



INTERNATIONAL ATOMIC ENERGY AGENCY

REPORT OF THE
OSART
(OPERATIONAL SAFETY REVIEW TEAM)
MISSION

TO THE
DAMPIERRE
NUCLEAR POWER STATION
FRANCE

11 TO 29 NOVEMBER 1996

AND
FOLLOW-UP VISIT
15 TO 19 JUNE 1998

DIVISION OF NUCLEAR INSTALLATION SAFETY

OPERATIONAL SAFETY REVIEW MISSION

IAEA-NSNI/OSART/98/93F

PREAMBLE

This report presents the results of the IAEA Operational Safety Review Team (OSART) review of Dampierre nuclear power plant in France. It includes recommendations and suggestions for improvements affecting operational safety provided to the responsible French authorities for consideration and also describes 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 some 18 months later. The purpose of the follow-up visit was to determine the status of all proposals for improvement, to comment on the appropriateness of the actions taken and to make judgments 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 judgments 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 result 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 invitation of the Government of France a three week OSART mission was conducted at Dampierre nuclear power plant. The plant is located in the Loire valley South of Paris. It consists of four 900 MW units of the EDF CP1 standardized design with a 3 loop primary circuit. The units were first connected to the grid between March 1980 (Unit 1) and August 1981 (Unit 4).

The team consisted of eight external team members, three Agency staff and up to five observers, as shown in the OSART Team composition at the end of this document. The team travelled to Paris on Friday, 8 November 1996. Saturday and Sunday were spent on team training activities. Due to the fact that Monday, 11 November was a national holiday in France, it was spent carrying out plant orientation training, whole body counting and a site tour. The entrance meeting, took place on Tuesday, 12 November. The team then conducted the OSART review, completed its initial reports and presented its findings at an exit meeting on Friday, 29 November. In addition to senior managers from Dampierre, the exit meeting was attended by Mr. Yves Corre from the EDF corporate organization and P. Saint-Raymond from the regulatory body DSIN. M. Saint-Raymond stated that he would like to see more experts from France used on OSART teams and, in particular, a greater number of regulators should be used.

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. In addition, an exchange of technical experience and knowledge took place between the OSART team members and their station counterparts on how the common goal of excellence in operational safety could be further pursued.

Throughout the review, the exchange of information between the OSART team members and station personnel was very open 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 station's performance compared with good international practices.

At the request of the Government of France, the IAEA carried out a follow-up to the Dampierre OSART mission from 15 to 19 June 1998. The team comprised three members, one from United Kingdom, one from Brazil and a team leader from the IAEA.

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

OSART MAIN CONCLUSIONS

The OSART team concluded that the senior managers at Dampierre are committed to improving operation at the plant. The team found good areas of performance, including the following:

- The video conference facility provides live interactive training on theoretical nuclear concepts.
- The MICADO dosimetry system provides real time control of personnel doses within the radiation controlled area and assists with dose prediction and exposure time.
- The flowchart in the plant quality assurance manual clearly illustrates the complex relationship between plant documents and plant procedures

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

- The control room operators do not always monitor critical plant parameters or deal with control room distractions in a timely manner.
- Plant staff do not always comply with the plant policy for the use and modification of operating and maintenance documents.
- The process being used to train operators during refresher training does not ensure that all operators demonstrate proficiency on the completion of training objectives and the time spent training on the use of plant specific normal and abnormal procedures is less than seen at some other plants.
- The organizational structure and methods for controlling contamination at the plant do not always ensure that contamination is contained within the controlled areas. In addition, contamination control practices within the controlled areas need improvement.

FOLLOW-UP MAIN CONCLUSIONS

The IAEA follow-up team received excellent cooperation from the Dampierre staff and experienced openness and transparency in conversations held and information provided during the review. The plant's attitude facilitated the exchange of information and the resolution of unclear topics. In all cases agreement was reached with the Dampierre management on the assessment of the actions implemented.

The team noticed a real management commitment to a sustainable enhancement of nuclear safety at the site and to the resolution of the OSART findings. This was demonstrated by the changes in the organization and coordination of responsibilities e.g. outages, training, radiation protection, chemistry etc. towards the achievement of safety goals. Additional evidence was demonstrated by starting the resolution of OSART findings at an early stage, by the considerable human and material resources allocated to this end and finally by the setting of general and specific indicators to track the action plans implemented.

Specifically the team found a remarkable achievement in the total prohibition of consumption of drugs and alcohol at the site, the comprehensive and well thought out equipment identification, excellent storage of shelf-life spare parts in the warehouse, thorough investigation of skin extremity doses, comprehensive work carried out to develop chemistry analytical procedures and finally the sound training specifications and control for emergency call-out teams.

Nevertheless, the team concluded that further efforts from Dampierre management are still needed in regard to plant staff adherence to rules and policies in the areas of personnel contamination, industrial safety and documentation, as abnormalities were still observed. The plant management is invited to continue the efforts currently placed in the communication of expectations and enforcement of rules and policies, especially at working level and to closely monitor the evolution of indicators established for this purpose.

The final statistical analysis of the status of the twenty two recommendations and nineteen suggestions identified during the OSART mission in November 1996 reveals, that 71% were resolved, in 27% the plant had made satisfactory progress and 2% showed insufficient progress.

1. MANAGEMENT, ORGANIZATION AND ADMINISTRATION

1.1. CORPORATE ORGANIZATION AND MANAGEMENT

The Dampierre NPP is a four unit 900 MW PWR plant operated by Electricité de France. The corporate organization consists of central departments providing technical, training and human resource support to all EDF nuclear plants. The EDF corporate strategy is to maintain a consistent design basis, policies and standards which are fundamental to personnel and plant safety, while providing each plant with greater flexibility to implement local programmes to optimize plant and human performance. While this strategy is a change from corporate programming for all plants, there is no evidence that this added significant work load on plant management.

Functional responsibilities of the nuclear safety, operations, maintenance and environmental engineering corporate functions are well defined and focus on nuclear plant operation support. The corporate and station groups meet periodically to review the status of common programmes and share experience. Once per year, there is a formal meeting to establish the annual work programmes for the next year. Certain plants participate in pilot projects before new programmes or policies are implemented at all sites.

The nuclear safety management infrastructure includes a nuclear safety council at the EDF general manager level, an operation nuclear safety committee at the NPP operation division level and a safety technical committee at the plant level. The committee roles vary from high level review of nuclear safety performance to individual event reviews, as well as review of common underlying factors to events to determine changes which may be needed from policy to programmes. A strong focus on nuclear safety exists but the policy related to fitness for duty should be improved. The team recommends that a strategy be developed to achieve the eventual prohibition of alcohol consumption during lunch on site.

1.2. PLANT ORGANIZATION AND MANAGEMENT

Dampierre plant management structure consists of four departments, which are responsible for the operation of Units 1&2, operation of Units 3&4, technical support and administration. The organization is led by a director who is assisted by 7 functional sections such as quality assurance, human resource and communication. Nine committees aligned with the key effectiveness areas for the station are charged with the responsibility of developing policies, strategies, programmes, monitoring performance and making recommendations to the management committee for approval. This management structure requires a considerable time commitment on the part of the managers and may need to be reviewed as more experience is gained.

The roles and responsibilities of departments and managerial positions were found to be well defined and understood. The plant director is fully responsible for nuclear and industrial safety performance and he holds the line managers for production, technical and maintenance functions fully accountable for the performance of their departments with respect to safety. There are adequate human resources available for safe plant operation.

The selection process for technical staff was based on experience and demonstrated technical competence. All technical and management staff receive annual performance assessments. Some management performance appraisals were reviewed and they identified development opportunities as well as contributions to safety. The practice for annual performance assessment of the other staff varies from none in the chemistry area to about 50% for operators and maintainers. Performance assessment of these groups is on a voluntary basis, at present. Periodic performance assessment is important to reinforce management expectations for safety. Dampierre plans to extend this programmes to all staff. The selection process for managers was found adequate for technical experience but it lacks a documented process to ensure that the managerial competencies required are properly identified. The team suggests that job competencies be documented and then used to assist in the selection and development of managers.

The plant recently updated the nuclear safety policy and communicated it to all staff through the section supervisors. The nuclear safety and quality section provided support to ensure a consistent message was delivered. The objective was to get staff to understand how the broad 5 principles relate to everyday work through self assessment and practical examples. An assessment by the team revealed that plant staff are aware of the existence of the policy but do not always apply the principles in the conduct of their work activities. The team recommends that management improve communication of its expectations through more frequent field visits and visible actions related to plant safety.

An internal self assessment conducted in 1995 formed the basis for the Dampierre 96 action plan. This plan, coupled with the director performance contract, forms the basis for the 1996 goals and objectives. The objectives set are comprehensive, challenging and seek improvements in all key areas of safety. The performance measures which are in use at the plant level for communication with corporate groups, are adequate to monitor performance results in safety areas, but more measures should be used at the plant level to ensure that programmes important to future safety performance are being carried out. The team suggests that the performance measures monitored by senior management be expanded.

Plant management is monitoring progress against plans and objectives. In June, a mid year report was produced showing progress of the Dampierre 96 action plan. Monthly reports are produced to monitor performance of the major plant indicators. A review of the results achieved so far, revealed that a number of objectives and programmes were not completed as planned. The team recommends that the plant improve the process to prioritize the programmes and objectives for 1997 to ensure that programmes important to plant safety are resourced and completed.

1.3. QUALITY ASSURANCE PROGRAMME

A quality assurance manual update was undertaken in 1995 and is almost complete. This update was required to bring the manual into compliance with the corporate programme. The manual provides documented roles and responsibilities and a description of the organizations responsible for the key station processes essential to nuclear safety. More detailed site wide procedures and section procedures were also developed or updated to be consistent with the new manual structure and requirements. Approximately 70% of the procedures have been updated. The manual includes a guide which represents schematically the relationships between the site procedures for a given theme or process. The team recognized this guide as a good practice. A communication programme was

implemented to ensure staff were aware of the new manual. Management and technical staff demonstrated an awareness of the new manual and its application to their area of responsibility.

The nuclear safety quality department has a comprehensive programme of inspections and audits. Every month, a certain number of plant areas are inspected to monitor areas such as periodic testing of systems important to safety, maintenance activities, system chemistry parameters, equipment isolation and condition, fire prevention and housekeeping. A comprehensive programme of audits is also carried out which includes areas identified by the monthly inspections for further review and areas identified by the plant management. Finally, once per year, systems important to plant safety are reviewed to establish their general condition, maintenance backlogs, material condition, documentation status and modifications. The results from these inspections and audits are well documented and findings are clearly identified and presented to plant management. Accepted actions are tracked. The findings reported to management accurately reflect the problems areas important to safety.

In 1995, about 50% of the actions accepted from audits and evaluations external to the plant were completed as scheduled. For actions initiated as a result of internal assessments, evaluations and follow up to significant events, less than 35% were completed as scheduled. For 1996, a summary is not available but will be provided to management as part of the annual report. The actions not completed are tracked in the nuclear safety committees and management is aware of deferral of some of these actions. Improvements to overall plant performance depend on timely completion of these actions. The team recommends improved prioritization and more frequent monitoring of backlogs in this area.

1.4. REGULATORY AND OTHER STATUTORY REQUIREMENTS

In France, nuclear plants operated by EDF are regulated by a number of government bodies. Matters of national safety policy and standards common to all plants are regulated by the DSIN. Plant operation, maintenance and modifications are monitored by regional departments called DRIRE. The DES department is responsible for providing technical expertise to the DSIN and DRIRE in all matters of nuclear safety. Radiological protection and protection of the environment is monitored by a department called OPRI on behalf of the regulator, the Radiation Protection Officer of the Ministry of Health. Roles and responsibilities and interfaces between these groups and the plant are well defined. Good communication exists between the plant and the regulatory bodies.

Local regulatory staff are located in a regional office and monitor plant operation for a number of EDF sites near the Loire. Sixteen inspections are conducted every year at Dampierre to review plant compliance with regulations during plant operation, maintenance and outages. As a result of these inspections, corrective actions may be required, as appropriate, by DSIN to EdF corporate departments as far as generic issues are concerned and by DRIRE to the plant as far as plant specific issues are concerned. In addition, significant events are analysed in detail and discussed with plant staff. With respect to planned outages, the regulator requires submission of the safety related system maintenance programme for approval prior to the outage. Regulator approval is required prior to restart to ensure results from the inspections and maintenance meet specifications. The plant inspection programme was found to be adequate.

1.5. INDUSTRIAL SAFETY PROGRAMME

Plant industrial safety policies clearly indicate that industrial safety is everyone's responsibility. The station director holds line managers and supervisors accountable for the safety performance results and the safety programmes in their area of responsibility. A recently formed risk prevention department is part of the technical support department and is adequately staffed to provide common services to all departments.

The Dampierre industrial safety performance has been improving in 1996 but does not meet the EDF objectives nor the median PWR worldwide value. During the visit the team observed examples in the field of non compliance with industrial safety rules, industrial safety requirements which were not always clearly identified, hazards which were not always identified and some defective industrial safety equipment.

The team believes that these performance shortcomings are due to a lack of clear policies and procedures as well as a lack of line management enforcement during field visits. The team recommends improvements in this area.

1.6 DOCUMENT AND RECORDS MANAGEMENT

Responsibility for document control and records management is distributed between the departments but the administration group defines the overall process and requirements. In general, good overall control of permanent station documentation and records exists but the internal verification process could be improved. Audits conducted recently identified certain field documents which were not updated following changes to the master copies but these problems had been rectified. The team noted that the station policy related to the process for making temporary modifications to station operating and maintenance procedures was not adhered to under all circumstances. Also, some procedures were missing and still needed to be developed. The team recommended that the quality assurance requirements for preparing, verifying and using procedures be adhered to.

STATUS AT OSART FOLLOW-UP VISIT

The review of the actions taken by the plant to resolve the issues in this area reveal, that two recommendations were totally resolved, three were found with satisfactory progress, while the two suggestions were totally resolved.

The actions implemented by the plant to prohibit the consumption of drugs and alcohol at the plant is a remarkable achievement, and exceeds the expectations of the OSART team which raised this issue. The team was also favorably impressed by the comprehensive management selection criteria developed and implemented.

The obvious improvement observed at the site in activities, documentation, material conditions etc, reflects that Dampierre leaders have managed to convey their expectations to the plant. Nevertheless, the team encourage the plant managers to continue reinforcing communication of management expectations and investigation of root causes, in specific topics such as industrial safety and personnel contamination to achieve the objectives defined in the plant strategic plan.

Dampierre has created a comprehensive set of management indicators that appear to be well balanced between the quantity and adequacy of parameters trended and has managed to effectively

incorporate the priorities set in the strategic plan and in the management contracts. These priorities are well tracked on a monthly basis.

Finally, the plant management has placed significant efforts on the improvement of industrial safety and documentation at the site and the dissemination/communication of established rules and directives. The team noticed significant progress in those two areas, since the former mission. Nevertheless, the team also noticed that plant staff do not always adhere to established plant rules in those areas and invite the plant management to continue enforcing industrial safety and adherence to documentation rules (specially at working level), and to keep vigilant to the evolution of indicators established to this purpose.

DETAILED MANAGEMENT, ORGANIZATION AND ADMINISTRATION FINDINGS

1.1. CORPORATE ORGANIZATION AND ADMINISTRATION

1.1(1) Issue: Dampierre does not have a strategy to prohibit wine or beer consumption on the site. A long standing practice at the plant has been to allow the consumption of small quantities of wine or beer during the lunch hour but the site policy prohibits use of alcohol or drugs while on the job. For example:

- Wine was available to control room staff during lunch in the kitchen near the control room.
- Wine was available during the lunch hour at the site restaurant.
- Wine and beer are available in the canteen for contractors.
- Some plant staff were observed to consume small amounts of wine with their lunch in the above locations.
- The team is aware of one case when management had to address problems related to fitness for duty due to use of alcohol consumption.

International experience indicates that the availability of alcohol on site should be strictly prohibited. Fitness for duty in all aspects of nuclear plant operation is an essential element in the overall plant and personnel safety. The availability of wine or beer during the lunch hour makes the enforcement of the site policy more difficult and could potentially lead to abuse under certain circumstances.

Recommendation: Plant management should develop a strategy which will lead to the eventual prohibition of wine and beer consumption on-site. The experience of other EDF plants with more restrictive practices would be helpful in compiling this strategy.

Plant response/action:

The plant's internal rules clearly specify the obligation to comply with French labor legislation in this area.

Prior to the OSART, and over a period of several years, the NPP has been conducting a programme to reduce alcohol consumption at the plant. Stricter rules were thus applied in 1997, with reminders sent in particular to the supervisor of the contractors' restaurant in the shape of memos signed by the Director of the NPP, referring to removal of aperitifs containing alcohol, restriction of volumes supplied, etc.

At the beginning of 1998, an action plan aimed at prohibiting all alcohol consumption at the plant, including in catering/restaurant facilities, was adopted by the Plant Management Committee. These provisions are more restrictive than French labor law. As modification of internal rules is required, the statutory bodies have to be consulted before a decision is taken. This consultation will take place in early April 1998. The internal regulations will then be submitted to the Labor Inspectorate (Inspection du Travail).

Independently of this action plan, the Dampierre plant supports prevention programmes in this area via the group 'Eclair et Vous', a voluntary organization active in the prevention of alcoholism and providing assistance to people who are experiencing, or have experienced, problems with alcohol.

IAEA comments: The action plan aimed at prohibiting the consumption of alcohol at the site adopted at the beginning of this year was finally enforced on the first of June of this year. The internal safety rule 2B 'Instructions to comply regarding health and Industrial Safety' states that drugs and alcohol are prohibited on site and in buildings outside that are used by the site for different purposes eg: the Visitor Centre, Cafeteria and contractors canteen. These instructions establish that any person under the influence of drugs/alcohol has to be sent to the medical centre. Letters have been sent to the management of the canteen and security to instruct that they check for alcohol at the entrance of the site. Information has been made available to department /sections for distribution at the plant. In addition, in the future similar detectors to those used at the airport will be installed at the entrance of the site, this will facilitate the control of banned products into the site.

The plant reported that from the adoption of the plan to final enforcement (preparation period) plant personnel has significantly reduced the consumption of alcohol at the site. Given the sensitive nature of this issue, the team recognized that the action implemented by Dampierre exceeded by far the intent of the recommendation.

Conclusion: Issue resolved.

1.2. PLANT ORGANIZATION AND MANAGEMENT

1.2(1) Issue: The lack of a documented management development and selection process may not ensure that candidates selected to the plant management positions in technical, maintenance and production areas have the required competencies to establish high standards for nuclear safety and implement effective programmes. For example:

- An analysis of the competencies such as nuclear safety attitude, leadership, teamwork, innovation and management skills required for each position is not documented. This need has been recognized by Dampierre and work is planned for 1997.
- The selection process for the operations managers, group managers and director positions is carried out through a corporate succession and career plan. Candidates judged to have the right experience and competencies are nominated. The plant director can also nominate a candidate. The decision is made by a corporate group based on knowledge of the individual and feedback from references. The plant director has input into the process and can refuse a selection. The job specific criteria used could not be clearly stated based on documentation.
- A development programme for each manager based on the personal annual evaluation against the required competencies is not always in place.
- Some managers recognized the need for additional development. They put in place specific training to establish the required standards in plant industrial safety and demand high levels of performance through field inspections.

The department manager plays a major role in setting and demanding high levels of performance in nuclear safety and industrial safety. Through frequent presence in the field and discussions with staff, he must communicate standards and monitor effective implementation of these programmes. He also plays a key role in the selection and development of his subordinates who in turn will support the implementation of effective programmes and promote a conservative decision making process. If these competencies do not exist, plant management may not be able to provide the leadership to the organization and progress as rapidly towards high standards of nuclear safety.

Suggestion: Plant management should document the job competencies for each key position and use them to support the management development programme and selection process.

Plant response/action:

Plant management has reviewed the selection of managers in strategic posts and the development of job competencies, with a view to:

- determining, for each strategic post, a selection process which ensures that the candidates selected for technical supervisory posts in maintenance and operations possess the required skills.
- Adapting skills to key performance factors, as stated in the Plant Strategic Plan (1997 - 2000). This objective will be pursued over the next three years, ultimately going

beyond management posts to formalize the skills required for each job, in addition to rules specifying professional development in post.

‘Strategic posts’ is taken to mean managers at the 3 levels of management identified, which are integrated into the contract-based initiative for setting objectives:

- Associate Directors;
- heads of department;
- shift operations managers* and section heads.

The selection process for Associate Directors (formerly group managers) is based on a corporate career path/succession programme. The candidates considered suitable (due to their experience and competencies) are appointed to these posts by the corporate organization. They are not selected at local level.

* Note: a corporate selection committee also takes part in selection of shift operations managers.

A selection tool (plant memo D5140/NS/REC.01) has been created for all department and section heads, which will be able to be used as a basis for a personal development initiative.

Principle

Recruitment is based on the following:

- the expected job profile (the minimum requirements)
- the result of cross-comparison of opinions expressed in evaluating the criteria tested, analysis of the candidates’ career paths, views of candidates’ managers and former managers.

(The process includes at least 2 interviews, conducted by different people).

The selected candidate must satisfy the minimum requirements associated with the job profile.

Methodology

The methodology is defined in plant memo D5140.NS/REC.01. It breaks down into three stages:

- the first stage, including analysis of the post to be filled
- the second stage, which defines the minimum and desired requirements associated with the job profile
- the third stage, during which the candidate is assessed.

Implementation

This organization has been in place since the summer of 1997, and in particular in relation to new managers in posts with responsibilities in the new organization.

IAEA comments: The responsibility of selecting Plant Managers, Associate Directors and Advisors rests with the corporate organization and that of selecting Department Managers, Section Managers and Shift Managers rests with Dampierre management. To formalize the selection process at the site,

based on the OSART recommendation, the plant has developed a memo that includes clear and detailed criteria for selection of managers, such as: leadership, safety as a first priority, the attitude with regard to finding out root causes, team work attitude, and many others. Based on the information contained in this memo interviews are carried out. The document is of excellent quality and amply satisfies the intent of this suggestion.

Conclusion: Issue resolved

1.2(2) Issue: Plant management do not always convey their expectations for quality and high standards in the conduct of plant operation and maintenance. For example:

- At the weekly management committee, the discovery of a radioactive source in conventional solid waste leaving the site led to a discussion with emphasis on the delay in notification, the requirement for a significant event report and the need to locate the source. The need for a thorough investigations into the root causes and a re-examination of the site process for waste monitoring was not emphasized. The preliminary investigation which followed by radiation groups was insufficient.
- Observations by the team and discussions with staff revealed that management presence in the field was infrequent. Supervisors and shift managers were observed not reinforcing their expectations with staff during field visits.
- A number of deficiencies noted in the field during team inspections, such as gas bottles not tied off and eye wash station out of service near a chemical laboratory were only corrected after senior management was prompted.
- Isolation of a diesel generator on channel B while a compressor was not tested on channel A led to unavailability of compressors on both the A and B channels for a short time, contrary to the technical specifications. The management response was focused on whether an actual system unavailability had taken place rather than investigating the reasons for inadequate review prior to isolation of the diesel generator on channel B.

Without leadership at all levels of the organization to ensure compliance with all policies, the implementation of important programmes and learning from minor events, the achievement of high levels of performance in nuclear safety may not be possible.

Recommendation: Management should ensure that field inspection guidelines are developed and implemented for line supervisors and managers. These guidelines should identify standards for work performance and material condition as well as actions to be taken to reinforce or correct inadequate performance in the field. Management should use committee meetings as an opportunity to clearly communicate their expectations with respect to industrial and nuclear safety and also promote learning from plant events.

Plant response/action:

As part of plant reorganization, and taking account of this recommendation, the desire to enhance communication of Management expectations regarding nuclear safety and industrial safety was taken into consideration in two different ways:

- The number of levels of management was reduced, enabling Plant Management to express their expectations as close as possible to those responsible for implementing actions. Responsibilities have been reaffirmed.
- Organization and reinforcing of management presence in the field.

Expression of nuclear safety requirements in meetings and committees

A flatter management structure has been adopted. The subject of nuclear safety is systematically covered at meetings of the Management Committee, which ensures that the key lessons are learned from plant events. Each Associate Director acts directly in conjunction with the Shift Operations Manager or the projects. This takes place via the following bodies:

- the daily ‘unit review’ meeting chaired by the Associate Director, Units in Operation, and the Associate Director, Outages;
- the weekly Technical Management meeting;
- the Operating Safety Committees (CSE), which analyze all significant operating event reports.

These bodies, and in particular the CSE’s, work to draw elements of experience feedback from the events analyzed. The actions adopted are monitored to ensure that they are implemented.

It should also be noted that department and section heads are now members of the plant CSE.

Management inspections

From 1996, a programme of industrial safety-related field inspections by management was implemented in twin-Unit 1/2. This programme was extended into 1997. Similarly, twin-Unit 3/4 initiated training programmes with a view to implementing the same approach. These training programmes were not conclusive (training body has been changed), as a result of which refresher training in management in-the-field inspections is planned for the first half of 1998. In particular, management in-the-field inspections were scheduled and performed during the outage of Unit 1 in late 1997.

The DAMPIERRE AMBITION project made provisions to reinforce management presence in the field. A programme of management in-the-field inspections has been implemented. This programme is set down on a contractual basis in the management contracts of the different departments. In particular, the Management Committee has defined its own programme of in-the-field inspections.

These management inspections in the field, whether performed by Plant Management, the department or the section, have a number of objectives:

- to ensure that defined requirements are complied with, and explain them (these requirements are recalled in the following paragraph),
- to obtain information on problems associated with field work,
- to correct or ensure the correction of malfunctions observed.

These inspections result in a report in which corrective actions are indicated and tracked.

Standards for work performance and material condition

Standards for work performance and material condition are defined in several documents: the Quality Manual, industrial safety instructions, personnel instruction book, design and manufacturing documents, etc.

To facilitate application of these documents, the NPP has drawn up concise documents summarizing the points on which the plant wished to focus: ‘the five key points of industrial safety’, the worksite

conduct standard (plant memo D5140/NT/95.79), the housekeeping standard (plant memo D5140/NT/95.63), conduct in and access to control rooms (plant memo D5140/NS/CDI.01). These documents have been distributed, some of them for a number of years, and all staff on the site are expected to apply them.

IAEA comments: Following the intent of this recommendation the directive D5140-NA-ORG-28 'Presence of Managers in the Field' was developed. This directive establishes that:

- The participants in management tours should communicate operating quality expectations to plant personnel.
- Tours should be conducted three times a year for logistic managers and twelve times a year for technical managers. In all those, industrial safety has to be always included
- All managers (including the site manager) should conduct plant tours.
- Unscheduled tours are also conducted in general and specific topics when performance is suspected to be below expectations.
- All managers should be accompanied by a manager one level below in the case of Industrial Safety tours and by another person who could be a shift supervisor, field operator or a technician in the case of general plant tours.
- The tour has to be prepared in advance. During the tour discussion has to be held with plant personnel and a report has to be written.
- Managers conducting plant tours should be aware of the standards for work performance and material conditions described in the plant response

The deficiencies reported are grouped and trended by number by the MSQ team. The results are included in the annual safety report. Several reports were observed of different areas of the plant and most of them were covered.

Several examples were noted during the review in which management expectations were communicated eg: Pictures distributed around the warehouse to show workers what the shelves should look like, A Letter sent by the site manager to all Dampierre staff to communicate his concern about the inadequate results in the industrial safety area, an article in the site magazine about the post-OSART expectations of the plant manager etc.

With regard to plant conditions, housekeeping, labeling, documentation, control of contamination, behavior of the operators etc, the plant has significantly improved and this reflects how plant management has succeeded in improving the communication of his expectations. Nevertheless, in some of these areas as described in specific issues such as personnel contamination, industrial safety and documentation, there is still room for improvement. The team concluded that management reinforcement in the communication of expectations and investigation of root causes, is still needed to achieve the objectives defined in the strategic plan.

Conclusion: Satisfactory progress to date

1.2(3) Issue: Plant performance indicators monitored at the department and plant level may not provide sufficient confirmation that major plant processes and programmes which contribute to plant safety are being executed as planned. For example:

- The execution of the maintenance programme is not monitored in a way which can assure that backlogs are being minimized, the planned maintenance programme is executed as planned and the resources available are sufficient.
- Training programme results are monitored by reviewing overall number of hours of training. Completion of the planned initial training, progression training in accordance with the national programmes and refresher training are not monitored to ensure plans executed as expected.
- Completion of action items arising from audits, inspections, and external evaluations are tracked at an individual action level but not at a high level. In 1995 less than half of the planned actions were completed. The plant intends to ultimately complete all these outstanding actions. In 1996, no status is available.
- No tracking mechanisms are in place to ensure items important to plant safety learned from external operating experience are monitored at a senior level.

Completion of root cause analysis, human factors analysis and completion of associated actions are not monitored regularly to ensure lessons learned from plant events are implemented promptly. Plant safety depends on a comprehensive maintenance programme, maintaining plant material condition in excellent condition, ensuring that lessons learned from events are implemented promptly and correcting root causes from audits and evaluations. Without monitoring these items at a sufficient frequency, plant management may be unable to ensure that effective programmes are in place to minimize precursors and underlying factors which usually can lead to significant events.

