



INTERNATIONAL ATOMIC ENERGY AGENCY

DRAFT REPORT OF THE
OSART
(OPERATIONAL SAFETY REVIEW TEAM)

MISSION

TO THE

BELLEVILLE
NUCLEAR POWER PLANT

FRANCE

9 TO 26 OCTOBER 2000

AND

FOLLOW-UP VISIT

13-17 MAY 2002

DIVISION OF NUCLEAR INSTALLATION SAFETY

OPERATIONAL SAFETY REVIEW MISSION

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PREAMBLE

This report presents the results of the IAEA Operational Safety Review Team (OSART) review of Belleville Nuclear Power Plant, in 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 20 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 eight operational areas: management, organization and administration; training and qualification; operations; maintenance; technical support; 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 Nuclear Safety Standards (NUSS) programme 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 Belleville Nuclear Power Plant from 9 to 26 October 2000. The plant is located in north-west of the Cher administrative department on the left bank of the Loire and on the boundary of the Loiret, Nièvre and Yonne departments. The site contains two PWR type reactors of 1300Mwe. The units were first connected to the grid in October 1987 and July 1988.

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; 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 Belleville NPP OSART mission was the 108th in the programme, which began in 1982. The team was composed of experts from the United Kingdom, The Netherlands, United States of America, Czech Republic, Spain, Republic of Slovenia, Brazil, Germany and Belgium, together with the IAEA staff members and an observer from Hungary.

Before visiting the plant, the team studied information provided by the IAEA and the Belleville NPP 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.

At the request of the Government of the France, the IAEA carried out a follow-up to the Belleville OSART mission from 13-17 May 2002. The team comprised of four members, one from USA, one from UK and two from the IAEA. Three of the four reviewers in the team had been members of the original OSART team. The purpose of the visit was to discuss the action taken in response to the findings of the OSART mission.

During the five days visit, team members met with senior managers of the Belleville Nuclear Power Plant and their staff to assess the effectiveness of their responses to recommendations and suggestions given in the official report of the Belleville OSART mission. The team provided comments on the responses, provided some additional suggestions for improving response actions and categorized the status of response actions. Definition of categories of response status and a summary of the results in a quantitative manner are provided at the end of this report.

MAIN CONCLUSIONS

The OSART team concluded that the managers of Belleville NPP are committed to improving the operational safety and reliability of their plant with the ambition to achieve the upper quartile performance of all plants within a few years. The team found good areas of performance including the following:

- The Belleville strategic plan and contract process, which converts corporate strategy to business plans and into contracts with managers and supervisors, although not fully deployed will enable the plant to engage all personnel and make significant steps forward in management effectiveness at all levels of the organization.
- Belleville management's current policy to enhance safety under one heading of risk analysis (risk management), within a quality framework. The new structure will combine industrial safety, nuclear safety and radiological protection. The concept of analyzing the risk in all tasks raises awareness and develops mitigation actions.
- Several operational approaches to enhance the quality of operators work, like; having one day dedicated to inform shift personnel on operational data and changes before returning to shift from the scheduled ten day break or annual leave; operation procedures containing logic diagrams which provide control room operators with a clear vision of the overall evolution.

The OSART team observed that several other good initiatives to improve operational safety were taken during the last three years. The timely preparation for the OSART has engaged management and staff to improve in several areas. The team raised a concern that these activities may not continue when the prospective of the visit is no longer a feature. The team encouraged the plant to consider extending the content of the OSART preparation project into the established normal line organization and management processes.

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

- The need to establish and reinforce management standards and to ensure that personnel internalize the standards and comply with them routinely as a part of normal daily work.
- The need to develop a questioning attitude within all departments and at all levels to ensure that actions and activities are challenged from a safety perspective as a matter of routine.
- The need to improve radiation protection practices at the plant to ensure that policies and procedures in this area are followed as a matter of routine. Examples are; identification of radiological hazards, application of appropriate contamination control practices and strengthening the adherence to ALARA principles during normal operation.

Some of the good initiatives taken by management have not yet shown result in the field and some of these were not fully understood by staff. Closing the communication gap between staff and management by more effective management presence in the field should hasten the achievement of plant targets.

The plant had requested the team to do focused review of Industrial Safety and Work Management. The team proposed several possible actions to improve in these areas, reported in the Management, Organization and Administration and Maintenance parts of this report.

Belleville 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.

FOLLOW-UP MAIN CONCLUSIONS

The follow up team received excellent co-operation from Belleville staff and was impressed by the progress that the plant has made since the OSART mission in October 2000. In all discussions the Belleville staff were open and straightforward, and exhibited a desire to move forward and further develop their plant. The willingness of plant management to consider new ideas and implement operational safety changes are a positive indicator of the high potential of this plant to achieve continued future success. In all cases, agreement was reached with the Belleville management on the assessment of the actions implemented.

The plant has done a thorough analyze of all the recommendations and suggestions offered by the original OSART team and has effectively responded and implemented operational safety improvements that will further enhance the safety of the plant. The team would like to highlight some of the areas where good progress was observed, as follows:

- Key to the Belleville management's response to the OSART recommendations and to the successful response in many areas is the Strategic plan and Business plan arrangements adopted into the normal "way they do business" at the plant.

Operating first of all top down the senior management team set strategic direction for Belleville aimed at the plant being in the top 20 in the world by 2005. The management team took into account all factual information from stakeholders in providing key goals in three specific areas, Operational Safety, Competitive Strength and the Environment. Communication at all stages of the process ensured staff were aware of the key issues.

Help from staff in natural work teams was requested in a bottom up approach to provide the tactics or actions to achieve the strategic goals. All suggestions were considered and most were adopted, reasons being given for those that were not. The strategic aim of incorporating many small victories to achieve the goals was the approach adopted. Communication of these "victories" has been an important part of the recognition of staff involvement.

Ownership of the actions is evident in staff interviews. It is estimated that of the order of 85% of the staff are very supportive of the management approach for Belleville.

This activity has been instrumental in improving motivation and commitment on the site, which in part will have contributed to the significant improvement observed in many areas of the operation of Belleville since the OSART mission. The adoption of this structured approach to the future of Belleville and the involvement of the management team and site staff deserves to be recognised.

- Senior plant management is demonstrating a significant overall commitment to raise the standards in the working processes as well as in the plant material condition. Several commendable initiatives have been either implemented or strengthening to better coordinate the work process through the TEM organization, reduce the low-level defects through setting up an effective organization for reporting, allocating recourses and effectively deal with the defects. The follow-up team's discussions and field inspections confirm that Belleville has reached good results and some of the success factors are the broad involvement of staff in developing the initiatives and their adoption of the new standards.
- The further development of the risk assessment process since the OSART mission and specifically its integration into one organisation with radiological protection, nuclear safety, industrial safety and quality has contributed to this important methodology becoming part of

every day work. Several examples of risk assessments reviewed were considered to be comprehensive and owned at the worker level. Many of the risk assessments are undertaken by the craft personnel and only reviewed by management if the risks are considered to be significant. The risk assessment process is seen as a significant contributor to improvements in Belleville's performance indicators in areas such as industrial safety and contamination control.

- Following the OSART mission, EDF approved the building of a full scope simulator at Belleville. The full scope simulator is scheduled to be complete in October of 2002 followed by a testing program with training starting in early 2003. The full scope simulator will provide additional training opportunities and realism. The follow-up team was impressed by the effectiveness in realizing this decision, giving the possibilities for the Belleville staff to further improve their professionalism and the operational safety at the plant.

The follow-up team also likes to highlight some areas where the plant needs to pay more attention on the way to reaching its vision:

- The plant has implemented several activities to improve its FME approach. The follow-up team recognised several of these to be in line with plant's expectations, such as performed risk analyses, procedural instructions and precaution signs at areas as the fuel pool area unit 1, which also was set up as a model area. However, during inspection of the pool area, five small objects (two small lamps, a loose padlock, small stainless steel hook and a small plastic cover) were found close to the fuel pool on unit 1. Thoroughness in implementation and common understanding of the FME approach is essential to reach success.
- Although standards at Belleville have improved since the OSART mission, given the target of being in the top twenty of world plants, there is a need to expose staff to those higher standards to which the plant aspires. Linked to this, if further benefits are to be gained from the adoption of a questioning attitude there is a need to ensure that staff recognise and have internalised the high standards as the basis of their questions. Exposure of staff to these standards is best achieved by benchmarking with plants which operate to these standards as the norm. International benchmarking provides the optimum way to remove this potential limiting factor to further improvements for Belleville in the future.
- While there are many benefits from EDF being the largest nuclear organizational structure in the world, there are also specific challenges to progress at a individual site like Belleville. The OSART team and the follow-up team observed several instances of corporate inertia slowing progress toward resolution of issues or implementation of new good ideas and modifications. The team believes that Belleville must take into account the potential of delays that accompany a large corporate structure like EDF.
- In order to establish effective monitoring of the surveillance programme the plant started to trend some of the surveillance test results. However, the percentage of the trended results of surveillance tests is still limited and clear policy on increase of trended results was not yet displayed. Because the trending is one of the basic effectiveness monitoring tools, the team encourages the plant to achieve further sustainable progress in this area, which will enhance plant staff confidence in their reliance on performed surveillance tests when taken out of the safety trains of any reason.

A statistical analysis of the status of the 24 recommendations and 9 suggestions identified in the OSART mission in October 2000 shows that 39 % were resolved, 58 % were making satisfactory progress and 3 % (one issue) were making insufficient progress. Several of the resolved issues were

category specific and limited in scope. The remaining issues are in many cases related to needed cultural changes and will need more effort and attention to be resolved.

1. MANAGEMENT, ORGANIZATION AND ADMINISTRATION

1.1. CORPORATE ORGANIZATION AND MANAGEMENT

Belleville is a two unit 1300MW(e) PWR plant operated by Electricity de France (EDF) situated on the Loire in the centre of France.

The EDF corporate organization consists of major departments providing technical, engineering, training and human performance support to all EDF nuclear plants. The corporate strategy aims at maintaining a consistent design basis, common policies and standards on safety, including support resources.

Corporate policies provide clear statements to the plant director on his responsibilities for nuclear safety. Corporate provides the necessary resources to support the safe operation of the Nuclear Power Plant (NPP). Major programmes to resolve plant problems are separately financed from corporate funds.

The Belleville plant director enters into a management contract with the Director of the Nuclear Division. Corporate support and expertise comes from both the corporate operational units (engineering, laboratory group, technical support) and the expertise and support departments (industrial safety, nuclear safety, budget and finance). This support is transparent, expedient, and timely although occasionally it limits development at Belleville for the sake of maintaining common approaches for the fleet. However, since this is supported by risk probability arguments it should not impact nuclear safety.

The beginnings of a deregulated market for electricity in France (not as mature as the markets in other parts of Europe) have brought about an enhanced focus on costs, which is necessary to support the business. Despite this relatively new challenge for EDF, emphasis on nuclear safety still appears as its number one priority.

1.2. PLANT ORGANIZATION AND MANAGEMENT

A flattening of the organization has taken place at Belleville and its organizational structure including its functional arrangements is clearly established. There is clear line accountability for decisions and actions in support of the plant with guidance from advisors who are responsible for the quality of their advice but have no line accountability. Three levels of work are identified in the structure, level 1 deals with strategy, level 2, handles tactics and implementation, level 3 does day to day work. Currently there are 653 EDF personnel on site.

The management of the site is based on a meeting structure on the three levels. The first level is the "Senior Management" made up of the plant director and deputy director who are ultimately the decision making body for the site. Supporting them is the management team (Equipe de Direction), which is made up of the directors with the senior advisors (Chef de Mission). This body is the strategy and policy formulation body. To translate policy and strategy into action plans for the site involves the line department heads (Chef de Service) in an implementation meeting (College de Direction). Department implementation meetings with the section heads and in some cases the workers develop detailed supporting activities.

The Belleville strategic plan based on corporate guidance, forms the basis of the annual "contract" agreed between Belleville and Corporate in which clear goals and objectives for safety and performance are set based on eight guidelines. Belleville has translated these into a plant target of achieving industry upper quartile performance.

The eight guidelines form the basis of on site contracts between the heads of service and the senior plant management; the contracts contain negotiated targets, which, once agreed, are signed onto by

both parties. Some departments involve staff to formulate these contracts. The functioning of the plant structure is governed by these 'management contracts' between all levels. The contracts form the basis of the accountability process, which includes a formal review with the plant director, every six months and monthly departmental reviews.

Some personnel from all levels demonstrated a clear understanding of Belleville's goals and objectives and their connection to the management contracts. These people also understood and supported the linking of these contracts to personal interviews. Although currently not fully deployed there is a strong intent to involve all personnel by the end of 2001.

This "management contract" process has been described as a good practice at a previous EDF plant OSART (Golfech). However, Belleville is now extending the process to engage all personnel on site. Although not formally designated a good practice, the team wishes to strongly encourage the continued use and development of this process, which they consider will be key to future site progress.

Despite this however the team noted a lack of a questioning attitude at all levels of the organization towards conditions and practices which did not meet appropriate standards. Linked to this is the fact that standards are not well established in many areas. The team has recommended the Belleville management address these issues on a priority basis since their resolution is essential to the continued positive development of the plant.

The site has recently defined a project way of working designed to bring the functional groups closer together. The basic project is "The Outage" for which one of four project leaders is nominated. A second project was the recently introduced (June 2000) Tranche en Marche (TEM) the objective of which is to manage the plant operating periods in a similar way to "outage" such that the same processes apply to each. Within the project working arrangements the plant appoints a project manager who reports directly to senior management. For the outage the Project leader is responsible for the Duration, Cost, Safety, Industrial Safety and RP. For the TEM project the Project leader, the operations department manager, (assisted by one of the four project coordinators) is responsible for similar functions with the exception of RP. The team encourages the plant to continue this project style of working and in particular, to continue and strengthen the TEM activities as this will lead to beneficial improvements in work management arrangements. The team noted some lack of effectiveness in the existing work management process and has recommended improvements to the present TEM arrangements in the maintenance section of this report.

Day to day work activity on the site is governed by the work management meeting but the management over view of plant operations is undertaken by the two-weekly COMEX meeting, which is attended by most Belleville managers and is chaired by the deputy plant director. This meeting is the key decision making body for actions regarding safety, operation and work management for the plant.

Nuclear safety issues are debated at the GTSR meeting, which has similar representation to COMEX. It meets five times per year to consider changes to plant or procedures, which could affect the technical specifications. "Special" meetings of this body can be called at short notice to address urgent plant issues. A unique (to EDF) meeting called RSPR is held weekly as an information exchange body at which all departments represented at manager level discuss safety events from the department. The deputy plant director chairs the meeting. Lasting only one hour, each department is given a brief period to speak followed by a short discussion on the learning points for all. The independent safety engineer is always the last to speak to give a site over view. The team encourages Belleville to continue this meeting as it represents a good platform from which to advocate the site safety ethos and to launch new safety initiatives.

A further and important part of the management meeting arrangements is the CHSCT, which involves union members and covers Health and Hygiene. This committee meets three monthly. The meeting chaired by the deputy director has Union, EDF, “works” doctor and “works” inspector representatives and successfully contributed to the management of asbestos and legionella at Belleville.

The plant director reviews the performance of about 45 – 60 personnel each year for consideration of development and promotion. The department managers do appraisals for people lower in the structure; to date about 75 – 80% have been completed this year. In general the age profile does not seem to be an issue. Even so, some departments have identified specific recruitment policies to mitigate a possible problem during the 2005 – 2010 period.

A key issue for the plant is the introduction of the 35-hour week followed by a 32-hour week. In order to complete the same amount of work an extra 45 personnel will be needed whereas the 32-hour week will mean a further 30 people. With natural wastage over the period this will result in an additional 20 people on the site. In recruiting personnel a key feature is their competence (both technical and personal) for the roles the requirements for which are set down in a comprehensive set of job descriptions.

Nuclear safety policy is established at Belleville. It is a focus of the strategic plan and the contracts. Belleville management is very keen that the policy is transparent, because they have a good relationship with the DSIN (see section below).

Belleville management’s current policy is to enhance safety under one heading of risk analysis (risk management), within a quality framework. The new structure will combine industrial safety, nuclear safety, and radiological protection under one group known as Quality, Safety, Risk Prevention.

The concept is that by analyzing the risks in all tasks, awareness is raised; mitigating actions developed, and changes to the task activities initiated resulting in lower numbers of accidents and significant events. The process requires that before each job a risk assessment is carried out by planning, the worker, and supervisor and any changes to the work procedure initiated before work commences. The team noted this process was not consistently applied by all work groups. The team encourages the Belleville management team to apply increased attention to the field performance of the process and to continue this initiative targeted at improved safety and reduced industrial injury and has recognized it as a good practice.

In support of safety performance there are agreed management observation programmes. These generate corrective actions, which are tracked using a Lotus Notes programme. A review of the actions indicated a high proportion (84%) were completed to time, however the team noted that despite this, less than adequate material condition and performance standards exist in the field in some areas.

The Lotus notes action tracking programme, which was adopted initially for the OSART project is now used more widely for many action tracking tasks. The team encourages the further development of this programme to enhance its functionality and encourage its use by all departments.

In support of safety, Belleville has an active engineering department who link with a corporate level committee (Comité Technique d’Exploitation) to decide whether to carry out only those modifications showing a positive result in terms of safety. To guarantee the quality of execution of any modification, it is usual that a prototype be implemented on a unit (not necessarily at Belleville). This gives rise to

operating experience feedback based on which the modification can be progressed with confidence on the EDF fleet. For modifications at Belleville the plant management have to be satisfied that the change is beneficial. If it is not satisfied, the site can refuse the modification.

On a wider perspective Belleville considers operating experience from other French reactors and from reactors around the world to ensure it addresses best practices. Operating experience is shared on the site. The team encourages Belleville management to enhance this programme so as not to miss significant learning opportunities.

The team also believes that the plant's intensive OSART preparation characterized by the significant clean up of plant and equipment, recent introduction to some employees of standards targets and goals and the production of a number of documents and changes completed just before or in progress during the OSART may not be sustainable in the post OSART period. The team encourages the plant to develop and support the initiatives in the management processes depicted above since they are key to maintaining the improvement process that the plant has started.

1.3. QUALITY ASSURANCE PROGRAMME

Belleville has a strong QA audit programme, which undertakes between 6 and 8 audits per year. A long-term programme exists to ensure departments are not audited out of sequence. The management can request special audits at any time. The audit recommendations become corrective actions, which are formally tracked in the Lotus notes programme. Currently corrective action discharge is at an acceptable level compared to nuclear plants worldwide.

The existing quality assurance manual is being revisited and a new QA Manual structure is being developed to recognize the process approach being adopted within EDF. Ten processes have been identified and a flow chart approach is being used to clarify the process and interfaces. Personnel at all levels are being consulted in the development of this process approach and the European Foundation for Quality Management (EFQM) model is being used to conduct self-evaluations of the processes during their development. To date Radiological Protection, Fuel handling and the Modification Process have been completed and it is expected that the total completion of the task will take between 2 –3 years. The approach will require all documents to be reviewed and redrafted in a new format. The communication of this approach is at an early stage as it is intended to see some benefits first so that it can be demonstrated as a value-added activity. The team encourages Belleville to continue with this approach.

Despite this new QA process being applied to radiological protection the team has noted significant shortfalls in the performance of that function in the field and the plant is encouraged to ensure that the effectiveness of the programme is assessed with respect to the standards and values being used (are they sufficiently challenging) and the impact on field performance.

1.4. REGULATORY AND OTHER STATUTORY REQUIREMENTS

The organization of the regulatory arrangements is clearly understood by the management of Belleville. Established links exist between the regulatory body at national level (DSIN and EDF) and at local level (DRIRE and Belleville plant). At local level the regulator also monitors environmental and industrial safety.

The regulator makes about 20 formal inspections per year and additionally might make 1-2 special visits following events. This compares very well with other EDF plants (about the average). Following formal visits reports are made requiring formal close out with the plant.

Examination of the files indicated that actions were closed out to time. The regulator had no outstanding issues with Belleville.

In parallel with the formal inspections members of the regulatory staff were in contact with the plant daily and made visits about once per week.

Regarding the recent Dampierre problems (the same regulator was involved) an assessment by the regulator was made and a conclusion reached that no evidence of the Dampierre problems were found at Belleville.

The regulator explained their role in the emergency arrangements and confirmed that Belleville met their expectations in this area.

Overall the regulator confirmed that the relationship with Belleville was very professional and gave him no cause for concern. He hoped that the relationship would continue.

1.5. INDUSTRIAL SAFETY PROGRAMME

The Belleville industrial accident frequency rate over the past two years (1998 and 1999) has been above 2 industrial safety accidents per 200,000 hours. This is significantly worse than the industry norms and does not approach the targets the plant aspires to. Further from 1990 it has been trending up (the 1998 and 1999 figures dominate this trend.)

Belleville management's current policy is to enhance safety under one heading of risk analysis (risk management), within a quality framework. The new structure will combine industrial safety, nuclear safety, and radiological protection under one group known as Quality, Safety, Risk Prevention. Although a process for nuclear risk assessment has been practiced for several months this process is now being extended to cover industrial safety also. (Belleville has a target of zero injuries).

The team recommends the management to further advocate this policy along with taking measures to convey its sincerity in improving plant conditions with respect to personal safety by ensuring that industrial safety is a key topic when they talk to staff in the field and that staff recognize this as more than just "telling me to put my hard hat on".

1.6. DOCUMENT AND RECORDS MANAGEMENT

No clear consistent document management policy exists on Belleville site. Documents are currently managed centrally but then devolved to 41 satellite centres based on the department organization. Each department manages its own documents and in some cases, document amendments are not completed in good time. However to mitigate this a policy of hand written amendments exists to ensure that the plant is operated to the most up to date information. This does not meet world best practice.

The document management system has no valid performance indicators with which to estimate performance or to provide a basis for managing improvements. A recently developed document audit process has just been deployed and will help to provide confidence that the document system is meeting objectives.

The team strongly encourages Belleville management to develop and deploy a consistent document management policy and to check its effectiveness periodically.

STATUS AT OSART FOLLOW-UP VISIT

The OSART team identified five issues in the MOA area, four supported recommendations and one a suggestion. The OSART follow up team judged that three recommendations were progressing satisfactorily and one was resolved. The suggestion was resolved.

Key to the Belleville management's response to the OSART MOA recommendations and to the successful response in many areas is the Strategic plan and Business plan arrangements adopted into the normal "way they do business". The process was top down for strategic direction and bottom up, involving most of the staff to identify specific tactics to deliver the goals. The strategic direction provided a vision of Belleville being in the top 20 plants in the world by 2005. The consistent communication of this message supported by the recognition of staff involvement is contributing to motivation of the staff to improve plant performance.

By definition management organisation and administration issues generally have long term solutions. However significant progress in risk assessment, management presence in the field, training, the use of "model" areas to address house keeping and material condition, the reinforcement of a questioning attitude, and the demonstration of clear management standards and expectations have all contributed to significant station improvement.

An area of concern related to the adoption of a questioning attitude was identified in the approach to FME which was not at the standard to which the plant aspire. Other than this the use of this important technique to enhance safety seemed to be well consolidated.

Clear management standards and expectations have been set which have contributed to the station improvements in housekeeping and material condition. The development of booklets for all site personnel, the presence of management in the field, at training courses, and in cross department meetings have all helped communicate these standards. Further improvement may be limited by not utilising international bench marking to expose staff to the high standards aspired too.

The thrust of Belleville's OSART preparations have formed an integral part of the input to the strategic and business planning process which is now consolidated into the way business is conducted.

The area of industrial safety is particularly worthy of note, where staff in work teams have made significant efforts to improve the results obtained. The key way now available for further improvement is to bench mark very high performing plants.

The holistic approach to document control introduced at Belleville ensures that documents are reviewed in a planned way and that the review conducted is "transparent" and to acceptable time scales. The process incorporates a fast track arrangement to ensure that, if necessary, quality assured documents can be delivered to staff at short notice to meet the needs of plant activities.

DETAILED MANAGEMENT, ORGANIZATION AND ADMINISTRATION FINDINGS

1. CORPORATE ORGANIZATION AND MANAGEMENT

1.1(1) Issue: The development of a questioning attitude within all departments and at all levels is not yet sufficiently mature to ensure that actions and activities are challenged from a safety perspective as a matter of routine. Managers contribute to this by not consistently questioning inappropriate practices and standards during plant visits. Examples are:

- Some areas of the plant such as the cooling water pump house, the main steam isolation valves area on unit 1, and areas of the turbine hall basement do not exhibit the housekeeping and cleanliness standards typical of plants in the industry upper quartile. A plant wide housekeeping example is the large number of isolation locks left on plant items rather than returning them to the lock boxes provided strategically around the plant.
- When taking a safety train out of service for testing operations personnel do not routinely test the opposite train to demonstrate its capability to meet its safety duty. Although this is currently in compliance with the operating instructions it does not meet international best practice.
- Plant labeling is of poor quality, broken or occasionally missing and in many places supplemented by black marker pen on the plant item. In one case, the unit 1 diesel train black marker pen was used to annotate the electrical panel because “the operator needs the information close to the panel instrument”.
- The use of clear polythene bags on the fuel pool level does not comply with international best practice. If clear bags fall into the pool they cannot easily be seen making recovery difficult, and can block fuel element cooling flow.
- A number of plant leaks were identified, which were not previously identified by the plant, using the defect identification process. Some of the leaks such as those in the containment spray pump areas were from the primary circuit and were characterized by boric acid crystals at the leak site.
- A manager crossed a safety barrier (painting in progress – wet paint) preventing access to the cooling pool area on unit1 in order to get to the pool area. However access was not possible because of painting work on the route. Although a discussion took place regarding the risk posed by wet paint (which could be considered as constituting a risk assessment) such action by a manager can send signals to the plant staff that crossing barriers is an acceptable practice.
- An inspection team entered the unit 2 pool cooler room, a hearing protection area, without hearing protection. A manager accompanied the team.
- A group of workers in the waste handling building employed slings and a grab which were not within their testing and certification period.

A lack of rigor in routinely questioning inappropriate low level or inconsequential practices encourages behaviors, which if not addressed could lead to significant event precursors not being challenged. In some cases the importance of regularly questioning issues may not be routinely communicated in a way that emphasizes its contribution to continuous improvement in nuclear safety and the learning environment.

This lack of a questioning attitude across all areas of the plant is a significant contributor to the culture of not correcting deficiencies in housekeeping and material condition in various areas of the plant, the lower than expected work management performance and the non-compliance with some instructions.

In making the following recommendation and supporting suggestions the team noted a link between this issue and a perception that some personnel are adverse to taking responsibility for issues outside of their work area (i.e. “its someone else’s job”).

Recommendation: The Belleville management should reinforce the need to adopt a questioning attitude by all staff in all aspects of daily work. The team suggests that one approach could be to widen the scope of the risk management process in order that it specifically and continually raises awareness about the need and benefit of adopting a questioning attitude at all times and by all staff.

The team also suggests that over a short timescale but commensurate with the need for normal operation all plant staff should receive training on the risk analysis process and its links to asking the right questions. Further over a specific short period following this awareness raising training the staff, in teams, should be encouraged and recognized for identifying and taking actions to correct deficiencies both on the plant and in plant processes. Management needs to be visible in ensuring that identified improvements are acted upon in a timely manner in order to demonstrate their commitment and support for continuous improvement activities.

Plant Response/Action:

In order to reinforce questioning attitudes on a daily basis, the strategy that has been adopted is designed to tackle root causes. The site has thus made progress in the following complementary areas: manager behavior, development of a ‘risk-assessment’ culture, staff motivation and acknowledgement of their attitude.

Since the OSART mission, management presence in the field, welcomed by the OSART team during the review, has been reinforced even further. Managers have realized that their behavior needs to be exemplary and thorough. Today, every manager aims to spend 20% of his time in the field, in order to be in closer contact with the teams, explain expectations, point out what is allowed and forbidden, listen to problems encountered by staff, respond to these problems, and give tangible signs of commitment.

Managers have a duty to set an example, and now have the opportunity to demonstrate their responsiveness when unacceptable deviations are observed.

Furthermore, senior management plant inspections scheduled within the various departments now supplement the program of management presence in the field.

Managers have stepped up their commitment towards and support of activities intended to bring about ongoing progress. The main improvements have been made in the site’s two major processes (or projects): The Power Operations Project and The Outage Project.

- The Power Operations Project works according to a set of rules used to prioritize work requests, which are now properly complied with and monitored using management indicators.
- Outage planning and proceedings were also greatly improved in 2001, thanks to a certain number of innovations resulting from the effective use of experience feedback from

contractors, staff suggestions and external benchmarking activities. Supported by managers, these ongoing improvements enabled us to complete a simple refueling outage within the shortest time ever recorded by any French nuclear power plant, while achieving satisfactory operational and industrial safety results.

Questioning attitudes have also been enhanced thanks to a risk-assessment initiative which has been extended to most areas, and which has been deployed at all staff levels, beginning with the senior management team. Above and beyond the mere formalities, it is the meaning behind the concept, which has been widely enforced. Line management deploys the principles within the departments, in terms of expectations and professional enhancement of cross-functional analysis coordinators. A risk-assessment representative has been appointed within each department. The whole of line management, right down to first-line supervisor, has been made aware of the issues at stake. Skill development needs have been defined (to date, approx. 60 persons have been trained in cross-functional risk-assessment, with about forty more due to be trained in 2002). Naturally, it is the Power Operations Project and Outage Project that will reap concrete benefits from this initiative.

Questioning attitudes have also been enhanced in the areas of monitoring and plant upkeep. A long-term organizational structure is in place, with a manager responsible for coordinating the departments involved. A supervisory and reporting system has been set up to enable the senior management team to assess the efficiency of the defect identification, collation and processing system, on a regular basis

Staff motivation is maintained by means of various tools: ownership (designated owners of plant areas); model areas within each department to provide motivation; training in deviation identification techniques (80 persons have been trained to date).

As of this year, the motivation and acknowledgement of work teams having identified deviations and taken corrective measures, either on the plant itself or with regard to processes, are based on a more comprehensive system for the collation and processing of staff suggestions. Any worker may put forward a suggestion and take part in its processing phase, in contact with his line management. The best suggestions are selected for inclusion in the yearly challenge, where the best ones are rewarded.

A challenge was organized at the end of 2001 during the Unit 1 outage, in order to reward those teams which best addressed industrial safety hazards on their worksites. This challenge, particularly appreciated by our contractors, was instrumental in highlighting good practices, correcting gradually encountered deviations and in showing all EDF staff as well as contractors how seriously risk-prevention was taken by management.

In addition, a system of acknowledgement has been devised in order to improve industrial safety. It encourages each worker and each team to participate and take initiatives in risk prevention, within the scope of their professional activity. This motivating tool is used to gauge and highlight progress made in this area, both in terms of results achieved and the ways of achieving them.

Managers are now reinforcing their commitment towards and support of ongoing improvements, through a higher standard of deviation analysis (events or incidents in particular) and through the more thorough monitoring of corrective actions. Department action plans and commitments are closely monitored by senior management committees, using performance indicators as a tool. In January and February of 2002, senior management carried out checks specific to this subject. It should be noted that for the second year running, no

notable observations were made in this regard, following inspections carried out by the Safety Authority.

IAEA comments:

The use of an improved risk assessment and risk management process reinforced by managers present in the field is seen as a significant contributor to Belleville's enhanced use of a questioning attitude by plant staff.

Supporting the use of risk assessments is a key task of managers when undertaking plant inspections. Their main role is to listen to staff and be more demanding about acceptable standards and to encourage staff to question anything they feel is not meeting acceptable arrangements. Personnel questioned confirmed that managers were effective in this intent. Management tour report forms reviewed also indicated where issues had been raised and evidence indicated that greater than 85% of actions arising from the tours were cleared to time.

The whole risk assessment process is supported by 10% of staff currently trained to undertake risk assessments with a firm intent to increase this to 15 % before the end of the calendar year. Once trained staff are then available to train others so enhancing the plants capability to further use this process.

Several examples of risk assessments reviewed were considered to be comprehensive and owned at worker level. Many of the risk assessments are undertaken by the craft personnel and only reviewed by management if the risks are considered to be significant. Examples of radiological risk assessments confirmed this approach.

The risk assessment process is further reinforced by the integration of risk assessment representatives in each department. These positions are instrumental in achieving better cross functional risk assessments.

Questioning attitude and the related deployment of risk assessments has been enhanced through the scheme for ownership of plant areas known as models for the remaining parts of the plant. This scheme has engaged the enthusiasm of many individuals for the plant and has contributed to staff motivation. Examination of several model areas indicated a significant improvement in the plant since the OSART mission. Expansion of the scheme by emulating the plant improvements on a wider scale will bring about significant benefits for Belleville. One model area did not fully support a questioning attitude in that several FME issues were noted in the fuel pool area, even though this was a specific issue raised by OSART.

