance, weekly messages, reinforcement of standards and expectations by team leaders.
 - Leaders and supervisors use fire safety observation checklists to familiarise themselves with fire safety standards.
 - Paired observations throughout the year: Safety director/fire and rescue officer/fire marshal/leaders.
 - Contractors regularly briefed on fire hazards.
 - Regular talks by the fire and rescue officer at senior management meetings in order to familiarise leaders with deviations from standards.
- ➔ Actions completed. Specific awareness-raising measures (excluding safety days) are repeated once a year and a talk is given by the fire & rescue officer once a month.

E – Action plan effectiveness review

The effectiveness of this action plan is regularly reviewed through observations in the field conducted by leaders, by the fire safety strategic manager, by the fire safety expert and by the fire and rescue officer.

Improvements have been noted regarding compliance with fire load standards, even if deficiencies are still being identified. The introduction of an "impoundment system" and the

ongoing allocation of resources to this process will ensure that further progress is made regarding compliance with rules in the field.

Standards and expectations governing the control of compensatory measures have become much stricter since the OSART: the fire and rescue officer regularly challenges workers in order to improve their fire safety culture.

As far as behaviours are concerned, fire safety culture will be assessed through a review of low-level events, to be conducted as part of the sub-process review at the end of 2015.

IAEA comments:

The plant has analysed the suggestion made by the OSART and has identified the causes of the deficiencies in the area of fire protection. Subsequently, the plant has introduced a corrective action plan that addresses the behaviour of the personnel, including contractors, and the lack of human resources allocated to maintaining an appropriate level of fire protection practices. The action plan includes training of plant personnel and contractors, including coaching in the field during outage.

In addition, since 2014 three specific actions were implemented: enhanced management focus (fire protection was one of the five main themes observed in the field), dedicated two-day field observations since January 2015 by the deputy plant manager, two dedicated personnel in charge of fire zoning. The plant performance indicators in the area of fire protection demonstrate tangible improvements over the recent two years.

Conclusion: Issue is resolved

4. MAINTENANCE

4.1 ORGANIZATION AND FUNCTION

The team identified one good practice in the area of crossover professional development for maintenance personnel. While using this programme, the plant has witnessed that the recruited staff are more knowledgeable about the practices on other sites, acquire the necessary technical skills for infrequently-performed activities, and are qualified more rapidly.

The team also recognized that the plant has adopted a mechanism of frequent communication, discussion, and experience sharing between contractor monitoring supervisors from different departments, which has helped to improve contractor performance and management. The team considers this as a good performance.

4.5. CONDUCT OF MAINTENANCE WORK

The team has made a suggestion in the area of preparation, control and implementation of maintenance activities. Maintenance activities are not always prepared to highlight the first-time performer of task, and identify risks and error-likely situations involved. Work practices and conditions in the field do not always meet the plant management expectations.

4.7. WORK CONTROL

The team also noted that delays in maintenance activities, sometimes on safety related systems, are not consistently tracked and analyzed. The plant is encouraged to improve its tracking and analysis of delay of scheduled work activities.

DETAILED MAINTENANCE FINDINGS

4.1. ORGANIZATION AND FUNCTIONS

4.1(a) Good Practice: Crossover professional development for maintenance personnel.

The plant has adopted a programme for crossover professional development of maintenance personnel. A joint employment structure, which is shared by the plant and its contractors, recruits two persons for duration of two years: one of them will be hired by the plant and the other will be hired by the contractor.

These two persons are seconded to the plant for outages, where they provide support to the work coordinators. The rest of the time, they work for the contractor on outages at different plants in the EDF fleet. The two year programme enables the trainees to carry out numerous activities, develop professional capability, understand practices and experience different plants in terms of work planning and coordination.

The persons who have gone through this crossover development programme have shown some marked characteristics:

1. They have a more complete overview of the way things are done at EDF and within the contractor companies.
2. They are more knowledgeable about the practices on other sites.
3. They acquire the necessary technical skills for infrequently-performed activities.
4. They are qualified more rapidly as work coordinators or contractor monitoring supervisors at NPPs.

4.5. CONDUCT OF MAINTENANCE WORK

4.5(1) Issue: Maintenance works are not always properly prepared, controlled and implemented to ensure the integrity and availability of plant equipment and reduce the risk of injury to personnel.

During the review the team identified:

- On 16 June 2011, an error occurred during calibration of reactor cavity and spent fuel cooling and treatment system sensor 2 PTR 005 SN, causing the unavailability of the cooling train for 6 seconds (Significant Safety Event 11-008). Causes of the event include first-time performer of this task and non-identification of the risks involved during the work preparation stage.
- On 28 August 2012, when measuring the loop flow rate, the recorder was connected to the wrong terminal, which resulted in prolonging the duration of group 1 Limit and Condition of Operation (LCO) on Primary Reactor Coolant System Requirement (RCP5) (Significant Safety Event 12-025). Causes of the event include first-time performer of this task and non-identification of error-likely situation (similar terminals close to each other) during work preparation.
- After the replacement of the circuit card in an electrical cabinet, the workers proceeded with trouble-shooting under the test permit, which did not cover the scope of trouble-shooting. The main control room was not notified of the trouble-shooting activities.
- Tools were found resting on cables in a cable tray, during work on diesel generator 1 LLS 682 GE (post-Fukushima modification).
- Five pieces of paper (extracted from maintenance procedures) were found on the electrical cabinet for the combustion turbine. These papers are not controlled copies of the maintenance procedure.
- In the demineralization water station, an electric motor with an electric cable connected to a junction box had been left on the floor since September 2012. There was no information about on-going maintenance activities.
- When working on auxiliary boiler system valve 0 XCA 016 VV, tools and small items were found on the insulation pipe, which could potentially drop down.
- The lighting was poor when workers worked on sensor 2DEL 002 SZ associated with the electrical building chilled water system.

Inadequate preparation for some maintenance activities and the lack of strict controls of maintenance works could result in damage to equipment and injury of personnel.

Suggestion: Consideration should be given by the plant to improve the preparation of maintenance activities, and reinforce the appropriate behaviors and work practices at jobsites during maintenance work.

IAEA Basis:

SSR-2/2

8.8. A comprehensive work planning and control system shall be implemented to ensure that work for purposes of maintenance, testing, surveillance and inspection is properly authorized, is carried out safely and is documented in accordance with established procedures.

8.9. An adequate work control system shall be established for the protection and safety of personnel and for the protection of equipment during maintenance, testing, surveillance and inspection.

NS-G-2.6

4.26 The factors to be taken into account in developing administrative controls and procedures applicable to MS&I should include, but are not limited to, the following:

- the generation of adequate written work procedures;
- the use of work permits in connection with equipment isolation;
- control of the plant configuration;
- industrial safety controls;
- general risk assessment;
- training and qualification of personnel;
- control of materials, products and spare parts;
- housekeeping and cleanliness;

5.14. A comprehensive work planning and control system applying the defense in depth principle should be implemented so that work activities can be properly authorized scheduled and carried out by either plant personnel or contractors, in accordance with appropriate procedures, and can be completed in a timely manner. The work planning system should maintain high availability and reliability of important plant SSCs.

GS-G-3.1

4.8 In planning for education and training needs... Training should also cover awareness of the consequence for the organization and individual of failing to meet the requirement.

Plant Response/Action:

A – Causal analysis

This suggestion concerns failures resulting in maintenance quality deficiencies.

The diagnostics performed by the OSART and shared by the NPP, especially shows 3 areas of improvement.

- quality of maintenance work (behaviour in the field and worksite management).
- Planning of power operations maintenance activities.
- Personnel training and skills.

Operating and maintenance quality control constitutes a site priority, coordinated with the maintenance quality control committee reporting to the macro-process Generate, and liaising with other contributing macro-processes.

B – Strategy adopted to resolve the recommendation or suggestion

The aim is to limit the number of quality deficiencies by enhancing quality of the work packages and reinforcing the level of management requirements. The main drivers used are as follows:

Operating and maintenance quality control based on:

- Coordination of the subprocess Control maintenance quality (MQI) reporting to the macro-process Generate (MP2), whose purpose is to define the requirements and work methods and analyse the events and low level events to improve operational quality. A specific action plan to prevent quality deficiencies has been compiled together with the other macro-processes and coordinated by the MQI committee
- The operating and maintenance quality deficiencies are reported with the corrective action programme and identified for wider scope of analysis. There are several levels of tracking.
 - The findings collected are reviewed on a daily basis (findings review meeting).
 - Daily management operational focus on plant and daily activities (daily corrective action programme managerial meeting).
 - Weekly managerial validation of conclusions of the analyses and allocation of the related corrective actions (weekly corrective action programme managerial meeting).
- No inexperienced workers appointed as the work supervisor for sensitive activities.
- Organisation described in practice sheet 046.
- Setting up of the post-job review support tool for better analysis of operating experience.
- Further to the increased revision of DI55, the maintenance groups have taken measures to respond to the new baseline. Based on certain criteria, raising of a condition report in the SYGMA application to classify the deviation and track effectiveness of the remedial and corrective actions implemented.

Relevant manager presence in the field

- Training and coaching of managers in the field have been set up.
- Simplified materials have been provided for the requirements and expert(s) have been appointed in every observable field. A nuclear operator fundamentals handbook has been compiled describing cross-functional operations fundamentals and listing those that have a direct impact on site performance in terms of nuclear safety, industrial safety, radiation protection and the environment and supplemented with operating discipline observables in 2013.

- The site manager presence in the field system was supplemented with the dedicated field team in January 2015. The field is defined as all the activities contributing to site success. The dedicated field team therefore analyses actual running of the basic processes in order to simplify the organisation for improved effectiveness and checking and reinforcement of the requirements in the field as close as possible to the workers, in areas such as industrial safety, plant material condition, fire risk, foreign material exclusion, activities with risk of quality deficiencies, etc.
- The dedicated field team is composed of 4 members (management team, second line manager, first line manager and expert in the area) and guarantees presence in the field of 2 days every 2 weeks.

Improved maintenance job planning based on:

- Compiling of a practice sheet providing a reminder of the checking to be performed for scheduling of preventive maintenance by the participants at every stage of implementation, from scheduling to implementation of the activity.
- Setting up of functional equipment groups on unit 1 since mid-January, facilitating scheduling of the activities. Every functional equipment group grouping together the various plant systems is allocated to a maintenance window per week.
- Factoring in of sensitive activities with compiling of practice sheet 046 entitled Definition of the sensitive activities strategy for power operations and outage, stipulating:
 - definition of a sensitive activity.
 - types of activity concerned.
 - sensitive activities process.
- Integration of sensitive activities by identifying the type of activity concerned with indication on the schedule (AAR for activities with risk of reactor scram, TS for sensitive transients and #AS# for other sensitive activities).
- Review of activities ahead of and behind the daily schedule with the OE subproject manager at the daily corrective action programme managerial meetings.
- Cleaning out of the portfolio of equipment anomaly and job planning management work requests coordinated by the power operations project team.
- Setting up of a weekly work request committee to allocate the work requests to the outage or power operations projects by incorporating the multi-year planning perspective in order to:
 - Uphold the outage programmes, comply with outage modular planning and manage scope freeze,
 - Manage the work request backlog,
 - Ensure allocation of the works requests to the appropriate project.
- Incorporation of recorded site risk assessments in the QA process.
- In addition, the site hosted a TSM on Work Management in October 2014, which proposed avenues to be explored to improve job planning. These avenues were studied within the framework of the action plan of the MQI subprocess for 2015. This involves providing preparation time for the maintenance worker and performing physical and administrative checking prior to maintenance so as to reduce the risk of the maintenance work not being carried out and identify malfunctions as early as possible in the preparation phase.

Personnel training and skills

- Running of training committees over the past 3 years factors in trainee feedback (training feedback sheet) and maintenance quality deficiencies and safety events

recorded in simple findings to define team needs with the managers and set up reactive professional development actions for the gaps observed. Compiling of a joint training catalogue for Chooz and Civaux.

- Training of all the personnel on mock-up DP255 for bolted joints for awareness raising as to the importance of proper torquing and effective locking.
- Training on the mock-up for installation of nozzle dams in the steam generator channel head prior to every outage.
- Simulator training for all the Control teams just before zero power physics testing.
- On-the-job evaluation performed by management on employee activities in the field.
- Penetration testing mock-up, which should be set up soon, to train the testing personnel in this type of activity.
- In the I & C and Electricity Department: Support for personnel with level 1 nuclear safety authorisation undergoing professional development for preventive maintenance activities, with shadow training by experienced work supervisors, and support for young personnel with level 2 nuclear safety authorisation concerning the on-site emergency plan for emergent work to widen their fields of competence.
- Refocus of the maintenance workers on their core business: the logistics project currently results in diagnostics aiming to improve worksite logistics and relieve the work supervisors of secondary tasks as much as possible (PROLOG Project)

The purpose of all these actions is to facilitate the worker's activity in the field. Prevention of quality deficiencies is a concern at all levels. The aim is to provide the maintenance worker with all the means to get it right the first time. The maintenance quality deficiency action plan contains a communication plan for widespread communication on the actions aiming to eliminate quality deficiencies.

C – Method used to check that the action plan is appropriate

Site indicators have been set up to track the results stemming from the actions decided upon:

- Number of significant (with nuclear safety and capability impact) and insignificant operating and maintenance quality deficiencies
- Number of field walkabouts per manager
- Number of post-job reviews conducted in the specialisations
- Rate of schedule compliance
- Tracking of work request backlogs

The main actions taken are coordinated with an internal checking plan defined at the committee and subcommittee meetings for the macro-process Generate.

In addition, manager field walkabouts, setting up of the dedicated field team and organisation of the corrective action programme measure effectiveness of the action plan set up and detect the points to be strengthened in the systems adopted.

In addition, at the end of 2014 corporate level provided the site with a self-assessment tool for the operating and maintenance quality control initiative, which was filled in at the start of 2015. The site internal perspective was then supplemented with an external viewpoint on the same baseline, since the site hosted a peer review of experts on this topic at the end of March 2015.

The results of these assessments show that the action plan is relevant, appropriate to site aims and places the site in a highly satisfactory position (overall weighted mark of 73%).

D – Action plan

See the MQI action plan for further information

E – State of action plan progress and reporting procedure

State of progress of the targets and actions is assessed at every generation committee meeting. An action tracking sheet consultable in the action tracking database is allocated to every action coordinator.

F – Evaluation of action plan effectiveness

Action plan effectiveness is assessed within the framework of reviews of the subprocess and the macro-process Generate.

IAEA comments:

To address this issue, the plant has created a new post at Director level whose one of the responsibility is to be in charge of planning and monitoring of maintenance defects. An elaborate action plan has been developed to enhance the quality of maintenance work. Implementation of these actions is in progress and work is planned to be completed by end of 2015. In parallel effectiveness of actions already completed is being evaluated. Maintenance work request backlog has been further divided into equipment defects and minor defects. As of May 2015 equipment defects have been reduced from more than 1500 in March 2014 to 705 (50% reduction). However minor defects are showing an increasing trend and as of May 2015 stand at 1134 against a target of 850. In 2014, 17 significant events were caused by defects in maintenance quality. The plant has fixed a target of less than 7 events for 2015 and by end April 5 events have occurred due to defects in maintenance. The plant has also set up an expectation of around 40 field visit per year for each manager and one of the focus area of these visit is to look for deficiencies in quality of maintenance.

Conclusion: Satisfactory progress to date

5. TECHNICAL SUPPORT

5.1 ORGANIZATION AND FUNCTIONS

The technical support functions are established at corporate level, described in a comprehensive set of documentation and are performed by various corporate-level and on-site groups.

At the plant, activities within the scope of the technical support functions are conducted by various on-site groups, with the assistance of corporate engineering. As an example, the team noticed a pro-active approach in handover of corporate-level permanent modifications, creating a closer link between the corporate-level technical support, plant level technical support and the operations departments, providing ownership on modification to the plant personnel. The plant applies the process for major or complex modifications. The team recognized this as a good performance.

One more example of a proactive organizational approach is establishment at the plant of a spent fuel disposal committee (COM EVAC). The committee performs a comprehensive check of the fuel handling system and associated systems before the beginning of the fuel disposal campaign. The approach exceeds standard regulatory and technical requirements, in addition to safety aspects; COM EVAC also addresses conventional safety, radiation protection and fire protection aspects, as well as managerial and human aspects. The team recognized this as a good performance.

5.3. PLANT MODIFICATION SYSTEM

The plant has a well-structured modification programme, which is standard for all French nuclear power plants. The programme establishes rules for initiation, conduct and closure of corporate-level and local temporary modifications, and it draws clear lines of responsibilities. However, the team found evidence that in some cases temporary modifications were not identified in the field and not properly implemented and controlled. In some cases, modification documents did not address all aspects of the modification in sufficient depth, there is no deadline for corporate level temporary modifications, and sometimes temporary modifications were not closed in a timely manner. The team has made a recommendation in this area.

5.5. HANDLING OF FUEL AND CORE COMPONENTS

The plant has well defined processes for the handling of fuel and core components, which are well documented and communicated to the plant staff. Also, the plant introduced a generally effective foreign material exclusion (FME) programme, which is well organized and supported by corresponding procedures and software. However, the team observed that the expectations and implementation of the plant FME programme in the area of the spent fuel pool (SFP) is not always adequate to guarantee that all FME-related low level events (LLE) and near misses (NM) are identified and reported by all involved plant personnel. The team has made a suggestion on this subject.

DETAILED TECHNICAL SUPPORT FINDINGS

5.3. PLANT MODIFICATION SYSTEM

5.3(1) Issue: The plant temporary modifications programme does not ensure all modifications are identified in the field, evaluated, monitored during their lifetime and closed in a timely manner.

The team observed the following facts:

- There is no concrete deadline applied to the maximum duration of a temporary modification. The performance indicator (PI) is – as short as possible.
- Currently there are 175 active temporary modifications at the Plant.
- During the plant tour, a temporary heater was observed in room NA 412 (safety system). It was explained that the heater heats the room to prevent boron crystallization in the safety system and that it has been in place for about 10 years. Plant personnel explained that the modification, to find a proper engineering solution of the issue, was not raised because it was not considered as a part of the modification process.
- During the plant tour, a temporary modification OI № NO11730, dated 03.01.2002 (charging pump) was found. Plant personnel explained that the modification was overlooked by corporate level engineering.
- An interview revealed that some modifications have existed since the beginning of operations at the plant.
- In room ME0410, an oxygen meter was used for the condenser system, and was neither tagged nor labeled. The plant does not consider this fact to be a temporary modification.
- During an interview with TS staff, it was stated that for corporate modifications, the site action plan is reviewed every 6 months at corporate level with regard to prioritization. The Plant is waiting for the corporate decision concerning the date of removal of the temporary modification.
- In Unit 1 SDM, elevation +7,2m, near beam G2, a temporary cable laid along cable tray MF0605 is resting on supports or hanging out. It is not marked with any ID or label.

