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REPORT
OF THE
OPERATIONAL SAFETY REVIEW TEAM
(OSART)
MISSION
TO THE
ST. ALBAN
NUCLEAR POWER PLANT
France
20 September -6 October 2010
and
OSART FOLLOW UP VISIT
19-23 March 2012

DIVISION OF NUCLEAR INSTALLATION SAFETY
OPERATIONAL SAFETY REVIEW MISSION
IAEA-NSNI/OSART/158F/2010

PREAMBLE

This report presents the results of the IAEA Operational Safety Review Team (OSART) review of St. Alban 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 18 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

by the

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. It also includes the results of the follow-up visit that was requested by the competent authority of France for a check on the status of implementation of the OSART recommendations and suggestions.

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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 St. Alban Nuclear Power Plant from 20 September to 06 October 2010.

St Alban NPP is part of the EDF nuclear fleet (58 reactors) and has two 1300 MWe PWR units in operation on the site since 1986/87. There are 670 EDF workers on site along with approximately 100 permanent contractors.

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, Radiation protection; Chemistry; and Emergency planning and preparedness. 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.

The St. Alban OSART mission was the 158th in the programme, which began in 1982. The team was composed of experts from the Belgium, Canada, Czech Republic, Germany, Lithuania, the Netherlands, Slovakia, Sweden and the United States of America together with the IAEA staff members and observers from Slovakia and the Czech Republic. The collective nuclear power experience of the team was approximately 400 years.

Before visiting the plant, the team studied information provided by the IAEA and the St. Alban 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 compared with good international practices.

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 either 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.

A follow-up mission was undertaken during 19-23 March 2012.

MAIN CONCLUSIONS

The OSART team concluded that the managers of St. Alban 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 produces a nuclear safety guideline for outages
- The use of remote video surveillance of fuel inspection and handling activities
- Motivating plant staff regarding the benefits of operating experience and associated corrective actions
- Using a sophisticated key control system to ensure that only authorized personnel have access to radioactive sources.

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

- Limiting the extent of access to the Main Control Room to only the number of necessary personnel.
- The need to minimize the number and time validity of temporary modifications.
- The manipulation of reactivity should be undertaken in a manner that is commensurate with its significance.
- Enhance control of contamination to make it more effective

St. Alban NPP 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.

ST. ALBAN FOLLOW-UP MAIN CONCLUSIONS (Self Assessment)

At the time of the OSART review hosted by Saint Alban NPP in September/October 2010, the station was going through a very specific phase. A new senior management team had been at the helm for only one year, and a few weeks prior to the start of the review, had just approved the station business plan setting out its key strategic principles for the next five years.

As far as the station's expectations regarding the review were concerned, it was hoped that the OSART conclusions would evaluate on the quality of the station's self-assessment and strategic principles. It was also hoped that the OSART conclusions would provide some further insights of these strategies.

Concerning the adequacy of key strategic principles set out in the business plan, the general findings raised by the team highlighted the aptness of these principles. From this perspective, this review was a definite added benefit.

For the past 18 months, the station has been focusing on the practical implementation of its road sheet. Throughout this essential phase, the insights, recommendations and suggestions provided by the reviewers in their various areas have been analyzed and addressed. Below are a number of examples to illustrate how the station has implemented and took into account the findings of the OSART mission:

- A number of OSART recommendations and suggestions highlighted the fact that a certain number of standards and expectations were not being sufficiently assimilated or implemented, and that staff were not always committed to or involved in improvement efforts.

In the light of these facts, the station adopted a team project strategy at the start of 2011, aimed at fostering staff initiative and commitment as well as reinforcing the leadership status of first-line management. In the course of 2011, each work team built their project around two priority areas: (i) health and safety at work and (ii) care and attention at the point of work, driven by team leaders with the support of a station senior manager. Aimed at encouraging creativity and team commitment, this bottom-up approach was expanded by adding another strand, specific to team dynamics.

Furthermore, the monthly deployment of management standards and expectations that was started in early 2010 (2 station-wide expectations consistently reinforced by all leaders) has continued and now forms an integral part of the station's overall management system. This system is also supported by management presence in the field and coaching initiatives. When identifying the areas on which to focus its monthly standards and expectations in 2011 and 2012, the station drew extensively on the OSART findings raised in 2010. As of 2011, one of the two monthly expectations now focuses on promoting one of six error-reduction techniques. This approach is being used to change behaviours and reinforce leadership and daily rigor over the longer term.

- A number of recommendations and suggestions raised at the OSART mission in 2010 highlighted a number of multi-faceted issues. Three integrated actions were taken to address these issues:
 - A general overhaul of the station's organizational structure aimed at redefining the scope of each macro-process (nuclear safety, industrial safety-RP, environmental protection, generation, forward-planning, etc.) and its respective committees and review groups. This resulted in the creation of sub-committees partly comprising personnel with hands-on experience of the plant, which started operating in 2011 (nuclear safety sub-committee, emergency-planning and preparedness sub-committee, fire-protection sub-committee, environmental protection sub-committee, post-maintenance testing sub-committee, temporary modifications sub-committee, etc.).

Fundamental issues raised by the OSART team are taken into account by these permanent bodies, with a view to achieving sustainable results that are challenged on a regular basis.
 - Furthermore, the work management organization has undergone significant changes that are still being deployed, including the implementation of a modular planning system. Improvements brought about by this method have made the station more proactive, more efficient and more cross-functionally aligned. The method is designed to optimize resolution of plant deficiencies, thus helping to address the challenges identified by the OSART mission.
 - A "black spot" eradication system also started being rolled out at the start of 2011. At the start of 2012, it entered its operational phase. The purpose of the system is to identify cross-functional issues that technically-oriented workers consider to be highly challenging to day-to-day plant operations. A wide range of issues have been identified and are now being addressed, such as the running of the demineralised water production plant, work permits and effluent management.
- In addition to this category-based approach, a reflection of the extent to which the OSART mission has influenced the methods chosen by St Alban NPP, the latter has set up a steering committee to review each of the recommendations and suggestions,

develop solutions and implement the resulting actions. This project-based effort has gone hand in hand with the distribution of the various recommendations and suggestions among different processes and departments, not only with a view to tracking them to completion, but also to ensure they are permanently embedded for purposes of trending and self-assessment.

All these items are also part of the site priorities for 2012: successfully carry out refuelling-only outages in complete safety (unit 2 in May 2012 and unit 1 in August 2012), strengthen individual involvement and alignment of the managerial line, implement service projects and improve site environmental results.

The insights of the OSART mission will thus have a lasting influence on the way the station is run.

OSART TEAM FOLLOW-UP MAIN CONCLUSIONS

St Alban NPP management and staff has gained significant benefit from the OSART process as indicated by the follow-up results. The plant analysed the OSART issues and developed appropriate corrective action plans. The willingness and motivation of plant management to consider new ideas and implement a comprehensive safety improvement programme was evident. It must be borne in mind that this was accomplished at a time period when the plant workload was greatly increased as a result of actions it had to take following the Fukushima accident.

Of the 20 issues produced at the OSART mission, it was evaluated by the follow-up team that 10 of these issues had been resolved, 9 issues had made satisfactory progress to date and there was one issue where insufficient progress had been made.

The following provides an overview of the issues where some degree of further work is necessary:

With respect to the issue regarding limitation of access to the Main Control Room (MCR), the plant has addressed the issue in two ways i.e. from an organisational perspective and by carrying out modifications to the MCRs in both units. A decision has been taken by the plant nuclear safety board to introduce a badge exchange system at the entrance of the MCR, which will allow only a designated number of people to be able to enter the MCR. The plant still does not have expectations concerning the number of people who have access to the control room at the same time. Rules concerning the serenity inside the MCR are planned to be displayed at the entrance area but also will be clearly defined in a technical note from Operations department. A video screen will be placed at the entrance area where the operators are able to display the message if the access to the MCR is authorized, limited or restricted e.g. during sensitive actions and testing. It is planned to implement the above mentioned processes at the beginning of the next outage (May 2012). Modifications to the MCR of both units have been completed: an electronic door (which also can be blocked) gives access to a counter, which is now physically limiting the number of people being able to stay at the entrance area.

A working group was formed to determine technical hold-points and error-reduction tools during reactivity management tasks and also when performing sensitive activities. After an event in June 2011 (exceeding the right hand-boundary of the operating envelope), there has been an implementation of human error reduction tools (HERT) for power variations which

are considered sensitive activities. Also, a technical note NS/PC-00054 (Conduct of sensitive tasks within Operations) was revised in order to include a category on reactivity management and to define when and how the HERT have to be applied. The plant has developed a training guide together with changes in the Full Scope Simulator-training sequences in order to be able to provide specific training on reactivity management issues. Even though power increase and power-reduction activities now require a pre-job briefing, there is still no plant expectation to have to have continuous supervision while performing these actions. Normal operating procedures do not indicate when HERT have to be applied but the Shift Manager is responsible for ensuring that, for example, a PJB is performed during reactivity manipulations.

The issue regarding plant maintenance working practices not being always conducted in a safe and reliable manner by plant staff and contractors was addressed and improvements on the industrial safety results achieved, especially in maintenance, are evident. Manager presence in the field helped on situations where practices and tools were found to be inappropriate. Starting in 2012, an improved contractor industrial safety induction followed by a knowledge test will be implemented. Future comprehensive action plans to further improve maintenance working practices (for example for lifting activities and work at heights) will be adopted.

Deviations were dealt with within the material conditions programme to address the issue on the plant material condition program not being fully implemented to resolve deficiencies. Progress charts for leaks, corrosion, housekeeping, electricity and more have been established and give a good indication of the level of performance. However, the team noted during field tours that there are still unrecognized or long standing leakages e.g. on the auxiliary feedwater system (ASG).

The plant has developed and introduced a plan to remedy deficiencies in the area of handling safety significant and non-safety significant temporary modifications. The plan is based on a corporate directive that provides definitions and organisational principles for the management of temporary modifications. Since 2010, the number of active temporary modifications has decreased from 170 to 150. The plant has a target to remove 60% of active temporary modifications by the year 2014. However, since the beginning of the year 2012, 9 new temporary modifications have been installed and 2 removed. The plant has not specified, in their procedures, a time limit for temporary modifications and has no criteria for conversion of temporary modifications into permanent ones, but has a plan to correct these deficiencies shortly. Additionally, interference between active temporary modifications is not systematically analysed.

A set of actions to remedy the status of the corrective actions backlog and improve the CAP programme itself has been developed. During the year 2011, 865 corrective actions were raised in the tracking databases as compared to 609 in 2010. As a result of the plant's activities, the number of the corrective actions which exceeded the completion due date decreased from 209 in 2011 to 72 currently with an average deadline overrun of 5 month and 26 are pending closure. 6 corrective actions of 72 are safety related. The plant still runs several independent data bases and has no plan for integration as in the near future a new modern tracking system will be introduced. The plant does not assess the effectiveness of the corrective actions totally, but only for those which are safety significant and reportable to the regulator. There is still no clear prioritization of corrective actions.

Regarding the rigor in the implementation of radiation protection procedures and practices in the Radiation Controlled Area (RCA), the plant initiated actions to improve the ALARA

programme based on 1) the reduction of the radioactive source by removing activated corrosion products from the reactor cooling water during shut down - also the plant has set up a “hot spot” database which gives a comprehensive list of hot spots in all controlled areas. Workers can then be informed of any hot spots and their positions, 2) understandable reference documents which have improved staff knowledge and have supported plant expectations. They deal with the following topics: radiation protection signage, exiting the RCA, radiological work permits, jobs with potential contamination risks in the RCA, 3) the reinforcement of all plant ALARA principles by providing an extensive training programme for EDF workers and contractors to improve their behaviour in the radiological area, 4) weekly meetings which have been conducted on the topics of signage, risk assessment, radiological surveys, event reporting criteria and gamma radiography, 5) radiation protection deficiencies being systematically analysed, reported and feedback is provided to all employees and 6) supervision in the field of contamination checks being stepped up. However the team observed that some practices still do not fully meet ALARA principles e.g. an RP Technician not wearing dosimetry in an appropriate manner and his overalls not being fastened as required. Although efforts have been seen and an action programme has been set up, achieving a high level of control of occupational exposure requires constant vigilance and regular activity.

The plant is currently in the process of revising the whole process of procurement and quality control of chemicals and other substances, clearly defining the responsibilities and authority of different departments within this process. Through the OLIMP electronic system (Safety sheets), criteria for quality and safety as well as the extent of declared parameters verification with regard to particular use was implemented ensuring that only chemicals meeting defined criteria are being procured. For new, unused chemicals and substances, the approval of the national entity (UTO), the health safety at work department and the risk prevention department as well as CEIDRE is required before starting the procurement process. Chemicals and other substances have all been identified by PMUC labels with their expiry date, batch number, date of opening etc. Special attention is given by the plant to avoid harmful effects on health. The plant organises a monthly discussion focused on educating plant staff and contractors. Nevertheless, during a plant walkdown, several unlabelled liquids were still noticed on the plant.

The plant procedures did not require to have an authorized person present at all times on the plant to declare a nuclear emergency and to notify the off-site authorities promptly and without consultation. The quoted phrase “and without consultation” in paragraph 4.23 of GS-R-2 is based on experience of past emergencies where delays ensued before appropriate consultation was made. It is intended to ensure that full authorization and responsibility is given to the emergency manager on site. This is currently not the case at St. Alban or at any other French EDF site. The shift manager has to initially try and contact (consult with) the standby senior manager and, if this is not possible, only then is he allowed to initiate response actions. This is obviously in disagreement with the “without consultation” phrase. The plant has reviewed and revised its signage procedure and this project is due for completion by April 2012. A new headcount process is in place and it has the ability to display at muster points the staff distribution on site online. There are still some gaps evident in the doors of the BDS (Emergency Control Centre) and repairs are ongoing. Flyers have been prepared for visitors to the site and these indicate expected behaviours during normal and abnormal plant conditions in addition to relevant phone contact numbers and a site map, indicating the position of all muster points. A fleet-wide initiative will launch the construction of a purpose-built emergency centre from 2014.

1. MANAGEMENT, ORGANIZATION AND ADMINISTRATION

1.1 ORGANIZATION AND ADMINISTRATION

The St Alban management system combines seven processes which include: management and communication, nuclear safety and industrial risk prevention, generation in power operations and outages, and human and financial resources. These are grouped in four process loops that are managed by committees lead by a senior plant manager. Plant departments participate on these committees to integrate department objectives. This system has been in place since the end of 2005.

The plant performance goals are captured in annual contracts between the corporate organization and the plant management, and similarly with each department. The annual performance contracts include commitments in the following operating fields: nuclear safety, management, unit capability, industrial safety, radiation protection, the environment, human and financial resources, information systems and communication. Specific performance objectives are identified to measure results. The annual performance contracts for 2010 are based on the results for the previous year and identify specific improvements needed in nuclear safety, industrial safety and radiation protection.

1.2. MANAGEMENT ACTIVITIES

Beginning in January 2010, the plant manager established an expectation for all managers to increase their presence in the field to observe workers use of the six error reduction tools and the requirements booklet. In order to achieve this objective, it is expected that every manager perform one field walk down a week to observe positive points and areas for improvement. The walk downs also create the opportunities for managers to ensure expectations are understood and to coach workers when they are not performing work as expected.

Plant management has established four major projects to improve performance in areas such as human performance, management presence in the field, controlling fire risks, and equipment material condition. Additionally management has developed fifteen action plans to improve areas including: industrial safety, environmental performance, radiation protection, control room deficiencies and surveillance testing.

While gaps still exist, the team sees this program as a driving force to changing behaviors in workers and raising the standards of performance. Plant management openly communicates to permanent and contract workers that performance in many areas, including industrial safety and radiation protection has not met objectives and that improvement is needed. The team recognized this as a good performance.

A robust internal and external communication system is used at St Alban. Nineteen internal communication tools using multi-media vehicles are used onsite to communicate performance and reinforce expectations. Twenty one external communication tools including a toll free hot line, monthly newsletter to stakeholders, periodic reports and a website are used to communicate to stakeholders and residents around the plant. St Alban's redesign of

the visitor centre for re-opening to the public has become a model for other EDF plants. The team recognized this as a good performance.

Plant management has committed significant resources through 2012 to improve the material condition and housekeeping of the plant through the implementation of the OEEI programme. The team recognized this as a good performance.

1.3. MANAGEMENT OF SAFETY

The team observed the following positive aspects of safety culture:

- Senior managers are dedicated to making safety improvements as their top priority;
- Each month senior managers identify two topics for the plant to focus on from a safety perspective;
- Throughout the OSART visit, plant peers have kept an open mind and were interested in learning how to improve their performance in areas discussed by the team.

These observations indicate a focus on learning to recognize and improve the plants safety performance. The senior managers also recognize the importance of coaching workers to understand and become proficient in the use of error reduction tools to improve safety.

The team also observed the following negative aspects of safety culture:

- Plant personnel tend to focus on complying with regulatory or corporate standards instead of looking outside France for benchmarking of best practices;
- Permanent staff were observed to not question the position of open fire doors and leaving them open when they should be closed;
- During the reactor down power as part of the labour strike, there were a number of distractions and dynamics in the control room that could have affected crew performance.

These observations indicate vulnerabilities to strong safety culture and that the workforce has not fully internalized the expectation of management for improved safety performance.

As a result of the increased manager presence in the field and raising expectations to document deficiencies on equipment, the backlog of maintenance work orders has significantly increased. As of the end of September 2010, the work order backlog was at 3075, and the backlog for safety related equipment was at 1020. In the last six months there has not been an appreciable reduction in the work order backlog on safety related equipment. The maintenance department performs a monthly analysis of the backlog on safety related equipment which is reviewed and approved by the shift manager. However, the analysis does not systematically consider the cumulative impact of deficiencies on safety related systems. The team suggested that a systematic approach be used to analyze the work order backlog to ensure the cumulative impact of a number of deficiencies on safety related systems does not affect system reliability or operator actions.

1.5. INDUSTRIAL SAFETY PROGRAMME

Industrial safety performance for EDF employees and contractor personnel working at the plant reached a record high in 2007 and then started to decline in 2008 and 2009. As of August, 2010, the total lost time injury rate for St Alban was 6,5 compared to the EDF fleet average of 4,7. Specifically, the contractor lost time injury rate for 2010 was at 7,1 compared to a EDF fleet average of 5,3. As of the end of September 2010, St Alban recorded nine lost time injuries for the year.

To address the poor industrial safety performance, plant management prepared a communication kit and held site meetings with all permanent and contract workers in June 2010. The performance trend was presented to all employees and managers reinforced the expectation for workers to: know their role and responsibilities, to comply with procedures, to stop when unsure, and not to improvise.

A particular emphasis has been placed on tripping hazards which has been a significant contributor to injuries. However, during field observations the team noted several examples where tripping hazards had not been corrected or documented. Additionally, workers were observed not complying with the personnel protection equipment requirements posted in the plant. In some cases, workers were unclear of the expectation.