Conclusion: Satisfactory progress to date

1.1(2) Issue: The establishment and reinforcement of management standards is not appropriate to ensure that personnel internalize the standards and comply with them routinely as part of normal daily work. Potentially contributing to this within some work groups is the lack of appropriate routine communication on work standards. Further, the plant intent is to be in the industry upper quartile of performance indicators. As the plant is currently approaching these performance levels in some areas such a target may not be sufficiently stretching to motivate the staff to achieve the plant's realistic potential. Some examples are given below:

- In many parts of Belleville plant floor surfaces are not level, and steps are introduced. Marking the edge of the step with a high visibility strip is common practice at high performing plants around the world but it is not the standard adopted at Belleville. This links to the industrial safety issue as many of these events were characterized as trips and falls.
- Appropriate fixing points are not all provided in order to afford an anchor point for moveable lifting beams (against the potential for seismic activity), in one case a beam was chained to a cable tray.
- Chemical storage in the warehouse does not conform to best international practice and at worst could be considered to pose a hazard.
- The extensive use of wooden supports and scaffolding boards within the radiological controlled area adds to the fire loading and does not comply with world best practice as wood is difficult to de-contaminate.
- Although smoking areas are provided in the plant, in many areas there was evidence (cigarette butts) that smoking was practiced widely outside of these areas. (This could also be a contributor to fire hazards).
- In operations there were no independent plant status checks following safety significant activities such as valve line-ups. World best practice provides for an independent check of such tasks to ensure confirmation of plant status to the control room operator.
- Inappropriate signage and a lack of barriers leads to staff unnecessarily entering radiation fields particularly during the operating phase of the units.
- Maintenance management standards regarding plant defects and the use of defect tags are not clearly expressed. As a result the plant exhibits a significant number of leaks and poor housekeeping areas.
- Maintenance and operations activities in the fuel pool area do not meet international standards in respect of mitigating foreign material exclusion.

An expectation to achieve high standards as expressed in the site strategic plan and disseminated via the management contracts when the actual standards have not been clearly established, communicated and demonstrated by management action leads to confusion among the plant staff. Without the necessary guidance inconsistent, inappropriate and in some cases unacceptable standards will be adopted by default. Such standards can result in performance that does not meet management intent and could lead to undesirable events or industrial accidents.

Recommendations: Plant management staff should adopt a phased strategy to deploy the high standards they wish to emulate.

The team suggests that to initiate this, managers should routinely take part in benchmarking visits to high performing plants where they would be exposed to these standards. To support the phased introduction the senior managers could set up a focused plant project sponsored by a senior manager and with a credible project leader. In order to make continued progress and convince the staff as a whole that standards must be raised, the project programme should ensure some “early wins”. These could form the basis of a staff communication campaign centred around managers taking every opportunity to advocate these standards particularly when undertaking plant visits. As the project continues possibilities to expose other staff such as middle managers, supervisors and workers to the standards achieved at other plants should be considered.

For plant based standards such as housekeeping and material condition consideration should be given to focusing initially on raising one specific area (for example the turbine hall basement unit 1) to high standards of excellence as a model for all other areas.

Plant Response/Action:

Belleville NPP has reinforced and clarified a number of standards: plant and material condition, quality of job closeout, monitoring of personnel and equipment contamination at RCA exits and a ban on smoking in industrial areas.

Each of these standards have given rise to the establishment of simple rules, clear signs, as well as briefings or training sessions for plant and contractor staff, with the main objective of explaining and standardizing expectations. The requirement concerning RCA exit checks was given particular attention and appropriate signs were set in place. An information campaign conducted in September 2001 helped to promote each of these standards. A booklet listing current plant regulations was published and widely distributed to plant personnel and contractors.

About 80 plant staff members attended a number of training sessions on the subjects of plant and material condition and field observation techniques, conducted by IAEA experts in May/June 2001. These principles have been deployed within the work teams. Since the beginning of 2001, whenever a plant condition, housekeeping, or industrial safety deviation is identified, it is entered in a ‘Minor Daily Task’ logbook located in the control room, written up on a ‘deviation report sheet’ or directly reported via voicemail. Each deviation is then analyzed and processed as quickly as possible by the Minor Maintenance Team. This system is monitored by indicators and a regular report is submitted to the Plant Operations Committee (COMEX). Managers conduct a number of field inspection tours in order to identify further deviations and monitor the system’s effectiveness. Written reports are produced in order to keep track of these field inspection tours.

Plant staff and line management have undertaken to step up their presence in the field, by ridding themselves of certain administrative tasks, reducing the length of meetings through better preparation, and by scheduling the time they spend in the field. The main aim is to explain and monitor expectations, and listen to staff comments. During these plant tours, each behavioral deviation or violation of requirements is immediately taken up with the person concerned, and he is given an explanation and reminder of expectations. In addition, the role of Contractor Monitoring Supervisors has been clarified with a view to refocusing them on the

essence of their craft, i.e. monitoring workers in the field. They use a specific job-monitoring document, which forms part of the Monitoring Supervisor's 'tool kit'.

The field inspection program has been enhanced by tours arranged as part of a risk-prevention challenge during outages, and by staff tours intended for the critical observation of work situations, notably compliance with requirements, and for the proposal of possible solutions. As an example, the implementation of a risk-prevention acknowledgement scheme is an effective means of promoting ongoing progress in risk-prevention practices. The implementation of a proposal scheme has proved effective in dealing with field concerns at the appropriate level.

New forums for discussion and exchange with staff are a useful means of communicating on the subject of standards, identifying concerns and expectations, as well as gathering proposals for making improvements. Monthly meetings with management, frequent meetings between senior management and workers, the establishment of a strategic plan with first-line managers followed by a medium-term plan with plant staff, provide a number of opportunities for conveying and reiterating rules to personnel.

Similarly, numerous meetings are arranged with contracting staff. Special outage arrangements, with a reminder of the associated requirements, are systematically presented to workers prior to outage. Since October 2001, they are required to take knowledge tests on the subject of risk prevention when they arrive on site. This provides an opportunity to supplement their training and remind them of plant expectations if any shortcomings are identified. The creation of a Risk Prevention challenge during the last outage was also useful in checking that standards were properly applied in the field, reiterating expectations and correcting deviations where necessary. This challenge was effective in highlighting the good practices of some companies. Lastly, weekly meetings are held with contractor company managers and monitoring supervisors in order to conduct a risk-prevention review of the past week, and address any problems raised by contractors.

The various expectations with regard to risk prevention are also mentioned in risk-prevention/radiation protection training sessions. A training worksite has been set up to exhibit these expectations and train staff in the use of appropriate work practices and in the use of personal protection and monitoring equipment.

The site intends to bring all plant areas up to the highest international standards of housekeeping and material condition. Each department has chosen one or more model areas in which these standards are applied. This principle will eventually be applied site-wide by gradually being extended to more plant areas.

A benchmarking and exchange program with other sites or other businesses has been successful in identifying areas for improvement by the plant. This program mainly concerns radiological cleanliness, risk-prevention management, the proposal system, outage management and the environment. Approximately 40 plant employees are involved in a corporate working group called the Power Operations Network (TEM), whose aim is to disseminate good practices in activity management on operational plants. Numerous have been brought onto the site and implemented in this manner.

IAEA comments:

Belleville management have established standards and expectations which are in general being adopted in the plant. The "Model" area concept has been used in several areas to demonstrate the standards of housekeeping and material condition which should be emulated in all areas. A programme is

ongoing to extend this beyond those already established plant areas such as the unit 1 auxiliary feed pumps.

Management presence in the field and training sessions for both plant and contractor staff is used to reinforce these issues. Examples of the written reports prepared following management plant tours were reviewed and evidence of actions taken to enhance standards and communicate issues noted. Actions arising from the reports are tracked through a formal system and action discharge is timely with better than 85% being done to agreed time scales. This management presence in the field which on average represents about 20% of the individual's time has been achieved by better management of meetings, and the delegation of minor administrative tasks to be carried out by more appropriate people.

Examination of a booklet issued to all plant and contractor staff appropriately confirmed these standards in all areas particularly related to the adoption of a questioning attitude. This will be supplemented by similar but up-dated booklets specific to each outage.

Benchmarking trips to establish standards adopted by high performing plants have only involved selected EDF plants and other industries in France such as STM and Butagaz. Rather than seeking to target international plants some international input has been achieved by utilising training from IAEA staff. About 80 Belleville personnel have attended these courses on topics such as material condition and observation techniques.

To support the communication of management standards and expectations new meetings have been established where the senior station managers meet with groups of 25 – 30 cross-department staff. These take place periodically throughout the year and provide a 2 – 3 hour period where managers can listen to staff and where issues can be discussed.

Conclusion: Satisfactory progress to date

1.2. PLANT ORGANIZATION AND MANAGEMENT

1.2(1) Issue: The focused OSART related activity undertaken by many of the Belleville staff in timely preparation for the visit may not continue when the prospective of the visit is no longer a feature. The preparation has engaged management and staff and encouraged communication and the clean up of several plant and buildings areas, the development of processes and documents to meet the perceived needs of the OSART team and has been a key feature of daily work for many people. Examples are:

- Many of the documents and processes described have only recently been initiated into the plant arrangements. In some cases these are supported by documents, which have only been authorized over the last few weeks or even days.
- Several workers were surprised by the intensity of the short-term initiatives and stated that in their view the plant had been cleaned only in readiness for the OSART. The team recorded quotes such as “You should have seen it before”.
- The introduction of an action tracking system was introduced as part of the OSART preparations to ensure that all pre-OSART work was completed.
- Some personnel considered the introduction of a new work management process, as part of the TEM project was an OSART initiative.
- Photographs of the control room taken during last year, supported by discussions with control room personnel indicated that many more “operator aids” in the form of papers stuck to the operating panels and temporary documents were in use prior to the OSART preparations.
- In order to demonstrate document control for the OSART a document audit process has recently been introduced. However it does not yet have sufficient data to form the basis of process improvements.
- In some areas such as painting and labeling staff are uncertain as to who will continue these activities after the OSART project terminates.

At the end of a very focused and high profile project, which has significant impact on the plant and processes at all levels in the organization, care is needed to ensure that a complacent attitude does not undo all the benefits accrued.

Suggestion: The plant should consider extending the OSART project to consolidate on the established foundations laid by the OSART preparation to ensure it continues over time and prepares the route for the key aspects of the project activities to be taken back into the normal line organization.

Plant Response/Action:

The Belleville work force was determined to make a success of the OSART, the challenge of which was clearly understood by everyone. The success of this international review instilled a sense of pride in all staff members, who clearly indicated their high expectations from management in continuing to raise plant standards. In the light of this, senior management and plant employees have undertaken to continue in this vein, by perpetuating the efforts undertaken in preparation for the OSART review.

The mission's success brought Belleville's new ambition to the fore: *'In 2005, Belleville will feature among the top 20 leading plants in the world in terms of operational safety, competitiveness, risk assessment and the environment'*. In each of these areas, a representative indicator has been chosen to gauge our progress and compare our performance with that of other international operators (reactor trips, UCLF, radiation exposure, waste).

This ambition is reflected in the Plant Strategic Plan. In November 2001, the plan was presented to the EDF Nuclear Power Generation Division, who gave its approval. It was drafted on the basis of complementary internal and external diagnoses (OSART, General Plant Audit, opinion surveys), which enabled us to describe Belleville's strategic problem in three points:

- Site performance objectives are not clearly stated and prioritized down to grass-roots level.
- The site does not make use of all its human potential. The lack of response to concerns in the field generates a feeling of resignation. The real contribution of each worker is not acknowledged.
- The lack of external references does not promote ongoing progress.

On the basis of these diagnoses, three strategies and thirteen 'work projects' have been planned for the next four years. Line management and plant staff are closely involved in their deployment.

The goal, which is clear to everyone, is not only to make a success of the OSART follow-up mission, but also to entrench the large number of existing and future processes within the normal plant organization.

The following aspects will help the IAEA reviewers to confirm that the momentum has continued after the OSART and that it is being sustained in the long term:

- The main projects set in place prior to the OSART mission have now been incorporated into our normal systems and processes. Examples include the Power Operations project, the Outage project, plant upkeep (plant and material condition), commitment to achieving ISO 14001 certification, and enhanced risk prevention.
- Organizational structures have been defined, managers have been appointed, while reporting and coordinating methods have been established (supporting documents: managerial and organizational memoranda; process memoranda; indicators; case summary charts; reports compiled by the Power Operations project team and by the COMEX, etc.)

These new work projects, designed to help us fulfil our medium-term objectives, have been identified, formally agreed upon with the departments, and are coordinated by line management (supporting documents: Strategic Plan approved by DPN Senior Management (EDF Corporate), Plant Business Plan for 2002, Department Business Plans; documents describing implementation of projects included in the medium-term plan, involving all managers and staff members).

IAEA comments:

The whole thrust of the OSART preparation and the issues arising were key inputs to the Belleville strategic plan. This has now been signed on to by EDF corporate and has been supported by tactical

business plans derived with input from a large proportion of the staff. The majority of staff sampled were very much in favour of the inclusive approach to developing the future for the plant and felt ownership and involvement.

Progress with the strategic plan and with the business plan is routinely monitored utilising a comprehensive set of indicators covering both the progress with the methods (enablers) and with the results.

A self assessment utilising the EFQM business model also supported the holistic approach being followed and tending to confirm the integration of the OSART ideas into an overall improvement effort.

Conclusion: Issue resolved.

1.2(a) Good practice: A formalized risk assessment process is used to review plant activities to identify nuclear and industrial safety risks and require development of mitigating strategies. This initiative was launched in 1998 through a focus on nuclear safety related operations.

Belleville management's current policy is to enhance safety under one heading of risk analysis (risk management), within a quality framework. The new structure will combine industrial safety, nuclear safety, and radiological protection under one group known as Quality, Safety and Industrial Safety. Although a process for nuclear risk assessment has been practiced for several months this process is now being extended and fully rolled out to cover industrial safety also. (Belleville has a target of zero injuries).

The plant management's desire to utilize risk analyses as a key management tool in driving excellent performance led to the Operations Department being made responsible for coordination of the initiative, with the aim of aligning departments, to enable improvement of cross-functional risk analyses.

The concept is that by analysing the risks in all tasks, awareness is raised, mitigating actions developed, and changes to the task activities initiated resulting in lower numbers of accidents and significant events. The process requires that before each job a risk assessment is carried out by planning, the worker and supervisor and any changes to the work procedure initiated before work commences.

Interviews with workers, supervisors and managers confirmed that the new process was being applied. They found it time consuming but felt that it was a positive step forward to reducing industrial accidents and enhancing safety. Risk analysis was also discussed with a group of ten workers from most plant sections. The group confirmed that the process, although new, should help them reduce industrial accidents. (They recognized that Belleville had the worst industrial accident record of all EDF nuclear plants).

The risk analysis process has been well communicated and is a routine topic at COMEX the two-weekly plant management meeting for the operational periods.

A high level example of risk analysis is the evaluation of Belleville Unit 1 ten year outage performance (Vade-Mecum Sureté) which resulted in a proposed plant configuration for all stages of the outage which minimize the overall risk. This will form the basis for future outages.

This plant-wide initiative, which is already starting to deliver results, ensures consistency among departments, and is aimed at achieving a renewed focus on risk analyses as a tool to help improve the quality in daily work for all plant activity.

1.5. INDUSTRIAL SAFETY PROGRAMME

1.5(1) Issue: Some Belleville and contractor personnel do not maintain an appropriate industrial safety focus to ensure that real and potential personnel injuries are reducing in line with plant goals. Some observed examples follow:

- The Belleville industrial accident frequency rate over the past two years (1998 and 1999) has been above 2 (ISA per 200,000 hours). This is significantly worse than the industry norms and does not approach the targets the plant aspires to. Further from 1990 it has been trending up (the 1998 and 1999 figures dominate this trend.) The figures also illustrate that the Belleville is the worst performer in the EDF nuclear fleet.
- Personnel were observed inappropriately using a safety harness. Although the procedure specified the need for a harness it was not provided and the personnel involved had to collect it from the stores. No instruction as to the fitting and use was given. Inappropriate use of such equipment or its use by untrained personnel can lead to injury.
- At the top of the first floor stairway above the diesel house the new fire door opens in such a way it could cause the opener to step backward and fall down the stairs.
- There are a number of unmarked “head-knockers” on the plant. An example was the pipe support steel work adjacent to the Safety Injection Pump on unit 1
- A number of areas would benefit from the addition of handrails, for example the platform near the Diesel 1 oil pump. (A potential 60-cm drop). Similarly the steps to the LP platform on the turbines or unprotected and someone could potentially fall 90 cm. However these are only representative and a survey of all such areas would be worthwhile.
- Two Belleville personnel were observed working in the cooling water pump house not wearing head protection. This lack of use of provided personal protective equipment illustrates a disregard for accepted safety practices.
- Belleville has an inconsistent approach to the use of industrial safety signage advising of the need to wear personal protective equipment. As many examples were observed it would be appropriate for the plant to undertake a full survey and act on the results.
- A member of the chemist staff was taking a sump water sample. This involved climbing approximately six metres down a vertical ladder in to an enclosed area. No safety protection or the provision of a safety guardian outside of the enclosed space was provided.
- Other examples are listed in issues 1.1(1) and 1.1(2).

A lack of industrial safety focus is a key precursor to personnel injury. Although many of the accidents so far recorded at Belleville have been of relatively low significance, in the trips and falls category, failure to take proactive action now increases the probability of a more serious future injury to a member of Belleville or contractor staff.

Recommendation: The management should take every opportunity to advocate the importance of risk analysis arrangements in support of the policy of reducing injuries to personnel. Plant management has recently extended the focus of the risk analysis arrangements established initially for nuclear safety, to include industrial safety and radiological protection risks. Managers in the field should routinely reinforce the application of this process.

The following proposals are offered for consideration by the plant and aimed at significantly raising the profile of industrial safety both on the plant and at manager and staff level:

- Initiate a one-off project designed to make impact in a relatively short time in order to improve this area of significant poor performance
- In parallel to maintaining the risk analysis approach a survey of all industrial safety hazards (including low-level issues) should be made and any findings acted upon immediately. A few items such as the addition of high visibility leading edges to stairs and floor level changes and the addition of handrails even though the potential fall is not great have been identified in this report.
- A team of operators and craftsmen (it could also potentially include some contractors) should be sent to the highest performing EDF plant (in the area of industrial safety) with a remit to evaluate all industrial safety practices. On return to Belleville they should make presentations of their findings to all staff groups starting with the College de Direction. Each presentation should be sponsored and introduced by the Plant Director.
- A senior member of the management team should benchmark the industrial safety arrangements (along with other areas) at a very high performing nuclear plant outside of France. Again presentations should follow his return.
- All of the above should be the subject of management interest and involvement and be accompanied by extensive communication to all staff using all available media but focussing on regular face to face meetings.

Plant Response/Action:

Poor industrial safety performance in 2000, continuing into early 2001, highlights the lack of vigilance and the passive attitude of staff toward daily risks. Belleville NPP has implemented an action plan designed to improve individual and collective behavior by reinforcing the idea of team solidarity and fostering the involvement and initiative of each worker. These actions have helped to reduce the overall accident frequency rate (number of lost-time accidents per million hours worked) from 12.4 in 2000 to 7 in 2001.

These actions are continuing to be implemented in 2002. They entail the following:

- Enhanced management presence in the field, with the main objective being to monitor, listen to and explain expectations. A reinforced field inspection programme (Senior Management Plant Inspections, Senior Management Tours, Department Management Tours, risk-prevention challenge) has helped to monitor the application of risk-prevention rules in the field, and remind staff of these rules.
- Continued involvement of department line-management in near-miss and accident management, through the immediate presence of managers in the field as soon as an accident occurs, in order to gather facts and clarify the circumstances of the accident.

Every accident or near-miss is analyzed and corrective actions are implemented on the basis of proposals submitted by those involved. When the causes of an accident are complex, a human factor analysis is conducted in addition to a general analysis. Analyses featuring exceptional facts or interesting feedback are reviewed by the Risk Prevention and Safety Technical Committee (GTSR). A monthly review, including reported deviations, is conducted by the COMEX, while an annual review is conducted by the GTSR.

- Encouraging all workers and teams to contribute to improved risk-prevention through the establishment of a collective risk-prevention acknowledgement scheme. This system is designed to gauge not only the performance of each team, but also the way in which progress is made in 3 areas: identification and processing of minor industrial safety deviations, conduct of field tours by workers themselves, and risk-prevention coordination within each craft team. The collective risk-prevention acknowledgement scheme is coordinated by a member of the senior management team and monitored by an approval committee.
- Getting departments or project teams (Power Operations or Outage) to identify all hazardous activities during outage, and carry out cross-functional risk assessments with the support of the Safety/Quality and Risk-Prevention department (QSPR).
- Encouraging the proposal and implementation of ideas for improving risk-prevention by setting up a proposal/innovation system open to all EDF staff, and by organizing OEF meetings with contractor companies at the end of every outage.

In addition, the QSPR department has opened new local stores offering risk-prevention advice and equipment for all activities performed inside and outside the RCA. Furthermore, each unit is permanently manned by a risk-prevention specialist (QSPR), close to the control room. He is required to be available at all times and provide workers with advice, assistance and support.

The proposal/innovation system and the collective risk-prevention acknowledgement scheme were implemented after a risk-prevention visit to Golfech NPP, dealing with the subject of risk-prevention management, and after numerous exchanges with other sites, such as Penly and Cattenom, having achieved good results in this field.

All of these measures, essentially designed to improve worker practices through a cautious and questioning attitude to risk, should help to reinforce the improved industrial safety performance observed in 2001. The plant is aiming for an overall accident frequency rate of less than 6 for 2002, dropping to 4 in 2005. This will place Belleville plant among the leading EDF plants over a sustained period (EDF target: < 7.5 in 2004).

IAEA comments:

The adoption of enhanced risk assessment methods was a key feature of the recommendation of the Industrial safety issue. The use of risk assessment methodology aligned very closely with radiological protection, nuclear safety and quality as part of a new department which takes the lead on risk assessment methodology, overall there is good evidence that this approach is meeting with some success.

The reinforcement of the use of risk assessments by managers in the field is also perceived by Belleville personnel as instrumental in the success of this approach.

Benchmarking of industrial safety approaches at Golfech, Cattenom and with a French steel making company have been used to develop the Belleville arrangements but there has been no direct attempt to visit high performing plants outside France and hence the benefit of totally independent thinking has not been achieved.

Based on the Golfech visit (a plant which has a similar management structure to Belleville; QSPR) new processes and procedures have been established requiring senior managers to get involved with industrial injuries and subsequent routine reports to be presented to management meetings (COMEX). These reports generally show acceptable downward trends for industrial accident related indicators.

An important aspect of the success in this area is the adoption of recognition of individuals and groups for successes and suggestions. Examples from the plant newspaper were evidence of this approach. Belleville management consider this particular aspect as very important to improved motivation

Conclusions: Satisfactory progress to date

1.6. DOCUMENT AND RECORDS MANAGEMENT

1.6(1) Issue: Procedural amendments to documents and drawings in many areas are not always timely and in some cases are not completed before the procedures next planned use. As a result personnel in some departments infrequently point out the need for procedure change because they have no confidence that the changes will be made. Contributing to this is the lack of a consistent policy across all departments for document management including updating plant documentation, issuing of documentation and management expectations for completion of document changes. Also no performance indicators exist to allow management to appropriately monitor performance and initiate improvements. Examples are:

- Document management staff were unable to clearly define the contents of the document list held in the 41-satellite document centres on the site. However ultimately they were able to provide lists of approximately 110,000 such documents distributed to the satellites.
- Discussions including the local document management personnel from the department indicated that arrangements were different at each location.
- There is no consistent policy for updating essential control room documentation after completion of modifications. For site initiated modifications the document amendments were often completed ahead of the modification implementation but for centrally initiated modifications document changes were after the event, usually by between 1 day and 1 week.
- Operations procedures are not always being updated in a timely manner. Many operational procedures amendment requests dated 1999 have still not been completed. These include procedures related to many functions such as valve line-ups and alarms, and include some safety related plant systems such as the containment spray and high-pressure injection.
- Generally no process existed to keep the initiator of a document amendment apprised of the progress of the change. This along with the fact that in some departments documents for which amendments have been requested have been re-issued in their original form have caused some personnel to stop initiating changes because they perceive that no action will be taken.
- Although in all departments urgent changes to documents can be made in hand draft typically document changes from initiation to re-issue takes up to three months.
- Two mechanical tasks could not be commenced because the procedures did not accurately reflect the long standing changed plant state.
- A system exists to recover all old documents but to date only limited checking has been done to confirm that all documents are current. Reliance is placed on the local document control personnel.
- Although a good document audit system has recently been initiated it does not yet have data available to make this a useful management tool.
- No document system performance indicators exist. Hence no consistent information was available from all departments about backlogs of documents requiring changes or other key parameters on which corrective actions could be based and monitored.

Insufficient control of operational documents can result in plant actions being undertaken based on inappropriate or inaccurate information. The potential for such actions to have safety significant consequences exists.

Recommendation: The plant management should establish a document management policy to be applied across all site departments that clearly states management expectations for document issue and changes. The policy enacted should ensure that the control of documents, their issue and changes, is conducted in an auditable and timely way appropriate to the importance of the individual documents.

The team suggests that the plant consider how performance indicators should be defined and tracked against specified targets set as part of the site planning and management contract process. These indicators such as numbers of documents awaiting change, time to complete the changes etc. should, in line with the current management processes, be reviewed monthly at department level and six monthly at site level such that improvements to the process can be initiated and monitored. Corrective actions based on these indicators should be tracked via the action tracking process.

Plant Response/Action:

This recommendation is being implemented with a view to providing users with new, modified, approved and up-to-date documents as soon as possible. It applies to the entire site and therefore needs to be coordinated by a process and managed by process monitoring indicators, in accordance with site management methods. Process indicators must be reviewed by a senior management committee.

The process comprises the following stages:

- 1-Creation or modification of a document by a plant department.
- 2-Document modification sent by requesting department to typing pool.
- 3-Typing.
- 3-Signatures for checking and approval of document.
- 4-Approved document saved in dedicated document computer application.
- 5-Filing and storage in central document storage area, followed by filing and storage in satellite document storage area.

Processing of this recommendation entailed the step-by-step definition of each finalized or non-finalized stage, in order to implement the necessary corrective actions and thereby reduce the overall period of implementation.

The Documentation Unit has created:

- A monitoring file associated with the life cycle of new or modified documents. This file indicates the number of new or modified documents, as well as the deadlines for each phase of the process. It is reviewed monthly by the documentation unit and twice a year by a senior management committee (COMEX).

- A monitoring file indicating those documents needing to be reviewed periodically and systematically. This file is linked to performance indicators indicating the number of overdue reviews and impending reviews. It is reviewed monthly by the documentation unit and twice a year by a senior plant management committee (COMEX).
- A new typing service (since 1/3/2001) committed to obtaining results in terms of quality and timeliness, with a deterrent penalty system in the event of failure to meet its commitments.
- An organization relying on designated representatives or contact persons within the plant departments. Information regarding new documents or documents needing to be modified immediately after their creation is conveyed through meetings or interfaces between documentation staff and department representatives. These meetings and interfaces also provide the opportunity to implement corrective actions if necessary.

The Documentation Unit has also taken the following steps:

Following a decision taken by the Operational Safety and Radiation Protection Technical Committee (GTSR), a fast-track system for modified documents was implemented in order to facilitate the processing of hand-written documents by the central documentation unit. This entails registering hand-written modified and approved documents in both the central and satellite document storage systems (a minimum amount of hand-written material is required). This simple and effective system is designed to reduce waiting times for modified documents to a maximum 3-day period, without violating quality rules. Users are almost immediately provided with a hand-written document in order to perform their activities properly.

The following phase in the closing-out of this recommendation entails the setting up, on site, of an on-line computerized central document storage system that can be accessed by all staff via the computer network..

IAEA comments:

Bellefonte management have introduced a process for complete document control for the life of all significant documents, which is accessible to all staff via the computer system. The focus of the process is a 72 page spread sheet (normally accessed electronically) which identifies all documents and where they are in the process. The spread sheet has several uses but the main three are, it enables the document author to know where the document is at any time, it enables document management to be systematically progressed, and it provides a “warning” if document reviews are delayed.

The spread sheet is also the driver for a systematic review of all documents whether modification is requested or not.

Monitoring of document modification is conducted at several levels. The COMEX reviews overall progress twice a year and the document management unit reviews progress monthly with the main departments. Performance indicators are available for all levels of review and at the time of the follow-up most indicators were better than 85 % of target. The process also provides a mechanism to predict future workload to facilitate document management resource optimisation.

At the time of the follow-up the average time for document revision was 15 days which, overall, the plant judge as acceptable. However, the process does allow for a staged approach where important documents needed urgently on the plant can be modified quickly. In the extreme a “fast track”

process allows documents to be amended in hand draft but signatures appropriate to the significance of the document are still required to ensure the necessary quality assurance.

In parallel with the system introduced by Belleville there is an ongoing corporate initiative to update all operations and maintenance documents to a national standard across all EDF plants. This will integrate with the arrangements introduced at Belleville in response to the OSART recommendation.

Conclusion: Issue resolved.

2. TRAINING AND QUALIFICATIONS

2.1. ORGANIZATION AND FUNCTIONS

Operational responsibility and policy responsibility for human resources is functionally split between two positions in the organizational structure. The human resources plant advisor (Chef de Mission) is responsible for the definition of policy, strategic coordination, development of proposals and overall monitoring of performance and works closely with the heads of departments. This enables the plant advisor to have a general view and long-term strategic vision in order to provide direction and guidance.

The head of the human resource department has operational responsibility for the implementation of this policy. To reflect a greater emphasis on skills development the organization of the training section was changed in 1999 when it was renamed the skills development section under the responsibility of a section head within the human resources department. The section head has the operational responsibility for the whole training system.

A network of departmental training representatives, totaling 15, who operate on a part time basis, supports the section head. They act as a liaison between the skills development section and their own department. The training representatives are responsible for keeping and updating the individual training records for all training matters. The system of recording training data does not easily provide information for tracking attendance at training courses, and the team made a recommendation to improve the system to provide more confidence in long term qualification of employees.

The skills development section is responsible for sending out course notifications for the site training courses and for enrollment in corporate courses. They collect the training needs of the various departments and manage the setting up of new training arrangements along with the choice of training service provider, which could be corporate (SFP), internal to the site or off-site.

Belleville does not have a training center, as it does not take trainees from other power plants. Initial training is done 100% at corporate level. The site provides 40% of the refresher training with the rest being provided by corporate or external.

The skills development section was involved in giving support to the human resources department for the drawing up of the job task descriptions and these have been completed for every job in each department. This section then defined the methodology for compiling the skills criteria and gave advice and support to the departments and confirmed the results as skills criteria were developed. The progression in this process varies across the departments; some have finished the process and have started to use it but some, for example the SRP, have their skills criteria only at the draft stage. These skills criteria are then used in assessment guides for nuclear safety authorization.

Currently the training representatives mainly participate in operational training matters and to a greater or lesser extent in the development of skills depending on the department. The intention of Belleville human resources policy is to consolidate the role of these representatives making them responsible for skills development and not just training. The idea is to create a network like that of the human factors representatives with similar professional development programs thus giving them a greater role of support to the department head. This strategy has already been embarked upon in some of the departments and will become widespread.

A system for shadow training has been set up. It is based on a signed agreement between the manager, tutor and the trainee. The agreement contains the training plan for the necessary qualifications needed for the assigned function. Progress is controlled by regular appraisals between the participants. The shadow training lasts on average approximately 2 years.

The senior management levels defines the three yearly training policy guidelines based on the plant strategic plan with special emphasis being placed on the following points:

- improvement in safety and availability
- improvement of staff skills in understanding their working environment
- gain in competitiveness.

The yearly training plan is then drawn up and adapted within each department. Every department has a standard training plan (PTF) per function that consists of courses identified at corporate level added to by the site in the site professional adaptation programme (PLAP). The individual training plan (PIF) is then compiled after an individual appraisal and training interview between the person and their immediate superior. The tracking system to ensure that all the training identified in the training plans is incorporated is not centralized and is not carried out in a uniform way.

2.2. TRAINING FACILITIES, EQUIPMENT AND MATERIAL

The training material is not stored in the section which is responsible for training. Following an observation by the nuclear inspectorate this training section has only consultation rights to training material, the responsibility for updating training material lies with the instructor. However, the training section manages the material for courses developed as a result of a specific request from the departments. The corporate and site training material examined was of good quality, including training specifications, training objectives, instructor guides, trainee handouts and slides.

In general the classrooms are all well equipped but the preparation of classrooms for risk prevention training was sometimes found to be lacking as identified by trainee feedback.

There is a designated area for fire fighting training, which was well equipped.