Review of modification RPEM00002 – modification of RPV main flange leak tightness alarm setpoint:

- Modification of reactor pressure vessel (RPV) leak detection alarm setpoint was initiated at the Plant and approved at corporate level. The risk assessment checklist was taking into account only technical work, but did not take into account simultaneous replacement of the procedure by a temporary one, with different criteria for operator's actions.
- Actual RPV leak detection alarm response procedure D5430/CDT/COI/506 was replaced by a temporary procedure № 13-03 developed at the Plant. The original procedure in Step 1 had requirement, in case of alarm actuation, Unit has to be transferred to Cold Shutdown within 15 days. This requirement is absent in the

temporary procedure, the procedure states: “Consider shutdown to replace the internal seal ring”. The risk assessment of modification did not take into account that the new procedure leaves a risk of operation of RPV with main flange leak for unlimited period of time.

- The modification has had the status of temporary modification for 7 years, and is currently reviewed at corporate level. Plant personnel could not clarify when the review is going to be completed, because there is no deadline for the close-out of corporate modification.

The large-scope temporary modification programme involves many departments and has an impact on equipment throughout the plant. Plant safety can be jeopardized if nothing is done to ensure that modifications are identified in the field, controlled during their lifetime in the field and closed in a timely manner.

Recommendation: The plant’s temporary modification process should be improved to ensure all changes to the plant are identified, evaluated, controlled during their lifetime and closed in a timely manner.

IAEA Basis:

SSR-2/2.

4.39: A modification programme shall be established and implemented to ensure that all modifications are properly identified, specified, screened, designed, evaluated, authorized, implemented and recorded.

NS-G-2-14.

5.39. A time limit should be specified for the duration of temporary modifications. After this time period, the temporary modification should be reviewed for its applicability, safety and necessity in the current plant conditions. After the review, an approval process similar to the initial approval process should be carried out if the temporary modification is to remain in effect.

NS-G-2-3.

6.3. The number of temporary modifications should be kept to a minimum. A time limit should be specified for their removal or conversion into permanent modifications.

NS-G-2-4.

3.21: Where it is reasonable, the goals and objectives of all management levels should be measurable and stated in terms that allow measurement of progress and clear determination of achievement. They should be challenging, realistic and focused on specific improvements in performance, and should be limited in number to prevent dilution of efforts in key areas.

GS-G-3.5.

6.3 a): Line management monitoring necessitates that managers... should examine trends in performance indicators.

Plant Response/Action:

A - Causal analysis

The station has identified the following root causes explaining the number of temporary modifications still fitted to the plant, their long-standing nature and the lack of clarity as to their date of removal:

- Insufficient understanding of the document revision process, preventing departments from reducing the number of temporary modifications that could be removed through this process.
- Insufficient control and oversight of the modification request process, resulting in insufficient overview of what could be resolved by a modification; failure to challenge our corporate engineering entities.
- Congestion of the "corporate modification" process caused by excessive workload resulting from Post-Fukushima modifications, sometimes leading to long delays in the implementation of modifications designed by these entities.
- Lack of long-term scheduling for the removal of temporary modifications through repairs carried out by the plant, essentially due to insufficient prioritisation and assessment of consequences
- Complex and constantly evolving risk assessment and regulatory compliance process (decree on Basic Nuclear Installations). The preparation of high-quality documents requires specific skills possessed by a small number of operations personnel (implementation and removal of temporary modifications mainly being requested by operations).

The station has identified the following root causes explaining identification gaps or database quality shortfalls:

- Insufficient understanding of the process: key members of personnel (personnel installing temporary modifications, shift managers) require aggressive coaching in order to ensure that modifications are not implemented without physical identification or administrative documentation.

With regard to coordination issues between departments, the station has highlighted weaknesses in coordination of the cross-functional group of experts responsible for temporary modification control, initially entrusted to a member of shift operations personnel, who did not have enough time to fulfil this role properly.

B - Strategy adopted to address the suggestion:

This strategy comprises 5 main strands:

- Renewed coordination of working group responsible for the reduction of temporary modifications, overseen by one person on day duty in order to improve coordination with other stakeholders and with maintenance departments. This effort will involve the long-term planning and engineering groups.
- Identification of method for processing each temporary modification (equipment repair, document revision, plant-specific modification or corporate modification).

- Medium-term reduction plan:
 - o Scheduling of repairs by maintenance departments
 - o Scheduling of known modifications
 - o Stepping up of efforts to expedite our requests with corporate entities (CIPN, CNEPE)
- In-field and document checks to ensure administrative compliance
- Deployment and reinforcement of new standards

These actions should enable us to immediately embark on the gradual reduction of temporary modifications while ensuring they are under proper administrative control.

C – Method used to verify adequacy of the action plan:

In order to verify whether this action plan would adequately address the aforementioned objectives, the station instructed the temporary modifications group to monitor a certain number of items:

- Tracking the number of temporary modifications and reduction rate on a monthly basis. Monitoring alignment of administrative controls with physical controls.
- Tracking of temporary modifications in system health reports (AP913). The number of temporary modifications brings down the overall grade assigned to the system in question.
- Checking for the absence of uncontrolled or unresolved temporary modifications that could be removed by actions taken by the temp mod control group (each temporary modification assigned to a specific department).

D – Action plan:

Process oversight:

Description of action	Department Due date	Status
Appointment of one temp mod representative within each department (including long-term planning and engineering)	All departments 31/02/2015	Completed
One person on day duty to oversee temp mod control process	Ops 31/01/2015	Completed
Safety Director to participate in certain temp. mod. review meetings	Senior mgt. 31/01/15	Completed

Deployment and clarification of standards and expectations:

Description of action	Department Due date	Status
Station temp. mod. group to be briefed on fleet-wide reportable events involving temporary modifications	Ops	on going
Shift crews to be trained on the temp mod process and on the preparation of high-quality documents	UFPI/SQA Ops 30/09/2015	In progress
Deployment of directive DI074 rev. 3.	Ops	Completed

	30/05/2015	
Risk assessment guidance updated to include physical controls	Ops 31/12/2014	Completed
Clarification of arrangements for document update requests	Ops 30/04/2015	Completed

Identification of methods for processing temporary modifications:

Description of action	Department Due date	Status
Draw up a comprehensive list of methods for the removal of temporary modifications (repair, plant modification, document change)	30/04/2015	completed

Components of the temp mod reduction plan:

Description of action	Department Due date	Status
Allocate a budget of 70000 Euros to reduce the number of temporary modifications	Ops 30/06/2015	Completed
Confirm whether all work requests for removing certain temporary modifications are active	All departments 30/09/2015	In progress
Work together with the planning group to schedule repairs over the forthcoming on-line outage cycles.	All departments 30/05/2015	completed
Issue "DEM" documents for temporary modifications that can only be removed via this process	All departments 30/12/2015	In progress
Challenge the department in charge of plant-specific modifications	All departments 30/06/2015	In progress
Challenge corporate entities in charge of corporate modifications (I&C changes, obsolescence)	Ops/Mods 31/12/2015	In progress
Review document update requests for temp mods that can be removed via this process	All departments 31/12/2015	In progress

In-field checks:

Description of action	Department Due date	Status
Ensure that the appropriate labels are affixed to temporary modifications on plant	Ops 30/06/2015	In progress

F – Action plan effectiveness review

This action plan is reviewed in detail at monthly temp. mod. meetings (department-specific deadlines agreed with the various department representatives). Results are tracked by looking at the number of active temporary modifications, as well as the items mentioned under paragraph C.

An annual review is performed to learn lessons from the results of the past year, as well as to identify process-related strengths and weaknesses and recommend corrective actions.

IAEA comments:

Insufficient understanding of the document revision process, insufficient control and oversight of the modification request process, bottleneck of corporate modification process, lack of long-term scheduling for removal of temporary modifications and complex and constantly evolving risk assessment and regulatory compliance process were identified by the plant as the root causes for this issue.

The plant has improved the coordination of temporary modification by assign a dedicated person on day-shift to lead the temporary modification reduction actions. Each temporary modification was evaluated to identify the method for its resolution, and medium-term temporary modification reduction plan was developed. Coordination with Corporate office has been improved. Frequent field and document checks were applied to ensure administrative compliance. Corporate directive on temporary modification was communicated to the staff by training.

The number of temporary modification is closely monitored by the plant, and it is also being reflected into the system health report. The number of temporary modification was stable in 2013 and 2014, and has decreased from 185 to 147 from January 2015 to May 2015. Field visit showed improvement of control on temporary modifications.

Conclusion: Satisfactory progress to date

5.5. HANDLING OF FUEL AND CORE COMPONENTS

5.5(1) Issue: Plant Foreign Materials Exclusion (FME) expectations and practices in spent fuel pool (SFP) areas are not adequate to prevent foreign materials intrusion into the FME zone.

The team observed the following facts:

Several items were found in spent fuel pool (SFP) areas/ rooms:

- Findings near the FME zones of Unit 1 and 2 included the following items:
 - flakes of paint,
 - socket,
 - metallic ruler,
 - small pieces of plastic,
 - small transparent container,
 - white items (possibly smear sheets),
 - gas sampling equipment.
- Findings within FME zone of Unit 1 were as follows :
 - small bits of concrete near railways,
 - small pieces of plastic,
 - loose tape,
 - fibers.

The plant has color-coded ‘purple’ area, about 50 cm wide, to indicate buffer zone for FME area. The plant does not consider items found in the ‘purple’ buffer zone located around the SFP FME zone as precursors of foreign material and generally attributes them to housekeeping issues, thus trending them separately from FME in the low-level event database.

An interview revealed that fuel route personnel controls and immediately investigates all low level events (LLE) and near-misses (NM) in the FME area and immediate vicinity of SFP, but is not expected to report and record them in the database. It was stated, that this is the responsibility of the FME champion who is part of the “Safety” project, while responsibility for the fuel route belongs to “Production”.

An interview revealed the absence of performance indicators on LLE and NM.

The plant has no expectations related to FME LLE and NM in the immediate vicinity of the SFP outside the FME extraction zone (50 cm.)

Interview with the FME Champion revealed the following:

- Only events which take place in the SFP and which involve fuel are registered in the SAPHIR database as FME events. The LLE and NM outside the fenced area (‘purple’ buffer zone and rest of the SFP room) are considered as FME and/or housekeeping issues and are to be registered in the TERRAIN database.
- The SAPHIR and TERRAIN databases are not integrated – they are independent databases.

- The TERRAIN database allows search using a key word like ‘FME’, but does not allow predefined search based on room number (only building ID), which makes it difficult to screen the records related to SFP area, marked as Housekeeping.
- The Plant has no specific document or expectation regarding the reporting and recording of LLE and NM in the SFP area, except for FME events in the SFP itself which are registered in the SAPHIR database, even though the general expectations to report all deviations are clearly communicated to personnel in the booklet titled: “l’excellence au quotidien”.
- While commenting on the number of FME facts found by the OSART team during the plant tour, which were not discovered and reported earlier, the plant personnel stated that the expectation is that every such event should be reported in the Terrain database and the expectations are reinforced during meetings with Operations and Maintenance personnel.

Without adequate FME practices in SFP areas, there is a risk of foreign material intrusion into fuel assemblies that may eventually result in fuel damage due to degraded heat removal or debris mechanism.

Suggestion: The plant should consider enhancing FME expectations and reinforcing practices in SFP areas to prevent foreign materials intrusion into FME zones.

IAEA Basis:

SSR – 2/2:

7.11. An exclusion programme for foreign objects shall be implemented and monitored...

NS-G-2.5:

3.9. The areas for the handling and storage of fresh fuel should be maintained under appropriate environmental conditions (in respect of humidity, temperature and clean air) and controlled at all times to exclude chemical contaminants and foreign materials.

5.19. A policy for the exclusion of foreign materials should be adopted for all storage of irradiated fuel. Procedures should be in place to control the use of certain materials such as transparent sheets, which cannot be seen in water, and loose parts.

Plant Response/Action:

A – Causal analysis

The facts observed highlight two types of issues:

- Level of requirements around the fuel pools
- Instrumentation in the field of FME (including reporting of events).

B – Strategy adopted to resolve the recommendation or suggestion

The 2 issues were processed in parallel:

- Housekeeping around the fuel pools: clarification of the requirements and dedicated managerial focus

- Instrumentation: Coordination of the reporting of known events and use of the findings recorded in the TERRAIN database

The issue of absence of interconnection between the databases was not able to be processed, as it involves corporate standardised tools.

C – Method used to check that the action plan is appropriate

The topic of FME has benefited from strengthened coordination in keeping with the impacts since 2012. It is the subject of field observations and in March 2015 it was targeted by the dedicated field team during the unit 2 outage, so that relevance of the site action plan could be assessed. Every year, at the review of subprocess Improve nuclear safety and QA, the issue is discussed with the specialisations and the action plan is supplemented accordingly. FME management has been integrated in analysis of the low level events of the subprocess.

D – Action plan

Clarification of the requirements for the fuel pools:

- Definition and display of a rule for management and circulation around the pools
- Securing of hard hats before entry to the fuel building

Housekeeping around the spent fuel pools:

- Application of DT340 (storage of fuel transport packaging)
- Removal of ropes
- Housekeeping rounds

Reinforcement of the requirements:

- Focus during one month on FME standards: Posters at site entrance, weekly messages, reinforcement of standards and expectations by team leaders.
- Dedicated field team walkabouts focused on this topic in March 2015
- Field walkabouts dedicated to the fuel pools
- Observation techniques for the Technical and Environment Department managers
- Stand dedicated to FME during the safety day in 2015

Identification of events

- Coordination of reporting in SAPHIR
- Dedicated analysis of low level events
- Encouragement of raising of FME findings (excluding reportable events) by making it a priority topic for observation in 2014

Only the actions in the plan strictly corresponding to the OSART findings are listed here. Other actions have also been taken to:

- Identify the worksites at risk (outage and power operations)
- Procurement of caps and other systems for improved control of tools and worksites
- Reinforcement of the requirements and support for the work coordinators in charge of worksites at risk

E – State of action plan progress and reporting procedure

All the actions dedicated to resolving this suggestion have been implemented. This action plan was reported on to the Improve nuclear safety and QA committee, to which the process reports.

F – Evaluation of action plan effectiveness

The different assessments (WANO Peer Review and peer review of operating and maintenance quality deficiencies) did not identify any specific issue around the pools. The dedicated field team walkabouts conducted in March confirmed the good quality of management of FME areas around the fuel pools.

Concerning the identification of deviations and anomalies related to FME management, around a hundred findings were raised by managers and personnel in 2014, which shows the level of attention paid to management of the risk of foreign material intrusion.

IAEA comments:

The plant has identified the root causes of the issue as insufficient requirements of FME, inadequate management focus, housekeeping around the spent fuel pool area and insufficient analysis of low level event related to FME.

Plant has provided clarification of the FME requirements and communicated to the plant staff consistently. One of the top 5 priorities for the plant in 2014 was FME management, and the plant dedicated a full month to the FME campaign in 2015. Signs and posts are visible in the plant areas and entrance to FME sensitive rooms, such as spent fuel pool.

Owner of spent fuel pool were assigned with the full responsibility for FME. Frequently walk downs by the owner were conducted and findings were input into one database for analysis.

Focused management observations in FME were conducted with the subject matter expert.

Areas adjacent to the spent fuel pool were cleaned, painting was applied for cracked floors, and unnecessary ropes were removed. Low level findings on FME were analysed and acted upon.

A field visit to Unit 2 spent fuel pool showed visible improvement of FME control, and housekeeping.

Conclusion: Issue is resolved

6. OPERATING EXPERIENCE FEEDBACK

6.2. REPORTING OF OPERATING EXPERIENCE

The plant has developed a humorous movie explaining the “do’s and don’ts” in reporting of low level events which complements the reinforcement of management expectations in this area. This good practice is to coach plant staff in the reporting of low level events using the prompt of a popular French comedy series called “Camera Café”. The team identified this as a good practice.

6.5. ANALYSIS

Analyses of some safety significant events is not being performed in sufficient depth and the plant root cause analysis process lacks certain attributes. The team has made a recommendation in this area.

6.9. ASSESSMENT AND INDICATORS OF OPERATING EXPERIENCE

At the plant operating experience programme is not periodically evaluated to determine its effectiveness. The team has made a recommendation in this area.

DETAILED OPERATING EXPERIENCE FINDINGS

6.2. REPORTING OF OPERATING EXPERIENCE

6.2(a) Good Practice: A humorous movie explaining the “do’s and don’ts” in reporting of low level events which complements the reinforcement of management expectations in this area.

This good practice is to coach plant staff in the reporting of low level events (deviations) using the prompt of a popular French comedy series called “Camera Café”. The movie has proven very popular with plant staff.



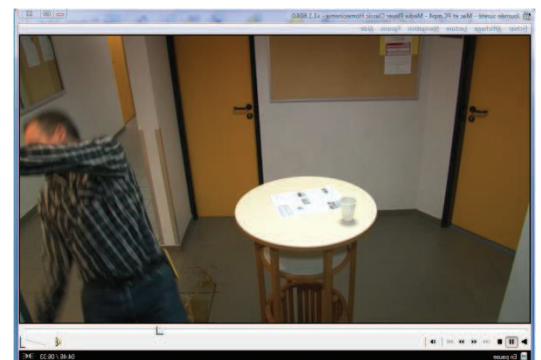
The caricatures and funny scenes in the movie (6 scenes in total lasting 5 minutes and 30 seconds) were designed by voluntary plant staff. This is used as a lively platform to exchange on the reporting method and how to adopt them on a day to day basis. Its purpose is to involve an increasing number of plant staff in the programme by motivating them to raise low level event reports using the relevant method. The idea is also to help people understand and feel that the corrective action programme (CAP) is no longer a machine to give additional work to people.