Suggestion: Consideration should be given to putting in place additional measures at the plant and department level to monitor the areas of maintenance, training qualifications and audit event follow ups to ensure management objectives are implemented.

Plant response/action:

As of January 1, 1998, the plant organization was changed, with a view, among other things, to improving control of the plant, particularly with regard to results. To this end, lines of management were shortened. The plant is managed by a Plant Manager, assisted with regard to operational aspects by three Associate Directors. The latter monitor performance via the meetings and committees which they chair in all areas, as follows:

- The Management Committee, chaired by the Plant Manager. The plant performance trend table is reviewed by the Management Committee each month. Corrective actions may be undertaken as a result of this analysis. This trend table is made up of the main indicators under the site project, plus situation-related indicators in accordance with the priorities for the year (e.g. risk analysis). In particular, the trend table includes indicators relating to monitoring of maintenance and qualifications.

- The Plant Operating Safety Committee. This committee monitors the effective integration of commitments made following events or audits. It is coordinated by the Plant Manager with the involvement of the Associate Directors. The committee examines the nuclear safety trend table each quarter, enabling definition of plant nuclear safety priorities in the medium term.
- The Technical Management Meeting. This meeting is chaired by the Associate Director, Units in Operation or the Associate Director, Outages, and covers all operational aspects associated with operation of installations in the short and medium term. In particular, it is responsible for arbitration between different job specialties and different projects, detection and monitoring of the main technical problems, analysis of corporate requirements and their implementation at the plant, and monitoring of decisions and quality commitments. Overrunning commitments are reviewed each quarter as indicated in plant memo D5140/NS/ORG.24 ‘Safety Quality Commitments: organization of monitoring’.
- Project reviews. Each project (unit-in-operation or outage) regularly performs project reviews in the presence of the relevant Associate Director. The aim of these reviews, in particular, is to analyze deviations from initial objectives and enable the Associate Directors to make all the necessary decisions to correct such deviations.
- Management contract review. Management contracts are discussed between department heads and the Associate Directors prior to signature by the Plant Manager. The Associate Directors conduct a review halfway through the year in conjunction with the department heads to assess the progress of actions covered by the management contracts. The Head of the management and cost control department participates in these stages of the management contracts.

Monitoring of objectives by the departments

Each department has a trend table enabling it to monitor its own objectives. In particular, indicators enable monitoring of performance of maintenance activities and the skill level of department staff, in particular via monitoring of qualifications.

An assessment of function monitoring indicators (functions are groupings of plant systems) is drawn up each month with the involvement of representatives of the departments.

They show, in particular, the state of the work backlog, and the documentation for the different systems. The departments can therefore implement the necessary measures to correct any deviations observed.

In the event of difficulty in maintaining these indicators, the problem is raised at the Technical Management meeting.

IAEA comments: The plant has established a set of management performance indicators to help identify deviations in major plant activities. Some other indicators to track activities that the plant management consider important, are also temporarily added to this set. The set of indicators appears to be well balanced between the quantity and adequacy of information. Some of these indicators proved very useful during the review to assess performance in several areas.

Conclusion: Issue resolved.

1.2(4) Issue: The station strategic plans and objectives do not provide staff with a clear and consistent set of priorities to ensure that action plans and programmes are aligned with the objectives which are most important to plant management.

- While reviewing the department work programmes with plant managers, a set of station priorities could not be identified to assist them in deciding the relative priority between the many programmes contained in the Dampierre 96 action plan, the actions contained in audits and significant event follow ups and the other station objectives contained in the performance contracts.
- A number of action plans contained in the Dampierre 96 action plan were not completed within the established target date. A systematic process to decide what actions would be dropped was not evident.
- The operating corrective maintenance programme is not planned on the basis of a formal analysis of the impact of the deficiency which is discussed during daily and weekly meetings.

Without a consistent set of priorities, plant staff, supervisors and managers may not always ensure that programmes and work which is important to personnel and plant safety are carried out in a timely fashion.

Recommendation: Plant management have recognized this need and should continue to develop a process to prioritize the objectives and programmes for the Dampierre 1997 strategic plan. These priorities should then be communicated to all departments and used in the preparation of work programmes in support of the strategic plan.

Plant response/action:

Each year, the plant defines an action programme, expressed in the ‘Dampierre 97’ action plan for the year 1997. This programme defines priorities for actions, centered around development of the site project and implementation of the new organization. They have been communicated to the departments, who have incorporated them into their management contracts.

The results for 1997 show that 90% of priority 1 actions were implemented, in addition to 50% of priority 2 actions, the majority of which fall outside the scope of the ‘Site Project’ file.

Some priority 1 actions, which have been partly completed, were spread into 1998, taking account of the workload for the year:

- finalization of some processes (management of modifications) at site level,
- risk analyses, implementation of which will be handled by the departments and coordinated by a Safety/Quality coordinator,
- some of the actions concerning preparation of the Post-OSART mission relating to the operation of installations.

The plant Strategic Plan ‘Dampierre Ambition’ was drawn up in late 1997, and incorporated into contracts at the beginning of 1998. It covers the years 1997-2000. A framework letter was also prepared for 1998 to define the main priorities adopted for the year under the Strategic Plan.

The department management contracts, which were based on this letter, prioritize actions according to the department's individual mission.

The contractual initiative for 1998 took shape with the signing of a management contract between the Plant Manager and each Head of Department. Project managers are also subject to a contract in the form of a letter of appointment covering the duration of their project. The initiative entails reaffirming priorities prior to signing of the contract. Consistency at plant level is ensured by the Cost Control and Management Monitoring Team, which verifies that all priorities have been fully taken into consideration, and ensures consistency among all departments and projects.

If significant unplanned factors arise during the year which may call into question the priorities defined, arbitration will be performed by the Associate Directors at a management meeting (in relation to individual actions) and by the Plant Manager within the Management Committee in the event of a key plant policy being called into question.

Monitoring indicators are established and examined on a monthly basis in the Management Committee.

IAEA comments: As described in the plant response, priorities based on the plant strategic plan are included in the management contract of each department. Two examples were checked and it was confirmed that priorities and indicators were included. These indicators are followed monthly. In addition, priorities are included in the management contracts for the project managers at the plant.

The ten percent of prioritized actions not implemented in 1997 (in one case due to involvement of other EDF divisions in modifications), were justified and postponed to 1998 by management decision.

Conclusion: Issue resolved

1.4. REGULATORY AND OTHER STATUTORY REQUIREMENTS

- 1.4(a) Good practice:** While modifying the station quality assurance manual and the associated plant procedures, a series of flowcharts were developed and incorporated into the plant quality assurance manual to easily illustrate the relationships between station documents and station processes. For example, all documents related to the maintenance process such as organization, maintenance procedures, planning, execution, record keeping, operating experience and staff training can be easily found in the flowchart under maintenance. Plant management staff were observed to frequently use the flowchart to locate information. This tool no doubt contributes to good awareness of the quality assurance manual and the supporting procedures. It is also useful when updating quality assurance documentation by ensuring that related documents are also checked.

1.5. INDUSTRIAL SAFETY PROGRAMME

1.5(1) Issue: The industrial safety rules, procedures and expectations are not frequently communicated nor reinforced by line managers and supervisors through regular field inspections and discussion with staff. Additionally industrial safety practices at Gury Le Chatel training centre do not reinforce good safety practices to trainees. The information collected from inspections and feedback is not always used to improve overall safety. During plant tours and discussions with managers, the team noted the following:

- Regular safety meetings with work groups are not conducted by the supervisors to review industrial safety performance, review major safety concerns, and obtain input from staff for improvements.
- Most departments do not have a systematic field inspection programme. One group has implemented a systematic field inspection programme at the manager level for industrial safety. This programme involved training for the people doing the inspections. The inspections are carried out weekly by the manager and his direct report responsible for the area. A systematic follow up process is in place to correct findings.
- A systematic field inspection programme by supervisory levels below the department manager level has not been implemented.
- The technical services department set an objective of 12 field visit by the line organization for the year. While the actual number is 19 year to date, this objective is well below the required frequency necessary to reinforce industrial safety.
- Observations by the team identified a number of instances where staff failed to follow safety rules such as the wearing of protective equipment in the turbine hall, wearing of protective gloves during radioactive work, safety glasses in the chemical lab. Supervisors or managers did not always correct the behaviour during these observations.
- No hearing protection is provided nor are the requirements posted for some areas in the radioactive zone despite the existence of high noise levels such as in the main circuit charging pump room. Safety rules require protection in these areas.
- More than 75% of the plant safety procedures are more than 5 years old. The experience gained at Dampierre and other plants does not seem to have been incorporated.
- The Dampierre accident rate despite the improvement in 1996 does not meet the EDF objectives and is above the median PWR worldwide value.
- At the Gury Le Chatel training centre, adequate fire detection and suppression system on the diesel generator does not exist. In addition, housekeeping was poor with oily rags, oil and water on the floors.

Without a strong line management presence in the field, learning from experience and communication of industrial safety goals, policies and procedures, industry experience has shown that the personnel accident rate is usually much higher with the potential for very

serious accidents. The EDF experience showed that plants with a strong management presence in the field focusing on industrial safety leads to superior performance.

Recommendation: The plant should extend the field inspection programme put in place by the twin Unit 1/2 group to other groups. This programme includes training, regular field inspection and follow up. The programme should also be extended to include section supervisors and foreman level. The plant should also implement a policy to require each work group to hold regular industrial safety meetings. The risk prevention department recently formed can assist in the implementation of these initiatives and help provide themes for the regular safety meetings. The information gathered from meetings with staff and experience feedback should be used to ensure industrial safety procedures, equipment and field aids meet the requirements of the industrial safety policies. Dampierre should ensure that the training centre use the same high standards for trainees in the training setting.

Plant response/action:

Field Inspection:

The DAMPIERRE AMBITION site project provides for generalized implementation of field inspections related to industrial safety. This policy is incorporated into the management contracts of the individual departments. It concerns the three levels of management. In particular, a specific programme has been drawn up for the members of the Management Committee.

Refresher training in this practice has been initiated for the first half of 1998. (Training in field inspections was given in 1997, involving 48 people. As the training did not totally satisfy the plant's expectations, the training programme initiated in 1998 will be conducted by a different training company.)

On completion of the refresher training, the managers concerned will develop inspections in conjunction with foremen or work coordinators.

The subject of field inspections is dealt with in greater detail in Recommendation R1.2(2).

Industrial Safety Meetings

For 1998, a review of industrial safety was incorporated into department management team meetings (see department management contracts). To raise industrial safety issues within work teams, each section organizes periodic meetings on the subject. The Risk Prevention Department provides support in the execution of some of these meetings.

Level of Industrial Safety at the Gurcy Training Center

The Gurcy Training Center was informed about the remarks made during the OSART mission and has taken these remarks into consideration.

— (Plant Management, Heads of Departments, First line management)

IAEA comments: After the OSART mission a new department “Risk Prevention ” was created that manages radiation protection and industrial safety.

The plant has worked on this issue after the mission, implementing several initiatives as described in the plant response. In addition, plant tours to this purpose have been established for all managers once a month (see more details in the issue 1.2(2)). Nevertheless, as the results did not satisfy the plant management a new strategy has been established within the last two months in co-ordination with the Extended Management Team. As a result a new action plan will be approved in the next few days. This action plan focuses on:

- How to improve rules and requirements
- Methods to enforce expectations
- Improvement of communications
- Involvement of committees in this subject
- Improving presence of managers in the field
- Improvement of the tracking system of deficiencies detected

Some other initiatives will be implemented, such as posters in visible places of the plant to communicate the statistics of industrial safety accidents

Statistics on the number of industrial accidents reported revealed that in the first five months of 1998 there was a decrease of approximately 40% compared with 1997. And compared with June 97, although the frequency rate has remained the same, the severity rate has dropped to 40% and the total frequency rate has also dropped to 70%. However, since February 1998 an increase in the frequency rate of industrial accidents at the plant has been observed.

Some other investigations reveal that since January this year there have been the same number of accidents for plant staff as for subcontractors and that most of the accidents are not caused in the work site but on the site and stairs.

During plant tours it was noticed that, although the majority of the workers wear hard-hats, in several cases workers did not wear them in areas in which their use was required. These workers were instructed by the managers accompanying the tour to wear them or to look for one in order to be allowed to work in this area. In other case a technician in a lathe in the turbine building was working without any protection (goggles, gloves, ear protection, hard-hat). In numerous cases workers do not use ear plugs in the turbine building even though it is clearly indicated at the entrance that the use of ear plugs is mandatory and ear plugs are easily available in boxes provided at the entrance.

The team recognized the significant efforts that the Dampierre management has and is currently placing to resolve this issue and the improvement observed in this area since the previous OSART mission. Nevertheless, Dampierre management should continue enforcing industrial safety specially at working level and to keep vigilant to the evolution of indicators established to this purpose.

Conclusion: Satisfactory progress to date.

1.6. DOCUMENTS AND RECORDS MANAGEMENT

1.6(1) Issue: Station staff do not always comply with the plant policy for the use and the modification of station operating and maintenance documents. In some cases, documents have not been produced and staff are executing the work based on experience.

- During preparations for performance of a unit synchronization the control room operators were observed making changes to the plant systems from the main control board without using procedures designated for that function. The operator used a hand-written flowchart to perform steps from an approved procedure.
- Control room procedures are updated daily while the in-plant procedures are updated weekly leading to the potential for different revisions of the same procedure being in use.
- An operator was observed starting an evolution with a flowchart with the incorrect revision.
- Control room operators use white out to remove or modify entries into the control room logs.
- On three occasions, the team observed maintenance staff using procedures which had been modified without independent verification. White out use was also observed.
- A procedure used to position the polar crane after the Unit 2 outage resulted in incorrect position due to lack of clarity.
- The operators were observed to develop hand written procedures using information from station procedures to improve ease of use. These procedures were then used to carry out field operations.
- In the chemical labs, a number of procedures were not yet available for use of instruments.
- A hand written procedure without verification was used to dilute the NaOH tank.
- A system line up was issued to the field operator on the boric acid tanks and was going to be used without the associated updated operating procedure.
- Administrative procedures to control the storage and distribution of station temporary and permanent documents are still under development.

Plant safety and reliability depends on staff using procedures which have been prepared and independently verified by qualified staff prior to use in accordance with the requirements of the quality assurance programme. Non compliance with these requirements may result in violation of plant technical specifications and potential nuclear safety implications.

Recommendation: The plant policy for preparation, verification and use of operating and maintenance documents must be clearly defined, communicated and enforced. When procedures are inadequate, then work should be placed on hold until an appropriate temporary procedure is prepared and verified by the appropriate authority. The plant

policy should clearly prohibit unauthorized modifications to permanent plant records such as station logs. The plant should have a method of monitoring the documentation revision process and field compliance with procedures.

Plant response/action:

Preparation and use of documentation

The policy for preparing work documents has been revised. In particular, the rules for modification, use of documents, preparation and use of temporary documents, and correction of documents have been redefined.

The use of 'Tippex'-type correction fluid has been prohibited, and the rules for temporary correction of documents include monitoring of modifications.

This policy has been integrated into the application memos of the operations and maintenance departments:

- Plant memo D5140/NO/CDI.06: 'Organization of shift turnovers - operations reports'
- Plant memo D5140/NS/CDI.15: 'Compilation and application of permanent and temporary operating instructions'
- Plant memo D5140/NS/ESS.01: 'Preparation and management of surveillance test procedures of Operations sections'
- Plant memo D5140/NA/MNT.03: 'Preparation and management of work sheets'

These plant memos were presented to each of the sections concerned.

Management in-the-field inspections, which are covered in the area of Management, Organization and Administration (MOA), must also enable monitoring of compliance with these instructions, and correction of bad practices where applicable.

Monitoring of documentation

Grouping of the documentation sections within the same entity as part of plant reorganization has enabled harmonization of all processes for monitoring the content of documentation. The provisions implemented are defined in plant memo D5140/NS/DOC.02 'Monitoring of Documentation'. In particular, the documentation section is responsible for all monitoring. It ensures compliance of documentation by means of a planned review of the different documentation storage locations.

IAEA comments: As described in the plant response, significant changes have been made in the organization with regard to documentation. It has been centralized in the Documentation Section of the Information System Department in order to have a consistent policy and to thereby enhance the system. Regular checks are carried out by the safety engineers in the main control room and auditors from the SQ department.

Although indicators have not been established to track performance, the plant reported that a significant improvement has been observed in this area. Observations carried out in the control room, radiation protection, chemistry etc. confirmed the good progress achieved in this area. No

corrections with Tippex were observed in any of the documents reviewed, and personnel interviewed/asked were aware of the new documentation rules. However, a few unauthorized modifications were observed in control logs and I&C procedures. The plant should continue enforcing management expectations in this area until these deficiencies have been totally eradicated.

Conclusion: Satisfactory progress to date.

2. TRAINING AND QUALIFICATIONS

2.1. ORGANIZATION AND FUNCTIONS

EDF and Dampierre managers have shown a strong commitment to the selection, training and qualification of station employees. Training policies at the corporate level reflect an emphasis on employee self-development. Ownership among line managers for the oversight of specialized training programmes represents their commitment to personnel enrichment. Safety culture principles have been incorporated into the Dampierre training courses. The high priority placed on staff training is reflected in qualified instructors and modern training facilities and materials.

EDF has adopted a systematic approach to training (SAT) methodology for training development, delivery and feedback on training programmes. Job profiles and good qualification schemes have been developed for all technical, supervisory and field positions at Dampierre. Good corporate overview is provided by a National Training Plan Guide that is used to by Dampierre managers to develop and implement the plant training process and a comprehensive individual training plan exist for authorization of individual staff positions.

The on-site training centre has eight full time staff of which three are well certified instructors capable of coordinating training activities. Instructors receive good training in the pedagogical aspects of adult learning. The total time for instructor training is about one to one and one half years followed by instructor duties lasting four to five years before returning to the plant. This rotation practice leads to a constant refreshment of new ideas and current plant knowledge of training applications. In addition, one to two weeks of annual in plant duties are assigned for each instructor to maintain proficiency in plant activities.

The on-site resource centre provides excellent math, science, language and communication course opportunities leading to certifications at the high school and college level. A good system is in effect to review the needs of the employees resulting in a training contract and an agreement that the employee receive the necessary time off from normal duties to participate. Well developed courses supported by the ministry of education are being conducted during 35 to 40 weeks a year with many operations and maintenance staff participating. It was indicated, however, that a greater involvement by line management is needed to support more employee participation.

The EDF lead contractor for training, SFP (professional training division) appears to be able to provide adequate support for training implementation. However the training section is experiencing a large administrative burden with respect to the scheduling and tracking of training courses due to the long lead time required by SFP to ensure that training classes are available.

A specific working group, made up of control room operators and field operators, has been formed to deal with training needs. This group works in parallel with management and the training centre to effectively bridge the gap between identified training needs and realistic performance based training that can be provided. This new approach was introduced at Dampierre and is a model that will be introduced at all EDF nuclear plants. This is a good example of the interest and support of Dampierre management for improving the quality of the training which is already being provided.

Safety and risk prevention is emphasized during all initial training, however the team recommended in the management, organization and administration section of the report that further follow-up by line managers is required to ensure safe work practices are adhered to.

Training records are well maintained both in hard copy and computerized storage. The tracking and scheduling functions of required training activities are well controlled by dedicated individuals in each of the department sections.

The training department has recently been reorganized at the section level, and is part of the on-site resource department which has responsibility for managing five other sections. The team suggested that Dampierre review the current responsibilities of the training section to ensure that it is given the appropriate level of authority within the organization to carry out its functions.

2.2. TRAINING FACILITIES, EQUIPMENT AND MATERIAL

The Gurcy Le Chatel training centre, located approximately 120 kilometers from Dampierre, provides good theoretical and practical initial and proficiency training to Dampierre employees. Excellent hands on training is conducted in the areas of operations, maintenance, radiation protection and chemistry. The facility can comfortably accommodate over 200 trainees for training classes lasting three days up to three weeks.

Dampierre has developed a privileged relationship with the Gurcy Le Chatel training centre for the support of special training needs by providing active involvement in new training initiatives and improvements. Many of the Dampierre initiatives have been adopted at the national EDF training centres. At Gurcy, high quality training mock ups and operational replicas of equipment, plant systems and controls are used extensively to provide real time situational training. The team recommended however, that the control of combustibles and some housekeeping practices for maintenance training be improved.

The quality and number of instructors at Gurcy provide for good individualized training. Good continuity and quality of training services are maintained by recruiting instructors from key power plant positions for periods of up to five years.

At Dampierre, the on-site training facility has eight well equipped classrooms with modern presentation equipment. Good mock-ups are which is used to reinforce practical concepts of the classroom training being provided. Dampierre has a well equipped functional on-site fire fighting facility to cover a wide range of practical training for general employees and technical staff. Plans have also been developed for the construction of an on-site fully operational mini-plant that will be functional in 1997 for use in training operations and maintenance personnel. This shows a dedicated effort by the management at Dampierre to provide good on-site performance based training opportunities.

Operations personnel have a good computer based compact simulators available for their use near each of the twin unit control rooms with an operations training instructor available to provide assistance. This is a convenient training tool, especially during initial operator training, for reinforcing knowledge of the basic operational principles learned during full scope simulator training at the Paluel training centre. A new state of the art post accident computer based simulator will be delivered in 1996 and used to improve the training tools currently provided. It is planned that in addition to

operator training all technical disciplines having responsibilities during emergencies will receive training on the new simulator. This upgrade effort is considered excellent.

An interactive live video conference training room is also being used to provide well structured training on theoretical nuclear concepts. This training is conducted by professionals and conferenced with other nuclear plants in France. Practical exercises are conducted during the courses with electronic feedback capability via telecommunications to the instructors. The team recognized this as a good practice.

2.3. CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

Initial training for control room operators is well balanced between theoretical and practical training. The initial training programme provided to operating personnel is well structured and based on a systematic analysis of authorized duties.

A comprehensive national programme has been established to ensure consistency and standardization of training requirements supplemented with plant specific on the job training. The shadow training programme is well controlled with good management involvement at the shift supervisor level. Qualified tutors are assigned to each new trainee and are responsible for ensuring mastery of specific tasks needed for competent performance.

The overall level of support and quality of training given to new operating personnel is good. The team noted however, that no independent verification of the final authorization process is being done and suggested improvements in this area. The team also noted that no standardized job performance measures are being used by training instructors during practical and shadow training for initial operators, or other technical disciplines in other departments, to ensure that consistent standards are being applied for all on-the-job training assessments. The team suggested improvements in this area.

The operating personnel continuing training requirements at Dampierre are based on a national EDF policy that requires all authorized operators and operating supervisors to receive a minimum of two weeks of training per year on the generic full scope simulator annually. This training is supplemented with well developed proficiency training that is based on identified continuing training needs. Although the training plan and the involvement of line management in continuing training appear good, improvements are needed in the content and methods used for continuing simulator training. The team recommended that Dampierre management improve the operator refresher training by strongly influencing the EDF corporate nuclear operations division (EPN) to review and improve the content, methods and frequency of the full scope simulator training.

The team also suggested that formal guidelines be developed to ensure that operating or other authorized key technical personnel, who are absent from their normal duties for extended periods are provided additional retraining as appropriate before returning to their jobs.

2.4. FIELD OPERATORS

Initial field operator training at Dampierre is well structured according to the EDF national requirements. The initial two year training programme is well balanced with site specific training to adequately familiarize new operators with the use of plant specific procedures and unique system

characteristics. The content of the training is based on a systematic analysis of knowledge and performance needs integrating training on safety culture principles and risk prevention as appropriate.

The line organization provides good job related input and performance feedback into the training development process with strong emphasis on improving the effectiveness of on-site training facilities. A good operational mini-plant facility is being constructed on site for expanding the practical training given to operators and maintenance personnel. The quality and content of practical on-the-job training is good and improvements are planned for 1997 when the initial training for field operators will be expanded to a rotational six weeks (instead of five) in plant shift training followed by one week of classroom training. This is a good example of supplemental training that was identified and is being implemented over and above EDF national requirements. The team did note however, that no standardized job performance measures are being used by training instructors to assess practical training and suggested improvements in this area.

2.5. MAINTENANCE PERSONNEL

Good initial training is provided to maintenance personnel at the national EDF training facilities. Training is provided using plant specific pumps and valves in both the static and operating modes to ensure a complete understanding of this equipment.

Maintenance personnel receive good apprenticeship training that is supplemented with performance based training in the plant. The quality of instructional material is good with training emphasis placed on the special maintenance skills required. Assessments are mostly conducted through instructor observations of skills demonstrated during maintenance activities and verification of correct equipment operation following disassembly and assembly work. Special hydrostatic tests are conducted on valves to verify correct completion of maintenance training tasks.

The initial training is well controlled at the section head level with emphasis placed on training needed in specialized skills. Authorizations to independently perform work are granted following completion of the initial programme and certification by the maintenance foreman that all training objectives have been completed. The initial maintenance training programmes at Dampierre appear to be well structured and implemented to provide the necessary skills to new maintenance employees.

Continuing training for maintenance personnel is closely monitored by foremen with emphasis placed on refreshing skills not normally performed and teaching new techniques as they become available. Timely training is provided on plant modifications and close supervisory attention is provided to ensure that qualifications are current for assigned duties.

The scope of continuing training is effectively determined by maintenance foremen who observe worker performance and conduct interviews once a year with each employee to identify training needs. This is an excellent method for developing employees, but some training needs are slow in being addressed, specifically in the area of more detailed training on the operational functions of the plant. Interviews with authorized maintenance employees indicated a need to provide more refresher training in the area of detailed plant operations. This training is being planned with the use of the plant compact simulator, SIPA.

2.6. TECHNICAL SUPPORT PERSONNEL

Engineers and technicians in the technical support group (SUT) and the safety and quality team (MSQ) receive good initial comprehensive training specific to their specialized duties. All technical support groups carry out annual interviews to determine future training needs. Continuing training is organized and tracked by each department with a responsible person assigned to monitor training activities. All technical support personnel receive good general employee training, which is appropriate to their position with risk prevention and safety culture principles emphasized. The initial training provided to authorize fuel handling technicians is impressive in both its content and scope. The training being provided to radiation protection and chemistry personnel at the Gurcy training centre is good with well equipped laboratories and test equipment being used.

2.7. MANAGEMENT PERSONNEL

Refer to Section 1 of the report.

2.8. GENERAL EMPLOYEE TRAINING

General employee training (GET) is well controlled for permanent and temporary employees. Risk prevention training is provided to all employees in the areas of radiation protection, industrial safety, first aid and fire fighting.

The determination of an individual's GET programme is based on a good analysis of worker responsibilities and is of sufficient content to promote safe work practices. The team noted however that more feedback on the importance of plant cleanliness and industrial safety practices should be introduced into the programme, both during initial and refresher training. The team noted several industrial safety practices that were not being adhered to either due to complacency or a lack of management oversight. These items are described in the Management Organization and Administration section of the report.

STATUS AT OSART FOLLOW-UP VISIT

The review of the actions taken by the plant to address the issues reveals, that the training department has managed to totally resolve the recommendation and three suggestions and to make satisfactory progress in one suggestion.

The Training Department has made a significant improvement in the training practices and methodologies that have been applied for the different Dampierre Departments since the OSART Mission.

The reorganization of the plant's management structure leading to a direct communication between the Plant Manager and the Training Manager, permits a more consistent assessment of the training needed by Dampierre personnel. Also, the improvement in the communication effectiveness among Departments permits an optimization of the training programme elaboration.

The criteria being used to authorize operating personnel to assume on shift responsibilities after their initial training process has been improved, and ensures the standardization and the effectiveness of the evaluation. Standardized and consistent performance criteria were also established to assess field operators. A similar methodology exists for Chemistry and Maintenance.

In addition, the operating personnel retraining programme was reevaluated in conjunction with the Paluel Staff, and, as a consequence, the programme was improved in its content and methodology. This new approach should be of great benefit to Dampierre as its contents exceed international standards.

A consistent methodology was implemented to provide guidance in the event of absence of operating personnel and technicians responsible for the nuclear fuel manipulation from their routine duties for a long period of time. However, a similar system is still to be established in reference to other safety related technical functions and should be implemented.

DETAILED TRAINING AND QUALIFICATION FINDINGS

2.1. ORGANIZATION AND FUNCTIONS

- 2.1(1) Issue:** The recent reorganization which removes training as a separate department and incorporates it as a section within the resource department has the potential of removing the training functions from the NPP strategic planning functions and makes it more difficult for training to have the correct profile in management decision making.

The resource department has six sections reporting to it and the amount of administrative work associated with each of these sections is significant. The large span of control required for managing such a large department may limit its effectiveness to closely monitoring the quality of individual section activities. Industry experience has shown that the training and qualification functions are of utmost priority for ensuring safe plant operation and must be effectively controlled along with daily NPP operations and decision making responsibilities. Training managers should have a high enough level of responsibility and authority to influence senior management decisions so that high quality training is maintained and that new training is introduced as appropriate for changes in task allocation, staffing arrangements and personnel reassignments affecting the qualification of employees. This is particularly important for Dampierre because of the efforts being placed on combining job responsibilities resulting in new or increased jobs and tasks being assigned to individuals. It is also a concern because of increased emphasis that is being placed on site plant proficiency training due to the need for less initial training. Without having the training and qualification functions at a high enough level in the organization to effectively control and monitor the training and qualifications of all employees affecting safety related activities, high quality personnel performance could be jeopardized which could affect the safe operation of the plant.