Belleville uses the SFP training center in Paluel for operation training on the simulator. The Maintenance Department sends its staff to corporate work site training facilities in Gurcy.

Belleville operations crews are trained on two full scope simulators for the plant series in Paluel training center, which is run by the SFP. In addition, the site has a SIPACT simulator used to visualize physics phenomena which is also used for key personnel in the EPP and SEPIA is especially used for steam generator tube rupture.

2.3. CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

Initial operator training is conducted at corporate level. Refresher training is conducted on SEPIA and SIPACT on site.

The operations crews receive two weeks of full scope simulator training per year, one course concentrating on technical aspects and the other on team situational training focusing on soft skills. The technical refresher training is composed of topics selected at corporate level (40%), site level (40%) and from crew requests (20%).

A monitoring system is set up to keep track of identified skills used in the field. The site simulator input in the simulator programme is based on this system. Additional training on the site simulators SEPIA and SIPACT rectifies any areas identified by the annual training feedback report.

As the shift operations manager is present in the team training, he can evaluate the trainees with the instructors on an informal basis. Belleville has especially requested that only the assessment conducted on the technical refresher training for authorization be sent to the operations management, the other assessment is only given to the trainees to encourage free discussions.

No formalized written structure is used during the assessment. The team encourages Belleville to incorporate the monitoring system used in the plant into the simulator assessment.

The operations department management only participates in some training feedback sessions and does not attend the training. Once in a two-year period for each team the assessment results are part of authorization renewal. In order to get a measure of independence into the assessment process the team encourages Belleville to consider utilizing the presence off of shift management during the assessment used for authorization license renewal.

The simulator instructors do not visit the site on a regular basis and tend to come during holiday periods and not at critical moments such as shutdown and start-up. As a result they are not routinely observing activities during significant operations.

2.4. FIELD OPERATORS

The training of field personnel was reviewed combined with an exercise involving Belleville field staff and their crew on the full scope simulator in Paluel. The Belleville instructor prepares the exercise in advance incorporating a maximum of field operations and places tags in the field that are clearly marked for training purposes only. After carrying out the instructions from the operators in Paluel in the field, the trainees bring back the tags as the operations sheets are completed. There are two direct telephone lines available to the simulator control room in Paluel. Belleville procedures and mechanical diagrams are used. The training lasts for two days, after the first day on site, the Belleville field personnel join their team on the full scope simulator. The exercise is discussed and evaluated and the field operators can thus observe the behavior of their crew under stressful conditions. The team found this to be a good practice.

2.5. MAINTENANCE PERSONNEL

Belleville uses for the training at corporate level the existing EDF and manufacturers training facilities as part of the nuclear industry in France.

The training and qualification of contractors and sub-contractors is closely monitored by EDF. The training specifications are drawn up by EDF. An independent body approved by EDF carries out the training. Refresher training is conducted after 3 years. The Belleville supervisors are trained (course N073 FAC) to monitor the (sub) contractor activities.

The system of defining training objectives based on competencies and skills is implemented for I&C and maintenance departments. It is fully operational and is the basis for the contents of the yearly personal training plan (PIF). The system is of good quality and gives a solid base for maintenance and development of necessary skills. For new recruits it provides the input for the shadow training and gives the supervisor and trainee a good view on progress to Qualification.

The mechanical department has started a system to keep track of skills used to identify the need of refresher training. The system is in the development phase. The team encourages Belleville to continue

developing this system and make it operational for the maintenance department since it already exists for the I&C department.

2.6. TECHNICAL SUPPORT PERSONNEL

The training for safety engineers is well-developed and based on competencies and skills.

It includes a comprehensive 18 months theoretical programme and long duration shadow training with another safety engineer for new appointees. It also includes annual situation-based training on the simulator with an operation crew to keep in touch of development in the field.

In order to strengthen the skills of auditing and review, courses on quality concepts and auditing are provided.

Following the decision to combine radiological protection, industrial safety and risk prevention, a corporate working group was set up to identify the training needs resulting from this decision.

2.7. MANAGEMENT PERSONNEL

To improve the professionalism of managers a training programme on regional level was developed. It was done on regional level in order to take advantage of the knowledge and experience of industries in the region. The programme lasts nine months and is done part time. The programme is composed of theoretical subjects, for example, role definition, self evaluation, project management and leadership styles. The programme also includes a lot of feedback, shared experiences, senior management support and guidance by internal and external experts.

2.8. GENERAL EMPLOYEE TRAINING

The initial training on safety and radiological protection is of good quality. The course has a refresher cycle of 3 years and lasts 2 days. The initial training and refresher courses are in line with and based on international standards.

In the refresher courses there are many instructors participating such as, from the SRP department, specialists from line departments and external instructors. The basic items of the courses are radiological protection reminders, ALARA concepts, topics on risk prevention, fire protection, feedback on international, national and site events and changes in regulation (if there are any). The trainees in one session are a mixture of various departments to promote site wide discussions.

The industrial safety and radiation protection performance of plant personnel is below the level of international standards in some areas. The team recommends that in addition to existing managerial measures for areas needing performance improvement such as industrial safety and radiation protection, all the managers should take an active part in refresher courses and additional professional development actions in order to directly voice at this time to the attendees their commitment to ensuring by monitoring performance and coaching in the field that plant policies, standards and targets are achieved.

The team suggests that the plant consider using new tools (pictures and videos of actual and ideal conditions) reinforce their commitment to helping their employees.

For employees who have an emergency response role in the PUI/PSI detailed training and refresher programs exist. However, the team suggests including a requirement for regular participation in exercises as a necessary item for requalification.

STATUS AT OSART FOLLOW-UP VISIT

In the area of Training and Qualification, the OSART team made two recommendations and one suggestion. The follow-up OSART visit resulted in one recommendation being fully resolved and one recommendation and one suggestion having made satisfactory progress to date.

Monitoring of training attendance has improved through the use of skill development representatives. While this increased oversight appears to provide an adequate interim solution to tracking training attendance, a comprehensive computer tool is still needed from the corporate level to reduce the potential for additional training records errors as described in this issue. Appropriate management support is needed to ensure timely implementation of this computer training tracking tool.

There has been significant improvement in management involvement in training. Senior managers frequently kick-off training sessions and provide summaries at the conclusion of training to ensure appropriate expectations are being conveyed to the students. Feedback from the increased management presence in the plant is also providing additional training enhancements.

Annual participation requirements in Emergency Preparedness drills was recently instituted. The plant has increased the number of drills planned in 2002, which should provide an opportunity to meet the new annual drill participation requirement. The planned participation schedule should minimize the number of members with qualification discrepancies by the end of 2002

DETAILED TRAINING AND QUALIFICATION FINDINGS

2.1. ORGANIZATION AND FUNCTIONS

2.1(1) Issue: The system of recording training data does not easily provide information for tracking attendance and ensuring current and long term qualification of employees.

Individual training files are stored within departments. The files contain information on codified corporate courses, site codified courses, site non codified courses, shadow training and individual qualifications. The information is partly contained in a computer system and partly on paper. The computerized database system contains information on corporate and site codified courses.

This system is updated by the training section and the training representatives of the departments involved. The updated printout is however not filed in the individual training record. Many records were found that were not updated.

A temporary restriction on an authorization was found written manually in an individual training record and was not mentioned in the computer database.

This computerized system does not support tracking of non attendance at training courses.

Examples:

In several departments, records of non-attendance at the course Recyclage de Prévention des Risques (N098) were found which were not rescheduled.

Three non-tracked non-rescheduled cases were found for the course mercure.

Lack of recording and tracking the individuals training could result in a loss of the long-term qualifications of employees without the knowledge of their supervisor.

Recommendation: The plant should install a system that comprehensively tracks training attendance and ensures current and long term qualification of employees.

Plant Response/Action:

The plant has sought solutions for the improved monitoring of Individual Training Files, qualifications and training course attendance, by implementing a joint initiative between departments and the skill development section through the intermediary of representatives.

Skill development representatives provide support to department managers and as such, are involved in the implementation of HR policy. Periodic meetings are held to explain site skill development policy. Training sessions are incorporated into a broader scope of professional enhancement actions.

The site is working very hard to implement this network of representatives, designed to enhance cross-functional efforts in common areas.

The skill development section vouches for quality in the overall monitoring of actions designed to ensure and keep track of professional enhancement. Its role is to alert and advise the departments. In order to do so, it provides them with the necessary documents.

- Monitoring of Individual Training Files :

The contents of Individual Training Files are sent to the skill development representatives of each department:

- When required: training attendance certificate, authorization certificates,
- Each month: review
- Every six months: individual administrative form, proficiency records.

Network representative meetings and department visits provide a special opportunity for a joint review of their comprehensiveness and status.

- Monitoring of authorizations

A monthly list is sent to each representative, based on authorization expiry dates.

In order to adopt a more proactive approach towards authorization renewal requiring more comprehensive prior assessment by line management, "standardized" groups have been set up in each department (a team, a section) with a common expiry date.

Furthermore, in order to highlight discrepancies and identify their causes, a table has been drawn up linking the "standard" authorization level of each job (see Standard Training Plan) to the authorization level assigned to the employee occupying that job.

- Training monitoring

Every month, a list of absentees is sent to the skill development representatives. This alerts them to the need for re-enrolment, unless circumstances have changed.

Furthermore, an exhaustive review was carried out for a certain number of qualifying courses. This was the case for "Occupational First Aid " (initial and refresher training) and "Risk Prevention" refresher training (N098) given to all plant staff, as well as "Fire Protection 3°" (initial and refresher training) given to operations department staff.

In addition to an administrative upgrade, these initiatives are intended to enhance document quality. Similarly, the site has committed itself to enhancing professional standards by means of skill assessment, in addition to providing training sessions.

As part of the effort to devise a comprehensive computer system (incorporating training management, training authorizations and standard training plans) common to all plants, the site is involved in a corporate development process.

IAEA comments:

Belleville has strengthened the individual department's oversight of training attendance through improved use of department schedulers and skill development representatives. Training personnel provide departments with regular reports of training attendance and authorization renewal deadlines. The individual departments have taken ownership of ensuring that all personnel attend any required training and that authorizations are maintained. The training department ensures compliance with training plans established by the individual departments. While this increased oversight appears to provide an adequate interim solution to tracking training attendance, a comprehensive computer tool is

still needed to reduce the potential for additional training records errors as described in this issue. The comprehensive corporate training tracking computer system has been tentatively authorized and initial scope and implementation determinations are scheduled for the near future. Appropriate management support is still needed to ensure timely implementation of this computer training tracking tool.

Conclusion: Satisfactory progress to date

2.1(a) Good practice: System of shadow training.

The shadow training system in the departments works on two levels. Firstly there is an organization set up for apprentices who are studying at schools or colleges. This is based on a sandwich course of four weeks on site and four weeks of study. The apprentice is guided through the time on site by a tutor who also liaises with the school teachers. There is a contract between the plant and the apprentice who is ensured of a job position if he successfully completes the course. Secondly, there is a similar system for new recruits to the department based on a plant policy document with a standardized three party contract between the manager, tutor and trainee. The tutor in the shadow training process receives the appropriate professional development training. In the same way as for the first system, the tutor uses a shadow training booklet with defined tasks and skills required for their new job. Progress in the activities is signed off by the tutor and the trainee as the objectives are achieved. Every two to three months an appraisal interview is held between the trainee and the manager. The whole process takes about two years to complete.

2.4. FIELD OPERATORS

2.4(a) Good practice: Simulator training including field operators.

The simulator training for control room operators is followed on site by the field operators by a direct telephone connection between Paluel and the site.

The valves and pumps which require manual actions during the exercise are tagged and on command of the control room shift in Paluel the operator goes in the field removes the tagging and gives feedback to the control room: manual action completed.

Group evaluation is done on the second day in Paluel .

Real time actions are be added to the simulator training by including the field operators actions in the plant. Furthermore, when field operators are in Paluel for the evaluation, they have the possibility to see the control room operators working under emergency conditions.

2.8. GENERAL EMPLOYEE TRAINING

2.8(1) Issue: Refresher courses on industrial safety and radiation protection are attended by some managers but the courses do not motivate employees sufficiently to compel them to adhere to management expectations, policies and standards in their everyday work.

The refresher courses on industrial safety and radiation protection are of good quality. However the team observed that in many cases, high safety standards are not practiced in the plant. These are documented in the following issues:

- 1.1(2) The establishment and reinforcement of management standards is not appropriate to ensure that personnel internalize the standards and comply with them routinely as part of normal daily work.
- 1.5(1) Some Belleville and contractor personnel do not maintain an appropriate industrial safety focus to ensure that real and potential personnel injuries are reducing in line with plant goals.
- 6.2(1) There is a lack of rigor applied to the identification of radiological hazards within radiation controlled areas.

- 6.2(2) Personnel contamination control practices are insufficient to prevent some inadvertent spread of contamination within and external to the radiation controlled area.
- 6.3(1) ALARA principles are not being consistently applied in the field for routine execution of work.

Although managers are present at the opening and during the evaluation of various courses, they do not utilize the opportunity to advocate expectations and set standards. Without a strong commitment to adhere to industrial safety and radiation protection rules, results in the field will not be reached.

Recommendation: The team recommends that in addition to existing managerial measures for areas needing performance improvement such as industrial safety and radiation protection, all the managers should take an active part in refresher courses and additional professional development actions in order to directly voice at this time to the attendees their commitment to ensuring by monitoring performance and coaching in the field that plant policies, standards and targets are achieved.

The team suggests that the plant consider using new tools (pictures and videos of actual and ideal conditions) reinforce their commitment to helping their employees.

Plant Response/Action:

In order to exhibit plant management's determination to improve plant risk prevention practices and results, each risk prevention training course is introduced by a member of the extended plant management team. During the introductory and summing-up phases, industrial safety as well as RP expectations and requirements are reiterated, with emphasis on strict adherence to basic rules and the importance of risk analysis. Members of the extended plant management team are provided with a supporting aide giving a reminder of the main messages to be communicated for each training course at both the introductory and summing-up phases. An end-of-course knowledge acquisition test is systematically given for each initial training course on risk prevention. Initial training for occupational first aiders is approved by the plant doctors and the refresher training courses by the plant nurses.

The QSPR (Safety, Quality and Risk Prevention) department now organizes specific training sessions and briefings requested by work teams, in order to meet specific needs on topics such as the wearing of breathing hoods, radioactive source management, emergency exposure or 'behavioral' training' (posture, movements).

The training worksite set up at the end of 2001 complements the pedagogical tools used for risk prevention training. Its purpose is to provide a visual presentation of expectations and to coach trainees in the carrying out of basic practices and the use of monitoring instruments.

A number of standards have been redefined and disseminated by means of an extensive information campaign. Expectations regarding the smoking ban in industrial areas, radiological risks in each plant area, and the monitoring of staff and equipment leaving the RCA, are clearly displayed by means of appropriate signs. An information campaign using posters and the site CCTV display system has proved successful in reinforcing the above-mentioned expectations. A booklet reminding staff of plant rules has been published and widely distributed to plant staff and contractors.

In order to supplement risk prevention meetings and discussions, each accident, near-miss and significant contamination report is conveyed to the risk prevention representatives in charge of co-ordination within the departments. Other sources of information such as the EDF industrial safety report, or feedback from risky situations encountered on other plants, are distributed and displayed within the departments. An example of this is the 'OUF' document, which visually describes real-life situations. This information is also used as a training support for general and refresher training.

IAEA comments:

Belleville has adapted a policy of "Risk Prevention" to address improvements in Nuclear Safety, Industrial Safety, Individual Radiation Protection, and Environmental Safety. The Risk Prevention model adopted includes:

- organisational changes including a new risk prevention department (QSPR)
- new training in risk prevention and incorporation of risk prevention techniques into existing training
- increased management involvement in training
- increased management involvement in the plant

As a result of the Risk Prevention initiative, there has been significant improvement in management involvement in training. Senior managers frequently kick-off training sessions and provide summaries at the conclusion of training to ensure appropriate expectations are being conveyed to the students. Increased management presence in the plant is providing additional training enhancements like clarification of expectations and expected standards of performance. Plant performance indicators show significant improvement in industrial safety and radiation protection.

Conclusion: Issue resolved

2.8(2) Issue: The qualification renewal process of the PC-team members does not include exercise participation as a minimal requirement. The annual renewal qualification process for each of the PC members is the responsibility assigned explicitly to the supervisor of the concerned staff member. The training and refresher needs are properly defined and tracked as is the exercise programme. However, the only formalized criteria for renewal qualification is the initial training and refresher requirement, as stated in Chapter C13 of the PUI. Regular participation in exercises is not one of these criteria but essential to maintain the ability of the person to fulfil their role in the EPP organization.

Suggestion: Considerations should be given to including in the qualification renewal process of the PC- team members' requirements on regular participation in exercises.

Plant Response/Action:

Belleville plant has taken into consideration the suggestion made by the OSART team by incorporating participation on at least one exercise per year as one of the criteria for renewal of EPP qualification. This applies for the main players from the Management Command Post (PCD), Assessment Command Post (PCC), Logistics Command Post (PCM) and Local Emergency Response Team (ELC) where the requirement is for at least one complete exercise per year whereas for the other players the requirement is for one internal command post training exercise per year.

The implementation of this decision was brought into force as of the beginning of 2002. The people in charge of the command posts have drawn up a training exercise program for those involved in their particular command post with an aim to ironing out the discrepancies during 2002. The plant EPP engineer keeps the computer database up to date tracking the participation of each staff member in exercises and practical training sessions. Using this information, the department managers then renew the EPP qualifications of personnel or request refresher training or additional practical training sessions.

In order to satisfy these new requirements, the number of EPP exercises has been increased for 2002 with 4 complete exercises, 4 portable equipment mobilization exercises, 2 house call-out exercises and one site evacuation alert with personnel evacuated to the fall-back facility. Other exercises involving evacuation of buildings and intervention from off-site emergency services either for fire fighting or for rescuing the wounded are also planned as part of the Fire Fighting and Medical Assistance Plan within the EPP area.

IAEA comments:

Participation in annual Emergency Preparedness drills was instituted as a requirement at the beginning of 2002. Qualification requirements for the PC teams now include:

- participation in a drill within the last year
- routine medical exams
- refresher training

The plant has increased the number of drills planned in 2002 which should provide an opportunity for all PC teams to meet the new annual drill participation requirement. The plant EPP engineer appropriately monitors, records, and determines participation based on the degree of involvement for

each participant in the drill. The planned participation schedule should minimize the number of members with qualification discrepancies by the end of 2002.

Conclusion: Satisfactory progress to date

3. OPERATIONS

3.1. ORGANIZATION AND FUNCTIONS

The operations department of Belleville NPP is responsible for the operation of two 1300MWe P'4 series Electricity De France (EDF) units. The operations department has established clear goals and objectives in the form of an agreement letter to the plant's Plant Manager which provides clarification on how operations will tangibly support the plant goals. There are also agreement letters from each shift which support the operations contract agreements.

The department is managed and staffed by well-qualified engineers and professionals. The team recognizes as a good practice a process for enabling line management to ensure operations personnel are adequately qualified.

There is a seven shift rotation within operations which provides adequate rest periods for all shift personnel. Following the scheduled extended break from shift duties, the team recognizes as a good practice the systematic review of operational data the day before returning to shift. Most plant personnel do not work shift requiring call outs to support emergent work activities. This callout function is periodically tested to ensure appropriate response by plant personnel to support operations. The staffing levels for each shift are adequate but only slightly above minimum staffing requirements. Currently, shift personnel are assigned only to a specific unit, which sometimes challenges the shifts during outages since no changes are made to staffing levels to compensate for the additional outage work loads.

The operations management team conveys a clear message to shift personnel that nuclear safety is paramount in every decision or action. This message is reinforced by interface via observation programmes. However, with seven operating shifts, additional interface time might be warranted to ensure shift personnel are aware of management's commitment to improvement. One example of management's commitment to safety culture is the risk analysis programme, which ensures nuclear and industrial safety is routinely considered when performing a task. The team considered this a good practice in the MOA section of the report.

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

A main and an emergency control room exist for each unit. The control room panels are well laid out and system and equipment status is adequately displayed with the help of mimics and annunciators. The number of alarming annunciators is relatively low however this number is not currently tracked within operations goals. Tracking and minimizing control room alarms and control board indication problems ensures that control room operators have the maximum controls, indications, and alarms available.

Previously, the formal work request system was used to fix all plant deficiencies. This process proved too cumbersome and recently a new process was introduced to identify and repair some low-level plant deficiencies. This process has had limited success. If operations personnel identified all low-level plant deficiencies, the aggregate volume of plant deficiencies would overwhelm the maintenance program. The team believes that the total volume of deficiencies has caused operations personnel to become complacent in identifying deficiencies. There were many minor deficiencies noted by the team within the plant. For example, while plant cleanliness was noted to be generally good, housekeeping conditions had deteriorated in some areas not frequently visited. A number of labeling deficiencies were identified in the plant. These deficiencies include missing labels, broken labels, unattached labels, and handwritten labels. Some material condition deficiencies were noted throughout the plant most notably in areas not frequently visited. A few operator aids were also identified in these areas. The team identified approximately 160 deficiencies of which only about 10% were identified in the work

request database. The team has recommended improving standards within operations with regards to identifying plant deficiencies. Additionally, the plant must support the operations team by fixing the identified deficiencies so that the operations personnel don't become frustrated by a lack of progress.

Field operators perform rounds utilizing an electronic logbook. This electronic data is stored on the computer network providing long-term retention and easy access of equipment parameters.

3.3. OPERATING RULES AND PROCEDURES

EDF has developed a very consistent set of operating rules and restrictions which maximizes availability of safety related equipment. These rules are explicitly followed by the Belleville operations organization. Safety related equipment unavailability is divided into group 1 or group 2 equipment within the technical specifications. The aggregate number of group 1 or group 2 unavailable equipment is limited to maximize overall safety equipment availability. Unavailability of safety related equipment is tracked by a status board in each control room. This unavailability is also tracked in the control room logbooks. These logbooks sufficiently document any plant problems and unit status.

The operations department maintains surveillance, startup and shutdown, and operating procedures. The accident procedures are drafted by corporate EDF and incorporating experience from the entire nuclear fleet then finalized and approved at the plant. The accident procedures are under revision to go to entirely symptom based procedures but are currently either event or symptom based. The startup and shutdown procedures also have a strong influence from fleet experience and are rewritten each outage to incorporate plant outage specific activities. These procedures contain visual aids and logic diagrams for the procedure flowpath. Several of these procedures also contain graphic descriptions of important plant parameters. The team recognizes the content and format of these procedures as a good practice.

Normal operating procedures contain appropriate guidelines to perform prescribed activities. Some non-safety related procedures are written too generally and need to be updated. Shift personnel have identified several non-safety related procedure deficiencies that have had untimely revisions. While awaiting implementation of procedure changes, temporary changes are made by hand leading to several procedures having handwritten markups. The team has made a recommendation in the MOA section of this report to improve the timeliness of updating operating procedures. The alarm response procedures in the control room were noted to be well written and used by the reactor operators.

3.4. OPERATING HISTORY

Unit capacity factors are difficult to compare due to Belleville being a load follow plant. Frequently, power is raised or lowered at the discretion of the dispatcher. The dispatcher can automatically adjust load by plus or minus 97MWe, not to exceed 100% power. Larger load changes are performed by the control room operators. A review of the power history curve indicates that during summer months, significant load changes may occur on a daily basis.

For the first three quarters of 2000, there were eight safety related significant events at Belleville. Six of these events contained human performance events caused by the operations team. Human performance problems were noted in the areas of plant monitoring, questioning attitude and risk analysis.

EDF has a formalized national operating experience feedback programme which addresses problems from the nuclear fleet. The plant then incorporates this experience into plant processes and procedures.

3.5. CONDUCT OF OPERATIONS

Each operations shift team is led by a shift manager. The shift manager is informed of shift activities. The shift manager has many duties. Operations management is aware that too many duties may distract the shift manager and monitors the aggregate of such collateral duties.

Individual shift turnovers conveyed the necessary information between the shifts. Shift turnover meetings, led by the unit shift supervisor, were observed to be conducted in a professional manner. The control room has recently been altered to include a gate to preclude easy access from non-operations personnel. The general guidelines of no more than four people at the counter were reinforced by control room operators. Reactor operators were observed to routinely monitor the control boards and maintain an overall atmosphere of professionalism.

As in most EDF plants, Belleville operations personnel frequently do not use real time verification techniques when communicating or performing field actions. There are not any established standards for such verification techniques. The team recommends that Operations management review this practice of not verifying communications or equipment manipulations important to nuclear safety.

The surveillance programme adequately verifies the availability of safety related equipment. The team suggests consideration be given to testing opposite train equipment prior to removing safety related equipment from service.

Some of the recent events at the station contained human performance errors by control room personnel. The team suggests providing improved Just-In-Time training to maximize competence by control room personnel.

3.6. WORK AUTHORIZATIONS

The plant has recently formalized the in-cycle, or work control project. This process has not yet matured to accurately schedule all surveillance and maintenance activities in advance. A daily work request meeting reviews the current day's activities to finalize the schedule. Operations personnel must routinely respond to changes in the schedule and review the aggregate affect via the risk analysis program. A good in-cycle project should minimize the real time schedule change decision-making by shift personnel as they are the last barriers to mistakes.

Work is appropriately authorized and safety tags are developed and hung by operations personnel. A computerized database tracks and prints tags and also applies intelligence based tagging rules to flag when safety tagging rules are being violated.

There is a plant programme to identify equipment that may be manipulated by other groups during surveillance testing. A tag is printed and hung on the component to identify that operations has temporarily relinquished control of the component to another group.

Plant modifications are typically determined by the EDF corporate structure and are implemented for all similar series reactor types. This sometimes leads to a large number of modifications being implemented in one batch. In 2001, a large batch of modifications will be implemented. Previously, a large batch of modification in the mid-90's left some operators uneasy with their knowledge of system changes. The team encouraged operations management to ensure adequate training is developed to cover the proposed plant changes.

3.7. FIRE PROTECTION PROGRAMME

There is a well-defined fire protection strategy at the plant. However, this strategy is undermined by fire protection complacency on the part of individual employees. The team noted several areas of the plant in non-compliance with the storage of combustible materials. Additionally, plant personnel are smoking in unauthorized areas. The team recommends the plant improve personnel compliance with the site fire protection plan.

The fire protection programme at the site is undergoing some changes. The design of the system is being altered to increase the number of fire zones and some detection devices are being updated. A recent programme to identify combustible storage accurately calculates and inventories fire loading within the storage area.

No major problems were noted by the team relating to the adequacy of fire fighting equipment like fire extinguishers, fire hoses, fire trucks, or personal fire protection equipment used by fire fighting personnel.

A training center is utilized which provides realistic training of fire fighting conditions within an industrial and radiological environment. Training in fire protection is performed every eighteen months. The local fire department works very closely with the plant and periodically participates in plant fire drills.

3.8. ACCIDENT MANAGEMENT

Emergency procedures provide instruction during accident conditions. In 1998, an event occurred on Unit 2, which challenged the operators to control and stabilize the plant following spurious containment isolation with autostart of the containment spray pumps. Additionally, one control rod failed to properly insert. Using the emergency procedures, the operators overcooled the reactor coolant system. The procedures, which led the operators into this situation, will be significantly changed in 2002. This event and subsequent drills have verified that the emergency organization is capable of responding to events.

The plant has severe accident guidelines which serve to protect the reactor building following beyond design basis events. A multifunction virtual computer tool allows operators to see in real time the thermo hydraulic characteristics of the primary circuit and reactor core during various accident scenarios.

The shift operations personnel receive approximately two weeks of simulator and two weeks of classroom training per year.

STATUS AT OSART FOLLOW-UP VISIT

In the area of Operations, the OSART team made three recommendations and two suggestions. The follow-up OSART visit resulted in one recommendation and one suggestion being fully resolved and two recommendations and one suggestion having made satisfactory progress to date. The OSART team recognizes that several of the issues are global in nature requiring significant effort to resolve. The team considers the plant's efforts to date as significantly improving process and program weaknesses identified in the issues.

The plant has made noticeable improvement with regard to material condition and housekeeping. Most areas of the plant are considerably cleaner and many equipment leaks have been repaired. And, while the progress has been considerable, continued efforts are needed to maintain the momentum of improving plant cleanliness and material condition.

Many features of independent verification techniques have been incorporated to ensure that safety system availability is maximized. These independent checking techniques include: checking some valve lineups, field operator reporting of activity progress, and reinforcement of risk concerns. As a result of improvements in the verification process, no line-up events have occurred in 2001 and 2002.

The plant has appropriately established surveillance testing frequency for safety related equipment based on probabilistic risk assessment and operating experience. This surveillance program precludes the need to test opposite train equipment when removing safety related equipment from service. A review of events from 1999 through 2002 determined that no events would have been precluded by performing this additional testing.

Following the OSART mission, EDF approved the building of a full scope simulator at Belleville. Simulator training should start in early 2003. In the interim, the training and operations departments have appropriately identified certain sensitive evolutions which benefit most from just-in-time training. This training is typically performed as a classroom review with selected experts from the site organization.

An extended benefit of improved plant housekeeping involves fire protection at the plant. The site fire protection organization has recently changed to include establishment of a fire protection officer. This officer provides continuity, oversight, and serves as a conscience to the fire protection program. Additionally, the site staff has embraced fire protection concepts by adhering to combustible material storage and designating smoking areas. One exception is that the wooden pallets stored in the plant warehouse exceed combustible loading requirements. These wooden pallets will soon be replaced with metallic pallets.

DETAILED OPERATIONS FINDINGS

3.1. ORGANIZATION AND FUNCTIONS

3.1(a) Good practice: A new process of individual qualification which integrates training, management and supervisor observations, personal performance, and professional development enables line management to assess the skills and qualifications of operations personnel. The uniqueness of this process is based on the integration of various programmes to develop an overall perspective of individual skills. The key objectives of this programme are:

- To ensure professionalism of staff.
- To provide assurance that staff will handle difficult situations with a collective approach capable of compensating for individual error.
- To ensure credibility in the view of external agencies.

Skills evaluations are built around three methods of observation:

- Daily monitoring of the individual.
- Assessment of training.
- Meetings between line managers and individuals.

An assessment guide is created for each field operator and control room operator. This comprehensive guide groups the following information:

- Monitoring of training.
- Monitoring of the quality of performance of daily actions and activities.
- Monitoring of rare or unusual activities that necessitate maintenance of skills through training.
- Identification of areas for progress, and tracking of these areas with respect to key safety-related activities.

Skills assessments are carried out throughout the year on the basis of criteria defined in the Corporate Skills and Knowledge Guide (GNCC) for operations job functions. These criteria form the reference base for each job function. They are transposed into practical applications that can be observed and measured by the Shift Manager and Unit Shift Supervisor. Monitoring is carried out on a continuous basis. In the event of an anomaly being detected, it is traced in the form of an “area for progress”, and dealt with immediately. The individual is therefore able to assess his own performance with respect to the observations made. Meetings between line management and the individual enable validation of the information in the assessment guide, and provide the basis for the decision to issue or re-issue the qualification.

3.1(b) Good practice: Shift personnel, returning from the scheduled ten day break, go through a systematic review of operational data the day before returning to shift. Within the shift system, one normal working day is scheduled on the day before returning to morning shift duty after a 10 day absence (rest period, plus one week training on simulator). This day enables the whole crew to be brought together to communicate all of the necessary data to ensure a calm and well-informed return to shift duty under optimum nuclear safety conditions. The meeting comprises two parts:

The first part, coordinated by the operations planners from the off-shift Operations Planning and Logistics Group, who are responsible for technical monitoring of the units within the In-Cycle and Outage Projects, consists of:

- A summary of key events occurring during the team’s absence.
- A description of ongoing problems.
- A description of the programme of activities planned for the coming week.

Each crew member is given the opportunity to request clarification on any points as needed, and to ask for further information on the processing of work requests issued by the crew during the previous shift cycle.

The second part of the meeting, coordinated by the Department Manager or Deputy Manager, provides an opportunity to:

- Debate issues relating to the department, the plant and the company.
- Communicate information and obtain the views of crew members.
- Answer questions asked by personnel concerning ongoing issues.
- Provide reminders of priorities and requirements, particularly in the areas of nuclear safety, risk prevention and industrial safety.

Based on the quality of the information provided and the direct contact that it affords with department management, this meeting helps maintain dialogue between management and staff and enhances the level of safety with respect to activities performed by crew members.

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

3.2(1) Issue: Operations personnel are not routinely identifying all plant deficiencies in keeping with industry standards. Examples of plant deficiencies not identified include:

Labeling deficiencies - A number of labeling deficiencies were identified in the plant. These deficiencies include missing labels, broken labels, unattached labels, and handwritten labels. Interviews indicated that the current processes for making and replacing labels are too cumbersome. Currently, there is no capability for rapid manufacturing of labels to fix identified problems in real time.

