



**IAEA**

International Atomic Energy Agency

**REPORT  
of the  
OPERATIONAL SAFETY REVIEW TEAM  
(OSART)  
MISSION**

**TO THE  
CIVAUX  
NUCLEAR POWER PLANT  
FRANCE**

**12 to 28 MAY 2003**

**AND**

**FOLLOW-UP VISIT**

**6-10 DECEMBER 2004**

**DIVISION OF NUCLEAR INSTALLATION SAFETY**

**OPERATIONAL SAFETY REVIEW MISSION**

**IAEA-NSNI/OSART/04/118F**

## **PREAMBLE**

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

This report also includes the results of the IAEA's OSART follow-up visit which took place 20 months later. The purpose of the follow-up visit was to determine the status of all proposals for improvement, to comment on the appropriateness of the actions taken and to make judgements on the degree of progress achieved.

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

**FOREWORD**  
**by the**  
**Director General**

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

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

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

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

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

The report that follows presents the conclusions of the OSART review, including good practices and proposals for enhanced operational safety, for consideration by the Member State and its competent authorities. It also includes the results of the follow-up visit that was requested by the competent authority of France for a check on the status of implementation of the OSART recommendations and suggestions.

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## INTRODUCTION AND MAIN CONCLUSIONS

### INTRODUCTION

At the request of the Government of France, an IAEA Operational Safety Review Team (OSART) of international experts visited Civaux Nuclear Power Plant from 12-28 May 2003. The purpose of the mission was to review operating practices in the areas of Management Organization and Administration; Training and Qualification; Operations; Maintenance; Technical Support; Radiation Protection; Chemistry; and Emergency Planning and Preparedness. This OSART mission also included an enhanced review of Operating Experience Feedback, that is documented in the area of Technical Support. In addition, an exchange of technical experience and knowledge took place between the experts and their plant counterparts on how the common goal of excellence in operational safety could be further pursued.

The Civaux OSART mission was the 118th in the programme, which began in 1982. The team was composed of experts from the United States of America, Germany, Finland, Canada, Sweden, United Kingdom and Belgium together with the IAEA staff members and observers from Brazil and IAEA. The collective nuclear experience of the team was approximately 300 man-years.

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

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

At the request of the Government of France, the IAEA carried out a follow-up to the Civaux OSART mission from 6-10 December 2004. The team comprised of four members, one from Germany, one from Sweden and two from the IAEA. Three of the four reviewers in the team had been members of the original OSART team. The purpose of the visit was to discuss the actions taken in response to the findings of the OSART mission.

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

## MAIN CONCLUSIONS

The OSART team concluded that the managers of Civaux NPP are committed to improving the operational safety and reliability of their plant. The team identified a number of commendable features at Civaux NPP, including the following:

- A well motivated staff who work together as a team with shared responsibility
- A culture of openness and honesty in identifying potential areas for improvement
- Good support for the operations department in their central role
- Management willingness to involve all levels of the staff in programs for improvements is evident in most of the areas.

Civaux NPP is a new plant and the present material condition of the plant is good. However, the team observed early signs of decline in housekeeping and material condition. The plant is encouraged to further its efforts to maintain housekeeping and material condition.

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

- Enhance the attention to detail and adherence to rules in several areas of human performance; for example: industrial safety and several other areas
- Civaux NPP should accelerate the implementation of corrective actions
- Greater attention should be paid to low level and near miss events.

Although not the subject of a specific proposal in the report, the plant should consider benchmarking its performance against the best international plants.

An important element of the OSART review is the identification of those findings that exhibit positive and negative safety culture aspects of operational safety performance. The OSART team used the guidance provided in INSAG-4, INSAG-13, INSAG-15 and the IAEA Safety Report Series No 11 to assess various organizational and technological aspects of operational Safety Culture at Civaux NPP. The team concluded the following positive aspects of safety culture exist:

- The plant has a strong commitment to being open minded to new ideas
- Good communication has been established between departments
- Teams are motivated and work effectively with a desire to improve.

The team also recognized the pride of the workers and managers in their nuclear power plant and was impressed with the staff's professionalism. Senior management should continue to encourage and reward the staff's behavior in this area.

The team also recognized some areas of safety culture where Civaux should seek a higher level of performance. These were:

- Enhance a culture of following rules, as needed in the area of Industrial Safety
- Managers and supervisors should increase their oversight of field conditions and spend more time in the plant coaching and listening to workers
- The plant should set uniformly high standards for performance for all departments.

The team recognized that several actions are already in place to address some of the above proposals. The Civaux management expressed a determination to improve in the areas identified by the team and indicated a willingness to accept a follow up visit in about eighteen months.

Interviews were conducted with various levels of workers, including senior managers, middle managers, line managers, control room staff, technicians and field workers.