Suggestion: Consideration should be given to reviewing the current functions and responsibilities of the training and qualification section within the NPP organization and take the necessary actions to ensure that it is maintained at the appropriate organizational level for ensuring that high quality initial and proficiency training is maintained for all employees at Dampierre.

Plant response/action:

As part of the plant reorganization, research has confirmed that, in view of the importance of training, the person with responsibility for the training structure should be in direct contact with the heads of the specialist departments and advisors. The legitimacy of this structure needed to derive from its composition and its status within the general organization of the plant. As a result, it was decided to set up a full-fledged training department, with a scope of activity covering training development, management and implementation of training.

The creation of this department meets the need for a 'skills development' approach incorporating very good knowledge of the job specialties, and the need to be managed by a member of the NPP's Extended Management Committee (to enable participation in plant strategic considerations).

The head of the training department, who, like all department heads, reports directly to Plant Management, is also responsible for preparing and monitoring the Plant Training Plan, which contains the plant's training strategy.

Key contacts for each department and team have been specifically designated within the department. This organization enables enhanced response capability, so that the detection, explanation, development and implementation of training actions are performed in close cooperation with the job specialties and entirely in accordance with identified needs.

IAEA comments: The modifications that were performed in the Dampierre NPP organizational structure at the beginning of 1998, establishing a direct communication between the Plant Manager and the Training Department, have permitted a more effective assessment of Dampierre Departments' training necessities and optimize the actions that need to be taken to improve personnel proficiency and ensure plant safety and reliability.

Conclusion: Issued resolved.

2.2. TRAINING FACILITIES, EQUIPMENT AND MATERIAL

2.2(a) Good Practice: An interactive video training (VFI) programme is available in the training centre to provide live training on theoretical nuclear concepts (thermodynamics and vessel yielding techniques). The training is being conducted by professionals and shared with other nuclear plants in France. The VFI experiment aims at exploring the possibilities of putting training and work sites closer by using modern training technologies ('Tele-tutorship').

This shadowing system is designed for trainees who are faced with availability problems due to work constraints (posted shift teams for instance). This training may also be a solution for small groups located in remote areas and for whom it is desirable to share training resources.

The VFI project has been developed by EPN (Corporate Nuclear Operations Division) and it is an example of EDF-GDF tele-tutorship launched by the Ministry of Labor in the framework of the 'Learning companies' programme (RENAULT and FRANCE TELECOM are currently working on similar projects).

The VFI system is used by three 'Learning companies' (Chinon, Saint-Laurent and Dampierre) and two training centres (GRETA in Tours and GURCY for the SFP). It is based on the structure and functioning mode of Resource Centres of the plants.

In Dampierre, four trainees from the Generation Departments are taking a VFI training course called 'Unit Yielding' where the main principles of thermodynamics are taught. Trainees have the opportunity to ask questions during practical exercises.

The system is connected to the telephone network. It has two screens (one to view the participants and the other one to view working documents), a projector connected to a computer to transmit documents and an adjustable camera.

VFI may also be used in broader communication contexts (video-conferences, work meetings), because 10 EDF nuclear sites are equipped with this system.

2.3. CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

2.3(1) Issue: No independent comprehensive verification is being done, following the completion of initial training, to ensure that the process and evaluation criteria for the authorization of operating personnel is carried out consistently to the same performance standards. Operator trainees receive a combination of classroom, simulator and shadow training over a two year period to prepare them for authorization to operate the plant. The training is separated into four modules where progression to the next module is carefully evaluated. It is noted that the process of independent evaluations following segmented modules have been of recent benefit to the programme.

Trainees are closely monitored by individual tutors and their shift supervisor to attempt to ensure confidence with respect to expected performance before granting authorization. Although this process is good, there is no final independent verification that all training

performance criteria have been completed and that the expected level of knowledge and ability has been achieved to a consistent standard. No standard measure of performance is applied following completion of all training. Operators do not receive a final comprehensive examination to test their overall knowledge and ability nor receive an oral board determination to independently verify that they have acquired the expected level of knowledge to safely operate the plant. One or both practices are common in most other nuclear plants for independently verifying that operator trainees have mastered all training required and for ensuring confidence in safe performance. Without a final independent verification of the process for authorization of operators, inconsistent standards could be applied for determining their qualifications.

Suggestion: Consideration should be given to establish guidelines for ensuring that an independent verification of the process for authorizing operator qualifications is being consistently applied to the same standard.

Plant response/action:

The operator training scheme, and in particular the simulator-based initial training modules, enables operators to acquire the necessary plant control capabilities for each type of operation of a nuclear power plant unit (normal, incident and accident operation, and loss of power supplies).

An evaluation is performed after each of these modules and on completion of the 'Operator Safety Training' courses (FSO1 and FSO2). The overall result of these evaluations forms part of the essential information enabling the staff member's line management to make a decision on authorizing qualification.

However, to enable operators to link up the 4 initial modules, to give them a better overview of the different phases of operation and the links between them using the working documents of the NPP, and to enable them to understand malfunctions during normal operation, a 'Scheme Completion' training module for operators was created and implemented by Dampierre NPP in conjunction with the Paluel Training Center.

The 'Scheme Completion' module takes place on 4 consecutive days within 3 to 5 months after module 4. It is conducted on a simulator, and is centered around startup of the unit from the Normal Outage condition to the Maximum Available Power condition.

The specification for this training was drawn up during 1997. The final training dossier was validated in early 1998. The first experimental session with operators from Dampierre will be held in the first week of June, 1998, with the second scheduled for September. This training will be conducted on a systematic basis for all new operators trained at Dampierre.

On completion of the course, an end-of-session assessment sheet will be sent to the course members and to their line management by the instructor responsible for the session. This enables indication of areas for progress, in relation to which additional work appears necessary, in spite of the global objectives having been attained. If these objectives are not attained, this assessment sheet will be accompanied by a second 'progress aid' sheet. This sheet is completed by the instructor on the basis of observations made during training, and then sent to the staff member's line management.

This training in fact corresponds to independent verification within the qualification process, although issuing the qualification remains the responsibility of the staff member's line management.

IAEA Comments: A special training module was established to ensure that, after the initial phase training and before the operators have been qualified and have assumed their duties on shift, an independent evaluation of the operating personnel is performed. This module was initially applied at the beginning of June/1998, is very well structured and should be a great benefit to Dampierre as its contents supersede international standards.

Conclusion: Issued resolved.

2.3(2) Issue: The process being used for training operators during refresher training does not ensure that all operators demonstrate proficiency on the completion of all training objectives and the amount of time spent training on the use of plant specific normal and abnormal plant procedures is less than seen at other plants. The operator continuing training programme at Dampierre is based on the EDF national scheme that requires all authorized operators and operating supervisors to receive two weeks of training on the generic full scope simulator annually. The simulator training is divided into two one weeks segments, one week of refresher training and one week of situational training. However, the actual time spent each day using the simulator is only three hours or approximately 30 hours a year. This is low compared to other plants having the use of a plant specific full scope simulator. From discussions with over 10 operating personnel the one week of situational training is effective, however, the one week of refresher training can be very repetitive as it deals mostly with accidental events. Although training on accident conditions is important, operators expressed a need to receive a sufficient amount of balanced simulator training on the use of plant specific procedures during normal and abnormal conditions. A review of events over the past two years showed at least four instances where increased training in communication and the use of procedures may have been of benefit in avoiding these events. Normal practice is to have four operators participate at the same time in refresher training with a Paluel instructor available to assist as a technical or shift supervisor. During a review of this training it was observed that two of the trainees were assigned as operators and the other two as observers. Although this training appeared effective, the training scenario being conducted was only conducted once and did not allow for the operators observing to actually demonstrate their performance. Refresher training on the use of normal and abnormal plant specific procedures is important to ensure that all operators refresh their skills on conditions not routinely confronted with during daily plant operation. Without a sufficient amount of balanced full scope simulator training on the use of all plant specific normal, abnormal and emergency procedures, operators can lose proficiency to safely operate the plant during all modes of operation.

Recommendation: Dampierre should improve the refresher training currently being provided to operating personnel by strongly influencing the Corporate Nuclear Operations Division (EPN) to reevaluate and improve the amount, methodology and scope of simulator training to ensure that a sufficient amount of balanced training is conducted to maintain operator proficiency on the use of all plant specific normal, abnormal and emergency procedures. It is recognized that a new PC based post accident simulator will be delivered at Dampierre in 1996 for use in training operators on emergency operating conditions. The combination of the availability of this new training simulator along with what is already being done during local proficiency training on accident mitigation may be an opportunity for Dampierre management to re-evaluate the refresher training on the full scope simulator and to more closely align it with the needs identified from the review of the existing training and operator performance.

Plant response/action:

The Dampierre NPP has worked in close cooperation with the Paluel Training Center and the EDF Corporate Professional Training Department to develop the content of refresher training programmes

for operating personnel. This approach helped enable ratification by the Corporate Nuclear Power Plant Operations Division (EPN) in mid-January 1998 of a new simulator-based refresher training structure, under which the proportion of training imposed at corporate level falls from 80% to 50%, with training determined by the individual site rising accordingly from 20% to 50%.

This will enable the Dampierre NPP to propose more scenarios which meet the direct expectations of staff and/or department and plant Management.

Within these refresher training programmes, the Corporate Nuclear Power Plant Operations Division now requires only those points to be covered which are considered essential in the generic approach to operation of power plant units, such as the steam generator tube rupture scenario, the application of new instructions, and the following three evaluation areas:

- evaluation of strict control of operations;
- evaluation of risk analysis;
- evaluation of monitoring.

The NPP writes to the appropriate Training Center each year to establish the list of desired scenarios for the year. This list is drawn up on the basis of experience feedback and the requirements noted in the different operations teams.

Following this modification of the refresher training structure, the methodology for preparing the scenarios by the NPP and the Training Center is to be defined with a view to enabling its implementation as of the refresher training programmes of the second half of 1998.

The NPP has also asked the Training Center to draw up an annual record of the training programmes performed for its staff to enable experience feedback to be collected, thus enabling improvement of subsequent refresher training programmes.

However, it is impossible in practical terms to use the instructions specific to the Dampierre NPP for a number of reasons:

- The simulator used is modeled on a unit at the Gravelines power plant.
- The simulator is not systematically updated to bring it exactly into line with actual power plant units (e.g. in the case of the 1993 batch of modifications).
- As the simulator is used by several power plants, it is difficult to envisage maintaining, at the Training Centers, permanently up-to-date documentation corresponding to the different plants. It should be noted that the instructions at the different plants are derived from corporate operations rules, and are therefore consistent. The differences are thus not fundamental in nature, and therefore still enable operational training.

Moreover, all training on the SIPACT post-accidental simulator at Dampierre is performed using the site instructions.

IAEA comments: The proportion between the training imposed by the corporate level and the training determined by the site was modified from 80/20% to 50/50%. This increases the possibility of achieving plant necessities because it permits the plant to interfere more effectively in the training content. Also, it permits all trainees to participate effectively during all simulator practices, avoiding the necessity of having operators acting on occasion as observers without manipulating some

scenarios. This new approach, in addition to a reorientation that was made in the training content and the modification performed on the methodology being used, permits an improvement in the training of personnel in normal and abnormal operations conditions.

Conclusion: Issued resolved.

2.3(3) Issue: No formal guidelines exist to ensure that control room operating personnel, who are absent from performing authorized duties for extended periods of time, are provided additional retraining prior to re-assuming their duties. At Dampierre, authorized personnel are allowed to be absent from their authorized duties for a period of up to six months before a suspension of their authorization is considered. International practice has shown that operating personnel need to perform their authorized duties on shift at frequent periodic intervals in order to remain proficient to safely operate or supervise the operation the plant. At Dampierre, authorized personnel who are off shift for extended periods of time do not have the opportunity to refresh their skills on a plant specific full scope simulator prior to assuming authorized duties. It is recognized that operating personnel do maintain their refresher training current and may have the opportunity to refresh their skills on the generic PWR referenced simulator during their period of absence from shift. However, without clear guidance on additional retraining, required reading of significant changes to plant procedures and modifications, etc., required to maintain an authorization current, operators and shift supervisors who are off shift for extended periods could be assigned duties for which they are insufficiently prepared. It is also recognized that other technical plant personnel are allowed to be absent from their jobs for the same duration (six months) before their authorization is questioned and therefore management should be encouraged to develop and use similar guidelines to ensure proficiency is maintained.

Suggestion: Consideration should be given to establish guidelines that will ensure that authorized personnel who do not routinely perform watch standing duties, or are off shift for extended periods of time, are provided additional retraining or evaluation prior to assuming authorized duties. This will ensure that, in addition to already established continuing training requirements, operators and shift supervisors maintain current knowledge of plant procedures, modifications and changes in operating rules. Practices in other countries include periodic quarterly proficiency watch standing duties of between five to seven watches per calendar quarter, with controls in place to ensure additional retraining is provided if their proficiency is not maintained. This suggestion may equally apply to other safety related plant technical positions and should be considered where appropriate.

Plant response/action:

The Dampierre NPP has established a methodology aimed at monitoring operator knowledge prior to authorizing a return to shift duty following a prolonged absence. This methodology is described in plant memo D5140/NS/HAB.02. It relates to resumption of shift duty after all absences of over one month, with two different cases being considered:

1) Absences of less than 6 months

In the case of absences of less than 6 months, an interview is held between the operator and his/her shift supervisor. Following this interview, the decision regarding a return to shift duty is taken by the shift supervisor.

2) Absences of over 6 months

In the case of absences of over 6 months, authorization is automatically suspended. A methodology governing resumption of shift duty in such cases has been defined:

- Simulator-based refresher training must be performed before resumption of shift work.
- A return period based on shadow training is organized over 3 days.

On completion of these three days, the operator is interviewed by his/her shift supervisor, who validates the resumption of shift duty (the staff member is once again considered to be authorized).

An identical methodology is applied to field staff.

With regard to other 'technical' staff, it is worth noting that all nuclear safety authorizations are suspended when a staff member does not perform their activity for more than 6 months. Following this period of absence, the staff member is interviewed by their line management, who make a decision on re-issuing authorization, if necessary with accompanying measures (refresher training, repeat training, etc.). The formal structure for these interviews has not yet been defined. Research into the subject has yet to be conducted.

In addition, with regard to fuel handling, refresher training is compulsory where a staff member has not performed this activity for more than 12 months.

The conditions of issuing authorizations are described in plant memo D5140/NA/HAB.01.

IAEA Comments: Guidelines have been established to provide adequate guidance to ensure that the operating personnel that is absent from their duties for an extended period of time is to be submitted to an additional training before reassuming their duties. A similar process also exists regarding the personnel responsible for the nuclear fuel manipulations. However, with reference to the others safety related plant technical functions, a formal structure to perform the equivalent evaluation has not been implemented yet.

Conclusion: Satisfactory progress to date.

2.4. FIELD OPERATORS

2.4(1) Issue: No standardized job performance measures are used during practical and shadow training to assess whether operators have mastered specific tasks required for their duties. At Dampierre, field operators are enrolled in a training programme lasting about one and one half years consisting of a series of classroom training and practical training sessions that are conducted on-site and organized with the National Training Department. Although a check out is conducted by a qualified training tutor to authorize completion of practical training objectives, consistent standard performance criteria are not used. International practice has shown that the use of standardized performance criteria to measure the knowledge and ability of operator performance can significantly enhance training effectiveness leading to the safe performance of job duties. Without the use of a standard measure of performance, operator trainees may not be evaluated to a consistent level of performance as a consequence of individual tutor expectations. This could result in inconsistent performance on-the-job.

Suggestion: Consideration should be given to develop job performance measures for use in assessing operator mastery of completed practical and shadow training. This will ensure that consistent standards are being applied for all practical training assessments and assurance that operators have effectively learned the correct level of performance expected of them during job duties. This suggestion may also apply to the practical training provided for other plant technical positions and should be considered as appropriate.

Plant response/action:

Training of field staff comprises theoretical training, given in training centers, and practical training in the power plant. The first is based on acquisition of knowledge and training in the field, the second on the transfer and acquisition of knowledge and experience by comparison of actual experiences. A linking sheet enables linking of these two types of training to ensure that they complement one another perfectly for enhanced effectiveness.

Training in the power plant necessitates designation of a mentor, who is responsible for monitoring the trainee staff member. The mentor must have an overview of the staff member's training, and must, at all times, be aware of where the trainee stands in relation to their training path. The mentor is the link with the training center.

Due to the specific nature of this alternate training of field staff, assessment of the latter is divided into three parts:

- The first part takes place in the training center, with assessments performed throughout the course to validate knowledge acquired.
- The second part, for which the mentor is responsible, relates to the trainee's knowledge in the field. A support sheet has been produced to assist the mentor. This is appended to the linkage booklet after each module carried out in the power plant.
- The third part, for which the mentor is responsible, enables overall assessment of the performance of field staff. To assist the mentor, 5 performance evaluation sheets have been produced.

Traceability of the assessments is ensured.

All of these provisions, some of which were already in existence at the time of the OSART mission, are described in plant memo D5140/NT/93.65 'Shadow training of field staff'.

In addition, all staff who are new to the plant take part in an induction day covering industrial safety, first aid and fire protection. The aim of this day is to make staff aware of the risks they are likely to face, and the provisions to be taken to protect themselves.

Having completed this day, new arrivals must undertake a certain number of shadow training periods in the field to enable them to obtain their initial 'industrial safety' qualifications. This shadow training is also traceable. The provisions are described in plant memo D5140/NS/HAB.06.

Shadow training is also monitored in relation to the other 'technical' departments. It is described in the following plant memos:

D5140/NT/96.05 (chemistry)

D5140/NT/95.47 (maintenance departments).

IAEA Comments: Standardized and consistent performance criteria were established to assess field operator practical training. A similar methodology has also been used in some cases in Chemistry and Maintenance. Although this practice has been implemented recently regarding Operations training, its consistency will permit a significant improvement in the method being used to confirm personnel proficiency.

Conclusion: Issue resolved.

3. OPERATIONS

3.1. ORGANIZATION AND FUNCTIONS

The organization for plant operations is clear and well described in the plant administrative procedures for normal operations. The duties of the individuals that work in the control room are not as clearly defined for abnormal operations. For example, the operator duties for control room panel monitoring were not clear. The team recommended that a clear set of standards and management expectations be developed and implemented for control room functions. The operators and their supervisors are knowledgeable in all aspects of plant operations. Additionally, the operations department has an evaluation process but it is not consistently used to evaluate operators performance.

The interfaces between the operations management organization and other plant departments are well understood and effective. With the exception of multiple unit transients, the shift supervisors are adequately supported by other departments on the back shifts and during emergencies. Shift composition includes one shift manager for two units, one shift supervisor for two units, two control room operators per unit and five field operators per unit. In addition to these people, there is a tagging supervisor on each shift for each twin unit and a safety engineer is on call to support the shift manager. The team considers the normal operations staffing to be adequate. However, the team notes that Dampierre does not have an organizational plan to implement in case of a dual unit transient which ensures adequate supervision of both control rooms. The team recommends that Dampierre establish such a plan to ensure adequate manning.

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

The control room panels use mimic diagrams and are well laid out. The plant process computer is a tool that is used by the operators in the control room to trend plant parameters and the computer seems to be adequate for the needs of the operators. The process computer also generates numerous alarms that the operators have to respond to during normal plant operations. The plant policy on operator aids was also reviewed and it was noted that the expectations to minimize these aids was well enforced. The labeling of plant components was a concern to the team. Some valve labels could be improved and the labeling of large components was not always clear. The team suggests that Dampierre evaluate their policy of large component labeling to ensure themselves that they are not missing an opportunity to increase their margin of safety. The housekeeping of the plant was generally acceptable and in some cases was in very good condition, but there was some areas away from the normal tour areas that could be maintained at a higher level of cleanliness.

3.3. OPERATING RULES AND PROCEDURES

The operating technical specifications operational limits and conditions were reviewed for accuracy and conformance. The operating shift reviews situations where the technical specifications must be entered and consults with the plant safety engineer to ensure compliance. This independent review was considered a positive aspect of plant operations. The team also reviewed the significant events over the past year and concluded that the normal operating procedure quality and expectations for adherence were not up to industry standards to minimize entry in technical specification requirements.

The normal operating procedures were reviewed to determine the accuracy of the procedures and how they are used. The procedures did not always prevent the operator from causing an undesirable condition and the plant operating procedures do not have provisions for recording completion of procedural steps. In addition to this, operators are allowed to make corrections without initialing and dating the correction. The operators did not always use the approved procedures consistent with good operating practices. The general issue of procedure control and usage is discussed in section 1.6 of this document.

The plant has procedures for the outages that are well written, with controls and hold points to ensure proper configuration prior to continuation of plant evaluations. The outage procedures also contain sections for operator feedback and operator cautions. The standards for outage operating procedures meet or exceeded industry standards. Dampierre has a new programme that controls the position of valves important to safety. This programme ensures that valves are locked in their required state after a refueling outage or an equipment outage. This practice should ensure that systems important to safety are correctly aligned.

The plants emergency operating procedures conform to industry standards and have specific responsibilities designated to control room operators. The operators can also use a computer based simulator located next to the control room to practice on emergency procedures to enhance their operating skills for emergency conditions. The computer simulator was considered to be a good operating tool for the operators.

3.4. OPERATING HISTORY

The plant has implemented a long term operations data and history programme for improving the reliability of the systems and effectiveness of operations. The system contains the most important indicators and is being upgraded to have an improved set of indicators to help the plant perform better in the future. Additionally, a process was implemented to monitor the effectiveness of the plant systems operability and to determine actions to be taken in different areas. The systems are divided into different categories in accordance with their functions. The analysis evaluates the procedures, equipment deficiencies, temporary modifications, experience feedback and labeling. Significant events are well defined to determine which events have to be reported by the operations personnel. The system also looks at other events that have been reported to permit subsequent analysis. Corrective actions to preclude recurrence have been effectively implemented as determined by the event analysis and the process to monitor internal events is consistent. However, the plant does not have a sufficiently rigorous process for making the decision to restart the reactor after a reactor trip. The team suggests implementing a documented and structured process to perform post trip reviews, to assure that the decision to return the reactor to power operations has been fully evaluated. Operating experience feedback is sent to operations personnel under the Shift Manager responsibility and eventually lectures are used to transmit the most important operating experience feedback.

3.5. CONDUCT OF OPERATIONS

Operating practices have not been conducted in a standardized manner among the different shifts. There were some opportunities where management expectations and international standards were not being achieved. The shift turnover is carried out in the control room and is based mainly on verbal information obtained from the out going shift and during the shift briefing. The team

recommends that the operations department implement a written procedure, to be followed during the shift turnovers, containing the minimum amount of information required to assure awareness of the oncoming shift.

The criteria for locking safety valves is effective and well controlled. Operators rounds are conducted periodically and checksheets for the recording of shift operating data are used adequately. However, equipment deficiencies in the control room and in the field are not consistently tracked among the four units to ensure that the deficiencies have been reported. The team suggested that consideration should be given by the operations department to establish and effectively use a consistent system to identify equipment deficiencies among the four units. The method to control the keys used to operate safety related equipment or for administratively locking equipment is well organized and controlled.

3.6. WORK AUTHORIZATIONS

Operations management is committed to minimizing the unavailability of safety-related equipment, but the process of work control is not well defined at Dampierre. Although the shift manager controls the work that needs to be done for his shift, there is a minimum amount of long range planning to assist in equipment outages. It was noted that the shift is very involved with prioritizing and approving the work on the weekly and daily schedules. The tagging office support was seen as beneficial to operations planning.

The work isolation system is effectively managed to ensure the safety of individuals working on the equipment. The tagging system is also effective in positive configuration control by the use of locks on vital equipment. The plant has daily meetings to discuss the status of equipment that is being worked on, or equipment that is being prepared to be maintained. There were some instances where the shift manager deferred work due to the short range scheduling resulting in him not having information to allow the equipment to be taken out of service.

Appropriate documents were in place for work permits, testing authorization and the documentation for the tagging process. The shift also has easy access to maintenance work status and temporary modifications using the computer system at their work stations.

3.7. ACCIDENT MANAGEMENT

The Operations Department organization, which supports an emergency condition is well structured and the assignment of roles and responsibilities are adequately established. The minimum shift teams are staffed to ensure the permanent availability of enough operations personnel at the plant to perform the immediate actions necessary in case of an accident in one of the twin units. Multiple unit transients are discussed in organizations and functions. There is also a qualified team that is maintained on call continuously, and can be assisted by the corporate organization, to support and advise operations personnel in a reasonable time. Emergency operating procedures are adequately available in the control room. Additionally, there are procedures that will allow operators to cope with situations beyond the design base accident. The communication system is clearly understood and permits adequate collecting, recording and transmitting of information to other organizations to analyze and manager severe accidents. Control room instrumentation and controls available for operators provide enough information to recognize and to analyze severe accidents. The

documentation maintained in the technical support centre is well controlled and adequate to assist the control room personnel.

3.8. FIRE PROTECTION PROGRAMME

The fire protection programme at the plant is well established and the assignment of responsibilities is clearly defined. The methods being used to maintain the fire barriers are adequate and the plant is organized in fire zones to permit a rapid identification of the area to be confined to ensure plant safety. Although both motor driven auxiliary feedwater pumps are located in the same room, some improvements were implemented in the power supply and instrumentation cables insulation, and there is a reinforced detection and suppression systems in the area. The fire detection systems provide appropriate information to control room personnel. Prompt response and the communication process available to support an event are effective. Equipment and systems are kept in good conditions and functional tests are performed periodically to confirm their operability. The plant fire brigade personnel (the second response team) is continuously ready at the plant to initiate fire fighting actions and can be supplemented by a professional fire brigade from an external organization. Fire fighting training is effective and periodically conducted by the plant fire brigade, and some drills are performed under real fire conditions at the off-site training facility. However, the fighting team are not provided with special protective clothing

STATUS AT OSART FOLLOW-UP VISIT

The review of the action taken by the plant to address the issues reveals that the Operations Department has managed to totally resolve two recommendations and three suggestions and to make satisfactory progress in the other recommendations.

The Operations Department of Dampierre has worked intensively to ensure that operating practices are being conducted in accordance with management expectations in a standardized manner. Procedures establishing in detail the expected control room personnel behavior have been implemented, and have been used effectively. An improvement in the control room personnel performance could be observed during the follow up.

The shift turnover practices have also been improved. A document establishing the minimum amount of information required to be transmitted to the oncoming shift has been implemented. It could be observed that the shift supervisor and the control room operators turnovers were significantly improved. However, there are still some shift functions in which the minimum amount of information to be transmitted during the shift turnover can not be ensured, and improvements are necessary in this area to ensure a totally effective turnover process at the plant.

A detailed procedure was implemented to perform post trip review and was tested by operating personnel on the simulator. The process permits taking the decision to return the reactor to power operation in a systematic and structured manner.

A temporary organization to command the control rooms has been defined in case of a simultaneous twin unit event. This strategy does not jeopardize the minimum crew requirement established by plant regulations. In addition, the plant intends to improve the tagging supervisor qualification to better support this condition.

The large equipment labeling has also been improved satisfactorily, permitting a prompt identification of the equipment even from a certain distance. Also, a comprehensive process was implemented and has been consistently used to identify equipment deficiencies in the field.

DETAILED OPERATIONS FINDINGS

3.1. ORGANIZATION AND FUNCTIONS

- 3.1(1) Issue:** The control room operators do not always monitor critical plant parameters or respond to control board distractions in a timely manner. This is due to unclear management expectations for control board monitoring and a lack of requirements to minimize control room distractions. During routine observations of control room activities it was noticed that the operators are allowed to leave the main control panels to attend shift briefings in a room adjacent to the main control room. From this area the operators can see and hear control room annunciators, but the operator does not have a view of critical plant parameters which are used to alert the operator of possible problems. During subsequent observations it was also noted that the operators leave the main control room panels at times other than shift briefings to be in the briefing area.

While conducting interviews with control room operators it was noticed that the operators do not systematically monitor their main control panels. On one occasion the shift supervisor had to request the control board operator to return to his panel as he had equipment in manual control. On another occasion, both control operators were in discussions for a prolonged period of time without observing or monitoring the control board parameters. During the past year Dampierre had a situation that placed the unit in a condition that exceeded the plants technical specifications for reactor coolant temperature and pressure during a plant cooldown. This was a direct result of inappropriate control board monitoring practices. Another situation occurred within the last year that resulted in insufficient feedwater flow to the units steam generators, resulting in a reactor trip. Proper control board monitoring could have prevented both of these situations.

It was noticed that the operators did not immediately respond to some control board annunciators and many computer generated alarms. The team questioned the operators on this practice and were informed that many computer alarms have very little value to the operator and that some control board annunciators are routine for plant operations and therefore not an immediate concern.

When operators were questioned on how they should respond to control board annunciators they indicated that they are supposed to refer to the annunciators response list to inform them of reasons for the annunciator and expected actions, but the team did not observe any instances where the alarm response list was used in responding to annunciators.

Control room operators have a responsibility to be aware of and anticipate changing plant conditions. The control room operator has a responsibility to take appropriate actions prior to alarms if possible and also take manual action prior to an automatic response from the plant. All operators, whether they are in the control room or in the field, must always use defense in depth approach to ensure the plant is operated in the safest possible mode. Automatic functions and annunciators are a tool for the operator to use to maintain the plant in a safe condition they are not a replacement for good operator performance. If the

operators in the main control room do not monitor their panels systematically, critical plant parameters may exceed the limits of safe operation.