Housekeeping deficiencies in infrequently visited areas - In some infrequently visited areas of the plant, housekeeping conditions are not in keeping with industry standards. These areas include the Radwaste facilities, the demin plant, the cooling towers, and the turbine building basement. Some housekeeping deficiencies, like improperly stored isolation locks and chainfalls, were noted in other areas of the plant.

Material condition deficiencies - Material condition deficiencies were noted throughout the plant but most notable in infrequently visited areas of the plant. Material condition deficiencies include corrosion, boron buildup, and minor equipment deficiencies like missing covers or bolts or small leaks.

Seismic concerns - There were a few examples of conditions in the plant which operations personnel should question for a determination of whether these conditions should be considered seismic concerns. Examples include an unsecured vacuum cleaner and temporary heater in the Unit 1 charging pump room. Also, there were lead blankets placed on piping and equipment in several areas of the auxiliary building.

Temporary Modifications - A service air line was connected to a superheated steam line for air injection. Operations personnel used and accepted this temporary lineup without questioning whether it had been assessed as a potential temporary modification. Operations management has now determined that this connection should be considered a temporary modification.

Unauthorized Operator Aids - A few unauthorized operator aids were identified in the plant. These were located in infrequently visited areas. A control panel in the radwaste treatment building had handwritten valve lineups. The demin control panel and auxiliary feedwater pump instrumentation contained handwritten setpoints and spans. Also, in the turbine building, a fire alarm panel had an unauthorized alarm response sheet taped to the panel.

Inadequately labeled equipment may lead to inappropriate manipulation of plant equipment and loss of configuration control. Poor housekeeping and material condition leads to a reduction in the availability plant equipment. Equipment stored without proper seismic considerations could cause unanticipated loss of safety equipment during a seismic event. Unapproved temporary modifications and operator aids could affect configurations assumed in normal operation or accident mitigation.

Recommendation: The plant should improve standards within operations with regards to identifying deficiencies in labeling, housekeeping, material condition, seismic concerns, temporary modifications, and operator aids. Additionally, other plant organizations should support operations by fixing identified deficiencies.

Plant Response/Action:

Following an examination of the issues by the site and by the operations department, the following actions were taken:

- A processing logbook for minor daily tasks (called ‘PTJ’ in French) has been placed in the shift supervisor’s office on each unit. This logbook is directly filled in by operations staff, who report defects concerning lighting, locks, housekeeping, including cleanliness or telephones. The workers responsible for correcting these defects come to resolve the identified problems on a regularly basis and also fill in the logbooks. This system is only designed for ‘minor defects’. Defects concerning sensitive equipment (e.g. fire door at the boundary of a fire safety zone) are still processed via the normal work request system. The system is up and running, and is considered satisfactory by operations staff and their line managers.
- As of December 31st 2001, 17 members of the operations department had attended an IAEA training course on the subject. The operations department intends to have a greater number of its members undergo training (by wider participation of its members in future training courses) and take this initiative down to the level of each individual. The influence of ‘rubbing off’ on fellow peers is also a valuable tool. This is naturally implemented by having staff participate in rounds or field inspections, accompanied by staff members having attended an IAEA training course.
- Management control has been enhanced in this area. As an example, the number of formalized field inspection tours conducted by shift supervisors and shift managers increased from 42 in 2000 to 69 in 2001. These tours are written up in a report and identified deviations are monitored. This system is a powerful strategy in the policy of the operations department and is monitored by an indicator linked to a reward system. Furthermore, various tours are conducted as part of the management control process carried out by the department’s senior management team, in addition to industrial safety inspection tours carried out as part of a site-wide process.
- Deviation reporting booklets are also available in order to track defects concerning plant condition. Identified defects are fed into a database and processed by the site’s ‘minor maintenance’ group, of which one department employee is a member.

IAEA comments:

A root cause analysis performed by the plant staff determined the following causes contributed to weaknesses in identifying plant problems:

- Cumbersome identification and reporting systems
- Unclear standards and poorly defined expectations
- Insufficient management oversight and controls

In response, the plant has:

- simplified the user interface with the work request system
- created a log for identifying minor maintenance needs

- created a minor maintenance response team
- trained 80 members of the plant staff (17 within operations) on standards for identifying deficiencies utilizing IAEA training
- improved plant material condition in selected areas of the plant which represent the model for plant standards
- established housekeeping days to thoroughly clean areas of the plant
- scheduled housekeeping plant tours for individual departments and the entire site

Tours of the site indicate significant improvement regarding identification and disposition of plant issues like housekeeping, material condition, labeling, temporary modifications, and seismic concerns. Continued emphasis is needed to maintain momentum in this area.

Conclusion: Satisfactory progress to date

3.3. PROCEDURES

3.3(a) Good Practice: Startup, shutdown, and unit operation procedures contain logic diagrams which provide control room operators a clear vision of the overall evolution. Additionally, the startup and shutdown sequences of the outage schedule are customized to each outage and proceduralized to incorporate all activities. Operators have a set of documents ergonomically designed to provide an overview at all times, enabling them to:

- Determine their position within the process at any time,
- Visualize key phases completed
- Have a forward view of future activities

These procedures, based on Normal Operating Rules (RCN) which incorporate experience feedback from corporate level, are structured to include:

- A section focused on principles which states the operating principles common to the operating condition concerned and includes a general logic diagram setting out the sequencing and defining the various stages. This is known as the “Administrative procedure”.
- Sections specific to each sequence, which set out, in the form of a logic diagram, the activities to be performed to bring the unit from a given initial condition to a final condition. These are known as “Action procedures.” These action procedures are implemented via action sheets which are applied from the control room, in the field, or by maintenance depth.

This logic diagram supplements the startup procedure and specifies:

- All of the activities to be performed in accordance with the logic sequencing of the outage schedule,
- Reactor mode changes (Outage Safety Committee and final assessment/check)
- Specific conditions with respect to performance of an activity,
- Reminders of key safety points and requirements,
- Pressure and temperature characteristics,
- Planned surveillance tests.
- It incorporates experience feedback from previous outages.

3.5. CONDUCT OF OPERATIONS

3.5(1) Issue: Operations personnel frequently do not use real time verification techniques when communicating or performing field actions. These techniques, which include self-checking, communications feedback and independent verification of actions, are commonly used in the industry and reduce the opportunity for human performance errors.

Self-checking – Reactor operators frequently use self-checking when performing equipment manipulation. However, field operators do not always utilize this same self-checking rigor. For example, a field operator manipulated several pumps and valves on a demin water panel in rapid succession without self checking. Interviews indicate that field operators have not been trained to self-check comparable with control room operators. Inadequate self-checking is frequently considered the cause of many human performance errors within the nuclear industry.

Communications – There are no standards to ensure verbal communications are appropriately received. Communications feedback provides additional assurance that verbal communications were correctly heard. Interviews indicate that communications feedback techniques are used in high noise areas, when the evolution is very sensitive, or if the instructions are in question. More frequent communications feedback should assist in strengthening the questioning attitude between plant personnel when instructions are given.

Independent Verification of Manipulations on Equipment Important to Safety – There is no process in place to require independent verification of the manipulation of equipment important to nuclear safety. Requiring a second check of manipulations on equipment important to nuclear safety provides additional assurance that equipment important to safety are properly aligned.

Recommendation: The plant should improve the use of verification techniques when performing activities important to nuclear safety.

Plant Response/Action:

Bellefonte NPP has focused its efforts on two areas:

- Human factors
- Development of specific independent checking tools

The operations department relies first and foremost on training, this including both initial and refresher training.

In this respect, control-room operators are made aware of operational communication during their simulator team-training sessions. During these simulator training sessions, emphasis is placed on the organization of tasks within the team, the risks associated with poor operational communication, and the importance of reporting back of activities entrusted to field operators, etc.

Efforts are also targeted at field operators who remain in permanent contact with the control-room operators. As part of this effort, the ‘communication’ topic forms an integral part of field operator training and as such, is incorporated in a specific training action, designed to ensure that information is properly exchanged between team members. Furthermore, a number of full-scope simulator situational training sessions, attended by field operators, are organized every year. These sessions enable each shift team member to fully understand the importance of

reporting back of activities and the confirmation of outgoing and incoming messages. Training sessions are followed up by a detailed discussion enabling the team to identify areas for improvement with regard to human factors.

However, while the operations department has not opted for the systematic use of message repetition, it has extended operational communication to other communication techniques.

The operations department has also made a concerted effort to develop specific tools or techniques:

- The ‘risk assessment’ initiative incorporates double-checks into identified counter-measures when there is no means of checking an operation locally or of verifying whether post-maintenance testing is possible. During refresher training on simulator, a site topic is devoted to the study of a problematic situation in order to develop operator skills in performing risk-assessment incorporating technical and organizational counter-measures.
- The ‘sensitive transient’ initiative was developed by 7 operations shift teams. This initiative fully addresses the concepts of operational communication, monitoring and independent checking during transients specifically flagged for special attention. Examples of such transients include: collapsing the bubble, primary pump shut-down and start-up, primary circuit drainage down to vessel head mating surface level, first criticality after core reloading, switching from normal RHR shutdown to normal SG shutdown, heating of primary circuit from single phase intermediate shutdown to dual phase intermediate shutdown, etc. Most of the analysis procedures for sensitive transients have been set in place since the OSART.
- The operations department has established tools for the independent checking of equipment maneuvers. Independent checking procedures for key line-up points have been implemented, particularly during outage. These procedures are used to check that essential line-up points (pump suction and discharge, mini-flow, lubrication) are properly complied with. At present, these independent key-point checking procedures, of which there are 15, concern essential safety-related systems where a line-up error could cause damage to equipment, thereby jeopardizing their functionality: low and medium-pressure safety injection pumps, emergency turbine-driven and motor-driven auxiliary feedwater pumps, containment spray pumps, charging pumps, residual heat removal system for shut-down, etc. These independent checking procedures will be increasing in number. Key line-up points are then checked locally by staff members other than those who performed the line-up.
- The independent checking technique is also applied to specific points after potential risks have been identified. To quote an example, this is done during post-maintenance testing after the component cooling system/essential service water heat exchangers (RRI/SEC) have been cleaned.

IAEA comments:

Belleville has incorporated many features of independent checking to ensure that safety system availability is maximized. These independent checking techniques involve:

- redundant checking of safety system lineups to ensure accurate valve alignment
- field operator reporting of activity progress
- pre-job briefs / just-in-time training of sensitive evolutions to ensure all involved individuals are aware of their assigned tasks
- risk assessments which identify sensitive aspects of activities to ensure appropriate focus is applied

Additionally, human performance error reduction techniques have been introduced in operator training. As a result of improvements in the verification process, minimal line-up events have occurred in 2001 and 2002.

Conclusion: Issue resolved

3.5(2) Issue: The plant policy of not testing the functionality of opposite train equipment prior to removing safety related equipment from service is not in keeping with industry standards. The plant does not have a policy to perform testing on opposite train equipment prior to removing safety related equipment from service. However, during outages when trains of safety related equipment are removed in a sequential manner, testing is performed, via post maintenance testing, on safety related equipment prior to removing the opposite train equipment from service. The plant's policy is based on the risk analysis determination of periodic surveillance testing frequency. This frequency provides assurance that safety related equipment is available when needed. However, since removing one train of safety related equipment from service invalidates the single failure criteria, opposite train testing provides additional assurance that the remaining train is capable of performing its safety function during conditions when single failure analysis can no longer be applied. Examples of systems important to safety not tested when making one train unavailable include the diesel generators, the auxiliary feedwater pumps, and the emergency core cooling pumps. Unavailability of safety related systems when single failure criteria can not be met may invalidate mitigation strategies during an accident.

Suggestion: Consideration should be given to implement additional opposite train testing when entering conditions where single failure criteria are not met.

Plant Response/Action:

Belleville NPP does not concur with the opinion of the OSART team.

Corporate EDF nuclear policy with regard to this matter is the following:

In general terms, a safety function (equipment, component or system) is pronounced as being available if and only if it can be proven, at all times, that it is able to fulfil the objectives assigned to it with the required level of performance. As a minimum requirement, the surveillance test programs included in chapter IX of the General Operating Rules are carried out as they should be: compliance with periodicity (including tolerance margin) and with operating procedure; achievement of satisfactory results.

The surveillance tests described in chapter IX of the General Operating Rules concern all safety-related plant systems of a nuclear installation.

Surveillance tests are technical checks that are carried out periodically. A technical check consists of a series of actions designed to test compliance of the item being checked against a reference criterion or reference criteria (pre-established data or conditions). It is conducted in accordance with pre-established operating procedures and analytical methods, which have been previously checked for applicability and representativeness.

This technical check is carried out at pre-defined intervals for the entire life span of the plant.

Safety-related systems featured in chapter IX of the General Operating Rules undergo exhaustiveness analyses in order to determine the set of checks required to ensure equipment availability and operability.

A surveillance test is pronounced as being satisfactory if, upon completion, all the above-mentioned acceptance criteria are met.

The tested system or function is considered available insofar as it complies with the requirements stipulated in chapter III of the General Operating Rules and meets surveillance test criteria.

Appropriate operational practice is ensured by scheduling the test in compliance with the defined periodicity.

According to the above-described policy, strict adherence to the surveillance test program is necessary and suffices to guarantee the availability of safety-related equipment. Furthermore, after maintenance work is performed on safety-related equipment, the latter undergoes post-maintenance testing, which also serves to guarantee equipment availability.

Additionally, the aim is to avoid over-use of equipment as much as possible, by keeping the number of start-ups to a minimum. If we did not optimize our maintenance and surveillance test programs, our equipment would be rendered unreliable through excessive use.

Performing specific tests in addition to those included in the surveillance test and post-maintenance test program would place additional strain on equipment, the availability of which is already ensured by its surveillance test program.

IAEA comments:

EDF has identified an appropriate surveillance testing frequency for safety related equipment based on probabilistic risk assessment and operating experience. This surveillance interval appropriately assures safety related equipment availability. Any additional surveillance testing would provide unnecessary challenges to plant equipment. Therefore, Belleville does not plan to implement this suggestion. A review of events from 1999 through 2002 determined that no events would have been precluded by performing this additional testing.

Conclusion: Issue resolved

3.5(3) Issue: Operations personnel do not receive adequate Just-In-Time training to maximize competence during infrequently performed complex plant operational evolutions. Control room personnel are not always given an opportunity to realistically simulate complex evolutions like startup, mid-loop operations, safety injection testing or infrequent operations like creating or collapsing a pressurizer bubble. The unavailability of an on-site simulator reduces the real time training options for operators. Some events occurring this year include human performance errors by reactor operators in the control room. These errors include a reactor trip while manually controlling steam generator levels and lifting a RHR relief valve while shutdown. Reductions in operator proficiency could increase the probability of transients or reduce the effectiveness of mitigating actions during an event.

Suggestion: Consideration should be given to providing Just-In-Time training for control room personnel prior to complex or infrequent evolutions.

Plant Response/Action:

The plant already provides a certain amount of 'just-in-time' training.

Examples include mid-loop operations, going onto cold shutdown, technical presentation of outage, presentation of core reloading and reloading package, etc.), which take the form of structured training sessions.

Certain infrequent transients also require special planning, which takes the form of sensitive transient analysis. Analysis of these transients prior to their occurrence may also be likened to just-in-time training, and the number of such analyses has increased since the OSART. These sensitive transients include collapsing the bubble, primary pump shutdown and start-up, drainage of primary circuit down to vessel head mating surface level, first criticality after refueling, switching from normal RHR shutdown to normal SG shutdown, heating of primary circuit from single phase intermediate shutdown to dual phase intermediate shutdown, etc. Most of the analysis procedures for sensitive transients have been set in place since the OSART.

The forthcoming acquisition of a full-scale simulator by Belleville NPP will also enable teams to receive just-in-time training immediately just prior to a major transient or sensitive test. Examples include house load tests, load reject dispatch tests or the approval of new surveillance test procedures.

The compilation of these training modules will be examined in conjunction with the Site Skill Development Structure.

IAEA comments:

Following the OSART mission, EDF approved the building of a full scope simulator at Belleville. The full scope simulator is scheduled to be complete in October of 2002 followed by an extensive testing program. Simulator training should start in early 2003. In the interim, the training and operations departments have appropriately identified certain sensitive evolutions which benefit most from just-in-time training. Due to the lack of an on site simulator, this training is frequently performed as a classroom review with selected experts from the site organization. These sensitive evolution training opportunities principally involve outage activities since many infrequently performed evolutions occur during this time. This classroom training appropriately provides just-in-time training to involved personnel to ensure heightened awareness of the evolution.

Conclusion: Satisfactory progress to date

3.7. FIRE PROTECTION PROGRAMME

3.7(1) Issue: Fire protection standards are not being maintained in all areas of the plant. Combustible material is stored and smoking is occurring in unauthorized areas of the plant. Areas in which inappropriately stored combustible materials include the warehouse, the radiation control area and the turbine building. Although the plant has gone to great length to establish designated storage areas which are analyzed and itemized for fire loading, there is still evidence that plant personnel are insufficiently aware of the need for increased diligence in fire safety. Examples of unauthorized storage of combustible materials and smoking violations include:

- Wooden supports and wooden scaffold material is used in the RCAs
- Cigarette butts were found near a lube oil pump
- In front of the diesel generator building there are many brands of cigarettes laying beside equipment.
- A recent cigarette butt was found in changing locker on Unit 1.
- A large pile of plastic waste as well as plastic drums was laying in the corridor in the RCA
- A quantity of paint was in a corridor in the fuel building
- Transport boxes with plastic material were stored in the Unit 1 RCA
- Several (~50) cigarette butts in 1 LD1005 - non smoking area
- The warehouse contains a large quantity of unnecessary flammable material such as wood, cardboard and flammable chemicals in open shelves
- Room KA0440 - a large quantity of paints and solvents stored in a pile
- Room KA0530 and KA0509 – an infrequently used store room off spent fuel loading bay contained amongst other things
 - wooden storage boxes
 - full garbage bags
 - clear plastic sheet
 - solvent spray
 - gas bottle not tied up and one held loosely in place by rope
 - oil drum

Unauthorized storage of combustible materials plus the presence of unauthorized ignition sources could invalidate the assumptions in the plant fire protection programme.

Recommendation: The plant should improve personnel compliance with the site fire protection plan by eliminating unauthorized combustible material and smoking in unauthorized areas.

Plant Response/Action:

In order to address the OSART recommendation fully, Belleville NPP has undertaken two types of actions:

a) Fundamental actions designed to address fire protection at the same level as operational safety

- Creation of a full-time fire-protection officer's position, for the close monitoring of guidelines and their implementation on site.
- Organization of weekly rounds by the fire-protection officer, for the immediate detection of cultural and technical discrepancies. Technical discrepancies are immediately reported to the minor-maintenance representative for processing, via the network of representatives. Cultural discrepancies are recorded by the fire-protection officer so that they can be analyzed and a plant action plan drawn up.
- Increased management presence in the field for Q.S.P.R. staff.
- Procedure overhaul (fire load management).

b) Actions designed to manage the flow of material in the RCA, and clarify those actions requiring issuance of fire permits

- Risk assessment prior to issuance of fire permit.
- A training worksite incorporating international fire-prevention and fire-fighting standards.
- Risk assessment prior to taking material into the RCA. Specific concerns are identified on the basis of this risk assessment:
 - need to take material into the RCA,
 - required, sufficient quantities,
 - identified storage locations,
 - radiological shielding to facilitate compliance with directive DI 82.

c) Actions designed to gauge awareness and ownership

- Operations drills are planned in collaboration with the fire-protection officer. A test surveillance operation is initiated by the fire-protection officer. An external perspective enables the relevance of these drills to be assessed.
- Weekly plant inspections are organized by the fire-protection officer in order to gauge the impact of these actions, and consequently, any negative or positive drifts.
- Industrial safety management tours are also effective in correlating the perspective of the fire-protection officer and that of the senior management team.

IAEA comments:

Belleville has performed a root cause analysis on fire protection issues and determined the following causes contributed to weaknesses in this area:

- Clear ownership of fire protection within the organization has not been established thereby leading to vague and unclear responsibilities
- Insufficient line management in the field to reinforce fire protection expectations
- Lack of clear fire protection standards

Belleville has subsequently instituted a full time fire protection officer who is providing program oversight and has appropriately updated site fire protection documents and requirements. Additionally, enhancements to the fire protection program include:

- Routine plant inspections of fire protection issues
- Increased management observation in the plant which including identifying fire protection issues
- Consistent review of fire protection drills by the fire protection officer
- Improved involvement of the plant staff with fire protection issues
- Improved signage in the plant
- Better designations of smoking areas and appropriate cigarette receptacles in these areas

While these efforts have clearly improved fire protection programs and policy, the plant warehouse still has some outstanding fire protection issues. A document, recently developed to identify fire protection discrepancies in the plant, showed that the warehouse exceeds fire loading requirements due to a large number of wooden pallets. A plan is in place to minimize or eliminate wooden pallets on the site by 2003.

Conclusion: Satisfactory progress to date

4. MAINTENANCE

4.1. ORGANIZATION AND FUNCTIONS

Maintenance responsibilities are divided between a Mechanical department consisting of approximately 80 people and a department combining Electrical and Instrumentation & Control consisting of approximately 80 people. Maintenance services such as warehousing, cleaning, and painting, are supported by other departments. Two other departments which support maintenance are the Outage and In-cycle project organizations. All the department heads report to the Plant and Deputy Plant Manager. While this may not be the typical organization seen in the industry; the roles, responsibilities and goals for each department are clearly defined and understood via a contract agreements between the plant manager and the department heads.

The departments operate in an independent way to convert policy to practice. This results in each department having slightly different programs and policies. The plant has recently introduced an integrated cross functional work management project called “Unit Operating Organization” or “Tranche En Marche” (TEM) which is designed to emulate the good features of the already successful “Outage Project”. The team recognizes the potential of this new project but also identified some shortfalls of its present arrangements and has made recommendations in this area. It should be noted that prior to the visit, the plant had requested the team to pay special attention to this area.

Staffing appears adequate to control existing maintenance backlogs but some managers indicate that there is a lack of ability to adequately address the preventive maintenance programme. The relationship with the main contractors is considered acceptable with a focus on improving contractor skills.

The plant has several databases serving maintenance. The SYGMA software, developed for the entire population of nuclear plants, serves as the major maintenance management tool although it is not perceived as user friendly by some work groups.

4.2. MAINTENANCE FACILITIES AND EQUIPMENT.

Each of the maintenance organizations has well equipped workshops. The maintenance facilities consist of mechanical, electrical, and instrument and control shops. Shops also exist within the radiation control area. In addition, there is a calibration shop for each discipline and a storage area for tools. The standards for these shops were considered good in mechanical and acceptable in electrical and I&C.

Qualified contractors manufacture all parts needed by plant maintenance. Contractors also perform calibration of measuring instruments and tools on a regular basis. Each maintenance section has the capability to perform calibration on measuring devices like torque wrenches and instruments. Calibration records are up to date and complete. Some problems were noted with uncontrolled measuring equipment being used in the field.

Training facilities and mock-ups are available for major maintenance activities including vessel head stud tensioning, steam generator primary side access and vessel thermocouple seals. Tool storage has good controls to prevent damaged equipment from being reissued. Special fireproof cabinets were available for the storage of chemicals and flammables. For example, in the mechanical shop, some hazardous materials are stored in special cabinets and materials that cannot be re-used are segregated in metallic boxes, which are close and sealed. The team did note some fire protection issues within the maintenance function. These are identified in the operations section of the report and recommendation has been made on the topic.

4.3. MAINTENANCE PROGRAMMES

The plant has a well-defined preventive maintenance (PM/PRV) programme commensurate with the importance of the equipment. The programme, used throughout EDF, is based on internal and international experience. The site adds its own specifics for non-safety related systems. The Plant is presently changing its PRV over to a Reliability Centered Maintenance programme (RCM). Predictive maintenance techniques such as vibration monitoring, valve diagnostics, thermo-graphics, oil analysis etc. are all utilized to adjust the PM programme and also to inform head office and other plants of results.

The overall In-Service Inspection (ISI) requirements are clearly defined for safety related systems by EDF head office. An In-Service Inspection group is established at the plant. The programme is adequate to comply with regulatory and plant policy and technical specifications. Appropriate procedures and qualified equipment are being used, and ISI inspectors are qualified and knowledgeable of specific ISI techniques. ISI results are reviewed and analyzed and timely corrective actions are being taken. ISI documentation is easily retrievable and accessible to other plant departments. Changes to the frequency and extent of inspections are approved by management. The team recognized as a good practice a simple method for recording all information related to tracking technical and administrative documentation of ISI testing. This system permits faster treatment and retrieval of documents inside EDF and by the French Safety authorities.

The corrective maintenance programme is somewhat hampered by the work management system problems identified in the “Tranche En Marche” issue mentioned earlier. This is manifested by the large quantity of minor plant and equipment deficiencies present as noted in section 4.6. All work requests, work orders, deviations and maintenance records, are stored on the SYGMA system.

4.4. PROCEDURES, RECORDS AND HISTORIES

Every maintenance task at the plant has a work order that contains, when appropriate, nuclear or industrial safety risk analysis, procedures to be applied or hand written instructions, tagging document, deviations, and a history of the job. In general, such documentation is well managed and compiled with. It is known that the plant has undergone a project to review procedures since 1999. However, some not-so-critical procedures with known problems have not been updated for many years hence some technicians have become complacent and no longer request the appropriate procedure changes. The team has recommended a general review of procedures by the plant in the MOA section of the report.

The documented history of the plant is available in a main document control system and satellite centers. Documentation is well controlled and easy access is available by computer.

4.5. CONDUCT OF MAINTENANCE WORK

Maintenance staff are provided training in their specialized skills and many perform their work conscientiously and professionally. Some maintenance activities were however observed where work and industrial safety standards needed improvement. The team recommended that plant management should enhance their field oversight and supervision of maintenance practices to ensure high industry standards are thoroughly understood by all involved and to perform additional coaching and training to reinforce those expectations. The team also noted problems in the area of foreign material exclusion standards and recommended a review of the present policies to prevent ingress of unwanted material in sensitive areas and equipment.

4.6. MATERIAL CONDITIONS

In general, the plant material condition is acceptable. The team found evidence of a large number of low level defects including broken flexible conduit, missing instrument covers, poor housekeeping, and other material condition problems on some equipment particularly in areas not frequently visited. The team recommends that the number of low-level material condition defects be reduced through better identification and correction. The plant should pay particular attention to correcting deficiencies in areas not frequently visited like the radwaste buildings and the water treatment building.

4.7. WORK CONTROL

Every work order has a comprehensive risk analysis sheet to evaluate industrial and nuclear safety problems. It is reviewed and signed by the appropriate staff. This risk analysis process has been noted as a good practice in the MOA section of the report.

Maintenance performance indicators have been developed by all departments, however improvements are needed to identify, analyze and prevent the causes for work delays like unavailable parts, plant operational restrictions, displacement by emerging work, etc.

The team recognized as a good practice the computer application that has been developed as a user-friendly tool to manage the work of each supervisor and the status of each work order. All the information is displayed using colour coded information, which is easily managed.

4.8. SPARE PARTS AND MATERIALS

Procurement of all safety related and large spare parts is performed by the corporate organization which also manages the rebuilding and redistribution of overhauled spare parts. The plant only purchases common issue items.

On receipt, all safety related spare parts are checked for condition and the necessary documentation. The paperwork remains with the part during storage. A safety related part received without paperwork is quarantined. Oil and grease is acceptably stored in a separate building. However the team found the main warehouse areas have several concerns that should be addressed and has recommended the plant review and improve their condition.

4.9. OUTAGE MANAGEMENT

The outage organization is a project-based group comprised of multidisciplinary teams with members recruited from various departments of the plant organization. The outage organization concentrates on controlling reactor mode changes and strives to drive the plant organization to comply with outage targets.

The initial outage schedule is decided approximately one year in advance. Three types of outages are defined: a simple refueling outage, a normal maintenance outage, or a ten year outage.

Long term planning and scheduling provide for safe, timely and orderly work. Schedules are used for detailed planning and validation by the outage project team. The outage review report is comprehensive and allows effective follow-up and includes an analysis of work planning, experience feedback, optimization of the standard schedule, and identification of discrepancies.

STATUS AT OSART FOLLOW-UP VISIT

The original OSART team offered five recommendations in the area of maintenance, four of the recommendations are progressing satisfactory and for one the progress was found insufficient.

The plant has responded effectively to the OSART recommendation on reviewing the performance of the TEM organization by deeply defining the root causes and developing several experimental trails. These trails have been further developed into sub activities for strengthening the performance and standardized the approaches in triggering work and scheduling. The organization has been more clearly defined as well as responsibilities for all involved staff. Less work activities are now postponed the main shortcomings are now on the way to be resolved. Larger involvement of different craft in developing solutions to shortcomings and to built up the scheduling is one of the success factors, another is that all are now working in the same process. Furthermore, the performance indicators have been set up and are reviewed on a monthly basis.

For the issue on management oversight, the plant has clearly identified the root causes and developed actions for raising the maintenance standards and managements oversight. The plant has broadened the issue after defining the root causes and expanded their actions also to personnel accountability, responsibilities and internal monitoring.

Different levels of management, supervisors and foremen were interviewed about their level of oversight and they confirmed that the implemented actions are now giving results. They discuss their expectations with their subordinates when handing over work and in several cases now the performer also deal with the planning and preparation of the work. Management, supervisors and foremen are now more out in the field supporting their staff and furthermore their field tours give them an opportunity to observe not only their own staff.

As both units were in operation, only some worksites were visited and the interviewed workers at those work sites confirmed several of the changes written in the plant response.

The plant has implemented several activities to improve its FME approach, mainly for the fuel pool area. The fuel pool area at unit 1 has been set up as a model area and is now exemplary painted and in general good order. Signs have been posted with clear FME messages. The team recognized also, through presented risk analysis, which precautions should be taken to avoid loose parts or tools close to the pools. However, during inspection of the pool area, five small objects (two small lamps, a loose padlock, small stainless steel hook and a small plastic cover) were found close to the fuel pool on unit 1. The implementation of the plants FME policy needs to be further strengthening, as well as the questioning attitude towards risks with having loose objects laying around the pool area.

A set of commendable initiatives, has been implemented by the plant to effectively reduce the amount of low-level defects. These initiatives includes activities on working on the behavior of plant staff, establishing effective reporting system, allocating sufficient resources, management presence in the field and continuously monitoring the progress. The visited model areas shows clearly the high ambition of Belleville NPP and the teams inspections in the field shows that the amount of low level defects have considerable decreased since the OSART mission in its field inspection. The plant presented for the team, its plans for continue to deal with corrosion issues and to extend the reached progress in improvement of material condition to other areas of the plant.

The plant has effectively raised the standards in the main warehouse to good international standards in all areas, except for the fire load issue. The warehouse contains still a considerable amount of wood and paper boxes. The plant has planned to resolve this resting issue by ordering metallic palettes and repack components in wooden boxes in special plastic material and the place them on these new palettes.

DETAILED MAINTENANCE FINDINGS

4.1. ORGANIZATION AND FUNCTION

4.1(1) Issue: The present performance of the work management system allows a large fraction of work to be re-scheduled at short notice resulting in ineffective utilization of resources and delays to essential work.

- Although the average per cent of work added to the operating maintenance schedule at short notice has varied from 10% to 33% over the last eight months, in some weeks it has been as high as 65% particularly in the mechanical maintenance area.
- Some maintenance departments plan for up to 40% of their resources continually on unplanned emerging work.
- Of 5 mechanical jobs monitored 4 were unable to continue due to logistic delays. Some mechanics expressed a view that this was a common occurrence.
- Maintenance departments have different approaches and interpretations on items important to work management, e.g., there are different interpretations on work request completion, either completion of the work order or completion of field work.
- Operations do not appear to adopt their rightful leadership role in the work management process.
- Although departments have targets and statistics for work completion times, considerable more analysis is required at department and other management levels to determine the common causes for work disruption, i.e. spare parts, operations requirements, displacement by emerging work etc.

Recognizing the significant improvements made in maintenance performance over the last two years and the increasing need for better operation and maintenance co-operation to capitalize on that improvement, Belleville NPP has recently (June 2000) introduced a new project. The objective of this new project, called Tranche En Marche (TEM) is to emulate the successful features of the outage project during normal plant operating periods. To meet this objective it is tasked to co-ordinate and control all operating activities, (maintenance and operations) seeking to optimize their interactive actions (taking into account safety, quality, industrial safety, radiation exposure, environmental availability and cost constraints). In particular it concentrates on medium term planning, four week planning, utilization of resources (short and medium term). The project is sponsored by the Deputy Plant Manager and lead by the Operations Manager who delegates this responsibility on a day-to-day basis to the Shift Manager. In exercising this delegation he leads the daily work management meeting which is a key part of the process. The project is supported by a full time coordinator and four planners.