Following are some key messages delivered by this movie:

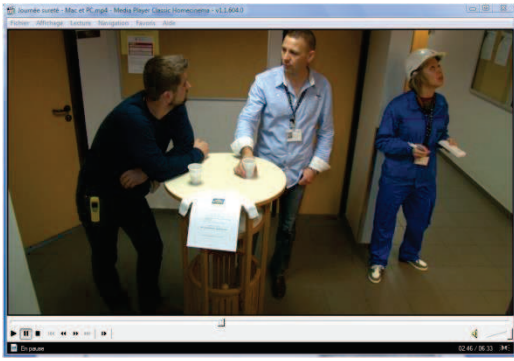
- 1) When possible, the deviation is to be corrected immediately to avoid an unsafe condition followed by writing the condition report (pictures 1 & 2).
- 2) Managers should not use condition reports to reach their perceived walk down targets (picture 3)
- 3) A condition report is not a “negotiating tool” (picture 4)



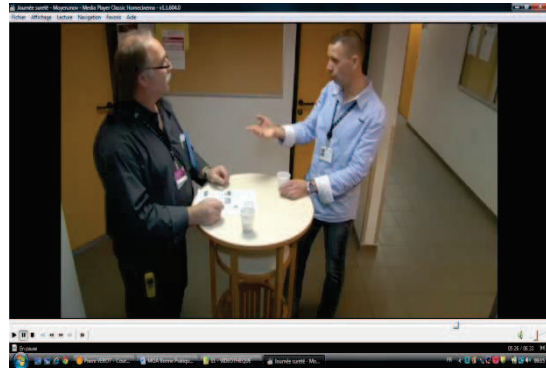
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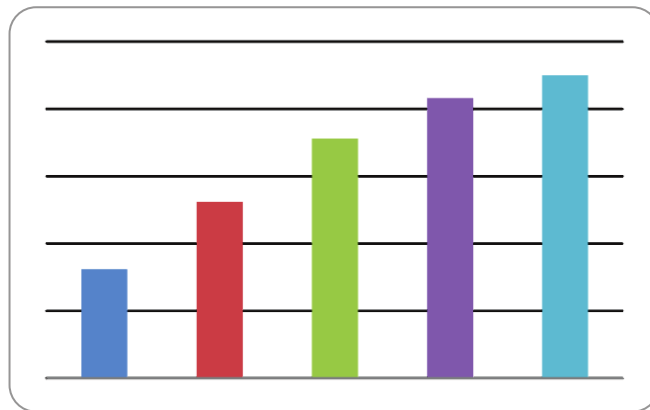
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This movie was first broadcast during the safety day organized on January 2013. Further to the enthusiasm shown by the participants, it was presented and supplied to other sites in the French fleet.

One of the benefits of this practice is an increase in the number of non managerial staff raising reports at the plant in 2013, as shown in the graph below.



6.5. ANALYSIS

6.5(1) Issue: The plant's root cause analysis process of significant events lacks certain attributes, and analysis is not always performed in sufficient depth.

The team observed the following with regard to analysis of safety significant events:

- In the event involving “Tagging out power supply of pressurizer relief valves in incorrect reactor state” (ESS 12-004), the tag-out was performed by the Tagging Officer without authorization by the Shift Manager. The analysis report does not address WHY the Tagging Officer performed this unauthorized action and hence, no corrective actions were developed to strengthen this broken barrier.
- During the above (ESS 12-004) event, the shift staff had expressed its apprehension about the actual reactor state. But the Shift Manager was very confident of the perceived reactor state which turned out to be incorrect. As per the analysis report, the actual reactor state could have been easily confirmed by checking the plant technical specifications which was not done by any member of the shift. However, the analysis report does not address the issue of WHY no reference was made to the technical specifications.
- One of the causes of the event involving “Unauthorised post maintenance testing of back up chemical and volume control pump” (ESS 13-007) was the staff unawareness of implications of modification carried out on the LLS 1 power circuit resulting in unidirectional operation of this switch. The plant analysis did not address the possibility of such unawareness of the plant staff regarding various other modifications carried out at the plant.
- Miscommunication between the Shift Manager and the Safety Engineer was identified as another cause of the above (ESS 13-007) event. However the analysis report does not refer to earlier events of similar nature involving miscommunication between Shift Managers and Safety Engineers at the plant and the reasons for such communication failures.
- For the event on “Operation outside the technical specification temperature limit” (ESS 12-018), inconsistencies between the temporary instruction and the KIC (electronic procedure) was identified as one of the causes. However, the analysis report does not address the extent of condition by specifying a check on similar inconsistencies with other temporary instructions.
- At the plant, coding fields are not assigned in the root cause analysis reports. In addition there is no requirement/directive from corporate to identify and record repeat events and the extent of cause/condition in these reports.
- Significant events are coded in the RAS database. However some of these codes are at a higher level and are not tracked at actionable level. For example LD -14, non compliance with INSAG-4 involves lack of questioning attitude, self check etc., which are not tracked separately.
- At the plant, there is no formal training and retraining requirement for staff performing root cause analysis of events. However some plant personnel have attended training courses conducted by Corporate. The Corporate office has been requested to provide a formalized training which is likely to be conducted in November 2013.

Without precise identification of the root causes of events, their recurrence cannot be prevented.

Recommendation: The plant should enhance the process of root cause analysis of safety significant events and perform an in depth analysis of such events.

IAEA Basis:

SSR-2/2

5.28, in part, “Events with significant implications for safety shall be investigated to identify their direct and root causes, including causes relating to equipment design, operation and maintenance, or to human and organizational factors.”

NS-G-2.11

4.3, in part, “The level of the investigation carried out should be commensurate with the consequences of an event and the frequency of recurring events. Significant factors that would influence the magnitude of an investigation may include the following:

-Whether a similar occurrence has taken place earlier at the same installation”

Appendix III.3. Training (both initial and refresher) should be provided for the staff who might take part in an investigation. This should include training in investigation techniques, documentation needs, witness interviews, conflict resolution and dealing with confidentiality issues. Whereas all investigators should receive some basic training in event investigation, including root cause analysis, for more difficult and complex investigations there may need to be at least one expert facilitator who is familiar with such methods of investigation.

Plant Response/Action:

A – Causal analysis

Site analysis identified the following main causes:

- Method used: it does not easily enable the root causes to be systematically detected and codified
- Capacity of the participants to analyse the events: certain persons in charge of analysis had not been trained
- Effectiveness of action plans: there was no system to identify repeat events and analyse why the action plans were not sufficient to prevent recurrence

B – Strategy adopted to resolve the recommendation or suggestion

As this recommendation recurs on all the EDF sites, corporate level asked the nuclear power plants to deploy a new method known as in-depth event analysis. As the deployment schedule corresponded to the OSART follow-up period, Chooz NPP was enrolled as a priority site for deployment and induction by corporate level. Implementation of this new initiative also constituted the opportunity to rally management around the significance of investigation of root causes, strict application of the method and training of the participants. In order to process the third point, it was first of all considered that it was sufficient to roll out the questioning right from drafting of the report. However, the scope of this consideration was then broadened within the framework of application of the BNI Order, which stipulates that effectiveness of site actions should be reviewed.

Concerning the remark on tracking of the INSAG4 codes, this coding has been effectively analysed by the Human Performance Expert for a number of years. This analysis is presented

to the dedicated safety committee and can thus result in the site adopting actions accordingly. Although this analysis system is not new, it mainly resulted in 2015 in the site starting to deploy in the teams the safety culture guidelines compiled by corporate level, with participation of the Chooz Human Performance Expert.

C – Action plan

1/ Deployment of the in-depth event analysis method

The site has applied the method developed by corporate level since January 1, 2014. It is based on international standards for event analysis in the nuclear industry, mainly distributed by WANO and INPO. It is in compliance with the Human Performance Enhancement System (HPES) method.

In-depth event analysis is conducted for all the significant safety events (also for significant radiation protection, significant environment events and significant transport events). Since the start of 2015, further to positive internal operating experience, the site has conducted in-depth event analysis for all the category 1 findings and simplified event analysis, an adapted version of in-depth event analysis, for category 2 findings.

In-depth event analysis offers several advantages for the report coordinators and readers:

- Simplification: suppression of the notions of inappropriate action, failed barrier, facts and non-facts, degrees of causality, elements of comprehension and impacts of inappropriate actions,
- Investigation: guidelines for root cause investigation,
- Pedagogy: graphic representation facilitating familiarisation of the readers with the analysis.

Identification and processing of root causes of an event, regardless of whether they are of a technical, human or organisational nature, must be able to prevent recurrence and contribute to preventing occurrence of events of the same type. In-depth event analysis thus contributes to improved equipment, human and organisational reliability.

2/ Training of analysis participants

21 employees had been trained in the in-depth event analysis method by the end of 2014 (including 13 in 2013). Training lasts for 2 days for those who have already deployed the former method and 4 days for those uninitiated in event analysis. Scheduling of the new training is integrated by the UFPI Training Department for 2015 according to site needs.

3/ Effectiveness of action plans

In order to improve effectiveness of the site corrective actions, several initiatives have been taken:

- The report template has been modified to systematically include questioning on effectiveness of previous actions. If a repeat event is involved, this enables the site to build an action plan accordingly.
- Alignment with the BNI Order, which stipulates effectiveness review of the actions, is being considered. Within this framework, some noteworthy events are selected, for which some of the main actions are assessed with the site independent checking system implemented by the Nuclear Safety, QA and Audit Department (SQA).

D – State of action plan progress and reporting procedure

Action	Status	Operational coordinator	Due date
Train the first employees in the use of in-depth event analysis prior to deployment	Closed out	Feuillet	12/2013
Notify the local Chalons en Champagne office of the Nuclear Safety Authority of the change in the method (complete presentation of the method)	Closed out	Lucchini	12/2013
Modify the organisation memo for processing significant events to draw maximum benefit from the in-depth event analysis method	Closed out	Feuillet	06/2014
Analyse all the site significant events with the in-depth event analysis method as from January 2014	Closed out	Feuillet	01/2014
Mid-year report before rolling out the use of in-depth event analysis to analysis of the simple findings of category 1 in the corrective action programme	Closed out	Feuillet	09/2014
Train more employees in the in-depth event analysis method	Ongoing	UFPI	
Modify the significant event report template to integrate review of past actions	Closed out	Feuillet	12/2013
Validate the organisation for measuring effectiveness of the actions stemming from significant events	Closed out	Heibel	02/2015
Implement a programme for checking effectiveness of the actions stemming from the significant events in 2014	Ongoing	SQA	12/2015

E – Evaluation of action plan effectiveness

In order to assess maturity of Chooz NPP concerning in-depth event analysis, the site benefits from a regular snapshot compiled by corporate experts. It has thus been concluded that the initiative has been properly implemented and the method is thoroughly understood by the personnel in charge of analysis, but that the capacity to widen the scope of investigation shall be further encouraged.

IAEA comments:

To address this issue, the plant with support from the Corporate organization has implemented a new root cause analysis (RCA) methodology which is in line with the industry

practice. RCA report template has been modified to include separate sections on extent of cause/condition and repeat event checking. Till date around 35 events have been analysed with this new methodology and sample check on few of RCA reports indicated marked improvement in identification of the root causes and development of corresponding corrective actions.

26 employees have been trained in the new methodology and training of additional staff is planned. However future retraining of staff has still not been addressed. A snap shot on quality of 7 RCA reports (based of around 19 parameters) was conducted by the Corporate organization. Results of this snap shot were found very positive in terms of clarity in understanding of the process and presentation of the analysis. However in some cases all the 19 parameters were not fully met.

Conclusion: Issue is resolved.

6.9. ASSESSMENT AND INDICATORS OF OPERATING EXPERIENCE

6.9(1) Issue: At the plant, the operating experience programme is not periodically evaluated to determine its effectiveness.

- Requirement to perform a periodic effectiveness review of the overall OE programme including that for corrective actions does not exist at the plant.
- OE is handled in a number of databases like TERRAIN, SYGMA, RSA, L@CID, outage event database etc which are handled by different departments. Such a spread of information can lead to difficulties in overall assessment of the programme effectiveness.
- The initial approval of a root cause analysis performed at the plant is given by the concerned area director. In some cases, the reports are rejected by him for lack of quality/depth of analysis. However, such cases are neither recorded nor monitored for effectiveness review.
- Some of the key indicators like number of recurrent events, corrective actions exceeding the completion date and number of times such dates are exceeded, which can help in monitoring the effectiveness of the programme, are not tracked at the plant. The plant is planning to implement such type of performance indicators by the end of the year.

Without an effective assessment of the OE programmes, opportunities to identify necessary improvements could be missed.

Recommendation: The plant should establish a requirement for effectiveness review of its OE programme and perform it at periodic intervals.

IAEA Basis:

SSR-2/2

5.33 The operating experience programme shall be periodically evaluated to determine its effectiveness and to identify any necessary improvements.

NS-G-2.11

8.2 The operating organization or licensee should periodically review the effectiveness of the process for the feedback of experience. The purpose of such a review is to evaluate the effectiveness of the overall process and to recommend remedial measures to resolve any weaknesses identified. Indicators of the effectiveness of the process should be developed. These may include the number, the severity and the recurrence rate of events and the causes of different events.

6.62 The effectiveness of the operating experience review programme should be assessed periodically to identify areas of weakness that require improvement.

Plant Response/Action:

A – Strategy adopted to resolve the recommendation or suggestion

In order to ensure periodic effectiveness review of the processes, work has been carried out to improve the site integrated management system. Effectiveness of operating experience is reviewed with coordination of the subprocess Manage continuous improvement (AMC). The AMC subprocess coordinator is responsible for subprocess effectiveness, performance and results. He runs the quarterly committee meetings and annual review:

- ➔ The purpose of the quarterly committee meetings is to check meeting of the targets laid down by tracking the indicators, identify malfunctions and the ensuing improvement actions and coordinate progress of the actions. Work is carried out on compiling and tracking of the most relevant indicators to assess running of the subprocess.
- ➔ Annual review results in an annual report being compiled on effectiveness and running of the operating experience process. Based on analysis of the indicators, assessment of the actions taken, analysis of low level events and risk assessment, effectiveness of the operating experience process is evaluated every year. The causes of malfunctions and low level events are analysed to determine the improvement actions to be taken for the following year.

Corporate directive DI135 describes the expectations for the organisation of operating experience. Its distribution in July 2014 has enabled the working framework to be set out so as to improve the organisations, especially concerning operating experience for maintenance workers. In 2015, the operating experience coordinator shall support the departments with the transposition of DI135. The aims are as follows:

- ➔ Revitalise operating experience on site and develop recording and distribution of operating experience for maintenance workers
- ➔ Clarify running of the operating experience process and especially the role and use of the various tools and databases provided

B – Action plan

In 2013:

- Improvement of the integrated management system and updating of the organisation memo for the macro-process Coordinate.

This memo stipulates that effectiveness of the process should be assessed with the annual subprocess reviews. The input data, targets and indicators of the AMC subprocess are defined in the subprocess ID card. The content and expectations of the annual review are described.

In 2014:

- Tracking of analyses and corrective actions overdue:

Analyses and corrective actions overdue are tracked on a weekly basis at the weekly corrective action programme managerial meetings attended by all the Department Heads. The rate of analysis and corrective actions ongoing and overdue is calculated on a monthly basis and tracked at the monthly corrective action programme managerial meetings. Coordination of the analyses and corrective actions is thus improved.

- Self-assessment for application of DI135:

The purpose of site self-assessment against DI135 was to take an inventory of the site operating experience process compared to the requirements laid down by corporate level and define the improvement actions to be implemented.

- AMC subprocess review:

The annual review structure was improved for better evaluation of effectiveness of the subprocess. It focuses on: analysis of the indicators, opinions of the stakeholders, feedback from the committee meetings, trending and low levels events derived from field findings, results of internal checking and audits, status of the documentation, progress of the targets laid down for 2014, risk evaluation and targets set out for the following year.

In 2015:

- Analysis of site assessment against DI135:

The self-assessment performed in 2014 is deepened in order to define a detailed action plan to improve the operating experience process

- Definition of relevant indicators to evaluate effectiveness of the operating experience process, by considering the existing indicators and setting up tracking of these indicators

In order to improve annual effectiveness review of the process, the indicators in place need to be reviewed and tracking of additional relevant indicators needs to be set up.

C – State of action plan progress and reporting procedure

- Organisation of coordination of the AMC subprocess is described and applied. The indicators are tracked at the AMC committee meetings on a quarterly basis. The minutes of the committee meetings are recorded in the macro-process MP1 database. Analysis of the indicators, opinions of the stakeholders, feedback from the committee meetings, trending and low level events derived from field findings, results of internal checking and audits, status of the documentation, progress of the targets laid down for 2014 and risk evaluation are used during the annual subprocess review to evaluate effectiveness of the operating experience process and define improvement actions for the following year. The minutes of the annual review are recorded in the macro-process MP1 database.

- Site self-assessment against DI135 was performed at the start of 2015, based on the self-assessment performed in 2014 with a precise inventory of the organisation in place. This self-assessment highlights the weaknesses of the site operating experience process and defines the actions to be set up. The action plan is validated by the macro-process MP1 committee. Progress of this action plan and meeting of the targets laid down act as input data for the annual AMC subprocess review in 2015.

- The indicators defined as relevant for effectiveness review of the operating experience process are:

- Rate of repeat events
- Rate of corrective actions processed by the due dates
 - Actions stemming from operating experience analysis committee (GAREX) meetings
 - Actions derived from post-job reviews
 - Overall rate

- Rate of type 1 and 2 analyses conducted by the due date
 - Effectiveness review of outage operating experience
 - Checking of effectiveness review of the actions stemming from significant safety events
 - Tracking of processing by the due dates allocated for actions stemming from significant events
- State of progress of setting up of tracking of these indicators:
- Rate of repeat events: Setting up planned for the first half of 2015
 - Rate of corrective actions processed by the due dates:
 - Actions stemming from operating experience analysis committee (GAREX) meetings: External operating experience requiring an action to be taken by the site is analysed at the fortnightly operating experience analysis committee (GAREX) meetings. All the actions derived from the operating experience analysis committee (GAREX) meetings are recorded as a simple finding in version 2 of the Terrain database by the OE coordinator. These findings are tracked by the OE coordinator. He checks that a coordinator and a due date have been allocated for every finding within 15 days, and that the action has been implemented by the due date allotted. Ongoing actions are discussed at every operating experience analysis committee (GAREX) meeting. The tracking file is available in the minutes of the meeting in the macro-process MP1 database.
 - Actions derived from post-job reviews: deployment of the post-job review support tool was started in February 2015. The purpose of this tool is to facilitate post-job review and improve recording of operating experience for maintenance workers. The actions derived from post-job review are transferred to version 2 of the Terrain database for processing. Setting up of the indicator planned for the first half of 2015
 - Overall rate of corrective actions processed by the due dates: Setting up planned for the first half of 2015. This indicator supplements tracking of the corrective actions ongoing and overdue, which was setup in 2014 but does not report on effectiveness of the process.
 - Rate of type 1 and 2 analyses conducted by the due date: Setting up planned for the first half of 2015. This indicator supplements tracking of the analyses ongoing and overdue, which was setup in 2014 but does not report on effectiveness of the process.
 - Effectiveness review of outage operating experience:

Operating experience is reviewed by the outage OE subproject manager at the end of every outage. An action plan is compiled for the next outage by summarising the various sources of OE from the previous outage. After the next outage, the outage OE subproject manager compiles the report on the events that have occurred, effectiveness of each action, and whether or not there are grounds to continue or modify the action.
 - Checking of effectiveness review of the actions stemming from significant safety events: In 2015, five level 1 checking operations are planned to review effectiveness of the actions stemming from the most noteworthy significant safety events in 2014. It is planned to roll out this type of checking to 4 to 6 significant events a year.