Recommendation: Dampierre management should develop and implement a set of standards that provides clear expectations for control room operating practices with emphasis on control board monitoring. Training should support the expectations and standards which are developed.

Plant response/action:

Calmness in the control room, and the behavior of operators, are clearly considered by plant management as essential elements of the operating safety of the power plant units.

The expectations of Dampierre management were thus formalized in plant memo D5140/NS.CDI.01, entitled 'Conduct in and access to the control room'.

This note has been modified via additions to the section dealing with the operator as responsible in the control room.

These additions specify the following points:

- the presence of two operators in the control room, with strict limits placed on the locations and reasons which may provide grounds for one of the two operators to leave the operations control area. In particular, it is specified that it is not possible to leave the control area to attend a team information session, including in areas common to both units in a twin-unit.
- the expected quality in terms of actual monitoring of operating parameters. This is expressed through the need for a periodic 'scan' of the control panel, in addition to immediate reaction to the appearance or disappearance of an alarm.
- the final addition covers the use of documents. Dampierre complies with Nuclear Power Plant Operations Division policy on this, which is included in the Quality Manual, and is presented during initial training and refresher training programmes.

Operations must therefore be carried out in compliance with general instructions and alarm sheets, although it is not mandatory to keep the documents in the hand.

Conversely, however, the Instruction Introductory Document, and the instructions concerned under chapter VI of the General Operating Rules, must be followed with the instructions in the hand.

Finally, the modified note specifies that correction of a document must give rise to a deletion and initialing by the corrector, and that the use of 'liquid paper' is not permitted.

These requirements were sent to the Dampierre Training Department, which includes them in the training programmes which it conducts, and ensures that they are passed on by instructors at training centers.

In addition, they are also incorporated into the new refresher training programmes, which feature assessment of operators according to three behavior-related subjects:

- strict control of operations

- risk analysis
- monitoring.

IAEA Comments: A set of performance standards were formally established by Operations management, defining clearly management expectations regarding control room operating practices. A significant improvement was observed in the control room operators behavior. The main control board monitoring has been performed more attentively, and the alarm responses have been carried out in a timely manner. These practices have been reinforced during the continuing training.

Conclusion: Issued resolved.

3.1(2) Issue: The staffing procedure for operations management is not sufficient to fully support a dual unit transient. At Dampierre, the organization is established assuming a single unit failure or transient. The shift compliment includes a shift supervisor (CT) a shift operations manager (CE), and a tagging supervisor for the management team. The shift manager and the shift supervisor have had extensive training to provide them with the tools necessary to diagnose and make decisions regarding the safe operation of the Dampierre units. The Tagging supervisor has limited training, which is not to the same level as the shift supervisor or the shift operating manager. If the Dampierre Twin units have a dual unit transient or accident, the shift compliment may not be sufficient to adequately support the tasks required and implement the proper procedures. The current expectation is that the shift supervisor will take command of one unit while the shift manager notifies the safety engineer (IS) and begins his procedure for state based monitoring. It is unclear who would assume command of the other unit if a simultaneous transient occurred on the twin unit power plants. When operating management was questioned on the subject there was no consistent satisfactory plan to deal with this situation. The only other senior shift operating person available to assume command of the other unit during a dual unit transient is the tagging supervisor. He would need to make decisions regarding safe operation of the second unit. Senior plant management confirmed that this person is not trained to perform this function. The purpose of the shift supervisor in the control room during a transient is to ensure procedures are properly followed and intercede if necessary to ensure safe operations involving the reactor core and its components. By using the tagging supervisor, versus a qualified shift supervisor, decisions may be made or neglected to be made. This situation could endanger the mitigation of the transient. The operating shift supervisor has been trained in accident mitigation and emergency procedures used during an accident. The shift supervisor is also experienced in plant operations and has to prove his expertise each year in a requalification programme. A qualified shift supervisor is responsible for safe and conservative operations and knows what his procedures and his operators can do for him in times of abnormal operation. Without these important skills, the knowledge to continue plant operations, when to allow automatic controls to function and when to intercede can be the difference between an event which endangers plant equipment or personnel, and safe conservative plant operations.

Recommendation: Dampierre should develop and implement plans to ensure a qualified operating supervisor is in command and control of each unit on the site for all accident conditions.

Plant response/action:

The organization established at the plant depends on the minimum staff numbers and skills required under the General Operating Rules to handle the incident and accident conditions taken into consideration in design and during operation.

The design condition adopted at corporate nuclear power plant operations level is a fire involving casualties and leading to total loss of one electrical train (instruction I4A + fire + casualties), whereby the incident or accident affects only one unit.

The staff numbers and skills are defined in instruction IN.32 and incorporated into plant memo D5140/NS/INC.01.

A situation involving simultaneous occurrence of two incidents or accidents necessitating application of General Operating Rules instructions in the same twin unit is not taken into account in design, in view of its very low estimated probability.

Nonetheless, an exceptional organization has been defined to manage such a hypothetical simultaneous occurrence of accidents. This organization resorts to personnel as backup from the other twin unit:

Coordinator: the technical supervisor is responsible for coordination in the unit in which permanent post-incident surveillance (SPI) instructions are not immediately applied. He is responsible for alerting the Site Management Command Center, and requesting backup as follows:

- from the technical supervisor of the unaffected units to ensure coordination in the other unit.
- from the operations foreman of the unaffected units, to perform operational actions on the other unit.

Permanent post-incident surveillance: the shift operations manager applies permanent post-incident surveillance to one unit. On his arrival, at the latest after 40 minutes, the Safety Engineer applies permanent post-incident surveillance to the other unit.

Operational actions technician: the operations foreman of the twin unit under accident conditions performs operational actions on the unit managed by his technical supervisor. The operations foreman of the unaffected units performs operational actions on the other unit (each operations foreman works with his technical supervisor).

After one hour, a decision regarding the organization to be implemented is taken by the on-call management team member (Site Management Command Center 1).

These provisions were validated by the Operating Safety Committee on 13.03.98.

IAEA Comments: A strategy was defined to implement a temporary organizational structure to command the control rooms in the case of a dual unit event transient. This structure would take place until the arrival of the on call personnel and assumes that there is no other incident/accident taking place at the other two units. It should be emphasized that this temporary organization does not jeopardize the minimum crew required by plant regulations. The upgrading of the tagging supervisor qualification, that is being considered, is a more effective solution to address this situation and may provide Dampierre with more flexibility to manage this kind of events.

Conclusion: Issued resolved.

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

3.2(1) Issue: There is not a established labeling programme that allows for immediate identification on all major plant components.

Most components at the Dampierre plant do not have identifications that are easily observable to operations, maintenance, or other technicians. Pumps and motors have limited labeling that are no larger than the small valve tags used throughout the plant used to identify the equipment number of the valve. While walking through the turbine building, and the control area, with the operations counterparts, the team had difficulty identifying most components without walking around the component to find a small tag near the component. This was due to the fact that identifications tags are not consistently labeled in the same area of the valve or component. In addition to this, some valve identification tags were missing from the valve area. Similar components located adjacent to each other, but for different units, were not readable unless you looked for the small tag identifying the component. The field operators have requested and received larger labels on at least one component after an inadvertent actuation of the fire protection system. Proper labeling of plant components and equipment is necessary to easily identify equipment during abnormal conditions. Operators are knowledgeable of the location of equipment in the plant, or can usually find the proper component if needed, but in an intense situation they may not have the time to ensure that they are on the correct equipment and may make a wrong assumption. This could lead to the field operator, mechanic or technician being on the wrong unit or the wrong train of equipment. Proper labeling of equipment is desirable to allow operators the opportunity to identify, report, or isolate equipment during abnormal conditions or to prevent further degradation of plant conditions. Proper plant labeling also allows personnel at the plant an easy way to identify where they are suppose to be when areas of radiation are of concern. By not having to search for a component they should not accumulate unnecessary dose. Finally, the high visibility labels on equipment and components reduce the risk of performing improper alignments of safety systems necessary for conservative plant operations. Proper labeling of equipment should also ensure urgent operations are not delayed or performed incorrectly at the wrong time.

Suggestion: Consideration should be given by Dampierre to establishing a site policy that addresses the requirements for proper identification and labeling of plant equipment and components that allows for easy visibility of equipment name, unit and train.

Plant response/action:

The practical modalities concerning labeling of the different plant components are described in a plant technical memo (D5140/NT/98.114). They specify in particular the format of the labels (size, color, type of base, etc.). Equipment labeling complies with a corporate standard.

However, the suggestion by the OSART team led us to review the labeling of large equipment. An operations/maintenance working group, led by a shift operations manager, thus drew up a list of equipment requiring adapted labeling. The group also specified the provisions for marking of the equipment concerned.

The provisions adopted are described in technical memo D5140/NT/98.93. In particular, the memo states that labeling is performed by marking in paint using stencils, with characters 60 or 100 mm high, black on a white background, applied on one line or on several lines, depending on the equipment.

This labeling, which involves over 150 equipment items in each unit, has been performed in all 4 units, inside and outside the controlled area.

IAEA Comments: A comprehensive guideline was implemented and an extensive job performed, improving large equipment labeling. Large equipment can now be easily identified even from a certain distance, providing adequate operator aid mainly in case of emergency. Also, it should be emphasized that most of the motors have their identification established near to them (on the wall, for example) and not fixed on the equipment, to facilitate maintenance works.

Conclusion: Issued resolved.

3.4. OPERATING HISTORY

3.4(1) Issue: The plant has not established a documented and structured process to perform post trip reviews after each unit reactor trip. The shift manager is responsible for carrying out the direct cause analysis, and could be supported by the engineering and plant staff if necessary. He is also responsible for evaluating the adequacy of the systems response and plant parameters during the event. Operating procedures currently do not require a detailed evaluation of Plant Response prior to plant criticality. The current procedure only requires that the cause of the trip is known. Lack of a structured and documented post trip review process could allow returning the plant to power operations with insufficient assurance that all important systems are operating correctly.

Suggestion: Consideration should be given to implementing a documented and structured process to perform post reactor trip reviews, to assure that the decision to return the reactor to power operations has been fully evaluated.

Plant response/action:

Return to criticality of the reactor following a reactor scram is conditional, in particular, on knowledge of the causes of the scram. The search for the underlying causes and the resolution of the problems which led to the reactor trip form part of the conditions which must be met prior to a return to criticality. This action constitutes one of the stages of re-startup in accordance with the instruction EP COR 10 'Reactivity balances and hold point prior to criticality'.

In addition, to confirm effective functioning of the automatic actions relating to a reactor trip, before return of the reactor to power operation, a transient analysis guide has been prepared. This enables verification of the general behavior of the installation, and the logical progression of the sequence of events and I&C devices.

The analysis is based on the on-off digital information supplied by the KIT log. The computer inputs activated on reactor trip are compared with those of a reference trip. Any absence of inputs must be analyzed and justified.

Validation of the analysis through the use of this guide is also incorporated into instruction EP COR 10.

The conformity of the transient is validated at the end of the guide by the operator and the technical supervisor. The guide is then archived with the surveillance test EP COR 10.

This guide was written in the first quarter of 1998. It was tested on simulator, and will be tested under real conditions, when applicable, to enable verification and any necessary improvements.

IAEA Comments: A detailed procedure was established to perform post trip reviews. This procedure has been validated on the simulator by shift personnel and has also been improved to assure that the decision to return the reactor to power operation condition will be taken through a documented and structured process. The actions taken by the plant have fully satisfied the purpose of the recommendation.

Conclusion: Issued resolved.

3.5. CONDUCT OF OPERATIONS

3.5(1) Issue: Operating shift turnovers are not conducted in a standardized and documented manner that prescribes the minimum amount of shared information to fully assure the operator is aware of the status of equipment and systems for the subsequent shift personnel. Control room personnel shift turnovers are conducted using the control room log books entries and are mainly based on the verbal information obtained from the person being replaced. Additional information is obtained during the shift briefing. Field operator shift turnovers are conducted based on the verbal information obtained from the exchange of information between the off-going operator and the on-coming operator. Additionally, information is exchanged at the shift briefing. Although some field operators performing functions for Units 3 and 4 utilize log book entries to record activities performed, these are not followed during the shift turnover systematically. It was observed in some instances, in the control room and in the field, that inconsistencies of the information transmitted between shifts during shift turnovers has lead to situations in which safety related equipment operability could have been impaired due to a insufficient control of deficiencies reported and less than rigorous control of equipment status. A boric acid leak in a valve of the safety injection system was observed without adequate operator awareness and one boric acid transfer pump was unnecessary operated on recirculation for 3 days because of these inconsistencies.

The lack of an adequate procedure to require that plant conditions should be determined with a minimum amount of information concerning plant status during the shift turnover, could cause insufficient transmission of information between shifts and impair the operability of safety related systems.

Recommendation: The operations department should implement a written procedure that should be followed during shift turnovers. The procedure should include the minimum amount of information required to assure awareness of the oncoming crew to the status and configuration of the plant.

Plant response/action:

To optimize formalization of shift turnovers, certain documents have been drawn up:

- Incorporation of a ‘Key Points’ document for shift turnover of field staff in ‘field’ turnover logbooks.
- Incorporation of a ‘Key Points’ document for shift turnover of operators in the control room logbooks.
- Incorporation of a ‘Key Points’ document for shift turnover of technical supervisors in the latter’s logbooks.

These documents contain a list of essential points to be covered during shift turnovers to ensure optimum transmission of information.

In addition, a ‘key points for briefing’ document has also been drawn up. This defines the key points to be covered, and is placed at the front of the technical supervisor’s logbook. Its use is the

responsibility of the technical supervisor, as the organization of the briefing is largely an internal matter for each team.

It should be noted that this type of procedure represents a redundant backup for the knowledge and experience of staff. It is not a comprehensive guide, thus leaving scope for the professionalism of staff.

This organization was set up during the first quarter of 1998. The 'key points' sheets were included in the organizational memo D5140/NO/CDI.06, which was validated by the plant Operating Safety Committee (CSE) on 13.03.98.

IAEA Comments: Significant improvements were implemented regarding the shift supervisor, control room operators and controlled area operator shift turnovers. However, the utilization of the 'Key Points Document' in general and the methodology being used to perform other field operators shift turnovers, do not ensure that a minimum amount of information is being transmitted to the oncoming shift. The plant intends to improve the field operators shift turnover by using operational information that already exists in the plant computer. This could be of substantial benefit to the effectiveness of the process. However, the Operations Department should continue to make efforts to ensure that a thorough standard practice is being effectively carried out during all operating personnel shift turnovers.

Conclusion: Satisfactory progress to date.

3.5(2) Issue: The system to identify equipment deficiencies at the plant is inconsistent among the four units. Equipment deficiencies in the field and in the control room are not consistently tracked to ensure that the equipment deficiencies have been reported.

Although unit 1 and unit 2 have a process to identify equipment deficiencies, the method is not being used in a consistent manner as it was observed that some deficiencies were not adequately marked. Some oil leaks in the main turbine valves and in the lubricating turbine oil system, a boric acid leak in a safety related valves, a power cables disconnected and dropping from the tray, a valve wrapped with plastic to contain an existing leak and other equipment deficiencies were observed without an adequate identification. Also, it was noticed that in some cases uncontrolled tags are being used in the field and in the control room to indicate equipment deficiencies. Observations in the field indicated an inconsistency of deficiency tag use. No standardized tag was observed over the two week review. The lack of a method to mark equipment deficiencies could impair the adequacy of reporting and processing work requests. This situation could result in delays in prioritizing and making repairs needed in safety related equipment, potentially affecting their operability.

Suggestion: Consideration should be given by the operations department to establish and effectively use a consistent control system that allows for the in-plant identification of equipment deficiencies that have been previously reported.

Plant response/action:

This suggestion is dealt with under Recommendation R4.6(1) relating to the area of Maintenance.

IAEA Comments: A comprehensive and thorough methodology was implemented to locally identify the equipment deficiencies reported. This methodology ensures the traceability of the process used to reestablish the operability of the equipment, and has been used consistently in all units of Dampierre.

Conclusion: Issued resolved.

4. MAINTENANCE

4.1. ORGANIZATION AND FUNCTIONS

Maintenance activities at Dampierre are carried out by three organizations: the maintenance departments of the twin unit groups 1/2 - 3/4 and the technical group. Although the maintenance organization at Dampierre is complex, responsibilities and authorities are documented and interfaces between different groups involved in maintenance are facilitated by means of meetings, committees, and application notes. These meetings and notes are helpful, but they are not always effective.

The maintenance performance indicators are not sufficient to determine the effectiveness of this area. In addition, there is not a clear set of goals to drive the organization towards continuous improvement. For example, indicators such as repetitive work (re-work), preventive, predictive and corrective work loads, and backlog are not used. A comprehensive set of indicators and goals is important to perform objective evaluations of performance and search for continuous improvement.

The maintenance operation interface in the work process is conducted by means of the computerized maintenance management system and the meetings for work requests and the issuing of work. The tagging supervisor and shift manager resolve the difficulties with respect to tag-outs for the next days work.

Staff personnel are supported during normal operation by a small number of contractors, and mutual support between the different groups enables peaks in activities to be absorbed. When necessary, some activities are subcontracted. The plant is moving towards increasing its capabilities in job planning. The organization of the Loire valley, grouping five power plants to develop a strong partnership with contractors, is improving the performance of subcontracted jobs.

Maintenance personnel have adequate experience and skills to perform their assigned duties. They also demonstrated good proficiency during work, but it is necessary to improve industrial safety and radiation protection practices as noted in section 1 and section 6 of this report.

4.2. MAINTENANCE FACILITIES AND EQUIPMENT

There are many well-equipped maintenance facilities to support the plant in normal operation and during performance of the outages. Inside and outside the controlled area there are adequate workshops, tools rooms, laboratories and decontamination facilities for safe and efficient completion of the work.

Measuring tools and equipment are identified with a bar code and are calibrated and controlled by means of a user-friendly computerized system which guarantees the traceability of the process. When equipment is determined to be unserviceable, the system does not allow its release for use.

Rigging equipment is classified in different categories according to the load capacity. Each category is assigned a color code, and all the individuals of the family are painted according to this color, reducing the possibility of errors during use. This is recognized by the team as a good practice.

Tools used in the controlled area are checked twice for contamination before they are stored in the hot tool room. First, by the work supervisor and second by the tool controller in the storage room.

The decontamination facility is equipped with different kinds of equipment, such as chemical bath, blast cleaning, steam cabin, hydrolaser, ultrasonic bath etc. Some of these systems are rarely used due to the plant policy on the limitation of liquid effluents which could result in performing manual decontamination that could be done remotely. Section 6 discusses some opportunities for improvement in the decontamination facility.

Floor and walls of the decontamination facility are painted, but in some localized areas the protection is damaged or loose. This can result in permanent concrete contamination.

Some contaminated equipment was stored with lead blankets to provide shielding, but there was no indication of the radiation dose nor any barrier to prevent people moving close to them. In front of the area used for temporary storage of the contaminated equipment, there is no shielding.

4.3. MAINTENANCE PROGRAMMES

The corporate maintenance department has launched a project for optimising maintenance programmes based on the importance of the equipment and moving tasks from preventive to condition-based. The objectives are to have quality maintenance satisfying statutory requirements, and taking into account safety, availability and costs.

The plant site is adapting the local maintenance programme according to the requirements of general operating rules, provided by the nuclear safety department, and the basic preventive maintenance programme. The input to this programme is provided by the corporate maintenance department, regulations and experience feedback. Fifty systems are completed so far and the whole project should be completed by 1999, resulting in an optimized maintenance programme.

The predictive maintenance programme is being implemented with the objectives of improving the reliability of the equipment, maintaining a high level of safety and availability, reducing the maintenance costs, and optimizing preventive maintenance. The programme in force is well validated and effective.

There is vibration monitoring of the 75 safety-related or availability-related rotating machines per unit. There is also electronic diagnosis of 120 motor-operated valves per unit, yearly thermography check of electrical connections in transformers, electrical boards, chargers, inverters, generator excitation cabinets, turbine protection cabinets and full-length rod control cabinets.

Condition monitoring of reactor coolant pumps by acoustic analysis in all four units are performed and continuous monitoring of the Unit 3 main generator stator bars vibration is performed after permanent installation of detectors in the heads of the stator winding.

As a consequence of thermographic monitoring and oil analysis in the preventive maintenance programme of the main transformers, switchyards and other high voltage equipment has been modified. In addition, the preventive maintenance programme for batteries has been adjusted in accordance with the results of the individual diagnosis performed with the battery status analysis tool.

In general, important deficiencies are reported; however, some deficiencies that may impact on equipment operability, such as conduit or cables layout are not always reported. Further discussion of the deficiency reporting system is given in section 3 of this report.

There is no clear control of maintenance backlog for each one of the units. This can delay the implementation of maintenance work on safety-related equipment. This is discussed further in section 4.5.

The plant has recently implemented a specific control of ongoing maintenance activities on critical systems and has grouped them according to the functions they perform in the plant. A user-friendly graphic presentation with different colors, according to the amount of ongoing maintenance activities, provides an overview of the actual situation.

Each job in the maintenance programme is converted into the work standard order. The work procedure, risk analysis, work permit, post maintenance testing, spare parts and special tools are included in the work package.

4.4. PROCEDURES, RECORDS AND HISTORIES

Maintenance procedures are easily retrievable from the maintenance procedures file and are updated when necessary. Frequently they are updated when preparing the work packages.

The procedures can be modified or updated by the planner responsible for the work without subsequent checks and approval. This omits an effective verification process.

The maintenance data and histories are recorded in the database of the computerized maintenance management system. This data is used for analysis, experience feedback and updating of the maintenance programmes. Work orders are stored in a computer database and the procedure data sheets are stored in the documentation centre on microfilm.

4.5. CONDUCT OF MAINTENANCE WORK

All maintenance activities are performed with work orders and work permits that are properly authorized, controlled and performed by qualified workers. However, industrial safety practices should be improved. This is discussed further in Section 1.

Housekeeping in general is satisfactory, but some contractors' areas in the fuel building that have materials, tool boxes, steel bars, ducting and a portable fan, did not meet high standards.

The procedures are generally followed, but sometimes lack of adherence to these procedures has occurred. For example, placing the polar crane in the parked position after outages is governed by procedure, but the procedure was not well written or followed for locking the polar crane of Units 1, 3 and 4 in the proper position. Procedure issues are discussed further in section 1 of this report.

The maintenance backlog could not be identified. There are no criteria to define the backlog and separate preventive, predictive and corrective maintenance. The team suggested determining the backlog criteria and taking the necessary steps to provide clear work figures in a user-friendly manner.

4.6. MATERIAL CONDITIONS

The plant has made significant efforts to improve material conditions, but room for improvement still exists. Deficiencies in electrical and mechanical equipment were identified during plant tours. Most of the deficiencies were old, and the plant field operators and maintenance personnel had failed to detect or report them. The team recommended that clear expectations for detecting and reporting deficiencies in the field and mechanisms are put in place.

4.7. IN-SERVICE INSPECTIONS

The in-service inspection programme is performed according to the corporate basic preventive maintenance programme (PBMP) and the EDF reference guide (RSEM) published in 1980 and based on French regulations for pressure vessels and hazardous installations. These are complemented by all applicable decrees and performed through close co-operation between Dampierre and the corporate chemistry and metallurgical laboratories. Automatic and semi-automatic equipment is used for high radiation areas and when necessary special robotics applications are used.

The in-service inspection programme for Dampierre is well structured and well documented.

4.8. SPARE PARTS AND WAREHOUSES

Responsibility for procurement receiving, storage, distribution and management of spare parts belongs to the economics department of the administration support group. maintenance performs qualitative controls, checks the contents of documents, and defines specific storage conditions and stocks.

When nuclear spare parts are obsolete or not available, the corporate organization (UTO) provides the alternative spare with equivalent qualification to the original requirement.

Receipt of spare parts is performed in one specific area of the main warehouse. The parts remain in this area until all the documents and requests for installation are satisfied. In the receiving process, quantitative/qualitative monitoring of packages is performed to check part numbers and contractual documents required for installation.

There are enough storage facilities for spare parts and materials. The warehouse is well equipped with internal heating and continuous monitoring of temperature and humidity.

Storage of oils, gas and flammable products takes place in specific facilities, isolated, and well controlled.

Each storage location has its own geographical identification and an identification label. In the central area of the main warehouse there is an automatic facility (Robotbac) for parts storage and retrieval. The maximum time required by the Robotbac for storage and retrieval of one part is one minute, and it has capacity for 17000 items.

During the warehouse inspection, some spare parts with limited life are stored without shelf life control. The policy of Dampierre is that shelf life management of items is initiated on reception, and the items are allowed to be stored when the shelf life is defined. The use of spare parts with depleted

shelf life can result in premature equipment failure affecting reliability of plant systems. The team recommended to Dampierre that an action plan should be established to control all spare parts that have a limited shelf-life.

4.9. OUTAGE MANAGEMENT

Dampierre has a permanent outage organization responsible for the four units. Each outage is managed as a project. Coordination between the different groups participating in the outage is ensured by a coordination team headed by a coordinating outage engineer. This project is performed with the cooperation of technical department engineer, maintenance engineer, production engineer and shift operations manager. Interfaces are supported by daily meetings between different departments involved.

Outage preparation starts 23 weeks before unit shutdown. Dampierre has developed a specific flowchart calendar for outage preparations, and meetings for checking the programme schedule are held on a regular basis.

Personnel involved in the outage are knowledgeable in their duties and contractors are qualified by external organizations. Dampierre gives contractors a pamphlet which provides them with information relating to scope, organization, goals and objectives of the outage.

For co-ordination of outage activities, specific schedules are issued, and several daily meetings are held between representatives of the different departments involved.

A comprehensive report is issued at the end of the outage. It contains the different topics which may interest the plant management and corporate authorities. Experience feedback files are issued and integrated into future job documents.

STATUS AT OSART FOLLOW-UP VISIT

The review of the actions taken by the plant to address the issues reveals that maintenance management has managed to totally resolve the two recommendations and the suggestion.

In the case of the first recommendations the plant has managed to enhance the existing document and process to identify and report all visible defects and enforce them. It resulted in a substantial improvement in the material conditions at the plant. In the second recommendation the plant has gone far beyond the intent of the recommendation establishing strict controls on spare parts with shelf life and allocating a specific, sealed and well indicated room for those spare parts.

Finally the plant has treated the suggestion as a recommendation creating a comprehensive and clear set of backlog indicators that permit easy identification of deviations by unit, type of maintenance or importance of the work to safety etc.

DETAILED MAINTENANCE FINDINGS

4.2. MAINTENANCE FACILITIES AND EQUIPMENT

- 4.2(a) Good Practice:** Rigging equipment is classified in different categories according to load capacity and thread dimensions. Each category is assigned a color code and all the individuals in the category are painted according to these categories. This is controlled by a table in which colors are displayed versus load capability and fundamental dimensions. This approach helps in the selection of the correct items, providing additional information to the user and preventing human error.

4.5. CONDUCT OF MAINTENANCE WORK

4.5(1) Issue: There are no clear figures for maintenance backlog for each one of the units and there are no criteria that define the backlog. The data presented by the plant is not sufficient to determine existing backlog in each unit. The data presented included preventive, predictive and corrective maintenance, together with other scheduled activities to be performed in the future, such as refueling outages and future preventive or corrective maintenance in the course of work package preparation. Individual figures for these activities were not provided. The plant could not provide the established backlog criteria based on the impact of safety and reliability of the work to be conducted. Inadequate criteria and control of backlog could delay the implementation of maintenance work on safety-related equipment.

Suggestion: Consideration should be given to determining a backlog criteria and taking the necessary steps to provide clear work figures in a user-friendly manner to identify the existing backlog in each unit.

Plant response/action:

Maintenance indicators were revised as part of the plant reorganization to take account of the suggestion of the OSART team and the new division of the departments. They concern the 5 main maintenance departments: Rotating Machines (MMT), Static Machines/Valves (MSR), I&C/Testing (SAE), Electricity (SEL) and Technical Logistics (SLT).

The indicators adopted only involve the work requests (DI) and work orders (OI) outside outage periods. They are identical for all 5 departments, and are distributed on a monthly basis.

The indicators are drawn up for each department, on a unit-by-unit basis, and concern the following:

- The number of work requests (safety-related and non-safety-related) in the planning phase, and the number in the backlog.
- The number of work orders and work order phases (safety-related and non-safety-related) in the planning phase, and the number in the backlog.

This represents the 'planning' workload.

- The number of work orders and work order phases (safety-related and non-safety-related) in the performance phase, and the number in the backlog.
- The equivalent workload in hours.

This represents the 'performance' workload.

The progress of the analysis of work performed is also monitored, with:

- The number of work order phases for which a level 1 analysis has not been performed, with the number of phases older than one week.
- The number of work orders for which a level 2 analysis has not been performed, with the number of work orders older than one week.

Details on a unit-by-unit basis are given for each of these indicators, with a distinction drawn between safety-related and non-safety-related.

Rolling six-month monitoring of key indicators on a unit-by-unit basis is presented in the form of histograms.

These indicators are distributed to the Associate Directors, the heads of the relevant departments, and the heads of unit-in-operation projects.

The definition of all of these indicators is detailed in technical memo D5140/NT/98.126.