An examination of the performance of this process indicated:

- The TEM process, as defined, has the potential, when fully implemented, to resolve the work management issues.
- The TEM work management meetings are rightly chaired by the shift manager but management attendance and support from different departments varies.

- The different department approaches (see above) are allowed to intervene with the needs of the TEM for information gathering and trending.
- Although these work management arrangements are relatively new, the perception of some workers is that its mandate to improve their ability to efficiently perform work has not been fulfilled.

The ineffective management of work planning and scheduling and performance, and the subsequent poor utilization of resources can lead to increasing backlogs of maintenance, poor material condition and a potentially frustrated workforce.

Recommendation: The plant should review the performance of the TEM work management project with respect to its objectives and make the appropriate changes to ensure it meets its mandate in a timely manner. Within this the plant could consider:

- At least initially strengthening management support to the TEM organization by increased management presence at the work planning meetings. The emphasis should be on operations leadership and maintenance departments support.
- Improving the consistency of the various department approaches to resolving work management issues,
- Ensuring the TEM is resourced and authorized to collect sufficient consistent information from all contributing departments to enable timely analysis of common causes of work management process inefficiencies and to take the requisite corrective action. The outcome of this analysis would be distributed to the various department managers for monitoring the results of those corrective actions and for them to take action if trends do not improve.
- Ensuring all work is funnelled through the TEM (via department representation) emphasizing that operations takes the lead role including the application of the preventive maintenance programme,
- Supporting the very important role of the coordinator by clearly defining his role in managing the long-term operation of the process
- Ensuring that the shortcomings with inputs such as those from the automatic triggering of preventive maintenance work for all departments via the PRV computer programme, are corrected with high priority,
- Communicating with workers that these actions are being taken to improve the situation and request their input for further improvement.

Plant Response/Action:

Belleville NPP has conducted a major review of the Power Operations Project.

45 members of staff, ranging from Plant Manager to technician, took part in this two-day review, which encompassed all crafts involved in the Power Operations Project.

These two days of discussion were used to diagnose existing practices and identify shortcomings.

Participating staff members then put together 13 trials, which they are currently implementing:

Trial 1 : Improving site relations with the grid management agency.

Trial 2 : Looking at how changes to grid/plant programmes affect our performance.

Trial 3 : Work-request trend monitoring by the shift team.

Trial 4 : Attendance of shift supervisor at COMEX meeting.

Trial 5 : Placing the preliminary work-request and work-request meetings in a medium-term context.

Trial 6 : Set up a formal agreement between the outage project (AT) to power operations project (TEM) and vice-versa

Trial 7 : Setting up a multi-skilled team to carry out diagnoses and minor maintenance activities.

Trial 8 : Schedule: Setting up a schedule review project.

Trial 9 : Known and recognised craft representatives to facilitate a cross-functional approach.

Trial 10 : Defining the status of the TEM coordinator.

Trial 11 : Clarifying ownership of equipment maintenance at the plant

Trial 12 : Analysing the establishment of a TEM nerve centre.

Trial 13 : Spare parts.

Other sites have also implemented this approach, which is co-ordinated at corporate level. We thus had the opportunity to take part in two exchanges of experience in 2001, which provided us with ideas for improvement.

In May 2002, we are taking part in an exchange of good practices.

- Additionally, a considerable amount of work has been done on the preventive maintenance programme.

Representing all Maintenance and Operations crafts, this "Task Force" thoroughly reviewed the preventive maintenance management system. The system is designed to standardise inter-departmental practices, group together activities and improve reliability of medium and long-term scheduling. 12 persons had to be seconded to the task force for approximately one year.

- In addition, a multi-skilled team examined ways in which to standardise mid-cycle shutdowns.

This effort resulted in:

- the establishment of standard mid-cycle and weekend outage schedules,
 - the compilation of a work package for every activity capable of being performed during an outage requested by the grid,
 - the establishment of schedules defining the critical path for each of these outages.
- The TEM co-ordinator monitors how well priorities are being met, on the basis of a number of indicators. These indicators are reviewed at the TEM's monthly OEF meeting, attended by department managers. They reflect the departments' ability to meet TEM requirements. Additionally, some departments now monitor the causes of rescheduling in order to identify their nature.

At present, the TEM only deals with activities that are linked to the power generation process.

- Approved at the end of 2001, the Belleville Plant Operation Project clearly redefined the TEM's operating target, as well as the roles and responsibilities of players and departments.
 - The Operations Department Manager is the TEM project manager
 - Operations is the owner and the Shift Manager has on-line responsibility.

- TEM co-ordinator provides support to the Shift Manager, coordinating the crafts.
- The crafts are prime contractors for the conduct of their activities (craft representative).
- The medium and long-term perspective is factored into the project and is one of its key priorities. The "Engineering" and "Project" departments merged in the summer of 2001. One of the aims of this new department is to enhance monitoring, forward-planning and optimisation with regard to medium and long-term issues. As a result of this approach, Engineering is much more closely involved in the TEM and outage projects.
- Members of the Extended Plant Management Committee regularly attend the TEM's work request and scheduling meetings. On-call senior plant managers usually attend Friday and Monday meetings. Department managers attend on the other days. The purpose of attending these meetings is to check that the TEM process is running smoothly and that players are fulfilling their mandate. Individual attendance is monitored by the TEM co-ordinator.

IAEA comments:

The plant has responded effectively to the OSART recommendation on reviewing the performance of the TEM organisation by deeply defining the root causes and developing several experimental trails. These trails have been further developed into sub activities for strengthening the performance and standardised the approaches in triggering, scheduling and managing work. The organisation has been more clearly defined as well as responsibilities for all involved staff. Less work activities are now postponed and the main shortcomings are on the way to be resolved. Larger involvement of different craft in developing solutions to shortcomings and to built up the scheduling is one of the success factors, another is that all are now working in the same process. Furthermore, the performance indicators have been set up and are reviewed on a monthly basis, and clear trends of improvement could be seen.

Conclusion: Satisfactory progress up to date.

4.5. CONDUCT OF MAINTENANCE WORK

4.5(1) Issue: Some maintenance and support activities are not being performed to acceptable industry standards. Insufficient management and supervisory oversight in the field and ineffective communication of the standards is contributing to these weaknesses not being identified and corrected.

Examples of poor practices noted included:

Mechanics working on a large pump coupling were not undoing the bolts in a diagonal pattern. Shaft rotation was prevented by coupling two wrenches together to provide adequate leverage. Fitted bolt positions were not noted for reassembly. Bolts were removed with a makeshift thin metal rod which was being hit with a soft mallet. The work area was not cordoned off with signs warning of work in progress. An apprentice was learning that this was the correct way to do a job.

An electrician was observed testing a live electrical control panel internals, operating internal disconnect switches and pulling fuses without gloves or eye protection.

Scaffolders were working in a noisy area without ear protection.

Mechanical maintenance shop machine tools are cleaned every Friday (according to the foreman) despite being covered with shavings and cuttings on Wednesday.

A mechanic's tool box contained a somewhat haphazardly arranged collection of tools including an over abundance of well used adjustable wrenches and cleaning solvents.

Mechanics did not consult procedures for preparation of a job and consequently had to make frequent visits to stores for equipment.

Several examples of indiscriminant use of red and white tape to cordon off areas of hazard with no signs as to the conditions within the area. Inappropriate fixing of the tape to chairs, boxes and anything else to hand.

Poor foreign material exclusion practices [see issue 4.5(2)].

Numerous examples of broken, bent or misplaced insulation covers.

Slings in the waste treatment building do not have indication of recent testing as do the majority of slings in the plant.

Gas bottles not tied off in the decontamination workshop.

Insufficient clean up after repairs to pump 2CTA 105CR.

Recently painted valves also have shaft stuffing box and labels heavily painted over.

I&C technicians were performing work on safety systems without a work order. However, they were in possession of other needed documents. The work was not specified on the daily plan even though it had been identified two days previous. The technicians said they were doing the work because it was urgent.

Maintenance managers and supervisors did not always recognize the need to correct such situation in the field.

Inadequate maintenance practices could lead to poor material condition and deteriorating safety equipment reliability and/or result in injury to personnel.

Recommendation: Plant management should enhance their field oversight and supervision of maintenance practices to ensure high industry standards are thoroughly understood by all involved. The plant should consider strengthening the training and coaching of relevant personnel on standards and procedures necessary to meet these standards.

Plant Response/Action:

The findings associated with maintenance activities have led the site to intensify its efforts in various areas, such as clearly defined expectations, in particular with regard to:

- Compliance with mandatory requirements
- Better safety/quality management through risk assessment
- Monitoring through presence in the field,
- Improved practices in the areas of industrial safety and radiation protection, by adopting a questioning attitude towards work practices, particularly with regard to the wearing of personal protective equipment.

This is reflected in various action plans designed to improve practices and quality, as well as individual and collective professionalism.

To begin with, the site and line management departments have clearly conveyed plant objectives, challenges and expectations to work teams at team briefings and during the job-planning phase (COMEX, section meetings, Power Operations and Outage Project meetings, job briefings). Internal checks have been scheduled to identify weaknesses (senior management plant tours, department management tours, indicators, etc.). Calls to order are systematically made (immediate observation) when deviations are observed. The involvement of field staff has reaped results: without their discreet but efficient contribution, good results would not always be achieved (Safety, Quality).

Ownership has been promoted in many areas by adopting a ‘line of work’ approach and by using shadow training to demonstrate some aspects of the roles played by work coordinators and planners. Workers are encouraged to analyze, discuss, produce and present information directly resulting from their activities.

Presence in the field is nowadays incorporated into several initiatives via plant condition tours, industrial safety tours and department management tours (Power Operations and Outage), providing the opportunity to make observations and gauge how much progress has been made over time; a database is used to monitor detected deviations and corrective actions implemented as a result of management tours.

Job closeout reports are produced upon the completion of work carried out by contractors. Managers in the field check maintenance work carried out by technicians.

Work sites are marked off in accordance with reference criteria, particularly in the case of jobs lasting more than half a day.

A plant memorandum has been drafted in order to define the framework of maintenance work reports.

Over and above this fundamental effort, characterized by increased management presence in the field, training sessions and actions designed to raise staff awareness have been implemented with a view to embracing international standards (IAEA training). These efforts will be pursued on an ongoing basis. Furthermore, the "pre-job risk-assessment" reference document has been deployed and is being applied. It is also being used for urgent maintenance work.

Model or reference rooms are being brought up to standard. Joint inspections are periodically carried out by operations and maintenance.

A training worksite has been set up in order to make training and refresher courses more practical. Training in technical work practices has been developed for some maintenance departments in 2002.

The implementation of an action plan for monitoring supervisors, in addition to coaching, has been effectively used to clarify monitoring rules in accordance with the Quality decree.

The industrial safety/risk prevention challenge for outage has boosted staff and contractor motivation: good work practices and compliant behavior are praised in front of workers.

IAEA comments:

The plant has responded effectively to the OSART team's recommendation by clearly identifying the root causes and developing actions for raising the maintenance standards and management oversight. The plant has broadened the issue after defining the root causes and expanded their actions also to personnel accountability, responsibilities and internal monitoring.

Different levels of management, supervisors and foremen were interviewed about their level of oversight and they confirmed that the implemented actions are now giving results. They discuss their expectations with their subordinates when handing over work and in several cases now the performer also deal with the planning and preparation of the work. Management, supervisors and foremen are now more out in the field supporting their staff and furthermore their field tours give them an opportunity to observe not only their own staff.

As both units were in operation, only some worksites were visited and the interviewed workers at those work sites confirmed several of the changes written in the plant response. Also the general order of the work sites were noticed by the team to be improved as well as the thoroughness and rigour demonstrated by the workers.

Conclusion: Satisfactory progress to date.

4.5(2) Issue: Good foreign material exclusion practices are not properly established and are sometimes not followed in the spent fuel pool and other areas.

Foreign Material Exclusion (FME) practices were not properly established in the fuel pool area.

A sign was posted outside the hot tools counter specifying anyone going to the pool area must ensure nothing from their personal equipment or tools can fall into the pool. No such provisions were demanded of the team during their initial visits and posters in the plant depict workers overlooking the pool with personnel equipment not tied off. During the visit more stringent controls were put in place at the entrance to the pool areas.

Several inappropriate items were noted in the pool areas; clear plastic covering a valve on Unit 2, loose test cables on the refueling crane platform.

Foreign material exclusion is also not properly controlled in other areas and the team noted the following examples:

Two blue hoses and a small support lying near the top of an open tank. 2TEP832CD

Several bolts near the top of a boron tank during ongoing work.

Several sump covers left open throughout the plant including the RCA.

Compressed air tubes to valves 1 AMP171VL and 128VL were disconnected with open ends.

Several components, valves, pumps, pipes and tubing were stored in the warehouse without covers over the open ends.

The uncontrolled entry of foreign materials into safety related systems could lead to a deterioration in their performance.

Recommendation: The plant should review the need for and establish a foreign material exclusion policy and ensure the protection of sensitive areas and equipment from the ingress of unwanted material. Relevant staff should be trained on these procedures.

Plant Response/Action:

- The precautionary action adopted is designed to ensure, from the planning phase of an activity through to closure, that no foreign material can be overlooked or misplaced inside or near to a pool. This precaution appears in the prevention plans and risk assessments associated with all activities carried out next to and above the pools.
- As part of the preventive measures taken with regard to maintenance activities, warning signs displaying precautions to be taken against foreign material intrusion have been placed on the doors leading to pool areas. Measures have also been taken to prevent the loss of components forming part of hazardous equipment. For instance, all moveable parts on the refueling machine are held in place by chains.
- When hazardous work is performed, an inventory of tools is included in the work-monitoring file prior to and after the activity. This is done together with the monitoring supervisor and work team leader.

- An organizational system has been adopted for maintenance activities. In particular, standard transparent plastic refuse bags may not be used. For the closing-out of a worksite, the storeman distributes bags to each work team leader (work team leader's name on bag with assigned number). Bags are pink in colour.
- During pre-job meetings, the work team leader is required to secure his tools by means of a rope attached to a fixed point, while attaching small tools to a floater.
- In order to maintain an exclusion zone around the pool, entrance doors to the transfer pit and lowering device are fitted with a padlock.
- For the above-mentioned purposes and as a precautionary measure, store personnel have examined storage racks for potential risks of foreign material intrusion into stored equipment. Open ends on pumps, pipes and tubes have been blocked.

IAEA comments:

The plant has implemented several activities to improve its FME approach, mainly for the fuel pool area. The fuel pool area at unit 1 has been set up as a model area and is now exemplary painted and in general good order. Signs have been posted with clear FME messages. The team recognised also, through presented risk analysis, which precautions should be taken to avoid loose parts or tools close to the pools. However, during inspection of the pool area, five small objects (two small lamps, a loose padlock, small stainless steel hook and a small plastic cover) were found close to the fuel pool on unit 1. The implementation of the plants FME policy needs to be further strengthening, as well as the questioning attitude towards risks with having loose objects laying around the pool area. The team encourage the plant to do benchmarking with other plants to improve their FME-approach for maintenance works.

Conclusion: Insufficient progress to date

4.5(a) Good practice: A simple method of recording all the information related with tracking technical/administrative documentation of In-Service Inspection (ISI) indications is being used at Belleville site and is now required on all EDF plants. It permits a faster treatment and retrieval of dossiers inside EDF and with the French Safety authorities.

The main information includes:

- determining the nature of the defect and its analysis
- presumption of evolution or not
- harm that might be caused: qualitative and quantitative analyses if required
- evaluation of the impact on the safety of the plant or risk for personnel
- possible remedial actions
- choice of the treatment or monitoring action
- performance of requested repair work.

The last ten-year outage at Belleville demonstrated the effectiveness of this indication treatment methodology.

4.6. MATERIAL CONDITIONS

4.6(1) Issue: A large number of low level defects exist at the plant from lack of maintenance. Some of these defects apply to safety related systems. Management expectations are not made clear in this area. During plant tours, it was apparent to the team that some plant managers, supervisors and staff did not recognize and identify these kinds of defects.

A process to increase the awareness of required material condition and housekeeping among staff was introduced in early 1999. 230 Volunteer employees were equipped with small deficiency reporting pads which also described the required standards and what to look for in deficiencies. The 15 day initial trial produced 1600 deficiency reports. About 800 of those still exist today. The scheme has since fallen from use.

It is recognized that the Plant only recently, introduced a defect tagging system which probably explains its lack of use for low-level defects.

Examples of such conditions found by the team include:

Steam leaks at:

- Unit 1 Turbine building pump ESS-301 PO,
- Auxiliary steam building from passing valves OREA-403VV and OREA 404VV,

Oil leaks at:

- Unit 1 Tube oil system for #2 feed pump 1 JSM4120G
- Oil purifier 1-AJH0221D
- Lubricating oil pack for condenser coding water 1-CRF011 BA
- Diesel 2 LHP001AP leakage from flanges, cylinder heads and turbo cooler
- Charging pumps on both units RCV171 PO

Water leaks at:

- Condenser tube cleaning system 2TA407CR
- Sample station in Unit 1 room NB 0460
- Cooling water pump house pump glands

Cabling problems:

- Broken flexible conduit in motorized valve at auxiliary feed water pumps
- Cable tray strap missing and cable resting against sharp edge in RCA Unit 1 room MB0413

The team noted several areas of corrosion on equipment, examples of lighting not working and equipment labeling problems.

In some forgotten areas not regularly visited such as the waste treatment and water treatment building, the Unit 1 safety valve room, the cooling water pump house and the Auxiliary steam building, the number of minor defects was large by international standards.

In the first 2 days of the review the team noted 60 examples of low level equipment defects plus 100 further minor deviations such as labeling, cleanliness and painting deficiencies.

Although the impact of any one of these defects is small the combined effect of a large number of low level defects sends the message to staff that such standards are acceptable. This can ultimately adversely influence the availability of important plant equipment. Additionally, small defects may become large defects if not fixed in a timely manner.

Recommendation: The number of low-level defects should be reduced. Management expectation for the identification and correction of minor deficiencies should be established and clearly communicated to appropriate staff. Desired improvements in this area should be reinforced through management and supervisory presence in the field.

The plant is encouraged to rapidly expand the use of the deficiency tag identification of defects to facilitate better control of situation.

Plant Response/Action:

In order to address this recommendation, the plant has set up an organizational system with the appropriate resources and a reporting process to senior plant management.

The implemented process consists of the following:

- **Working on the behavior** of plant staff by having them attend IAEA training sessions (80 staff members have attended this training) in order for them to attain a high standard in the area of plant and material condition, thereby enabling them to better detect minor discrepancies in the field. These training sessions will continue to be held.
- **Establishing a centralized reporting system with the appropriate resources, for the entire site.**
 - These resources consist of:
 - * Voice-mail (no. 4400 for minor housekeeping discrepancies and 8888 for IT and telephone defects) made available to all plant staff (EDF and contractors)
 - * Minor daily task logbooks on units 1 and 2, primarily intended for use by operations shift teams
 - * Blue booklets available for all plant staff to identify and notify all discrepancies observed in the field.
 - * Organized plant tours with management participation (risk prevention, plant and material condition, senior management plant tours) and documented reports

All minor discrepancies identified in the field using one of the above methods are centralized in an on-line database. 40% of discrepancies are reported via the small daily task logbooks, 25% by voice mail, 23% following plant tours and 10% via booklets.

In addition to merely restoring compliance, this system is an effective means of improving general plant and material condition without in-depth analysis being required (cleaning, repainting, thermal insulation repairs, etc.)

The equipment owner, designated department or minor maintenance team is responsible for rectifying discrepancies.

- **Managing the process through a minor maintenance team.** This team is supervised by a housekeeping manager who convenes department representatives on a monthly basis in order to check the status of minor deviations which are being processed.
- **Establishing a set of process management indicators**
- **A project review, carried out** every two months by a senior management committee made up of senior plant managers and department heads (COMEX), to which all indicators and progress reports on minor discrepancies detected in the field are submitted.

Running concurrently with this process, senior management together with departments and staff members have set up 20 model areas on site, 4 of which have been completed. The idea behind this is to create an incentive through concrete examples. This is an effective means of exhibiting a standard for plant and material condition.

IAEA comments:

A set of commendable initiatives, has been implemented by the plant to effectively reduce the amount of low-level defects. These initiatives includes activities on working on the behaviour of plant staff, establishing effective reporting system, allocating sufficient resources, management presence in the field and continuously monitoring the progress. The visited model areas shows clearly the high ambition of Belleville NPP and the teams inspections in the field confirms that the amount of low level defects have considerable decreased since the OSART mission. However, as an example some overgreasing was found in a model area (diesel room) that affects the total good impression of this room. The plant presented for the team its plans for continues to deal with corrosion issues and to extend the reached progress in improvement of material condition to other areas of the plant.

Conclusion: Satisfactory progress to date

4.7. WORK CONTROL

4.7(a) Good Practice: The electrical section has developed a user-friendly computer application to manage on-line the work of each supervisor, the status of each work order, rescheduling, etc. All the situations are displayed using colour coded information which is easily managed.

While the team does not condone the independent development of the process, it recognizes the unique computer application aspect, which could be applied plant-wide and be potentially useful for other plants.

Each preventive maintenance programme for each piece of equipment has been divided into maintenance actions, each of which appears on a separate line of the screen, showing the name of the action, the priority, frequency, duration, cost, subcontracting if necessary, the name of the planner in charge and the decrees requiring this operation for safety related equipment and pressure vessels.

This data base has been started and there are at present 2000 maintenance actions in it, 90% of which can be found in the Sygma data base, and a colour code shows if an action is ready to be performed when requested or is awaiting more information, spares or other resources.

The data base allows us to:

- find out, rapidly, the cost, duration and work load during outage,
- manage the working load of each planner and track accurately the inclusion of different documents such as basic preventive maintenance programmes, mail, periodic testing, experience feedback,
- generate a ten-year schedule of the activities during operation and outages and to a yearly work load for the section,
- extract on a yearly or monthly basis the preventive actions for the work shop, to allow accurate tracking and avoid missing any out.

4.8. SPARE PARTS AND MATERIALS

4.8(1) Issue: Processes for the reception, storage and control, of material do not meet industry standards at the main warehouse.

No well defined areas exists to keep material entering the stores separate from that already segregated.

There is no segregation of safety versus non-safety related spare parts

There is no separate storage area with humidity and temperature control for storage of sensitive components such as electronic equipment important to safety.

The shelf life programme of the warehouse is not sufficiently comprehensive with respect rubber/elastomer seals O-rings, and electric capacitors.

Black plastic bags are not always used to prevent degradation of elastomers.

A large quantity of flammable materials (wood, cartoon paper, etc) is stored in the warehouses.

There are several examples of non-protected open ends on pumps, piping and tubing.

Chemicals are also stored in the warehouse in vertical racks. No analysis has been performed to ensure that non-compatible fluids are not stored in close proximity or above each other.

The inadequate storage of spare parts and equipment can lead to the issue of incorrect or substandard material or damaged and degraded equipment to the plant.

Recommendation: The plant should review the condition of the main warehouses and establish and implement a process for the receipt storage and control of material that meets or exceeds international standards.

Plant Response/Action:

With regard to the dispatch and receipt of equipment, the receipt/dispatch area has been divided into two separate areas. Shelves have been specifically assigned to each department awaiting equipment delivery. In the special case of I&C/electrical spare parts, which need to be sent more often for repair, a work area has been specially reserved for sending them off site and for receiving them.

In order to avoid any risks of confusion between safety-related and non-safety-related components, each component is individually identified by a tag indicated its item number and product category. If necessary, each component's safety significance is highlighted by means of a red tag bearing the letters 'IPS' (meaning safety-related).

Humidity in the warehouse is periodically monitored by means of hygrometers, which have been installed in various locations of the main warehouse, with the help of the technical department's testing section.

In the particular instance of robotised-picking parts storage area, which contains 20000 items (70% of Belleville's stock), a modification scheduled for 2002 will create dry storage conditions with a moisture level of under 40%.

Corporate policy is applied for the storage of rubber/elastomer components. It sets their life span at 10 years from the time of vulcanization.

When they are received in the main warehouse, they are labeled in such a way as to avoid any confusion regarding their expiry date. In addition, the regulatory annual inventory provides the opportunity to identify any components due to reach their expiry date. These are then isolated and disposed of.

The material used for physical and chemical storage and protection (called 'Gardac') is a certified product developed by UTO, the EDF storage specialist. Its use is mandatory for safety-related components and is recommended for others. Furthermore, rubber/elastomer substances are stored in the robotised-picking parts storage area, where there is very little natural light. As a result, they are not exposed to ultraviolet rays (which cause them to age).

In an effort to reduce fire load, flammable substances that are not essential to warehouse activities are periodically removed.

With regard to the storage of chemicals, a fundamental action has been implemented in close collaboration with the ISO14000 certification process and the chemistry section. Pallets fitted with retention trays have been purchased and identification sheets displaying pictograms specific to each substance have been placed at the storage location of each substance. The compatibility and common location of stored substances is checked during storage.

In addition, a process has been set up to ensure that every substance on the site has been authorized. A designated representative for each department using these substances is responsible for ensuring compliance with the process. A risk assessment is performed on non-PMUC substances prior to their use.

IAEA comments:

The plant has effectively responded to the recommendation and raised the standards in the main warehouse to good international standards in all areas, except for the fire load issue. The main storage contains still a considerable amount of wood and paper boxes. The plant has planned to resolve this resting issue by ordering metallic palettes and repack components in wooden boxes in special plastic material and the place them on these new palettes.

Conclusion: Satisfactory progress to date.

5. TECHNICAL SUPPORT

5.1. ORGANIZATION AND FUNCTIONS

The overall organization to support plant safe operations is composed of site support groups which are distributed throughout various departments and dedicated engineering groups. The plant technical support group serves as a contact point between the plant, principally operations and maintenance, and the corporate engineering groups. Corporate engineering groups provide the necessary expertise in the areas of design, modifications, fuel, licensing, training, and operational experience for safe and reliable plant operation. The combination of plant and corporate engineering staffs seem to be sufficient in number and quality to support plant safe operation.

Safety and Quality Department has a lead role in nuclear safety oversight in the plant. Safety engineers, on a weekly rotational on-call bases, independently evaluate safety barrier status and make conclusions on nuclear safety. On a weekly and monthly bases, they prepare reports on events, make proposals to management, and provide selected safety system status. An extensive yearly safety report is prepared and submitted to the safety committee for review.

The technical support organizations business plan or “Contract Agreement” has nuclear safety as a priority. Managers and engineers are committed to safety through programs, procedures, prioritization of work, and the risk assessment process. Each year management conducts personnel interviews dealing with the results achieved, training needs, personnel prospective for the next year and other topics. This is a comprehensive information exchange between management and personnel and leads to long-term professional development.

5.2. SURVEILLANCE PROGRAMME

The plant surveillance programme is developed in corporate engineering and adopted to plant specific requirements. Preparation of the plant specific surveillance requirements is done within engineering. Based on the licensing requirements for each system and the generic surveillance procedures, plant specific surveillance procedures for each system and component are developed. The plant does not have any specific organization with overall responsibility to follow and ensure tests are executed.

A comprehensive review of the existing surveillance programme was completed. This review led to improved knowledge of the surveillance programme in support engineering and the realization that some changes to the existing procedures were required. However the team suggested that the plant establish a process for systematic assessment and effectiveness analysis of the surveillance programme with measurable performance indicators for tracking and improvements.

There is procedure guidance on how to initiate or change a procedure however, approval of surveillance procedures is done utilizing only department lines of authority. The team suggested that plant considers some independent safety overview should be conducted on safety related surveillance procedures to assure full coverage of the safety envelope by the surveillance procedures.

Separate appendices of the I&C surveillance procedures are developed to describe alarms expected during execution of the tests that have impact on alarm status in MCR. These tables are delivered to the control room operators during initiation of a test and are a good way to inform operators of expected alarms. In addition to the shift manager, a second level review of test results is performed within the department and safety engineers review safety related component testing.

5.3. OPERATIONAL EXPERIENCE FEEDBACK (OEF) SYSTEM

The plant has an extensive OEF programme at the plant and corporate level. Guidance is established at the corporate level and adopted across different departments in the plant. Safety and Quality Department Safety Engineers and Shift managers review safety significant events, make root cause analyses, and prepare reports to the safety authority. Safety committees review all safety significant reports and actions.

Directives DI 19, DI 30 and others are used as a basis for distinguishing between safety significant, safety relevant, and minor events. All event reports from different departments and corporate, which include also foreign industry experience, are assessed by the Operations Experience Feedback Committee. Within departments, a designated engineer is leading the analysis of an event and the department head approves the actions. A common database to track all actions to be taken by the departments relating to the OEF programme is established and has improved responsiveness to the process.

The team reviewed several safety significant event reports. Events are analyzed based on well-prepared corporate guidelines and the root cause is determined. It is obvious that substantial effort is given to the details of the analysis, however some inconsistency can be found in the extensiveness of root causes analyses for recent safety significant events. This inconsistency can lead to inadequate corrective actions. The team recommends that plant management encourage a greater questioning attitude and improved analysis of safety significant events by more involvement of staff from all levels of organization which will improve staff awareness of the issues and the quality of the analysis. The timeliness of the analysis and derivation of corrective actions should also be improved.

Overall performances indicators of the plant show continuous improvement. The number of reactor trips while critical is still above industry averages. The plant has performed an analysis and proposed corrective actions. Some of the long-term actions like a full scope plant specific simulator have not been proposed in these corrective actions. An effectiveness programme to periodically review the OE process is not established at plant, or department level.

5.4. PLANT MODIFICATION SYSTEM

The plant modification process is supported by strong corporate construction, engineering and transmission engineering organizations to prepare packages of modifications to be implemented, mainly in outages. The design is independently reviewed inside corporate engineering groups. All proposed modifications are subject to review by the safety administration.

A guiding principle between plant and corporate regarding safety related modifications is that only corporate engineering groups prepare this type of design change. Modifications needs are requested through the plant modification committee. Almost all design calculations and verifications are done within corporate engineering groups. Special files are prepared to inform departments of the procedure and drawing changes necessary after modification implementation. These files are examined in departments. Individual departments need to update their documentation according to the proposed markups of the documents. Additionally provided training is crucial to achieve safe and reliable use of the modified systems and assure plant safety.

Temporary modifications to the systems and components are described in procedure DMP. Conditions in the field exist which do require reevaluation of the configuration control process and temporary modification process in the plant. Criteria to distinguish between, operations work, maintenance work, temporary modifications and modifications are not always well understood and implemented in the plant. The team recommends that the plant assure clear policies are in effect and

proper control practices in place for temporary modifications and configuration control of plant system with necessary safety reviews on existing temporary modifications.

5.5. REACTOR ENGINEERING

The plant fuel group has strong corporate support in the area of core burnup requirements, core design, safety evaluations, startup, surveillance, fuel design and engineering support. Core loading, unloading, and surveillance testing is performed on plant. There is clear guidance for responsibilities of the departments involved in this process. Engineers have a clear understanding and feel responsibility for the safety importance of their work. Special fuel training courses are conducted in utility for the fuel operators and engineers involved in fuel management. Refresher training and indoctrination are prepared before major fuel movement activities with emphasis on OE from similar events, special conditions, organization, precautions, RP and other questions.

Operating technical specifications provide the necessary instructions and actions to be taken in the case of leaking fuel. Analyses of the failed fuel have detected tight defect and fretting in previous cycles. There is a continuous improvement of fuel integrity in the plant. Nevertheless, analysis at corporate level recognizes that foreign objects need to be prevented from entering the primary circuit during all types of work in the plants.

Reactor startup tests and surveillance results of the core are reported to the corporate fuel group. Reactor core peaking factors are correctly monitored and properly trended over fuel cycle and protection settings adjusted.

5.6. FUEL HANDLING

The main responsibility for fuel management and movement are all located in one organization which is a good contribution to safe fuel operations. The corporate fuel group is working with the subcontractor Framema for fuel supply, Cogema for fuel reprocessing, and Transnucléaire for transport operations. There is a strong interrelation between suppliers and utility in assuring fuel quality and safety.

In addition to the fuel supplier inspections, there is a visual inspection provided at the plant. Fuel movement plans are prepared by corporate engineering groups, verified and executed with independent verification on site. The fuel supervisor, with proper qualifications and training, approves fuel movement. Refueling procedures contain precautions which warn personnel to prevent foreign objects from falling into the open reactor and spent fuel pool. Recently the plant prepared a short procedure and placed additional warnings in the spent fuel pool.

There was an event where a fuel element from the refueling machine was placed on an existing element in the upender. The event was properly analyzed and effective corrective actions were taken.

5.7. COMPUTER APPLICATIONS IMPORTANT TO SAFETY

Computers are used to supply additional information to the control room operator. Computers are not used for plant control; therefore, nuclear safety does not rely exclusively on any computer application. Clear and concise corporate criteria are established to determine safety related computer applications.