Tracking of processing by the due dates allocated for the actions stemming from significant events: Tracking is ensured by the Engineer in charge of Relations with the Nuclear Safety Authority.

IAEA comments:

Subsequent to the OSART mission, the plant management directed the OE coordinator to monitor the effectiveness of OE programme and conduct annual effectiveness review. Meanwhile directive DI 135 on OE was issued by the Corporate in July 2014. One of the requirements of this directive was to conduct an annual effectiveness review of the OE programme. DI 135 however didn't include any guidance on the methodology to be followed to conduct such a review. The plant carried out self assessment to identified gaps between what was existing at the plant and requirements provided by DI135 and an action plan was developed to address these gaps.

The plant has developed 8 performance indicators for conducting the annual effectiveness review of the OE programme which also includes analysis of LLEs. While few of these PIs were tracked in 2014 development of all these PIs has been completed by May 2015. However performance indicators (PIs) on Low-Level Events (LLE) and Near Misses and OE during outages are not covered in this annual review as they are handled in different processes. Based on these PIs the plant is planning to issue the first annual comprehensive effectiveness review report by the end of 2015.

Conclusion: Satisfactory progress to date

7. RADIATION PROTECTION

7.1 ORGANIZATION AND FUNCTIONS

The Risk Prevention Department (SPR) has good organization and supervision of contractors. This relationship encourages a review of operating experience and any subsequent learning is incorporated into future work ensuring optimization of doses. This is recognized as a good performance.

Radiation Protection training is adequate, although it is noted that there is no requirement for refresher training for medical staff on decontamination techniques and the plant has recognized that Radiation Protection level 1 refresher training is too focused on error reduction tools, taking away from the radiation protection focus. This has been self identified and actions are being implemented to redress the balance. The plant is encouraged by the team to continue to search for and implement improvements in RP training.

7.2 RADIATION WORK CONTROL

A good practice has been recognized that enhances controls preventing inadvertant access into zones of elevated dose rate (orange zones) that require specific authorization, since the implementation of this practice in 2009, the plant has not had a significant reportable event of persons entering and orange area without appropriate authorization.

7.3 CONTROL OF OCCUPATIONAL EXPOSURE

Much effort is put into the ALARA planning process, both at power and for future outages, with the detailed preparation of plans, equipment and briefing notes.

It is recognized that the plant has 95% of areas within the Radiological Controlled Area that are classed as 'radiologically clean'. However, observations have shown that contamination control practices within the Radiation Controlled Area do not always ensure that potential exposure to contamination is minimized and that spread of contamination is prevented. The team has made a recommendation in this area.

7.5 RADIOACTIVE WASTE MANAGEMENT AND DISCHARGES

Radioactive waste is not always processed as early as practicable and signage/labeling is not always applied correctly or consistently which does not follow the principle of optimization of doses. The team has made a suggestion in this area.

DETAILED RADIATION PROTECTION FINDINGS

7.2 RADIATION WORK CONTROL

7.2 (a) Good Practice: Enhancements to standard identification of orange zones.

Orange zones are areas of elevated dose rates that require specific authorization for people to enter. In order to prevent inadvertent access without the appropriate authorization the plant has established enhanced warnings at the entry to all orange zones.

Where an orange zone is accessed through a door, as well as the standard warnings posted on the door, the plant have placed fixed extendable barriers at chest height.



Where there is a partial orange zone (term used when only part of the room is classified as an orange zone) the plant apply the standard barrier tape which is supplemented with a visible and audible sign that has motion sensors that activate the flashing lights and audible warning.



Since the implementation of both practices in 2009, the plant has not had a significant reportable event of persons entering an orange area without appropriate authorization.

7.3 CONTROL OF OCCUPATIONAL EXPOSURE

7.3(1) Issue: Contamination control practices within the Radiation Controlled Area do not always ensure that potential exposure to contamination is minimized and that spread of contamination is prevented.

The following observations were made:

- Two workers observed stepping over barrier in change room in full RCA dress. They then stepped back over into the undressing area and proceeded to undress correctly.
- Two individuals observed exiting C1 area without using MIP 10 frisker before using C1 monitor (as is the expectation).
- Individual observed exiting controlled area of the hot laboratory without monitoring paper work.
- Workers observed proceeding to C1 monitor without monitoring hard hats in CPO.
- 4 of 109 C2 alarms where persons did not call to notify Risk Prevention Department (SPR), as is the expectation, in 2013.
- Easy to by-pass C1 monitor in male change area (unit 2), evidence of this having happened before (one instance in 2012 where individual was found contaminated at C2 monitor, during the follow-up investigation it was revealed that the individual had by-passed the C1 monitor).
- Skips used to transfer potentially contaminated waste bags from RCA to BTE are overloaded preventing proper closing of lid.
- Discussions revealed that contractors Radiation Protection Officer identified that members of his staff working in radiation protection were not reporting their own contamination events. Staff were reminded during training session on new C2 monitors of expectations. Target for 2013 for Risk Prevention Department and subcontractors was 3 C2 alarms. By 30/04/2013 subcontractor alone had 5 C2 alarms.
- Order/layout of clothing bins in Effluent Treatment Building female change area does not facilitate ease of undressing and, if there is more than one person, persons that are partially undressed must cross paths (in close proximity) with persons in full RCA dress in order to place their clothing in the correct bin.
- Layout of 'hot lab' access area encourages crossing of barriers. The 'hot lab' is an area that workers go to in order to obtain an electronic dosimeter for use in controlled areas that are not within the main RCA (auxiliary) building. In order to return the electronic dosimeter the worker must cross the monitoring point from non-controlled area to controlled area.
- Tools that are returned to the Radiation Controlled Area tool store are monitored using the CPO, if an alarm is initiated the item is removed, swabbed, if $>4\text{Bqcm}^2$ detected it is then decontaminated. There is no implemented procedure/ guideline for what to decontaminate where, some people using the bench in the corner of the store, others taking the item away to a specific facility. Once decontaminated to $<4\text{Bqcm}^2$ by smear the item is returned to the store. There are no guidelines as to what dose rate is acceptable to be received in the store. The items that pass the CPO ($<800\text{ Bq}$) are automatically put back into the store, this could lead to items with as much as $\sim 700\text{ Bq}$ (possibly a single particle) being allowed back into the store with no further checking to see if it is loose or fixed contamination.
- Surveys are conducted at power according to schedule but are not reviewed

and validated in a timely manner.

- Two examples: BAN PL05 survey completed 05/06/2013 initial review by contract monitors supervisor 22/05/13, final review by SPR staff member 29/05/13.
- 1LIMZC DED survey completed 17/05/13, initial review by supervisor 21/05/13, final review by SPR staff 30/05/13.
- Outage survey reviews are conducted in a more timely manner.
 - During at power operations there is no means of knowing how many C1 alarms are initiated as it is not expected to be reported. Individuals remove clothing and pass through C1 dedicated. SPR are not aware of how many bags of contaminated clothing are filled per year.
 - Radiation Protection Personnel guardian's area is accessible by persons from the Radiation Controlled Area side and by persons who have already passed through the C1 monitor (cross contamination possible).

Examples of worker behaviour obtained from the corrective action programme:

- CVT-2013-2-00742- Incorrect clothing worn in RCA area was not challenged by SRP contractor.
- CVT-2013-2-00982- 10 out of 60 people were observed wearing nitrile gloves worn in the 'zone circulation' (area in which the expectation is that cotton gloves are worn).

Inconsistent application of contamination control practices could lead to spread of contamination potentially challenging RCA boundaries.

Recommendation: The plant should enhance its contamination control practices to ensure that contamination is minimized and spread of contamination is prevented.

IAEA Basis:

GSR Part 3

3.90. Registrants and licensees:

(d) Shall establish measures ...to control the spread of contamination;

NS-G-2.7

3.11. Changing areas shall be provided, as appropriate, at the entrances to and exits from those zones which are contaminated or may become contaminated (Ref. [2], para. I.23). Changing areas should be designed to prevent the spread of contamination by means of partition into a clean side and a potentially contaminated side.

3.12. Equipment is required to be provided, as appropriate, for the monitoring of persons at exits from controlled areas in order to ensure that contamination levels on their clothing and body surfaces are below a specified level.

3.13. Before items are removed from any contamination zone, and in any case before they are removed from controlled areas, they are required to be monitored as appropriate.

3.55. Site personnel, including contract personnel, should be specifically trained and qualified in the use of protected clothing.

Plant Response/Action:

A – Causal analysis

Behaviour and vigilance

Lack of assessment of certain risks and of any consequences for health and contamination control.

Worker behaviour related to compliance with contamination control requirements.

B – Strategy adopted to resolve the recommendation or suggestion

Reinforce contamination control requirements in the field with strengthened communication.

Rally the whole site on the EVEREST 2016 project making the workers more disciplined on the worksites and strengthening the logistics and checking means.

Provide a systematic reminder of the basic requirements during risk prevention refresher training and proficiency training in the event of triggering of the C2 monitor alarms.

Consolidate the role of the area supervisors and the RP control room for application of the requirements in the field.

C – Method used to check that the action plan is appropriate

Tracking of the number of field walkdowns and dedicated field team walkdowns conducted by management

Tracking of the findings identified by the area supervisors and the RP control room

Recording and coordination of the findings in the corrective action programme database

Everest project steering committee

Tracking of deployment of the worksite training facilities

Tracking of monthly key performance indicators:

- Rate of C1 monitor alarms (during outage)
- Rate of C2 monitor alarms
- Rate of C3 monitor alarms
- Number of contaminated rooms

D – Action plan

1. Changes in risk prevention refresher training concerning dressing and undressing methods and radiological monitoring to be carried out (start of 2014)
2. Proficiency training attended by workers who have triggered the C2 monitor alarm => reminder of the target rules for the cause of triggering of the C2 monitor alarm (start of the 2014 during outage and start of 2015 during power operations)
3. Managerial processing of recurrent deviations concerning triggering of the C2 monitor alarms => If the C2 monitor alarm is triggered twice, meeting with the worker concerned, instructing party, manager and project specialisation representative. As from the C2 monitor alarm being triggered three times, meeting between the worker concerned, manager, instructing party and Risk Prevention and Environment Director (in 2013)
4. Deployment of the EVEREST project => Improved zoning and tool process (end of 2014 and during 2015)
5. Improvement action for the contamination control process of the specialisations (mid-2014)

6. Reinforcement of communication with Flash Info (news flashes), industrial safety induction (best practice PP58) and weekly reports
7. Dedicated field team walkdown conducted on 26-27 February by the site managerial line (senior management, Department Heads and first line managers) with coaching from the expert in the area to reinforce the requirements in the field in addition to manager field walkdowns.

E – State of action plan progress and reporting procedure

Tracking of the monthly key performance indicators is discussed with the specialisations at the contamination control improvement committee meetings

The department action plan is tracked in the action tracking database and at the contamination control improvement committee meetings and reviews

The other actions are tracked at the EVEREST steering committee meetings on a monthly basis (action plan defined in the EVEREST project management memo)

The deviations observed in the field are recorded in the TERRAIN database and analysed for the annual subprocess review

The dedicated field team report was discussed at the management team operational meeting by the members of senior management

F – Evaluation of action plan effectiveness

The rate of C2 monitor alarms for the site in 2014 was 0.16% for a target of 0.18%

The corrective action programme findings constitute inputs for the annual macro-process MP4 review.

IAEA comments:

In order to fulfil radiation protection expectations in the field of contamination control, the plant has initiated a programme to prevent the spread of contamination. The programme is based on the following steps:

- Old C2 monitors were replaced by new monitors at the RCA exit. The new C2 monitors are very sensitive and can precisely detect worker contamination.
- As part of the EVEREST project, the plant has installed so called “stepover barriers” at some areas in the plant various RCAs where contamination exceeds $0,4 \text{ Bq/cm}^2$, designed to prevent the spread of contamination. These stepover barriers consist in cabinets including aids such as gloves, overshoes, overalls and contamination measurement equipment.
- The plant provides a systematic reminder of the basic requirements during risk prevention refresher training, and proficiency training in the event of triggering of the C2 monitor alarms for EDF workers and contractors.
- Activities performed by area supervisors and RP staff for contamination control requirements in the field are documented in the TERRAIN database and analysed as part of the relevant annual subprocess review.
- All radiation protection deficiencies are systematically investigated, processed within the corrective action programme and feedback is provided to all employees. Also, the plant

has developed a “contaminated zone” memo which gives a comprehensive list of potentially contaminated zones in all controlled areas. Workers can then be informed of any contaminated zones and their locations, which ensures that the correct PPE is worn.

The plant demonstrated good improvements and has reduced the number of contamination events. Furthermore, the use of performance indicators has confirmed effective implementation of corrective measures.

Conclusion: Issue is resolved.

7.5 RADIOACTIVE WASTE MANAGEMENT AND DISCHARGES

7.5(1) Issue: Radioactive waste is not always processed as early as practicable and signage/labeling is not always applied correctly or consistently which does not follow the principle of optimization of doses.

The team observed the following:

- Containers used to store radioactive waste outside of the main of the RCA (in the Very Low Activity Waste Storage Area) were observed to be:
 - showing signs of corrosion.
 - eleven radioactive wastes oil containers are not labeled consistently.
 - Some with very old labels/ trefoils that are torn or partially faded through weathering.
 - old or illegible labels/stickers/forms not removed or replaced.
 - other warning signs (such as chemical hazard signs) are in poor condition.
- Initial observations revealed some bags stored in a temporary radioactive waste store for items <2mSv/h with no labels or with labels that have not been filled in.
- 37 ISO containers with Container Safety Convention (CSC) safety authorisation out of date. EDF DI 127 will be coming in to force from July 2013 requiring all containers to be maintained in date. Budget requests are currently awaiting approval before an ‘action plan’ can be commenced to address this issue.
- Containers used to store contaminated tooling outside of the RCA (in the contaminated tooling storage area) were observed to be:
 - showing signs of corrosion.
 - labeled inconsistently with radioactive transport trefoils, some with activity details completed, some without.
 - some with very old labels/ trefoils that are torn or partially faded through weathering.
 - security seal broken.
 - old or illegible labels/stickers/forms not removed or replaced
 - trefoils attempted to be covered with tape.
 - empty container marked with trefoils.
- The compactor is currently out of service preventing conditioning/sorting of some radioactive waste. This is creating a backlog of waste (currently being stored in BTE), all waste skips are now full preventing any more movement of waste from the main RCA (auxiliary building) to the BTE (building where waste sorting is taken place).
- Incorrect labeling of container -labeled with ‘yellow zone’ trefoil when the dose rates did not warrant that labeling, Although in this case the labeling was conservative it was by chance rather than by design- label was left on from previous contents of container.
- Skips/buckets that contain bags of radioactive waste awaiting conditioning, in the compactor room (QB560) and QA621, are wrapped in black cellophane with no indication as to the contents, no doserates in contact or at 1m are marked on the “package”.
- Approximately 80% of containers in TFA (outside waste storage area) require re-conditioning or re-checking. Due either to legacy waste or changes in standards of waste conditioning.
- Some waste has been in storage for 10 years.

Warning or information labels/signs are applied inconsistently, unnecessarily or unclearly it may lead to a culture of ignoring warning signs, therefore encouraging behaviours that do not adhere to ALARA principle. Long term storage of waste can lead to unnecessary worker exposure particularly if waste needs to be double handled to meet new waste conditioning standards that have come into force since the waste was put into storage awaiting removal.

Suggestion: The plant should consider ways to ensure that waste is processed as early as practicable and correct signage is applied consistently to ensure optimization of doses.

IAEA Basis:

GSR Part 3

3.131. Registrants and licensees, in cooperation with suppliers, as appropriate:

(a) Shall ensure that any radioactive waste generated is kept to the minimum practicable in terms of both activity and volume;

(f) Shall develop and implement a strategy for radioactive waste management and shall include appropriate evidence that protection and safety is optimized.

GSR Part 5

Requirement 11: Storage of radioactive waste

Waste shall be stored in such a manner that it can be inspected, monitored, retrieved and preserved in a condition suitable for its subsequent management. Due account shall be taken of the expected period of storage, and, to the extent possible, passive safety features shall be applied. For long term storage in particular, measures shall be taken to prevent degradation of the waste containment.

NS-G-2.7

2.19. Operational considerations for a dose control programme include the actions to be taken once the plant is operating in order to optimize doses to workers involved in waste management (the handling, transfer, storage and disposal of radioactive waste).

4.2. The operating organization should establish, as part of its overall strategic planning, a radioactive waste management programme (RWMP), as referred to in Section 2, which should include provision for:

(k) maintaining facilities and equipment for waste collection, processing and storage in order to ensure safe and reliable operation;

4.20. Excessive accumulation of untreated and/or unconditioned radioactive waste may give rise to hazards and should be avoided if reasonably practicable by means of properly scheduled treatment and/or conditioning.

4.26. Radioactive waste should be processed as early as practicable in order to convert it into a passively safe state and to prevent its dispersal during storage and disposal.

Plant Response/Action:

A – Causal analysis

- Lack of knowledge of the requirements of the baseline applicable to the containers temporarily stored in the very low level waste area (identification of the type, hazard signs and dose rate on contact and at one meter).
- There was no regulatory requirement or internal baseline stipulating compliance for shipment of the containers dedicated to temporary storage in the contaminated tool storage area prior to the issue of DI127 (applicable in 2014).
- The compacting press is waste treatment equipment with limited maintenance.
- Radioactive waste conditioning requirements and checking related to shipment to waste disposal facilities have become far stricter over the past few years so that most of the waste has to be reconditioned.
- Waste backlog that has not been cleared off further to problems with sorting and approval.