These indicators will be implemented progressively from the 2nd quarter of 1998, as implementation necessitates IT developments in a new corporate application installed at Dampierre in late March 1998.

It is worth noting that these indicators are supplemented by the function indicators prepared by site Engineering services, which enable prioritizing, via a function-based approach, of the systems on which work is required.

IAEA comments: Indicators for the maintenance backlog have been in use by the plant for the last three months. This late implementation was caused by the plant reorganization that took place at the beginning of this year, in which maintenance in both twin units groups were merged. The information provided in the plant response satisfies fully the objective of this suggestion.

Conclusion: Issue resolved.

4.6. MATERIAL CONDITIONS

4.6(1) Issue: Deficiencies in electrical and mechanical equipment were identified during plant tours. Most of the deficiencies described were old, and the plant field operators and maintenance personnel failed to detect or report some of these deficiencies. Although the plant has made significant efforts to improve material conditions, room for improvement still exists, as demonstrated by the following deficiencies found in the field:

- Oil leaks in most of the charging pumps of Unit 1/2. In one of them, the oil is spread out on the floor, with no identification of the hazard.
- Significant amount of oil due to leaks in the turbine lubricating jacking pumps of Unit 3.
- Oil leaks in the turbine lubricating jacking pumps and vacuum extractor fan of Unit 4.
- Significant water leaks from the gland packing of the Unit 2 auxiliary conventional island closed cooling water - also corrosion on system pumps. Water is reaching the pump base.
- Water leaks from the mechanical seals of some condensate pumps.
- Water leaks from a check valve in the discharge of RRI pumps Unit 2.
- Steam leaks from a manifold connecting the discharge of six manual valves in the drain system of Unit 2. Also corrosion on the valves.
- Steam outlet of the turbine driven auxiliary feedwater pump of Unit 4 is very corroded, the replacement of the piping ongoing.
- Tubing disconnected and left close to the vacuum extraction fan of Unit 4 turbine lubricating jacking tank.
- Cable trays unsecured, damaged in some cases with risk of cable damage.
- Cables inadequately laid out and incorrectly supported. In one case one cable that was hanging in the turbine area was correctly placed after the matter was reported.
- Ground cables disconnected, broken or excessively long, affecting the surrounding instruments.
- Conduits loose or damaged; this is of special importance to the changing pumps in which numerous deficiencies were found.

Inadequate material condition of the equipment could lead to situations in which the operability of the systems and personnel safety is impaired. In addition, persistent low material conditions will erode good operating safety practices in the field.

Recommendation: Dampierre should establish clear expectations for detecting and reporting deficiencies in the field, and ensure that plant personnel accomplish them.

Plant response/action:

(Also concerns suggestion S3.5(2))

The process for identifying equipment malfunctions which was in existence in Units 1 and 2 mainly concerned external leaks.

A study was carried out with a view to implementing this process on a general basis for all 'visible' deficiencies on all installations. The new organization facilitates this uniform implementation.

The organization implemented in the first half of 1998, following the establishment of the new organization at the plant, consists of identifying all visible deficiencies in the field (excluding the control room) covered by work requests of the 'Equipment Anomaly', 'Industrial Safety' or 'Label' types. The defects taken into consideration comprise mainly the following:

- defective equipment (out of operation);
- equipment in a degraded condition (abnormal noise, equipment broken, etc.);
- defective insulation of systems (thermal insulation);
- integrity of plant compartments (dampers, fire doors, openings, etc.);
- external leaks.

The details and practical modalities are described in plant memo D5140/NS/CDI.21. This memo was presented and validated at the Technical Management Meeting on March 24, 1998. It was also presented to all of the sections concerned for comments.

The general principles are as follows:

- Any member of staff (operations or maintenance) discovering a visible equipment malfunction must identify it by means of a specific label affixed as close as possible to the anomaly detected.
- Each label must correspond to a completed work request, and the information given on the label must enable rapid location of the work request concerned.
- Following repair, the department performing the work removes the label and returns it, stuck to the tagging certificate, to the tagging office (the labels are self-adhesive).

With regard to leaks, in addition to identification by labeling, warning signs and leak recovery equipment are installed where necessary. In addition, a weekly inventory of leaks is drawn up by operations. A monitoring document is kept up to date, and discussed on Mondays between operations and maintenance as part of the 'Unit-in-Operation' project, to enable determination of priorities and appropriate actions.

IAEA comments: As a result of extensive tours in different units and areas of the site that include control rooms, turbine buildings, controlled areas, diesel generators rooms, emergency cooling water pumps room etc., carried out by the three members of the follow-up team, a substantial improvement in material conditions at the site was noticed. A few deficiencies were found and half of them were properly identified in accordance with the reviewed procedure to identify visible defects.

Conclusion: Issue resolved.

4.8. SPARE PARTS AND WAREHOUSES

4.8(1) Issue: Some spare parts with limited life are stored unprotected and without shelf life control. The policy of Dampierre is that shelf life management of items is initiated on reception at the warehouse, and the items are allowed to be stored when the shelf life is defined. Periodic checking of preservation, packaging and shelf life is carried out during the annual stocktake. These measures belong to the action plan implemented in 1994. There are spare parts stored prior to these dates that may not meet the correct criteria. During the visit to the warehouse it was observed that some spare parts with limited life were unprotected, unidentified and without any data concerning shelf life. The plant is implementing an action plan to update shelf-life information of parts in store prior to 1994. The use of spare parts with depleted shelf life can result in premature equipment failure affecting reliability of plant systems.

Recommendation: The plant should establish an action plan to control all spare parts with shelf-life and guarantee that there are no spare parts in the warehouses with unidentified shelf-life.

Plant response/action:

Dampierre nuclear power plant has set up an organization which enables management of the shelf life of spare parts stored in the general warehouse. These comprise mainly non-assembled parts made from elastomer, e.g.:

- seals;
- servomotor diaphragms;
- miscellaneous elastomer parts.

The organization is defined in the note ref. D5140/NS/PDR.01 and was set up during the first half of 1997.

Consumable products used in safety-related equipment are covered by the policy on Products and Materials for use in Power Plants, and were therefore already managed within this framework.

For each of these parts, a limit date for storage is defined (by quarter/year), taking into account the duration of storage at our suppliers' premises.

Our requirements, particularly regarding conditioning and packing, are set down for suppliers in the Specifications relating to the procurement of these parts.

In the warehouse, the storage racks for the parts bear a specific label indicating 'item subject to limited shelf life'. On receipt, and after monitoring of the conformity of the product, a specific DAMPIERRE Storage Limit Date label is affixed to the package.

On distribution of an item subject to limited shelf life, the warehouseman must check that the storage limit date indicated on this label has not been exceeded. If the limit date has been exceeded, the part is not distributed, and a warehouse anomaly sheet is prepared.

A comprehensive annual check is conducted by the Economics Department. This check is initiated by the warehouse supervisor. A stamp is then applied to the label bearing the storage limit date, to specify that the check has been performed.

IAEA comments: Observations carried out in the warehouse confirm the information provided by the plant. In addition a special room has been dedicated to the storage of shelf-life spare parts. This room is prepared to prevent the sunlight from coming into it and a poster clearly indicates that the room contains the aforementioned spare parts. In this case, the actions taken by the plant amply address the intent of this recommendation.

Conclusion: Issue resolved.

5. TECHNICAL SUPPORT

5.1. ORGANIZATION AND FUNCTIONS

The organization for the technical support at Dampierre is standardized within the EDF organization and the responsibilities of each department are clearly defined. The technical support activities are carried out under the site responsibility, however the corporate organization plays a significant role in the support of the site.

Plant management has a special team for emphasizing safety, independent of other sub unit groups. The safety quality team (MSQ) deals with the common safety related issues by carrying out verifications and audits of technical support work. A verification plan for technical support work is well prepared according to plant management policy. However, the technical support verification plan's effectiveness could be improved by established targets.

Technical support work is shared by many departments on the site. However, there is no statistical data regarding the sufficiency of human resources for technical support work. The number of significant events has slightly decreased, however the number of lower level events and failures have not decreased.

5.2. SURVEILLANCE PROGRAMME

In general, periodic surveillance tests are carried out based on well documented procedures. The safety related surveillance test programme is well established.

The safety related surveillance tests are defined in chapter 9 of the general operation rules, which were approved by the safety authority as the summary tables and the periodic test rules. However, according to the corporate organization request, the site carries out additional proposed but not yet approved safety related surveillance tests which will be included in chapter 9 of the general operation rules after the authorization by the safety authority. These tests have been carried out in the same way as the plant safety related surveillance tests. From the regulatory point of view, these tests are similar to many voluntary non-safety related surveillance tests carried out according to the equipment supplier's recommendation. However, these tests deal with safety related functions and equipment and should be approved as soon as possible by the safety authority.

The scheduling of surveillance testing is decided on Thursday, one week in advance of testing, and then a responsible person is assigned from each affected department.

During an observation of surveillance tests, the team noted several deficient work practices. For example, the terminals with which the temporary measurement tool was to be connected inside a reactor power instrumentation panel were not marked in advance. The cables for the temporary measurement tools were not removed from a panel before returning the panel to the normal condition. The need for a review of surveillance work practices should be evaluated.

After a surveillance test the measured data such as temperatures and vibrations of important pumps are put into a data base and the historical trends are monitored on a work station screen. This is

done to identify potential deficiencies in a maintenance engineering section. This is considered an excellent method for analysing surveillance test data.

5.3. OPERATIONAL EXPERIENCE FEEDBACK (OEF) SYSTEM

Internal site operating experience is collected and put into the SAPHIR data base according to three criteria levels. Several hundred internal safety relevant occurrences are reported every year at Dampierre NPP. However, a systematic process is not used to evaluate OEF and the team recommended that this be developed.

Occurrences which have less safety significance are also expected to be entered into the centralized SAHIR system, however the criteria for entering these occurrences is not clearly defined. Although the screening method for entering data about the OEF system is explained to site employees in a safety related education course, detailed descriptions are desirable in the guidelines.

The corporate organization and the site have no targets for safety performance indicators. An adequate review of safety performance indicators has not been carried out, and there is no systematic way to classify the failures for trend analysis. The numbers of events and occurrences have been numerous and constant for several years, however without an analysis it is hard to determine where weak points are. The team suggested that occurrences be systematically classified and trended.

Each sub unit group has a safety quality engineer who participates in safety related activities and reviews safety-related occurrences. This is a good system that independently verifies occurrences.

Dampierre NPP gets information on external OEF experiences every year and many are incorporated in the plant. However, some of them are accomplished after a long period of time. For example, a water hammer problem occurred while warming a main steam line. This information was forwarded to the plant in September 1994 and a temporary approved operation procedure was used for a start-up in October 1995 while a permanent revision was not carried out until January 1996.

A new OEF training programme for operators was started in January 1996. In this programme relevant OEF information is given. However a revision to this document is carried out only once a year and therefore may not provide information to all operators on a timely basis. The scheduling for revising this document and training on its content needs improvement.

5.4. PLANT MODIFICATION SYSTEM

The plant modification system in the EDF organization is well established and systematic. This is according to the strategy that all 900 MW nuclear power plants should have the same design and the same reliability. The corporate organization decides the number of modifications and the amount of contractors needed to support their completion. Many modifications are done on a trial unit initially and are then carried out at the other units.

The administration of the modification work at the site is the responsibility of the modification department (SMIPE). The site does not plan any locally initiated safety related or reliability related modifications.

The on-going modification package for all 900 MW units, described as Package 93, consists of 66 modifications, 54 of which relate to safety. The Package 93 was carried out on Unit 3 during the last outage and is planned to be completed on the other units during the next outages. The team recommended that ways of carrying out safety related improvements more rapidly be investigated.

A tag from the temporary devising measure (DMP) system is used to indicate a temporary modification of facilities for work. Unnecessary tags are supposed to be removed following the completion of work. However, some unnecessary tags were seen in the field. The site practice does not require a check list to be used for the removal of unnecessary tags.

5.5. REACTOR ENGINEERING

The corporate organization provides strong support for reactor engineering for the site. All reactor physical parameters are calculated and decided at the corporate offices and forwarded to the plant. The documents are well established and available on-site.

Dampierre has no reactor safety engineer. If technical support is needed, the site will call the corporate organization for support. Some staff of the corporate nuclear fuel group (GCN) are on 24 hour stand-by for emergency calls from the site. It is common practice to have an on-site reactor engineer available to respond to core physics problems.

The team noted that the concentrations of Xe and I^{33} in the primary coolant of the Unit 4 have increased more than usual. The potential fuel leak rate is 1/10000 based on the analysis of the corporate nuclear fuels group (GCN). The team also noted that the site, until now, has never shutdown a reactor before the leakage level reached the operational limitation.

5.6. FUEL HANDLING

The organization and responsibilities for fuel handling are well established. The documents are also well prepared. The plant personnel in charge of fuel handling are well qualified to perform their duties.

When visiting a fuel handling building, however, the team noted some house keeping practices which should be improved and recommended improvements in this area.

5.7. SAFETY RELATED COMPUTER APPLICATION

The industrial purpose computers are physically independent from the administration purpose computers. Safety related computer applications are only carried out with the industrial purpose computers which are well controlled against illegal software usage.

The administration of the computer application is documented in two written guidelines of the corporate organization and of the site. Both are well defined to maintain computer system reliability.

The major role of the process computer system is to accurately display plant parameters for supporting operators. The maintenance contract between EDF and the outside contractor prescribes the deadline of 24 hours for repair. The role of the computer for the reactor safety might be not large, however it is questionable that the site has no requirements or targets for the out-of-service time limitation.

The room for industrial purpose computers (a process computer system) is kept in very good condition.

Within the administrative purpose computers, there are two systems dealing with plant equipment data. The two systems are planned to be more fully integrated with each other in the near future. This will result in the historical maintenance data of the equipment being referenced from the maintenance work control system (SIGMA) in order to elaborate a work order.

A check for computer virus and foreign software on servers used for administration purpose is carried out once a week. Some 47 computer virus were found in a year. The number may not be large compared with the total number of work stations and PCs, however improvements in anti virus techniques may be warranted.

STATUS AT OSART FOLLOW-UP VISIT

Of the three recommendations and one suggestion in this area, two recommendations were resolved and one was found with satisfactory progress. The suggestion was also found with satisfactory progress.

The OEF system that was implemented and has been used provides adequate traceability to the Significant Operating Events. However, in reference to the other internal and external events, the current methodology still is not effective and needs to be improved. Emphasis should be given in ensuring that this system is applicable to all plant Departments and that an effective follow up of the actions to be taken is in place.

A methodology was recently implemented to classify internal occurrences. As there is still not a sufficient amount of events classified to permit an effective trend analysis, this function could not be assessed. However, as the process is well consistent, this will be very helpful to analyze plant weaknesses.

The implementation of permanent design modifications in Dampierre, and in the other EDF plants as well, is highly dependent on the Corporate policy. Although some modifications related to safety have not been implemented in a timely manner, it is recognized that EDF's practice has been to implement in a timely manner those modifications that are essential to maintain plant safety. It was also observed that Temporary modifications have been implemented at Dampierre in a timely manner.

A detailed housekeeping practice guidance was established and implemented, and has been consistently used to ensure safe operations in the fuel handling building.

DETAILED TECHNICAL SUPPORT FINDINGS

5.3. OPERATIONAL EXPERIENCE FEEDBACK (OEF) SYSTEM

5.3(1) Issue: There is no systematic tool to evaluate operational experience feedback (OEF) effectiveness. The site does not track progress in completion of external OEF action nor carry out trend analysis of OEF progress. The site has no clear policy on how to decide an OEF deadline, and there are many OEF items which are not accomplished after several months. For example, an operation procedure revision required as a result of corporate organization OEF review was temporally revised and used after 13 months, and a permanent revision was carried out after 16 months.

Effective timely completion of OEF actions is necessary to take advantage of the experience of others and avoid incidents which impact on nuclear safety.

Recommendation: A systematic programme, which can track the external OEF progress and evaluate OEF system effectiveness should be established.

Plant response/action:

To improve the effectiveness of integration and monitoring of OEF and the consistency of case handling, plant Engineering services were grouped, as part of the plant reorganization, in a full-fledged department (Plant Engineering Department - SIS) reporting directly to plant management. This department is responsible for coordinating experience feedback.

A post of Technical Advisor has also been created, with the role of helping in decision-making, ensuring clarification, providing information, informing Plant Management and department heads on technical matters, and proposing technical options or policies.

These new provisions have enabled redefinition of OEF organization at the Dampierre plant. This organization is described in plant memos D5140/NO/REX.02 and D5140/NA/REX.04, and comprises three complementary levels of OEF processing, as follows:

- The first level of OEF processing is carried out within the different job specialties (analog I&C, digital I&C, electrical, valves, static machines, rotating machines, testing, operations, etc.). Each group (known as a COREX committee), coordinated by a member of the engineering department, meets once a month. The role of the COREX committees is to select at source the key internal events, to organize their integration and/or to communicate them to the different entities concerned, and to monitor the application of decisions. After each meeting, a report is drawn up, which, through the use of indicators, enables recording of new situations, actions in progress, and actions awaiting processing.
- The second level of OEF processing groups one or more related job specialties. Each group (known as a CODUREX committee) meets once every two months. The role of the CODUREX committees is to process important internal OEF events passed up from the first level, and incoming OEF. The groups also monitor the development of Basic Preventive Maintenance Programmes (PBMP), and validate Local Maintenance Programmes (PLM) and the actions to be initiated on the basis of the statements prepared by the first level. Each meeting is the subject of a report, with tracking of actions in progress.

- The third level of OEF processing, coordinated by the Technical Advisor, brings together the heads of technical departments 5 times each year. The role of this OEF Coordination Committee is to promote OEF at the plant and monitor the effectiveness of the organization. It informs decision-makers, ensures the necessary clarity to enable decision-makers to arbitrate, defines work orientations for plant engineering services, proposes training actions and ensures the involvement of the plant in international OEF events (WANO, NUMEX, etc.). Each meeting results in the drawing up of a report.

In addition, the coordination committee also prepares forward-looking assessments and proposals for improvements for use by managers at the plant. These assessments are presented once each year by the Technical Advisor at the Technical Management Meeting.

The head of the Plant Engineering Department is responsible for all incoming OEF, and designates a coordinator with responsibility for integration of this type of OEF.

Each level of OEF processing monitors the actions for which it is responsible. The third level is responsible for ensuring a global overview.

Implementation of these arrangements began in the first quarter of 1998 following establishment of the new organization at the plant.

IAEA Comments: Although there is at Dampierre a consistent process to control the OEF regarding the Significant Operating Events, it should be observed that for the external and others internal events, the current system still does not meet an adequate effectiveness and needs to be improved. A great effort has already been done by Dampierre to improve this system. A detailed procedure was implemented to provide guidance to establish the adequate OEF control. The current system permits to track adequately the OEF being implemented. However, not all plant Departments have been submitted to this control yet, neither there is an optimized means to assess the completion of the required actions. The job that has been done at Dampierre in this area should continue, to ensure the total implementation of the necessary OEF control.

Conclusion: Satisfactory progress to date.

5.3(2) Issue: Trends in in-house occurrences are not monitored by classifying their nature. Some 600 occurrences a year were detected in the last three years and the number is not decreasing. The in-house occurrences are not classified, based on their type of failure, therefore the trend of each kind of occurrence cannot be monitored. This inhibits the plant management from finding out the weak points of the plant and taking proper corrective actions.

Suggestion: A programme to systematically classify occurrences and to analyse the trends in them should be established.

Plant response/action:

Within the new OEF organization (see Recommendation R5.3(1)), the first level of OEF processing is responsible for preparing an annual assessment enabling analysis of trends by evaluating repeat underlying causes.

For each occurrence, a classification in terms of key factors (safety, availability, cost, industrial safety/radiation protection, environment) and causes (operation, equipment, human factors, organization) is carried out by the COREX committees based on the criteria defined in plant memo D5140/NA/REX.04.

Following analysis by the CODUREX committees and the OEF Coordination Committee, this annual assessment is presented by the Technical Advisor to the Technical Management Meeting, enabling Management to rule on the proposed improvements.

The implementation of these provisions began during the first quarter of 1998 following the establishment of the new organization at the plant.

IAEA Comments: A comprehensive procedure was recently implemented and has systematically been used to establish a methodology to classify all plant occurrences. This methodology has already been used to perform statistical analyses of the Significant Operating Events causes. However, as soon as Dampierre has a significant amount of events classified, this trend monitoring should also be applied to other events categories to help management to detect and correct latent weakness at the plant.

Conclusion: Satisfactory progress to date.

5.4. PLANT MODIFICATION SYSTEM

5.4(1) Issue: Modifications to improve nuclear safety are not always completed in a timely manner. EDF policy is to carry out a modification package on one unit of a specific unit type (e.g. 900 MW) and then install this package on all units of that type as outage time permits.

The Package for 1993 was carried out at Dampierre Unit 3 during the last outage and will be carried out at the other units during the next available outage. This package consists of 66 modifications, 54 of which relate to safety, and includes many safety related modifications such as additional instrumentation to monitor the water level during mid-loop operation and the modification of the safety valves of the steam generators to mitigate the radioactivity release following a steam generator tube rupture incident, etc.

Another example of not implementing a modification in a timely manner is the continuous boric acid injection system into the secondary circuit of Unit 4. This modification should have been put into operation in 1996 but was delayed, mostly because the design of the modification was not complete on time for inclusion in the outage. It is essential that this system is installed as soon as possible, to give the Unit 4 steam generators (tubes made of Inconel 600 mill annealed steel, tube support plates with circular holes) the best possible secondary chemistry (against intergranular attack) until their replacement in 2004.

When nuclear safety enhancements are not completed in a timely fashion, the plant is not in optimal condition to prevent or mitigate a significant incident or accident.

Recommendation: The plant should define a policy that would prioritize modifications important to safety, in order to implement these modifications in a timely manner.

Plant response/action:

The standardization of French nuclear power plants, both in terms of design and during operation, enables utilization of experience feedback from a considerable number of reactor years, and hence enables improvements in safety.

In relation to safety, it seems more sensible to incorporate modifications in coherent and inseparable batches rather than on an individual basis. The guarantee provided by a single study of compatibility and consistency is better than a series of unconnected improvements. In addition, this enables updating of documentation in a single stage, thus ensuring its compliance with the condition of the power plant unit.

The process of handling modifications is necessary to ensure the benefit of the modification, to preserve the physical and document-related consistency of each reactor series, and ensure the quality of performance of the modification. The period utilized for handling modification files is essential to ensure compliance with safety and quality requirements.

Quality of performance is guaranteed by means of the following provisions:

- All modification performance activities are subject to approval of the job files by the departments of the power plant concerned, who, on the basis of the information in the file, validate the feasibility of the work in relation to the specific conditions of site installations.
- The modifications are initially implemented in a ‘first-off’ unit to collect experience feedback relating to all aspects. They are then only implemented on a general basis in the whole of the reactor series concerned once any corrective actions resulting from experience feedback have been taken into consideration. This approach is aimed at minimizing alterations during work.

Examination of modifications and scheduling proposals are validated at corporate level by a body under the management of EDF’s Nuclear Power Plant Operations Management, the Operations Technical Committee (CTE), which is thus able to optimize management of priorities in terms of the importance and urgency of files from the point of view of safety, and the possibilities of studies and integration into all French nuclear power plants.

In addition, each modification is examined by the specialists concerned during preparation for submission to the Operations Technical Committee to verify that the priorities of matters with a significant impact on the safety levels of power plant units have been taken into consideration. This may lead to certain modifications which are a priority due to their importance in relation to safety being pulled out of the batches. For these specific files, a decision is made on performance of temporary modifications or possibly palliative measures.

This was the case in the examples listed below:

Risks associated with mid-loop operation

In view of the extensive safety-related risks, compensatory measures (additional Technical Specifications for Operations, temporary ultrasonic sensor) were installed while awaiting full performance of the modification.

Risks associated with rapid sweeping of the core by a volume of water with low boron concentration

Temporary modifications were also implemented in this case, while awaiting performance of the definitive modification.

Risks associated with poor venting of Safety Injection System and Containment Spray System lines

A specific procedure ensuring correct filling of the lines, and a surveillance test, have been implemented at the plants prior to performance of the modifications included in the batches.

IAEA comments: IAEA Comments: The implementation of permanent design modifications at Dampierre depends strongly on the Corporate policy established by EDF. The same process occurs at all other EDF plants. Nevertheless, it should be noticed that although some modifications have not been implemented in a timely manner, the modifications that do not just provide an improvement of safety, but rather, need to be implemented urgently to guarantee plant safety, have been prioritized by the Corporate Organization. Some examples of this approach are the following events:

- Cracks identified recently on CIVAUX Unit 1, leading to the shutdown of all operational units of the same series.
- Vessel head penetration line cracking identified at BUGEY in 1992, that led to the replacement of all Dampierre reactor vessel heads.

In addition it should be emphasized that the modifications being implemented are going to be concluded by the end of 1998, and that there is already another programme to perform another batch of design improvements up to 2004.

Temporary design modifications related to safety, have been implemented by Dampierre, whenever necessary to assure plant safety, in a timely manner. Some examples of this approach are:

- Installation of a leak detection system on the vessel head penetration lines while waiting for the reactor vessel head replacement.
- Installing a fire detection system for Reactor Coolant Pumps.
- Modifying the control relay circuitry to avoid Reactor Coolant System inadvertent dilution.

Conclusion: Issue resolved.

5.6. FUEL HANDLING

5.6(1) Issue: House keeping practices in the fuel handling building are not sufficient. The plant personnel were observed to approach a fuel pool without provision to prevent foreign materials such as hard hats and glasses from falling into the pool. The plant personnel did not pay any attention to transparent plastic wrappings near the spent fuel pool in a fuel handling building. There were temporary materials of a contractor which had no control sheet clarifying contents, time frame and an indication of the EDF person in charge of the work. Also some rolls of tape were noticed lying on the floor and on equipment near the fuel pool.

Recommendation: The site practice on house keeping in the fuel handling building should be improved.

Plant response/action:

Provisions regarding housekeeping of areas in the fuel handling buildings with regard to the fuel pools are described in memo D5140/NT/98.139. They mainly concern rules relating to the following:

- organization of intermediate storage of materials,
- preventive measures regarding falling objects (e.g. hard hat, eye protection, keys, measuring instruments),
- general cleanliness.

This memo also refers to the memo on the worksite conduct standard (D5140/NT/95.79).

In addition, a notice fixed at the entry to 20 m level of the fuel building pools reminds staff of the main provisions to be implemented in relation to all jobs in the vicinity of the pool.

IAEA Comments: A procedure was implemented establishing in detail the housekeeping requirements in the fuel handling building. This practice has ensured the existence of adequate conditions to perform activities in the vicinity of the pool, as was observed during the follow-up visit.

Conclusion: Issued resolved.

6. RADIATION PROTECTION

6.1 ORGANIZATION AND FUNCTION

As part of Dampierre's risk prevention policy the various radiological protection functions were combined in June 1996 within two sections of the technical group (SUT) to help improve radiological control. RP advice, policy and radiological control within the reactor radiological controlled areas (RCA) are contained within the risk prevention group (SPR). Environmental monitoring and radiological control outside the reactor RCA are the responsibility of the radiation protection and environment section (SRE) within the technical group of the SUT.

Risk prevention groups were also created in each group to try and improve communications between departments on safety and encourage a consistent safety policy. The 1991 EDF policy on reducing doses has been adopted by Dampierre which requires the setting up of ALARA committees, reducing annual doses to the ICRP 60 recommended annual dose of 20 mSv and reducing the collective dose per reactor to 1.2 man-Sv by 2000 AD. Permanent and outage cross site ALARA committees have been set up and eight radiological performance indicators have been produced to assist in monitoring the effectiveness of the ALARA process, however they do not include contamination incidents. Deputy heads of each group are now appointed as safety engineers responsible for implementing radiological advice within their own groups. As part of the process Dampierre has adopted a policy of 'self protection' whereby personnel are trained in self monitoring.

6.2. RADIATION WORK CONTROL

Radiation work control is primarily managed through a combination of RP advice, work control documents and the MICADO radiological control system which controls access to the reactor controlled area (RCA) and monitors and records doses in real time. To assist Dampierre in controlling doses during outages, dose constraints are placed on Dampierre by EDF based on the NPPs with the lowest outage collective dose. Evidence of good dose control is shown in the 1995 outage to exchange a steam generator, in which the daily planned collective doses closely followed actual collective doses. There was also a good performance, during reactor outages of designating safe 'green' areas within the reactor building where personnel could wait or read documents in a low background area.

However the organization structure and methods for controlling contamination do not ensure that contamination is always contained within the controlled areas. For example, during outages in 1996 at the exits of the RCAs over 300 spots of contamination were found on roads leading out of the RCA. These events coupled with an incident during the OSART mission involving radioactivity being detected in a vehicle leaving the site also suggest that formal communication with and between the two RP functions within the technical group (SUT) is not adequate. The team recommended that Dampierre should create a programme to eliminate abnormal radiological events which occur outside the RCA and monitor its effectiveness. Internal structures should also be reviewed to ensure more effective investigations of incidents.

With regard to radiation monitoring, Dampierre still has many radiation instruments calibrated in rads rather than the new SI unit of Sv. This leads to confusion in interpreting dose and dose rates.