Those interviewed consider safety a high priority which is most visible in:

- OTF structure (organization to support operations);
- Well integrated Operating Experience from other French plants and technical exchanges;
- Training;
- Short management hierarchy;
- Safety and QA organization.

Nearly all workers felt personal responsibility for safety.

## **FOLLOW-UP MAIN CONCLUSIONS**

The follow-up team received excellent co-operation from the Civaux NPP staff and was impressed by the progress that had been made. The willingness of the plant management to consider the recommendations and suggestions made by the OSART team in May 2003 and to implement operational safety changes is a strong indicator of the plant's desire to achieve continued future success. The plant has worked hard and successfully to address the issues raised by the OSART team.

The plant made a thorough analysis of the recommendations and suggestions and implemented several different programmes that support the resolution of many of the issues. The approach of the plant was to integrate the response to OSART issues with their ongoing improvement program built around strategies to enhance pragmatism, rigour, and helping each other. In particular, management's emphasis on rigour focuses on many of the issues identified by the OSART. Civaux has also worked in conjunction with Chooz plant, the other N4 plant, to monitor system condition and to develop common solutions.

The follow-up team was particularly impressed with Civaux actions to encourage managers and staff to spend more time in the field. Several programs have been instituted to assist the plant in reaching the point where managers now spend about 40% of their time in the field. The time in the field is used to observe actual plant conditions and to coach workers in such areas as housekeeping and industrial safety. As a result plant housekeeping is much improved.

In the area of industrial safety, the plant has clearly defined expectations, and the OSART follow-up team saw that people working in the plant generally meet these expectations. Industrial safety performance has improved since the time of the OSART, however the plant recognises that further improvement is possible.

The plant has worked to instil greater rigour in the activities to identify and fix material condition issues in the plant. A rapid response team has been assembled and under the Monitoring, Investigation and Performance structure (VIP program) all those involved in developing and implementing engineering solutions come together and work toward closure of identified items.



The plant has aggressively developed a programme to identify and analyse low level events. The result of this program has been the early identification and correction of some issues before they could become more severe. By seeking international contacts and feedback, the plant has become one of the leaders within EDF in development of this program. Corrective actions, whether from the low level events programme or other programmes, are dealt with in a timely fashion.

# 1. MANAGEMENT, ORGANIZATION AND ADMINISTRATION

## 1.1. CORPORATE ORGANIZATION AND MANAGEMENT

The Civaux Centre for Nuclear Production of Electricity (CNPE) is a two reactor (2 x 1450 MWe – N4 design) site operated by “Electricité de France” (EDF). The N4 design is the most recent of the French fleet of nuclear plants with only seven percent of the EDF plants of the N4 design. EDF is a very mature nuclear organization with 58 nuclear units supplying about 80% of the power in France.

The corporate organization provides support through the DPN (Nuclear Power Plant Operations Division). The President of EDF is ultimately responsible for nuclear safety and quality and delegates authority to the director of DPN. Site management reports to the DPN director. Corporate direction provides a clear focus on safe and reliable operation and assists the site organization to establish goals and objectives consistent with that focus.

The corporate organization provides sufficient resources to support the site in virtually all areas of operation. Site management, through the level of department managers, considers the corporate organization to provide valuable support. Safe and reliable operation is a focus for the corporate and site organizations.

EDF has recently restructured along world geographical lines to more effectively meet the demands of European wide market de-regulation and the near term changes in structure of EDF. These changes will apply added stress to the nuclear plant organizations as EDF changes in the future. The Civaux management team is aware of the potential impact of these changes and is developing, but has not completed, action plans to address them.

## 1.2. PLANT ORGANIZATION AND MANAGEMENT

The Civaux organization has been designed from its inception to be participative in the management of the units. While this participative approach is used, it is clear that the plant manager has overall responsibility for safety. This is clearly understood throughout the organization while individuals in the organization are mindful of their contribution to safety. Committees and sub-committees are used extensively to make management decisions by a consensus approach. With a few exceptions (notably the operational meeting called ROP) these committees are chaired by the plant manager. Significant efforts are expended to assure adequate preparation for these meetings by all management levels involved (Plant Manager Deputy Plant Managers (DPM), advisors, and Department Managers (DM)). These efforts are necessary in order to ensure adequate time for consensus building for the decisions. When consensus cannot be reached, the plant manager makes decisions. The senior staff indicates this is rarely necessary.

This approach provides a high level of management team involvement in decision making and acceptance of decisions at all management levels. It demands a significant effort on the part of the plant manager and deputy managers. The participative approach is viewed positively by department managers. Advisors function in an advisory capacity to both the plant manager and the department managers. Decisions are generally made at the subcommittee level and validated by the primary committee, the direction team. The subcommittees are organized along support subject lines (e.g., Human Resources, Communications, Quality of Operations). Implementation of all decisions is the responsibility of the department managers and is monitored by the ROP. The department managers' implementation of decisions, actions and programmes is not always timely or uniform in

approach. The team has recommended that the plant complete a number of items as soon as possible and establish a culture that ensures a timely completion of activities important to improved plant nuclear safety and operations.