The team recommended that managers should take additional action to ensure the expectation to identify and correct field hazards in a timely manner is clearly understood, and should reinforce the expectation for compliance with personal protection requirements.

DETAILED MANAGEMENT, ORGANIZATION AND ADMINISTRATION FINDINGS

1.3. MANAGEMENT OF SAFETY

1.3(1) Issue: The periodic analysis of the backlog of safety related work orders is not performed with sufficient systematic criteria to ensure there is no cumulative effect that would impact on the reliability of safety systems or compromise operator actions.

- The current work order backlog is 3075, with 1020 work orders on safety related equipment.
- In the last six months there has not been an appreciable reduction in the work order backlog on safety related equipment.
- The requirements for analyzing the work order backlog on safety related equipment does not contain guidance or direction on how to consider cumulative impact.

The potential of an unknown reliability risk can be created and remain undetected as a result of many uncorrected deficiencies existing on a safety system.

Suggestion: Management should consider including a systematic approach to analyze the work order backlog to ensure the cumulative impact of a number of deficiencies on safety related systems does not affect system reliability or operator actions.

Basis: NS-G-2.6

8.2. Maintenance actions can have significant effects on reliability and risk, but they can also entail a significant expenditure of resources. In order to reconcile potentially conflicting demands, individual maintenance actions should be prioritized according to their importance, and their probable effects on reliability and risk should be quantified. Different approaches can be used for this, all of which are based firstly on the selection of SSCs important to safety and secondly on specifying risk and performance criteria to ensure that the SSCs remain capable of performing their intended functions. The maintenance work that is most important for ensuring the reliability of components and controlling risks should be identified by these means.

Plant response/Action

In answer to this problem, the NPP has undertaken a number of actions and initiatives, staged across different, complementary timescales:

- The monthly analyses of open safety-related work orders have continued in all the key maintenance sections (mechanical and electrical maintenance, I&C). They make it possible to ensure there are no alerts, and to react if necessary and deal with an item of equipment.
- The fix-it-now team (FIN team), which was created in July 2010, has developed over time. It is guided by the operations department, which dictates its priorities. Therefore, at the beginning of the day, the team is given the task of correcting all equipment defects that may lead to a group-1 or group-2 unavailability (limiting condition of operation) according to the technical specifications for operation. Thanks to the creation and development of this new response team, the duration of safety related equipment unavailability could be lowered. A Technical Support Mission

conducted in 2011 was able to see the full value of this initiative and advised the plant to broaden it to include, for example, logistical and support services.

- The operations department now monitors control room alarms closely, and this responsibility has been assigned to one shift team which is in charge of handling these specific defects. Coordinated by the power operations project, regular meetings take place to drive forward a fast response and resolution of equipment problems that generate alarms in the control room. Safety systems are of course prioritised during these meetings. Thanks to this system, which has brought ownership of the issue back to the operations department, the power operations project and the maintenance sections, the number of alarms caused by equipment failure is now under control and kept low.
- Towards the end of 2011, the operations department and the internal, independent audit branch developed a plan to safeguard temporary operating procedures. This plan sets out regular (twice a year) assessments of the reliability of this basic process. Amongst a whole range of issues that have been examined, one issue concerned the handling of safety system defects that give rise to the use of temporary operating procedures. Now that the plan is firmly in place, 2012 will be spent driving forward this initiative.
- Two-monthly meetings take place in the control rooms between the deputy plant manager and the heads of the operations and maintenance departments. They provide an opportunity to take stock of all the equipment deviations that have an impact on the interface in the control rooms, and to discuss planned solutions. Safety systems in particular are reviewed.
- In 2011, the foundations were laid for a comprehensive approach to reduce the backlog of work orders. This has produced a first set of results, and the plant has gone from a total of 3000 active work orders at the beginning of the year, to approximately 2700 at the end of the year. The decision has been made to drive this initiative forward during 2012, and to reach an overall objective of 1500 equipment defect work orders by the end of the year (for units 0, 1 and 2).
- At the beginning of 2012, the power operations project broke new ground by setting up a modular scheduling system. This means that work activities can be grouped together. So, for example, a preventive maintenance task now has a link to the Sygma maintenance management database, where a search can be made for emergency work requests. This makes it possible to assess whether emergent work can be added to the preventive maintenance window. This system makes it possible to improve efficiency in resolving the backlog of work requests, and to improve efficiency across the board (fewer tag-outs, line-ups, post-maintenance tests, technical specifications related events, etc.). This promising initiative is being closely monitored by the plant's production committee

In the context of applying the recommendations of the WANO SOER on the Fukushima event, the plant conducted a reliability review of its key safety systems. Drawing on a range of elements (work requests, field observations, surveillance test programme results, etc.), the shift supervisor, on the one hand, and the safety engineer, on the other, stated their opinion concerning the health of the systems, and a senior management review took place. Aside from the fact that this review did not reveal any particular deviations, the exercise itself proved to be very useful for all those involved. Following analysis, the decision has been taken to conduct this type of exercise on a sustainable basis within the framework of the new AP913 methodology now in place at the plant. In response to a corporate expectation derived from best international standards and practices, the plant has set up a group in charge of producing function reports and equipment reports with a view to improving equipment reliability. The objective is to end up with a very precise overview of equipment condition

and function, through closer collaboration between the operations, maintenance and engineering departments, and to set into motion actions to further improve equipment and function reliability.

IAEA comments:

The plant considered the suggestion fully and formulated a structured approach, with a variety of initiatives to address the issue. Mainly, a 3-tiered systematic approach was adopted consisting of 1) the formation of a cross-functional group to improve equipment reliability in line with AP913, 2) implementation of AP928 (Work Management) with regard to modular work planning and the grouping of plant systems in a functional manner and, 3) enhanced processing of work requests for equipment defects involving the FIN team. This approach serves to ensure that the backlog of safety related work orders does not have any cumulative effect which could impact on the reliability of safety systems or in any way compromise operator actions.

Conclusion: Issue resolved

1.5 INDUSTRIAL SAFETY PROGRAMME

1.5(1) Issue: Industrial safety hazardous conditions are not always identified and prioritized through the deficiency or deviation process, and personnel are not consistently complying with personal protection requirements.

- A pipe support about two feet from the floor in a narrow walkway behind the unit 1 spent fuel pool has sharp edges that have been the source of a prior leg injury. The corrective action implemented as a result of the investigation painted the support with yellow and black striping. However the sharp edges have not been covered leaving the potential for a repeat injury.
- Electrical and other technical boxes/cabinets in many areas of the plant have no safety hazard warning labels, or are missing identification tags.
- Eye wash stations at Deminee YA 0526, and at MA 0505 in the turbine hall are non-functional.
- The breathing apparatus in box number 055 in the Chemical Water Treatment building (YA 0525) has no expiration date tag.
- An angle iron on the floor in the room containing 1ASG021PO is creating a trip hazard.
- Floor drain at JSK-329 OS is not fully covered presenting a trip hazard.
- Several operators failed to comply with signage requiring hardhats to be worn outside the unit 2 entrance and in electrical building room CL 0707.
- Workers in the Electrical Building LBB001 RD were not clear on requirements for wearing hardhats, gloves, goggles.
- The deficiency and deviation process do not always flag and prioritize industrial safety hazards in the field for timely corrective actions.

The failure to report and prioritize these hazards or correct these behaviors increases the possibility of injuries to plant personnel.

Recommendation: Management should take additional action to ensure the expectation to identify and prioritize correction of field hazards in a timely manner is clearly understood, and should reinforce the expectation for compliance with personal protection requirements.

Basis:

NS-R-2

6.5. Repairs to structures, systems and components shall be performed as promptly as practicable. Priorities shall be established with account taken first of the relative importance to safety of the defective structure, system or component. The priority assignment is given to backlog of identified deficiencies in industrial safety work.

NS-G-2-4

6.56. An industrial safety programme should be established and implemented to ensure that all risks to personnel involved in plant activities, in particular, those activities that are safety related, are kept ALARA. An industrial safety programme should be established for all personnel, suppliers and visitors, and should refer to the industrial safety rules and practices that are to be adopted. The programme should include arrangements for the planning, organization, monitoring and review of the preventive and protective measures. The operating organization should provide support, guidance and assistance for plant personnel in the area of industrial safety.

Plant response/Action

Several new initiatives have been launched in order to both improve the detection and processing of industrial safety deviations, and comply with industrial safety requirements:

- An annual ‘industrial safety challenges’ competition was launched in March 2011.
 - 39 teams, most often based on existing department teams, have been created and are led by first-line managers.
 - One senior management team member is assigned to each team, for support, coaching and help in attaining the objectives.
 - The challenges consist of 4 performance objectives:
 1. ‘Accidents’: achieve a sustained reduction in the number of industrial safety events, and more particularly, an objective of zero lost-time accidents.
 2. ‘Prevention’: conduct a minimum number of industrial safety talks on a range of topics (6 over the whole year).
 3. ‘Continuous improvement’: define and deal independently with a minimum number of actions aimed at improving industrial safety (5 over the year, 3 of which must be closed out).
 4. ‘Field walkdowns’: observe and improve working conditions in the field (including a minimum of 10 walkdowns with a member of the senior management team).
- As from January 2011, the management of industrial safety work requests (DI-SC) has been strengthened and is now a factor that is included in the sets of indicators produced for the ‘health and safety process’ and for the power operations project.
- A programme aimed at processing industrial safety related housekeeping deviations was completed in 2011.
- The manner in which management should handle industrial safety related behavioural deviations has now been defined in senior management procedure PRPIL00009. During the unit 1 outage in 2011, this message was clearly communicated to staff and to workers, and transitional coaching was provided.
- Throughout 2011, several month-long campaigns were run to enforce industrial safety expectations in the field. This initiative will continue in 2012.
- The senior management team set out and highlighted all our industrial safety expectations to contractors brought in to work on the unit outage in 2011.

IAEA comments:

A new plant policy was adopted in 2011 regarding industrial safety and health at work. The plant also initiated an annual competition regarding industrial safety challenges: from 2012, this challenge will take place yearly on a sustainable basis. Teams have been formed and these teams are actively encouraged to be autonomous in the detection and remedy of industrial safety problems. An example was given that when concrete drums containing radioactive filters had to be maneuvered by a forklift truck in the past, the possibility for an industrial accident existed, should the drum overturn during the lifting process. The team in

charge of this activity designed a lifting cage for the drums which ensured that no overturning was possible during transport.

The performance objectives of the challenge were fulfilled for 2011, e.g. a downward trend in the number of industrial safety events, 186 industrial safety talks undertaken on a range of topics and 132 management field tours conducted during March-December 2011.

A management expectation on the wearing of personal protective equipment is in place and punitive actions (site ban) have been taken where this expectation has not been fulfilled.

Plant tours did not indicate any safety hazardous conditions from an industrial safety perspective.

Conclusion: Issue resolved

2. TRAINING AND QUALIFICATIONS

2.2. TRAINING FACILITIES, EQUIPMENT AND MATERIAL

The worksite training facility has simple pieces of mechanical equipment from both inside and outside the radiological controlled area. These were designed and created for training on as a result of real experiences from previous plant events and when the human factor was identified as a contributory cause. The training scenarios contain situations during which the trainees' behaviour is assessed. The team recognized this as a good practice.

2.3. QUALITY OF THE TRAINING PROGRAMME

All newly-recruited personnel follow a lengthy training course which consists of 14 weeks of the academic aspects of craft common knowledge and 20 weeks of specific aspects of their future craft specialization. In view of this and the large volume of information to be assimilated, an initial course called "Boost your memory" has been designed to improve the trainees' ability to absorb information. The team recognized this as a good practice.

2.4. TRAINING PROGRAMMES FOR CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

Each year, it is compulsory for the main control room personnel to undergo a four-day refresher and situational training course on the simulator. During the simulator training, it is strictly required to follow the six error reduction tools (self-check, timeout to think, peer checking, three-way communication, pre-job brief and post-job brief). However, the team observed that during the refresher simulator training and also in the plant, operational personnel did not effectively use 3-way communication. The team encourages the plant to further enforce the use of the error reduction tools.

2.9. TRAINING PROGRAMMES FOR TRAINING GROUP PERSONNEL

Training courses are conducted by qualified plant training department (UFPI) trainers, instructors or by contractors, and occasionally by plant trainers. Training in the classroom and on the simulator as well as on-the-job training demonstrate the trainers' high level of knowledge and skills and their ability to use modern teaching aids. Full-time trainer and instructor authorizations are renewed every 2 years. However, the team observed that occasional plant trainers are not retrained with regards to pedagogical skills. The team encourages the plant to implement pedagogical refresher training for occasional plant trainers and instructors.

DETAILED TRAINING AND QUALIFICATION FINDINGS

2.2. TRAINING FACILITIES, EQUIPMENT AND MATERIAL

2.2(a) Good practice: A training facility, reproducing real field conditions, has been created to teach workers the correct actions and behaviour.

The worksite training facility has simple pieces of mechanical plant belonging to both the inside and outside of the controlled area. It represents various work situations with numerous scenarios e.g. contamination, irradiation, use of hazardous materials, working in a confined area, at heights or in a tank, electrical risk, floor level hazard awareness, allowing the plant and contractor personnel to train. All this equipment is controlled from a control room.

It facilitates the application of error prevention techniques during activities such as the installation or removal of devices and the manipulation of plant equipment while in contact with the control room. Errors can be simulated without having real consequences. Work situations having led to deviations can be “replayed” until the correct action and behaviour are achieved.

As a result, maintenance and operating activities can be performed in a calm environment. Workers are then ready to undertake complex actions. Poor working situations are analysed for full understanding in order to avoid repeat defects. Satisfactory partnerships tend to develop with the contractors using the worksite training facility. They also become more committed to improving plant operation.

2.3 QUALITY OF THE TRAINING PROGRAMMES

2.3(a) Good practice: Training to boost new trainees' memory.

All new recruits follow a lengthy training course:

- 14 weeks to learn the common aspects of the various crafts
- 20 weeks to learn the specific aspects of their future craft speciality e.g. operations, I&C, electrical, fuel, testing, maintenance. In view of this large volume of information to be assimilated, an initial course called « Boost your memory » has been designed to improve the trainees' ability to absorb information.

The interactive games incorporated in this extra course, presented by a cognitive memory specialist also helps to create an excellent team spirit amongst the trainees. Trainees retain the information taught in the various courses and have a more serene approach to the various evaluations. The final training results of these evaluations and the managers' assessments have confirmed the effectiveness of this course.

3. OPERATIONS

3.1. ORGANIZATION AND FUNCTIONS

Every year, the Operations department defines an internal checking plan to reinforce compliance with the requirements based on the previous year's performance and to assess the effectiveness of safety-related processes adopted within the department. The fields to be checked and enhanced are defined by the Deputy Department Head assisted by a Shift Manager. Each shift crew is assigned to a specific topic and they are responsible for implementing an action plan and in accordance with specification defined to allow them to meet expectations. The team recognized this as a good practice.

The team noted that techniques to enhance human performance are not consistently used when manipulating equipment. The team encourages the plant to consider consistently using human performance enhancement techniques during all manipulations involving plant equipment.

3.3. OPERATING RULES AND PROCEDURES

The plant procedures are clearly written and their content is well performed. However, the team noted several instances where changes were made by hand and were not signed and dated. This makes it difficult to verify who recorded the data and when it was done. The team encourages the plant to re-evaluate its policy in this respect.

The plant has a well-defined surveillance program and actions are taken to strengthen the quality control for the surveillance test process. However, the team has recognized that there have been several events during the last year concerning surveillance testing. The team encourages the plant to further improve its capacity for ensuring the surveillance testing is conducted in an appropriate manner.

3.4. CONDUCT OF OPERATIONS

The plant has started a program to improve plant status control. Despite efforts within the plant housekeeping program, the team noted deficiencies concerning labelling, unauthorized operator aids and housekeeping. The plant expectations are for all deficiencies to be clearly identified and reported. However, the team noted a number of deficiencies were not identified and reported by the field operators. The team developed a suggestion in this area.

The Main Control Room (MCR) access rules are not effectively reinforced. The plant has not established clear expectations concerning the number of people who have access to the control room at the same time. On one occasion, the team observed 19 people in the MCR with a loud discussion going on. The team recommended that the plant establish a clear methodology concerning limited access to the main control room.

The team made several observations of control room activities during the review. Reactivity management principles implemented by the plant are lacking in comparison to IAEA standards for conduct of operations. The team made a recommendation that reactivity

manipulations on the plant should always be performed in a manner that is commensurate with its significance.

3.6. FIRE PREVENTION AND PROTECTION PROGRAMME

During the review a few examples of breaches in fire zones (e.g. fire doors left open) were observed which were not always identified by personnel. The team made a suggestion in this area.

Even though some improvements can be seen concerning response times of the 2nd line response team during firefighting drills compared to 2009, the team believes that there is still room for enhancement. The team encourages plant management to strengthen the effectiveness and performance of firefighting drills.

DETAILED OPERATIONS FINDINGS

3.1. ORGANIZATION AND FUNCTIONS

3.1(a) Good practice: Operations department internal control – one shift crew – one area

Every year, the department defines an internal checking plan to enforce compliance with the requirements defined by the baselines as well as to assess effectiveness of safety-related processes adapted within the Operations Department.

The fields to be checked and enhanced are defined by the Deputy Department Head, assisted by a Shift Manager. This depends on operating experience from the previous year and priorities are defined in the departmental contract.

Each shift crew is assigned to a specific topic and they are responsible for implementing control actions in the area or areas assigned to them each year and according to specification defined to allow them to meet expectations. The breakdown for 2010 is as follows:

- Team A: alarms and follow-up of monitoring means in the control room.
- Team B: surveillance testing.
- Team C: SAPHIR sheets.
- Team D: temporary modifications (DMP/MTI), temporary operating procedures and fire zoning/volumetric protection.
- Team E: tracking of the checking plan.
- Team F: line-ups, administrative lockouts and temporary safety instructions.
- Team G: work permits. Number of open work permits decreasing.

This organization allows improvement in the quality of supervisory actions, enforces the compliance with processes, allows self-assessment and enhances awareness of responsibilities.

3.4 CONDUCT OF OPERATIONS

3.4(1) Issue: The plant personnel do not always identify and report deficiencies in the main control room and in the field.

The team noted the following deficiencies:

- Tank 1 CEX 310 LN has no proper level measurement despite having to be measured during field operator rounds
- Very poor material condition and equipment in room 2DEL002BA
- Dust and rubbish on cables and electric box 2CFI001TF, pump house
- Fuel leakage under emergency diesel generator of unit 2 without deficiency tag
- 1RCV791 VP boron leak not reported
- Bad housekeeping in the painters room, BAN
- Telephone standing on a MCR panel and not fixed
- Thick layer of dust on pipes (oil system), in turbine building unit 1
- Debris between main lubrication oil pump on unit 1's turbine building
- Equipment on the floor (04 OLHT015CKL1), not stored in a proper way
- Operator aid D5380 NTMA00140, rev 01 page 6/22 at the control rods drive mechanism room has no indication of being a controlled copy.
- 1GCT 024 VV, turbine bypass system, not labelled
- 12 valves not labelled in steam dump valve gallery
- Several recorders in the main control room, unit 1 are running at the wrong aligned time

If the identification and reporting of deficiencies are not performed to a high standard and within management's expectations, plant safety may be affected.