Off line computing capability are used in corporate support groups to calculate core parameters during core surveillance. Clear responsibilities are defined between plant and corporate in managing safety related data, software, and hardware. By applying DI 64 and IN 26 directives, quality assurance is maintained on input data and processing. A detailed review which analyzed over 122 applications

determined 22 to be safety related. A nuclear safety risk analysis was performed on these applications and actions determined to further decrease risk. Documenting computer software is done through a well-structured corporate process which enabled the plant to have good configuration management of the database and process software. Backup files for computer software are available and training is provided to plant personnel to be able to re-establish plant process computers. The system for security of software is in place to control access to the source codes and data in the main plant process information system software.

STATUS AT OSART FOLLOW-UP VISIT

In the area of technical support, the OSART follow-up team agreed that the Belleville staff has made a good effort to address the issues. The 2000 OSART mission made two recommendations and two suggestions. The follow-up team agreed that one suggestion has made satisfactory progress and one has been fully resolved and also one recommendation has been resolved and second one has made satisfactory progress.

Overall assessment of the surveillance programme by the safety, quality and risk prevention (QSPR) department was established. In order to establish effective monitoring of the surveillance programme the plant is reinforcing the trending of the surveillance test results. The team was satisfied with progress, however encourages the plant for further sustainable progress in this area, which will give to the plant staff much more confidence in solution of the issue 3.5.2 too.

The process of plant surveillance program or procedure modifications includes a tracking sheet system used by QSPR department to control and review the process of implementation of the surveillance procedure changes in terms of requirements, criteria and/or periodicity. By using the tracking sheets QSPR department assures the full coverage of the safety envelope by surveillance procedures and process.

In the issue on OE feedback system to increase involvement of staff from all levels of the organization in analysis of safety significant events, to improve quality and timeliness of the analysis and implementation of corrective actions the new procedure has been developed by a designated plant-working group. A procedure submitted to the plant nuclear safety and risk prevention technical committee (GTSR) is already applied in the process of significant events investigation and analysis and shows improvements in some areas.

Belleville has developed a new plant wide policy on handling and control practices for temporary modifications and configuration control of plant system throughout the all plant. The rules described in the policy are already successfully applied in the field, however the full scope validation of the related procedure is expected to be done during the next outage in June 2002.

DETAILED TECHNICAL SUPPORT FINDINGS

5.2. SURVEILLANCE PROGRAMME

5.2(1) Issue: Overall systematic assessment of the efficiency of the surveillance programme and the establishment of performance indicators to measure the effectiveness of implementation is not done in the plant.

There is no single group responsible for assessing the overall performance of the safety surveillance of the plant. Distributed through the departments, the programme has no oversight for assuring;

- all surveillance is correctly performed in a timely manner,
- it collectively meets all acceptance criteria, records are prepared,
- trend analysis for the measured parameters and components are performed.

At present the outage surveillance activities require significant additional guidance in order to avoid non-compliance with the surveillance requirements which may not be necessary if an adequate assessment programme exists.

Lack of an effective assessment of the efficiency and effectiveness of the surveillance programme along with trended parameters could lead to unnecessary duplication of work and an inability to detect technical specifications violations.

Suggestion: Consideration should be given to establish a process for systematic assessment and effectiveness analysis with measurable performance indicators for surveillance programme tracking and improvements.

Plant Response/Action:

Surveillance test results are subjected to first and second-level analysis within the departments involved in the process.

Within the scope of his remit, the on-call safety engineer checks the compliance of test results on a daily basis.

A comprehensive surveillance test review system has been operating satisfactorily for the past six months: effectiveness of the surveillance test programme is reviewed by the QSPR every three months on the basis of reports submitted by the departments involved in the process.

Using this system, the QSPR independently monitors the effectiveness of the surveillance test programme.

Since the OSART, new trending initiatives have been introduced on the basis of experience feedback.

IAEA comments:

Procedure for overall assessment of the surveillance programme by the safety, quality and risk prevention (QSPR) department in the plant was developed and approved in October 2001. QSPR department is considered as an overall owner of the surveillance program in the plant. As part of the overall safety surveillance of the plant all the nonsatisfactory results and results satisfactory with limitations are reported to QSPR department, where they are tracked and analysed.

In order to establish effective monitoring of the surveillance programme the plant is reinforcing the trending of surveillance test results. However, the percentage of the trended results of surveillance tests is still limited and a clear policy on increase of trended results has not yet been displayed. The team encourages the plant for further sustainable progress in this area, which will give to the plant staff much more confidence in solution of the issue 3.5.2 too.

Conclusion: Satisfactory progress to date

5.2(2) Issue: Safety related surveillance procedures do not receive independent review outside the line authority which approved them.

Surveillance requirements are prepared and reviewed through management and the Safety Committee, however department procedures written to support these requirements are not approved on the same basis of independent review. A recent assessment of surveillance procedures found that they did not completely address the requirements and some correction was necessary, however there has not been an independent check on the subsequent changes to assure their adequacy. There are examples where surveillance tests are performed without clear guidelines on how to re-establish normal configuration after testing.

Lack of independent safety review of surveillance procedures could allow errors to exist and lead to an unverified safety function of components and systems.

Suggestion: The plant should consider some independent safety overview on safety related surveillance procedures to assure full coverage of the safety envelope by the surveillance procedures and process.

Plant Response/Action:

Chapter IX of the General Operating Rules contains all surveillance test criteria and periodicities.

The exhaustiveness of surveillance tests was reviewed by the QSPR department from 1998 to 2000, following application of chapter IX Lot 93-Gemmes.

A tracking sheet system enables the QSPR department to ensure that any criteria or periodicity modifications have been formally committed to by the relevant departments.

A new exhaustiveness review of the surveillance test programme is currently in progress with a view to the upgrading of Technical Documentation (which includes an upgraded version of Chapter IX).

IAEA comments:

As mentioned above, the complete review of comprehensiveness of surveillance program was successfully done by plant recently. To ensure that all surveillance program requirements and criteria are covered by department surveillance procedures in next fuel cycle and refueling outage the QSPR department in cooperation with other responsible departments issue a special document on this topic.

The process of plant surveillance program or procedure modifications includes a tracking sheet system used by QSPR department to control and review the process of implementation of the changes in terms of requirements, criteria and/or periodicity. Tracking sheet system serves as an official request of QSPR department to responsible department to implement the modification in department surveillance procedure and gives a formal evidence of responsible department on implementation of required modification. The tracking sheets system ensures QSPR department full coverage of the safety envelope by surveillance procedures and process.

Conclusion: Issue resolved.

5.3. OPERATIONAL EXPERIENCE FEEDBACK (OEF) SYSTEM

5.3(1) Issue: The analysis of some safety significant events do not always produce the appropriate training, modification and procedure change corrective actions in a timely manner. Plant management is not creating all the appropriate corrective actions based on operating events. This is partly because of a less than optimum questioning attitude which presently exists in the plant [see issue 1.1(1)].

The analysis of the reactor trip during heatup of Unit 1 on 21.07.2000 when improper control board monitoring caused a SG level reactor trip, did not identify additional training for operators on the simulator to establish common board surveillance practices during evolutions.

Similarly the event on 11.06.1998, which was later declared as INES 2, did not identify any emergency procedure change requirements, even though WANO SER 99-2 identifies these.

The timelines of corrective action implementation has been improved over this year, however it still takes a considerable time to define actions, obtain approvals and implement the changes. Events could be possibly prevented by more timely implementation of corrective actions.

The consequences of the event which occurred on 11.6.1998 could possibly have been reduced if proper and timely corrective actions had been taken when the relay problems were discovered two years previously.

The plant has not fully developed operational experience programme performance indicators or self-assessment processes to measure the effectiveness of the program.

An efficient operating experience programme at plant including proper definition and timely implementation of corrective actions is crucial to prevent events and assure high level of safety.

Recommendation: Plant management should encourage a greater questioning attitude and improved analysis of safety significant events by more involvement of staff from all levels of the organization which will improve staff awareness of the issues and the quality of the analysis. The timeliness of this analysis and derivation of corrective actions should also be improved.

Plant Response/Action:

Following this recommendation, managerial and organizational procedure has been reinforced so as to significantly improve event analysis and the implementation of appropriate corrective actions.

The entire process has been reviewed by a working group consisting of the usual players (analysis coordinators, line management departments, shift operations managers, safety engineers, human factor consultant, quality advisors, senior management). The following conclusions have been drawn:

Issue identified: Analysis of certain safety-related events does not incorporate all appropriate corrective actions. As a result, the site still needs a lot of time in order to define, approve and implement corrective actions.

Definition of causes: Workers involved in the event are not always available to attend the plenary assessment meeting scheduled as close to the event as possible.

In some cases, deviation analysis with regard to quality assurance is not performed sufficiently in depth.

Departments concerned with the resolution of identified causes are not always sufficiently involved in the definition of corrective actions.

Implemented corrective actions: proposals for improvement were presented to senior management and to all department heads, who have adopted them and deployed them within their departments.

Example of an implemented action:

- Participation of corporate specialists in the approval of an analysis conducted by the senior management committee, in order to exchange ideas on analysis quality criteria and means of improvement. Department management support staff in charge of defining corrective actions during the analysis phase also took part in this work sessions (see action no. 3).

Actions implemented and monitored by indicators:

1. Department management has given priority status to the availability of resources required for these analyses and for the definition of corrective actions.
2. A designated analysis coordinator promptly convenes all persons involved in the event, as well as the human factor consultant, in order to obtain a fresh account of the facts and establish a cause tree. The coordinator is supported by a quality engineer.
3. Corrective actions are sought with the participation of all departments affected by the resolution of identified issues. Department representatives are granted the necessary authority to commit their departments to implementing corrective actions within the deadlines. The expected, measurable result of each corrective action is specified.
4. An evaluation grid is produced for each event, enabling the analysis coordinator and senior management committee to assess the process and the quality of the final analysis.
5. All actions and their deadlines are tracked in a computer application accessible to all staff. They are frequently reviewed by the Senior Management Committee in order to check whether commitments are being met.
6. This whole system is monitored and an annual report is submitted to the Senior Management Committee.

Conclusion: The overall result is positive, particularly where corrective action processing is concerned: Reports for the year 2000 and 2001 reveal:

- A more than 40% reduction in average processing times (approx. 110 days at present).

- A constant decrease in the number of delayed corrective actions (2 in 2001, 7 in 2000), and more actions completed ahead of time (12 in 2001, 9 in 2000).

Nevertheless, progress still needs to be made in the involvement of all players in the definition of corrective actions (at present, this is the case for only 40% of actions). We are in the process of conducting a complementary analysis to remedy this situation. We will be establishing closer contacts with St Alban and Golfech, considered to be the best EDF performers, in order to exchange information.

IAEA comments:

Based on results of the OSART mission and own plants assessment of the issue a working group was established to address the recommendation.

New procedure on reportable events and /or significant events, which includes main necessary actions and measures concerning increased involvement of staff from all levels of the organization in analysis of safety significant events, improved quality and timeliness of the analysis and implementation of corrective actions has been developed by working group. This procedure has been submitted to the GTSR and is already applied in the process of significant events investigation and analysis, however it was not yet approved.

Presented results show obvious improvement in timelines of implementation of corrective actions, improved involvement of the staff from all levels of organisation in the process of events investigation and analysis.

Conclusion: Issue resolved

5.4. PLANT MODIFICATION SYSTEM

5.4(1) Issue: The policies and procedures governing temporary modifications are not understood by some parties involved in the process and are not consistently applied.

In the I&C E maintenance department there is a process for temporary lifted wires and jumpers. 33 such documents and controlled I&C temporary modifications have existed for over 10 years as they are not accepted by corporate office as valid modifications for all reactors of this type. They are considered valid by local management and hence remain classified as temporary modifications. The traceability from the identification tag for temporary modification to the approved documents is difficult. There is insufficient information communicated to the shift crews on the required action for minor temporary modifications installed.

Examples of general temporary modifications found in the field are:

- Compressed air system connected to superheated hot water tank in turbine building without proper temporary modification treatment.
- Flanges missing on a flange connection on turbine closed cycles heat exchangers not classed as a temporary modification.
- Temporary test cables strung on the side of cable trays without identification.
- Lifting devices attached improperly to nearby cable trays without identification.

There are many examples of lead shielding on components without adequate review of the seismic response risk.

In these cases configuration control is not being maintained. Awareness of design and configuration control, equipment seismic and environmental qualifications are not always evident in the field.

Strict control of temporary modifications and configuration control are necessary to assure safe operations in all states and conditions.

Recommendation: The plant should assure clear policies are in effect and understood and that proper control practices in place for temporary modifications and configuration control of plant system. Necessary safety reviews should be performed on existing temporary modifications.

Plant Response/Action:

Belleville NPP has set up a 'temporary installations' working group, consisting of all departments and sections, for the joint and cross-functional resolution of this issue.

Overseen by the operations department, this working group used the OSART team's finding as a springboard and has supplemented it with our own experience feedback:

- Deviations to be processed in the field,
- An organizational structure lacking inconsistency at times, thereby resulting in a lack of involvement by those concerned,

- Imperfect knowledge of working documents,
- No comprehensive tool for monitoring temporary installations,
- Inaccurate temporary installations tracking sheet

Belleville NPP arranged a visit to Cattenom NPP in order to seek good practices which have already been identified: dynamic organization, centralized processing, effective storage system, good temporary installations tracking sheet, risk assessments approved by operations, regular inventory, existence of a temporary installations review committee.

Medium-term actions scheduled by the Belleville working group are:

- Putting temporary installations into the tagging management system (in order to improve monitoring)
- Improving the quality of the temporary installations tracking sheet
- Standardizing storage conditions (same conditions for each department)
- Widely distributing an information document on temporary installations and how they are managed (raising awareness and reinforcing ownership)
- Having risk-assessments systematically improved by operations.

In the longer term, plans are being made to:

- Transform the temporary installations working group into a permanent temporary installations review committee
- Designate a clearly identified temporary installations coordinator for the site, whose role would be that of facilitator and policy enforcer,
- Draw up periodic inventories (of temporary installations) as quarterly 'surveillance tests'

The intent is to make inter-departmental administrative control and interaction more reliable, by instilling a sense of individual ownership and responsibility with regard to the management and use of temporary installations.

Furthermore, physical management (labeling and storage) of temporary installations has been overhauled by the departments since the OSART mission.

IAEA comments:

Belleville has developed a new plant wide policy on handling and control practices for temporary modifications and configuration control of plant system throughout the all plant. The rules described in the procedure are already successfully applied in the field, however the full scope validation of the procedure is expected to be done during the next outage in June 2002. The follow-up team encourages the plant to finalize the approval process of the procedure in very near future.

Safety review of existing temporary modifications (mainly I&C) was done and number reduced, however not significantly. The overall modification process within the EDF utility mainly leads to the number of these modifications in the plant.

Conclusion: Satisfactory progress to date

6. RADIATION PROTECTION

6.1. ORGANIZATION AND FUNCTIONS

The organization and functioning of Radiation Protection at Belleville NPP is clearly defined in the “Note de management de la Section Sécurité Radioprotection”, dated 09/27/2000. This, also defines the mission, all interface meetings with other groups in which the staff have to participate and responsibilities of the members of this section. The plant management policies are based on a self-protection philosophy, which places the responsibility for radiological protection with maintenance, operations etc. As defined in plant procedures the radiological protection section has no direct operational responsibility. The main responsibilities of the Industrial Safety and Radiation Protection section are to provide assistance, advice, training, and monitoring on safety and radiological protection activities and participation in risk prevention analysis.

To improve the implementation of the safety and radiological standards the plant is developing an evaluative programme called Risk Prevention Analysis, which will be a very helpful tool in coaching industrial safety and radiation protection.

Since the standards are established at corporate level, the industrial safety and radiation protection section is not involved in their development, only in implementation and control.

The plant management provides policies, criteria and administrative limits, as well as goals and objectives. However supervisors do not spend sufficient time in the field, procedures are not always reviewed in time and goals like total activity released to the environment could be improved. The team encourages Belleville NPP to review this process and the goals related to environmental releases. The application of the ALARA principle is based on the policy of self-protection and personnel responsibility. This principle is considered by plant management as the foundation for avoiding risks related to ionizing radiation. Even though the plant is performing very well in relation to individual and collective dose targets improvements could still be made on ALARA aspects concerning minor events and ALARA principles applied in the field for routine execution of work. The team recommends that Plant management should strengthen the adherence to ALARA principles for radiation dose control particularly during normal operation. This would include minimizing employee time in radiation fields by better control of access to such areas.

6.2. RADIATION WORK CONTROL

Radiation work control is managed through a combination of radiation protection advice, work control documents and the MICADO computer code radiological control system, which controls access to the Radiation Controlled Area (RCA).

Based on the self-protection philosophy maintenance supervisors are responsible for radiation protection, including dose control, contamination control, waste generation and used tools storage for all aspects of the works under their control. Radiation work permits are only obligatory to orange and red areas in which dose rates are above 2mSv/h (ambient dose rate).

In accordance with good international practices procedures are established to ensure that individuals are free of contamination before leaving the radiation controlled areas. However, during plant inspections personnel contamination control practices were observed to be insufficient to prevent some inadvertent spread of contamination within and external to the RCA. Inappropriate radiological contamination control practices were observed inside controlled areas and some poor monitoring practices were observed at the exit of the Radiological controlled area. The team recommends that Plant management should ensure all relevant staff understand the correct contamination control

procedures to be used at the plant, are skilled and tested in their use. Furthermore, their performance should be monitored and coached on a regular basis by supervisors.

It is also suggested that the plant consider significantly reducing the acceptable number of portal monitor activations on exiting the RCA from the present 1% of the entries.

Survey programs are performed in accordance with procedures established by the plant. However air samples and contamination surveys are not performed frequently in all areas inside the controlled area and considering the large number of hot spots and contaminated materials and equipment stored inside RCA this frequency does not meet international best practice. The team encourages the plant to consider reducing the period between radiation surveys in order to increase control of airborne and surface contamination.

6.3. RADIATION DOSE CONTROL

The ALARA principles are applied at the plant to both individual and collective doses. The primary responsibility for optimizing personnel radiation exposure is assigned to the supervisors that are responsible for the work performed in the RCA, such as maintenance supervisors. However a lack of rigor applied to the identification of radiological hazards within radiation controlled area results in numerous examples of poor labeling, inappropriate signage and a lack of communication of conditions throughout the RCA, which are not in accordance with good international practices. The team recommended that the plant should ensure all radiological hazards within the facility are adequately labeled to effectively communicate the magnitude of the hazard to all within its vicinity.

The plant is well equipped to perform measurements of internal contamination, the medical centre organization is good, with programmes and activities well defined. The facility has the capacity to perform whole body counts in accordance with the demand imposed by the plant during normal operation and outages. The medical centre team knows their responsibilities and procedures are well understood. Calibration and tests are performed accurately and consistently in accordance with the program. A total of 6476 examinations were made between January and September when seven internal contamination events were reported. The medical centre is also responsible for providing advice to radiation protection on external dose limits.

Whole body external doses are well controlled by the use of electronic dosimeters and film badges. Dose and time of entry and exit from the radiation controlled area is recorded on the dose control system called MICADO. Electronic dosimeters provide control of the doses in real time and film badges, which provide the official dose records, are processed monthly. The recording and control of individual measuring doses is the responsibility of the medical centre. For this they have a link with the DOSIREG system that provides the doses measured by film badge. The deviation between electronic dosimeters and film badge is close to 20%. The doses reported by film badges are not inserted in MICADO, and do not exist in an automatic system which is capable of preventing entrance of individuals approaching the dose limit established by the plant (20mSv/year). This responsibility belongs to the medical centre. Hence a human error could cause inadvertent access in to the controlled area by individuals whose dose is above limit established by plant. The team encourages the plant to consider improvements to the dose management system to take in account the official doses daily and establish an interlock between control of doses and access.

6.4. RADIATION PROTECTION INSTRUMENTATION, PROTECTIVE CLOTHING, AND FACILITIES

The plant has good portable monitoring instrumentation and the calibration is provided by external laboratories, which are authorized by the regulatory authorities. Portable instruments to measure radiation exposure are calibrated annually and the programme is controlled by radiation protection section. Portal monitors are also calibrated by external laboratories and tested monthly, electronically and with radiation sources. However they are not tested daily with radiation sources to verify operability. During the visit a monthly test on the portal monitor C1, which had been used by personnel, was executed without success. Tests with radioactive sources were performed on C1 and C2 portal monitors and indicated points where contamination could not be detected and the associated portable monitor (teletector) was not operating. The team encourages the plant to consider reviewing the procedures and programme for performing the daily tests on portal and portables monitors.

6.5. RADIOACTIVE WASTE, MANAGEMENT AND DISCHARGES

The management of waste discharges to the environment and environmental monitoring is performed by Technical and Nuclear Logistic Department, in accordance with DI 82/DI 104. Solid waste is stored temporarily in the BTE building in accordance with the programme prior to sending it to CENTRACO or ANDRA. The prime responsibility to manage and segregate waste is with the work team leader. After segregation which only considers if the waste is compactable or not, the total wastes generated are sent to BTE, where a visual inspection is made to confirm the acceptability of the segregation. In the BTE building waste is surveyed and separated in accordance with the level of radiation, and to determine what proportion can be incinerated prior to final disposal. Two types of metal drums are used for the purpose of segregation. Concentrate, filters, primary resins and waste which is above a radiation level of 2mSv/h are placed in concrete drums which are stored temporarily. During inspection of the storage facility, inappropriate housekeeping standards were observed. A waste storage drum which should be used for radioactive waste, were stored containing solvents, sludge, red drums with oil and small cans. The high volume of compactable waste could be explained by the recently completed ten year outage, but the absence of treatment of this type of waste contributes to the increased volume of waste stored. The team encourages the plant to consider improving housekeeping in the radioactive waste store area, define methodology for using metal drums, remove flammable material from this area and establish procedures to promote segregation before packaging. The inventory and activity control in concentrate and resins are performed by software and analysis in accordance with DI 82/DI 104.

The radioactive effluents released are controlled by chemistry analysis and instrumentation. Objectives and goals for reducing the amount of the activity in effluents are established. However the total activity released to the environment is bigger than other French facilities. The primary liquid effluent releases to the environment are monitored by the KRT system which is calibrated monthly and annually, but a test is not performed before the start of releases that can last up to five days. As this monitoring system is the last barrier to prevent inadvertent releases, effluents could be released above the set point. The team encourages the plant to consider improving (reducing) the goals for radioactive liquid releases and performing a calibration test before each batch of releases.

The environmental monitoring programme is established in accordance with Regulatory requirements and OPRI directive. This programme is well developed and the results are timely reported to regulatory authority. Credit for the success of this activity is due to the close working relationship with the University, which makes the results public.

STATUS AT OSART FOLLOW-UP VISIT

The OSART team identified three issues in the RP area. All three issues were supported by recommendations and the OSART follow up team judged that one was progressing satisfactorily and two were resolved.

The organisation and functioning of the radiation protection section at Belleville continues to support high standards of radiological protection for the site.

Since the OSART mission performance has been enhanced by the development and deployment of new pictorial signs representing the hazards. In the radiation protection area they have adopted two stages of "Orange" zone (between Red and Yellow) designed to support a progressive approach to dose management. Integrated with a revised locking policy this should further contribute to the already downward trend achieved in Belleville's collective dose.

Problems identified with contamination control observed by the OSART team, particularly related to the use of the C1 and C2 portal monitors have been successfully addressed by the addition of monitoring instruments, the removal of water from the C1 / C2 area (to prevent contamination being washed off such that it can be traced back to the work site). Also contributing to this is the simplified pictorial signs related to dressing and undressing at the RCA boundary.

Structured management tours addressing all issues specifically assist in the RP area by raising awareness of the need for improved contamination control. Records from these tours are tracked and routinely reviewed by the management team.

The development of a new training facility which realistically models RCA access and egress and addresses key high risk activities has been developed to further enhance understanding in this critical aspect of nuclear power plant operation.

With the exception of a minor point related to using ear plug type hearing protection in contaminated zones, a practice which deviates from "best practice" the sites responses to the OSART recommendations have been addressed.

All of the above positive actions have contributed to a revised approach to ALARA based on risk assessment. The incorporation of risk assessment, industrial safety, nuclear safety, radiation protection and quality into one department is leading to a consistent approach to risk assessment across all functions and this is key to the successful adoption of an improved ALARA process.

DETAILED RADIATION PROTECTION FINDINGS

6.2. RADIATION WORK CONTROL

6.2(1) Issue: There is a lack of rigor applied to the identification of radiological hazards within radiation controlled areas. Even though there are well-defined policies and procedures, numerous examples of poor labeling, inappropriate signage and a lack of communication of conditions were evident throughout the RCA.

Examples of such conditions encountered were:

- 3 boxes containing contaminated hoses were found inside room NA0442, without labels together with materials and equipment with radiation exposures between 0.05mSv/h and 0.2mSv/h. Neither materials nor room were labeled.
- Many materials and equipment with radiation levels, between 0.05mSv/h and 0.2mSv/h were observed inside the room KA0440, Unit 1, without labels.
- In BTE (enfûtage), more than five boxes with contaminated material were found in without label. The dose rate on contact was 0.004mSv/h.
- A portable exhaust fan with radiation exposure of 0.006mSv/h was found without label.
- An empty container labeled as RAD III, IT0,5, Co-60 (0,40GBq) was found outside the effluent treatment building.
- More than ten boxes were found in the hall of BAN building 5.40 containing contaminated material without labels.
- Inside the room KA 0442 unit 1, three boxes were left containing contaminated hoses without labels to indicate contamination levels or radiation exposure.

Examples of signs outside rooms that did not display actual conditions within the room were:

- Evaporator room was identified as a yellow area with a hot spot of 5mSv/h. However inside the room there was no hot spot but a large area around the evaporator measuring 5mSv/h.
- Room NB 0416 had no sign on the door, but inside there was a plastic drum with 2.2mSv/h on contact. Lead blankets had been placed around the base but there was no signage or roping off to prevent people standing close.
- Room QB0651 is classified as orange zone, but without one dose rate noted on the sign.
- Room NA0529, hot spot on TEP 004VP, without sign outside the door.
- At the entrance door of SAS TES system Unit 1, the level of radiation exposure indicated that the room was yellow zone, but no sign was posted.

Some rooms containing high radiation hot spots up to 2mSv/h are not labeled and some doors to such rooms were found not locked for instance:

- BAN A room NA 0533 contained a number of hot spots on REN 101 RF of between 3mSv/h and 17mSv/h. The room was designated as yellow zone and the door was found not locked.
- BAN B room NB 0507 on RCV contained many hot spots 2mSv/h to 4mSv/h. Door not locked.
- BAN A room NA 0444, hot spot 1,5mSv/h without shield and door not locked.
- BAN A room NA 0442, hot spot not designated 4mSv/h on RCV without shield and door not locked.

A lack of identification of radiological hazards and poor labeling of those could result in unnecessary doses and overexposure of personnel.

Recommendation: Management should ensure all staff adhere to radiation protection policies and procedures on labeling of radiological hazards within the facility in order to effectively communicate the magnitude of the hazard to all within its vicinity.

Plant Response/Action:

Rules governing the RCA and sign-posting in that area have been revised. Each room is checked at least once a month, while those with very changeable ambient radiation levels or hot spot occurrence are checked more frequently, particularly during outage. Information pertaining to dose rate, air contamination and the presence of hot spots, is displayed outside each room.

This activity has now been incorporated into the plant's QA system. Checks are performed to ensure that the information notifying staff of radiological risks in each room is relevant.

RP surveys indicating dose rate for each room are posted at the entrance to the RCA and at the entrance to the reactor building during outage. The displayed information specifies areas with a high radiological risk factor, such as orange or red zones. Areas referred to as 'green points' are laid out at each level of the reactor building, in order to prevent workers from being unnecessarily exposed when they do not have to work directly on equipment.

Changes have been made to hot spot management policy. Operating measures such as the flushing of systems and efforts to improve circuit chemistry adjustments have been effective in reducing the number of hot spots. In addition, new measures implemented by the site require an area to be reclassified when dose rates caused by hot spots are much higher than the area's initial grading. Furthermore, protective equipment and physical barriers limit access to hot spots.

Crates and containers are systematically labeled. Labels indicate content, dose rate and the person in charge of the equipment. All unlabelled crates are brought to the attention of the department or person concerned. Particular attention is given to this point during field inspections.

Requirements governing checks at RCA exits have been given special attention and appropriate signs have been produced. An information campaign has been effective in promoting this standard. A booklet featuring current plant regulations has been published and widely distributed to plant and contractor staff.

Management conducts numerous plant tours in order to check compliance requirements in the areas of radiation protection and radiological cleanliness. Each behavioral deviation or failure to comply with requirements is immediately taken up with the person concerned, by management, and expectations are reiterated and explained.

This plant inspection programme has been supplemented by tours organized as part of the risk-prevention challenge during outage, and in particular during the last unit 1 outage in October 2001. They are an effective means of identifying recurrent problems and seeking appropriate solutions. For example, under-gloves are now used to carry out high-precision work in optimal conditions without contaminating work packages when taking notes. Furthermore, a high-performance hand/foot monitor has been installed at the reactor-building exit. These practices will be tested during the next outage scheduled for July 2002.

Expectations are reiterated in risk-prevention/radiation protection training sessions. A training worksite is used to demonstrate expectations and train staff in good work practices and proper use of personal protection equipment and monitoring instruments.

Changes have been made to the organization of the QSPR department, thereby strengthening the role of risk-prevention specialists in providing support, advice and assistance, and carrying out monitoring activities in the field.

A benchmarking and exchange programme run with other sites has been effective in importing good practices and implementing them on site. Examples include delimitation of hot spots and use of under-gloves.

IAEA comments:

The plant have adopted a revised signage policy which requires the results of monthly (or more frequently for areas where ambient dose conditions can change frequently) area surveys covering dose rate, air contamination levels and the presence of hot spots to be prominently displayed outside each room. Dose rate surveys are posted at the entrance to the RCA and are colour coded to indicate the radiological dose levels. Belleville has developed an additional "colour" orange zone to better characterise the conditions. This has been seen as a good practice and is being emulated in some other EDF plants.

In order to further limit dose to personnel a revised locking system has been introduced where all "Red" zones are required to be locked using dual keys (one held by Operations the other by RP). For some areas with hot spots locking is required but a system of common keys has been incorporated to ensure that operations activity is not restricted. However, personnel entering these locked zones are fully briefed on conditions in addition to the new posted notices and understand the need to move to "green" or low dose zones if their presence is not directly required at the higher dose work site.

Regarding the labelling of material to be moved from the RCA, a new labelling approach has been adopted to indicate dose rate, content and the "owner" for all crates and boxes used to transport material from the RCA. To reinforce the rigor of this activity the new process requires RP to monitor the material first with the newly established transport group confirming the monitoring before movement can be confirmed.

The adoption of the above arrangements was significantly influenced by benchmarking activity within EDF predominantly based on two Belleville RP engineers being part of the National (EDF) RP team.

The above improvements are the subject of revised training and refresher training arrangements which is targeted at improving the culture of the total work force including contractors with regard to their attitude to risk, the use of risk assessment and radiation protection.

Evidence in the plant, and discussion with plant workers confirms the success of this revised approach.

Conclusion: Issue resolved.

6.2(2) Issue : Despite adequate policies and procedures personnel contamination control practices are insufficient to prevent some inadvertent spread of contamination within and external to the radiation controlled area. Inappropriate radiological contamination control practices were observed inside the controlled area and some poor monitoring practices were observed at the exit of the radiological controlled area

- A maintenance technician was observed, exiting the controlled area with a piece of rag. He did not survey himself neither the rag. The portal monitor alarmed, when checked the dose rate was close to 0.002mSv/h.
- A person from maintenance was observed trying to exit the controlled area without monitoring himself and his personal objects with the portable monitor. A manager instructed him to perform his survey.
- More than five persons were observed not appropriately surveying themselves and their personal objects with the portable monitor placed at the exit of controlled Area.
- An electrical supervisor and auxiliary technician were observed performing work inside a room containing tables and hoses and which were contaminated to between 2000c/s and 3000c/s. Neither table nor hoses were labeled. The electricians and radiation protection technician did not know about the contaminated materials, no warning was posted at the entrance. The contamination was discovered when the auxiliary technician alarmed a portal monitor at the exit from the RCA.
- Vacuum cleaners were observed within the RCA with dose rates of 0,05mSv/h without labels. If opened they can cause internal, external and surface contamination.
- The plant uses disposable earplugs in the Radiation Controlled area. This is unusual, as it requires a person to insert a plug with gloved hands, which could be contaminated.
- Tests performed in portal monitor C1 demonstrated that radioactive sources of activity twice the alarm point could not be detected in some locations of the overalls. Portal monitor C2 had similar problems.
- The list of the last years' events related to contamination of protective clothing and skin showed a total of 884 contamination events in C1 and 348 in C2 portal monitors.
- An unlabelled bag containing a contaminated flashlight at 2Kc/s was found inside an electrical shop.
- The plant has set their target for the number of contaminations detected at the exit from the RCA to be less than 1% of the entries. This would mean about 1400 per year would be acceptable.