B – Strategy adopted to resolve the recommendation or suggestion

- Set up a multi-year action plan to clear off waste and shells more than 10 years old (action tracking sheet A-9977)
- Raise personnel awareness as to the requirements for signs on the containers and waste
- Perform regulatory inspection of good condition of the containers stationed in the very low level waste storage area on a monthly basis (external) and on a quarterly basis (internal) guaranteeing leaktightness.
- Apply DI127 to internal transport of the containers in the contaminated tool storage area
- Upgrade the compacting press (action tracking sheet A-10015).

C – Method used to check that the action plan is appropriate

- Tracking of the rate of temporary storage in the very low level waste storage area.
- Tracking of availability of the compacting press.
- Archiving of the work packages and inspection reports for the very low level waste storage area (containers).
- Internal checking and field walkdowns (V-Doc database) to track the requirements of the baseline for the nuclear auxiliary and waste treatment buildings.
- Report on the waste committee meetings and macro-process MP4

D – Scheduling of the actions taken and added value for problem solving

- Treatment of the waste temporarily stored in the waste treatment building in 2013
- Reduction of the volume of waste temporarily stored in the low level waste storage area in 2014, with the action continued in 2015.
- Upgrading of the compacting press (closed out)
- Request for proposals for the preventive maintenance contract of the press by a specialised company in 2015.
- Reinforced signage concerning waste sorting procedures in the RCA on the platform at 22 m on units 1 and 2 and in the waste treatment building in 2015.
- Checking programme initiated for the containers in 2015 (action tracking sheet A-9306)

E – State of action plan progress and reporting procedure

- The rate of occupation of the very low level waste storage area is complied with
- Decrease in the volume of waste more than 10 years old
- Level of press availability has improved
- Few findings of deviations in signage
- The budget has been allocated for container maintenance

F – Evaluation of action plan effectiveness

Downward trends in the indicators:

- metal waste: 180 tonnes temporarily stored as at the start of 2014 with 111 tonnes as at April 2015
- Tracking indicator for the rate of temporary storage in the very low level waste storage area compared to the regulatory mass limits: January 2014: 36%, December 2014: 23%

IAEA comments:

In response to the suggestion, the plant performed an analysis and an action plan was drawn up. This action plan includes the setting up of strict storage arrangements of radioactive material and waste.

Clear application documents have improved staff knowledge and have supported plant expectations in the area of identification and storage of contaminated equipment and waste.

The plant modernised the compacting press and signed a contract with a maintenance contracting firm to ensure regular preventive service and maintenance of the compacting press, for reliable processing of solid waste. The plant also purchased a new X – ray system giving information on the actual content of waste drums. This system also enables better waste sorting.

Strict deadlines were set up for processing and shipment of waste. All steps mentioned above have contributed to decreasing the volume of stored waste at the plant and to improving waste processing.

However, some deviations were observed on waste identification labels.

Conclusion: Satisfactory progress to date.

8. CHEMISTRY

8.1. ORGANIZATION AND FUNCTIONS

The new chemistry performance indicators related to primary, secondary and tertiary chemistry were set to be challenging. Based on new indicators a chemistry dashboard has also been set up in order to improve awareness of chemistry parameters by site departments. This approach has been recognized by the team as a good performance.

8.2. CHEMISTRY CONTROL IN PLANT SYSTEMS

The plant has set up a program for chemistry control. However the team observed that the program is not adequately comprehensive to cover all the activities required for effective chemistry control in the plant. The team has made a suggestion in this area.

Cooling tower scaling levels are monitored by calculating and monitoring the Ryznar stability index. The Ryznar stability index is calculated on a daily bases in order to establish the scaling potential of water flowing through the tertiary circuit and also contributes to reduction of harmful waste to be processed (all scaling waste from cooling towers is considered to be harmful due to potential presence of amoeba). The team has observed this methodology as a good practice.

8.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

The plant has used a corporate system PMUC (Products and Materials for Use in Power Plants) to improve the control of chemicals. The team observed examples where control programme of chemicals was not monitored in the field. The team has made a suggestion to the plant to improve the present chemicals control programme and practices in the similar way to what has been implemented for the laboratory management of chemicals.

DETAILED CHEMISTRY FINDINGS

8.2. CHEMISTRY CONTROL IN PLANT SYSTEMS

8.2(1) Issue: The plant chemistry control programme is not comprehensive to deal with all the chemistry aspects of plant systems.

The team noted:

- The plant has not carried out measurements of organic compounds in order to reveal potential intrusion of resins, or other organic pollutants to the reactor cooling water and thus provide control of fuel deposits. Chemistry specifications for these measurements have not yet been set up.
- Chemistry specifications have not included the required analyses and values (e.g. expected value or limit value) for concentration of corrosion products such as total Fe in the primary circuit during start up and at full power. Only corrosion radionuclide gamma activities have been measured. Radioactivity measurement is a delayed indicator of foreign material intrusion or elevated corrosion rate because of the long activation period.
- The concentration of dissolved oxygen in the primary circuit is not verified. Chemistry specifications have not required this, although they do include its expected and limit value. The plant plans to measure the concentration of dissolved oxygen next year and relies now on only the measurement of dissolved hydrogen.
- Aggressive organic impurities such as acetates or formiates in the secondary circuit with the reactor at full power, have not been analysed. Chemistry specifications for these measurements have not yet been set up.
- The chemistry control programme does not contain instructions for the periodicity of evaluating control charts. In some cases, measurement values were placed for a prolonged period on one side of the baseline. This may indicate some systematic deviation in analysis.
- Partly emptied oil tanks have not been regularly checked to ensure that the quality of the remaining oil meets the prescribed criteria. In the oil store, only 3 of 8 oil tanks have been checked on a yearly basis.
- The procedure for the demineralization station does not include details of the methodology and criteria, such as the total volume capacity or other parameters, for the replacement of old resins by new resins.

Without a comprehensive chemistry control programme, the risk of uncontrolled formation of deposits and corrosion in plant systems cannot be minimized.

Suggestion: The plant should consider enhancing the chemistry control program to deal with all the chemistry aspects of plant systems.

IAEA Basis:

SSR – 2/2

7.13. The chemistry programme shall provide the necessary information and assistance for chemistry and radiochemistry for ensuring safe operation, long term integrity of structures, systems and components, and minimization of radiation levels.

SSG – 13

3.3. The chemistry programme should include procedures for selection, monitoring and analysis of the chemistry regime, instructions for operations involving chemistry processes and evaluation of operating results, the operation and reference limits for chemistry parameters and action levels and possible feedback from operating experience.

3.4. The chemistry programme should ensure that:

n) Sources of impurities in the water systems are known and actions for minimizing these sources are implemented.

4.6. The chemistry control programme should be used to confirm, from records, that chemistry control parameters and diagnostic parameters remain within their specified ranges. Records from the chemistry control programme should be controlled and reviewed and any deviations should be analysed in conformance with the management system of the operating organization.

4.30. The concentration of chemical compounds with a low solubility (that may deposit on the fuel surface and cause a temperature increase and consequently a fuel cladding failure) should be kept at minimum. Such chemical compounds include calcium, magnesium, aluminium, silica (considered as potentially zeolite forming elements) and organic compounds.

5.5. The chemistry control programme should support the production of high quality water and should include the following:

(a) The specification and application of a suitable chemical treatment (e.g. pH control for PWRs/WWERs and oxygen control) for the minimization of corrosion processes, and hence reduction of the amounts of corrosion products in the water;

5.13. Corrosion processes should be monitored, trended and controlled. Corrosion products either come from in-core components or are released from corroding and/or wearing surfaces into the coolant system. The corrosion products are then transported by the primary coolant to the reactor core, where they are deposited on surfaces within the neutron field and become activated. They are subsequently released again into the coolant system, transported out of the core and deposited on out-of-core surfaces.

9.18. Lubricants and hydraulic oils from systems important to safety and/or the availability of systems important to safety should be regularly analyzed to check control parameters that characterize the condition of the lubricant.

Plant Response/Action:

A – Causal analysis

The OSART suggestion concerns lack of control of all the chemistry parameters defined in the IAEA guidelines. Up to now, the Nuclear Power Generation Division

(DPN) had opted to monitor certain parameters with the chemistry specifications. The latter are defined in the general operating rules and were selected as they ensured appropriate performance of site equipment. However, other measurements were performed whenever necessary but not requested by corporate level on a permanent basis.

B – Strategy adopted to resolve the suggestion

This finding was repeated over the different OSART missions conducted at the French fleet and thus resulted in the setting up of a working group for international inter-comparison at corporate level, which highlighted the lack of monitoring of certain parameters. This working group is composed of corporate entities (Corporate Engineering Support, Corporate Chemistry Support and the Skills Advisory Section), different French NPPs and Philippsburg NPP. It was thus decided to set up corporate issue (AP) 11-05 “Changes in the chemistry specifications”, which was validated at the equipment management board meeting in 2012.

The letter for deployment of AP1105 in 2012 (D455031115749) described a part of the measurements to be performed, followed by a series of letters increasing the scope of measurements. The list of chemistry parameters concerned is provided below:

ANNEXE 1 : Programme de surveillance renforcé (annule et remplace celui du courrier D4550.31-12/3338)

Paramètre	Système	Domaine(s)	Périodicité d'analyse actuelle dans les spécifications chimiques	Nouvelle périodicité d'analyse
Oxygène	RCP	RP et AN/GV si RCP hydrogéné	Non demandée	Mesure manuelle 1 fois par mois
Métaux (Fe, Ni, Cr, Co, Zn)	RCP	RP et AN/GV	Non demandée à l'exception de Ni et Zn dans le cadre de l'injection de zinc	2 à 3 fois par cycle dont 1 fois au redémarrage
COT sortie bâche SED	SED	Tous domaines	Non demandée	Mesure manuelle 1 fois par semaine

C – Method used to check that the action plan is appropriate

Further to AP1105, the Nuclear Power Generation Division (DPN) opted to increase the number of parameters monitored by the sites, so as to improve control of the chemistry parameters with application of the letter for deployment.

The Peer Review at Chooz and the Corporate OSART mission in 2014, which assessed site chemistry control, did not issue any recommendation or suggestion on this topic.

In order to drive continuous improvement, Chooz NPP decided on top of AP1105 to develop other methods, such as measurement of organic acids and total organic compounds (TOC) on the primary side.

D – Scheduling of the actions taken and added value for problem solving

Deployment of AP1105 has been conditioned by letters for application sent to the site by corporate since the equipment management board meeting in 2012.

E – State of action plan progress and reporting procedure

For the actions not selected by corporate, the site has set up monitoring with the subprocess “Optimise unit chemistry” (OCT), which has been in place since October 2012 and is part of the macro-process Generate.

Based on this organisation, chemistry issues are tracked and improvement to site chemistry is made. Setting up of the organic acid method is coordinated according to this process.

Monthly reports are compiled within the macro-process and the action plan is presented to the OCT committee meetings which are held four times a year. The committee was set up further to the Nuclear Inspectorate Review (EGE) in 2012, which demonstrated lack of chemistry control on site.

F – Evaluation of action plan effectiveness

Based on the letter for application of AP1105, the methods have been defined and developed. Proper setting up of the measurements in keeping with the specified frequencies is checked with the Merlin computer application. The measurements thus performed fulfil corporate requests and consequently demonstrate effectiveness of deployment.

In addition, action plan effectiveness is assessed within the framework of reviews of the OCT subprocess and the macro-process Generate.

IAEA comments:

The plant has updated its current chemistry requirements for plant systems regarding organic compounds, corrosion products, oil and control of resins.

Enhanced control is performed for aggressive inorganic impurities in plant systems. The plant now regularly monitors total organic carbon (TOC) in the primary circuit. The procedure for preventive maintenance at the demineralisation station includes the periodicity for replacement of old resins by new resins. The method for analysing corrosion products present in the primary circuit is now tested and verified. Instructions for the periodicity of control chart evaluation have been added to the chemistry control programme. However, the system for oil checks at the warehouse is not fully implemented yet.

Conclusion: Satisfactory progress to date.

8.2(a) Good Practice: Use of the Ryznar stability index to monitor cooling tower scaling levels.

Cooling tower scaling levels are monitored by calculating and monitoring the Ryznar stability index which measures the susceptibility to scaling and corrosion.

The Ryznar stability index is calculated on a daily basis in order to establish the scaling potential of water flowing through the tertiary circuit. Measurements are transposed onto the Ryznar correlation matrix and onto the schematic representing the concentration factor, divided into 4 zones. Actions and operational limits are defined for each zone.

Benefits:

- The Ryznar stability index gives a rapid and clear indication of potential cooling tower scaling levels.
- The matrix and action statements prevent interpretations by stipulating the required actions, which could go as far as taking the unit into controlled shutdown mode.
- Reduction of scaling levels on cooling tower plates.
- Reduction of sulfuric acid amount and harmful waste needing to be processed (all scaling waste from cooling towers is considered to be harmful due to potential presence of amoeba).

8.6 QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES.

8.6(1) Issue: The chemicals control practices do not adequately support effective chemical controls and usage within all plant groups.

Although the plant has developed a chemicals control programme, the team found the following:

- In the general warehouse, some chemicals were not labelled with an expiry date: e.g. Coolelf Supra GF NP for conditioning diesel generator cooling water, Asorel CN, PolyPetrofilm 3/6, Lessive souda 30%, among others.
- In the mechanical workshop, a bottle probably containing oil was not labelled. Two bottles containing oil (Hulle Mobil DTE 746, Hulle Mobil gear 600 KP 200) were not labelled with a pictogram illustrating risk and an expiry date.
- Chemical storage deviations were observed in the warehouse. Newly delivered chemicals were stored with chemicals assigned for removal. There were no designated, separate areas for new chemicals and waste chemicals. Also, chemicals awaiting removal were not labelled as waste.
- In the unit 1 auxiliary building, blue drums probably containing sand were not labelled.
- In the unit 1 auxiliary building general store, substances under PMUC (Products and Materials for Use in Power Plants) control, such as Tempofix, Asorel CN, Degarissant Nettoyant, were not labelled with an expiry date, and were stored without covers.
- Two bags of harmful chemical (calciumchlorite) were improperly stored near the unit 1 cooling tower without storage identification.
- In room NA 0423 the charging pump, a plastic bottle filled with an unknown liquid was not labelled.
- In the unit 1 auxiliary building, a bucket for gathering oil leaks, containing solid boric acid, was not labelled with a pictogram warning of its toxicity. Also, a bucket with toxic boric acid was not stored under restricted conditions (toxic chemicals should be stored in a locked cabinet).
- Two bottles of chemicals were found in station M0 without an expiry date (propane-1,2-diol 40.0 – 70.0 %, Ethandiol 90-95%).
- Boric acid packages were not designated as toxic chemicals, according to the safety data sheet in the warehouse.

Shortfalls in the chemicals control practices may lead to inappropriate chemical usage and personnel injury.

Suggestion: Consideration should be given to improving the chemicals control practices in order to support effective chemical controls and usage.

IAEA Basis:

SSR – 2/2

7.17. The use of chemicals in the plant, including chemicals brought in by contractors, shall be kept under close control. The appropriate control measures shall be put in place to ensure that the use of chemical substances and reagents does not adversely affect equipment or lead to its degradation.

SSG – 13

9.3 The use of chemicals and other materials at the plant, including those brought to the plant by contractors, should be controlled in accordance with clearly established procedures. The intrusion of non-conforming chemicals or other substances into plant systems can result in deviations in the chemistry regime, leading to component and system damage or increase of dose rates. The use of uncontrolled materials on the surfaces of the components may also induce damage.

9.13. Management should periodically carry out walkdowns of the plant to evaluate the effectiveness of the chemistry programme and to check for uncontrolled storage of chemicals.

9.15 Chemicals should only be stored in an appropriate store that is fire protected and captures spillages and which is equipped with a safety shower, as required. Oxidizing and reducing chemicals, flammable solvents and concentrated acid and alkali solutions should be stored separately. Tanks containing chemicals should be appropriately labelled. Reasonably small amounts of chemicals can be stored in other controlled environments in the workshops or operational department.

9.16. In the storage of chemicals, account should be taken of the reduced shelf life of opened containers. Unsealed and partly emptied containers should be stored in such a manner that the remaining product is kept in a satisfactory condition.

Plant Response/Action:

A – Causal factor analysis

- Behaviours/Lack of involvement
- Knowledge gaps concerning requirements for chemicals
- Complex process
- Insufficient monitoring

B - Strategy adopted to address the recommendation/suggestion

- Communicate more aggressively on industrial safety rules so as to make individuals more accountable
- Optimise the process
- Increase the number of checks

C – Method used to verify adequacy and effectiveness of the action plan

- Field observations with condition reports raised in the CAP (Corrective Action Programme) database
- Regular checks of fire cabinets and of chemicals being brought onto site
- Reporting on the occasion of “health and safety” sub-process reviews

D – Action plan

- Revision and implementation of risk prevention training material (since January 2014)
- Describe and optimise the process for the control of chemicals
- Special software developed by the chemistry department (2014) to keep track of inventory, labelling and compatibility of chemicals, as well as to keep track of chemicals up until disposal.
- Risk-awareness coaching on chemicals during newcomer training
- Contractors undertake to comply with requirements for bringing chemicals onto site.
- Communication plan for reminding requirements about chemicals
- PP34: letter written to contractors prior to outage, reminding them of administrative rules
- Appointment of an environmental safety officer to assist the various work groups (in 2014)

E – Progress of action plan and reporting methods

- Status of plan discussed at the Safety/radioprotection macro-process committee meeting on 11/09/2014.
- Use of new chemical control software by the chemistry department.
- PP34 letter sent out prior to unit-1 and unit-2 maintenance outages in 2014

F – Action plan effectiveness review

- CAP reports are used as inputs for the annual health and safety sub-process review.
- Observations conducted by the station have identified improvements in the behaviours of certain contractors.

IAEA comments:

The plant is currently in the process of revising its entire procurement process and quality control of chemicals and other substances by clearly defining the responsibilities and authority of different departments within this process. The chemistry department has developed a dedicated software for labelling and tracking the compatibility of chemicals until their disposal. For new, unused chemicals and substances, the approval of the national entity (UTO) and the risk prevention department is required before starting the procurement process. The plant gives special attention to the avoidance of harmful effects on health. The plant provides chemical risk–awareness coaching during newcomer training and refresher training. Also, contractors undertake to comply with requirements for bringing chemicals onto the plant. Chemicals and other substances have been identified by PMUC labels with their expiry date, batch number and risk pictogram. However, some deviations were observed on chemical identification labels (e.g. the same chemical was labelled with different risk pictograms).

Conclusion: Satisfactory progress to date.