Suggestion: Consideration should be given to ensuring that the plant personnel properly identify and report deficiencies in the main control room and in the field.

Basis:

NS-G – 2.4

Paragraph 5.17. Responsibilities and lines of communication shall clearly be set out in writing for situations in which the operating personnel discover that the status or conditions

of plant systems or equipment are not in accordance with operating procedures.

NS-G – 2.14

Paragraph 3.1. The shift supervisor should manage plant operations on each shift and should be responsible for overall safety at the plant, protection and safety of personnel, coordination of plant activities and performance of the assigned shift. The responsibilities typically should include supervision of the shift personnel and direct control of plant operations in accordance with the operational limits and conditions and operating procedures. In addition, the responsibilities of the shift supervisor should normally be:

- To perform plant inspections to identify and correct problems involving the performance of personnel, policies and procedures, housekeeping, material conditions and hazards to personnel; to ensure that deficiencies are identified and corrective action is initiated.

Paragraph 3.5. The main responsibilities of the control room operators are to operate the plant and the plant systems in accordance with the design intent and operating procedures and to maintain the reactor and other plant systems within the established operational limits and conditions. The control room operators' activities should cover, but are not limited to, the following items:

- Operation, control and monitoring of plant systems in accordance with relevant operating and administrative procedures;
- Reporting of anomalies or uncertainties in the plant state to the shift supervisor and documenting plant evolutions and significant events at the plant;

Paragraph 3.6. The field operators who are assigned to control operational activities outside the control room should be made responsible for monitoring the performance and status of equipment in the field and for recognizing any deviations from normal conditions. They should also respond properly to plant conditions with the goal of preventing unanticipated transient operational states or at least mitigating their consequences.

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

Deterioration in material conditions of any kind, corrosion, leakage from components and accumulation of boric acid, excessive vibration, unfamiliar noise, inadequate labelling, foreign bodies and deficiencies necessitating maintenance or other action

Paragraph 6.20. Plant housekeeping should maintain good conditions for operation in all working areas. Working areas should be kept up to standard, well lit, clean of lubricants, chemicals or other leakage and free of debris; the intrusion of foreign objects should be prevented and an environment should be created in which all deviations from normal conditions are easily identifiable (such as small leaks, corrosion spots, loose parts, unauthorized temporary modifications and damaged insulation). The effects of the intrusion of foreign objects or the long term effects of environmental conditions (i.e. temperature effects or corrosion effects or other degradations in the plant that may affect the long term reliability of plant equipment or structures) should be evaluated as part of the plant housekeeping program.

Plant response/Action

Actions undertaken:

- The weekly periodic test to inspect plant conditions and housekeeping has been modified so that operators perform a room assessment (ref.: GA/PC-10050). This assessment inspects the rooms in accordance with the standards and expectations stated in EDF's "plant condition improvement scheme" (OEEI) and launches any associated corrective actions. This action aims to "adjust" the observations of the operators (see attachment for an assessment example);
- A room assessment is performed every Friday morning with a member of the plant management team, a member of the maintenance dept. and a shift crew member. This assessment is used to process any deviations identified in the field, to launch corrective actions and to train the operators in this regard;
- As part of the three-way meetings held on Thursday afternoons (meeting between senior management of operations dept. with the shift manager and the deputy shift manager), a review is completed of the labelling under the responsibility of the shift crew (labels currently being installed, issuing of new labels to be installed);
- The operations dept. internal oversight plan includes a section on the monitoring of deviations in the control room (weakened monitoring equipment, alarms present);
- The field round performed by the field operators is part of in-the-field presence undertaken by the managers, as are the observations in work situations (task observation). As such, the area concerning the detection of minor and low level events is addressed.

Context:

The operations dept. project is currently being implemented. A new organisation, particularly at management team level, will provide the shift manager with support in terms of his managerial functions:

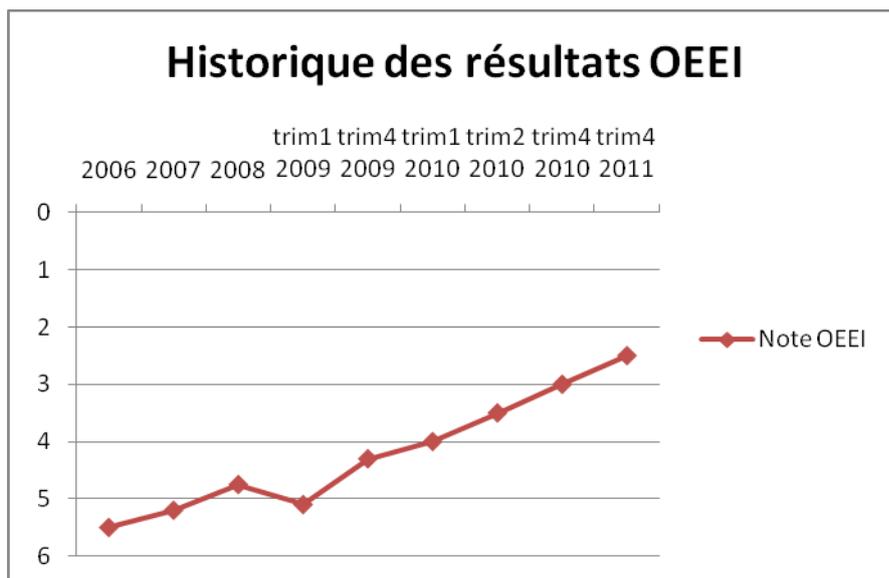
- A deputy shift manager responsible for managerial coordination in the main control room;
- An operational safety officer (or DSE in French - ie a third operator) in charge of in-the-field managerial coordination and tagout management. The DSE is the expert in change of industrial safety issues, ranging from tagouts to controlling the fire risk, plant condition and housekeeping, and radiation protection.

Results achieved:

- Over the 2010-2011 period, the number of minor deviations and low level events detected (representative of detection by field operators of deviations in the field) stood at around 10,000 for the year 2010 and remains at about the same level for 2011 (with 80% of these deviations corrected). This significant number of deviations detected (practically constant between 2010 and 2011) is representative of the operators' improved observation and detection skills (given that the plant has made overall progress in terms of its OEEI ranking (see previous section));
- With regard to leaks, the results obtained were 61 leaks/unit (with an target of 80/unit) in 2010 and 44 leaks/unit (with an target of 45/unit) in 2011.

Assessments:

- A local assessment was performed in order to produce a site-wide survey map. This map is updated each week and a report is submitted to the management team meeting;
- A assessment by external inspection is also performed at least once a year to determine a 'score', which is a snapshot of plant condition and housekeeping (from score 7: 'unacceptable conditions' to score 1 'excellent'). Between the beginning of the year 2010 and the end of 2011, the plant progressed from score 4 (average condition) to score 2.5 (close to 'good' level with six out of eight sub-areas recording a 'good' level).



IAEA comments:

The plant has taken the initiative to modify the weekly periodic testing of the installations in a way that operators perform a room assessment of the rooms dedicated to them according to the standards and expectations stated in EDF's "plant condition improvement scheme".

There are programmes in place for "in-the-field-presence" of managers of the operations department and also the plant management team.

The results achieved show that the number of minor deviations and low level events detected stood around the same level in 2011 as in 2010 (with around 80% of these deviations corrected) which can be taken to be an indicator of an improved level of observations and also observation skills.

Though the number of deviations reported in the field and in the MCR is still high, the team believes that identification and reporting of deviations is now at a good standard.

Conclusion: Issue resolved

3.4(2)Issue: Access to the main control room is not sufficiently limited to ensure a proper working environment and existing access rules are not being followed.

During the review the team noted:

- The units have no limit on the number of people allowed to access the MCR and the plant has no expectations concerning the number of people who have access to the control room at the same time.
- During a power decrease there were 19 people in the MCR and there were loud discussions going on.
- One rule requires personnel to request permission to access the MCR area. Several occasions were noted where this requirement was not adhered to as well as not reinforced.

Unnecessary distractions can cause a lack of alertness of the crew to changes in plant conditions.

Recommendation: The plant should limit access to the main control room and reinforce existing rules.

Basis:

NS-G-2.14

Paragraph 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.

Plant response/Action

This problem was addressed two-ways:

- from an organisational perspective
- by carrying out alterations to the control room.

Organisational improvements:

A ‘control room access’ GAP team, made up of one representative from each department, was set up in 2011 to come up with a proposal for an organisational structure that would limit access to the control room.

On 26 September 2011, a first meeting was held, attended by all the department representatives (see report attached).

On 18 October 2011, GAP members carried out a benchmarking visit to Blayais NPP with a view to replicating its successful format (see report attached).

Alterations to the control room:

Modifications to the unit 2 control room were completed in January 2012. A new access point is now in place, physically limiting the numbers of people able to access the counter (cf. photo attached).



CONTROL ROOM RENOVATIONS

With a new access point to the room

IAEA comments:

The plant has addressed the issue in two ways i.e. from an organisational perspective and by carrying out modifications to the main control rooms (MCR) in both units.

A decision has been taken by the plant nuclear safety board to introduce a badge exchange system at the entrance of the MCR, which will allow only a designated number of people to be able to enter the MCR.

The plant still does not have expectations concerning the number of people who have access to the control room at the same time.

Rules concerning the serenity inside the MCR are planned to be displayed at the entrance area but also will be clearly defined in a technical note from Operations department.

A video screen will be placed at the entrance area where the operators are able to display the message if the access to the MCR is authorized, limited or restricted e.g. during sensitive actions and testing.

It is planned to have implemented the above mentioned processes at the beginning of next outage (May 2012).

Modifications to the MCR of both units have been completed, an electronic door (which also can be blocked) gives access to a counter, which is now physically limiting the number of people being able to stay at the entrance area.

Conclusion: Satisfactory progress to date

3.4(3) Issue: Reactivity manipulations on the plant are not always performed in a manner that is commensurate with their significance.

Observations during the OSART evaluation include:

- Error reduction techniques like cross-check, 3 way-communication and pre-job-briefing could not be observed during the power decrease (1350 MW →1100 MW) nor during the dilution process.
- The shift supervisor was not informed of the start of the dilution process.
- Power variations, e.g. down powering activities, are not considered as being sensitive activities according to plant guidelines DP168, DII 18 and PP54.
- Responsibility for reactivity manipulations in some cases is transferred down to the reactor operator without him having to refer to the shift supervisor.

Without an appropriate reactivity management procedure and the extensive use of error reduction techniques, reactor safety might be affected.

Recommendation: Reactivity manipulations on the plant should be performed in a manner that is always commensurate with their significance.

Basis:

NS-G-2.14

Paragraph 5.23 Reactivity manipulations should be made in a deliberate, carefully controlled manner, and should include appropriate time intervals between reactivity changes, during which the reactor is monitored to verify that the desired response has been obtained.

Paragraph 5.24 Any planned major changes to the reactor power or to any other operations relating to reactivity should be initiated only after a pre-job briefing on the expected effects of the change. Prior to any major change being made, any conflicts in procedures should be resolved and possible distractions from work or contingency action should be discussed.

Paragraph 5.25 Self-assessment and error prevention techniques, such as the stop, think, act, review (remembered as the mnemonic STAR) methodology and peer checking, should be used during reactivity manipulations. Effective and appropriate control should be established over other activities that could affect reactivity or the removal of residual heat and which are performed by other plant personnel such as chemistry technicians or instrumentation and control technicians.

Plant response/Action

Together with the Cattenom operations department, the Saint-Alban operations department has set up a working group to focus on reactivity management issues. This working group comprises control-room operators and shift managers.

Purpose

The purpose of this initiative is to determine technical hold points and error-reduction tools that must be implemented (which tools and when to apply them) during routine tasks involving reactivity management.

In January and February 2011, each station worked independently (via the control-room operator working group) to come up with an initial set of ideas. The St-Alban control-room operator working group met on 18 February in order to review the status of St Alban NPP (see minutes appended).

On Thursday 24 February 2011, the working groups of both stations met at Cattenom to discuss the progress accomplished to date (see minutes appended).

Further to this meeting, a certain number of pre-job briefings were selected. The respective documents were divided up between both stations for preparation and review.

On 5 June 2011, the right-hand boundary of the operating envelope was exceeded during a load increase, causing entry into a group-1 tech spec limit condition (ref. 1 RPN6) and requiring a safety-significant event (criterion 3) to be reported (ref. RESS-2-005-11). Further to the ODM meeting convened by operations senior management on 17/06/2011, the following actions were agreed for implementation as of 20 June 2011, pending the outcome of the Cattenom/St Alban working group initiative (see attachment):

- Compliance with recommendations of normal operating rule ref. RCN PIL governing low-power operations,
- Conduct of a pre-job brief prior to reducing load below “PCoMax” and subsequent load increase (see attachment for PJB aid).

Additional actions subsequent to this event are as follows:

- Write an S106 document (shift crew training) based on this transient in order to review trends in axial power imbalance during load increase,
- Implement a reactor control training guide,
- Provide reactivity management training on full-scale simulator.

On 12 December 2012, a phone conference took place with Cattenom NPP in order to review and approve the conclusions of the joint undertaking.

The list of pre-job briefs was reviewed and discussed at the control room operator working group meeting on 16 December 2012 (see attachment).

On 17 February 2012, the arrangements were approved by the operations department management team.

An S106 document (shift crew training) was issued (see attachment) and procedure ref. NS/PC-00054 (Conduct of sensitive tasks within Operations) was revised in order to include a category on reactivity management pre-job briefings. The list of documents is appended.

IAEA comments:

A working group was formed to determine technical hold-points and error-reduction tools during reactivity management tasks and also when performing sensitive activities.

After an event in June 2011 (exceeding the right hand-boundary of the operating envelope), there has been implementation of HERT (human error reduction tools) for power variations, which are considered sensitive activities. Also, the technical note NS/PC-00054 (Conduct of sensitive tasks within Operations) was revised in order to include a category on reactivity management and to define when and how the HERT have to be applied.

The plant has developed a training guide together with changes in the Full Scope Simulator-training sequences in order to be able to provide specific training on reactivity management issues.

Even though power increase and power-reduction activities now require a pre-job briefing (PJB), the plant has decided that there is still no need to have continuous supervision while performing these actions.

Normal operating procedures do not indicate when HERT have to be applied. The Shift Manager is responsible for ensuring that, for example, a PJB is performed during reactivity manipulations.

Conclusion: Satisfactory progress to date

3.6. FIRE PREVENTION AND PROTECTION PROGRAMME

3.6(1) Issue: The plant staff do not always follow practices that provide integrity of fire zones.

During the review the team noted:

- 1JSL971WA fire penetration wall flap maintained open by temporary ventilation ducting
- Fire zoning door found open: 2JSK518PD (2ASG in 2BW) twice in 6 days
- Two fire doors (1JSK027PD and 1JSN031QG in BAN +17m) found open without automatic closure system. Staff walked through 3 times and nobody closed the doors.
- There are at least 2 fire doors which are held in the open position and have to be closed manually in case of fire (1JSW572QP et 2JSW572QP)

Improper fire prevention practices could lead to safety implications, should a fire occur.

Suggestion: The plant staff should consider demonstrating more rigor in the implementation of fire zone integrity.

Basis:

NS-G-2.1:

Paragraph 2.9 Plant personnel engaging in activities relating to fire safety should be appropriately qualified and trained so as to have a clear understanding of their specific areas of responsibility and how these may interface with the responsibilities of other individuals, and an appreciation of the potential consequences of errors.

Paragraph 2.10 Staff should be encouraged to adopt a rigorous approach to their fire fighting activities and responsibilities and a questioning attitude in the performance of their tasks, to foster continual improvement.

Paragraph 3.2 Responsibilities of site staff involved in the establishment, implementation and management of the program for fire prevention and protection, including arrangements for any delegation of responsibilities, should be identified and documented....

Plant response/Action

Awareness-raising activities for all personnel at the plant:

- December 2010 requirement campaign;
- Fire prevention initial training part of syllabus at new recruit academies;

- Fire training refresher courses every three years for all personnel working in industrial facilities, with specific training for personnel in the risk prevention dept.;
- Update of plant memo regarding fire zoning; monitoring charts set up in the tagging supervisor's office.

Specific awareness-raising activities targeting specific personnel:

- Meetings between the nuclear safety senior advisor, the fire officer, the professional fire fighting officer, the fire zoning crew and the shift crew;
- Preparatory meetings with contractors for 2011 unit outages;
- Information in terms of loss of integrity provided to safety engineers by the fire zoning manager.

Actions to support the identification of fire zoning items:

- Floor drains involved in fire zoning renovated and painted in red;
- Doors on boundaries of fire areas identified with labels.

IAEA comments:

There have been specific awareness activities such as monthly campaigns regarding fire-zoning displayed via the site-wide communication system.

Since 2010 there is an engagement of the fire protection specialists during initial training sessions for new recruits.

There are regular exchanges of the fire protection specialists together with the shift crews concerning their presence in the field in order to get feedback.

Special presentations on how to judge fire zoning deficiencies have been given to the shift crews.

In addition, aids in the field such as labeling and red paint indications are a good support for the identification of fire zoning items.

No fire zone doors were found open during tours in the field.

Conclusion: Issue resolved

4. MAINTENANCE

4.5. CONDUCT OF MAINTENANCE WORK

The majority of maintenance activities at the plant are performed in a competent manner. However, personnel sometimes show lack of attention to the open parts of equipment to prevent foreign material intrusion. The team encourages the plant to enforce its FME expectations. In the past, the plant had several events initiated by inappropriate maintenance actions and wrong practices which led to a reactor scram and equipment inoperability. During a walk-down, the team found examples of deviations in unsafe handling of loads using cranes, some improper usage of tools and poor work practices. The team has made a suggestion in this area.

A chain with magnetic ends is a very user friendly tool for installing a barrier at worksites, especially in the electrical department. The team considered this to be a good practice.

4.6. MATERIAL CONDITIONS

During the plant inspection and walk-down, the team found oil and water leaks, broken cable protective covers, and deficient lifting and measuring devices. Also, in certain cases deficiencies in material conditions are not resolved in a timely manner. The team suggested that the plant should consider reinforcing its material conditions programme.

4.9. OUTAGE MANAGEMENT

An effective guideline is used for the preparation, scheduling and performing of outages. This document sets out the various operational safety risks likely to be encountered at various stages of the schedule; the specific conditions for carrying out activities and enhanced by lessons learned in previous years can thus be found. This guideline indicates various risks and potential safety issues, recalling traps to be avoided in terms of nuclear safety. This document gives all stakeholders the same level of information. It is distributed to the plant top management, heads of department and engineers. The team recognized this as a good practice.