Inappropriate radiological contamination control practices could result in the spread of contamination within and external to the radiation controlled area.

Recommendation: Plant management should ensure all relevant staff understand the correct contamination control procedures to be used at the plant and that they are skilled and tested in their use. Furthermore, their performance should be monitored and coached on a regular basis by supervisors.

Within this the plant could consider significantly reducing the acceptable number of portal monitor activations on exiting the RCA from the present 1% of the entries.

Plant Response/Action:

Requirements governing the monitoring of personnel and equipment at RCA exits have been reinforced, particularly at worksite and reactor building exits and prior to going through the C1 portal monitor. Signs featuring pictograms, as well as floor markings, remind people of the basic monitoring procedure. The number of monitoring instruments has been increased and new hand/foot monitors will be installed at reactor building exits in time for the next outage. An information campaign has been effective in promoting and reminding staff of these standards. A booklet featuring current regulations has been published and widely distributed to contractor companies.

C1 and C2 portal monitors are tested monthly. In the event of an anomaly, the portal monitor is withdrawn from service and repairs are carried out within 24 hours.

An analysis is conducted whenever a person is contaminated. It contains a list of facts as well as a diagnosis, and particularly includes a human factor analysis. It suggests actions for improvement in order to prevent the recurrence of such events. These analyses are formally monitored.

The organization of the QSPR department has been developed in order to strengthen the role of risk-prevention specialists in providing support, advice and assistance, as well as conducting monitoring activities in the field.

Special attention has been given to housekeeping and job closeout quality. A monitoring document for use by Monitoring Supervisors, whose role is to monitor and supervise contractors, is used to appraise job-site cleanliness, correct any deviations and reduce contamination spreading hazards. 'Work area step-over' kits equipped with contamination monitors and marking-off equipment are made available to work team leaders. Radiological cleanliness reference areas serve as model examples for job-site and room cleanliness.

Belleville NPP has drawn up a list of activities which most urgently require an overall review of work and job-site organization, particularly with regard to radiological cleanliness. The aim is to contain contamination within the job-site and prevent worker contamination through the use of airlocks and appropriate checks. The two activities chosen for the next outage are vessel opening and closing operations, as well as valve overhauls in the reactor building. Other activities are scheduled for 2003-2004.

Management conducts numerous plant tours in order to check compliance requirements in the areas of radiation protection and radiological cleanliness. Each behavioral deviation or failure to comply with requirements is immediately taken up with the person concerned, by management, and expectations are reiterated and explained. Deviations are tracked and documented by means of written reports.

This field inspection programme has been supplemented by plant tours organized as part of the risk-prevention challenge during outages. They are an effective means of identifying recurrent problems and seeking appropriate solutions. For example, under-gloves are now used to carry out high-precision work in optimal conditions without contaminating work packages when taking notes. This practice will be tested during the next outage, scheduled for July 2002. The

use of fine rubber gloves for use in damp conditions should significantly reduce the hand-contamination rate, which currently accounts for 80% of contamination cases.

Belleville NPP has decided to continue using earplugs in noisy areas of the RCA. Instructions have been posted up, advising personnel how to avoid contamination when putting on and removing hearing protection.

Rules governing the management and withdrawal of equipment and waste from the RCA have been completely redefined and subjected to a quality assurance process. They are drafted in the form of a 'transfer process', describing equipment receiving/dispatching activities. They are checked extensively. Their purpose is to ensure that no radioactive substances are disseminated outside the RCA and off site.

Risk-prevention expectations are also mentioned in risk-prevention/radiation protection training sessions. A training worksite has also been set up to exhibit these expectations and train staff in the use of appropriate work practices and in the use of personal protection and monitoring equipment. At the end of these sessions, each trainee is required to take a test in order to check that he has attained a satisfactory level of knowledge.

In 2001, randomly selected contractors were required to take tests in the areas of radiation protection and industrial safety as soon as they arrived on site. These tests are used to gauge their knowledge of basic radiation protection rules, as well as to reiterate and explain expectations when shortcomings are identified.

IAEA comments:

Management safety tours are a key feature of Belleville's response to this recommendation. During safety tours plant management specifically set standards and expectations for all personnel on site including contractors. Simplified pictorial signs have been developed to reinforce the need for monitoring and the basic procedure. The amended C1 / C2 procedure used at Belleville is being considered for wider application within EDF. In order to better track, trend and trace the source of contamination problems Belleville have installed improved hand and foot monitors and have removed the wash basins from between the portals such that contamination incidents cannot be "washed away" and thereby removing key data-points for contamination spread investigation.

The whole approach which is reinforced by the use of a training work site where radiological cleanliness can be practiced is focussed on containing contamination to the close confines of the specific work sites. Particularly during outages all personnel including contractors are subject to random testing to ensure that appropriate knowledge of radiological expectations and practices are fully understood.

In support of the new arrangements the use of special fine rubber gloves has been adopted following a benchmarking visit to Golfech NPP. This approach has been trialled and gloves are on order for deployment at the next outage.

The original OSART team were concerned about the possibility of ear contamination from using earplugs within contamination control zones, which was not seen as being aligned with best practice. Currently Belleville have posted notices recommending how earplugs can be used minimising the potential for contamination, although a good suggestion from a staff member utilising ear plugs on strings is being considered, this specific point is as yet unresolved although there is perceived commitment to do so. Notwithstanding the initiative on ear plugs, during a visit to the RCA the OSART follow up team were provided with external ear defenders (of the type which are attached to the hard hat). Although when questioned the Belleville personnel considered these were not as

effective as ear plugs their use does address the fundamental problem and the station are encouraged to develop this approach further.

Conclusion: Satisfactory progress to date.

6.3. RADIATION DOSE CONTROL

6.3(1) Issue: Despite policies to apply ALARA principles at the plant, ALARA processes are not being consistently applied in the field for routine execution of work.

- There are a large number of hot spots throughout the RCA compared to the international standards. This could be caused by an increase in radioactive corrosion products which could be aggravated by lithium concentration.
- BAN A, room NA 0443 has a label outside the room indicating hot spot of 150mSv/h, inside room on RCV pipe, the sign on the hot spot indicates 40mSv/h without lead blankets. Room labeled as yellow zone and the door was not locked.
- BK, room KA 0431 contains used flexible ventilation piping from the sanding operations on the containment repair project stored in boxes. There is however a hot spot covered in lead blankets in a pipe just above the boxes, the sign for which is very easily missed. The sign warning of hot spots is behind the “as-found” open door. The hot spot measured 8mSV/h.
- BAN A, room NA 0543, hot spot 22mSv/h on RCV without shield and the door was not locked.
- Door 1 JSK 408 PD, which is signed for hot spots and with an orange symbol, was found wide open with no installed lock assembly. This door is the entrance to room KA 0441 and a Radiation field of 1.60mSv/h existed at the open door. There are many lead shielding blankets on the floor of the room.
- Significant lapses in contamination control practices of staff were noted (6.2(2)).
- There are very few sources of radiation fields that are cordoned off at a distance so as to prevent people inadvertently entering significant radiation dose rate.
- Minimization of solid waste volumes is not being rigorously applied as there is an excessive use of wood, scaffold and other wrapping material in the RCA and there is no effective segregation of waste into likely clean or contaminated articles.

The absence of adherence to ALARA principles in the routine execution work, could lead to unnecessary collective dose and potentially unplanned radiation exposure.

Recommendation: Plant management should strengthen the adherence to ALARA principles for radiation dose particularly during normal operation.

The plant could consider utilizing similar ALARA principles and practices that it has successfully used during outage work to achieve minimal outage collective dose. This would include:

- Minimizing the time people spend in areas of radiation exposure by frequent monitoring and signage and firm control off access to such areas (i.e. frequent field measurements and placing of warning signs, locking doors, constructing barriers and limiting access to high radiation areas).
- Reducing the sources of radiation by decontamination (i.e. removal of the multitude of present hot spots and applying shielding for those that cannot be removed).

- Close monitoring and coaching of staff in the adherence to personal ALARA practices.

The plant should also consider removing the root cause of excessive hot spot formation.

Plant Response/Action:

Since September 2001, the exposure of workers carrying out all maintenance and operations activities within the RCA is forecast and monitored, using a Projected Dosimetry Evaluation sheet (EDP). This new system is described in a process known as 'Optimal Radiation Protection', which incorporates the ALARA approach.

During the planning phase preceding every maintenance activity, projected individual and collective dose rates per job phase are assessed. This assessment also entails systematic efforts to reduce exposure levels. When the radiological risk factor is considered significant ($0.5 \text{ mSv} < \text{individual dose / day} < 1 \text{ mSv}$) or high ($\text{individual dose / day} > 1 \text{ mSv}$), an in-depth analysis is carried out by the relevant craft with the support of the QSPR department, and approved by the QSPR department or Senior Management, depending on the radiological risk factor. Other criteria pertaining to collective dose and dose rate also give rise to in-depth analysis. When the job is in progress, radiation exposure levels are monitored on a daily basis in order to check that results are consistent with projected values. If the actual dose is 20% above the forecast, the job is interrupted and the forecast reassessed. If it is 20% below the forecast, the forecast is reassessed. This new system was instrumental in reducing exposure levels during the last outage (295 mSv effective dose, as against the initial target of 345 mSv), identifying deviations and implementing innovative solutions. Each deviation is processed by the crafts and monitored by the QSPR department. In spite of the 23-day outage extension on unit 2, radiation exposure results for 2001 met the target.

Rules governing the RCA and sign-posting in that area have been revised. Each room is checked at least once a month, while some rooms with very changeable ambient radiation levels or hot spot occurrence are checked more frequently, particularly during outage. Information pertaining to dose rate, air contamination and the presence of hot spots, is displayed outside each room. Changes have been made to hot spot management policy. Operating measures such as the flushing of systems and efforts to improve circuit chemistry adjustments have been effective in reducing the number of hot spots. In addition, new measures implemented by the site require an area to be reclassified when dose rates caused by hot spots are much higher than the area's initial grading. Furthermore, protective equipment and physical barriers limit access to hot spots, while a programme for the gradual elimination of hot spots is in progress as part of the corporate zoning process.

Requirements governing the monitoring of personnel and equipment at RCA exits have been reinforced, particularly at worksite and reactor building exits and prior to going through the C1 portal monitor. Signs featuring pictograms, as well as floor markings, remind people of the basic monitoring procedure. The number of monitoring instruments has been increased and new hand/foot monitors will be installed at reactor building exits in time for the next outage. An information campaign has been effective in promoting and reminding staff of these standards. A booklet featuring current regulations has been published and widely distributed to contractor companies.

An analysis is conducted whenever a person is contaminated. It contains a list of facts as well as a diagnosis to investigate the causes, and particularly includes a human factor analysis. It suggests actions for improvement in order to prevent the recurrence of such events. These analyses are formally monitored.

Management presence in the field has been stepped up in order to explain and monitor compliance with expectations, as well as listen to staff comments. During field inspection tours, each behavioral deviation or violation of requirements is immediately taken up with the person concerned. Expectations are reiterated and explained to him. The field inspection programme has been enhanced by plant tours arranged as part of a risk-prevention challenge during outage, and by staff field tours intended for the critical observation of work situations, notably compliance with requirements, and for the proposal of possible improvements.

At the end of 2001, the site acquired a new RCA access management system: MICADO 2. This system bars RCA access to persons failing to meet cumulative radiation exposure criteria, to persons failing to keep up to date with their medical examinations, or to contractors not having undergone their whole-body count. The system is also designed to monitor worksite radiation exposure more closely in real time, in addition to exposure monitoring carried out by workers.

The various measures implemented to exhibit ambitious radiation exposure targets from 2002 to 2005 include:

	2001		2002 (-8%)		2003 (-8%)		2004 (-5%)		2005 (-5%)	
	<i>Un1</i>	<i>Un 2</i>	<i>Un 1</i>	<i>Un 2</i>	<i>Un 1</i>	<i>Un 2</i>	<i>Un 1</i>	<i>Un 2</i>	<i>Un 1</i>	<i>Un2</i>
<i>Outage length (days)</i>	31.5	41	-	35	47	-	33	46	-	33
<i>Outage dosimetry (mSv)</i>	400	350		300	560		350	335		250
<i>In-cycle dosimetry (mSv)</i>	170		205		130		125		130	
<i>Total 2 units (mSv)</i>	920		505		690		810		380	
<i>Average/Un/yr. (man .Sv)</i>	0.46		0.25		0.345		0.405		0.19	

IAEA comments:

The strengthening of the approach to ALARA has been focussed enhancing the use of risk assessment in all areas. A significant number of Craft personnel have been trained such they can carry out their own systematic risk assessments, validated by RP, prior to commencing level 0 or 1 operations or maintenance activities. For level 3 or 4 job activities, RP must approve the assessment before work commences and must be involved with and check the optimisation of the assessed radiological risk.

The outcomes of risk assessments are continuously monitored and reviewed on a daily basis such that a deviation of +/- 20% is investigated as a learning opportunity for the future.

In support of dose reduction and optimisation the labelling improvements, hot spot reduction and posting of dose survey information described in the IAEA comments to 6.2(1) above are all contributors. In addition the consideration of the use of operational activities such as flushing and the use of lead shielding has been adopted to facilitate dose reduction.

Again the importance of ALARA is a key expectation frequently expressed during management plant tours which are a significant contributor to the successful plant response to this recommendation.

Belleville management believe that this improved approach to ALARA has contributed to the successes they have recorded in overall dose reduction which is trending downward since the OSART mission in 2000.

Conclusion: Issue resolved.

7. CHEMISTRY

7.1. ORGANIZATION AND FUNCTION

The Chemistry section at Belleville reports to the technical and nuclear logistics department. The Chemistry section is responsible for chemical and radiochemical analyses of primary, secondary and auxiliary systems, environmental surveillance, liquid and gaseous effluent and the chemical supervision of the demineralization plant. Staff members are sufficient to carry out all analyses during steady operations as well as during the outages. No contractor support is needed in the chemistry section.

The experience level of the section is maintained continuously by job rotation and by the well-formalized and structured shadow-training program, which is based on training guides.

The staff is fully informed on plant policies and standards and the goals and objectives of the department and the chemistry section are well documented. Once per year the department manager presents the aims of the department to his staff. The performance and aims of chemistry section are checked monthly by supervisor of chemistry, discussed with his department manager and shown to the staff as performance indicators and diagrams.

The information flow within the group is clearly defined and working well. The supervisor talks to all his staff at the weekly on-call meeting and every 3 month at the section meeting.

Well-developed organization roles and responsibilities and relevant procedures exist in the “Technical and nuclear logistic department” and the chemistry section has job specifications for each job. Responsibilities and authorities are clearly described and understood. The use of senior foremen (specialists removed from daily routine tasks for performing special tasks outside of line management) was noted as working well.

The interfaces with corporate organizations are well defined. There is good cooperation with the chemical and metallurgical laboratories in Paris, through a liaison engineer.

The laboratory section communicates system chemistry results and required actions effectively with all the other sections and departments of the plant, especially with the operations department. However the importance of good chemistry on the system and equipment is not fully appreciated by many staff. The team recommended that the plant should improve the communication of the importance of good chemistry to all relevant staff.

For chemical parameter variations a formalized procedure to track chemistry deviations exists. A summary list with all deviations is available. Integration of corrective measures is organized with the plant safety department.

7.2. CHEMISTRY CONTROL IN PLANT SYSTEMS

Plant operating and chemistry practices are consistent with EDF practices for plants with similar design and material composition.

A coordinated lithium/boron chemistry is used for primary circuit which is appropriate for the material mix of this plant. However the load following demands on the plant creates problems for keeping this area within the devised range.

The secondary side all volatile treatment (AVT) is appropriate for the materials used in secondary circuit. Morpholine and Hydrazine injection is used to minimize the corrosion rate and preserve the integrity of secondary side components. The continuous operation of the steam generator blow down system effectively helps to maintain good secondary side water chemistry. The plant takes additional

actions to ensure chemistry conditions remain good, for example, the proactive replacement of steam generator blowdown anionic resins in the event of increasing MSR (Moisture Separator-Reheater System) conductivity.

Shut down and start up chemistry is well defined and performed. In order for operations staff to have an understanding of the challenges of a good primary system chemistry, the chemistry section has developed, jointly with EDF Corporate Training Dept., a training session entitled “cold shutdown conditions” for operating crews. Since 1997 this half-day training has been systematically provided before any fuel outage and covers the shutdown stage until oxygenation.

For radioactive effluents, proper procedures and practices have been developed and implemented. To optimize effluent management the lab initiated, in 1995, a modification in the layout of effluent sumps. This project included the installation of a pump before transfer to the waste treatment building, based on effluent, chemical and radiochemical characteristics. The advantages of the modification are:

- It avoids contamination of the floordrain effluent tank inside the waste treatment building,
- Optimizes costs,
- Limits released activity.

This project shows the creativity of the section.

7.3. CHEMICAL SURVEILLANCE PROGRAMME

Chemical surveillance programs are clearly defined in documents and understood by staff. Work schedules, including sampling plans and the QC/QA program, are displayed from the MERLIN computer system and checked by the foremen. Results of the readings, analysis and QC/QA checks are keyed in this computer system and are automatically checked with the specifications. The data can be used for creating reports, trends, control charts and curves. Corporate level and operations are connected with the application. The team considers the MERLIN application with its multitude of tools as a good practice.

Key parameters are mainly monitored by on-line instruments installed in the primary and secondary circuits. The instruments that have nuclear safety significance have main control room readouts to provide information and alarms and to facilitate implementation of prompt corrective actions.

All the on-line and manual analytical equipment is routinely calibrated and maintained, but the failure of on-line instruments is high. The tracking system for the surveillance programme of the on-line analyzers is insufficient. The team suggested the plant to review the surveillance programme for on-line analyzers and formalize the system of reporting data from preventive maintenance and periodical tests.

The integrity of fuel cladding is monitored by gamma spectrometry during normal operation and power transient with the aim of detecting fuel cladding defects and to follow defect evolution. On-line and off-line wet sipping methods are used for identifying defective fuel assemblies. The plant is allowed to refuel failed fuels based on the criteria determined on EDF Corporate level.

7.4. CHEMISTRY OPERATIONAL HISTORY

As mentioned above all chemistry data is effectively collected, analyzed and stored in a computer database, which is used for all tasks and work control of the chemistry section.

The chemistry section produces regular reports including monthly trends and reports after each outage with an overview of the evolution of all interesting parameters, a synthesis of all significant events and incidents.

The responsibilities for reporting and experience feedback analysis are clearly defined and effectively implemented.

Internal and external experiences are evaluated by experienced people. To perform this correctly a feed back system is implemented at the plant. The information flow of experience feedback is provided by EDF's "La lettre du REX" which is send twice per year to the chemistry section.

Lessons learned are effectively incorporated into policies, procedures and training.

7.5. LABORATORIES, EQUIPMENT AND INSTRUMENTS

The chemistry laboratories are well equipped and have adequate space. The housekeeping is very good. All analysis and measuring equipment in the laboratory is periodically checked and calibrated. To ensure the quality of the measurements the laboratory participates in round robin tests periodically and cross comparison tests for the on-line analyzers with corporate level.

The storage of chemicals used for analysis is well controlled by a technician who is responsible for the tasks at the chemistry warehouse. Sufficient qualified spare parts are available in the warehouse of chemistry section. The storage of the chemicals corresponds to requirements.

The plant has a Post Accident Sampling facility that enables obtaining samples from the containment spray system. The sampling system and the sampling programme are in accordance with EDF policy. A handbook entitled "Organisation locale de crise" with a special section on chemistry, adequately describes the post accident sampling process. The chemistry section is responsible for periodically checking the post accident sampling system for operability.

7.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCE

Corporate policy prescribes the quality of operational chemicals to be used in different plant systems by taking into consideration the material quality requirements, safety and health risk. This PMUC programme is implemented at the plant, but the role of the programme and the impact on plant and systems are not well understood. The team recommended strengthening the programme for the control of chemicals and commercial products to ensure, that only authorized products are on-site.

The quality control of bulk chemicals, resins, diesel fuels, kerosene and oils is well performed by the chemistry and maintenance departments. The shelf life of all chemistry reagents is clearly defined and labeled.

STAUS AT OSART FOLLOW UP VISIT

Appropriate actions have been taken on the OSART recommendations and suggestion. The two recommendations have made satisfactory progress and the suggestion was found to be resolved.

The position of chemistry has been strengthened and relations with other departments have improved since the OSART mission. The plant has implemented actions to improve relations with other departments and to promote awareness of the importance of good water chemistry. Furthermore, the chemistry section has been involved in developing programmes for refurbishment of plant installations affected by corrosion damage, as well as improving storages practices for operational chemicals. Activities have been planned for 2002 to further improve the common understanding of chemistry matters in operation.

The plant has taken several actions to improve the availability of on-line analyzers and has developed indicators to monitor the availability, which is reviewed on a monthly basis. Oxygen meters have been replaced, silica meters will be replaced in the course of 2002 and hydrazine meters are due for replacement in 2003. Furthermore, a maintenance contract, drafted together with the other plants in the Loire Valley, is undergoing signature. This contract will reduce on line analyzer repair and maintenance times. These activities, together with the strengthened monitoring programme, will ensure that the plant reaches an acceptable level of availability for the on-line analyzers within two years.

Chemical storage conditions in the main store have been improved and fireproof cabinets are now used to store flammable products, while retention trays are being used for some products. The plant has further developed a process for the authorization of chemicals and other substances, which ensures appropriate use of PMUC as well as non-PMUC products. This process is now undergoing final approval after its initial period of use. Additionally, corporate activities will make it easier for users to address risks associated with the use of different chemicals, and to state the appropriate safety precautions for the use of chemicals.

Generally speaking, chemistry is now gives greater recognition at the plant and member of the chemistry section are more actively involved in several activities where chemistry advice is needed.

DETAILED CHEMISTRY FINDINGS

7.1 ORGANIZATION AND FUNCTIONS

7.1(1) Issue: The importance of good chemistry to the plant is not properly understood and respected by all affected plant employees despite that functions, responsibilities and interfaces of chemistry with other plant groups are defined.

- The primary circuit lithium concentration is often out of the preferred range partly due to the effects of load following. However, despite possible corrosion and ALARA consequences, this is accepted by management rather than being discussed and optimized together with the grid management.
- A general lack of understanding of the impact of chemical phenomena to plant equipment is indicated by the significant number of corrosion problems evident in the plant.
- The lack of chemistry knowledge is evident in the poor storage arrangements for chemicals in the main warehouse, for which the chemistry section is not responsible.
- The use of non-PMUC (Material and equipment for the use in power plant) products without a clear defined risk analysis and procedures demonstrates that the impact of these chemical products is not understood [see Issue 7.6(1)].
- Because of the lack of understanding of chemistry, not everything is done at plant level to ensure that unavailable on-line instruments are repaired in a timely manner.
- For important systems like the primary and secondary circuit and effluent management, procedures which describe the responsibilities and interfaces between chemists and operations exist. However this is not the case for the demineralization plant. A tracking system is in place for the primary circuit, secondary side and treatment of gaseous and liquid waste, which has not been implemented at the demineralization plant.
- The demineralization plant is regularly started by the field operator during the absence of the chemists despite the fact that advice on good chemistry control of pre-treatment and deionisation can be important to establish the treatment process. The interface and responsibilities for the primary circuit, secondary side and treatment of gaseous and liquid waste are clearly defined and action sheets are used for the interface of chemistry with other plant groups, but not at the demineralization plant.
- The team observed inadequate logbooks at some workstations which did not contain sufficient details of chemical status of systems.
- Maintenance response to the repair of chemistry related equipment tends to take a lower priority than warranted by the condition.
- Operations and maintenance are not aware of the impact of numerous leaks and their volume on effluent activity.
- The chemistry section offers special training to operations staff before outage. This training is done by a chemistry senior foreman and a corporate instructor. No chemistry training exists for the normal operating periods.

- A shift manager has been appointed as the operations interface to chemistry.

Insufficient respect of the role of chemistry to the plant performance could lead to violation of chemical limits and consequently increased corrosion and degradation of systems and equipment.

Recommendation: The plant should review their chemistry approach during normal operations with a view to emulating the successful approach used during outages. Plant management should also consider including chemistry factors in their regular refresher training of employees. Resolution of the situation at the demineralization plant should be carried out in a timely manner.

Plant Response/Action:

An analysis of the findings has enabled the plant to identify a number of causes. Corrective actions can thus be divided into two main groups.

Maintenance of plant facilities :

A long-term programme for refurbishing those plant installations most affected by corrosion has been drawn up. This programme started with:

- Refurbishment of part of the pumping station (painting and installation of a leak-recovery system for stuffing boxes).
- Repainting of part of the diesel rooms.
- Repairs to the chemical injection facility on the demineralisation plant.

This work will continue in the coming years and other projects are being studied, such as containment of acid fumes in the demineralisation facility.

With regard to maintenance, concrete actions have been carried out in order to improve preventive maintenance of chemistry on-line analysers and to reduce their failure rate. These actions are described in the response to the suggestion put forward by the chemistry reviewers.

Strengthening relations between chemistry and other departments :

In this regard, several concrete actions have been carried out, while other longer-term actions have not yet been totally completed, but have made good headway :

- Relationship with Power Operations Project (TEM): Nowadays, a technician systematically represents the chemistry section at all TEM meetings. This technician also takes part in the TEM corporate federation project group comprising several sites. Chemistry activities involving several crafts (e.g.: replacement of demineraliser resins or calibration of the boron meter), are systematically subjected to a risk assessment. This commitment is written into the chemistry section's business plan. All chemistry section activities liable to generate operability loss have been identified with input from the Operations department, and are systematically subjected to a joint analysis. These activities are incorporated into the TEM schedule.
- A thorough review has been carried out with the warehouse staff on the storage and handling of chemical products. This aspect is developed in the response to the recommendation on operational chemicals (PMUC).

- Relations with Operations:

The Plant Management Committee (COMEX) has now clearly defined the responsibilities between Operations and Chemistry with regard to the demineralisation plant. For this part of the plant, instructions are tracked in an identical manner to that already applied to all other plant systems. A specialist has been appointed within the chemistry section and is the single point of entry for Operations with regard to the demineralisation plant. In addition, one of the shift operations managers has been appointed as an interface with Chemistry.

Concerning effluent management, Operations has appointed an off-shift technician to monitor production of effluents and promptly implement corrective actions if necessary. He is the chemistry section's designated interface. Operations have introduced effluent production targets into their business plan, with input from Chemistry.

A training file on the role of Chemistry at the plant has been produced in order to enhance relationships between Operations and Chemistry, through greater mutual understanding among crafts. This file will be presented to all shift teams in the year 2002. In addition, the chemistry section and Operations have made a commitment to involve technicians in immersion courses. 5 laboratory technicians will thus be going to spend a few days on a shift team in the course of 2002. Similarly, operations staff will spend time working in the chemistry section. These exchanges commenced in 2001.

In order to limit primary circuit corrosion, Operations and chemistry section staff have undergone awareness training to limit pH correction time. Whenever the authorised boron/lithium ratio is exceeded, correction is carried out in less than 6 hours. In 2001, this six-hour period was only exceeded 8 times – mainly due to reactor stabilisation for flux maps - for several dozen pH corrections on both units.

As a result of all these actions, a considerable improvement has been noted in relationships between the chemistry section and other departments – particularly with Operations – in the field. These actions have also enhanced awareness of the importance of chemistry in plant operations.

IAEA comments:

The position of chemistry has been strengthened and relations with other departments have improved since the OSART mission. The plant has implemented actions to improve relations with other departments and promote create an awareness of the importance of good water chemistry. Furthermore, the chemistry section has been involved in developing programmes for the refurbishment of plant installations affected by corrosion damage, and improving storage practices for operational chemicals. Activities have been planned for 2002 to further improve the common understanding of chemistry matters in operation.

Conclusion: Satisfactory progress to date.

7.3 CHEMICAL SURVEILLANCE PROGRAMME

7.3(1) Issue: The tracking system for on-line analyzer performance and maintenance is insufficient to develop and monitor short and long term corrective actions although a chemical surveillance programme for on-line analyzers is implemented.

Calibration and servicing of on-line analyzers is mainly done by the manufacturers. Chemists control and implement the preventive maintenance of the devices. Nevertheless during the OSART mission more than 5 on-line analyzers were out of service. The specifications require that the on-line analyzers have to be repaired as soon as possible. The team found 2 analyzers which had been out of service for 6 weeks. For one of them the replacement part was not stored at the plant because it is too expensive. The other will be completely replaced.

The chemistry section is responsible for 97 on-line analyzers. Instruments were out of service for an accumulated 386 days between 1/1/00 to 9/30/00. This means 1.45% unavailability for this year or one on-line analyzer is down every day.

It is a goal of chemistry to reduce unavailability of on-line analyzers. A technician indicated that many had already been replaced.

There is no feedback to the foreman or MERLIN when the preventive maintenance is being done by the technicians. The technician only makes an entry in the MERLIN life data sheet when something unusual has been done. Some quality assurance stickers were found not signed at on-line devices.

The plant policy gives priority to on-line analysis over manual measurements.

Continuous surveillance of the plant chemistry is not ensured because of the failure of on-line analyzers. Manual analysis only provides a snapshot of the chemical situation, on the other hand, an on-line analyzer is available over 24 hours and delivers data continuously over that period.

Suggestion: The plant should consider formalizing and enhancing the system of monitoring performance, preventive maintenance and surveillance of the on-line analyzers.

Plant Response/Action:

Improving the availability of chemistry on-line analyzers has been made a priority of the laboratory section.

As part of the preventive maintenance programme, the following actions have been taken:

- A formalized preventive action policy for each on-line analyzer
- Traceability of action in the MERLIN database
- As part of the corrective maintenance programme, the following actions have been taken:
 - Establishment of a 72-hour deadline, with mandatory results from the contractor in contracts currently being renewed (excluding the neutronic boron meter which,

given its very low failure rate, does not require a corrective maintenance contract).

- Monitoring of on-line analyzer repair time.

At the end of 2002, a cross-comparison of on-line analyzer availability on plants in the Loire Valley will be organized in order to exchange good practices and quantify the benefits gained by a change in organization.

The loss of availability factor dropped from 1.5 % in 2000 to 1.2 % in 2001

The replacement of oxygen meters in 2001 (20% of availability loss) and the replacement of the silica meter scheduled for 2002 should enable us to drop below 1% in 2002, with a further decrease to 0.5% in 2004.

These monitoring activities are included in the laboratory section's target agreement.

IAEA comments:

The plant has implemented a number of actions to improve the availability of on-line analysers has developed indicators to monitor their availability, which are reviewed on a monthly basis. Oxygen meters have been replaced, silica meters will be in the course of 2002 and hydrazine meters are due for replacement in 2003. Furthermore a maintenance contract, drafted together with the other plants in the Loire Valley, is undergoing signature. This contract reduce on-line analyses repair and maintenance times. These activities, together with the strengthened monitoring programme, will ensure that the plant reaches an acceptable level of availability for the on-line analysers within two years.

Conclusion: Issue resolved

7.3(a) Good practice: Application of a Laboratory Information and Management System called MERLIN for the diverse jobs of a laboratory from taking samples to data evaluation. With the MERLIN application the plant has:

- easily integrated corporate chemistry specifications
 - adjusted them to plant specifics, setting of more restrictive thresholds, setting specifications per type, date and frequency
 - adjusted them to the laboratory organization and job rotation system
- Custom made work schedules (including analysis, samples and readings), based on workstation
 - scheduled analyses to be carried out
 - unscheduled requests from operations
 - keyed in, check and validate data
 - some considerable time thanks to the use of remote computer terminal for readings
- Improved its trend analysis process
 - easy creation of charts, reports and curves for any chemical data
 - instant access to older plant data (historical records since commissioning)
- Improved its QA system
 - track measuring instruments
 - enhanced first level check: display of chemical specifications when keying in results, display of 10 latest values, red marking of any deviation
 - display and use on-line instrument data (control charts)
 - enhanced supervision based on the existence of lines of defense: deviation report issued every night and immediate treatment by foremen
 - one single computer application for all section activities
- An integrated experience feedback system to corporate level
 - efficient communication with corporate level: improved corporate experience feedback with instant display the data relating to all French plants in real time

A risk analysis was carried out jointly with the plant computer deputy prior to the actual implementation of MERLIN. This analysis list risk of and barriers to any deficiency in the software.

MERLIN has a custom made work schedule for the plant and each work station. The data input is checked with the chemistry specifications and validated or red marked for any deviation. With MERLIN the plant has a quick tool to created any kind of reports or trends

with instant access to historical records since commissioning. Furthermore, MERLIN has an integrated quality assurance system and experience feedback system to corporate level.