9. EMERGENCY PLANNING AND PREPAREDNESS

9.1. EMERGENCY PROGRAMME

The plant has selected members of the staff and assigned them duties during an emergency. Several of these individuals share the same position in the emergency plan. They take turns to be on call during non-working hours. The plant's staff with assigned duties for the emergency plan meets for one day, once a year ("journée PUI") to discuss their duties with colleagues and share experiences. The team considers this as a good performance.

The corporate headquarters of the plant recognized that Emergency Planning and Preparedness (EPP) specialists often worked alone at each site and needed to share knowledge and experience. The corporate headquarter of the plant has organized a network of EPP specialists from each site to share information and improve performance. The team has recognized this as a good performance.

9.2. RESPONSE FUNCTIONS

The authority to declare an emergency is given to PCD1, the duty representative of senior management, who is present on the site only during working hours. Outside working hours, the shift manager ("chef exploitation") is expected to consult with PCD1 before declaring an emergency. The team has made a recommendation on this subject.

Protective action recommendations for the public are generated separately by the plant's organization (EDF) and by the regulator. The plant, the corporate headquarter of the plant, and the regulator, assess the off-site consequences of the accident using estimated releases derived from models. Although computer code simulations are useful prognostic tools during an emergency, the plant is encouraged to recognize that dose projections are very uncertain and that for severe emergencies, making accurate projections of off-site doses may be impossible. The IAEA has produced guides that provide criteria for triggering protective actions for the public directly from dose rate measurements (operational intervention levels). The plant has implemented this type of criteria for accidents involving early releases (fast kinetic accidents). The plant is encouraged to implement these criteria for all types of accidents.

The operation team prepares a diagnostic of the plant based on the status of the barriers for the release of radioactivity. This assessment uses some of the available measurements to select a pre-calculated source term and to assess its consequences using pre-calculated tables and computer code simulations. The source term may be re-adjusted by specialists of SEPTEN in Lyon on the basis of other measurements, but the process is complex and cannot be carried out on-site. The plant has other measurements that require operator interventions and that are not available on-line. The plant is encouraged to use all sources of information during an emergency, and to share, in a timely fashion, all sources of information with other organizations that are involved in the assessment of the consequences of an accident.

The arrangements for information of the public by the plant and the public authorities do not provide a joint source of information at a location outside the urgent protective action zone (UPZ). The team has made a suggestion regarding this matter.

The plant notifies off-site organizations for even the smallest event occurring on-site. This policy ensures that the prefect and the corporate organization of the plant are able to answer media enquiries in a well informed fashion. The team recognizes this as a good performance.

9.6. EMERGENCY EQUIPMENT AND RESOURCES

The corporate organization of the plant has prepared a comprehensive library of simplified technical drawings that can be used to brief the media, and to prepare press releases during an emergency. This library is available in the form of a booklet, and a DVD containing digital drawings that can easily be edited. The team recognizes this as a good performance.

9.7. TRAINING, DRILLS AND EXERCISES

The plant has created an immersion programme for fire-fighters from off-site that provides instruction based on extensive exposure to the surroundings and conditions present at the plant. A fire brigade officer spends three days on-site, shadowing a shift-crew in its daily work and participating in an exercise with the response team. The team has recognized this as a good practice.

DETAILED EMERGENCY PLANNING AND PREPAREDNESS FINDINGS

9.2. RESPONSE FUNCTIONS

9.2(1) Issue: A person with sufficient authority to declare an emergency promptly, without consultation, is not on the site at all times.

The plant has implemented measures to minimize the potential delays for the declaration of an emergency. However, the team has observed the following facts:

- The authority to declare an emergency is given to PCD1, the duty representative of senior management, who is present on site only during working hours. The PCD1 checks if the entry point conditions are met, and then declares an emergency.
- Outside working hours, the shift manager (“chef exploitation”) is expected to consult with PCD1 before declaring any category of emergency, even one of low severity.
- If the shift manager cannot reach the PCD1 on duty, he is authorized to declare an emergency, he can initiate protective actions for the public in the Precautionary Action Zone (PAZ), and then has to try to contact another PCD1 not on duty.

Without a person on-site at all times, with authority to declare an emergency without consultation, delays in the implementation of protective actions may reduce their effectiveness in protecting the workers and the public.

Recommendation: The plant should ensure that there is always one person on site authorized to declare an emergency and notify the off-site authorities without delay.

IAEA Basis:

GS-R-2;

4.23: “Each facility or practice in threat category I, II, III or IV shall have a person on the site at all times with the authority and responsibilities: to classify a nuclear or radiological emergency and upon classification promptly and without consultation to initiate an appropriate on-site response; to notify the appropriate off-site notification point (see para. 4.22); and to provide sufficient information for an effective off-site response. This person shall be provided with a suitable means of alerting on-site response personnel and notifying the off-site notification point.”

Plant Response/Action:

A – Causal analysis

Chooz NPP has transposed the recently amended corporate baseline which is in our opinion in the requirements of the IAEA guidelines.

B – Strategy adopted to resolve the recommendation

Discussion with the corporate baseline coordinators and analysis of the corporate OSART mission report.

C – Adequacy review of site organisation

If precise and pre-defined criteria are met, the Shift Manager calls the PCD1 (the Emergency Response Director) and asks him to activate the on-site emergency plan. In order to do so, they simultaneously apply the orientation and accumulated events flowchart (LOIC).

The PCD1 can be contacted at any time (senior management on call). The Shift Manager has all the means of telecommunication required to make the phone call in compliance with the emergency telecommunication systems baseline (RMTC). The link enabling the Shift Manager to alert senior management on call is classified as category 1 (= two diversified means guaranteeing resistance of the link to the hazards defined in the design baseline, including a means of communication that has to remain operational in the event of flood and loss of off-site power). This results in the presence of a fixed telephone, satellite telephone and satellite telephone with autonomous power supply.

The PCD1 contacts the Prefecture and the Nuclear Safety Authority by phone so as to uphold availability of the Shift Manager for his control room monitoring actions. The Shift Manager thus ensures human redundancy guaranteeing that the abnormal and emergency operating aims have been properly identified by the shift crew for the situation by applying an independent procedure (state based monitoring – SPE) until the Safety Engineer arrives.

If the PCD1 cannot be contacted, the Shift Manager has delegated authority to activate the means of alert and deployment of the on-call personnel on site and at home.

The Shift Manager's procedure also stipulates that he should try and contact a back-up PCD1 immediately.

In addition, if a criterion for triggering the reflex response phase of the off-site emergency plan is met, the Shift Manager has delegation to activate the off-site sirens and the population phone calling system (SAPPRE). The prefecture is integrated in the automatic calling system (SAPPRE – local alert system).

In extreme situations (of Fukushima type) beyond the design basis of the on-site emergency plan, if the usual means of telecommunication are out of order and no PCD1 can be contacted, an alert procedure is available in the control room. This involves activation of the EDF corporate alert messaging service under Shift Manager responsibility using the emergency iridium satellite telephone. In this case, it is not the Shift Manager who informs the Prefecture, as it is not known if it is still able to coordinate emergency response management in this situation (the Emergency Response Director of the corporate command post (PCD-N) calls the national Nuclear Safety Authority when he receives the call and then the public authorities and explains the situation).

In addition, EDF is waiting for IAEA GSR Part 7 as mentioned in the encouragement specified in the EDF SA corporate OSART mission report:

"During the mission, the team observed that the plant has implemented measures to minimize the potential delays for the declaration of an emergency and provided the authority of declaration to the shift manager after consultation with the manager on duty (PCD1) or without consultation if the PCD1 is not available. At the time of the OSART review, the IAEA standards still required a person on-site at all times with the authority to declare an emergency without consultation. However, a new revision of GSR Part 7 Preparedness and Response for a Nuclear Radiological Emergency is to be published soon. The team encourages the plant to review its compliance with the new IAEA standard on this issue."

IAEA comments:

The emergency preparedness and response arrangements were upgraded at the plant in 2014. According to the new procedure, the shift manager has access to all communication equipment to reach the on-call plant emergency director (PCD1). If the PCD1 cannot be contacted, the shift manager has an explicit delegation to initiate the on-site emergency plan if the specific criteria are reached, but the notification of the off-site authorities (regulator and the Prefect) is done by the PCD1 or by the corporate emergency director (PCD-N).

The team acknowledges all the efforts done to improve the human redundancy and to minimize or even eliminate any potential delays for the declaration of an emergency. At the time of the review, the current IAEA standard GS-R-2 still formally required a person on-site at all times with the authority to declare an emergency without consultation. On the basis of lessons identified in exercises and from the response to emergencies that have occurred since its publication GS-R-2 is going to be revised, and the new revision of GSR Part 7 “Preparedness and Response for a Nuclear Radiological Emergency” is to be published soon requiring “to ensure that arrangements are in place for the prompt identification and notification of a nuclear or radiological emergency and for the activation of an emergency response”.

As soon as the new GSR will be published the plant is going to review and ensure full compliance with the reformulated requirements.

Conclusion: Satisfactory progress to date.

9.2(2) Issue: The arrangements for informing the public by the plant and the public authorities do not provide a joint source of information at a location outside the urgent protective action zone (UPZ).

During the review the team noted:

- The plant and the public authorities do not operate a joint information centre for the media.
- The plant public information centre for hosting press conferences is located on the site.
- The communication group of the plant and the off-site authorities organize a conference call to coordinate the public messages before briefing the press separately, in different locations.
- The corporate headquarter of the plant (President of EDF) could take over the role of sole spokesperson for the emergency. In such a case, the plant spokesperson (PCD0) would stop his activities to ensure that there is a single spokesperson.

Without a joint information centre, public information given from different locations may lead to confusing and inconsistent information about the risks of exposure and the appropriate actions to be taken. This confusion may lead to unsafe actions on the part of the public and loss of confidence in the official's recommendations.

Suggestion: The plant should consider consulting with the public authorities to make arrangements for informing the public during an emergency at a single location outside the UPZ.

IAEA Basis:

GS-R-2;

4.83. "Arrangements shall be made for: providing useful, timely, truthful, consistent and appropriate information to the public in the event of a nuclear or radiological emergency; responding to incorrect information and rumours; and responding to requests for information from the public and from the news and information media."

4.84. "The operator, the response organizations, other States and the IAEA shall make arrangements for co-ordinating the provision of information to the public and to the news and information media in the event of a nuclear or radiological emergency."

GS-G-2.1;

4.36. "These arrangements should ... coordinate the provision of information to the public by national officials, local officials and the operator. This could include the establishment, as soon as possible, of a public information center, as described in Appendix VIII, to serve as the single source of information."

6.12. "Joint press briefings should be given periodically (at a joint public information center) with participation by the operator and local and national officials."

Table 15. “Public Information Center; Function: Coordination of all information released to the news media concerning the emergency by the facility, local governments and national governments. Staffed by representatives of all these organizations. Characteristics: Located in the vicinity of the site of the emergency with space and infrastructure to support use by the news media and for conducting media briefings. For facilities in threat categories I, it is a pre-designated facility outside the UPZ.”

Plant Response/Action:

A – Causal analysis

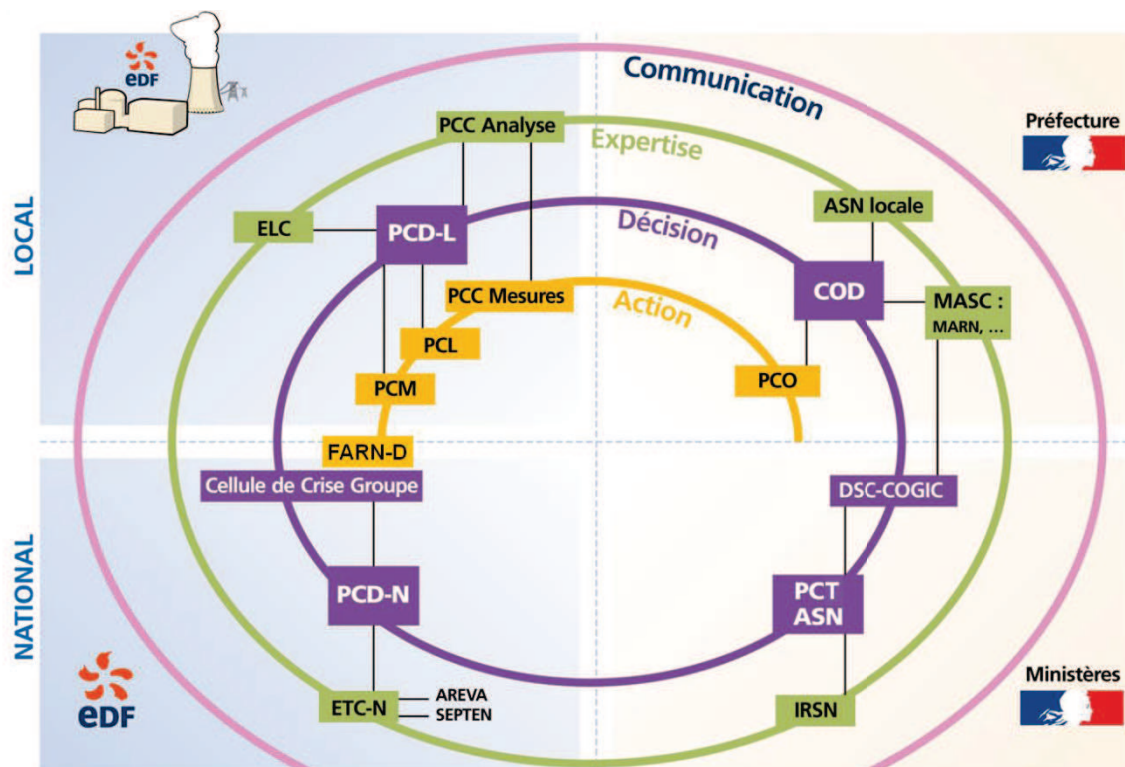
Chooz NPP has transposed the recently amended corporate baseline, which in our opinion takes into account the requirements of the IAEA guidelines.

B – Strategy adopted to resolve the recommendation or suggestion

Discussion with the corporate baseline coordinators and analysis of the corporate OSART mission report.

C – Adequacy review of site organisation

Reminder of the emergency response organisation diagram:



Every command post responds within the organisation in a well defined field of responsibility. The organisation is made up of 4 fields of responsibility: action, decision-making, expert appraisal and communication.

Concerning the field of communication, the four spokespersons (from the Nuclear Safety Authority, Prefecture, EDF corporate level and EDF site level) can liaise regularly throughout the event using a telephone conference call system (known as the spokesperson conference call, in order to check consistency of the information that they have and inform each other of the messages issued to the media by each of these entities.

The action sheet for the PCD0 (senior management command post) stipulates:

- development with the PCD5 of the internal and external communication strategy
- discussion and validation of the communication strategy with the on-call nuclear communication team of the Generation and Engineering Branch (DPI) and Nuclear Power Generation Division (DPN) senior management
- participation in the spokesperson conference call

The action sheet for the spokesperson of the corporate senior management command post stipulates:

- development with the communication manager of the information strategy and content, giving rise to written and oral expression
- function of spokesperson of EDF and the nuclear operator to be ensured after media training
- scheduling of information and communication messages with the other entities involved in emergency response management (local and national public authorities and the NPPs) during the spokesperson conference calls.

EDF emergency response organisation seems to fulfil the requirements of the IAEA guidelines. The NPP will not initiate site-specific actions concerning this issue, which in addition was not raised during the corporate OSART mission (end of 2014).

It should be pointed out that the coordination carried out during the spokesperson conference call does not rule out joint communication between EDF and the public authorities in a place outside the threat. This possibility is an integral part of the communication strategy to be specifically defined during every emergency situation.

IAEA comments:

According to the corporate initiative the emergency response arrangements were upgraded at the plant in 2014. In line with that the plant has reviewed its arrangements for informing the public in case of different types of emergency.

The roles and responsibilities regarding the crisis communication are clearly regulated. The coordination of all information released to the media or to the public is properly ensured by the telephone conference call system operated between the site, the local prefecture and the corporate. The means for telecommunications have also recently been enhanced with satellite technologies.

In case of an emergency internal and external communication strategies are developed on both the site and corporate level. These strategies decide on the place and the frequency of the press briefings.

Depending on the extent of the emergency different facilities equipped with proper telecommunication systems could be used for press briefings like: the public information centre at the site, the office of the Prefect or the EDF Group's emergency unit in Paris (Wagram).

The plant is encouraged to prove with emergency exercises involving all respective organisations that the public information given from different locations and supported by the telephone conference call system are coordinated properly and never confusing.

Conclusion: Satisfactory progress to date.

9.7. TRAINING, DRILLS AND EXERCISES

9.7(a) Good Practice: Immersions to build a strong relationship between the on-shift response team of the plant and the fire brigade.

In addition to visits to the plant by the fire-fighters in order to identify access points and the main fire risks, the plant has implemented a programme of exchanges in order to build a strong relationship between on-site and off-site response teams. This exchange provides instruction based on extensive exposure to the surroundings and conditions present at the plant. The main objective of the programme is to improve the efficiency of fire fighting and rescue operations.

These exchanges are organised as follow:

- A fire brigade officer spends three days of immersion training with an on-site shift team. The first two days are devoted to shadowing the team in its daily work. The third day is based on discussions with the on-shift designated individual for first response. It also includes the preparation, observation and feedback on an exercise with the response team. These training activities improve the knowledge of the plant and its risks for the fire-fighters.
- Each on-shift designated individual for first response spends one or two days at the fire station. These days are devoted to visiting and presenting the facilities of the fire brigade (command centre, call centre, response centre, etc.). The on-shift designated individual for first response also discusses with his counterparts maximum credible fire scenarios on the site of Chooz and how to tackle them. These activities improve the professional development of the designated individual for first response.

Advantages and benefits:

- Building a strong relationship between the fire brigade officers and the on-shift designated individual for first response
- Improved understanding of what is expected of the on-shift designated individual for first response and fire fighters during a fire.
- Better understanding of priority actions for the on-shift designated individual for first response concerning the appropriate response to a maximum credible scenarios (for example, main transformer fire).
- Better understanding in the changes to the on-site emergency plan (for example, presentation to the fire-fighters of corrective actions implemented after the update of the fire protection technical basis in 2010).

14. SEVERE ACCIDENT MANAGEMENT

14.1 OVERVIEW OF SEVERE ACCIDENT MANAGEMENT

The plant has a well established severe accident management programme. This programme was developed using insights from analytical studies, phenomenology-related research and experimental investigations, and was carried out by design organizations at corporate level. The appropriate links were made to relevant international programs carried out in the SAM field.