DETAILED MAINTENANCE FINDINGS

4.5. CONDUCT OF MAINTENANCE WORK

4.5(1) Issue: The plant maintenance working practices are not always conducted in a safe and reliable manner by plant staff and contractors.

During the review the team noted:

- Some event reports displayed inappropriate maintenance actions and wrong practices, which led to a reactor scram, and equipment unavailability on several occasions (RESS200310, RESS200709, RESS101109).
- In the Calculator Room a worker used a screwdriver to withdraw a stacked electronic board from the box of Plant Computer System, i.e. not using the proper tool;
- The area under a metal container that was lifted using the turbine hall crane was not barriered off to prevent personnel walking under the load. As a result a worker was observed under the load.
- A mechanic touched a hot bearing with his bare hands to check its temperature;
- While performing maintenance work on an air compressor of a diesel generator on Unit 2, a contractor displayed improper usage of measuring tools – a clearance gauge was used for removing an oil filter gasket.

Without performing activities and work practices in a safe manner, the probability of equipment damage and risk of personnel injuries can increase.

Suggestion: The plant should consider enhancing its maintenance working practices to ensure that plant staff and contractors comply with safety rules and best work practices.

IAEA Basis:

NS-G-2.6

para. 3.8 Contractors should be subject to the same standards as plant staff, particularly in the areas of professional competence, adherence to procedures and evaluation of performance. Suitable steps should be taken to ensure that contractors conform to the technical standards and the safety culture of the operating organization.

para. 4.23. Procedures and work related documents should specify preconditions and provide clear instructions for the work to be done, and should be used to ensure that work is performed in accordance with the strategy, policies and programmes of the plant. The procedures and work related documents should be technically accurate, properly validated, verified and authorized, and they should be periodically reviewed. Human factors and the ALARA principle (to keep radiation doses as low as reasonably achievable) should be considered in the preparation of work instructions.

para. 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;
- control of the plant configuration;

GS-G-3.1

para. 2.21. All work that is to be done should be planned and authorized before it is commenced. Work should be accomplished under suitably controlled conditions by technically competent individuals using technical standards, instructions, procedures or other appropriate documents.

Plant response/Action

Improving industrial safety

In 2011, the industrial safety results improved and especially in maintenance. The site moved to the 15th place for fleet implementation. As at the end of 2011, the site achieved the performance of 94 days without a reactor scram, and in 2011, the Maintenance Department went 825 days without causing a reactor scram. The main improvement actions and drivers are as follows:

- Distribution of a weekly Risk Prevention Department report used by the managerial line to raise personnel awareness.
- Discussion and managerial coordination of industrial safety reinforced in the teams based on the industrial safety competition (industrial safety improvement actions identified and implemented in the teams).
- Coordination of the contractor risk prevention network and comparative field walkabouts.
- Improved contractor industrial safety induction upstream of the outages, which will be collectively and individually assessed with a knowledge test in 2012.
- Practice of managerial processing of behavioural deviations which could go as far as contractors being banned from the site and withdrawal of EDF personnel authorisation.

Additional specific actions have been implemented within the maintenance groups, such as:

- Retroactive and prompt analysis of industrial safety events (for example, in the Rotating Machinery Section):
 - 100% analysed, 43 analyses conducted covering benign treatments and near misses.
 - 89% of work accidents with and without lost time analysed within 10 days (for a DPN average of 79%).
- Locking of electrical cabinets and boxes.
- Wearing of specific hearing protection (moulded ear plugs).

- Coordination of industrial safety in the teams with weekly ¼ hour industrial safety discussions.
- Setting up of a lifting permit to improve control of this activity.

In 2012, departmental initiatives are mainly focussed on:

- Checking and improved safety of lifting activities and work at heights, both of which are covered by a specific action plan.
- Rolling out of the industrial safety competition, which encourages personnel involvement and awareness of responsibility.

Manager presence in the field focussed on work practices

In 2011, manager presence in the field contributed to rectifying the situations where practices and tools were found to be inappropriate.

In 2012, setting up of modular planning for power operations constitutes the opportunity to add checking of the tools required at the same time as checking of the spare parts specific to the maintenance operation at D-day-4 weeks.

IAEA comments:

Improvement on the industrial safety results achieved, especially in maintenance, are obvious.

Additional specific actions within the maintenance group have been implemented, such as prompt analysis of industrial safety events, the set-up of an industrial safety challenge and technical modifications concerning the locking of electrical cabinets (around 8000 locks changed).

Manager presence in the field helped on situations where practices and tools were found to be inappropriate.

Starting in 2012, an improved contractor industrial safety induction followed by a knowledge test will be implemented.

Rules for behavioural deviations, which could go as far as contractors being banned from site, have been defined for radiation protection, and extended to industrial safety. Concerning behaviour inside the Radiation Controlled Area, 35 people have already been excluded temporarily from work sites inside the RCA.

Further improvements in maintenance working practices, for example for lifting activities and working at heights, are ongoing.

Conclusion: Satisfactory progress to date

4.5(a) Good practice: Chain with magnetic ends for designating worksite.

A special user-friendly tool has been designed by the I&C team to mark electrical worksites using a plastic chain with magnetic ends. This system is simple, extremely quick to use, and it can be used in electrical rooms. Field workers simply “clip” the magnets to the relevant metallic electrical cabinet. Each chain also has a plasticized tag so all labelling requirements are met and the label can be rewritten when necessary. The walls of a room can be equipped with metal plates also.

The rapid installation of this system saves time and effort. It is not necessary to fetch supports and special marking tape. It also improves work site safety.

4.6 MATERIAL CONDITION

4.6(1) Issue: The plant material condition program is not fully implemented to resolve deficiencies.

During the review, the team noted:

Oil and water leakages are not always eliminated in a timely manner:

- Oil drops onto the floor from a crane engine gears, BAN, +21m, Unit 2.
- Oil is leaking onto the floor (200 drop per min). There are 6 mats to collect the oil. The place is not fenced, marked, labelled to show slippery hazard. Turbine Hall, -4m, next to 1VPU131PU, Unit 1;
- Pool of oil under Pump 1RCV172PO (High Head Injection Pump);

Deviations exist in cable protective covers:

- Cabling protection not evident beside hot hardware in room containing pump 1ASG032PO.
- The metal protective cover of cable of a temperature sensor near bearing of pump 2SEC002PO is absent and cable's insulation is damaged. The same cable protective cover and same bearing of pump 2SEC004PO is also absent.
- An electric cable is installed through door QB0567 with danger of damaging it (signs were already visible on cable), Effluent Treatment Building.
- A crane power supply cable is not properly protected from penetration. It is wrapped with a rubber tyre and insulation touched the metal plate on roof of Service Water Pump House.

Other deviations:

- Lifting device hook protection was broken, BAS,+0.0m, Unit 1;
- The windows of the cleaning machine of the intake structure are not transparent;

Deficiencies in material conditions not being resolved in a timely manner can result in plant system inoperability and increase the risk of fire.

Suggestion: The plant should consider improving the implementation of the material condition program to ensure the effectiveness of resolving deficiencies.

Basis:

NS-G-2.14

6.20. Plant housekeeping should maintain good conditions for operation in all working areas. Working areas should be kept up to standard, well lit, clean of lubricants, chemicals or other leakage and free of debris; the intrusion of foreign objects should be prevented and an environment should be created in which all deviations from normal conditions are easily

identifiable (such as small leaks, corrosion spots, loose parts, unauthorized temporary modifications and damaged insulation).

Plant response/Action

Processing of minor deviations in 2011:

Année	(Plusieurs éléments)							
Nombre de Date début	Étiquettes de colonnes							
Étiquettes de lignes	EN COURS	EN D.I	OU O.S	SOLDE (vide)	Total général			
0 - Voirie / génie civil		249	189		438			
1 - Propreté / Rangement	55	23	2286		2364			
2 - Repérage / étiquetage / affichage / condamnations / graffitis	86	16	425		527			
3 - Incendie : prévention / lutte.	1		16		17			
4 - Intégrité des circuits / fuites / confinement	4	2	55		61			
5 - Electricité	111	103	2417		2631			
6 - Etat des matériels mécaniques / dispositions antisismiques	50	84	385		519			
7 - Matériels de sécurité et de radioprotection.	18	2	59		79			
9 - Prestations			294		294			
(vide)								
Total général	325	479	6126		6930			
2 b) Etiquettes Conduite	717		1434		2151			
Total Global écarts Mineurs	1042	479	7560		9081			
Taux de solde global	83,25%							

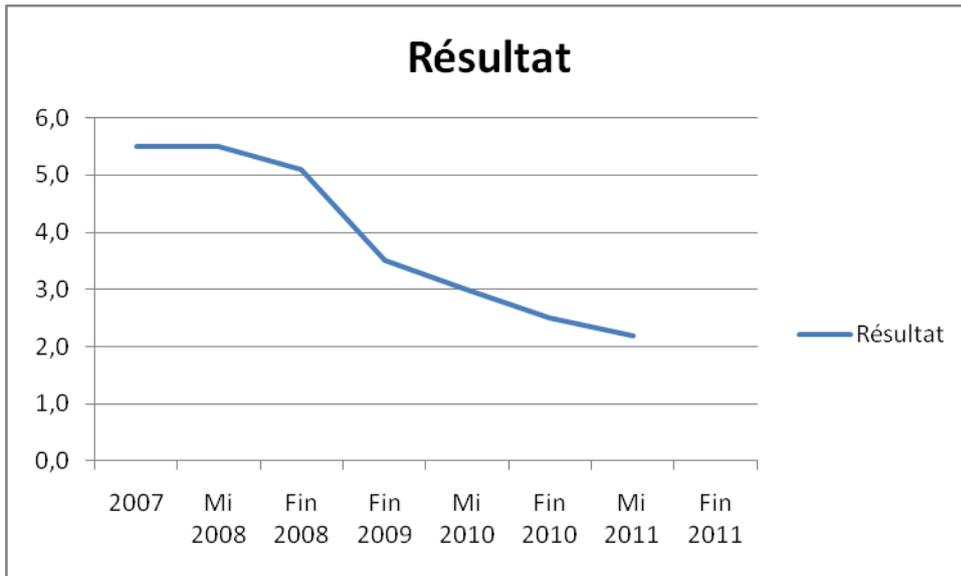
7560 deviations were dealt with in 2011 under the “ERTI OEEI” arrangements for processing of minor deviations.

The Friday morning so-called “housekeeping” walk downs with plant management confirm the station’s progress.

The grade given by the nuclear inspection department (corporate EDF body) confirms that significant improvement. The plant has been assigned the level “good” at corporate level

The grade given by the nuclear inspection department (corporate EDF body) likewise confirms the improvement:

(1 = excellent and 7 = unacceptable)



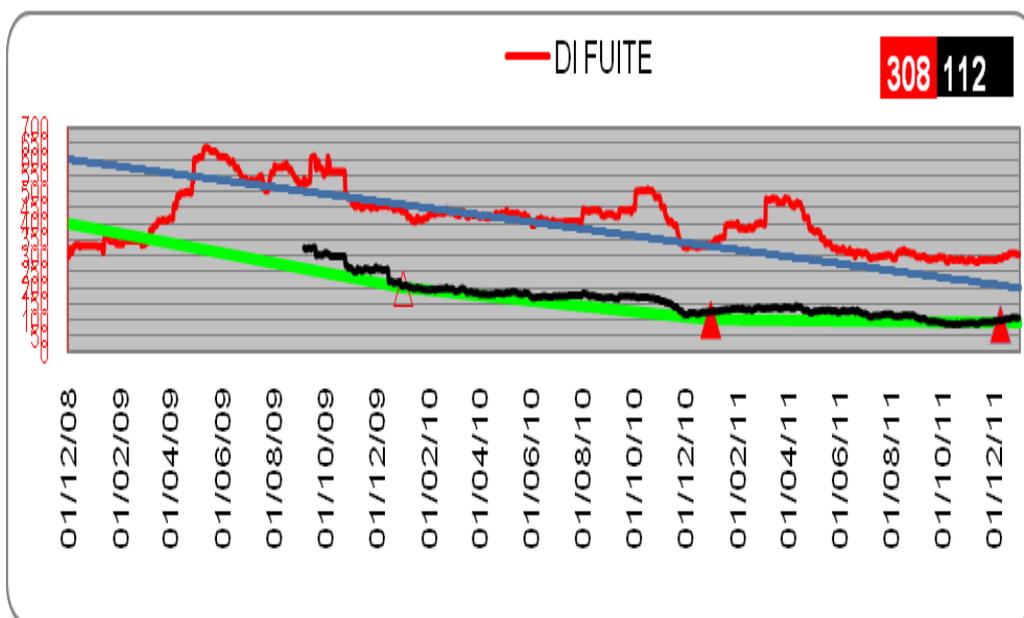
There is still room for improvement in the areas of packing. In 2012, departmental initiatives will be focussed on upgrading the last rooms, such as in the effluent treatment building and the laundry, for handover from the OEEI project team to the sustainable improved plant material condition (MEEI) process.

Leak action plan:

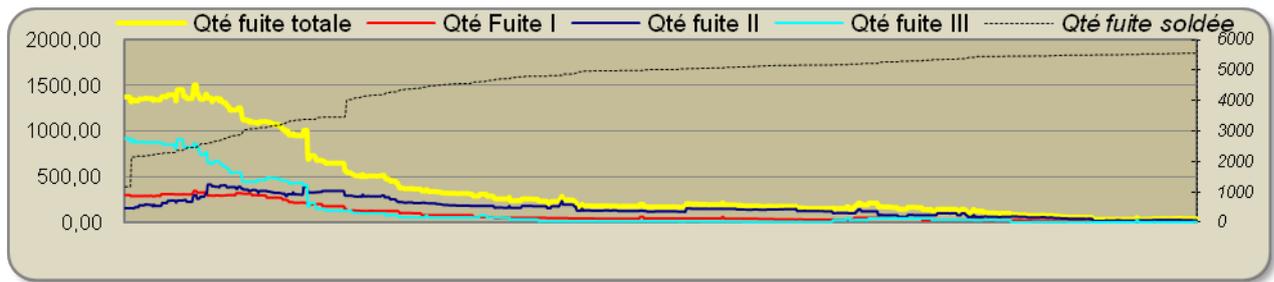
Over the last two years, thanks to human and financial investments, as well as technical modifications, the station has been assigned the level “good”, in the area of leak control.

A budget of €650k over the last two years (renewed for 2012)

Over the last 3 years, 3600 work requests have been dealt with – The level “good” was confirmed by corporate inspections.



Reduction in effluent volumes:



Action plan for deviations in the electrical and fire protection area:

An I&C/electricity department work coordinator is responsible for coordinating the processing of housekeeping-related deviations in the electrical and fire protection area and the regulatory electrical deviations reported by an approved organisation (SOCOTEC).

The assessments and inspections performed in 2011 did not raise any alerts in these areas.

In 2011:

Around 400 emergent work jobs and 25 preventive jobs were carried out in the area of fire protection

Around 2300 deviations were dealt with in the area of electrical housekeeping.

As regards regulatory deviations, 36% of deviations were dealt with in 2011. 26% of the remaining deviations will be dealt with in the 1st half of 2012.

IAEA comments:

A lot of deviations were dealt within the OEEI-programme since the OSART review.

Progress charts for leaks, corrosion, housekeeping, electricity and more have been established and give a good indication of the level of performance.

The team noted during a field tour that there are still unrecognized or long standing leakages e.g. on the auxiliary feedwater system (ASG).

Conclusion: Satisfactory progress to date

4.9 OUTAGE MANAGEMENT.

4.9(a) Good practice: Nuclear Safety Guidelines for outages.

The plant has a guideline which has been specially prepared for each outage by the Outage Nuclear Safety Engineer. This guideline indicates various risks and potential nuclear safety issues, recalling traps to be avoided in terms of nuclear safety, and includes relevant operating experience feed-back.

The guideline contains:

1. Purpose, scope, etc;
2. Characteristics of the outage;
3. Objectives of the outage in terms of nuclear safety and industrial safety analysis;
4. Main work activities and modifications to be carried out;
5. Identification of works which need authorised movement of equipment above the reactor;
6. The different reactor conditions and a summary of related Technical Specifications.

Nuclear safety guidelines for the outage:

1. General Operation Rules updated since the last outage;
2. Required interface with the regulator;
3. Temporary modification request;

Previous OE St Alban and across the fleet:

1. Events which occurred in St Alban and across the fleet;
2. Troubleshooting for recurrent issues related to the application of the guidelines.

The document gives all stakeholders the same level of information. It is distributed to the plant top management, heads of department, outage engineers, project managers and the outage manager. This document is used in the outage safety meeting to prepare for outages and it is presented to Operations, Shift Managers, Shift Supervisors, Tagging Officer, MCR Operators and Field Operators. The objective of the guideline is to increase awareness of all personnel who are involved in carrying out the outage about the nuclear safety aspects.

5. TECHNICAL SUPPORT

5.1. ORGANIZATION AND FUNCTIONS

The plant is progressively putting in place the use of system engineers for technical support. The team encourages the plant to further increase the manning of system engineers and to reinforce their specific training programme.

5.2. SURVEILLANCE PROGRAMME

A comprehensive surveillance programme is in place at the plant. However, trend analysis of data related to the surveillance programme is not yet fully implemented to detect early degradation of structures, systems and components (SSCs). This part of the surveillance programme could be further improved and, as a result, the team made a suggestion in this area.

Surveillance testing is used to verify that plant systems and components relevant to safety are operable. The plant found some surveillance testing being performed beyond the period authorized by the Operating Technical Specifications. The team suggested that the plant should consider rigorously demonstrating the effectiveness of compliance with surveillance test periodicity.

5.3. PLANT MODIFICATION SYSTEM

The plant has a procedure governing the use of temporary modifications. During the review, the team noted 170 temporary modifications in place and a number of old temporary modifications. The plant has recognized this issue and has started to analyze the situation in order to develop a further corrective action plan. The team recommended improvements in the management of temporary modifications, so that the number and validity of temporary modifications is kept to a minimum.

5.5. HANDLING OF FUEL AND CORE COMPONENTS

The plant has put in place a remote surveillance system for fuel handling and physical inventory activities that allows enhancing reactor engineering related technical support. The system allows for real time tracking of recordings from a remote office with a view to early detection and analysis of defects, and early transmission of the video to corporate entities for further expert appraisal and confirmation of plant analysis. In addition, the system allows online improvement of the sharpness and the level of details of the fuel assembly pictures. This facilitates the diagnostic to be performed by reactor engineering experts and has shown proven benefits related to the identification of small size foreign materials. The team recognized it as a good practice.

DETAILED TECHNICAL SUPPORT FINDINGS

5.2. SURVEILLANCE PROGRAMME

5.2(1) Issue: Trend analysis of data related to the surveillance programme is not sufficient at the plant to detect early failures or deficiencies of all structures, systems and components (SSCs).