Operations and Safety & Quality departments may display MERLIN data after they have been validated by the chemistry section.

The MERLIN system is one single tool for all chemistry jobs.

7.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

7.6(1) Issue: The control of chemicals at the plant does not always meets the requirements of PMUC (Produits et Matériaux Utilisables en Centrale – Material and Equipment for use in power plants) and the role of the PMUC programme and its impact on the plant are not well understood.

The plant has assigned a PMUC interface at Belleville to the corporate level. The responsible person has not received specialist training for handling of hazardous chemicals.

Chemistry is only responsible for operational chemicals and has assigned a responsible person for all tasks connected with operational chemicals. Chemical control of the operational chemical products is adequate.

The team found several chemical products without PMUC identifications.

An exception license process for the use of non-PMUC products is implemented but the criteria and processes are not clearly described or understood by relevant staff. A draft of a new procedure exists, but the risk analysis is not formalized. The responsibility for this risk analysis is not clearly defined. The labeling system for non-PMUC product with an exception license is also not clearly defined. The team found several chemical products with “Belleville” label, but without the exception license.

A statement was made that the “Belleville” label only indicates that the chemical has been delivered to Belleville. The use of the “Belleville” label is not clear.

Inadequate control of chemicals and commercial products can result in personnel injury and damage to plant systems and components.

Recommendation: The plant programme for the control of chemicals and commercial products should be strengthened to ensure only authorized products are on-site and that they are properly labeled and controlled.

Plant Response/Action:

Improved storage of chemicals at the main warehouse has been continued by an in-depth action performed in close collaboration between the ISO 14000 Project and the chemistry section.

Bulk chemicals are stored on pallets with a retention tray. Descriptive sheets with pictograms of the risks are displayed for all stored chemicals. When chemicals are put in the warehouse, it is checked that those stored close together are compatible. Their expiry date is also checked then. The required industrial safety sheets (FDS in French) are grouped together for each chemical and available for users on the computer system, under the responsibility of the QSPR (Quality-Safety-Risk prevention Dept.) which is in charge of updating them.

The list of non-PMUC chemicals can also be accessed on the computer system.

In conjunction with the chemistry section, a process has been drawn up to guarantee that any chemical used at the plant is authorized. Each department using it was involved in developing this process and has appointed a coordinator responsible for ensuring that it is followed.

This process is based on 3 simple rules:

1. In all cases (including safety-related equipment), the use of PMUC chemicals is required.
2. The number of non-PMUC chemicals is limited and the long term goal is to no longer use any. This action is being carried out jointly with Dampierre NPP.
3. However, if a non-PMUC chemical must be used, the warehouseman checks that the use of this chemical has been included in the risk assessment by the craft for the planned worksite.

It is therefore possible to check at the worksites that all chemicals used are either PMUC or authorized by the relevant risk assessment.

In addition in the contracts signed with the contractors, it is required that they use only chemicals obtained from the plant warehouse.

In the course of summer 2002, EDF will provide on the plant intranet network a site on PMUC chemicals. It will thus be easy for each user to use corrosion risk assessments already performed. It will also be possible to apply for PMUC authorization for new chemicals.

IAEA comments:

The plant has responded effectively to the recommendation made by the OSART team. The chemical storage conditions in the main store have been improved and fireproof cabinets are now being used to store flammable products, while retention trays are being used for some products. The plant has further developed a process for the authorization of chemicals and other substances, which ensures appropriate use of PMUC as well as non-PMUC products. This process is now under going final approval after its initial period of use. Additionally corporate activities will make it easier for users to address associated with the use of different chemicals, and to state the appropriate safety precautions for the use of chemicals.

Conclusion: Satisfactory progress to date.

8. EMERGENCY PLANNING AND PREPAREDNESS

8.1. EMERGENCY ORGANIZATION AND FUNCTIONS

Emergency preparedness arrangements in Belleville rely on a national doctrine established at the EDF corporate level. This national doctrine is compiled in a standard model (“maquette du Plan d’Urgence Interne et documents associés au PUI”) issued by the corporate level after approval by the regulator. Belleville NPP staff is then responsible for the local implementation of these arrangements. To achieve this, the duties to develop, maintain and organize the EPP arrangements are assigned from the Belleville general manager to the Safety & Environment Advisor and to a dedicated engineer from the Safety Quality Department for practical implementation and follow-up.

In order to involve the plant staff who are working with EPP and to develop and maintain their understanding of EPP arrangements, an “EPP-network” is established and officially endorsed by the general manager of the plant. This network creates good acceptance and understanding of the EPP arrangements and ensures a continued awareness of EPP needs.

The organizational structure of the internal emergency plan (PUI) is based on five local centres shared out among two main locations: near the control room of the affected unit and in a protected safety building (BDS: Bloc de Sécurité). The leading and co-ordination of the response is performed by the Management Emergency Plan Centre (PCD). The Local Operation Emergency Response Centre (PCL) assists the shift team to control the event and to bring the plant to a safe state. The Local Crisis Team (ELC), located in the Emergency Response Room (LTC) close to the main control room evaluates, in close cooperation with national crisis teams from EDF and from the IPSN (Institute for Radiation Protection and Nuclear Safety), the nature of the emergency in order to enhance the response or to support the PCL. The Logistical Emergency Response Centre (PCM) is in charge of all the logistical aspects of the emergency (management of the people on site, provision of additional support to other teams, turnover, etc.). The Assessment Emergency Response Centre (PCC) is in charge of the evaluation of the radiological consequences of the event on and off site.

The relations between Belleville NPP and local authorities (prefecture of Cher) and other off-site organizations (rescue services, medical assistance services, local hospitals) work properly. In case of an emergency, a liaison officer (function PCD3) is sent to the emergency centre of the prefecture of Cher in order to assist the prefect which is responsible for the off-site emergency response and acts as the nominated coordinator of the other neighbouring departments (Nièvre, Loiret and Yonne). The good collaboration between Belleville and other off-site actors is expressed by several concluded agreements (on information, on specific material disposal, etc.) and, at all levels, close contacts exist between Belleville and other rescue groups (common training, etc.).

During an emergency the Belleville general manager takes the overall responsibility receiving local and corporate support. While this statement is clearly established in official EPP documents, some other information sources (training material for instance) confirmed by some interviews performed during the mission shows some confusion. To avoid any confusion, the team encourages the plant to clarify the responsibilities within the PCD during training and refreshing courses and to distinguish the daily duties assigned to the PCD1 from their duties during an emergency (i.e. when the internal emergency plan -PUI- is activated). The team also encourages the plant during exercises to instruct PCD1 to wear both PCD0 & PCD1 armbands as long as PCD0 is not present in the PCD-room. It will indicate to other EPP-staff members that the both functions are assumed in that case by PCD1.

8.2. EMERGENCY PLANS

The PUI consists of three parts:

- The first part is divided into 6 chapters: firstly an introduction describing the PUI file and its internal and external distribution followed by a chapter describing the general organization to be put into place in case of an emergency. The third chapter consists of the action procedures (“action sheets”) for each of the emergency centres including one for the site security service. The next three chapters cover the post-crisis actions, the resource inventory and the description of the telecommunication means.
- The second part of the PUI covers the general instructions to persons who do not have emergency response duties.
- The last part consists of support documents like phone books, maintenance arrangements, training and qualification required for involved staff, roles of duty, home calls, etc.

The responsibilities of the different emergency centre teams are clearly defined and the staffing of each function is adequate. The control and verification of the roles of duty, performed every week, is very strictly followed by the plant management.

While the arrangements of turnover of the emergency centres members are included in the PUI procedures, the team recommends including the test of turnover arrangements in the exercise programme.

The prefect of the Cher department who is responsible for the off-site response including other neighbouring territories has a concern in this area, namely the need to improve the population notification system. Some weakness was identified during the last national exercise performed for the Belleville plant in May 1998. The off-site emergency plan (PPI: Plan Particulier d’Intervention) is under revision as requested by a ministerial instruction issued in the first part of 2000. The team recommends that the necessary legal steps to enable progress to be made on the installation of a local population notification system be made in a timely manner. An efficient system should be operational to alert and notify the population within the EPZ. The team also suggests that the main instructions to be followed by the population after receiving the first notification of an emergency in the NPP of Belleville be distributed within the zone on a regular basis.

8.3. EMERGENCY PROCEDURES

The procedures used in case of an emergency are mainly included in the PUI file (actions sheets). In each emergency centre, controlled copies stored in plastic sealed envelope are provided as well as other specific support documentation to be used within the emergency centres.

The team suggests optimizing the use of the badge system to automatically count and quickly identify missed persons after gathering of people present on the site at the moment of occurrence of the event.

The team recommends to take into consideration unfiltered releases or different containment failure modes for projected dose assessments based on plant conditions.

A specific “Health and fire fighting” plan (PSI: Plan Sanitaire et Incendie) supplements the PUI. This PSI plan is very well developed and uses a part of the PUI functions (especially from the PCM logistical team) in combination with people from the on-duty plant staff and external rescue teams who

have received specific on-the-job training in the area. This PSI plan is identified as a good practice by the team.

8.4. EMERGENCY RESPONSE FACILITIES

The on-site emergency centres, called command posts (PC), were found well set up and ready for operation. The management, logistic and assessment PCs (PCD, PCM and PCC) are located in a special building, called BDS (Bloc de Sécurité). This building is equipped with air-conditioning with iodine filters and with an emergency electrical supply (diesel and batteries). The BDS also contains food and water stocks for at least three days. From PUI level 2 actuation, each PC member goes through a radiological control area located at the entrance of the BDS before to access to their PC room. The telecommunications and call-up systems to be used in case of the activation of the PUI are highly diversified (internal and external), in a more extensive way than the corporate doctrine (e.g. higher periodical tests periodicity).

There are 6 gathering points shared out among the site. These are well indicated using a different colour for each of the points.

The medical centre on site is well equipped and organized to take care of injuries or irradiated or contaminated persons. Special agreements exist with local hospitals to further taking care of affected persons. These agreements also cover training of potentially involved people from the hospitals and provides assistance of EDF radiological protection “on-call” staff to cope with contamination and radiological hazards in the hospitals.

A press briefing centre located close to the Public Information Centre is designed to host 50 to 70 journalists. It contains educational material and can also be in auditory connection with the corporate EDF press-briefing centre in Paris. Extra communication personnel could also, if needed, requested from other EDF plants (in the frame of the twinning agreements with Dampierre, Nogent, Chinon and St-Laurent plants).

A back-up centre, called LEC (Local Environnement et Contrôle) is provided in Neuvy/Loire close to the plant to manage and control the removal of non-essential personnel from the site or to organized the turnover of the EPP teams, when these actions could not be performed on the site due to high background radiation. This back-up centre is well equipped and covered by adequate arrangements: it provides monitoring and decontamination facilities, clean replacement clothes, 3 different shuttle bus (one for shuttling to the affected site, one for driving back to home and one for the turnover personnel sent to the site). Water from the decontamination facilities is collected in a special tank (12.6m³) for further processing.

8.5. EMERGENCY EQUIPMENT AND RESOURCES

There is a substantial range of dedicated equipment and resources at different locations on the site: in the BDS PC rooms, in the on-site medical centre, in the back-up centre in Neuvy/loire, etc.

The radiological monitoring network consists of four on-line on-site ambient \dot{a} -dose rate stations (circle of ~1 km), four additional on-line similar stations at 5 km distance, 10 “genitron” stations (ambient \dot{a} -dose rate measurements which can be downloaded using infra-red connection) located around the site boundary and 10 “genitron” stations in the 10 km zone (villages, etc.). This network is not sufficient to provide necessary information on a release from an unmonitored pathway. However, a test of automatic retransmission of the data from the 20 “genitron” stations was successfully performed in 1999 on the Dampierre NPP site. This improved radiological monitoring network was put in operation in mid 2000 at that plant. It is expected that this improvement will be extended to all French NPP sites

but the final decision has not yet been made at EDF corporate level. The team encourages the plant to improve the radiological monitoring network according to the same approach followed by Dampierre NPP. The number of on-line monitoring points will then be increased from 8 to 28 stations.

Belleville has two dedicated radiological monitoring vehicles to carry out on-site and off-site monitoring of dose rates and for taking air and water samples. The sampling device is programmable and portable. These vehicles are also used on daily basis for general environmental surveillance. In the frame of the twinning agreements with Dampierre, Nogent, Chinon and St Laurent plants, an additional radiological monitoring vehicle can be requested during an emergency. While the personal protection provided in these vehicles follows the national requirements issued by the EDF corporate level, the team suggests providing them additionally with stable iodine tablets, respiratory protective masks with filtering cartridges and waterproof protective clothes. The team also suggests to supplement the supply of protective equipments to external rescue teams for off-site interventions, to ensure their protection against radiation hazards.

8.6. TRAINING, DRILLS AND EXERCISES

For employees who do have a role in the PUI/PSI, detailed training and refresher programmes exist. For each PC, training and refresher courses are divided into mandatory and recommended categories. Each course is produced on the basis of detailed specifications and receives a specific coding number. The PC staff members were well trained. However, the team suggests including a requirement for regular participation in exercises as a necessary item for requalification (see Issue 2.8 (2)).

For general employees not involved in the EPP organization, training on instructions to be followed in case of PUI activation is systematically given by the Safety Quality Department. During exercises, refresher information is given at the gathering places.

An exhaustive emergency exercises programme is used at Belleville. This programme covers many different types of exercises: internal or external, partial or global, with or without intervention of external rescue services, fire fighting and/or medical aid exercises, etc. In total, there are about 15 exercises/year.

The French regulations set as an objective to perform a national wide exercise for each French NPP-site every 3 years. This national exercise involves all the concerned parties at all levels (local and national, EDF and public authorities). In some cases, population could also be involved.

In addition to that national wide exercise, EDF organizes for the Belleville site a global exercise every 3 years with the corporate level (EDF support teams). This is normally performed about 1 year before the national global exercise.

For these 2 types of exercise, the shift team and the PCL and ELC teams work from a full scope simulator (in Paluel), the rest of the EPP-teams acting from their PC (PCD, PCC, PCM).

The other global internal exercises use the on-site compact simulator (SIPACT).

8.7. LIAISON WITH PUBLIC AND MEDIA

On a daily basis, the Belleville communication staff is very proactive in their liaison with the public, the media and the local community representatives. Internal and external communication utilizes different methods of media support such as press releases, information sheets, information magazines, etc. One of the actively promoted information support mechanisms is the use of a free number, which is

systematically mentioned in information brochures, etc. As this free number is also expected to be used during an emergency, the team encourages the plant to increase the simultaneous available connections when the PUI is activated in order to avoid any reaction resulting from the saturation of the free number access.

During an emergency, there are specific functions inside the PCD for dealing with communication with the media and the local authorities. The agreement between Belleville and the prefecture of Cher on mutual information exchange and contacts between Belleville and the corporate level enable a sufficient coordination and harmonization of information being released to the public and media.

STATUS AT OSART FOLLOW-UP VISIT

In general, the follow up team found that good progress has been made on Emergency Planning and Preparedness issues. Five issues were followed up, including three recommendations and two suggestions. Two recommendations were found to be resolved and one has made satisfactory progress. One suggestion was found to be resolved and one has made satisfactory progress.

A number of corrective measures were taken by the plant staff to improve the process of turnover of PC teams during the emergency drills. These newly developed measures were tested and validated during the last emergency drill in August 2001 and were found satisfactory. Current schedule includes two emergency exercises annually with PC teams turnover.

Significant efforts were put by the plant to solve the issue on installation of the public notification system. Sirens were installed in 2 km radius off-site area as a result of the agreement between government and EDF corporate in October 2000. Additional mobile public notification vehicles are ready to operate in 10 km radius off-site area. A new version of the off-site emergency plan (PPI) and the protocol on the use of sirens as public alert system has been developed in cooperation with responsible prefecture authorities.

The review and analysis of the suggested installation of computerised badge system for counting people in the mustering points was done. The results of the analysis shows that the time for counting people in the mustering points and identifying of the missing persons is mainly determined by the time spend by the transfer of the plant staff to these points after the alert. The process of manual comparison of the presence lists has been improved, therefore the installation of the suggested badge system was not found reasonable.

The new appendix to PCC guidelines issued by EDF corporate covers the issue on dose assessments and addresses the failures of filters and different containment modes in terms of projected radioactive releases to the environment. Changes in filtering or containment conditions are evaluated manually and based on this evaluation the source term input to the used KGE software reflects changed plant conditions in various scenarios of emergency situations.

PCC monitoring vehicles are now equipped with additional necessary personal protective equipment. The external monitoring teams are also equipped by protective breathing masks with filtering cartridges and protective waterproof clothing. Up to the time of dosimeters delivery, the plant will provide dosimeters for the external rescue teams after their arrival on site in case of emergency.

DETAILED EMERGENCY PLANNING AND PREPAREDNESS FINDINGS

8.2. EMERGENCY PLANS

8.2(1) Issue: The turnover of Command Post (PC) teams members has never been tested during exercises at Belleville NPP.

As a real emergency in a NPP could last for more than 24 hours, the turnover of PC-teams constitutes a critical step in the crisis management. During this turnover process, special care needs to be taken to ensure adequate and complete information transfer between team members and to avoid any disturbance due to high number of people in the different PC rooms. This turnover aspect is included in the internal emergency plan (PUI) procedures but it was never tested in exercises.

The absence of rehearsal of turnover during exercise could result in ineffective information transfer in case of an emergency.

Recommendation: The test of turnover arrangements of PC-teams should be included in the exercise programme. The team suggests that the first exercise should include the objective of identifying needs associated with the turnover process and refine the guidance on how to proceed.

Plant Response/Action:

Directly after the OSART mission, an in-depth review was carried out with regard to this suggestion. As a result, an exercise including turnover was immediately carried out in December 2000.

This exercise enabled us to finalize our operating methods for exercises including turnover. The action sheet has been deployed and approved.

The scheduling of an exercise in 2001 enabled us to validate our operating methods and schedule at least one exercise with turnover per year.

IAEA comments:

As a result of above-mentioned emergency exercise in December 2000 a number of corrective measures were taken by the plant staff to improve the process of turnover of PC teams. New forms, procedures and turnover checklists were developed to increase the effectiveness of information exchange while keeping the continuous control of the latest development of the plant status during the turnover. These new developed measures were tested and validated during the last emergency drill in August 2001 and were found satisfactory. Current schedule includes two emergency exercises annually with PC teams turnover.

Conclusion: Issue resolved

8.2(2) Issue: The necessary legal steps to enable progress for the installation of the local population notification system is not being done in a timely manner.

The programme to revise the off-site emergency notification process, resulting from a ministerial instruction issued in the first part of 2000, expects to improve the population notification system by installation of fixed sirens within the EPZ. However, a lot of uncertainties remain on the practical arrangements to be followed to achieve this improvement or on the expected necessary delay. For example, basic legal steps at the country level are still required before further steps can be taken.

First instructions to be followed by the population after declaration of an emergency are not distributed on a regular basis within the EPZ. Only after major changes, such information brochures are spread to each home in the zone.

Lack of effective population notification process could result in unnecessary population exposure in the event of a severe accident at the plant.

Recommendation: The necessary legal steps to enable progress to be made on the installation of a local population notification system should be completed in a timely manner. An efficient population notification system should be operational within the EPZ in close collaboration between the NPP of Belleville and the local authority and communities.

The team also gives advice to distribute within the zone on a regular basis (every year) the main instructions to be followed by the population after receiving the first notification of an emergency at the NPP of Belleville. This regular distribution could carry out using support like calendars or being included in local information brochures (Local Information Commission or Communities journals).

Plant Response/Action:

Working in close collaboration with the Public Authorities, the site has drawn up formal specifications for a public alert system within a 2-km radius of the site, comprising the immediate danger zone. Sirens were installed at the end of October 2001 and their use is governed by a protocol between the plant and the Cher Prefecture.

Along with this new alert system, the site has incorporated commitment criteria derived from the 'immediate response' phase of the off-site emergency plan (PPI). The 'immediate response' phase of the new PPI is being tested, and its implementation is scheduled for September 2002. It will be accompanied by an information pamphlet, distributed to the surrounding population, with instructions on what to do in the event of an alert. The Public Authorities will be responsible for distributing these information pamphlets.

IAEA comments:

Sirens were installed in 2 km radius off-site area as a result of the agreement between government and EDF corporate in October 2001. Partial mute test of the sirens after installation was successful, however, the full test of the sirens, which requires cooperation with the prefecture authorities was not yet carried-out. Additional mobile public notification vehicles are ready to operate in a 10 km radius off-site area.

A new version of the off-site emergency plan (PPI) has been developed. This version includes the presence of installed sirens and was validated during the emergency exercise in March 2002. The protocol on the use of sirens as public alert system was also developed in cooperation with responsible

prefecture. Both documents are currently in final versions ready to be signed by the plant and official prefecture representatives in June 2002.

Conclusion: Satisfactory progress to date

8.3. EMERGENCY PROCEDURES

8.3(1) Issue: During personnel accounting the potential of the computerized badge system is not exploited to quickly identify any missing persons.

Personnel accounting is managed by the Logistical Emergency Team (PCM) based on information received from the 6 mustering points distributed across the site. In case of discrepancies, handwritten lists are established at the mustering points and compared with global lists from the badge system to determine the number of missed persons.

This manual process could lead to unnecessary loss of time or errors.

Suggestion: Consideration should be given to optimizing the use of the computerized badge system to automatically count and quickly identify missing persons.

Plant Response/Action:

In response to the suggestion issued by the OSART team, Belleville NPP has contacted other nuclear power plants having adopted similar approaches to personnel accounting at muster points.

Measures implemented by Penly and St. Laurent plants have been carefully reviewed. Although these measures provide improved means of counting personnel at muster points, they are not designed to identify the exact location of personnel remaining in industrial areas, thereby making an efficient search impossible. Indeed, the KKK (computerized badge) system is not designed to monitor personnel exiting the RCA and heading towards the monitored area, as they are not required to register with the computerized badge system before the final site exit.

With regard to the investment needed to acquire a personnel accounting system based on the KKK access system, trials that have been implemented to date have not proven satisfactory in locating missing persons, even if personnel accounting has been partly improved.

The system in place at Belleville has shown, during a number of emergency drills, that personnel accounting at muster points was satisfactory in terms of both speed and reliability. Comparison with the KKK list of persons present on the site enables discrepancies to be detected within approximately 30 minutes after the alert.

However, the site has contacted the corporate body in charge of the KKK access system, with a view to incorporating personnel accounting into future system changes.

IAEA comments:

The review and analysis of the suggested installation of the computerised badge system for counting people in the mustering points was done. The results of the analysis shows that the time for counting people in the mustering points and identifying of the missing persons is mainly determined by the time spend by transfer of the staff to these points after the alert. Manual comparison of the KKK list of persons present on the site and sheets of present persons in the mustering points makes the minor contribution in time delay. This manual system, after the implementation of corrective measures, takes now just 5-10 minutes more in comparison with reviewed computerised systems used on other plants. Installation of the suggested system was not found reasonable.

Conclusion: Issue resolved.

8.3(2) Issue: The dose assessment used in the urgent phase of an accident is not performed utilizing conservative data for filtered or unfiltered releases and for different containment failure modes.

The dose assessments performed by the PCC using the so-called “Outil PCC” (standard scenarios) to quickly assess the radiological consequences in order to identify protective actions for the population and or the environment, is made from first information received from the emergency technical teams, using a diagnosis/prognostic methodology (3D/3P): based on main parameters (core exit temperatures, activity dose rates, etc.), a flow chart is applied to select a standard scenario. However, that methodology uses a fixed unique containment status. This containment status is defined such that the leak rate is limited to the design leakage rate and that the release from the containment is always filtered. International experts however, via the IAEA InterRAS or similar methodology, use a source term estimation based on plant conditions including filters and different containment failure modes.

The use of unique non-conservative containment status could lead to underestimate projected doses for the population.

Recommendation: Projected dose assessments based on plant conditions should include parameterization for filtered or unfiltered releases and for different containment failure modes (containment closed, failure to isolate, containment by-pass, catastrophic containment failure).

Plant Response/Action:

In January 2001 a new appendix to PCC guidelines (EPP) was issued by EDF corporate which addresses the issue of containment leaks or filtering failure. In December 2001 also the new version of the PCC guidelines replaced the original ones.

The method used by the PPC team is no longer only based on a single containment condition but makes it possible to assess the radiological impact of gaseous releases in an accident condition, whatever the unit condition. The method consists in re-assessing the source term if there is a gap between forecast and actual releases at the stack level and/or in the environment. During twice-yearly emergency drills, the EPP teams are trained to manage this type of failure.

Ultimately, as of June 2002, EPP management would automatically trigger the off-site emergency drill if the accident trend is evolving quickly, with a view to provide immediate support to the local government when it comes to launch prompt protective measures for the public.

IAEA comments:

The new appendix to PCC guidelines issued by corporate level to all EDF nuclear power plants addresses the filtered or unfiltered releases and different containment failure modes in terms of projected dose assessments released to environment. Changes in filtering or containment conditions are evaluated manually and based on this evaluations the source term input to the used KGE software reflects changed plant conditions in various scenarios of emergency situations.

If the failure of filtering or containment tightness is obvious, these evaluations can be done directly in first calculation of dose assessments to environment. In case the mentioned failures are not obvious, the first calculation of dose assessments are compared with results of actual monitoring of the

environment and failures of filtering or containment tightness are evaluated and implemented in to the source term inputs to the KGE software in next step.

Conclusion: Issue resolved.

8.3(a) Good practice: An extended and very well developed “Health and Fire Fighting Plan” (PSI: Plan Sanitaire et Incendie) supplements the Internal Emergency Plan (PUI: Plan d’Urgence Interne).

This PSI plan includes 3 main phases: during the first intervention, the main objectives are to alert the NPP staff and to proceed with the first rescue intervention without special means. The second intervention is led by the “2nd-intervention team” deployed quickly on the field, while the third intervention consists of intervention of external rescue teams. The second intervention team is composed of 5 on duty members: 4 coming from the Operation service and one from the Site Protection service. The 4 Operation members pass through a “Safety Room” for getting equipment (fire protection clothes, respiratory protection means, first medical aid case, etc.) while the Site Protection member goes to a PRS point (Rescue Collecting Point) identified by the location of the event. A mobile PC is installed using a vehicle equipped with communication means, dose meters, etc. The role of this 2nd-intervention team is to co-ordinate the intervention, to assist the potential injured people and to assist and guide the external rescue teams on the site. In addition, a logistic team, composed of some of the PCM members on duty, is activated to further support the 2nd-intervention team (supplying of additional material, medical support from the on duty nurse, etc.). The available mobile fire fighting means are very extensive (vehicle with a large amount of different kind of equipments, mobile motorised pump, etc.). Observation during the OSART mission of a local PSI exercise confirmed the operability of the PSI plan.

8.5. EMERGENCY EQUIPMENT AND RESOURCES

8.5(1) Issue: The teams sent on the field during an emergency have insufficient protection against radiation hazards.

Concerning the external fire brigade rescue teams, the protection means for off-site interventions are:

- Local fire brigades (brigades from the Department of Cher) do not have any specific equipment: no stable iodine tablet, no dose meter, no protective clothes, no respiratory protection;
- The specialized rescue team coming from Bourges has a dedicated vehicle with special equipment including personnel protection (protecting clothes, respiratory means including filtering cartridges). However, no stable iodine tablets are available and the dose meters appear to be of “out-of-date” technologically (“all or nothing” portable dose meters or personnel pen dose meters).

The equipment provided in the 2 NPP radiological monitoring vehicles, as prescribed by EDF corporate level, consists of:

- Paper protective clothes;
- Overshoes;
- Dose meters and film badges;
- Respiratory devices with 20 minutes autonomy.

However, no stable iodine tablet nor respiratory protective masks with filtering cartridges, not waterproof protecting clothes are presents.

Lack of effective protection against radioactive hazards could result in unwanted exposure of team members while intervening on the field during an emergency.

Suggestion: Consideration should be taken to providing adequate personal protection measures to external rescue teams and to Belleville monitoring teams.

Plant Response/Action:

PCC vehicles that are sent into the field have always carried the following protective equipment: protective paper clothing, over-shoes, electronic dosimeters and breathing apparatus with 20 minutes of autonomy.

Since March 2002, this equipment has been supplemented with protective breathing masks with filtering cartridges, protective waterproof clothing and a provision of stable iodine tablets for all those intervening.

At the plant’s request, Public Authority vehicles will also carry protective breathing masks with filtering cartridges, protective waterproof clothing and dosimeters, by the end of 2002. In January 2002, the plant provided its emergency assistance centers with boxes of stable iodine tablets for all those intervening.

IAEA comments:

PCC monitoring vehicles are now equipped with additional necessary personal protective equipment. The external monitoring teams are also equipped by protective breathing masks with filtering cartridges and protective waterproof clothing. Their dosimeters are already ordered, but not yet delivered. Additionally, the plant will provide dosimeters to the external fire brigade after their arrival on site in case of emergency.

Conclusion: Satisfactory progress to date.

**SUMMARY OF STATUS OF RECOMMENDATIONS AND SUGGESTIONS
OF THE OSART FOLLOW UP MISSION TO BELLEVILLE NPP
13-17 MAY 2002**

	RESOLVED	SATISFACTORY PROGRESS	INSUFFICIENT PROGRESS	WITHDRAWN	TOTAL
Management, Organization and Administration	1R 1S	3R			4R 1S
Training and Qualification	1R	1R 1S			2R 1S
Operations	1R 1S	2R 1S			3R 2S
Maintenance		4R	1R		5R
Technical Support	1R 1S	1R 1S			2R 2S
Radiation Protection	2R	1R			3R
Chemistry	1S	2R			2R 1S
Emergency Planning and Preparedness	2R 1S	1R 1S			3R 2S
TOTAL R (%)	8R (33%)	15R (63%)	1R (4%)		24R (100%)
TOTAL S (%)	5S (56%)	4S (44%)			9S (100%)
TOTAL (%)	13 (39%)	19 (58%)	1 (3%)		33 (100%)

DEFINITIONS

DEFINITIONS - OSART MISSION

Recommendation

A recommendation is advice on how improvements in operational safety can be made in the activity or programme that has been evaluated. It is based on 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.

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 or 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.

Good Practice

A good practice is a proven performance, activity or use of equipment which the team considers to be markedly superior to that observed elsewhere. It should have broad application to other nuclear power plants and be worthy of their consideration in the general drive for excellence.

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, EDF and the staff of Belleville Nuclear Power Plant provided valuable support to the OSART mission to Belleville. Throughout the whole OSART mission, the team members felt welcome and enjoyed excellent cooperation and fruitful discussions with Belleville Nuclear Power Plant managers and staff, other EDF personnel and staff of local and national authorities. Information was provided openly and in the spirit of seeking improvements in operational safety. There was a rich exchange of knowledge and experience which contributed significantly to the success of the mission. It also established many personal contacts that will not end with the completion of the mission and submission of this report. The efforts of the plant counterparts, liaison officers, interpreters and the secretaries were outstanding. This enable the OSART team to complete its mission in a fruitful manner.

The IAEA, the Division of Nuclear Installation Safety and its Operational Safety Section wish to thank all those involved for the excellent working conditions during the Belleville Nuclear Power Plant review as well as during the follow up mission in Belleville.

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Years of nuclear experience: 20

Review Area: Technical Support

ONDRUJ, Pavel

Dukovany NPP, Czech Republic

Years of nuclear experience: 15

Review Area: Operations II

PITESA, John

Duke-Energy Co., United States of America

Years of nuclear experience: 20

Review Area: Operations I

TALBOT, Kenneth

IAEA

Years of nuclear experience: 30

Assistant Team Leader

SMALLENGANGE, Wim

Elektriciteits-Produktienmaatschappij

Zuid-Nederland Kernenergie, The Netherlands

Years of nuclear experience: 12

Review area: Training and Qualification

SCHÜTZ, Sigrid

Bayernwerk Kernenergie GmbH, Germany

Years of nuclear experience: 7

Review Area: Chemistry

VIANA MARIANO, Nelio

Angra Nuclear Power Plant, Brazil

Years of Nuclear Experience: 19

Review Area: Radiation Protection

OBSERVER:

Varju, Attila

Paks Nuclear Power Plant, Hungary

Years of nuclear experience: 14

TEAM COMPOSITION OSART FOLLOW UP VISIT

EXPERTS:

EARP, John

Nuclear Electric Ltd., United Kingdom

Years of nuclear experience: 26

Review Area: Management Organization and Administration
Radiation Protection

HANSSON, Bertil

IAEA

Team Leader

Years of nuclear experience: 36

Review Area: Chemistry
Maintenance

TOTH, Alexander

IAEA

Years of nuclear experience: 17

Review Area: Emergency Planning and Preparedness
Technical Support

PITESA, John

Duke-Energy Co., United States of America

Years of nuclear experience: 20

Review Area: Operations I
Training and Qualification