The severe accident domain was initially defined for accidents occurring in operating modes with the reactor vessel closed. For other operating modes and for the spent fuel pool, severe accidents were assumed as being very unlikely. Ongoing efforts are being made to include those in the SAM programme.

Events that are induced by a beyond design basis external hazard such as large earthquakes and that could affect both units at the same time are currently not completely covered by the scope of the severe accident management program. Current safety standards contain no hazard-resistance requirements for severe accident related equipment; consequently, some of the equipment used for mitigation is not qualified for external hazards.

The major objective of the severe accident management program applied by the plant is to preserve containment integrity and using all means to avoid large early releases in the event of extended fuel damage.

This objective is supported by a set of state oriented Emergency Operating Procedures (APE), which contains all the possible preventive actions and by a Severe Accident Management Guideline (GIAG), which focuses on mitigative actions. The proper application of procedures and the guideline is facilitated by effective training, communication arrangement and other mobile equipment.

The team acknowledges that according to the post-Fukushima action plan the plant will be upgrading its severe accident management program in order to mitigate an even wider range of accidents. It is also planning to create a “hardened safety core” with robust measures and equipment designed for extreme situations.

14.2 ANALYTICAL SUPPORT FOR SEVERE ACCIDENT MANAGEMENT

All the supporting analyses and documentation were developed by a qualified EDF organization. The most important analytical tool used for the supporting analyses were the well validated and widely used MAAP4 and TOLBIAC-ICB. The analyses used both for the development of the guidelines and for the equipment qualification are not always plant specific, similar analyses carried out for the P’4 plant series were applied instead. The plant is encouraged to assess the impact of any plant specific differences of the results of the analyses.

The use of Level1 PSA (EPS) supported the identification and grouping of severe accident sequences for further assessment or for development of related strategies. The Level2 PSA

has not been carried out for this plant series yet. The insights from similar studies done for other plant series were utilized only after the SAM program development, but these insights were fed-back to the program.

14.3 DEVELOPMENT OF PROCEDURES AND GUIDELINES

The plant has a set of Severe Accident Management Guidelines. Different guidelines have been prepared for each respective part of the emergency organization, and these guidelines should be used in parallel.

A set of separate procedures (GAEC) has been prepared for supporting contingency actions and any alternative or unusual configurations (power or coolant supply from other units, using the fire safety systems for cooling, etc.) and this is used by the corporate technical support centre staff (ETC-N).

The hydrogen issue is resolved with mobile recombiners, which are stored off-site and should be delivered and attached to the containment in case of an accident within 24 hours. In addition 118 passive autocatalytic recombiners (PAR) sized for severe accident are placed in different locations of the containment building, but there are no recombiners in the fuel building. Two PARs, which are placed on the polar crane, also fulfill a function in design basis accidents and hence they are safety classified. During every outage a visual inspection is carried out on them and 3 of the plates are taken and recombination efficiency is tested in a hydrogen environment. All the other PARs undergo similar surveillance testing every 10 years.

Currently, neither the containment nor the fuel building has hydrogen concentration measurement possibilities. A modification has recently been implemented to install temperature monitoring devices on the top of two recombiners, which measurement serves as an indirect indication of hydrogen content in the containment atmosphere. The absence of direct hydrogen concentration measurements requires certain restrictions on using the containment spray system.

Confirmation of the containment penetration isolation is required as part of the immediate actions in the event of a severe accident. The U2 operating procedure, which is part of the SAMG, aims at monitoring containment integrity and isolating the openings concerned if necessary.

A containment filtered venting system with a large sand filter has been installed to cope with containment over-pressurization in the late phase of a severe accident. As the requirement for seismic resistance was not built into the original design basis of the system, to conduct a study on seismic resistance is desirable. This system may only be used 24 hours after SAMG initiation if pressure inside containment exceeds 5 bar. Venting is subject to approval by the head of emergency response organization (PCD1).

If at least one train of the spray system were to operate during the accident, the reactor pit would be filled with water. However, spray operation in the first 6 hours after entering the SAMG is limited, and the spray system could be restarted only after the recombiners have successfully decreased the hydrogen concentration inside containment. After reactor pressure vessel failure, personnel are expected to partially restore and use the safety injection system to refill and deliver cooling water on top of the corium. Considerable uncertainty exists as to

whether the corium could be stabilized, and the corium concrete interaction stopped before the basemat completely erodes, and direct release starts. However, there are protecting underground walls installed around the containment to limit potential contamination of the soil and ground water.

In order to avoid high pressure melt ejection from the damaged reactor pressure vessel and direct containment heating, aggressive pressure reduction is provided with the forced opening of the pressurizer safety valves. According to a recent modification a portable battery rack can be attached from outside containment in a relay room to supply the valves in the event of station black out.

The SAMG relies on a set of well managed mobile or portable equipment (motor- driven spray pump, battery racks for opening pressurizer safety valves, diaphragm for FVS, etc.). Some are stored on different locations off-site, but some of them are stored in a temporary storage tent on site. The appropriate set-up and maintenance procedures are in place.

The accident management of the plant is supported by a set of special aids and guidance documents that was recognized by the team as a good practice.

Fuel damage in the spent fuel pool is not considered. Spent fuel pool accident management is based on preventive measures. A comprehensive accident prevention procedure is in place to decrease the probability of spent fuel uncovering in the pool, but a severe accident mitigation strategy is not available for accidents occurring in the fuel building. The team has made a suggestion to extend the coverage of the severe accident management guidance in this respect.

An alternative spent fuel pool make-up possibility is available either from the fire water system or from the demineralized water system. Both supply non-borated water, which is acceptable only if the original fuel structure (geometry) can be kept. To avoid pressure increase in the event of the spent fuel pool boiling, a skylight would be opened from the outside to release steam from the fuel building to the environment.

A proper seismic related monitoring and recording system exists. The necessary procedure is being updated and it will be in force next month. Seismic events do not trigger an automatic scram; the system generates an alarm in the control room.

14.4 PLANT EMERGENCY ARRANGEMENTS WITH RESPECT TO SAM

Severe accident management initiation is usually linked to an EOP used by control room staff.

Event diagnosis, evaluations and necessary accident management activities are carried out by different local teams: plant control room, emergency response centre (PCD) and technical support centre (ELC). All these teams apply the respective parts of the SAMGs. All local activities are effectively supported by the corporate emergency team and by the crisis team attached to the safety authority's technical support organization.

Obligations and responsibilities of the various teams, as well as the lines and means for communication between the teams are clearly set out in the emergency response plan.

A satellite telephone system was recently installed at various control facilities in order to ensure a reliable communication if all other means are lost.

Currently the guidance does not provide effective mitigation for severe accidents that are induced by beyond design basis external events and that may occur simultaneously on two units. The team has made a suggestion for some improvements in this respect. There is a post-Fukushima action in place to reassess the staff required for operating teams in order to ensure the plant self-sufficiency for 24 hours after such an accident.

14.5 VERIFICATION AND VALIDATION OF PROCEDURES AND GUIDELINES

Validation and verification of the SAMG were directly linked to its development. The validation process relies on the analyses done for the P'4 plant series. Certain representative scenarios were chosen that represent all respective severe accident-related phenomena. These cases were then analyzed with the help of validated analytical tools. Operator actions were taken into account in a series of sensitivity studies. Code limitations and uncertainties were understood and taken into account. For those phenomena where an analytical validation was not possible, the results of different (large or small scale) experiments were directly used.

The most comprehensive validation would be a Level2 PSA study that explicitly models the actions and assumptions from the SAMG. This type of study is ongoing and will be finalized by the next periodic safety review of the plant.

14.6 TRAINING NEEDS AND TRAINING PERFORMANCE

All shift crew members who have functions and responsibilities in severe accident management undergo initial and annual requalification training. This training includes severe accident management, which comprises an introduction to severe accident phenomena and a detailed explanation of the guide.

Different types of simulators are also used for operator training, but currently these simulators do not model situations with a severely degraded core. It is encouraged to include simulator exercises in SAM training as soon as the further development of the simulator supports the modelling of severe accidents.

To train the technical support team (ELC) role-playing exercises are organized regularly. This training focuses not only on the severe accident phenomena and on the actual role and performance of the team members in case of an accident but it would optimize the teamwork in case of complex situations. This was recognized as a good performance of the plant.

Emergency exercises are carried out for testing the effectiveness of the emergency response organization. These local emergency exercises are not carried out for long-lasting severe accidents. However, certain national EPP exercises based on pre-calculated scenarios simulate entry into the severe accident domain.

14.7 SEVERE ACCIDENT MANAGEMENT UPDATING AND REVISIONS

Maintenance and updating of all elements of the accident management program (including SAMG) are based on a procedure applied in the corporate technical support organizations. The plant's technical support staff only verifies updated procedures.

As soon as a plant modification with implications for SAMG is implemented, a new version of SAMG is issued. Currently the plant has a common set of guidelines for both units.

DETAILED SEVERE ACCIDENT MANAGEMENT FINDINGS

14.3 DEVELOPMENT OF PROCEDURES AND GUIDELINES

14.3(a) Good practice: The accident management of the plant is supported by a set of special aids and guidance documents

Any non-compliances that are temporary and recognized by the regulator until they are addressed can still have an impact on accident management. The plant regularly updates the list of these non-compliances, the majority of them are related to the seismic or other environmental qualifications of different systems. For all those deviations their potential impact on accident management is assessed, the potential failure modes are identified and documented.

The assessment results are incorporated into training and made available as a computerized aid to the emergency technical support teams.

With this aid the accident management response can be planned in an optimal and deliberate way taking into account any potential failure, limited availability or reduced performance of the non-qualified equipment or systems. With the help of this aid the technical support team can be aware of any potential leaks or damages of non-qualified tanks in case of certain events, i.e. an earthquake on the site. By using this aid some of the necessary compensation or contingency actions could be determined in advance.

The list of all connections which are used for mobile equipment is also available to the technical support team in order to suggest, properly plan and perform any contingency line-ups using these connections and any available mobile equipment.

In case of a station black out event on one of the units there is a possibility to supply safety systems from the diesel generators from the other, possibly non-affected unit. A procedure is used by the technical support teams to set-up cross connections from the neighboring unit and supply the 6.6 kV safety bus-bars. This procedure was validated with a simulated key path which confirmed its operability. This ensures that if at least one emergency diesel generator is available on site, then all the safety systems could get electrical supply.

14.3(1) Issue: The Severe Accident Management Guidelines (SAMG) in place do not cover all operation modes of the reactors and spent fuel pool.

The team observed the following:

- The severe accident domain is only defined for accidents occurring in operation modes with a closed reactor vessel. For other operational modes and for spent fuel pool, severe accidents are considered very unlikely but this assumption is not confirmed by PSA results.
- Although an EOP with all the preventive measures exists, there is no dedicated SAM guide in place at the plant to mitigate the consequences of an event involving fuel uncover or damage in an open reactor vessel operation mode. A draft guideline was developed for handling these situations, which is already available at the national Technical Support Centre (ETC-N), but it will only be finalized and implemented at the plant some time later date.
- Fuel damage in the spent fuel pool is not considered. The spent fuel pool accident management is based on preventive measures. A comprehensive accident prevention procedure is in place to decrease the probability of spent fuel uncover in the pool, but a severe accident mitigation strategy is not available for accidents that could occur in the fuel building.
- Certain preventive accident management actions, like opening the skylight on the top of the fuel building, or make-up the spent fuel pool with unborated water are acceptable only in the case that the original fuel structure (geometry) could be kept.

Without further extension of the SAMG coverage, severe accidents that could occur in open reactor operation mode or in the fuel building may not be properly mitigated.

Suggestion: The plant should consider updating the SAMG with dedicated guidance for events involving fuel uncover or damage that could occur either in an open reactor pressure vessel or in the spent fuel pool.

IAEA Basis:

SSR-2/2

5.9. Arrangements for accident management shall provide the operating staff with appropriate systems and technical support in relation to beyond design basis accidents.

NS-G-2.15

2.12. In view of the uncertainties involved in severe accidents, severe accident management guidance should be developed for all physically identifiable challenge mechanisms for which the development of severe accident management guidance is feasible; severe accident management guidance should be developed irrespective of predicted frequencies of occurrence of the challenge.

2.16. Severe accidents may also occur when the plant is in the shutdown state. In the severe accident management guidance, consideration should be given to any specific challenges

posed by shutdown plant configurations and large scale maintenance, such as an open containment equipment hatch. The potential damage of spent fuel both in the reactor vessel and in the spent fuel pool or in storage should also be considered in the accident management guidance.

3.54. In the case where several units are in operation at the same site, the use of a unit that has not been affected should be taken into account in the accident management guidance. It should also be considered whether or not the neighbouring unit has to be shut down. Special care should be taken to identify limitations on non-standard equipment that might be shared between units. For example, a cross-tie of heat removal systems from an unaffected unit may be useful for heat removal from the affected unit but this may require that the unaffected unit will remain at a certain predefined power level.

Plant Response/Action:

A – Causal analysis

The site has transposed the corporate procedures that were not available at the time of the OSART mission.

B – Strategy adopted to resolve the recommendation or suggestion

Liaison with corporate level and deployment of the new procedures. There are 3 types of procedures:

- Organisational arrangements
- Abnormal and emergency operating procedures
- Severe accidents: Severe Accident Management Guidelines (SAMG).

C – Action plan

Organisational arrangements

Further to the Fukushima accident, additional organisational arrangements have been set up to prevent the situation of loss of spent fuel pool cooling.

- DT331: strengthened prevention of the risk of loss of spent fuel pool cooling (display in the control room and the emergency response technical centre, of the diagram for time to spent fuel pool boiling to raise operations personnel awareness as to the deadlines for the actions required in the event of loss of spent fuel pool cooling. If the time to boiling is less than 72 hours, the sensitive areas such as the rooms housing the spent fuel pool cooling (PTR) pumps and the electrical rooms housing their outgoing feeders are secured, and maintenance operations in these rooms are carried out with specific risk assessments)
- DT347: Improved reliability of the closing of the sluice gate between the transfer compartment and the spent fuel pool in station blackout transient conditions (drafting of a site procedure for manual closing of the sluice gate, provision of the specific equipment and tools, setting up of a test on manual closing of the sluice gate between the transfer compartments and the spent fuel pool and implementation of worker training).

Abnormal and emergency operating procedures

These organisational arrangements have since been supplemented with updates of the following emergency operating procedures:

- Integration of the post-Fukushima temporary safety instruction for the Spent Fuel Pool Cooling System (PTR) in the symptom-based emergency operating procedures. Integration focuses on the following intellectual developments:
 - management of leaktightness of the fuel building bay
 - discharge of steam from the fuel building bay
 - placing of the fuel assemblies being handled in the safety position
 - precautions for the spent fuel pool cooling (PTR) heat exchangers in the event of loss of the Component Cooling System (RRI)
- Integration of the temporary safety instruction for the LLS emergency diesel generator in the symptom-based emergency operating procedures, as the LLS emergency diesel generator mainly enables digital information on the MIN1 and MIN2 spent fuel pool levels to be recovered in the event of station blackout.
- Integration of the temporary safety instruction for spent fuel pool makeup with the Spent Fuel Pool Cooling System improving reliability of replenishment of the spent fuel pool with water in the event of total loss of the cooling system
- Revamping of the spent fuel pool cooling abnormal operating procedure
- Factoring of operating experience, further to the inspection of the post-Fukushima temporary safety instruction by the Nuclear Safety Authority in 2013, into the symptom-based emergency operating procedures, and especially the RFL (modification of sheets LL216 and 217 and compiling of sheet LL225).

Severe accidents

Since 2011, the corporate emergency technical support team (ETCN) applies version 4B of the SAMG, which integrates management of the open reactor pressure vessel and the spent fuel pool.

A temporary safety instruction will be provided by the corporate engineering structure for application of version 4B of the SAMG procedures at Chooz NPP in the summer of 2015. This temporary safety instruction will integrate management of an open reactor pressure vessel and of the spent fuel pool.

D – State of progress

All of these actions have been implemented, except for:

- Application of version V4B of the SAMG, which will be deployed on the site in the summer of 2015
- Factoring in of operating experience from the post-Fukushima temporary safety instruction on unit 1 during the next outage at the end of 2015

IAEA comments:

The plant has considered the extension of SAMG coverage to mitigate severe accident occurring in different operation modes and in the spent fuel pool.

Plant modifications were carried out in order to improve the reliability of the spent fuel long-term cooling and ensure the continuous monitoring of the spent fuel pool level and temperature. Recently installed severe accident diesel generators ensure the continuous and autonomous electrical supply for all the related instrumentation. A new set of motor driven pumps were purchased and implemented last year for both units to ensure alternative non-borated coolant supply to the spent fuel pool from external sources.

The accident prevention procedures have also recently been updated and now incorporate all the related plant modifications that were carried out. Based on the relevant operating experience some of the procedures for the field operators have already been modified.

The team acknowledges all the efforts done to improve the preventive accident management for the spent fuel pool and for the fuel building. All those actions support the assumptions that severe accidents are very unlikely in the spent fuel pool.

Nevertheless, the plant is aware that the potential damage of the spent fuel in the fuel building should also be considered in the severe accident management guidance irrespective of the predicted frequencies of the challenges. An integrated guideline has already been developed to give mitigative advice of an event involving fuel damage in the open reactor vessel operation mode or in the spent fuel pool.

The implementation process of this guidance at the plant will be initiated by the end of this year after the proper training has been conducted. Currently, the guideline should only be applied in case of an accident by direction of the corporate Technical Support Centre.

Conclusion: Satisfactory progress to date.

14.4 PLANT EMERGENCY ARRANGEMENTS WITH RESPECT TO SAM

14.4(1) Issue: The SAM provisions do not provide effective mitigation for severe accidents that are induced by beyond design basis external events and that may occur simultaneously on two units.

The team observed the following:

- Diversified means are in place to supply power to certain vital equipment in the early phase of an accident in the event of a station blackout. There is one alternative gas turbine generator (with accident management purpose), which is not seismically qualified. In an event affecting all site emergency diesel generators, only one of the units could be backed up.
- A filtered venting system (FVS) is applied for pressure relief from the containment in the late phase of a severe accident. The sand filter of the FVS is not seismically qualified.
- Certain mobile equipment with accident management functions are shared between the two units and are currently stored in a temporary storage tent. This equipment will be relocated to the new hardened emergency complex as soon as this building will be erected.
- The size of the on-call crew both in the emergency response centre and in the technical support centre is independent of the extent of the accident. There is a post-Fukushima action in place to reassess the staff required for operating teams in order to ensure the plant self-sufficiency for 24 hours after the accident.
- Although a technical support centre (ELC) is available for each unit, only one team for ELC is on-call, and one dedicated ELC is staffed in case of multi-unit accidents, the data from the other unit would be supplied via fax.