Because of this, the team recommended that Dampierre should review its procedures and training to ensure that dose assessments are clear and understood and prepare a plan to convert all radiation instruments to the new units.

Observation of work within the active waste facility and the decontamination workshop indicates that some personnel do not always ensure that doses are ALARA and limits for taking additional radiological precautions are not always apparent. The absence of beta dose rate instruments to monitor skin dose may also affect doses being ALARA.

The team recommended improvements in these areas.

6.3. INTERNAL RADIATION EXPOSURE

During the last 10 years, nearly 20000 persons were tested for internal contamination with only 114 of the persons tested with positive results. Although low, over this period there has been no obvious downward trend, with between 4 to 24 persons contaminated per year. So far in 1996 internal contamination was detected in 4 persons with all doses below 1/10th of the annual dose limit.

To control the spread of contamination and hence reduce the risk of internal contamination exposure, controlled areas are well demarcated and segregated and, through the Dampierre's ALARA initiatives, a clean area policy has been adopted to try and ensure that at all times, where practicable, contamination levels within the RCA are kept below the lower limit of 8 Bq.cm⁻².

To reduce the risk of internal contamination further, air samplers are placed around the RCA with audio/visual alarm, and for work involving or likely to involve significant surface or airborne contamination, air samplers are placed local to the work and personal wear additional protective clothing with positive pressure respirators. Face masks are prohibited from being used at Dampierre.

However, in 1995, the MICADO dosimetry system was linked to the final exit monitor at two of the reactor controlled area change rooms which has revealed that during outages up to 400 incidents of personal contamination occur. Most of the incidents are associated with contaminated hands, which originate primarily from a common habit at Dampierre of removing gloves in contamination areas to perform delicate work. The team recommended that Dampierre reviews its working methods to minimize the spread of contamination and the transfer of contamination to personnel.

In addition, although the exits from the reactor RCA's are well laid out, undressing procedures between the initial and final monitoring points are unclear and the procedures allow a possible risk of skin and internal contamination. It is also noted that during outages a separate change room is opened for contractors which is controlled by contractors rather than Dampierre's employees and it is within this group that many contamination events occur. The team recommended that the number of contamination incidents should be monitored and the training of staff and contractors should be re-evaluated to ensure a good understanding of the reasons for contamination control.

6.4. INSTRUMENT, EQUIPMENT AND FACILITIES

The plant has sufficient portable and fixed instruments for normal operations and outages and good records are kept of location, issue and calibration, however, as previously mentioned, Dampierre is still in the process of converting radiation instruments from rads to Sieverts. All portable instruments are calibrated by an accredited contractor every 15 months but are normally withdrawn for

calibration every 12 months. Confirmatory checks are performed by Dampierre every 6 months. Calibration labels, with expiry dates are also fixed to each instrument. The contractor provides certificates of calibration. The two RP groups control their own instruments with stock checks every month. The instrument issue is well controlled from designated stock rooms and instruments are normally returned on the same day. However, instruments can be issued for up to one month without formal function checks being performed. The team suggested improved control in the checking of radiation and contamination instruments.

Most installed instruments are fitted with sources to perform in situ function checks against calibrated values. Good records are kept, however no trending is carried out to check against drift in calibration.

6.5. PERSONNEL DOSIMETRY

Whole body external doses are well controlled by the use of electronic personnel dosimeters and film badges within each RCA. Doses and times of entrance to and exit from the RCA are recorded on Dampierre's MICADO dose control and record system. The system operates in real time and can prohibit entry to the RCA if dose limits are exceeded. It is also used to assist in planning work and optimising and predicting doses and working times. MICADO is also linked to central dose record systems which allow access to dose information to all personnel who have worked in EDF.

Skin doses at the extremities of the body are not measured as Dampierre does not possess any beta dose rate meters or extremity dosimeters. Instead Dampierre relies on a system of ensuring that doses to the extremities are kept below 10 times the body dose rate to ensure that extremity doses remain within the statutory annual limits. Such systems do not always ensure that doses to the skin or extremities are accurately assessed and ALARA.

The team recommended that the policy for recording extremity and skin dose be reviewed to ensure doses to extremities and skin are accurately assessed and ALARA and that, in some cases skin dose rates should be measured with the appropriate instrument.

Internal doses are assessed with a number of body and thyroid monitors, supported by facilities off-site for bioassays. The facilities are well laid out and a rigorous system of calibrations and checks is carried out on the equipment. All personnel are monitored before they enter the RCA for the first time. All contractors are monitored before and after outages and Dampierre employees are monitored every 6 months. To assist in detecting possible internal contamination, personnel who activate the body monitors at the exit from the RCA are automatically monitored for internal contamination.

6.6. RADIOACTIVE WASTE, STORAGE AND DISCHARGES

Solid Active Waste.

Facilities for sorting and storing solid low level radioactive (RA) waste (BAC), which are under the radiological control of SPR, are well laid out and there is good segregation and plenty of room to ensure that doses are ALARA. There is some accumulation of waste as the compactor is being modified, but this is well controlled and stored behind lead screening.

RA waste is segregated at source taking into account dose rate and then re-sorted at the waste facility with further segregation into high and low dose rate items to assist in ensuring doses are ALARA. Activities are based on a single isotopic composition for the whole site. High level waste is stored separately in concrete containers. Procedures for sorting, storing and transporting waste are defined by the separate and independent authority for disposal of active waste, ANDRA.

Combustible solid waste is not currently burnt to reduce the volume.

Waste arisings have been examined and some materials used in controlling contamination such as curtains and floor covering, reduced where possible. As a result of this initiative the volume of low level drummed waste produced in 1995 dropped by 20%.

Liquid and Gaseous Waste

The systems for monitoring liquid and gaseous discharges are well designed with systems of segregation, filtration and recirculations to reduce the final activity of discharges. Discharges require authorization from the technical department. All discharge routes from the RCA's are continuously monitored with local and central alarms, with the exception of the decontamination workshop and the active waste sorting facility (BAC). However these two locations have absolute filters fitted to their stacks.

Limits are imposed on both the specific activity of the discharge and the amount released per year. Trending of accumulated activities is also performed to monitor total releases.

A comprehensive programme of environmental monitoring is carried out including, water, grass, milk, air and radiation dose rate by Dampierre and the government agency for radiation protection OPRI and results are compared to ensure consistency.

RA discharges are low and of the order of only a few percent, with the exception of tritium in liquid discharges which is normally about 40% of the annual limit.

Annual limits are set by OPRI and are designed to ensure that no member of the public receives more than 1/10th of their annual dose limit of 5 mSv at the site fence.

Low level liquid waste arising from the RCA, such as oils and solvents is stored on site awaiting a policy decision on burning such wastes.

6.7. RADIATION PROTECTION SUPPORT DURING EMERGENCIES

There are no designated emergency stores for radiological instruments, however in an emergency Dampierre would use instruments from the unaffected reactors, which seem to be of sufficient quantity.

STATUS AT OSART FOLLOW-UP VISIT

Of the five recommendations and one suggestion, the Radiation Protection group has totally resolved two recommendations and one suggestion. Satisfactory progress was achieved for two other recommendations, but it was considered that the response to one recommendation needed improvement to achieve satisfactory progress.

The team recognized the placing of all the radiological services under one group to be a major contribution to achieving the improvements required by the recommendations and suggestions.

There was evidence that the number of incidences outside the RCA was significantly falling, which was thought to be brought about by the good radiological practices and controls instigated at the exits of the RCA. During the remaining outages in 1998 it is hoped that the number of incidence will continue to fall and the team considers that satisfactory progress has been made.

Effective controls were in place to ensure doses were ALARA in the decontamination workshop including beta/gamma dosimeters and dose rate instruments to assess skin doses. The team considered the issue totally resolved and noted that work was also planned to install removable pipework to reduce doses further.

Instrument issue procedures were improved and regularly daily function checking of instruments before and after issue were implemented. The team considered this issue resolved.

A comprehensive survey during two outages in 1998 to assess the significance of beta doses to the extremities was implemented using finger TLD's and beta/gamma dose rate meters. The plant was able to demonstrate that extremity doses were not significant and the team considered this issue resolved. Nevertheless, the team encouraged the plant to continue monitoring beta dose rates in case conditions changed at a later date.

A policy for converting all dose rate instruments to mSv by the end of 1999 has been implemented. Concerns on the use of electronic dosimeters displaying either rads or millisieverts has been addressed by fixing labels to dosimeters to the older instruments so that they display mSv. The team considered that satisfactory progress had been made in addressing this issue.

The team recognized that the Radiation Protection group had put considerable effort into trying to reduce the number of personnel contamination events at the exits of the RCA. This included improved clothing change procedures, training, notices and the use of the MICADO system to identify personnel who were contaminated and there was evidence of a significant reduction in the number of events. However, the team considered the number of incidents during outage still very high and felt that the plant had not adequately identified the root cause of the problem and the issue.

DETAILED RADIATION PROTECTION FINDINGS

6.2. RADIATION WORK CONTROL

- 6.2(a) Good Practice:** The use of Dampierre's MICADO dosimetry system, operated by the risk prevention group, provides real time control of personnel doses measured on electronic dosimeters within the RCA and assists in predicting doses, dose limits and exposure times.

The system, which is connected to the human resources personnel database (MRH), giving access to EDF's national dosimetry database DOSINAT, is also used during outage preparation to predict doses for each stage of the work. During outages MICADO is used to compare actual doses to predicted doses so that discrepancies between forecast and real situations can be monitored effectively.

6.2(1) Issue: The organizational structure and methods for controlling contamination at the NPP do not ensure that contamination is always contained within the controlled areas. A vehicle containing refuse from outside the controlled areas activated the radiation monitors at the exit from the NPP Site. The source of the contamination was a bag from a vacuum cleaner which is not normally used within the RCA. The risk prevention group responsible for radiological safety was not informed until 5 days after the event and the NPP was unable to verify the source of the contamination, its composition, or whether the contamination originated on or off site. During 1996, approximately 300 spots of contamination were found on the roads adjacent to entrances to the RCA. Most of the events occurred at the exit from the RCA in outages during the removal of laundry and large contaminated objects. Of these approximately 50% were above the NPP's control level. At least 90% of these events would not have activated the NPP Exit Gatehouse monitors if they were transported off site.

There is no formal exchange of information on a day-to-day basis between the two RP sections involved in radioactive work within the technical group (SUT) to ensure that sufficient expert advice is immediately available to deal with significant radiological events which occur within each group, nor is there evidence of performance indicators or policy to assist in reducing contamination levels outside the RCA. The absence of performance indicators and formal communications between the radiological groups within the technical department may inhibit effective and immediate control to reduce and eliminate the spread of contamination outside the RCA and thus decrease the risk of contamination to personnel in these areas.

Recommendation: The NPP should create a programme and monitor its effectiveness in eliminating abnormal radiological events that occur outside the RCA. The use of appropriate performance indicators would assist in the successful implementation of this programme.

Dampierre should also review the interface between the RP groups to ensure that radiological problems are dealt with effectively and examine how staff performing radiological surveys inside and outside the RCA interact at the exits of the RCA to ensure that the contamination of items removed from the RCA is adequately controlled.

Plant response/action:

Interfaces between Radiation Protection groups

Interfaces between radiation protection groups no longer exist as a result of the plant reorganization. Radiological monitoring of roads at the plant, and monitoring performed prior to leaving the plant (in relation to personnel and equipment) are the responsibility of the Risk Prevention Department (SPR) only.

Plant Management is informed immediately on discovery of an abnormal radiological event in accordance with the transmission logic diagram included in plant memo D5140/NA/MAT.03. All abnormal radiological conditions are remedied in real time.

All abnormal radiological events give rise to the issuing of a deviation sheet, initiated by the SPR, with a view to analysis of the activity which caused the event by the entity responsible.

Programme for elimination of radiological events outside the RCA

The Dampierre NPP has implemented the provisions described in plant memo D5140/NA/MAT.03 'Management of movements of potentially radioactive materials' and specified in Directive 82 (DI82):

1. Systematic radiological monitoring of materials, by work supervisors, prior to exit from the RCA.
2. Systematic containment, except where technically impossible, in which case deviation sheets are issued, of materials for transport outside the RCA, including for monitoring in the premises of the Risk Prevention Department.
3. Management of a restricted number of RCA exit points by radiation protection staff, who authorize and perform lifting of physical lockout under the following conditions:
 - monitoring of integrity of packaging,
 - monitoring of absence of contamination on packaging,
 - dose rate of package less than 2 mSv/h in contact with the packaging,
 - transfer organized with destination and addressee identified.
4. Physical lockout of possible material exit points from the RCA.
5. creation of a 'DI 82' working group to deal with difficulties encountered by job specialty departments in its application.
6. preparation and presentation to work supervisors of technical memo D5140/ NT/98.127, which is aimed at them. This note sets out DI82 in terms of concrete actions.

Lines of Defense / Monitoring of Effectiveness

A radiological zero point for roads at the plant inside the security zone was established in the first quarter of 1998.

Provision is made for systematic monitoring of roads at the plant inside the security zone in accordance with procedure ES/RE/RAD/30257:

- once per year for the whole site,
- before and after each outage for zones which material passes through during the outages, and transit zones toward the Waste Auxiliary Building and the laundry.

Systematic monitoring of vehicles on entering and leaving the security zone is carried out. Gate monitors are installed for this purpose. Similarly, systematic monitoring of conventional waste disposal skips is in place.

The number of contamination points detected outside the RCA is recorded by class of activity (800Bq<A<100kBq, 100kBq<A<1MBq and A>1MBq).

An annual assessment, with analysis of trends and location, is drawn up by the SPR and discussed by the Operating Safety Committee (CSE).

Contamination incident indicators (monitoring of effectiveness of the ALARA initiative)

The following indicators are in place:

- number of persons showing body activity greater than the level allowing passage via gate monitor C2 at RCA exits (in absolute terms, and related to the number of exits),
- number of persons with ‘external’ contamination treated by casualty assistance services,
- number of persons with ‘internal’ contamination treated by casualty assistance services,
- overall number of contamination points outside the RCA with activity greater than 800 Bq.

The last of these indicators forms part of the nuclear safety indicators, and, as such, is examined once each quarter by the CSE.

As part of the implementation of these provisions and lines of defense, some contamination points outside the RCA were recently discovered. These events were dealt with immediately. They serve to confirm the appropriateness of the preventive measures defined, some of which were not yet operational when these deviations were detected.

IAEA Comments: The monitoring of all objects leaving the RCA is now under the control of one group, which has set up systems for monitoring and reporting radiological deviations at the exits of the RCA’s. The formal systems of reporting events, coupled with detailed monitoring of the areas outside the RCA, have enabled the group to identify the main causes of the spread of contamination which originate mainly from inadequately wrapped packages leaving the RCA.

This new initiative only commenced at the beginning of March 1998 following an intensive and detailed survey of the site to establish a “zero point”. So, at the time of the follow up mission, it was difficult to gauge the effectiveness of the new procedures. However, observation of monitoring procedures suggested good radiological practice supported by the fact that during the Reactor 3 outage in March 1998 the number of contamination events was approximately half that recorded in the Reactor’s previous outage in 1997. Nevertheless, the plant must confirm the effectiveness of the monitoring process.

Conclusion: Satisfactory progress to date.

6.2(2) Issue: Methods and equipment used for monitoring radiation dose rates may not ensure that dose assessments are properly made. Although Dampierre officially changed to the new SI units of dose equivalent in 1995, many radiation instruments have still not been converted to the new units. This is causing confusion among the staff, many of whom have difficulty converting between the old and new units which involves a conversion factor of 100. Eight personnel including an RP technician were asked to convert between the two units and only one, an RP trainee was able to successfully achieve this.

In addition, the unconverted instruments are calibrated in units which may give a response of approximately 20% less than the converted instruments.

The availability of radiation instruments calibrated in different radiological units for measuring the same quantities of radiation, which differ by a factor of 100, causes confusion and can lead to significant errors in estimating doses.

Recommendation: Dampierre should review their procedures to ensure that dose assessments are clear and understood. This review should include examining refresher training and the use visual aids within the RCAs.

Dampierre should also prepare a plan, including target dates, for converting all radiation instruments to the new SI units and consider liaising with other plants which have the same problem to see if:

- equipment can be rotated between sites during conversion so that problems with shortages can be reduced
- larger volumes of instruments could be converted at a time for reduced costs.

During the interim period, while the NPP changes to the new ICRU units, the NPP should ensure that all instruments of a particular type are calibrated in the same units.

Plant response/action:

To ensure that dose assessments are clear and understood, the Dampierre NPP has implemented the following provisions:

1. Training action

Industrial safety/radiation protection refresher training programmes (training courses number K56 and K69) now include a section dealing with SI units. Conversion exercises are carried out to ensure that these concepts are effectively assimilated.

2. Staff information

An information board indicating the Rem/Sievert conversion has been installed at each entrance to the controlled area in the various changerooms (approximately 18 boards, 30 cm x 50 cm).

A staff information campaign about this subject, via the plant publication 'DAM INFO' (distributed to all staff at the plant) has also been planned for the first half of 1998.

The staff of the Risk Prevention Department (SPR) monitor that these concepts are effectively assimilated at worksites.

3. *Measuring Instruments*

With regard to instruments used for measuring dose rates, a conversion campaign was initiated for 1998 and 1999 covering over 400 instruments.

While awaiting completion of this campaign, a label bearing a reminder of the conversion has been affixed to all of these instruments.

IAEA Comments: A purchasing policy and schedule has been produced to replace or modify all monitoring instruments. This conversion process began at the beginning of 1998 with purchase of 20 new radiation instruments and is scheduled to be completed by the end of 1999.

To assist personnel in assessing doses during this final transitory period, numerous conversion charts have been placed within the RCA supplemented by re-training of staff. Labels have been fixed to all electronic dosimeters so that they display mSv. This has significantly improved the ability of staff to monitor their doses. However, because of the costs involved it is not planned that they should be replaced until they are obsolete, which will be in 3 years time. The team believe this is a reasonable course of action as the original problem with the same type of dosimeter displaying two different radiation units (i.e. rems and sieverts) has been resolved with the new labels.

Conclusion: Satisfactory progress to date.

6.2(3) Issue: Methods used for decontamination and sorting radioactive material may not always ensure that doses are ALARA. Personnel in the active waste room (BAC) normally only use a gamma monitor for sorting waste by hand. As much of the activity consists of the beta/gamma emitter, Co-60, the contact dose rate and hence the dose to the hands can be significantly underestimated. Staff in the decontamination workshop use a table with an extract filter for decontaminating high active components, however the dose rate from contamination in the table and filter can be significantly higher than the dose rate from the items they were working on. Personnel also sometimes wear absorbent cotton gloves when using liquids to decontaminate items. The table and the filter are normally decontaminated at the end of the working week, unless exceptionally high activity is detected, however there are no limits for contamination or dose rate above which the table should be decontaminated.

Such practices can result in staff receiving doses which are not ALARA.

Recommendation: Contamination and radiation action levels for work involving handling and sorting radioactive material should be reviewed to ensure that all doses are ALARA. As a major component of the radioisotopic composition at Dampierre is the beta/gamma emitter Co-60, this review should include both the beta and the gamma components of the dose. To ensure doses from contamination on gloves and items are ALARA, instruments used for monitoring contamination should be kept in low background areas whenever possible.

Plant response/action:

To ensure that all doses remain ALARA, certain provisions have been implemented in the decontamination workshop:

1. Personnel (EDF and contractors) have been informed of the obligation to wear rubber gloves during decontamination operations. This obligation is displayed inside the decontamination workshop as a reminder to personnel.
2. Personnel (EDF and contractors) have been informed of the obligation to perform dose rate and contamination measurements prior to each decontamination activities. This obligation is displayed inside the decontamination workshop as a reminder to personnel.

A joint study conducted by the Technical Logistics Department (SLT), which is responsible for decontamination activities, and the Risk Prevention Department (SPR) has enabled establishment of a dose rate threshold at the workstation, before removal of the equipment to be decontaminated: the dose rate must be below 0.04 mSv/h, and the level of contamination below 200 Bq/cm².

3. A study involving measurement of extremity exposure and the beta/gamma ratio has been initiated, in particular in the decontamination workshop and in the Waste Auxiliary Building (BAC), to provide information with a view to a possible improvement in management of extremity doses (see Recommendation 6.5(1)).

4. A refit study has been initiated for the decontamination workshop, in particular with a view to improving problems of radiation exposure. The extent of the work necessitates scheduling over several years. The following are planned, in particular, for 1999 and 2000:

- removal of two decontamination tanks,
- modification of tank drainage piping,
- improvement of biological protections,
- repainting of walls.

However, certain actions have already been confirmed for 1998:

- repainting of the office,
- creation of a 'chemical products' room (2nd quarter 1998),
- installation of a second decontamination table (3rd quarter 1998).

Radiological monitoring of decontaminated parts is carried out in a room where the dose rate is very low (approximately 1 $\mu\text{Sv/h}$).

IAEA Comments: Beta/gamma dose rate meters and dosimeters have been purchased and are in use to monitor skin doses of personnel in the Decontamination Workshop. To reduce skin contamination, personnel working with wet materials are instructed to wear non porous gloves and record that they understand the instruction. This was confirmed by observation.

To help reduce doses from background radiation, decontamination tables are now monitored before and after work with limits placed on background radiation levels, above which, the tables must be decontaminated. Staff interviewed in the workshop understood the instructions and the low background levels were confirmed by actual measurements.

Plans are also in place to provide removable drain pipes. The team considered that the response addressed the recommendation.

Conclusion: Issue resolved.

6.3. INTERNAL RADIATION EXPOSURE

6.3(1) Issue: Contamination control practices within the RCA do not always ensure that exposure to internal contamination is minimized and that the unnecessary spread of contamination is prevented. In 1996, between 100 and 400 incidents of personal contamination per outage were found, mainly on the hands, on exiting the RCA at the contamination monitor at the entrance to the change room. This is mainly due to individuals removing their gloves while carrying out tasks within the contamination areas of the RCA. SRP staff have tried to get staff and contractors to wear rubber gloves in such situations but personnel do not like to wear them because it makes their hands sweat.

There is no obvious established procedure for removing clothing within the hot change room of the RCA. As this is an area where levels of up to 10 times the allowable skin contamination level may occur, there is a high risk of personal contamination if correct undressing procedures are not carried out. Also there are few intermediate portable contamination monitors within the RCA to check for contamination before it spreads further and the rules for using the existing monitors are not clear.

The removal of gloves within the RCA coupled with the transfer of potentially contaminated overshoes into the main change room could lead to unnecessary external or internal exposure.

Recommendation: Dampierre should review contamination control procedures to ensure the spread of contamination and transfer of contamination to personnel is minimized. Possible methods could include the use of performance indicators on the number of contamination incidents per outage or month.

Training of staff in this area should also be re-evaluated to ensure good understanding of the principles of contamination control. The effectiveness of supervisory field tours should be improved so that poor contamination practices can be recognized and corrected. Plant documents which describe the principles of contamination control should be reviewed and updated as necessary.

Plant response/action:

To improve prevention with regard to contamination of personnel, and ensure that the spread of contamination is minimized, the plant has taken certain measures, as follows:

- Request to use talc-coated latex gloves in work necessitating the removal of cotton gloves (writing, work requiring a degree of dexterity, etc.). Information is transmitted to personnel (via internal memos and inserts in the plant publication 'DAMINFO') to indicate these provisions and implement them on a mandatory basis.
- Installation of information boards in hot changerooms setting out the sequence of removal of the different elements of standard clothing. This method of undressing is also covered in risk prevention training (both initial and refresher modules).
- Indicators on the number of persons found to be contaminated at the final gate monitor ('C2' monitor) have been implemented, and form part of the plant indicators which are examined on a

monthly basis by the Management Committee. In addition, these indicators are monitored on a daily basis during outages by project managers. Cases of contamination which necessitate the involvement of the casualty assistance service are analyzed by departments in the same way as a workplace accident (Accident Study Sheet). This is indicated in Industrial Safety Instruction No. 31.

- To avoid the spread of contamination outside worksites, measuring instruments are installed at the exits of those worksites which have a high contamination risk (steam generators, fuel pool access, etc.). During outages, an instrument is also located at the reactor building exits to avoid contamination of other plant compartments and circulation routes.

In the field of training, in addition to the undressing instructions displayed in changerooms and also covered in training modules, as described above, a contamination simulator is now used in level 1 and 2 initial risk prevention training modules to enable trainees to visualize problems of contamination transfer, in particular during situation practice sessions on the training worksite.

Management inspections, which are covered under the area of Management, Organization and Administration (MOA), have a pedagogical function, which means that they can also enable correction of poor practices where applicable, thus helping minimize the spread and transfer of contamination.

IAEA Comments: In conjunction with the MICADO monitoring system and new reporting procedures, the RP group were able to identify the critical groups who were most likely to be contaminated at the exit of the RCA. 60% - 70% of events were due to hand contamination of a group of people working on scaffolding, insulation and maintenance.

The RP Group has issued clear instructions on the use of gloves for these persons, and installed contamination monitors at the exits of their work areas to try and identify and filter out those personnel who are contaminated before they reach the main change room at the exit of the RCA. However, the contamination monitors in the work areas may be in a high radiation background which can make it difficult to detect low levels of contamination.

Observation of the number of personnel contaminated per month since the implementation of the new procedures suggests that the number of persons contaminated is dropping (approximately 180 per outage in 1998, compared with peaks of 300 – 450 in 1997). However it was the team's view that the number of events per outage was still unacceptably high.

Because of this, coupled with:

1. evidence in the decontamination workshop office of personnel removing gloves without monitoring and,
2. the root cause of hand contamination amongst the critical group not having been identified at the time of the mission.

The team considered that insufficient progress had been made to address the issue. The plant should confirm that they have identified the critical groups and that they have discussed with them ways forward to reduce the number incidence of hand contamination.

Conclusion: Insufficient progress.

6.4. INSTRUMENTATION, EQUIPMENT AND FACILITIES

6.4(1) Issue: Radiation instrument control may not ensure that radiological surveys are accurately performed. Although the issue of RP instruments at the stock room in the RCA is well controlled and most instruments were returned on the same day, it is possible for instruments to be issued for up to one month before action is taken to retrieve the instruments. This seemed to be a considerable period of time in which to issue an instrument without formal checks on its performance.

RP instrument issued at the instrument stock room were checked with a Cs-137 source to ensure that they functioned properly, however a similar check is not performed on their return to the stock room to verify that they were still operational after use. As most failures of instruments occur during operational use it is important to ensure that they still function correctly after use, so that any incorrect measurement of dose rate can be followed up immediately.

Beta probes at the time of issue are only checked with a Cs-137 source. It is important that instruments used to measure a particular type of radiation are tested with a source of the same type of radiation to ensure that they will function properly.

Failure to regularly verify that an RP instrument operates correctly and detects the appropriate radiation may result in serious errors in estimating dose.

Suggestion: Review RP instrument control to ensure that instruments functioning properly and that surveys are accurately performed. Review procedures to function check instruments to ensure that they respond correctly to the radiation they are designed to detect.

Plant response/action:

To enable improved monitoring of proper functioning of RP instruments, the Dampierre plant has implemented certain provisions:

- a reminder of the obligation to monitor instruments on the part of the work supervisor, displayed above the shielded irradiation unit.
- based on the optimized use of the OUTIL computerized instrument management application, enabling details to be obtained of instruments withdrawn for more than one week, the store operative draws up a list of these instruments, and the Risk Prevention Department (SPR) reminds users, to ensure that the instruments concerned are systematically monitored at least once each week.

It is worth noting that the Dampierre plant initiated a consultation process on international practices in this area via WANO and NUMEX during the first quarter of 1998. Analysis of the answers to be received will enable us to improve these provisions if necessary.

- With regard to instruments used for mapping, the Risk Prevention Department has incorporated into procedures the obligation to carry out daily monitoring before and after performing measurements. The Specific Technical Clauses (CCTP) directed at contractors will be modified

to take account of this during the first half of 1998, along with the corresponding procedure worksheets.

- Monitoring by store operatives of proper functioning of measuring probes once each month using an appropriate source (beta source).
- A shielded irradiation unit will be installed in each equipment distribution store during the first half of 1998 to enable store operatives to monitor the proper functioning of instruments on distribution and return.

IAEA Comments: Observations of instrument issue at the Instrument Store and by personnel within the RCA confirmed the implementation of the procedure of function checking of instruments before and after use. Sources for function checking are properly labeled.

Personnel using instruments at the exits of the RCA understood the need to check their instruments before and after use each day and reporting procedures were in place to notify supervisors if instruments failed their checks after use.

Conclusion: Issue resolved

6.5. PERSONNEL DOSIMETRY

6.5(1) Issue: Methods for controlling doses to the extremities and skin may not ensure that an accurate assessment is made of the dose to these parts of the body and that these doses are ALARA. RP instruments and extremity dosimeters capable of measuring skin dose, are not normally available at Dampierre.