During the review, the team noted that:

- Trending using the KIT (plant computer) parameters through the ORLI software application is only used *a posteriori* for identified issues, not to systematically anticipate degradations.
- During the surveillance test of the auxiliary water system performed on 21/09/2010, abnormally low turbo-pump rotation speed and outlet pressure were detected at the 2ASG031PO pump. A slow degradation of the turbopump outlet pressure could have been noted and further degradation anticipated if a systematic trending of the KIT measurements (train B pressure 43 MP) had been performed.
- There is no systematic trending of the control rod drop times despite existing international and national experience feedback on events for similar core designs.

Without systematic trending of the surveillance programme results, an opportunity to detect any early degradation of SSCs is missed.

Suggestion: The plant should consider expanding the trending of the surveillance programme results in order to ensure the detection of SSC early failure or deficiencies.

Basis:

NS-R-2

5.5. The operating organization shall ensure that an appropriate surveillance programme is established and implemented to ensure compliance with the operational limits and conditions, and that its results are evaluated and retained.

6.10. Data on maintenance, testing, surveillance and inspection shall be recorded, stored and analysed to confirm that performance is in accordance with design assumptions and with expectations on equipment reliability.

NS-G-2.6

2.11. The objectives of the surveillance programme are: to maintain and improve equipment availability, to confirm compliance with operational limits and conditions, and to detect and correct any abnormal condition before it can give rise to significant consequences for safety. The abnormal conditions which are of relevance to the surveillance programme include [...] trends within the accepted limits, an analysis of which may indicate that the plant is deviating from the design intent.

9.16: All SSCs with functions that mitigate the consequences of accident conditions should be subject to periodic surveillance, to demonstrate their availability and effectiveness as far as practicable and to detect any degradation of their performance.

9.45: All documents and results of surveillance activities should be retained in accordance with quality assurance requirements. The following is a listing of typical documents relating to surveillance activities: logs and logbooks containing the readouts of safety system parameters; recorder charts and computer printouts; reports of tests, calibrations and inspections, including evaluation of results and records of completed surveillance activities; [...]

9.46. These documents should be used as a basis for reviews carried out:

- (a) To demonstrate compliance with operational limits and conditions;
- (b) To detect trends indicating deterioration of systems or components.

NS-G-2.2

7.4: The surveillance requirements should also cover activities to detect [...] forms of deterioration [...]. If degraded conditions were to be found, then the effect on the operability of systems should be assessed and acted upon.

NS-G-2.4

6.42. The surveillance programme should ensure that items important to safety continue to perform in accordance with the original design assumptions and intent [...]. The programme should include requirements for evaluation and review to detect in a timely manner degradation and ageing of structures, systems and components that could lead to unsafe conditions. This programme should cover monitoring, checks and calibration, and testing and inspection complementary to the in-service inspection.

Plant response/Action

In 2011, the station started to trend chapter 9 surveillance tests. The process implemented is as follows:

- Surveillance test results are recorded on a paper form by the operations department.
- These forms are then given to the operations unit not on shifts for second level analyses (2 operations deputy shift managers (CED in French) not on shifts).
Surveillance test results are transferred to WINSERVIR on specific surveillance test round forms, limited to completing criteria A and B of periodic surveillance tests.
- On the basis of these forms and the functionalities of WINSERVIR, it is possible to trend surveillance test results (results have been saved since 2010)
- NB: the data transferred to WINSERVIR is stored and safe (computer application IN26 qualified).
- It is the CED not on shifts in charge of performing the 2nd level analysis of surveillance tests who carries out trending.
- In the event of an alert that one or more parameters are drifting, the CED not on shifts informs his front line manager directly, for corrective actions to be implemented or further analysis.

IAEA comments:

The plant has analysed the issue and developed and implemented a process for trending safety related parameters of systems, structures and components to identify their early degradation. The new practice comprises paper and electronic forms that are completed by specified personnel after the surveillance tests and are further analysed by the responsible shift supervisor who may initiate further actions if test results are not satisfactory. Review of the recent trends analyses demonstrated improvements in this area and effectiveness of the introduced process.

Conclusion: Issue resolved

5.2(2) Issue: Some surveillance testing of safety related equipment is not being performed in accordance with the periodicity required by operating technical specifications.

During the review, the team found that there were many surveillance tests being performed which were beyond the period authorized by the Operating Technical Specifications (OTS).

Examples include:

- The 18M test of 2SEC-122MD and 2SEC-121MD was performed on 08/02/2010. The TS required the test to be performed no later than 06/09/2009.
- The 8 cycle test of 1RCV-100MD will be performed during the next refueling outage of unit 1 (2011). The TS requested the test to be performed no later than 24/11/2009.
- The 4-cycle test of 2JDT-171DT, 2JDT-172DT, 2JDT-175DT, 2JDT-176DT, 2JDT-252DT and 2JDT-253DT was performed on 08/02/2010. The TS required the test to be performed no later than 06/09/2009.
- The test of 2KRT-O32MA and 2KRT-O33MA was performed on 27/10/2009 whereas the TS required the test to be performed no later than 08/10/2009.
- The weekly test EP-KSC-002 was performed on 10/11/2008 whereas the TS required the test to be performed no later than 07/11/2008.

Without respecting the required surveillance test periodicity, which verifies that plant systems and components relevant to safety are operable, nuclear safety may be compromised.

Suggestion: The plant should consider rigorously demonstrating the effectiveness of compliance with the surveillance test periodicity of safety related equipment as required by OTS.

Basis:

NS-R-2

5.5. The operating organization shall ensure that an appropriate surveillance programme is established and implemented to ensure compliance with the operational limits and conditions, and that its results are evaluated and retained.

6.2. The maintenance, testing, surveillance and inspection of all plant structures, systems and components important to safety shall be to such a standard and at such a frequency as to ensure that their levels of reliability and effectiveness remain in accordance with the assumptions and intent of the design throughout the service life of the plant.

6.3. The programme shall include periodic inspections or tests of systems, structures and components important to safety in order to demonstrate their reliability and to determine whether they are acceptable for continued safe operation of the plant or whether any remedial measures are necessary.

NS-G-2.6

2.12. The operating organization should establish a surveillance programme to verify that the SSCs important to safety are ready to operate at all times and are able to perform their safety functions as intended in the design.

NS-G-2.2

7.1 In order to ensure that safety system settings and limits and conditions for normal operation are met at all times, the relevant systems and components should be monitored, inspected, checked, calibrated and tested in accordance with an approved surveillance programme.

NS-G-2.4

6.42 The surveillance programme should ensure that items important to safety continue to perform in accordance with the original design assumptions and intent [...].

Plant response/Action

Following the findings made by the OSART in 2010, the plant developed a number of lines of defence to secure the scheduling and execution of surveillance tests:

- The deviations listed by the OSART team relating to the ESW system, CVCS and the fire detection system, were analysed in-depth by the maintenance department's I&C section, leading to an overhaul of the department's organisation and to the decision to track surveillance tests. This new organisation is described in memorandum NT-MA00200.
- The operations department now supervises the process, and has general oversight of the execution of surveillance tests within the deadlines set. By Thursday evening each week, the shift manager has a full list of the surveillance tests that are due to take place the following week. This list includes details of the test deadlines and tolerance margins. The shift manager is able to verify that the schedule for the coming week does incorporate all the surveillance tests, with their margins of tolerance, and that the schedule takes into account test deadlines.

This verification made by operations ensures that the surveillance test programme is adhered to, and that the best possible slots are chosen to conduct the tests, in view of execution scheduling windows and deadlines.

Following this verification, execution is tracked by the relevant craftsperson, and any changes to the timing of the tests are managed by the craft section and by monitoring the schedule.

- In the context of the 'safeguard plan' initiative launched at the plant end 2010- early 2011, a plan to safeguard surveillance tests was devised and endorsed. The plan provides a framework for examining the reliability of the basic process of surveillance testing, by systematically reviewing all the different stages of the process: programming, scheduling, analysis and tracking of deviations, archiving. As from 2012, the newly-established nuclear safety committee will reassess this safeguard plan twice a year, under the supervision of the nuclear safety and quality senior advisor.

Under the terms of the ‘quality decree’, and in line with the responsibilities of the internal, independent nuclear safety audit branch, safety engineers also carry out sample reviews (2 reviews planned for 2012) of the scheduling/execution of surveillance tests, prior to test deadlines.

IAEA comments:

The plant has analysed and developed several systems that provide lines of defence to secure the scheduling and execution of surveillance tests. According to the new arrangements, the operating department supervises all of this type of activities. Continuous verification of the surveillance tests schedule is made by the responsible shift supervisor to ensure that surveillance tests are performed timely and efficiently.

Conclusion: Issue resolved

5.3 PLANT MODIFICATION SYSTEM

5.3(1) Issue: The number and validity of temporary modifications is not resolved in a timely manner.

During the review, the team noted 170 temporary modifications in place and which have not been resolved in a timely manner namely:

- LHAM00001 in place since 22/04/1991.
- RCPM00009 in place since 13/11/1997.
- RCPM00008 in place since 19/09/2000.
- RICF00021, RICF00023 and RICF00024 in place since January 2001.
- RICF00025 in place since 21/07/2001.
- RPNM00002 in place since 1988.
- RPRM00002 in place since 09/08/1988.
- RRAM00001 in place since 11/02/1994.
- SECM00001 in place since 28/02/1992.
- SECM00002 in place since 27/02/1992.
- The team noted that existing guidelines do not specify the maximum time limit for closure of temporary modifications.

Without proper control of temporary modifications, the plant configuration may be compromised with respect to nuclear safety.

Recommendation: The plant should ensure that the number and validity of temporary modifications are resolved in a timely manner.

Basis:

NS-R-2

7.4. The operating organization shall establish a procedure to ensure proper design, review, control and implementation of all permanent and temporary modifications. This procedure shall ensure that the requirements of the plant safety analysis report and applicable codes and standards are met.

NS-G-2.3

1.4: [...] controlling activities relating to modifications at nuclear power plants in order to reduce risk and to ensure that the configuration of the plant is at all times under control and

that the modified configuration conforms to the approved basis for granting a nuclear power plant operating license.

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.

6.5: The plant management should periodically review outstanding temporary modifications to consider whether they are still needed, and to check that operating procedures, instructions and drawings and operator aids conform to the approved configuration. The status of temporary modifications should be periodically reported (typically at monthly intervals) to the plant manager. Those that are found to be needed permanently should be converted in a timely manner according to the established procedure.

Plant response/Action

In 2011, the plant incorporated the provisions laid out in corporate directive DI 074, revision 2, entitled 'Definition and organisational principles for the management of safety significant temporary modifications (DMP) and minor, non safety significant temporary modifications (MTI)'. The provisions in this directive led to a review of the plant's own processes for managing DMPs and MTIs.

The full meaning and content of DMPs and MTIs have now been clearly defined, along with the requirements for each.

Using a single computerized data base means that operations teams can be confident they are fully aware of plant status at all times. The requirements regarding the checks that have to be carried out when installing and removing a DMP temporary modification have now been defined.

A yearly review will provide the framework for an overall assessment of the DMP/MTI process, and will ensure that MTI temporary modifications are removed on schedule.

In 2011, a survey was undertaken of all the DMPs and MTIs on the plant. This served to confirm the nature of the temporary modifications (DMP or MTI) and, when necessary, to alter them. A list is currently being drawn up of all the DMPs that are used in everyday normal operation.

Each MTI was individually examined in the drive to reduce the number of MTIs on the plant, and was classified according to the type of solution selected: awaiting spare parts, awaiting a plant-specific or corporate modification, pending waiver requested from the regulator, retain in its current state.

The plan to reduce the number of temporary modifications includes the removal of 10 MTIs per year, per unit.

IAEA comments:

The plant has performed an analysis of the OSART issue, developed and introduced a plan to fix deficiencies in the area of handling safety significant and non-safety significant temporary modifications. The plan is based on a corporate directive that provides definitions and organisational principles for the management of temporary modifications. Since the year

2010, the number of active temporary modifications has decreased from 170 to 150. The plant has a target to remove 60% of active temporary modifications by the year 2014. However, since the beginning of the year 2012, 9 new temporary modifications have been installed and 2 removed. The plant has not specified, in the procedures, a time limit for the validity of a temporary modification and has no criteria for the conversion of temporary modifications into permanent ones, but there is a plan to correct these deficiencies shortly. Additionally, interference between active temporary modifications is not systematically analysed.

Conclusion: Satisfactory progress to date

5.5. HANDLING OF FUEL AND CORE COMPONENTS

5.5(a) Good practice: Remote video surveillance of fuel handling, enhancing technical support.

A remote surveillance system for fuel handling and physical inventory activities has been put in place to enhance technical support and improved use of the video system.

The fuel condition recording equipment includes 2 cameras, a video rack and a connected external hard drive providing 8000 hours of continuous recording. The equipment is connected to the plant IT network for real or differed time recording on remote computers.

The system put in place is not expensive and allows for increased and faster use of technical support from reactor engineering, both from site level or corporate level. It allows real time tracking of recordings from a remote office with a view to early detection and analysis of defects, and early transmission of the pictures to corporate entities for further expert appraisal and confirmation of plant analysis. In addition, the system allows immediate strong improvement of the sharpness and the level of details of the fuel assembly pictures. This facilitates the diagnostic to be performed by reactor engineering.

The system can be used for shipment of used fuel, yearly physical inventory, verification of assemblies before refueling (search for foreign materials underneath the debris filter on the bottom end, search for impacts or foreign material on the fuel assemblies) and classification of damaged fuel assemblies (visual examination of the grids, rods and ends, classification of foreign material type).

This device is used each time fuel assemblies are subjected to a camera inspection by plant staff. For example, in May 2010, thanks to this device during the examination of the lower parts of the fuel assemblies inside the spent fuel pool, the plant identified the presence of small-sized foreign materials on 2 fuel assemblies.

Since small defects are hard to interpret on pictures, the fuel building operators can directly transfer the picture to work planning for further analysis.

Direct communication between fuel work planning and fuel building technicians has made it possible to optimize the camera shots and to detect small-size foreign materials.

6. OPERATING EXPERIENCE FEEDBACK

6.1. MANAGEMENT, ORGANIZATION AND FUNCTIONS OF THE OE PROGRAMME

Roles and responsibilities of one of the key players in the OE process (OE Manager) are not comprehensively defined and some of the duties performed by him are not documented. The plant is encouraged to clearly define and document all the roles and responsibilities of the OE Manager.

6.2. REPORTING OF OPERATING EXPERIENCE

The threshold for reporting of events at the plant is not sufficiently low to identify event precursors and emergent issues for trending. Some deficient conditions and practices observed by the team were immediately corrected but not reported. The team suggested that the plant should consider lowering and clarifying the reporting threshold so as to enhance its capability of identifying event precursors and emergent issues by trending.

6.6. CORRECTIVE ACTIONS

The plant corrective actions programme is not robust enough to ensure that corrective actions are effective. Corrective actions are spread in many databases and many actions have exceeded their completion date. Guidelines on prioritization, extension of due date and effectiveness review have not been developed. The team suggested that the plant should consider enhancing its corrective actions programme to ensure effectiveness of corrective actions.

6.7. USE OF OPERATING EXPERIENCE

The plant has developed a tool which aids in motivating the staff as to the benefits of operating experience and also helps in achieving recognition and support of management in the use of OE. The team recognized this as a good practice.

DETAILED OPERATING EXPERIENCE FINDINGS

6.2. REPORTING OF OPERATING EXPERIENCE

6.2(1) Issue: The threshold for reporting non-significant events and near-misses at the plant is not sufficiently low and clear to identify event precursors and emergent issues for trending.

- Well documented criteria exist at the plant for reporting significant events to the regulators. Reporting criteria for other high level events are also identified. However, for events below these levels, no reporting criteria and expectations have been specified.
- The team observed a contractor worker leaning over the spent fuel pool with a life vest on but no safety harness. The individual was counselled by plant staff but this near miss was not reported in the events database. Follow up indicated that clear definition and expectations on near miss reporting does not exist at the plant.
- In the Gas Turbine building (LHT) a tripping hazard was observed. A cable was crossing the walk way at half a meter height with an elevated pipe cover platform on the other side. The conditions were immediately corrected but not reported.
- The team found two transformers temporarily stored in the vicinity of safety qualified electrical boards. Investigation revealed that sufficient analysis was not carried out in terms of various hazards involved. The transformers were moved to a safer position but this issue was not captured in the plant OE system.
- The team observed a recorder chart roll lying on one of the MCR panels in unit 1. Staff in MCR were reminded about an international OE regarding a reactor scram due to mishandling of a recorder chart. After explanation the chart was removed but the deviation was not documented.
- Defects which are immediately corrected during the plant tour by management are not consistently reported and documented.

High threshold of reporting results in missed opportunities of learning from lower level events before they become significant and have an impact on nuclear safety.

Suggestion: The plant should consider lowering and clarifying the criteria for the reporting threshold of non-significant events and near-misses so as to enhance its capability of identifying event precursors and emergent issues by trending.

Basis:

NS-R-2

2.24 All plant personnel shall be required to report all events and shall be encouraged to report on any ‘near misses’ relevant to the safety of the plant.

NS-G-2.11

10.2 Operating organization should develop documents specifying appropriate reporting criteria specific to the type of plant being operated and consistent with national regulatory requirements. These criteria should specify the types of events and incidents, including problems, potential problems, non-consequential events, near misses and suggestions for improvement.

Plant response/Action

Since the OSART, the station has implemented or improved a number of systems to increase detection of deviations:

- The entry of managers' findings into the TERRAIN database is being stepped up.

Around 6,000 findings were entered into the TERRAIN database in 2011. These findings are used for trending. Since 2010, the standards to be reinforced by managers have been identified by the station's senior management every month. The month's findings must cover at least these areas. All the standards which are reinforced come from the "memento des exigences" (standards and expectations booklet). Senior management coordinated the initiative designed to ensure that members of the senior management team carry out 40 walk downs a year. In 2011, this was extended to all managers on the station and is coordinated at department senior management team level.

- Improvement in the "housekeeping" deviation detection process.

Since 2009, a considerable number of "housekeeping" deviations have been detected by the personnel as a whole (over 7,300 deviations in 2011). In 2011, the assessment of rooms was incorporated into the surveillance test performed every week by operations crews. This assessment incorporates standards in the area of housekeeping. Successive assessments by corporate level have confirmed the improvement in housekeeping.

- Wider use of debriefings

To encourage the reporting up of findings from the grass roots level, the station has introduced debriefings. Several years ago, the "fuel waste" section introduced daily debriefings. In 2011, other departments overhauled their arrangements for collecting debriefing findings. For example, in the "I&C/electricity" department, a debriefing form was introduced. In 6 months, 90 actions were identified.