By relying on equipment that is shared by different units or that is not seismically qualified, severe accidents induced by extreme external events such as large earthquake that affect the whole site could remain unmitigated.

Suggestion: The plant should consider enhancing its SAM provisions to ensure that effective mitigation is provided for beyond design basis external events that may occur simultaneously on two units.

IAEA Basis:

SSR-2/2

5.9. Arrangements for accident management shall provide the operating staff with appropriate systems and technical support in relation to beyond design basis accidents.

NS-G-2.15

2.12. In view of the uncertainties involved in severe accidents, severe accident management guidance should be developed for all physically identifiable challenge mechanisms for which the development of severe accident management guidance is feasible; severe accident management guidance should be developed irrespective of predicted frequencies of occurrence of the challenge.

2.17. Severe accident management should cover all modes of plant operation and also appropriately selected external events, such as fires, floods, seismic events and extreme weather conditions (e.g. high winds, extremely high or low temperatures, droughts) that could damage large parts of the plant. In the severe accident management guidance, consideration should be given to specific challenges posed by external events, such as loss of the power supply, loss of the control room or switchgear room and reduced access to systems and components.

2.18. External events can also influence the availability of resources for severe accident management (e.g. severe droughts can limit available natural cooling water sources, such as rivers and lakes, which are a backup for normal resources; seismic events may damage dams). Such possible influences should be taken into account in the development of the accident management guidance.

2.20. If a decision is taken to add or upgrade equipment or instrumentation, the design specification of such equipment or instrumentation should be such as to ensure appropriate independence from existing systems and preferably appropriate margins with regard to the use of the equipment or instrumentation under accident and/or severe accident conditions. These margins should be such as to provide confidence or, where possible, to enable demonstration that the new equipment or instrumentation will function properly under the anticipated conditions. Where feasible, these conditions should be selected as the design conditions for the equipment under consideration. In that case, proper acceptance criteria for the equipment should be selected that are commensurate with the safety function of the equipment and the level of understanding of the severe accident processes.

3.3. The accident management guidance should address the full spectrum of credible challenges to fission product boundaries due to severe accidents, including those arising from multiple hardware failures, human errors and/or events from outside, and possible physical phenomena that may occur during the evolution of a severe accident (such as steam explosions, direct containment heating and hydrogen burns). In this process, issues should also be taken into account that are frequently not considered in analyses, such as additional highly improbable failures and abnormal functioning of equipment.

3.95. If there is more than one unit at a site, the site emergency plan should include the necessary interfaces between the various parts of the overall emergency response organization.

Plant Response/Action:

A – Causal analysis

All the OSART observations concern the emergency response organisation baseline used by all the EDF nuclear power plants. This baseline did not thoroughly cover extreme situations for 2 units.

B – Strategy adopted to resolve the recommendation or suggestion

In the same way as the other sites, Chooz NPP has implemented the different changes in the emergency response baseline developed further to the Fukushima accident.

A multi-unit on-site emergency plan known as the SACA (climate and environmental safety plan) has thus been in place since 15/11/2012. A new modification of the emergency response baseline (RCPF) set up the Nuclear Rapid Response Taskforce (FARN) on 13/11/2014. The FARN provides human and equipment resources to the site in extreme

situations, for support of the site shift crews and handover in less than 24 hours, initiating response within 12 hours of the alert. The taskforce takes action to restore water, power and compressed air so as to limit worsening of the situation.

Concerning lack of seismic qualification of the sand filter and the LLS emergency diesel generators, within the framework of the post-Fukushima action plan:

- In phase 1, an LLS emergency diesel generator specific to every unit was installed. Its purpose in station blackout conditions is to resupply the measurements and functions required to monitor the accident.
- In phase 2, seismic reinforcement of the sand filter and installation of the station blackout (SBO) diesel generator strengthen the accident management systems.

C – Method used to check that the action plan is appropriate

Emergency response exercises using scenarios affecting the 2 units were run in 2014. An exercise involving the FARN will be run in 2016.

D – Action plan

Deployment of the emergency response baselines:

- Baseline 2RC in November 2012
- Baseline RCPF in November 2014

Running of exercises dedicated to multi-unit scenarios:

- 4 exercises of on-site emergency plan for climate and environmental safety type:
30/01/2014 – 16/09/2014 – 16/10/2014 – 20/11/2014

Setting up of the FARN at the EDF fleet:

- Manning to be able to be deployed for 2 units since January 2014
- Implementation of plant modifications for emergency connections: completion planned for 2016
- Running of a deployment exercise: planned for the first quarter of 2016

Strengthened technical resources:

- Setting up of an LLS emergency diesel generator for every unit: closed out in June 2013
- Installation of a station blackout diesel generator for every unit and seismic reinforcement of the sand filter: scheduled as from 2016

E – State of action plan progress and reporting procedure

The main changes in the emergency response baseline have now been implemented. The modifications have been implemented on the units for connection of the FARN equipment and exercises have been run to test robustness of the site organisation for multi-unit events.

In 2016, an exercise will be run with the FARN, and construction of the SBO diesel generators will be started.

F – Evaluation of action plan effectiveness

The emergency response exercises run in 2014 showed the site capability of response to external events affecting the 2 units. The programme has been designed so that all the on-call personnel can test their dedicated procedures.

IAEA comments:

The plant has considered the assessment of the hazard resistance of the equipment used for accident management and mitigation. For the proper seismic qualification, the supporting structures of the filtered venting system are still to be upgraded; the necessary modifications are already planned and will be carried out starting from 2016.

The recently installed hazard resistant severe accident diesel generators on both units ensure the continuous and autonomous electrical supply for the instrumentation and other low-power equipment which are used for severe accident management.

Several emergency response exercises simulating severe external events that affect both units were already carried out. The plant is devoted to run such “multi-unit” type exercises in a regular manner.

The emergency response plans were upgraded with the actions carried out by the centralised rapid action force (FARN). The FARN is able to reach the site and initiate response within 12 hours. The necessary technological modifications, implementing the external connections for cooling water, compressed air and electrical supply have recently been completed. An emergency exercise to test the FARN efficiency is planned for 2016.

The ongoing post-Fukushima action plan will give the definitive resolution of the issue, when the plant is going to create a so-called “hardened safety core” with equipment that are designed for extreme hazards. The design work for three major installations: the large last-resort diesel generator stations, the cooling pump stations with appropriate water source (wells) and an upgraded crisis centre has already started.

Conclusion: Satisfactory progress to date.

**SUMMARY OF STATUS OF RECOMMENDATIONS AND SUGGESTIONS
OF THE OSART FOLLOW-UP MISSION TO CHOOZ NPP**

	RESOLVED	SATISFACTORY PROGRESS	INSUFFICIENT PROGRESS
<u>Fuming MOA</u>			
R 1.1(1)	R		
R 1.3(1)		S	
S 1.5(1)		S	
<u>Suresh TO</u>			
S 2.3(1)		S	
2 2.4(1)	R		
<u>Yuri OP</u>			
R 3.2(1)		S	
S 3.4(1)		S	
S 3.4(2)		S	
S 3.4(3)	R		
S 3.6(1)	R		
<u>Sursh MA</u>			
S 4.5(1)		S	
<u>Fuming TS</u>			
R 5.3(1)		S	
S 5.5(1)	R		
<u>Suresh OE</u>			
R 6.5(1)	R		
R 6.9(1)		S	
<u>Igor RP</u>			
R 7.3(1)	R		
S 7.5(1)		S	
<u>Igor CH</u>			
S 8.2(1)		S	
S 8.6(1)		S	
<u>Jozsef EPP</u>			
R 9.2(1)		S	
S 9.2(2)		S	
<u>Jozsef SAM</u>			
S 14.3(1)		S	
S 14.4(1)		S	
TOTAL	7	16	
TOTAL %	30	70	

DEFINITIONS

DEFINITIONS – OSART MISSION

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.

DEFINITIONS - FOLLOW-UP MISSION

Issue resolved - Recommendation

All necessary actions have been taken to deal with the root causes of the issue rather than to just eliminate the examples identified by the team. Management review has been carried out to ensure that actions taken have eliminated the issue. Actions have also been taken to check that it does not recur. Alternatively, the issue is no longer valid due to, for example, changes in the plant organization.

Satisfactory progress to date - Recommendation

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

Insufficient progress to date - Recommendation

Actions taken or planned do not lead to the conclusion that the issue will be resolved in a reasonable time frame. This category includes recommendations on which no action has been taken, unless this recommendation has been withdrawn.

Withdrawn - Recommendation

The recommendation is not appropriate due, for example, to poor or incorrect definition of the original finding or it is having minimal impact on safety.

Issue resolved - Suggestion

Consideration of the suggestion has been sufficiently thorough. Action plans for improvement have been fully implemented or the plant has rejected the suggestion for reasons acceptable to the follow-up team.

Satisfactory progress to date - Suggestion

Consideration of the suggestion has been sufficiently thorough. Action plans for improvement have been developed but not yet fully implemented.

Insufficient progress to date - Suggestion

Consideration of the suggestion has not been sufficiently thorough. Additional consideration of the suggestion or the strengthening of improvement plans is necessary, as described in the IAEA comment.

Withdrawn - Suggestion

The suggestion is not appropriate due, for example, to poor or incorrect definition of the original suggestion or it is having minimal impact on safety.

LIST OF IAEA REFERENCES (BASIS)

Safety Standards

- **SF-1**; Fundamental Safety Principles (Safety Fundamentals)
- **GSR Part 3**; Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, Interim Edition
- **SSR-2/1**; Safety of Nuclear Power Plants: Design (Specific Safety Requirements)
- **SSR-2/2**; Safety of Nuclear Power Plants: Operation and Commissioning (Specific Safety Requirements)
- **NS-G-1.1**; Software for Computer Based Systems Important to Safety in Nuclear Power Plants (Safety Guide)
- **NS-G-2.1**; Fire Safety in the Operation of Nuclear Power Plants (Safety Guide)
- **NS-G-2.2**; Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (Safety Guide)
- **NS-G-2.3**; Modifications to Nuclear Power Plants (Safety Guide)
- **NS-G-2.4**; The Operating Organization for Nuclear Power Plants (Safety Guide)
- **NS-G-2.5**; Core Management and Fuel Handling for Nuclear Power Plants (Safety Guide)
- **NS-G-2.6**; Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (Safety Guide)
- **NS-G-2.7**; Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (Safety Guide)
- **NS-G-2.8**; Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (Safety Guide)
- **NS-G-2.9**; Commissioning for Nuclear Power Plants (Safety Guide)
- **NS-G-2.11**; A System for the Feedback of Experience from Events in Nuclear Installations (Safety Guide)
- **NS-G-2.12**; Ageing Management for Nuclear Power Plants (Safety Guide)
- **NS-G-2.13**; Evaluation of Seismic Safety for Existing Nuclear Installations (Safety Guide)
- **NS-G-2.14**; Conduct of Operations at Nuclear Power Plants (Safety Guide)
- **NS-G-2.15**; Severe Accident Management Programmes for Nuclear Power Plants Safety Guide (Safety Guide)

- **SSG-13**; Chemistry Programme for Water Cooled Nuclear Power Plants (Specific Safety Guide)
- **SSG-25**; Periodic Safety Review for Nuclear Power Plants (Specific Safety Guide)
- **GSR**; Part 1 Governmental, Legal and Regulatory Framework for Safety (General Safety Requirements)
- **GS-R-2**; Preparedness and Response for a Nuclear or Radiological Emergency (Safety Requirements)
- **GS-R-3**; The Management System for Facilities and Activities (Safety Requirements)
- **GSR Part 4**; Safety Assessment for Facilities and Activities (General Safety Requirements 2009)
- **GS-G-4.1**; Format and Content of the Safety Analysis report for Nuclear Power Plants (Safety Guide 2004)
- **SSG-2**; Deterministic Safety Analysis for Nuclear Power Plants (Specific Safety Guide 2009)
- **SSG-3**; Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants (Specific Safety Guide 2010)
- **SSG-4**; Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants (Specific Safety Guide 2010)
- **GS-R Part 5**; Predisposal Management of Radioactive Waste (General Safety Requirements)
- **GS-G-2.1**; Arrangement for Preparedness for a Nuclear or Radiological Emergency (Safety Guide)
- **GSG-2**; Criteria for Use in Preparedness and Response for a Nuclear and Radiological Emergency
- **GS-G-3.1**; Application of the Management System for Facilities and Activities (Safety Guide)
- **GS-G-3.5**; The Management System for Nuclear Installations (Safety Guide)
- **RS-G-1.1**; Occupational Radiation Protection (Safety Guide)
- **RS-G-1.2**; Assessment of Occupational Exposure Due to Intakes of Radionuclides (Safety Guide)
- **RS-G-1.3**; Assessment of Occupational Exposure Due to External Sources of Radiation (Safety Guide)
- **RS-G-1.8**; Environmental and Source Monitoring for Purpose of Radiation Protection (Safety Guide)

- **SSR-5**; Disposal of Radioactive Waste (Specific Safety Requirements)
 - **GSG-1** Classification of Radioactive Waste (Safety Guide 2009)
 - **WS-G-6.1**; Storage of Radioactive Waste (Safety Guide)
 - **WS-G-2.5**; Predisposal Management of Low and Intermediate Level Radioactive Waste (Safety Guide)
- ***INSAG, Safety Report Series***
- INSAG-4**; Safety Culture
- INSAG-10**; Defence in Depth in Nuclear Safety
- INSAG-12**; Basic Safety Principles for Nuclear Power Plants, 75-INSAG-3 Rev.1
- INSAG-13**; Management of Operational Safety in Nuclear Power Plants
- INSAG-14**; Safe Management of the Operating Lifetimes of Nuclear Power Plants
- INSAG-15**; Key Practical Issues In Strengthening Safety Culture
- INSAG-16**; Maintaining Knowledge, Training and Infrastructure for Research and Development in Nuclear Safety
- INSAG-17**; Independence in Regulatory Decision Making
- INSAG-18**; Managing Change in the Nuclear Industry: The Effects on Safety
- INSAG-19**; Maintaining the Design Integrity of Nuclear Installations Throughout Their Operating Life
- INSAG-20**; Stakeholder Involvement in Nuclear Issues
- INSAG-23**; Improving the International System for Operating Experience Feedback
- INSAG-25**; A Framework for an Integrated Risk Informed Decision Making Process
- Safety Report Series No.11**; Developing Safety Culture in Nuclear Activities Practical Suggestions to Assist Progress
- Safety Report Series No.21**; Optimization of Radiation Protection in the Control of Occupational Exposure
- Safety Report Series No.48**; Development and Review of Plant Specific Emergency Operating Procedures
- Safety Report Series No. 57**; Safe Long Term Operation of Nuclear Power Plants
- ***Other IAEA Publications***

- **IAEA Safety Glossary** Terminology used in nuclear safety and radiation protection 2007 Edition
- **Services series No.12**; OSART Guidelines
- **EPR-EXERCISE-2005**; Preparation, Conduct and Evaluation of Exercises to Test Preparedness for a Nuclear or Radiological Emergency, (Updating IAEA-TECDOC-953)
- **EPR-METHOD-2003**; Method for developing arrangements for response to a nuclear or radiological emergency, (Updating IAEA-TECDOC-953)
- **EPR-ENATOM-2002**; Emergency Notification and Assistance Technical Operations Manual
- ***International Labour Office publications on industrial safety***
 - **ILO-OSH 2001**; Guidelines on occupational safety and health management systems (ILO guideline)
 - Safety and health in construction (ILO code of practice)

Safety in the use of chemicals at work (ILO code of practice)

TEAM COMPOSITION OF THE OSART MISSION

MARTYNENKO Yury

IAEA

Team Leader

Years of nuclear experience: 29

VAMOS Gabor

IAEA

Deputy Team Leader

Years of nuclear experience: 35

FRISCHKNECHT Albert – Switzerland

Nuclear Safety Consultant

Years of nuclear experience: 25

Review area: Management, Organization and Administration

GILLIS Jürgen - Belgium

GDF-Suez Electrabel

Years of nuclear experience: 12

Review area: Training and Qualification

HESSE Holger - Germany

EnBW Kernkraft GmbH, Kernkraftwerk Philippsburg

Years of nuclear experience: 24

Review area: Operations 1

BYTTEBIER Jo - UK

Electrabel – GDF-Suez

Years of nuclear experience: 20

Review area: Operations 2

JIANG Fuming - China

CNNC Nuclear Power Operations Management Company

Years of nuclear experience: 16

Review area: Maintenance

POLYAKOV Alex

IAEA

Years of nuclear experience: 28

Review area: Technical Support

FOTEDAR Suresh - India

Nuclear Operational Safety Expert

Years of nuclear experience: 38

Review area: Operating Experience

GRAINGE Hannah - UK

Edf Energy

Years of nuclear experience: 10

Review area: Radiation Protection

PETRECKY Igor – Czech Republic

CEZ a.s – Nuclear power plant of Dukovany

Years of nuclear experience: 29

Review area: Chemistry

LEMAY François - Canada

International Safety Research

Years of nuclear experience: 30

Review area: Emergency Planning and Preparedness

ELTER, Jozsef – Hungary

MVM Paks Nuclear Power Plant Ltd

Years of nuclear experience: 26

Review area: Severe Accident Management

OBSERVERS

TYRER Mark Joseph - UK

Federal Authority for Nuclear Regulation

Years of nuclear experience: 28

Review area: Observer

KUZIN Sergey – Russian Federation

Kola NPP

Years of nuclear experience: 29

Review area: Observer

FEDOROV Anatoly - Russian Federation

Novovoronezh Nuclear Power Plant

Years of nuclear experience: 36

Review area: Observer

TEAM COMPOSITION OF THE OSART FOLLOW UP MISSION

MARTYNENKO Yury

IAEA

Team Leader

Years of nuclear experience: 31

Review Area: Operation

JIANG Fuming

IAEA

Deputy Team Leader

Years of nuclear experience: 18

Review area: Management, Organization and Administration and Technical Support

FOTEDAR Suresh - India

Nuclear Operational Safety Expert

Years of nuclear experience: 40

Review area: Training and Qualification, Maintenance, and Operating Experience

PETRECKY Igor – Czech Republic

CEZ a.s – Nuclear power plant of Dukovany

Years of nuclear experience: 31

Review area: Radiation Protection and Chemistry

ELTER, Jozsef – Hungary

MVM Paks Nuclear Power Plant Ltd

Years of nuclear experience: 28

Review area: Emergency Planning and Preparedness, and Severe Accident Management