Dampierre has produced a policy document (No 29 D5140/CS/29 - Dose rates in contact with the skin) which gives guidance on reducing dose rates to the skin, with the implication that if they are not significantly different from the body then the dose to the body can normally be assigned to the extremities. EDF has also consulted other utilities through WANO (D4006-52/96-007/RDP 23/02/96) but concluded that the survey did not provide sufficient information to decide on what type of dosimeter should be used or whether such dosimeters were worthwhile. Currently EDF recommends that if the dose rate to the extremity is more than 10 times the body dose rate then it should be monitored and where necessary an estimate placed in the dose records to ensure that the annual limit to the extremity is not exceeded. However at lower ratios, significant doses to the extremities may still occur and there is no guarantee that they will be the same for different persons doing the same work. For example; if the ratio was only 2:1 it is possible that if a person who works for an hour a day in a whole body field of 1 mSv/h over 10 days, his dose to his body would be 10 mSv but the dose to extremities would be 20 mSv. This would be a significant dose, which although below the annual limit should be recorded. However this may be only an estimate and if the radiation fields vary significantly over short distances, then the time and efficiency of the work could also significantly affect the extremity dose.

The absence of devices to monitor and accurately assess skin dose coupled with the high number of incidents of contamination to the hands during outages can lead to significant doses to the skin being unrecorded and doses not being ALARA.

Recommendation: The policy of using the 10:1 ratio of extremity to body dose rate should be reviewed to determine whether doses to the extremities are significant and ALARA. Where work is carried out involving β/γ isotopes, such as Co-60, the review should consider the use of radiation dose rate instruments, capable of measuring the skin dose so that an accurate dose assessment to the skin can be made.

Plant response/action:

With a view to ensuring that doses are ALARA, in particular during handling of items to be decontaminated, the Dampierre NPP has decided to initiate a study to provide information for research with a view to possible improvements in the management of doses to the extremities.

This study consists of measuring extremity exposure and the beta/gamma ratio for certain workstations, selected in conjunction with Occupational Health Services:

- Decontamination workshop: for operators of the ventilated table,
- waste auxiliary building: for operators responsible for monitoring waste before compacting,

— chemistry laboratory.

During this study, which began in January 1998, and which is scheduled to last approximately 1 year, the dose rates and integrated doses due to beta decay, on the one hand, and gamma radiation on the other hand, are measured. For this, staff are equipped with a 'ring'-type thermo-luminescent radio dosimeter in addition to their normal dosimetry film. The results are recorded in a table each month.

This study is detailed in plant memo D5140/NT/98.23.

IAEA Comments: The plant has carried out a formal survey in January and March 1998 using thermo-luminescent finger dosimeters to assess extremity doses. (procedure D5140/NT/97.91).

In conjunction with the Medical Department, groups and areas of work were identified where it was thought extremity doses would be significantly higher than whole body doses. The results of the survey showed that the mean ratio of extremity to body dose was ~ 1.14 with a maximum ratio of 2.67. This survey was supported by beta/gamma dose rate measurements in the same areas which gave a mean beta+gamma/gamma ratio of 1.08 with a maximum of 1.51.

In the light of these results, coupled with the acceptance that the radiological risk to the extremities was approximately an order of magnitude below that of the body, the team's view was that in the areas surveyed, there was not a need to wear extremity dosimeters as the dose to these parts of the body was generally not significantly different to the dose received by the body.

The team recognized the positive response by the plant in addressing this issue. Nevertheless, it was considered that it would be good radiological practice to continue to perform beta gamma dose rate measurements in case changes in radiological conditions required the use of extremity dosimeters in the future.

Conclusion: Issue resolved

7. CHEMISTRY

7.1. ORGANIZATION AND FUNCTIONS

The chemistry activities at Dampierre NPP are divided among three sections which are situated inside three different groups on the organization chart : in each twin unit group (1/2 and 3/4) the chemistry section is part of the generation department in the technical group the effluents laboratory of the radiation protection and environment section (SRE) is integrated in the technical department.

All chemistry sections have sufficient staff for normal power operation as well as outages. The organizational structures, the responsibilities and authorities are clearly defined and well understood by all staff members. Appropriate goals and objectives are established. Periodic (e.g. yearly) performance evaluations of chemistry personnel are rare, since they are voluntary, therefore workers can refuse such an evaluation without further consequences. Only management personnel are evaluated regularly.

The experience level of the chemistry workers is adequate. During work they demonstrated proficiency and good knowledge and understanding of current practices and procedures.

The interfaces with other plant groups are clearly organized and work well, especially the relations with the operations crew which are exemplary: daily morning meeting with the shift supervisor, effective communication with clear forms, prompt information about deviations, etc. Also the cooperation between the different chemistry groups at the site is exemplary.

The interfaces with corporate organizations are well defined. Especially good cooperation with the chemical and metallurgical laboratories (GDL) in Paris, through a liaison engineer, has to be underlined. In addition, the relations are excellent with the safety, radiation protection and environment department (DSRE) in Paris and with the Nuclear Fuels Group (GCN) in Lyon the relations are excellent.

7.2. CHEMISTRY CONTROL IN PLANT SYSTEMS

In general the primary and secondary chemical treatment programmes are good. The morpholine conditioning of the secondary system is an efficient way to prevent erosion-corrosion. Plant operating practices help to minimize corrosion.

To enhance these programmes, Dampierre has the intention to work at a higher pH in the primary circuit (7,2 instead of 7,0). Units 1 and 3 are already running with a higher pH in the secondary system, after replacement of the condenser (together with the steam generators). This replacement also solved the problem of the oxygen content in the extraction water which was frequently above technical specification, particularly during the summer period. On Units 2 and 4, condensers will be replaced soon.

The weekly determination by calculation of the primary-to-secondary leak, using all available data for cross checking the results was considered a commendable practice. This included reading of the N16 chains on the main steam lines; manual confirmation measurement of the previous values with a NaI-scintillator on a main steam line in the turbine building, Xe133 and Xe135 determination in the

uncondensable gases coming out of the condenser (CVI) and tritium determination in both primary and secondary system).

Nevertheless the team suggested that the continuous injection of boric acid into the secondary system on those units that are waiting for their steam generators to be replaced be implemented as soon as possible (Units 2 and 4).

The team also suggested that the Li on-line monitors (installed on the primary circuit but actually not operational) be made more reliable and be put back in operation as soon as possible.

Finally the team suggested that Dampierre investigate the possibility of increasing the cooldown rate of the primary system between 170°C and 60°C, in order to optimize the oxygenation phase of the RCS during shutdown for refueling.

7.3. CHEMISTRY SURVEILLANCE PROGRAMME

An extensive chemical surveillance programme exists to monitor the chemical parameters of the different systems. This programme is accomplished by relying on an extensive set of on-line monitors and on well performed chemical and radiochemical analyses and measurements.

Analysis methods are clearly understood and are being strictly followed. Analyses are scheduled to respect the specifications frequency. Appropriate standards and reagents are being used. The results are submitted to the operations personnel in a timely manner. The quality of the analyses are in accordance with the established requirements.

The corporate chemical and metallurgical laboratories (GDL) started to organize a yearly national cross comparison of chemical analysis results. Last year a series of boron and lithium samples were analysed and this year chlorides, fluorides and sulfates were determined. This initiative is strongly supported. A cross comparison programme could also be established internally between the different Dampierre laboratories, as well.

The Unit 1-2 chemistry section operates the demineralized water preparation plant. In order to avoid the presence of organic compounds in the plant systems, the incoming water is pretreated in a chlorination installation. In the different stages of the water preparation process the compliance with very strict specifications on organic compounds and remaining chlorine is verified.

7.4. CHEMISTRY OPERATIONAL HISTORY

All chemical data are effectively collected and analysed in an efficient manner. Most of the chemistry data coming out of the day by day surveillance programme is stored and archived on a software basis, and hard copies of all data are also safely and efficiently stored and archived.

However, readings of on-line monitors and results of laboratory analysis are not sufficiently trended and the team suggested extension of trend analysis of chemical parameters when the new computer application becomes available end 1997.

Both Dampierre chemistry sections are producing regular reports including monthly reports and reports after each outage, an overview of the evolution of all interesting parameters, a synthesis of all significant events and well structured incident reports.

The responsibilities for reporting and experience feedback analysis are clearly defined and effectively implemented. All reports receive appropriate management attention. Internal and external experience is evaluated by experienced people. To perform this correctly, the chemistry sections are assisted by the corporate organizations. Lessons learned are effectively incorporated into policies, procedures and training.

After an industrial safety incident with chemicals in the demineralized water plant, during which asphyxiating chlorine vapours were produced, some effective corrective actions have been implemented. One of these actions provided the possibility to open the roof of the building with an emergency button, so that vapors can escape. Although it is very unlikely that a similar incident will ever happen again, one should consider the potential environmental consequences of such a gas release.

7.5. LABORATORIES, EQUIPMENT AND INSTRUMENTS

The chemistry laboratories and sampling stations are well equipped and have adequate space. The housekeeping is also good.

The analysis chemicals that are used have the required quality. All analysis and measuring equipment is regularly calibrated. Current calibration standards and procedures are being used.

During the last couple of years a considerable effort has been made to develop chemistry working procedures. Nevertheless approximately 12% of the working procedures have not yet been either created or rewritten. The team recommended the outstanding working procedures which contain the calibration rules be developed as soon as possible.

The on-line monitors are currently controlled and GDL comes to the site every year to verify these devices. Three years ago GDL performed an extensive cross comparison (with their own monitors and with manual analysis results) of all on-line monitors in Dampierre.

On the primary system of each unit, a monitor is installed to measure the boron concentration on a continuous basis. The recalibration periodicity of this apparatus is 2 years, which is rather high compared to international standards. This is compensated for by a regular mini-calibration as soon as a small drift is observed.

The storage of chemicals used for analysis is well controlled. Sufficient qualified spare parts are available. Readily available shower and eye wash facilities are installed, although not all were in good working condition.

The post accident sampling and analysis system (PASAS) has to be completed: the team recommended that equipment to transport the samples and a measuring device to perform γ -spectrometry on post-accident water and air samples should be developed.

7.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS

The quality of operational chemicals is well under control using the products and Materials for Use in power plants system (PMUC), recently developed by GDL for operational chemicals. This system is based on certification according to the ISO 9000 standards. For most of the products at least two possibilities are on the approved list.

To control the quality of the emergency diesel fuel, some characteristics have to be checked periodically. The acceptance criteria for these controls are part of the chemical Specifications (SCH) edited by GDL. These requirements are not integrated in the technical specifications (STE), as they are in most other countries.

However, since the chemical specifications are actually being revised (to revision 2) and are now submitted for the approval of the Nuclear Installations Safety Directorate (DSIN), this concern will automatically be resolved, as both documents (SCH and STE) will be practically at the same level of importance. In the revision 2 of the SCH the fuel characteristics to be controlled are significantly extended.

7.7. RADIOCHEMICAL MEASUREMENTS

Accurate routine measurements are performed to determine aerosol, iodine and gas activities in many liquid and gaseous samples. α -total, β -total, γ -total, tritium, γ -spectrometry are measured. The team considered the α -spectrometry system available at the Dampierre site as a good practice.

A yearly cross comparison in γ -spectrometry is organized with the laboratories for the measurement of ionising radiations (LMRI) and with DSRE. This programme could be extended to other types of measurements.

In the SRE laboratory for liquid and gaseous effluents release control, the same radiochemical measurements are performed in the same accurate way. For these measurements the procedures prescribed by the office for protection against ionizing radiations (OPRI) are well followed. The procedure to permit a release is also well structured.

Fuel elements integrity is monitored during normal operation by surveying the fission product content of the primary circuit water. A reactor core is considered 'clean' ('coeur propre') when the following conditions are met : Xe133 activity < 185 Mbq/t during operation and no I131 peak during transients. The value of 185 Mbq/t corresponds to an average background activity level originated by fission products created on the outside of the fuel pins (U contamination).

With a higher Xe133 value the fuel cladding is 'suspected to leak'. In that case the fuel elements are sipped during the next outage, first qualitatively in the mast of the (un)loading machine, where outgoing gasses are captured in an air stream. On the elements with a positive response to that test, the leak dimension is determined in a sipping cell in the fuel building (BK).

Fuel elements with cracks bigger than 35 micrometre are not reloaded. Smaller leaks are considered not being an inhibition to reloading the fuel element. If the total activity of La, Ba and Np in the liquid sipping sample is below 100 Mbq/t.

Last year, in all EDF 900 MWe plants 35 elements were identified as leaking. Five of them have been reloaded, one of them in the Dampierre Unit 3, equipped with new steam generators. None of them has caused a significantly higher level of activity in the primary system.

The EDF policy to reload fuel elements with small leaks under well thought out strict conditions was considered acceptable although not in accordance with the 'zero leak' philosophy of some other countries. This policy needs continuous careful review in units which have steam generator tube leaks and secondary side steam leaks to atmosphere. This is the case on Unit 4 at Dampierre.

Some years ago the chemistry section of the twin Unit 1-2 advised not to reload a leaking MOX fuel element, although it was fulfilling the criteria which allowed it to be re-used. Their advice was followed by the plant management.

STATUS AT OSART FOLLOW-UP VISIT

The Chemistry Group has managed to totally resolve its two recommendations, one suggestion and has made satisfactory progress in two suggestions.

On-line Li monitors were being upgraded in two of the units and would be upgraded in the other two units by the end of 1998. The team considered that there was satisfactory progress in this area and the completion of this work and the procedures put in place should totally resolve this issue.

It was accepted that the current cool down rate used at the plant to limit the migration of corrosion production coupled with dose rate limits imposed before major work started during outages, satisfactorily demonstrated that doses would be ALARA and resolved the issue.

A user friendly computer network application has been installed at other plants of the utility and will be installed at the plant in October of this year. Evidence from the new MERLIN system installed at Gravelines demonstrated that comprehensive monitoring and trending of chemistry parameters was possible. The team considered that there was satisfactory progress in this area. The installation of the system and operating procedures at the plant in October 1998 should significantly improve the capability of the plant to monitor chemistry parameter and resolve the issue.

Procedures have now been written and issued for all analytical equipment in operation and the team considers that the issue of lack of documents and control of procedures is resolved.

To resolve the PASAS issue the plant has projects to determine the methods of manual sampling containment air and primary coolant and how the samples should be transported and analyzed. In addition, the plant has procedures to reconnect the boron and activity analysers within approximately one hour at the request of the emergency management team to monitor these parameters. The team considered this issue resolved.

DETAILED CHEMISTRY FINDINGS

7.2. CHEMISTRY CONTROL IN THE PLANT

7.2(1) Issue: The Li concentration in the reactor coolant system is frequently lower than the lower limit in the technical specifications, especially at the end of each fuel cycle. The main reason for this is that the installed Li on-line monitors are not reliable and at present they are taken out of service. Consequently, operations and chemistry people are not immediately aware that the Li concentration is low and, as a consequence, the pH of the primary water is low, although this only occurs for rather short periods of time. The pH policy at Dampierre NPP is to keep it as close as possible to 7.0 during the whole fuel cycle. For this purpose lithine (LiOH) is added to the reactor coolant when pH is going down. The lithine is injected by batch each time a laboratory analysis of a primary sample shows a low Li concentration. This method is time consuming. Putting back into operation the existing Li monitors, after implementing the planned modification to have a direct connection with the boron meter, will accelerate the process for adjusting pH and can be a solution to the problem. GDL is leading a project to develop a continuous injection system for all EDF plants. However, the earliest planned installation date for this system is 1999.

The technical specifications (STE) contain an upper limit (2,2 ppm) and a lower limit (0,6 ppm) for the Li content of the primary circuit. If this lower limit is violated, the pH level drops and the corrosion rate in the primary water rises. The first consequence of this is that the outage dose rates will increase and over the longer term primary system components, especially the fuel cladding, could be attacked.

Suggestion: Consideration should be given to taking all necessary measures to reduce the occurrence of low Li concentration. Prioritizing the modification of the Li on-line monitors and enhancing the reliability of those monitors is a good short term solution.

Plant response/action:

The Li on-line monitors were upgraded by the manufacturer in March 1998.

The modification enabling connection of the Li on-line monitors with the incoming signal indicating boron concentration was studied, and its implementation begun (cable feeding, pickup of signal from boron meter, etc.).

As part of the modification is only possible during outages, it has been implemented in Units 1 and 3, and is scheduled for Units 2 and 4 during the 1998 outages. Definitive startup of the equipment will take place during the first half of 1998 in Units 1 and 3, and after the 1998 outages for Units 2 and 4.

The lack of reliability has been resolved via the incoming signal from the boron meter, which enables automatic reading, every morning, of the boron concentration value, and hence monitoring of the appropriate lithium concentration (the boron value was previously displayed 'manually' following reading of the boron meter).

IAEA comments: The upgrading of the Li on-line monitors has been completed in Units 1 and 3. Commissioning tests began at the beginning of June 1998 and demonstrated that there was a good correlation between the existing manual sampling methods and the new automatic system.

Before becoming fully operational these tests will continue until the end of July 1998 to ensure the new system is functioning properly. After that period manual sampling will only be carried once a week.

The team agreed that the completion of the upgrade at all the units will be sufficient to address the intent of the suggestion.

Conclusion: Satisfactory progress to date.

7.2(2) Issue: The current maximum reactor coolant cooldown rate of 28°C/h is too slow to optimize the oxygenation phase of the RCS during shutdown for refueling. The chemical procedure to shut down the plant for fuel reloading has recently been revised for Units 1/2 and will soon be revised on Units 3/4 to provide better control the oxygenation process during the cooldown. This user friendly step-by-step procedure is used in close collaboration with the operations team and contains several hold points at which shutdown has to be stopped if chemical parameters are not met.

One of these steps is extremely important for the activation products migration rate in the primary circuit and consequently for the radiation dose rates during the outage. In this step, the primary system has to be cooled down as fast as possible from 170°C to 60°C. At 80°C, hydrogen peroxyde is added to passivate the fuel cladding.

Technical specifications allow a maximum cooldown rate of 56°C/h. The operations procedure however limits the cooldown rate to 28°C/h. This limit is an obstacle to optimizing the oxygenation phase of the reactor coolant system and consequently minimizing the outage dose.

Suggestion: Consideration should be given to optimising the cooldown rate taking into consideration other consequences of a rapid cooldown rate, in order to perform the oxygenation phase of the primary system in optimal conditions, so that the outage dose can be kept ALARA.

Plant response/action:

The cooldown rate of the primary system at Dampierre is in compliance with Normal Operating Rule (RCN) RCN AR 1 which enables shutdown of units from reactor at full power to authorization for descent below 4 bar relative (maintenance outage). The Normal Operating Rule prescribes 'cooling at as close to 28°C/h as possible without exceeding this value'.

Compliance with this temperature gradient is justified by the following:

- it corresponds to the nominal values of the connected systems (charging flow rate associated with contraction of reactor coolant, etc.) taken into account in accident studies (e.g. reactivity accidents in shutdown conditions),
- it enables compensation of the constraints induced by the numerous temperature stabilization stages over 3 hours in length during the cooldown phase to a maintenance outage.

This criterion thus satisfies the dual concerns of compliance with accident study hypotheses and avoiding subjecting the primary system to excessive thermohydraulic constraints (penalizing transients referred to as 'conditions').

With regard to the oxygenation phase, the same Normal Operating Rule recommends performance of oxygenation of the primary system from 80°C in the case of injection of oxygenated water (120°C in the case of oxygenation using air).

IAEA comments: The team accepted that, although increasing the cool down rate would reduce migration of highly active corrosion products to the circuits, constraints put in place to ensure that dose rates were below certain limits before major work commenced addressed the issue. Comparison with collective doses at similar reactors in other countries, coupled with firm evidence of downward trend in doses at the company's plant supported this view.

Conclusion: Issue resolved.

7.4. CHEMISTRY OPERATIONAL HISTORY

7.4(1) Issue: Readings of on-line monitors and laboratory analysis results are not sufficiently trended. The reason for this is that the computer application (A22) is not able to perform an effective trending in a reasonable period of time.

At the end of every day all data gathered by the different chemistry technicians (on-line monitor readouts, chemical and radiochemical analysis results and measurements, data on the status of the main and some auxiliary systems) are entered in the A22 application, manually or by unloading a computerized acquisition device. This A22 application does not enable automatic generation of trend analysis tables or graphs. To produce such trending means data have to be searched and re-entered manually, which is very time consuming. Within one year a modern user friendly computer network application (MERLIN) will be available.

Lack of extensive trend analysis will prevent the plant discovering a deviation at an early stage and enable investigation and elimination of the cause of the deviation before specifications are violated.

Suggestion: Consideration should be given to trending more systematically all important chemistry parameters, monitored on line or determined by periodic analysis or measurement. The new computer application MERLIN will be of great help to achieve this objective.

Plant response/action:

Monitoring of chemical, physical and radiochemical parameters is currently performed by the Chemistry section using a computerized application (A22), which is admittedly not very user-friendly. However, the operator is informed of any shifts or abnormal values in any of the key parameters. In addition, a weekly summary of the parameters is sent to the Shift Operations Manager. These provisions are described in plant memo D5140/NS/CDI.11.

To make it easier to monitor trends in these parameters, the NPP has decided to make use of the possibilities offered by the new corporate application MERLIN, which enables, in particular, data acquisition via a portable acquisition terminal (computerized chemistry field inspection).

As initial installations of MERLIN at power plants encountered certain technical difficulties, Dampierre will only be equipped with the application, following a test phase, during the second half of 1998.

Nonetheless, the site has made preparations for the arrival of the application to ensure that it is operational as soon as it is installed. The parameters which will be more specifically monitored and the organization of trend monitoring have been defined (plant memo D5140/NT/98.117). It will be possible to modify these provisions if necessary in accordance with the actual possibilities of the application once it has been installed.

IAEA comments: The MERLIN system has been installed at Civaux, Blayais and Gravelines and will be installed at Dampierre in October 1998.

Information received from Gravelines showed that the MERLIN system, which will be fully commissioned there by the end of June 1998, was able to provide comprehensive analysis and trending of chemistry parameters. The system will also provide operators with daily results with the previous day's results for comparison.

Procedures have also been written for trend analysis and daily record sheets for operators which specify the parameters to be recorded. Action levels have also been prepared. The team considered that the completion of the installation of the MERLIN system and implementation of the operating procedures will significantly improve the chemistry monitoring of the plant and will adequately address the suggestion.

Conclusion: Satisfactory progress to date.

7.5. LABORATORIES, EQUIPMENT AND INSTRUMENTS

7.5(1) Issue: A number of working procedures ('gammes') are not present at the working places. This is because either the document has not been created yet, or because it has to be completely rewritten as a consequence of major modifications to the equipment.

In a counting room practically all procedures for the radiochemical measuring devices (γ -spectrometry, α -total, β -total, γ -total, tritium) are missing. During a six monthly document status control check it was noted that about 12% of the working procedures are to be created. The backlog is especially important for the equipment procedures.

The concept of the analysis or measuring equipment procedures is global: the documents contain all necessary information to use, to control and to calibrate the equipment.

The absence of analysis and measuring equipment procedures will prevent the chemist technicians from having an essential tool that may help them in carrying out activities and in minimizing human errors.

Recommendation: The backlog in developing or rewriting equipment procedures should be eliminated as soon as possible.

Plant response/action:

Procedures relating to laboratory equipment currently in service have now all been updated.

IAEA comments: Procedures have been issued for all analytical equipment in operation. Overall, the plant has responded well to the recommendation with all of procedures for operational equipment written and included in the plant's quality control system. Documents issued so far are available as controlled documents in the laboratories accompanied by the appropriate record sheets.

There was also evidence that the new documents were being used by the laboratory staff. To assist in monitoring the progress in producing documents, controlled indexes specifying the procedures, their current status and issue number were in place.

The completion of the documentation for all operational equipment and procedures to prevent the use of equipment without proper procedures in place meets the requirements of the recommendation.

Conclusion: Issue resolved.

7.5(2) Issue: The EDF policy concerning a post accident sampling and analysing system (PASAS) has still not been completely determined and implemented. One of the reasons for this is that EDF, practically from the beginning wished to consider beyond design accidents as a part of the topics to be covered.

After a long but unsuccessful search for a system that could deal with all situations, the philosophy was changed completely. Nowadays the PASAS problem is split up in four areas: taking into account design basis accidents (DBA) and beyond design basis accidents (BDBA) and, for each type of accident, an accidental (first 24 hours) and a post-accidental phase.

For the accidental phase of a DBA all EDF plants have at their disposal a qualified device to measure the radioactivity of the primary water and of the containment air. The boron concentration of the primary circuit can be determined either with the qualified neutronic boron meter or by a calculated balance.

For the accidental phase of a DBA and BDBA, neither sampling nor manual analysis is needed. To evaluate the potential release hazard, predetermined source terms will be used. This conclusion is considered acceptable.

For the medium and long term post-accidental phase of a DBA a γ -spectrum of the primary water and containment air activity could be helpful. EDF is convinced that the actually installed sampling devices are sufficient to be used in post-accident conditions. Until now, EDF has not reached a conclusion on the device to bring the samples to the laboratory and on the equipment to measure these samples. Also the discussion on whether this equipment has to be constructed 'now' or after the accident has happened, is still ongoing.

Not having the possibility to transport and measure samples of primary water and containment air will deprive the group managing the emergency of information on what is happening inside the reactor coolant system and the containment.

Recommendation: In order to solve the PASAS-issue, the methods for transferring the samples from the sampling stations and the methodology to measure the γ -spectrum of highly contaminated water and air samples should be determined as soon as possible.

Plant response/action:

In the event of an accident, the primary objective is to return the nuclear steam supply system to a safe fallback condition, with the reactor sub-critical. To attain this objective, there is no need to perform sampling and analysis manually on the installation.

In addition, the corporate strategy for evaluating the radiological consequences in the environment under accident conditions is as follows:

- forward evaluation of releases on the basis of pre-determined data (and not actual measurements),
- real-time monitoring of releases via the stack,

— measurements at the plant and in the environment.

Once again, this methodology requires no manual sampling or analysis to be performed on the installation.

As a result, and in contrast with practises in other countries, the emergency management envisaged for nuclear power plants in France does not require measurements following manual sampling on the installation.

For long-term emergency management (off-procedure situations), to define unit restoration actions (ambient conditions in the reactor building and peripheral premises), it would be necessary to know, in particular, the specific activities of the containment air and the reactor building sump water.

These restoration actions (assessment, rehabilitation of premises, restart of the installation) would naturally be based on precise diagnosis of the level of deterioration of the core (in particular the fission product inventory), but the associated measurements would not be necessary in the short term. The time available would enable development, if necessary, of specific processes adapted to the ongoing situation.

However, the studies conducted, and some studies still under way, enable the following responses to be given:

Sampling periods and sample volumes

The periods for the first sample are:

- for primary system water, approximately one month for design-basis accidents and approximately one year at least for serious accidents.
- for reactor building air, approximately 7 days, regardless of the type of accident.

The volumes to be sampled, in view of the currently known requirements in terms of measuring results, have been minimized, and are one cubic centimeter (or even a fraction of a cubic centimeter) for primary system water, and 25 cm³ (normal pressure and temperature) for reactor building air.

The periods and volumes selected thus help limit dose rates.

Feasibility of transfer of samples

For design-basis accidents, EDF's (SEPTEN) radiation exposure studies, incorporated into DSRE memo D4006.52/96.082/AAC, show that, for air and water, the use of a lead cask of limited thickness would be sufficient.

For serious accidents, studies are still under way, and should be completed shortly.

Feasibility of gamma spectrometry using normal laboratory equipment

For reactor building air, measurement on the sample in container 'SG25G' will not present any problems for the two categories of accidents.

For primary system water, dilution might be necessary in certain cases (to be defined), otherwise direct measurement on the type 'SG15' container is possible.

The file relating to this problem (DSRE/GEV 8801) is scheduled for examination at corporate nuclear power plant operations level during the first half of 1998.

IAEA comments: Emergency procedures are in place to reconnect the boron and activity on-line analyzers if required within 1-2 hours after an accident at the request of the emergency management in order to monitor these parameters. In addition, projects have been identified to determine methods of manually sampling containment air and primary coolant and how the samples should be transported and analyzed at some time after an accident to assist in recovering the reactor. The team considered that the recommendation had been adequately addressed.

Conclusion: Issue resolved.

7.7. RADIOCHEMICAL MEASUREMENTS

7.7(a) Good practice: Each twin unit chemistry section has at its disposal a complete α -spectrometry set. This equipment will only be used if the α -total measurement is above the detection limit. The fact that this measuring device is present on a nuclear power plant site is above international standards. The available redundancy is rather exceptional. These α -spectrometers were brought to the Dampierre site in the light of the use of mixed oxides (MOX) fuel elements. That type of fuel is already present in Units 1 and 2 and will be loaded into the Unit 4 reactor in 1997. With the above mentioned equipment the chemistry sections are able to monitor efficiently an eventual α -contamination of the primary system and connected circuits.

The training programme to get acquainted with this equipment has been elaborated in cooperation with the Gurcy-le-Châtel training centre. This programme is integrating the DSRE doctrine on the subject and is essentially based on the DSRE reference procedure ('gamme'), for both the sample preparation and the measurement activities.

This equipment can also be used on fluids other than primary water. So it is an essential tool, especially for reactors with MOX fuel, to determine the origin and the amplitude of an eventual α -contamination.

8. EMERGENCY PLANNING AND PREPAREDNESS

8.1. EMERGENCY ORGANIZATION AND FUNCTIONS

EDF is a large utility with 55 nuclear power reactors at 20 sites and as such it is able to provide a sound basis for specialized fields like emergency preparedness. Corporate level departments in Paris are responsible for generic emergency planning and the sites are responsible for implementing them taking into account the local conditions. The corporate level departments provide additional support when the sites request it. The corporate level departments contribute effectively to the emergency planning and preparedness providing support in most of the areas in coordination with external organizations.