- Weekly coordination meetings for internal OE

A new system was introduced in October 2011. It is designed to identify OE items and monitor the actions decided on. It consists of weekly summary reports by the safety quality, risk prevention and operations departments. Every week, at a meeting chaired by the deputy plant manager and run by the local OE coordinator, action commitments are approved. "GLAREX" sheets are raised for these actions.

IAEA comments:

The plant has developed and introduced several systems to increase the detection of deviations in the field and deficiencies in the plant personnel performance. New reporting criteria are now clearly specified in the "memento des exigences" (standards and expectations). More than 6000 findings in the field were identified and these were entered

into a data base for trending and remediation. New initiatives also cover housekeeping issues (7300 in the year 2011) and human performance deficiencies (identified via work observations) that are treated, analysed and remedial actions are developed and implemented.

Conclusion: Issue resolved

6.6. CORRECTIVE ACTIONS

6.6(1) Issue: The plant corrective actions programme is not robust enough to ensure that corrective actions are effective.

- Incorrect revision of a maintenance procedure resulted in the wrong torque on six containment isolation valves in both units for about 4 years (NTDN 10149). This procedure deficiency was only identified during the next revision. Corrective actions developed to avoid recurrence were very limited in scope and were focused only on the mechanical maintenance department while revision of procedures is carried out by many other departments in the plant. The corrective actions also did not include revision of the documentation control procedure and did not address checking other procedures revised during this period (extent of condition).
- As at September 2010, 209 corrective actions in the action tracking database have exceeded their due date of completion. Average overdue period is around 8 months. Another 144 of the corrective actions in this database are awaiting close out by the sponsors. It is understood that this issue is being discussed in monthly management meetings and recently, reasons for this large backlog were discussed in detail in one of these meetings. However, reasons identified and various additional actions planned were not documented.
- Corrective actions at the plant are spread out in various databases like the action tracking database, GLAREX, FAP and many other departmental level databases which makes it difficult to perform an integrated trend analysis.
- At the plant no guidance document is available on prioritization (except for regulators reportable corrective actions), extension of due dates and effectiveness review of corrective actions. The team also observed that no effectiveness review of corrective actions is being carried out.

Ineffective corrective actions could result in recurrence of events thus impacting the safety of the plant.

Suggestion: The plant should consider enhancing its corrective actions programme to ensure effectiveness of corrective actions.

Basis:

NS-R-2

2.21. Operating experience at the plant shall be evaluated in a systematic way.

Abnormal events with significant safety implications shall be investigated to establish their direct and root causes. The investigation shall, where appropriate, result in clear recommendations to the plant management, which shall take appropriate corrective action without undue delay. Information resulting from such evaluations and investigations shall be fed back to the plant personnel.

GS-G-3.1

6.71 Senior management should ensure that corrective actions are subjected to approval, prioritized and completed in a timely manner on the basis of their significance. Managers should be held accountable for meeting due dates for corrective actions. Extensions or

exceptions to due dates for completing corrective action should be controlled and should be made only in response to new issues of higher priority.

Plant response/Action

- This event highlighted a failure to take account of RPMQ requirements (RPMQ: set of requirements for maintaining accident condition qualification status).

The mechanical maintenance department (ST) grouped together the RPMQ expectations into a single procedure for valves and fittings (GIMR01258), two procedures for rotating machinery (GIMP04036-GIMP04037) and two procedures for boiler making (GIMC00075-GIMC01651). These five procedures are now used as a reference base to identify and take account of RPMQ requirements.

On 16/06/2010 information was issued to the procedure writers in the mechanical maintenance department regarding the:

- Importance of applying reference bases and expectations, particularly RPQM;
- Importance of checking consistency between technical information (torque values, dimensions, functional clearance, etc.) when updating documentation;
- Fact that when an updated procedure is submitted for approval, the previous revision must be systematically attached so the person in charge of checking and validating it can check that the technical information is consistent.

To conclude, the mechanical maintenance department inspected the procedures involved in the event and reinforced its documentation inspection process. Further to this one-off event that was confined to the mechanical maintenance department, the site did not initiate corrective actions in the other departments.

- In 2011, 865 actions were raised in the action tracking data base (609 in 2010). As of the end of January 2012, 318 actions were being processed:
 - 102 actions were overdue and had overrun their deadline (as against 209 actions at the time of the OSART mission),
 - The average deadline overrun is 5 months (as against 8 months at the time of the OSART mission),
 - 26 actions were pending closure (as against 144 actions at the time of the OSART mission).
- Since august 2011, the plant increase identification and management of internal operating experience feedback by setting up a weekly meeting lead by the deputy plant manager and all head of department.
The factual improvement in terms of managing the data base is due to:

- monitoring ongoing actions using process macros during *ad hoc* commissions,
- monitoring data base indicators as part of the "Management the Unit" process, which is implemented during the monthly performance review conducted during the plant management team meeting,
- the trilateral meetings with the plant manager, deputy plant manager and the department manager (one per week, i.e. once every two months for each department) where the subject is addressed, for any departments identified as being 'in difficulty' during the monthly performance review.

- The SDIN (nuclear information system) will be implemented at the plant in 2016. In this context, the new "Action Plan" module will replace the SDA (action tracking data base) and RAS (relations with ASN) applications, as well as the Sygma FE (condition report) module (management of deviations). This module will also make it possible to:

- Manage operating experience feedback,
- conduct studies and integrate modifications,
- develop and integrate the specification reference base.

In the meantime, the plant will not take any steps to integrate its various databases.

In 2012, the plant will inspect the effectiveness of corrective actions. Further to significant events, the objective is to inspect the effectiveness of "high-stake" corrective actions adopted to prevent the reoccurrence of inappropriate actions (the real or potential consequences of which were deemed to be important).

IAEA comments:

The plant has introduced a set of actions to remedy the status of the corrective actions backlog and improve the corrective actions programme itself. During the year 2011, 865 corrective actions were raised in the tracking databases as compared to 609 in 2010. As a result of plant's activities, the number of the corrective actions which exceeded the completion due date decreased from 209 in 2011 to 72 currently with an average deadline overrun of 5 month and 26 are pending closure. 6 corrective actions of 72 are safety related. The plant still runs several independent data bases and has no plan for integration as, in the near future, a new modern tracking system will be introduced. The plant does not assess the effectiveness of the corrective actions totally, but only for those which are safety significant and reportable to the regulator. There is still no clear prioritization of corrective actions.

Conclusion: Satisfactory progress to date

6.7(a) Good Practice: A tool for motivating plant staff as to the benefits of operating experience and achievement of management recognition in this area.

The plant OE Manager screens about 1000 event reports from other NPPs of EDF and selects some of the events based on their advantage for potential improvements when implemented at the plant (100 selected in 2009). A project is then opened and allocated to the relevant specialisation for analysis and incorporation of the corrective action. Once the corrective action has been implemented it is then reported back to the OE Manager. Twice a year, based on an analysis tool, an evaluation regarding the benefits of these corrective actions is carried out and presented to the Nuclear Safety Committee. It is also disseminated to the plant staff for motivation and bringing out the advantages of such OE. The tool involves assigning a weight age factor of effectiveness considering the robustness of the corrective action. These weight age factors are:

A) 100% for corrective actions that are robust and sustainable:

Example: Significant safety event at Golfech on 23/07/2009.

Late detection of unavailability of train A reactor protections as details were missing from the alarm response sheet. As the issue was also identified on site the alarm response sheet was modified (document in the electronic document management system).

B) 50% for corrective actions that are robust but not sustainable:

Example: Near miss at Paluel on 08/10/2007.

Near miss of falling during radiological mapping at the bottom of the reactor pool.

As the risk was also identified on site, the risk assessment was amended (document not in the site electronic document management system).

C) 10% for corrective actions that are not robust:

Example: Significant safety event at Cattenom on 31/03/2009.

Leak from the control rod drive mechanism on the Reactor Coolant System.

Awareness raising for the shift crews concerning the impact of the Cattenom event and on the importance of drafting periodic reports on reactor coolant system leak.

After analysis of a significant safety event occurring on another site, if robustness of the corrective action is assessed at 100%, the benefit is 1.0 significant safety event prevented.

Valuation of 100 events selected in 2009 for implementation at the plant is:

NUMBER OF EVENTS POTENTIALLY PREVENTED IN 2009				
Scrams	Significant safety events	Significant environment events	Significant RP/chemistry events	Capability saved (in days)
10.6	46.6	4	22.8	34.3

This tool quantifies the benefits of factoring in of external OE on the plant. This tool has motivated the members of the OE coordination network and has also resulted in better recognition of the importance of OE and the role of the OE coordinators by the senior management.

7. RADIATION PROTECTION

7.2. RADIATION WORK CONTROL

The plant has a detailed radiation protection program.

The radiation protection program defines criteria for assessing and controlling the risks associated with radiation and contamination levels which might arise during the conduct of work. The criteria currently in use does not require the systematic involvement of RP staff until surface contamination levels exceed a value that could result in suspension of radioactive material at levels where internal exposure could be received ($> 400 \text{ Bq/cm}^2$). There is limited rigor in the control of surface contamination below this level, although it can be readily detected.

Instrumentation is provided for the detection of surface contamination on personnel at the exit from the Radiation Controlled Area (RCA). A portal monitor is used for the detection of surface contamination on clothing used in the RCA, however the geometry and sensitivity of this detector is not sufficient for detecting low levels of contamination on clothing or a spread of contamination within the RCA. Beta contamination whole body monitors are used for monitoring skin after changing out of RCA clothing. This equipment is also known to have low sensitivity to contamination (above that which could be found in the RCA), but it is not scheduled to be upgraded until 2012.

The quarterly and annual frequency of testing the functionality of the contamination monitors already described and also those instruments used for contamination control in the workplace is not sufficient that it would detect failures in the monitoring equipment in a timely manner.

The weaknesses in the detection equipment at the exit monitors and in functional testing could mean that there could be more contamination events than are presently being detected. Even with limited detection capabilities, 962 personal contaminations were detected at RCA exits from Units 1 and 2 in 2009. The measurement of personal contamination event occurrences using the metric rate per 1000 workers has not highlighted the significance of this statistic to the plant. There is also evidence that workers are receiving low level intakes of radioactive material.

A recommendation has therefore been identified in the area of the effectiveness of policies and standards used in the plant, including equipment, for contamination control.

7.3. CONTROL OF OCCUPATIONAL EXPOSURE

Significant efforts have been made in the last year to improve ALARA and contamination control standards at the plant, specifically with regard to high hazard work performed during outages. For example an ALARA plan has been developed and a new and more rigorous process for working with contractors on ALARA planning has been developed. The results of these efforts will not be realized until the upcoming outage.

The plant is encouraged to review the effectiveness of these changes following the outages and to continue making improvements to ALARA standards, processes and expectations.

The team observed that contamination control and ALARA practices in accordance with the radiation protection program were not fully understood and rigorously implemented at the plant. Action plans to address this have not been effective. This lack of rigor in the implementation of

field practices could lead to a spread of contamination within the RCA or radiation exposures that are not ALARA. A recommendation has been made in this area.

7.4. RADIATION PROTECTION INSTRUMENTATION, PROTECTIVE CLOTHING, AND FACILITIES

The plant has dedicated facilities for waste processing, and decontamination of plant equipment and tools. The level of attention that has been paid to these areas is minimal and there are some physical improvements required, such as ladies change room upgrades, etc. This is a focus area for improvement commencing in 2011. The plant is encouraged to continue with these improvements to ensure these facilities are brought up to the required standards.

The plant has a dedicated room for the storage of radioactive sources and has procedures for the authorization of personnel to use specific radioactive sources. As a part of this process, there is a security system for access control to specific radioactive sources kept in discrete storage locations. A good practice was recognized in this area.

DETAILED RADIATION PROTECTION FINDINGS

7.2. RADIATION WORK CONTROL

7.2(1) Issue: The policies and standards used at the plant are not adequate to achieve effective contamination control.

- The sensitivity of portal monitors for monitoring of workers coveralls from the RCA is 4500 Bq. The sensitivity of beta contamination monitors (for monitoring worker's skin leaving the plant) is 250 Bq. These monitors are not sensitive enough to detect contamination on RCA clothing which would detect a spread of contamination within the RCA or on skin at the level expected to be found within the RCA.
- In 2009 for both units, there were 395 personal contamination events on RCA clothing at the first RCA exit monitor (a portal monitor), 567 at the second RCA exit beta contamination monitor (measuring skin contamination) and 4 at the final site exit (a portal monitor). Most of the skin contamination was of the hands and feet.
- The quarterly and annual frequency of functional testing of the personal contamination monitors on exit from the RCA and contamination monitoring equipment used by workers to control contamination in the workplace is not sufficient to identify if equipment is malfunctioning in a timely manner. Only contamination meters which are used for the monthly contamination surveys are source checked before and after use.
- Units for storing radioactive waste, waste containers and items which are potentially contaminated are not labeled to warn that they may contain contaminated materials or elevated dose rates.
- There is no area designation for contamination control between 4 and 400 Bqcm⁻².
- Despite the potential for a spread of contamination below 400 Bqcm⁻² within the RCA, minimal rigor is required in the preparation of work permits for surface contamination up to this level. RP personnel are not required to be involved in the preparation of these permits and are only to be contacted if contamination greater than this level of contamination is detected.

Inadequate policies and standards can result in a lack of plant awareness of the presence or risk of contamination which can lead to an unplanned spread of contamination or radionuclide intakes.

Recommendation: The plant should improve its policies and standards to ensure that they are effective at achieving contamination control.

Basis:

IAEA Safety Series 115

I.4 Employers, registrants and licensees shall ensure, for all workers engaged in activities that involve or could involve occupational exposure, that:

(d) Policies, procedures and other organizational arrangements for protection and safety be established for implementing the relevant requirements of the standards, with priority given to the design and technical measures for controlling occupational exposures;

(e) Suitable and adequate facilities, equipment and services for protection and safety be provided, the nature and extent of which are commensurate with the expected magnitude and likelihood of occupational exposure;

(g) Appropriate protective devices and monitoring equipment be provided and arrangements made for its proper use.

I.26 “Employers, registrants and licensees shall, in consultation with workers, through their representatives if appropriate;

(a) establish in writing such local rules and procedures as are necessary to ensure adequate levels of protection and safety for workers and other persons

(d) ensure that any work involving occupational exposure be adequately supervised and take all reasonable steps to ensure that the rules, procedures, protective measures and safety provisions be observed

NS-G-2.7

Section 3.3 “The operating organization “shall designate as a controlled area any area in which specific protective measures or safety provisions are or could be required for (a) controlling normal exposures or preventing the spread of contamination during normal working conditions

Section 3.24 “The main objectives of radiological monitoring and surveying are: to provide information about the radiological conditions at the plant and in specific areas before and during a task; to ensure zone designation remains valid; and to determine whether the levels of radiation and contamination are suitable for continued work in the zone.

Section 3.6 “In some parts of a controlled area, compliance with the relevant limits can be achieved only by limiting the time spent there or by using special protective equipment. The definition of different zones within a controlled area, on the basis of dose rates or levels of loose contamination, should be considered. Some zones will necessitate setting conditions for restricted entry and special entry. Administrative control of entry into these zones can be effected by means of local rules or radiation work permits.

RS-G-1.3

Section 7.6 “Workplace instruments should be frequently source checked to ensure proper functioning”.

Plant response/Action

In response to both the IAEA’s recommendations and the desire to reach the best possible level of performance, the NPP launched a multi-year project on the control of contamination at its source. This project was divided into several deliverables, several of which took account of recommendation RRP1, and led ultimately to the following actions:

Equipment and instrumentation:

- All our C2 monitors (scanning workers leaving the RCA for skin contamination) have been replaced by monitors with larger probe surfaces and lower detection thresholds.

Detection threshold of former monitors: 800 Bq.

Detection threshold of new monitors: 200 Bq.

- Maps listing the different types and locations of contamination monitoring equipment are posted at exit points from reactor building worksites, and at the exits of the reactor building and the radiologically controlled area (before arriving at the C1 and C2 monitors).
- All the modifications made to equipment in order to network the online monitors have now been completed. A monitoring station will ensure real-time monitoring of airborne contamination and will be in place by the start of unit 2's refuelling outage.

Re-examination of policies and standards in contamination control:

- The policy defined in the plant's new 'Enhancement of health and safety and radiation protection' macro-process has been redefined. It now states clearly the plant challenges and objectives in the areas of health, industrial safety and radiation protection, and sets out the guiding principles for reaching our objectives. Preventive actions are developed and then tracked in coordination and information-sharing meetings.
- Our new absolute-value performance objectives have been split by project, craft and work activity. The following situations are flagged up as abnormal, and trigger a suspension of access to the radiological controlled area until an analysis has been carried out to establish how the worker was contaminated:
 - All body contaminations are dealt with by the medical centre
 - All C3-monitor alarms
 - 3 C2-monitor alarms set off by the same worker in any one year.

An on-the-fly analysis is carried out for each noteworthy deviation and is discussed in a proactive response meeting with the senior management team. If contractors are involved, they contribute to the analysis and may, as a result, be subjected to closer oversight through action plans or regular meetings.

The plant memorandum describing the handling by management of radiation protection deviations specifies those deviations that are deemed to be unacceptable and that may result in a ban on entering the plant.

- Until now, the risk prevention department (SPR) endorsed radiological work permits (RTR) for worksites with loose surface contamination > 400 Bq/cm². This threshold has now been lowered to 40 Bq/cm² and will be in force as from unit 2's refueling outage scheduled for end of April, in order to better control airborne contamination risk.

Develop and reinforce skills assessment and management leadership:

- The messages conveyed in the 'contractor safety' induction course were modified in 2011 and now highlight operating experience feedback from both fleet and plant radiation protection events, regarding contamination control in particular.
- Improve staff knowledge and carry forward expectations more effectively:
 - Joint walk downs by contractors and senior management team members were organised and are now a permanent feature (28 walkdowns in 2011);
 - 3 month-long campaigns on plant expectations were run during the unit 1 maintenance outage, 2 of which focused on contamination control. These

campaigns allowed managers to reinforce expectations during walkdowns and assess the extent to which staff understand their responsibility to adhere to these expectations;

Every day during outages, senior management team members will be scheduled to visit high-stakes worksites (meaning worksites with high dose), and during the unit 1 maintenance outage, they will perform walk downs at the exits of the reactor building and of the RCA change rooms.

IAEA comments:

In response to the recommendation, the plant performed an analysis and drew up an action plan. This action plan was approved by the plant radiation protection committee. Based on the action plan, the NPP launched a multi-year project on the control of contamination at its source. In the area of “Equipment and instrumentation”, new C2 monitors (scanning workers leaving the RCA for skin contamination) have been set up with larger probe surfaces and a lower detection threshold. Their sensitivity is four times higher than that of the former monitors.

All the modifications made to equipment in order to network the online monitors have now been completed. A monitoring station will ensure real-time monitoring of airborne contamination.

The second part of the action plan includes “Re-examination of policies and standards in contamination control”. The new policy states clearly the plant challenges and objectives in the areas of radiation protection, and sets out the guiding principles for reaching their objectives. Preventive actions are developed and then tracked in coordination and information-sharing meetings. The plant memorandum describing the handling by management of radiation protection deviations specifies those deviations that are deemed to be unacceptable and that may result in a ban on entering the plant.

The threshold of radiological work permits for worksites with loose surface contamination has now been lowered to 40 Bqcm⁻² in order to improve and control the airborne contamination risk.

The last part of the action plan is focused on “Develop and reinforce skills assessment and management leadership”. Its main objective is to improve the staff knowledge and reinforce requirements more effectively.

After implementation of this project the number of personal contamination events decreased by about 30%.

Conclusion: Issue resolved

7.3 CONTROL OF OCCUPATIONAL EXPOSURE

7.3(1) Issue: There is a lack of rigor in the implementation of radiation protection procedures and practices in the RCA.

- There were 187 dose rate and 8 dose alarms on electronic personal dosimeters in 2009. Tracking of these only began in 2009.
- There were approximately 200 minor intakes of radionuclides in both 2008 and 2009 which, while below reportable levels, can be a precursor to more significant intakes.
- A Radiation Protection technician performing undressing activities for a second individual, who was exiting an area with high contamination levels wearing a plastic suit, removed his respiratory protection before the possibly contaminated suit was contained.
- No contamination monitor was used in the exit of an individual who had been wearing a plastic suit in an area with high contamination levels, although Radiation Protection personnel were in attendance.
- On three occasions, individuals were observed not using personal protective equipment correctly when it was required.
- An individual wearing tyvec coveralls to protect against contamination in the work area left the work area still wearing the tyvec coveralls, without monitoring
- An un-identified hot spot was found in the decontamination facility (5.8 mSv/h contact). The hot spot was causing elevated dose rate (20 μ Sv/h) at a routine work station.
- The application of the criteria for the sub-designation of the RCA for contamination control and radioactive waste management purposes (<400Bq cm^{-2}), focused on waste management and not on contamination control.

A lack of rigor over radiological protection work practices increases the risk that personnel exposure may not be ALARA.

Recommendation: The plant should improve the enforcement of radiation protection practices in accordance with the radiation protection program to ensure they are executed in the RCA in a more rigorous manner.

Basis:

IAEA Safety Series 115

I.10 “Workers shall; (a) follow any applicable rules and procedures for protection and safety specified by the employer, registrant or licensee, (b) use properly the monitoring devices and protective equipment and clothing provided.

NS-G-2.7

Section 3.74 “Finally, each worker should also have specific responsibilities, such as:

- (a) Putting into practice the exposure control measures specified in the RPP
- (b) Identifying and suggesting improvements and good practices for the reduction of exposure whenever possible”

Plant response/Action

To establish more stringent standards for radiological risk control practices:

An ALARA programme has been established

Since 2010, an ALARA programme designed to reduce individual and collective dose values has been drawn up based on 6 main principles:

- reduce the source term,
- keep within the annual exposure target,
- improve dose management,
- continue and step up optimisation analyses
- develop optimisation analyses
- develop skills and a radiological protection culture among workers and management.

This programme incorporates actions which have helped to improve the setting of standards and achieve more rigorous application of radiological protection standards in the field:

- The ALARA GAP meetings introduced for level 3 risk activities have been extended to level 2 activities which resulted in 23 GAP meetings over the unit 1 heavy maintenance outage and involved 19 contractor firms which have cascaded down the standards set in the field. To control the implementation of the standards set at ALARA GAP meetings, SPR presence in the field has been increased.
- A “hot spot” data base has been built up which gives a comprehensive list of hot spots in all controlled areas. Workers can then be informed of any hot spots and their positions:
 - on plans available on the NPP’s computer network, which can be used in the activity planning phase,
 - on signs posted at the entrance to rooms, which can be consulted during performance of activities.
- The comprehensive analysis of dose rate alarms identified areas for improvement.
We have drawn up a list of activities entailing a risk of having the dose rate increasing to over 2 mSv/h and have worked with our contractors on the monitoring and supervision of workers on temporary contracts assigned to these activities.

In addition, if a dose rate alarm appears for a worker on a temporary contract, permission for access into the controlled area is suspended until a deviation analysis is obtained.
- Skills development for our staff and our contractors.
This includes:
 - campaigns to remind workers of radiological protection standards,

- the risk prevention department's weekly bulletin, published since January 2011,
 - the contractors' in-cycle prevention network (in 2011, 8 meetings of the network and 28 peer field walk downs),
 - induction of our outage contractors (987 contractors during the unit 1 heavy maintenance outage), weekly outage contractor meetings (19 meetings during the unit 1 heavy maintenance outage),
 - opening up our training mock- up (flow loop simulator) to our contractors.
- A self-assessment form which increases the effectiveness of the ALARA approach and the red area, orange area and radiography processes through field observations and internal control.

The "contamination control" project has been set up

To respond to IAEA recommendations and at the same time reach the best levels of performance, the NPP has initiated a multi-year station project to maintain contamination at its source. The project is divided into a number of parts, several of which address recommendation RRP2 and have led to concrete action:

Clarify and enforce field practices for self-protection and self-checking and increase operational control:

- Drafting of standard guidelines for the organisation of the steam generator worksite to control the risk of internal and external contamination.
- The airlock and hot changing room attendants' "supervisory" function has been taken over by the risk prevention department. An awareness-raising session was given to airlock attendants on the rules for entering and leaving the containment before the unit 1 heavy maintenance outage.
- The system of plant area supervisors (RZ in French) in the controlled area will come into operation in controlled areas at the beginning of the unit 2 refuelling outage planned for April 2012. Their job will be to facilitate and enforce radiological protection standards on worksites.
- Supervision in the field of contamination checks has been stepped up.

Improve signage and posting of conditions for access and work

- Standardised radiological risk signage is being developed for any objects temporarily stored in the controlled area
- Signage for worksite access conditions on the unit 1 heavy maintenance outage was standardised. OE from this will be incorporated into the unit 2 refuelling outage.

Reconsider out policies and standards in terms of the contamination control issue.

IAEA comments:

In order for each worker to fulfill radiation protection expectations in the field, the plant initiated actions to improve its ALARA programme based on the following steps:

1. Reduction of the radioactive source by removing activated corrosion products from the reactor cooling water during shut down. Also the plant has set up a “hot spot” database which gives a comprehensive list of hot spots in all controlled areas. Workers can then be informed of any hot spots and their positions.
2. Understandable reference documents have improved staff knowledge and have supported plant expectations. They deal with the following topics: radiation protection signage, exiting the RCA, radiological work permits, jobs with potential contamination risks in the RCA.
3. For the reinforcement of all plant ALARA principles, the plant has provided an extensive training programme for EDF workers and contractors to improve their behaviour in the radiological area.
4. Weekly meetings have been conducted on the topics of signage, risk assessment, radiological surveys, event reporting criteria and gamma radiography.
5. Radiation protection deficiencies are systematically analysed, reported and feed-back is provided for all employees.
6. Supervision in the field of contamination checks has been stepped up.

However the team observed that some practises still do not fully meet ALARA principles e.g. an RP Technician not wearing dosimetry in an appropriate manner, overalls not fastened as required in the RCA. Although efforts have been seen and an action programme has been set up properly, reaching a high level of control of occupational exposure requires regular activity.

Conclusion: Satisfactory progress to date

7.4 RADIATION PROTECTION INSTRUMENTATION, PROTECTIVE CLOTHING AND FACILITIES

7.4(a) Good Practice: A sophisticated key cabinet allows specific users to access only keys which unlock areas containing radioactive sources which they have authorization to handle.

The plant uses a “Keymaster” system which is a locked cabinet containing keys to discrete locations where radioactive sources are stored. The keys inside the cabinet are electronically locked such that when the cabinet is open it is not possible to access all of the keys. In order to unlock a key for use, the user must enter a user code and also a key code which he has been provided to allow him access to a specific source location. When the user enters both these codes, then the key to the specific source location is released for use. The source location then only contains sources which he is authorized to use. This system enables the plant to authorize individuals to use only specific sources that they are authorized to use and then restricts them physically from being able to access any other sources or any other areas containing sources which he is not authorized to use. This is a simple, but practical system which allows effective, physical control over access to radioactive sources.

8. CHEMISTRY

8.2. CHEMISTRY CONTROL IN PLANT SYSTEMS

The plant has developed a detailed program for chemistry control. Furthermore, a working group at corporate level is currently comparing EDF Technical Specifications with best international practices with a view to supplement the existing chemistry control program. However the team observed that the program still does not cover all the activities required for effective chemistry control in the plant. Specifically, the plant has not established a system for the detection of impurities such as chlorides, sulfates and others in reagents such as LiOH, $N_2H_4.H_2O$ and morpholine before their use in the primary and the secondary circuits. The team has suggested an improvement in this area.

The concentration of total corrosion products such as Fe in the primary coolant during start up is not monitored, only total gamma and gamma spectrometric activities are measured. Activity measurement is a delayed indicator of corrosion products transport or elevated corrosion rate because of the long activation period. The team therefore encourages the plant to extend its corrosion control program by measurement of elementary corrosion products.

8.3. CHEMICAL SURVEILLANCE PROGRAMME

The team has identified, as a good practice, the effective application of the quality assurance system of laboratories, based on international standard (ISO 17025).

8.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

Although the plant has implemented a comprehensive system, PMUC (Products and Materials for Use in Power Plants), and has set up a corrective actions plan to improve the control of chemicals, the team observed that some chemicals and substances were not properly handled to prevent inappropriate use. The team suggested improvements in this area.

DETAILED CHEMISTRY FINDINGS

8.2 CHEMISTRY CONTROL IN PLANT SYSTEMS

8.2(1) Issue: The plant chemistry control program does not allow early detection of chemical impurities of some water systems.

During the review the team noted:

- In the primary circuit during operation, oxygen concentration is not measured, although the plant has established limited and expected values for it. The NPP relies only on hydrogen measurement in the primary circuit during operation.
- Impurities such as chlorides, sulfates and others are not analyzed in reagents such as hydrazine and LiOH which are assigned for injection into the primary circuit.
- In the secondary circuit, there is no chemical control of reagents such as morpholine and hydrazine for the presence of impurities (Cl^- , SO_4^{2-} ...). Both are injected into the feedwater for its conditioning.
- The plant does not carry out measurement for tracking potential intrusion of anion exchange resin into the reactor cooling water.
- Monitoring of organic compounds in the demineralisation station is not performed.

Without a comprehensive chemistry control program, the plant may not be able to implement early and effective countermeasures for water systems and may increase the potential risk of corrosion.

Suggestion: The plant should consider supplementing the chemistry control program to enhance impurity monitoring of some water systems.

Basis:

DS 388 Chemistry Programme for Water Cooled Nuclear Power Plant

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;

4.13 The concentration of the chemical inhibitors that are added to cooling systems should adequately be controlled and monitored. The chemistry parameters to keep the proper treatment and the impurities should be controlled to minimize corrosion of the system and loss of integrity

4.29. Corrosive impurities should be kept below the specified limit to avoid corrosion of the primary system components. The most important chemical constituents are oxygen, chloride, fluoride and potentially sulphate.

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 and potentially silica (considered as potentially zeolite forming elements) and organic compounds.

Plant response/Action:

In 2010, a national working group coordinated by the corporate divisions UNIE-GPSI (operations engineering unit/process and information systems group) was appointed by the nuclear operations division, DPN, to compare EDF's chemistry specifications against the best internationally-accepted standards.

The conclusions of the working group led the DPN to launch in 2011 a fleetwide project targeted at gradually amending existing chemistry specifications.

A first test-phase was conducted in 2011 across several pilot plants to determine the physical and human impact of setting up an enhanced monitoring programme for a number of strategic parameters (boron, lithium, oxygen, total metals and ammonia in the reactor coolant system; ammonia, morpholine and methylamine in the high-pressure feedwater heater system, etc.).

A number of other NPPs, including St Alban, were asked to put in place a series of additional chemical analyses in 2012:

- A monthly determination of organic carbon (TOC) in the water for the nuclear island demineralised water distribution system using manual methods (TOC analyser in the process of being purchased);
- A monthly, manual measurement of oxygen in the reactor coolant system;
- A measure of total metals (Fe, Ni, Cr, Co, Zn) in the reactor coolant system, performed 2 to 3 times per cycle, particularly during start-up.

This programme is currently being rolled out in the laboratories section.

A more exhaustive programme of chemical analyses is due for implementation in 2014/2016 across all the NPPs, and will be driven by a set of requirements defined in either a transitional instruction or an amendment.

Ahead of the implementation of these new requirements, as early as 2011, the laboratories section set up an additional programme of chemical analyses to monitor a number of high-stakes parameters. Enhanced monitoring is now performed in the following areas in particular:

- Daily measures and adjustments to the lithium concentrations in the reactor coolant system, along with systematic checks following injection and homogenisation.
- Measurements taken twice a week from the feedwater plant (high-pressure feedwater heater system) to assess concentrations in morpholine, hydrazine, ammonia and methylamine, as well as the calculations of theoretical pH and theoretical conductivity associated with these results, in order to confirm the correct correlation between the pH measured in the HP feedwater heater system and the concentrations of chemical treatment products in the system.
- Complete, weekly analysis of the hot water system.
- Enhanced monitoring of the steam transformer and of the steam transformer system's feedwater tank (measuring pH, morpholine concentration, total conductivity), including a weekly injection of morpholine into the tank.

IAEA comments:

The corporate chemistry specifications policy-maker has updated the current chemistry specifications for plant systems regarding corrosion products, organic compounds and oxygen. Enhanced monitoring is performed for lithium, morpholine, hydrazine and ammonia

concentrations, and also for aggressive inorganic impurities in the plant systems. The plant has now initiated monitoring of all important parameters more frequently.

Conclusion: Issue resolved

8.3. CHEMICAL SURVEILLANCE PROGRAMME

8.3(a) Good Practice: The effective quality assurance system of laboratories is established based on international standards organisation (ISO) 17025.

The chemistry laboratories have established and maintained a quality assurance system appropriate to the scope of their activities. Laboratories document their policies, systems, programs and procedures to the extent necessary to ensure the quality of the results which includes validation of analytical methods, the internal quality and the external quality system.

Moreover, the environmental laboratory has established a quality assurance system that is officially authorized. Measurements can thus be shared and can be compared in an objective way; any measurement being made uses the same approved techniques according to the same quality assurance system. Their results are published on the Internet.

The benefit of the comprehensive quality assurance system of laboratories includes a high level of laboratory analysis and published measurement results of the environmental laboratory are irrefutable. The transparency and quality of results give the public confidence

8.6 QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES.

8.6(1) Issue: A number of operational chemicals and other substances are not labelled and stored at a sufficiently high level of safety and quality.

The team found several facts:

- LiOH was stored in the demineralisation station without the expiry date being specified.
- In the turbine hall, unit 2, ion exchange columns (1 SIT 246LT, 1 SIT 245 LT) containing the ion-exchange resins - the lifetime of the resins had expired, based on the label in place.
- There was Biosolv N6 stored in the main warehouse with an expired date for its use.
- LiOH, BaCl₂ and other chemicals in the warehouse were not labelled with expiry dates.
- In the radiation controlled area a tank with hydrochloric acid was stored without any warning labels, expiration date and label of PMUC (Products and Materials for Use in Power Plants).
- In the radiation controlled area laboratories, a drum of highly toxic hydrazine is stored outside a locked box. Soda was stored in the controlled area laboratories without shelf life information after it had been opened.
- Drums with decontamination reagent were stored in the mechanical store room of unit 2 without proper labelling – the name was hand written and the expiry dates and symbol PMUC (Products and Materials for Use in Power Plants) were missing.

Insufficient labelling and inadequate storage of chemicals could lead to a non conformity of chemical specifications and cause personnel injuries.

Suggestion: The plant should consider improving labelling and the proper storage of chemicals and other substances to achieve a high level of safety and quality.

Basis:

DS 388 Chemistry Programme for Water Cooled Nuclear Power Plant

9.3. The intrusion of non-conforming chemicals or other substances into plant systems can result in chemistry excursions leading to component and system damage or increase of dose rate.

9.9. Chemicals and substances should be labelled according to the area where they can be used, so that they can be clearly identified. The label should indicate the shelf life of the material.

9.10. When transferring a chemical from a stock container to a smaller container, the latter should be labelled with the name of the chemical, date of transfer and pictograms to indicate the risk and application area. The content of the smaller container should not be transferred back into the stock container. Residues of chemicals and substances should be disposed of according to the plant procedure. Quality of chemicals in the open stock containers should be periodically checked.

9.15. Chemicals should be stored only in an appropriate store that is fire protected captures spillages, and 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 with chemicals should be appropriately labelled. Reasonable amount of chemicals can be stored in other controlled environments of the workshops or operational department.

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

Plant response/Action

The NPP regularly highlights storage and labelling standards and expectations for chemical products in monthly campaigns aimed at developing staff understanding of requirements.

Similarly, the laboratory section periodically reminds staff of storage and labelling requirements by reiterating the specific duties and responsibilities of a chemist.

Lastly, the risk prevention department's weekly report routinely includes features on the topics of chemical risks, labelling and storage.

In addition, the OLIMP database was updated at the end of 2011, making it possible to finalise the drafting of FLU plant instruction sheets for chemical products used by the NPP. To date, more than 170 such instruction sheets have been created or updated. Amongst other things, this computer application generates and prints labels for all registered chemical products, with details of associated risks and preventive measures, and relevant pictograms.

A special 'chemical products' working group will be set up in 2nd trimester of 2012.. A number of representatives have been selected. One of the first topics this working group will review will be the standardisation of labelling of chemical products across all the NPP's departments.

IAEA comments:

The plant is currently in the process of revising the whole process of procurement and quality control of chemicals and other substances, clearly defining the responsibilities and authority of different departments within this process. Through the OLIMP electronic system (Safety sheets), criteria for quality and safety as well as the extent of declared parameters verification with regard to particular use was implemented ensuring that only chemicals meeting defined criteria are being procured. For new, unused chemicals and substances, the approval of the national entity (UTO), health safety at work department and risk prevention department as well as CEIDRE is required before starting the procurement process. Chemicals and other substances have all been identified by PMUC labels with their expiry date, batch number, date of opening etc.

Special attention is given by the plant to avoid harmful effects on health. The plant organises every month a discussion focused on educating plant staff and contractors.

Nevertheless, during a plant walkdown, several unlabelled liquids were noticed on the plant.

Conclusion: Satisfactory progress to date

9. EMERGENCY PLANNING AND PREPAREDNESS

9.1. EMERGENCY PROGRAMME

At the plant, some documents used during an emergency are not subject to controlled distribution. Without controlled distribution, the plant cannot ensure that the correct documents are used when required. The team encourages the plant to ensure that controlled distribution of the emergency documentation is implemented.