To ensure continuous support, the operations department, DXP, in Paris has four emergency planning engineers: a supervisor, an engineer for international relations and two for national emergency planning. The on-site emergency plan (PUI) coordinators at various sites keep good contact with each other for example they have annual common meetings.

Dampierre NPP has the complete responsibility for its emergency preparedness. The coordination responsibility of emergency planning belongs to the safety and quality team (MSQ) which reports directly to the plant manager. The head of MSQ presents PUI issues also to the plant technical safety committee (GTS) to which the plant and department managers belong. MSQ has one full-time PUI coordinator with appropriate authority who reports to the head of MSQ. The organizational arrangements are well understood and contribute to effective emergency planning and preparedness. The various departments are committed to their PUI responsibilities.

Numerous national, provincial and municipal organizations contribute to off-site emergency planning and preparedness. The rescue service manager is the prefect. The most important central national authorities are the nuclear installations safety directorate (DSIN), and its technical support organization the Nuclear Protection and Safety Institute (IPSN), the meteorological institute in France and the office for protection against ionising radiation (OPRI).

In addition MARN which is a department within the Ministry of Interior contributes to matters regarding national emergency planning policy and in case of a radiation accident is able to dispatch a support team to the prefecture. The national, provincial and local authorities have an active and cooperative attitude for emergency planning and preparedness.

8.2. EMERGENCY PLANS

The on-site emergency plan (PUI) clearly defines the tasks and responsibilities of emergency organizations. The PUI plan is updated, checked and approved according to plant directives. The corporate level emergency planning provides valuable support to the sites in the case of a crisis. In addition, surrounding EDF sites can provide further assistance to the crisis site.

The emergency organization has a sufficient pool of 273 authorized persons; 50 of them are on stand-by each week and can rapidly augment the shift staff. Dampierre NPP has two independent automatic means to contact emergency staff: radiomessages to pagers and telephone messages to

home telephones. The telephone alarm system uses 10 telephone lines and lasts only 3 minutes. Each individual is expected to respond immediately that he/she has received the call and arrive at the plant within 60 minutes. The manning of emergency organization has been tested frequently with success: During off-hours 20 % of on-call personnel have arrived within 10 minutes and 98 % within 30 minutes.

The off-site emergency plan (PPI) describes the responsibilities of authorities and potential protective actions to be conducted. Within the 10 km emergency planning zone there are nine communes. A new procedure for iodine pellets is under discussion.

8.3. EMERGENCY PROCEDURES

The on-site emergency plan (PUI) contains appropriate implementing procedures. They have a clear layout which often uses illustrative logic diagrams and preformatted sheets for registering situation based data.

The shift manager (CE) can trigger the on-site emergency plan (PUI level 1) for a conventional accident. If the situation requires triggering on-site emergency plan level 2 (site emergency) or level 3 (general emergency), then the shift manager contacts the plant management. After arriving at the NPP the plant emergency manager can declare an on-site emergency level 2 or 3. In the very unlikely case that neither the plant emergency manager nor his alternates have responded within ten minutes the shift manager can contact the EDF national emergency team (ENC) and nuclear installations safety directorate (DSIN) in Paris. Notifying the prefecture requires the decision of the plant emergency manager or his assistant (PCD1 or 2). However, the provincial and local authorities may be informed even earlier. The notification process uses independent automatic group messages via both telephone and radio.

The team suggested the use of 3 to 6 different weather stability classes in atmospheric dispersion calculations instead of the present two; this data can be acquired either from the Dampierre weather mast or from off-site meteorological stations. EDF is participating in research work concerning meteorological measurements and calculation methods; the team suggested that in long term Dampierre NPP make use of this development work. The team noticed also that methods for calculating actual releases that by-pass the stack are not available and suggested establishing such methods.

8.4. EMERGENCY RESPONSE FACILITIES

During a an on-site emergency (PUI) level 2 or 3 the command posts at Dampierre are in three locations:

- Site management command centre (PCD), site assessment emergency centre (PCC) and site logistics emergency centre (PCM) which are located in the administrative building or in the security building.
- Emergency technical centre (LTC), common for a twin unit and within a few minutes walk from PCL, the command post of the local emergency response team (ELC);
- Site operations emergency centre (PCL) adjacent to the control room.

At present, command posts PCD, PCC and PCM are located in non-protected rooms in the 3rd floor of the administrative building. In the case of contamination, these functions would be transferred to a security building where the space and equipment are more limited. As relocating command posts during an emergency could cause confusion, Dampierre has decided to establish permanent command posts in the security building in 1998. This is the most important current activity in Dampierre PUI. Placing PCD, PCC and PCM permanently in the security building offers a unique opportunity to re-evaluate the functions and equipment of the on-site emergency organization.

The site assessment emergency centre (PCC) assesses actual and potential releases and provides the site management command centre (PCD) with useful data to be transmitted to the authorities. The PCC has wall mounted panels, seven environmental parameters and one terminal, which displays, in addition to weather and off-site radiation, steam generator & condenser radioactivity concentration, core outlet temperature, containment pressure & dose rate. The terminal does not display trend curves of these parameters.

The local emergency response team (ELC) in consultation with national EDF emergency response team (ENC) and nuclear safety authorities (IPSN), makes a diagnosis and prognosis of the accident progression.

Plant process computer (KIT) & safety parameter display system (KPS) terminals provide extensive information about plant status and trends; they are normally active in the Site Operations Emergency Centre (PCL) and exist also in other command posts. During the review, it was noticed that the activation of the plant process computer (KIT) at these other command posts may take one hour after the initiating event. The team suggested that this time be reduced. At Paris ENC KIT & KPS may not be activated until two hours after the event.

The medical centre at Dampierre NPP has extensive equipment for monitoring, decontamination and giving first aid for injured persons.

The Murat corporate emergency response centre has effective working conditions. The central EDF technical assistance command post in La Défense is also well equipped, having among other facilities and equipment, tools for analysing and prognosing the accident sequence. It will move to northern Paris (St. Denis) in 1998. The facilities and equipment will have the present quality level. The number of EDF locations in Paris is going to decrease, this should improve the effectiveness of the on-site emergency planning activities as well.

8.5. EMERGENCY EQUIPMENT AND RESOURCES

The emergency equipment is well maintained. The recently commissioned dose control system MICADO has improved not only dose control but also personnel inventory. It can promptly list persons from 12 separate radiation controlled areas (RCA); however, two of these areas are relatively large covering the reactor building, auxiliary building and fuel building of a twin unit. The MICADO system gives also a work category code that helps in finding missing persons.

The control room emergency telephone has an effective device that can identify the location (telephone number and room) of the caller even after hangup.

During the review, it was noticed that the recently installed 10 radiation monitors at the site fence exit have only local display, which may limit their usefulness in an accident scenario.

8.6. TRAINING, DRILLS AND EXERCISES

The main competence of the organization of the on-site emergency planning is based on each person's normal work and its requirements. The specific emergency functions need dedicated PUI training.

Training requirements for each position are described in the individual training schemes (PIF) of each organizational unit. Many of them adequately include the PUI part. Operations department, radiation protection group and other organizational units train their personnel for accident situations. However, there is not yet an overall coordinated PUI training programme. The Plant Technical Safety Committee (GTS) has requested the safety and quality team (MSQ) to formalize a PUI training plan. The PUI coordinator has started developing a systematic PUI training programme. It defines for each PUI vacancy the pool of on-call persons, the PUI functions, capabilities, training and evaluation.

The feedback from PUI level 2 or 3 exercises has been properly collected and assessed by the GTS committee. The required improvements have been implemented. Coordination with Paris corporate departments & emergency organizations as well as joint DSIN & IPSN command post has been tested frequently, since the central units participate in about eight exercises annually.

An accident simulator SIPA, near Lyon, is also used for operator training. Next year an accident simulator SIPAC, which is basically SIPA in compact form, will be available for training in Dampierre and other EDF nuclear sites. The shift operation managers (CE), shift technical advisors (CT) and operators will be trained there one week each year. SIPA and SIPAC include severe accident phenomena but at present radiological models are not going to be included. SIPAC is going to be used in PUI level 2 or 3 exercises in real time.

The team recommended that Dampierre should confirm requirements for initial and refresher training according to each PUI post and provide a coordinated follow-up. In addition, persons on the on-call list should participate in the PUI level 2/3 exercises on annual basis.

The national EDF fire training centre (500 km from Dampierre) includes realistic models of electrical building, turbine hall & radiation controlled zone rooms.

8.7. LIAISON WITH PUBLIC AND MEDIA

Dampierre's communication unit and EDF's corporate management have well equipped facilities for communication. In case of a NPP emergency, in addition to the damaged power plant and corporate PCD, other EDF nuclear power plants also give press releases and reply to reporters' inquiries. The active information policy of EDF is a demonstration of their capabilities also during an emergency. Through the local information committee Dampierre NPP keeps close contact with the representatives of local authorities and population.

An information brochure 'What to do during an accident at Dampierre' made in co-operation with the off-site authorities has been distributed to each household within the 10 km emergency planning zone. This booklet describes the potential protective actions very practically, but the last distribution

was in 1991. The team suggested that Dampierre NPP should consider proposing a more frequent distribution of information concerning protective actions.

STATUS AT OSART FOLLOW-UP VISIT

The Emergency Preparedness Group have managed to fully resolve the recommendation and the four suggestions.

Methods to estimate the release rates based on the on-site monitors and pessimistic estimates of the size of the release are sufficient to address the issue and manage the accident. Nevertheless, the company is considering improving estimates of the consequences of different steam/water phases in the secondary circuit and if successful could incorporate them in the plants' accident envelopes. The team considered this issue resolved.

The plant has detailed methods of determining the dose rates down wind after an accident based on 7 weather categories, incorporated in two weather classes and plant conditions. Further work is being carried out as part of a Franco-German project to add a further weather class, however the team considered that the current methods provided sufficient information to manage the accident during the initial phase and felt the plant had resolved the issue.

Considerable work was carried out by the group to improve the emergency training procedures including incorporating changes to plant organization at the beginning of 1998. All call-out emergency personnel now have training profiles, packages and have participated in two to three exercises. The team considered that the issue totally resolved.

The improvements in communications with the local population; media and local emergency organizations were commendable and went well beyond the requirements of the suggestion. The team considered that this resolved the issue and would greatly assist the emergency organizations in protecting the public in the event of an accident.

DETAILED EMERGENCY PLANNING AND PREPAREDNESS FINDINGS

8.3. EMERGENCY PROCEDURES

- 8.3(1) Issue:** Methods for calculating actual release rates that by-pass the stack are not available.

Dampierre NPP has ten stable radiation monitors at the site fence, four at a distance of 1 km and four at 5 km. The monitors at fence do not have remote display, the others can be read from PCC.

In addition there are radiation monitors in the main steam lines. In case of steam generator leakage they react to the increase of N-16 -activity in the secondary circuit. N-16 is a short-lived activation product that exists only when the reactor is on power. In an accidental primary to secondary leakage, these radiation monitors might react qualitatively. However there is inadequate knowledge of the correlation between dose rate and activity concentration; further, there is no method to calculate the atmospheric release based on activity concentration, steam density and the functioning of steam line relief valves.

Real time knowledge of ongoing release rate enables fast calculation of radiation levels in the release plume area. The consequences of ongoing release by-passing the stack cannot be calculated without an appropriate method. Should there be simultaneous release paths through and by-passing the stack, the stack radiation measurements would not give a correct basis for off-site radiation calculations.

EDF has produced a useful handbook to make conservative prognosis of releases and release time schedules of various accident types. However, these conservative estimates might have different magnitude than the actual releases.

Suggestion: Consideration should be given to establishing a method to estimate actual release based on the near-site dose rate monitors at site fence and at distances 1 km & 5 km and a computerized method to calculate release rate from secondary circuit. This procedure should be based on measurements of radiation, flow and pressure in the secondary circuit and the status of secondary circuit relief valves. These calculation methods could also contribute to emergency exercise scenario planning.

Plant response/action:

The development of a calculation method for estimating actual releases based on near-site monitors is not currently considered necessary, as there are no provisions, in France, for decisions to be taken regarding counter-measures, in the short term, on the basis of the results of measurements performed in the environment. These decisions would be taken on the basis of equipment condition criteria, to enable incorporation of an anticipatory approach into the implementation of counter-measures.

Under accident conditions, we feel that it is not important to seek accuracy, but rather to gain a rapid overview of the potential consequences in relation to the action levels recommended for the implementation of counter-measures. We also feel that the guide available for emergency teams, which enables them to give, on a fairly rapid basis, a reasonably pessimistic overview of the

radiological consequences for the coming hours, effectively meets the expectations of the Public Authorities. This approach, which is still not very widespread, is beginning to interest certain other countries (Belgium, Sweden, UK, Slovakia).

Nonetheless, we are convinced of the benefits of supplementing estimates made at the plant with measurements carried out in the environment. A technical/economic assessment of an increase in the number of monitors and relaying of their data to the emergency centers has been carried out. The Nuclear Power Plant Operations Committee decided on February 2, 1998, not to relay the information provided by monitors at the site boundary, but to improve monitoring of the environment via the installation of 10 additional gamma tracer-type monitors ('genitrons'). These monitors will be installed in different communes or locations around the site during 1998.

IAEA comments: Current methods to estimate the actual release rates are based on pessimistic estimates of the size of the release supplemented by dose rate information from the site radiation monitors.

It is recognized that site monitoring systems can at best only give an indication of the size of a release which will be strongly dependent on source location and weather conditions. In practice the monitors are really only useful in confirming that an off-site radiological hazard exists, therefore implementing calculational procedures to estimate the size of the source will have limited value.

Nevertheless the plant recognizes that some improvements can be made in estimating releases and because of this, the company in conjunction with the Safety Authorities is analysing the consequences of different compositions of steam/water phase in the secondary circuit based on pressures in the primary and secondary circuit. This project may be completed by the end of 1999 and the results could be incorporated in the plant's accident envelopes depending on their value.

The team considered that the issue had been addressed and that the plant had provided a satisfactorily response to the suggestion.

Conclusion: Issue resolved.

8.3(2) Issue: Dampierre weather station weather stability measurement is inaccurate and Dampierre NPP uses only two weather stability classes.

The real shape of a release plume (width of risk sector and the concentration of radioactive materials) depends highly on the weather type. At Dampierre, these classes are estimated by measuring the temperature difference between 10 m and 80 m levels from the ground. The weather mast is lower than a good practice for vertical temperature gradient measurement would require. Several other EDF nuclear sites have SODAR weather measurement stations which should provide more comprehensive local data. SODAR is relatively new technology and wider use of it requires solving present technical problems.

The protective actions to be taken by the near-site population are based on calculated effective and thyroid doses caused by actual and potential release. Inaccurate weather stability parameters lead to inaccurate dose estimates.

Suggestion: Consideration should be given to using 3 to 6 different weather stability classes in atmospheric dispersion calculations; this data can be acquired either from the Dampierre weather mast or from off-site meteorological stations. Direct measurement of wind turbulence or fluctuation of wind direction might provide a better basis for weather stability than vertical temperature difference. In long term Dampierre NPP should follow the results of ongoing development concerning meteorological measurements and calculation methods. EDF participates in a French-German research project that develops atmospheric transport calculating methods.

Plant response/action:

The model used for forward assessments of radiological consequences is the model recommended by the safety authorities (IPSN). This model is intentionally simple, which makes it easier to use in an emergency situation. Another reason for choosing it is that excessively sophisticated models do not appear necessary for assessments of short-term radiological consequences, as the accuracy which could be derived from them would still not enable compensation of the uncertainties associated with knowledge of the source term and, in addition, would not be in keeping with the scale of application of counter-measures in the field.

To take account of the concerns of the Public Authorities, certain conservative factors have been incorporated to prepare a global estimate of the short-term radiological consequences, while remaining reasonably pessimistic to avoid excessive decisions.

Improvements are nonetheless being sought within the framework of a Franco-German working group. In response to a request from the safety authorities in both countries, a new model has been developed, with 3 dispersion classes (in place of the current 2). The IPSN is set to implement this model in its emergency center in early 1999. EDF, for its part, is studying the technical and financial impact of the application of this new model on measuring equipment and emergency tools.

However, it is worth noting that, after three hours, forecasts of radiological consequences would be calculated not on the basis of meteorological measurements made at the plant, but on the basis of forecasts transmitted by Météo-France.

Finally, EDF and Météo-France are working in close cooperation to prepare for a potential accident situation, as evidenced by the development by Météo-France, with the support of EDF, of a method of statistically adapting processing of digital model data to improve local wind forecasting for each plant.

IAEA comments: Although the plant uses only two major weather classes, i.e. normal and abnormal conditions, estimates of dose rates down wind are actually based on 7 standard weather categories provided by the company. These categories, which are based on wind speed, direction, time of day and precipitation, are manually calculated using a simple flow chart. Dose rates down wind are then calculated using the appropriate weather category and accident conditions.

A third weather class is being developed under a Franco-German working group, however, in the initial phase of an accident, when the implementation of urgent countermeasures is a priority, the current system would seem to be satisfactory. Because of this the team considered that the plant had satisfactorily addressed the suggestion.

Conclusion: Issue resolved.

8.4. EMERGENCY RESPONSE FACILITIES

8.4(1) Issue: Activation of plant process computer (KIT) terminals at emergency technical centres (LTC) may take too much time to ensure prompt availability of information needed by local emergency response team (ELC) at LTC.

Plant process computer (KIT) & safety parameter display system (KPS) terminals provide extensive information about plant status and trends; they are normally active in the site operations emergency centre PCL and KPS is also available in LTC, but the activation of a KIT-terminal in the emergency technical centre (LTS) requires calling a person from on-call-lists and operations that take about 10 to 15 minutes. The required arrival time is 60 min at Dampierre.

The local emergency response team (ELC), in consultation with the National emergency response team (ENC) and the nuclear safety authority (IPSN), makes the diagnosis and prognosis of the accident progression. KIT and KPS also exist in the national command posts of ENC and IPSN; also their activation needs a person from the on-call list and he/she must arrive within 2 hours.

Suggestion: Consideration should be given to reducing the time required to activate the KIT terminal at a LTC. Some ways of achieving this are providing LTCs with a stand-by KIT-terminal or procedurizing immediate activation of the LTC KIT-terminal by operational shift crew or relocating emergency technical centres closer to the site operations emergency centres (PCL);

Plant response/action:

The time required to activate the KIT terminal at the Emergency Technical Center (LTC) is in fact only 10 - 15 minutes max. This reflects the time required to respectively disconnect and reconnect the nuclear auxiliaries building control room terminal and the LTC terminal.

The period of 60 minutes referred to corresponds to the maximum authorized time which PUI on-call staff can take to reach their posts. All exercises conducted to date show that the teams of the different emergency centers are operational in less than 30 minutes.

However, a monthly exercise is performed by I&C technicians to train the corresponding staff to perform the switchover of the KIT terminal within as short a time as possible (procedure number GTR8802).

Technical Aspect/Modification

It is not technically possible to install a stand-by KIT terminal in the LTC, as the current design only enables connection of three terminals (1 for the main control room, 1 for the Safety Engineer and 1 for the Nuclear Auxiliaries Building or the LTC). It is for this reason that provision was made for this switchover, which unfortunately cannot be performed 'immediately', and therefore cannot be performed by the operations teams engaged in controlling the unit. The design modification does not appear justified in view of the observed 15-minute switchover time.

IAEA comments: Although it is accepted that the time to activate the KIT terminal in the Emergency Technical Center is dependent on the time for call-out team members to arrive, similar terminals are available on-line in the operation control rooms and at the headquarters of the company and the safety authorities. Thus irrespective of the time for the call-out team to arrive, information on plant conditions is available at all times to assist in emergency decision making. Therefore the current systems should be sufficient to ensure immediate information is available if required.

Conclusion: Issue resolved.

8.6. TRAINING, DRILLS AND EXERCISES

8.6(1) Issue: Dampierre NPP has neither a coordinated on-site emergency training programme nor an on-site emergency training register. A majority of persons on the on-call list do not participate in on-site emergency level 2/3 exercises on an annual basis.

PUI training requirements exist only in departmental general training procedures. Yet for same PUI functions persons from different suborganization units can be appointed.

In 1996 only about 50 persons of 273 on the on-call list participated in level 2 or 3 PUI technical exercises. PUI level 2 or 3 exercises provide the necessary organizational interfaces that are needed for co-operation functions. Annual exercises for each individual is a proper way to reveal potential improvement items.

Recommendation: Dampierre NPP should confirm requirements for initial and refreshment training according to each PUI post and keep a coordinated follow-up of conducted PUI training. The safety and quality team (MSQ) should oversee the level of PUI training requirements. Systematic PUI training programme including annual PUI level 2 or 3 exercises for all persons on the on-call list should be defined and confirmed.

Plant response/action:

The Dampierre Nuclear Power Plant has confirmed its requirements in terms of training and refresher training for each PUI post. These requirements were set down in a Local Professional Training Programme (PLAP) which determines, for each person on the on-call list, a method of acquiring the minimum knowledge of the actions associated with the PUI post.

The PLAP defines the following elements for each PUI emergency center:

- the profile of the on-call person, and any constraints inherent to the activity,
- definition of the activity associated with the type of on-call duty,
- the knowledge and skills necessary for effective performance of the activity,
- acquisition of the knowledge and skills,
- assessment.

A PUI field has been included in the Nuclear Safety authorization.

The knowledge and skills required by the on-call person concern:

- the job function: technical and professional skills (including industrial safety, quality and nuclear safety aspects),
- PUI organization: objectives, resources, tools, interfaces with Public Authority organizations,
- the facilities associated with the PUI activity.

The constraints associated with effective performance of the activity are identified. They are analysed by the Site Occupational Health Doctors, and the PUI on-call staff member is subjected to a medical fitness examination if necessary.

The PUI PLAP (Memo D5140/NT/97.79) has been validated by Plant Management following review by the Safety Technical Committee.

Each emergency center supervisor must ensure that their emergency center staff have participated in at least one level 2/3 exercise each year.

Practical implementation of these actions began in September 1997, with progressive and actual introduction in line with the implementation of the new site organization.

IAEA comments: In response to the recommendation the plant began implementing a plan and a programme of work to ensure that emergency personnel were adequately trained. However, after the re-organization at the beginning of 1998 the programme had to be altered to incorporate new posts and personnel.

The new programme was put in place in May 1998 which demonstrates that all personnel on the call-out list are trained in accordance to procedures and have participated in 2-3 emergency exercises. Of particular merit was the incorporation of medical examination to ensure personnel were fit to perform their emergency function.

The team also recognizes the thoroughness of the implementation of the programme.

Conclusion: Issue resolved.

8.7(1) Issue: The information brochure ‘What to do during an accident at Dampierre’ made in co-operation with the off-site authorities has not been distributed to near-site (within 10 km) population since 1991. This booklet, which contains practical information concerning alarms, sheltering, iodine pellets and evacuation, has been the principal advance information channel to the population of the local evacuation arrangements. Some important local data is outdated. The availability of this information booklet decreases during long distribution intervals.

Suggestion: Consideration should be given to proposing to the authorities a more frequent information distribution than until now. Annual information to the local inhabitants concerning protective actions within emergency planning zone is desirable.

Plant response/action:

The external communications strategy of the Dampierre NPP is based around three key lines of approach:

- communications by the plant,
- communications in conjunction with the Prefecture,
- communications on the initiative of the Prefecture.

These communications approaches, which concern in particular local populations, elected representatives and the media, enable regular information to be supplied to local residents.

1) 1997 - The key elements of the this communications approach in 1997 were as follows:

a) Communications by the plant

- Distribution of the NPP’s annual results to the inhabitants of the 9 neighboring communes located within the Off-Site Emergency Plan (PPI) zone (a 10 kilometer radius around the site). This represents a total of approximately 13,000 copies. The results (distributed by post) are aimed at providing local residents with better information on the activities of the plant.
- 10 meetings with local elected representatives on different subjects.
- 3 press files on site results and chlorination of cooling systems.

These elements are coupled with a certain number of media information actions, e.g. press releases (10 in 1997), large numbers of visitors (5628 in 1997) and events for schools (125 in 1997). All of these actions enhance knowledge of the activities of the plant, and enable provision of regular information.

b) Communications in conjunction with the Prefecture

A far-reaching operation has been organized around the distribution of iodine tablets to local populations in the vicinity of our installations (in communes within the PPI zone). The provision of iodine tablets follows a decision by the office of the Health Secretary of State on April 11, 1996. It is aimed at bringing an anticipatory approach to prevention, and represents an improvement in the protection of local populations. The actions undertaken were as follows:

Distribution of an 'Operation Iodine' bulletin (17,000 copies) to inhabitants and to the local government offices of the 9 neighboring communes (within a radius of 10 km around the site), explaining the conditions of provision of the tablets, and recalling the instructions to be followed in the event of an accident.

Organization of 10 public meetings in the 9 communes concerned, which covered the following subjects:

- explanation of the reasons behind the distribution programme,
- description of the accident scenario which may lead the authorities to order the consumption of iodine tablets,
- reminder of the instructions to be followed in the event of an accident, and the measures which could be taken by the authorities in respect of populations in accident situations.

Organization of 2 meetings for healthcare professionals (doctors and pharmacists) and a meeting for heads of schools.

c) Communications on the initiative of the Prefecture

Distribution of a letter from the 'Local Information Committee' (CLI) to local inhabitants in the vicinity of the power plant in November (the previous information letter was distributed in November 1996).

Meeting of the CLI on July 10, 1997, which the NPP, covered the following subjects:

- incidents occurring at,
- chlorination of cooling systems,
- the effect of the drought on the operation of the power plant,
- provision of iodine tablets.

2) 1998

Similar communications actions are planned for 1998. However, the following specific points are worth noting:

a) Communications by the Plant

- Distribution of annual results (13,000 copies) took place in March 1998.
- An image survey in the area around the NPP, aimed at analyzing the information needs of the surrounding population, will be carried out in April 1998.

b) Communications in conjunction with the Prefecture

- Reissuing and distribution of the brochure 'Que faire en cas d'accident?' ('What to do in the event of an accident') are planned.
- An emergency drill, putting into practice the Off-Site Emergency Plan (PPI), is scheduled for November 98. It may include a civil defense aspect. This necessitates joint preparation, with provision of information to elected representatives and local populations.

c) Communications on the initiative of the Prefecture

- Distribution of a letter from the CLI to local inhabitants in the vicinity of the power plant is planned.
- A meeting of the CLI is scheduled for May 98.

IAEA comments: In response to the suggestion, the plant has initiated major improvements in its methods of communication with the public which go well beyond the requirements of the suggestion .

The combination of meetings with the local population, media communications, the provision of information packages and the pre-distribution of iodine tablets should significantly improve the emergency organizations' capability to successfully implement their emergency plans

Conclusion: Issue resolved

**SUMMARY OF STATUS OF RECOMMENDATIONS AND SUGGESTIONS OF THE
OSART MISSION TO DAMPIERRE - JUNE 1998**

	RESOLVED	SATISFACTORY PROGRESS	INSUFFICIENT PROGRESS	WITHDRAWN	TOTAL
Management, Organization & Administration	2 R 2 S	3 R			5 R 2 S
Training & Qualification	1 R 3 S	1 S			1 R 4 S
Operations	2 R 3 S	1 R			3 R 3 S
Mechanical Maintenance	2 R 1 S				2 R 1 S
Technical Support	2 R	1 R 1 S			3 R 1 S
Radiation Protection	2 R 1 S	2 R	1 R		5 R 1 S
Chemistry	2 R 1 S	2 S			2 R 3 S
Emergency Planning and Preparedness	1 R 4 S				1 R 4 S
TOTAL R (%)	14 R 64 %	7 R 32 %	1 R 5 %		22 R 100 % S
TOTAL S (%)	15 S 79 %	4 S 21 %			19 S 100 %
TOTAL (%)	29 71 %	11 27 %	1 2 %		41 100 %

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.

ACKNOWLEDGEMENTS

The Government of France, the Nuclear Installations Safety Directorate (DSIN), Electricité de France (EdF) and the staff of Dampierre nuclear power plant provided valuable support to the OSART mission to Dampierre. France has provided significant contribution to the OSART programme by sending experts to other OSART missions, seconding a cost free expert to the staff of the NOSS Section of the IAEA, in providing consultants to review the OSART programme and in hosting OSART missions to eight French plants. Such close co-operation between France and the IAEA in all nuclear activities has established many personal contacts and a common basis for efficient work.

Throughout the whole OSART mission and the follow-up visit, the team members enjoyed excellent co-operation and fruitful discussions with Dampierre 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 that established many personal contacts that will not end with the completion of the follow-up visit and submission of this report. The efforts of the plant counterparts, liaison officers, interpreters and the secretarial team were outstanding. This enabled the OSART teams to complete their work 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 Dampierre nuclear power plant review and follow-up.

TEAM COMPOSITION OSART MISSION

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Assistant Team Leader

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Area: Technical Support

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Area: Maintenance

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Area: Training and Qualification

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Area: Radiation Protection

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TEAM COMPOSITION OSART FOLLOW-UP VISITS

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IAEA

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Team Leader

Review areas: Management, Organization and Administration
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AngraII, BRAZIL

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Hartlepool Nuclear Power Station, UK

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Review areas: Radiation Protection
Chemistry
Emergency Planning and Preparedness