9.2. RESPONSE FUNCTIONS

The plant does not have a person on the site at all times with the authority and responsibilities to initiate an appropriate on-site response promptly and without consultation, to notify the appropriate off-site notification point and to provide sufficient information for an effective off-site response. This can cause a delay in implementing protective measures for the employees and the public. The team recommended the plant to have a person on site, at all times, with the authority to initiate the plant emergency organization.

9.6. EMERGENCY EQUIPMENT AND RESOURCES

The plant has at its disposal sufficient facilities, equipment and instrumentation to be used in an emergency. However, a number are not kept in a condition to ensure that they will fulfill their functions when required. The team recommended keeping these provisions in good operating condition and in such a manner that they will fulfill their functions when required.

9.7. TRAINING, DRILLS AND EXERCISES

Training of plant staff and staff from external medical emergency response organizations is not regularly performed under emergency conditions and therefore radiation protection measures are not based on realistic dose predictions.

Without regular training under realistic conditions this staff does not have the skills to accomplish their non-routine tasks under emergency conditions. The team developed a suggestion in this area.

DETAILED EMERGENCY PLANNING AND PREPAREDNESS FINDINGS

9.2. RESPONSE FUNCTIONS

9.2(1) Issue: The plant procedures do not require to have an authorized person present at all times on the plant to declare a nuclear emergency and to notify the off-site authorities promptly and without consultation.

- The plant does not have a person 24 hours a day at the plant that is authorized to classify a nuclear emergency and to initiate the PUI
- The shift supervisor is only authorized to initiate onsite measures like starting the emergency sirens (for assembling people) and calling people on duty.
- According to the PUI in a “reflex” phase the “Prefect” has to be alerted by the PCD 1 within 30 minutes after certain criteria have been exceeded.
- For the most rapidly developing severe accident with serious offsite consequences as considered by EDF, releases are expected to start 45 minutes after the scram (large break loca without safety injection and no containment spray).
- While the plant believes response times are adequate, response times of people on call are not measured and recorded during the weekly exercises to see if the person on call can be reached. The only aim of the exercise is to check if the telephones and pagers are working well.

The absence on the plant of an authorized person 24 hours a day to initiate the onsite emergency plan and to notify the off-site authorities, could cause a delay in implementing the Emergency Plan.

Recommendation: The plant should ensure the presence of a person at the plant at all times who is authorized to initiate the plant emergency organization.

Basis:

GS-R-2 Sec 4.23 “Each facility....shall have a person on the site at all times with the authority and responsibilities....upon classification [of an emergency] promptly and without consultation to initiate an appropriate on-site response; to notify the appropriate off-site notification point; and to provide sufficient information for an effective off-site response”

NS-R-2 Sec. 2.32 “The operating organization shall establish the necessary organizational structure and shall assign responsibilities for managing emergencies. This shall include arrangements for: prompt recognition of emergencies; timely notification and alerting of response personnel; and provision of the necessary information to the authorities, including timely notification and subsequent provision of information as required.”

Plant response/Action

There is always one person present on site with the authority to decide to initiate the EPP. This is either the Emergency Response Director (PCD1) or, in the absence of a senior management team member as acting PCD1, the shift supervisor (CE).

The shift supervisor, in a continuous shift system providing 24-hour cover, is responsible in real time for nuclear safety. On site, he acts as a representative for the senior management

team, and is therefore delegated authority by the station director to take all the necessary immediate measures to protect staff and operate the plant. In particular, he can initiate the on-site emergency plan outside normal working hours.

The organisation within EDF stipulates the initiation by the senior management team of the emergency plan and of alerts in the following cases:

- The shift supervisor must monitor the plant with a procedure that tracks safety functions. It is therefore necessary to limit demands on his time and requests to perform other tasks.
- The senior management team member on-standby has an overview of the status of the whole plant. He is therefore best placed to select the most appropriate organization for a particular situation, and to activate the corresponding emergency plan.

If the senior management member on-call is on site, he decides whether or not to initiate the on-site emergency plan and proceeds as follows:

- Raise the alarm for a site alert and muster the on-site emergency organization
- Alert and inform the public authorities (the “Préfet” and the regulator, the “Autorité de Sûreté Nucléaire”)
- Alert and inform EDF’s national teams and muster EDF’s corporate emergency organization.

If the senior management member on-standby is not on site, the shift supervisor takes the decision to activate the on-site emergency plan, and calls on the senior management member to sound the alarm. The senior manager performs the following tasks from his home:

- Raise the alarm for a site alert and muster the on-site emergency organization
- Alert and inform the public authorities (the “Préfet” and the regulator)
- Alert and inform EDF’s national teams and muster its corporate emergency organization.

In the unlikely event that the standby senior manager is not contactable, the shift supervisor activates the on-site emergency plan (mobilizing the on-call teams and protecting personnel). He then contacts another PCD1 senior management member on-standby, who in turn raises the alarm to the remaining organizations - the “Préfecture”, EDF’s corporate division, the regulator - and, in addition, activates the off-site emergency plan as a reflex action. The objective is clearly to free up the shift supervisor, enabling him to focus on the priority task of monitoring both the plant and reflex-phase criteria, not forgetting the task of monitoring the other unit under his responsibility.

Operating experience feedback from the last 10 years demonstrates the efficacy of the alerts and the total availability of the PCD1s.

IAEA comments:

The quoted phrase “and without consultation” in paragraph 4.23 of GS-R-2 is based on experience of past emergencies where delays ensued before appropriate consultation was made. It is intended to ensure that full authorisation and responsibility is given to the emergency manager on site. This is currently not the case at St. Alban or at any other French EDF site. The shift manager has to initially try and contact the standby senior manager and, if this is not possible, only then is he allowed to initiate response actions.

Conclusion: Insufficient progress to date

9.6(1) Issue: The facilities, equipment and instrumentation used in an emergency, are not kept in a condition to ensure that they will fulfill their functions when required.

- A number of illuminated emergency exit signs are missing (above door ZFS P0182), are of different types, are installed in the wrong places (hanging with the picture down on a cable tray) or are hidden behind e.g. ventilation pipes (above door 1 JSL 717 QP)
- In the “Salle de Décontamination” the contamination monitor (MIP 10, SRP 011; December 2009) and the accessory measuring probe (SRP 002, Canberra SBM-2-D; 30-07-2009) are out of their calibration date. It was notified 3-4 times without resolution
- In the Salle de Décontamination one wall suffered significant damage due to a leakage since the beginning of 2010. This damage has not been brought to the attention of the maintenance department.
- Signs showing the way to assembling points are not correct:
 - are missing
 - in the vicinity of Pumping Station pointing to assembling point 9,
 - after exiting door 1JSL 531 OP pointing to assembling point 5)
 - they point in the wrong direction
 - beside door 2 FSP 0182 pointing to assembling point 1 downstairs instead of to the exit door
 - Corridor BES first floor; assembling point 1 (observed at 27/09),
 - arrows are missing
 - BW level 19.10 m. on the right hand side of elevator,
 - LB0716 “Couloir voie B”
 - BES corridor ground floor; assembling point 1 (observed at 27/09),
 - numbers are missing
 - BW level 19.10 m. on the right hand side of elevator, BL +3.24 m.
 - Right hand side of elevator LC 0603), etc
- Material condition of Fire fighting car PCOM: 1 breathing mask last inspection 2008.
- The equipment used to provide overpressure in the BDS is tested monthly to check if it will start. There is no test or measurement to confirm that there is sufficient overpressure. If the test was conducted appropriately, it could show that gaps e.g. between door 0 DSI 031 PD and its frame (length: 40 cm, width: 3-4 cm) may or may not be a problem.

Without keeping the facilities, equipment and instrumentation used in an emergency, in proper conditions, their correct functioning cannot be ensured when required.

Recommendation: The plant should ensure that all instruments, facilities and equipment to be used in emergencies, are kept in good operating condition and in such a manner that they will fulfill their functions when required.

Basis:

NS-R-2 2.38 Instruments, tools, equipment, documentation and communication systems to be used in emergencies shall be kept available and shall be maintained in good operating

condition, in such a manner that they are unlikely to be affected by or made unavailable by the postulated accidents.

GS-R-2 5.25. Adequate tools, instruments, supplies, equipment, communication systems, facilities and documentation (such as procedures, checklists, telephone numbers and manuals) shall be provided for performing the functions specified in Section 478.

GS-G-2.1 Sec 5.2 REQUIREMENTS FOR INFRASTRUCTURE

Inadequate responses to emergencies can often be traced back to an inadequacy in one or more of these infrastructural elements. The following gives some examples:

- Quality assurance programme: Failure to have a system in place to ensure that the emergency arrangements made are maintained at an adequate state of readiness has resulted in many problems. This is primarily because emergencies are rare events so equipment, facilities and resources designated solely for emergency response are not normally used and frequently there is no adequate programme to ensure that these resources are maintained.

Plant response/Action

EPP signage:

- We have addressed the deviations highlighted by the OSART.
- On the other hand, we are in the process of switching over to an entirely new organisation, with 6 muster areas at which staff must assemble in case of EPP activation. Signage was therefore re-examined from scratch. This switch is due to take place at the beginning of March.
- Notification and communication about these changes is appropriate, and at the time of the switchover, when the new 6 muster areas will become operational, flyers will be made available at the plant entrance detailing the main alarms and instructions to follow. A map of the plant will highlight the locations of the muster areas. A brochure has also been prepared to explain the new headcount process.

BDS emergency building:

- BDS containment:
 - Static leaktightness defects identified during the OSART mission have been addressed.
 - We are working on the dynamic containment in order to guarantee overpressure, should the iodine-trapping ventilation systems be put into service.
 - By 2014, a project derived from Fukushima OEF will equip each NPP with a purpose-built emergency centre, which will cover 1000 m², be seismically-isolated, and span 2 or 3 floors.
- Since 2009, the plant has made significant investment in improving emergency facilities. For example, the senior management team command post has been renovated and is now a lot more practical and functional.
- During the combined on-site and off-site emergency plan (PUI/PPI) drill conducted on 31.01.2012, the quality of the equipment in the emergency building was found to be good by the external observers.

Fire protection:

- Illuminated emergency exit signs: these were all checked and deviations were addressed. An EDF ‘ECSR inspection’ (reinforced targeted safety inspection) in September 2011 concluded that the self-contained emergency lighting units (fluorescent evacuation signs) were kept in good condition.
- Equipment in firefighting vehicle PCOM: the deviation was noted and addressed. A new fire truck has been ordered and will be operational as from 2012.

Other:

- A self-assessment of the ability of EPP equipment to fulfil its function was conducted by the EPP committee, in conjunction with the committee’s self-evaluation of the recommendations in the corresponding WANO SOER.
- This type of self-evaluation will become a regular exercise, and will take account of the feedback received from the OSART reviewers (in particular for the verification of plant signage).

IAEA comments:

The plant has reviewed and revised its signage procedure and this project is due for completion by April 2012. A new headcount process is in place and it has the ability to display, at muster points, the staff distribution on site online.

There are still some gaps evident in the doors of the BDS and repairs are ongoing.

Flyers have been prepared for visitors to the site and these indicate expected behaviours during normal and abnormal plant conditions in addition to relevant phone contact numbers and a site map, indicating the position of all muster points.

A fleet-wide initiative will launch the construction of a purpose-built emergency centre from 2014. A new fire fighting vehicle PCOM will be available by June 2012.

Conclusion: Satisfactory progress to date

9.7(1) Issue: Training of plant staff, and staff from external medical emergency response organizations, is not regularly performed under emergency conditions and therefore radiation protection measures are not based on realistic dose predictions.

- The exercise of taking samples and carrying out dose rate measurements with the aid of the measuring vehicle after a severe accident is not performed under realistic severe accident conditions. During that exercise people do not wear protective clothes and respiratory protection while they have to enter areas with possible surface and air contaminations. Realistic times to perform the tasks are not known.
- After a severe accident, personnel from the chemistry department have to take environmental samples. However, they are not trained to do that job under realistic accident conditions (with protective clothes and respiratory protection). Realistic times to perform the tasks are not known.
- The joint exercise with the local hospital on transporting a hurt and contaminated person and the reception and treatment of that person in the hospital has not been performed since 20-06-2007. Currently there is no date fixed for an exercise.

Without regular training under realistic conditions for plant staff and staff from external medical emergency response organizations, they do not have the skills to accomplish non-routine tasks under emergency conditions and radiation protection measures cannot be based on realistic dose predictions.

Suggestion: The plant should consider ensuring that regular training under realistic conditions is performed by plant staff and staff from external medical emergency response organizations.

Basis:

NS-R-2

2.35. Site personnel shall be trained in the performance of their duties in an emergency.

NS-G-2.8

4.32. A training programme for emergencies should be established to train and evaluate plant staff and staff from external emergency response organizations in confronting accident conditions, coping with them and maintaining and improving the effectiveness of the response. Emergency preparedness exercises should be designed to ensure that plant staff and staff from other participating organizations possess the essential knowledge, skills and attitudes required for the accomplishment of non-routine tasks under stressful emergency conditions [7].

NS-G-2.7

5.4. Training for workers should cover all topics relevant to the radiation task assignments and the potential risks. Those who need to work in zones of high radiation levels should be trained in their specific work activities so as to enable them to perform their duties in the minimum possible time, in keeping with the principle of optimization. This could include, for example, training on mock-ups, rehearsing the planned work and practicing emergency actions.

5.7. Training on emergency procedures should be given periodically to ensure that all persons who would need to take action in an emergency know which actions to take.

Plant response/Action

More realistic exercises:

- During EPP exercises, mobile safety equipment is frequently used, the CLONAS fallback area is activated several times a year and the scope of simulated actions has been widened (flood equipment: mobile pumps, diesel generator sets, installation of sluice gates, etc.)
- Specific training on erection of sluice gates has been carried out on exercises dedicated to the topic of flooding.

Boosting of NPP/hospitals relations:

- Resumption of contact with hospitals
- A large number of discussions between the EPP coordinator, the NPP's medical department and hospitals.
- These resulted in a revisited agreement, to include regular exercises (frequency of every 2 years) and regular training sessions for hospital staff given by NPP doctors.

Implementation:

- The post-Fukushima OE oversight inspection by the nuclear regulator on 27, 28 and 29 June required the implementation of specific flood equipment inside the RCA. The unannounced exercise involved 2 people playing the PCD1 role (senior management decision maker) and part of the logistics and resources (PCM) organisation. The exercise was deemed generally satisfactory by the nuclear regulator.
- Non-radiological exercise with the SDIS off-site emergency services and hospitals. It was the first exercise since 2007 with emergency teams from regional hospitals. This exercise included a number of potentially contaminated casualties. Emergency teams were able to practise how to manage a potentially contaminated casualty. The station doctors took advantage of the day to provide a training visit of the medical department's decontamination centre.
- Finally, the onsite/offsite emergency plan exercise on 31.01.2012 with all public authority as well as EDF local and national-level actors. A serious nuclear crisis was simulated, with releases into the environment requiring initiation of the authorities' emergency plan with immediate sheltering of the local inhabitants within a 2km radius around the NPP. At local level, the teams used protective equipment as soon as conditions warranted it.

Future exercises:

- Manning of command centres on station-wide practical exercises.
- Unannounced practical exercises planned in 2012 during mobilisation drills.

IAEA comments:

A protocol has been formulated between the plant and hospitals in Grenoble and Vienne to confirm their participation in plant exercises. It also confirms the availability of medical staff

and facilities should the need arise as a result of an accident at St Alban. An exercise drill was held with hospital doctors in October 2011.

Personnel taking environmental samples after a severe accident are now required by procedure to wear the appropriate personal protective equipment and this has been and will be continuously exercised.

Risk assessments have been undertaken to ensure dose limitations and 'stay times' are known prior to any work being undertaken, following an accident.

Conclusion: Issue resolved

**SUMMARY OF STATUS OF RECOMMENDATIONS AND SUGGESTIONS
OF THE OSART FOLLOW-UP MISSION TO ST. ALBAN NPP**

	RESOLVED	SATISFACTORY PROGRESS	INSUFFICIENT PROGRESS	WITH- DRAWN	TOTAL
Management, Organization & Administration	1R	-	-	-	1R
	1S	-	-	-	1S
Training and Qualification					
Operations					2R
	2S	2R	-	-	2S
Maintenance	-	2S	-	-	2S
Technical Support					1R
	2S	1R	-	-	2S
Operating Experience					2S
	1S	1S	-	-	
Radiation Protection					2R
	1R	1R	-	-	
Chemistry					
	1S	1S	-	-	2S
Emergency Planning and Preparedness					2R
	1S	1R	1R	-	1S
TOTAL R (%)	2 (25%)	5 (62%)	1 (13%)	-	8
TOTAL S (%)	8 (67%)	4 (33%)	-	-	12
TOTAL	10 (50%)	9 (45%)	1 (5%)	-	20

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 to 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 VISIT

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 its 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 its having minimal impact on safety.

ACKNOWLEDGEMENT

The Government of France, and the plant staff provided valuable support to the OSART mission and OSART Follow-up visit to St. Alban Nuclear Power Plant. Throughout preparation and conduct of the missions, the staff of the nuclear power plant provided support to the IAEA Operational Safety Section staff and the OSART team. Team members felt welcome and enjoyed good cooperation and productive dialogue with the managers of St. Alban NPP. This contributed significantly to the success of the missions. The managers, and especially the team's counterparts, engaged in frank, open discussions and joined with the team in seeking ways to strengthen the plant's performance. The personal contacts made during the missions should promote continuing dialogue between the team members and the plant staff. The support of the liaison officer, host plant peer, interpreters and administrative staff was outstanding. Their help was professional and appreciated by the team.

LIST OF IAEA REFERENCES (BASIS)

Safety Standards

- **SF-1**; Fundamental Safety Principles (Safety Fundamentals)
- **Safety Series No.115**; International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources
- **Safety Series No.117**; Operation of Spent Fuel Storage Facilities
- **NS-R-1**; Safety of Nuclear Power Plants: Design Requirements
- **NS-R-2**; Safety of Nuclear Power Plants: Operation (Safety Requirements)
- **NS-G-1.1**; Software for Computer Based Systems Important to Safety in Nuclear Power Plants (Safety Guide)
- **NS-G-1.2**; Safety Assessment and Verification for Nuclear Power Plants (Safety Guide)
- **NS-G-1.7**; Protection Against Internal Fires and Explosions in the Design of Nuclear Power Plants (Safety Guide)
- **NS-G-2.1**; Fire Safety in the Operation of Nuclear Power Plans (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-2-10**; Periodic Safety Review of 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)
- **GS-R-1**; Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety (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 (Safety Requirements)
- **GS-G-2.1**; Arrangement for Preparedness for a Nuclear or Radiological Emergency (Safety Guide)
- **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)
- **GS-G-4.1**; Format and Content of the Safety Analysis Report for Nuclear Power Plants (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)
- **WS-G-6.1**; Storage of Radioactive Waste (Safety Guide)
- **DS388**; Chemistry Programme for Water Cooled Nuclear Power Plants (Draft 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
- **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

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-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)

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