The department managers report directly to the plant manager. While this widens the plant managers span of control it reduces the number of management interfaces in the organization. Department managers rely on deputy department managers and First Line Managers (MPL) for day-to-day management support. The first line managers are a large group that includes shift operators, and field operators, and maintenance foremen. This group is charged with supervision of plant activities. The plant has initiated a training program to enhance professionalism and foster autonomy for these individuals. The program is developed by a smaller group of first line managers called the “mirror group.” That group reflects the needs of the entire group. The team recognizes this as a good practice.

The plant staff consists of approximately 700 managers and workers. Extensive use is made of contractors particularly in the maintenance area during routine operations as well as outages. Computers are used extensively and effectively throughout the plant and organization. There are a significant number of computers (approximately 750) on-site. The staff is effectively using these computers to support safe and reliable operations. The staff size is adequate for safe and efficient operations and control of plant activities.

The process of staff rotation and selection is well established in the EDF system and is implemented at the plant. Candidates are considered for rotation on an annual basis as nuclear system wide and plant needs are established. For needs within the plant, plans are made up to about one year in advance to bring people on to the staff (or move them within the staff) to work with their counterparts in the organization. This allows a significant degree of training and interaction to be obtained prior to the candidate taking the plant position. At Civaux, after a period of time, the individual must prepare a report, called “the Newcomer Report”, of noteworthy observations and experiences for management use. The structure of the report is purposely not constrained in order to assure the most open and direct comments possible. This report allows the existing management team to benefit from the experience of others. The team considers this a good practice.

The plant uses a mature system of performance appraisal coupled with a skills competency review on an annual basis to continually assure individuals are qualified for their assignments. The process is participative with both interviewer and interviewee expected to prepare and participate in the review. All skills are reviewed during the interview process and mastery is determined at the apprentice, acquired, mastery or mastery in a durable way categories. Each skill is also evaluated for the interviewee’s knowledge of theory, implementation of that knowledge and their behavior. Nuclear safety behaviors are evaluated in this regime.

The management structure and philosophy has placed safe operations, as embodied in the operations department, at the core of their safety approach. During plant operation, the operations department is the focus of everyone’s support. Owners of equipment (e.g., owner of pumps, owner of valves) are established to provide the shift managers and shift operators with the necessary information to ensure that equipment in operation is safe and reliable. System engineers, instrumentation and control, electro-mechanical maintenance, radiation protection, and Nuclear Environment Logistics (LNE) form the next layer of support. Other functions within the plant serve to support the operational needs. This organization is effective in assuring the safe and reliable operation of the facility.

During 2002 the plant experienced a number of INES level 1 events. The management team has considered the number to be excessive and identified attention to detail and adherence to

programs and procedures (rigor) as an important attribute to continue to achieve safe operations. A series of workshops has been established but not completed for all personnel to focus on rigor. These workshops are brainstorming sessions held at the department level. The results of the workshops are to be submitted to management for review and action. The team has noted that improvement in adherence to policies is necessary within the industrial safety, maintenance, radiation protection and chemistry areas. The team encourages management to complete this review and resulting actions in a timely manner.

Recently, some of the basic site policies have been reflected in a program to focus worker attention to detail by issuing pocket sized cards to all workers that re-enforce 7 key principles. The principles focus on adherence to safety practices and all site requirements. Each individual is to commit to these principles. Management is encouraged to continue evaluating methods to measure the effectiveness of this program.

The plant vision, mission, and goals are established within the consensus framework of plant management. Goals are established each year in a timely manner and are reviewed and approved at the corporate level. Once approved, goals contracts are established for the managers and the departments. These goal contracts are well documented and publicized.

Some goals may not be challenging enough to assure continued improvement when the targets are based on EDF averages. An important target has been relaxed from previous years because it has not yet been achieved (INES level 1 events in technical specification compliance). Problems are evident in industrial safety as indicated by the high industrial safety lost time accident rate. The industrial accident rate goal continues to be set around the EDF average. The EDF average and Civaux performance are above the international median. The team encourages management to continue to establish goals that will continue to enhance performance.

The process of monitoring, and reporting the status of goals to all workers is thoroughly computerized and rigorously implemented at the management level. Progress towards achievement of the established goals for the plant, departments, and projects is provided on a monthly basis in performance indicators and comprehensive reports. These reports include comments by management on what can be done to improve performance. Management is continuing to stress the importance of monitoring and achieving these goals at all levels of the organization. In addition to the status of goals, most other plants related documents are available on the computer system. The system also contains agendas for upcoming meetings, minutes of previous meetings, and the vision, mission and goals for the site. The system also provides access to the routinely updated performance indicators, reports on site and departmental contracts (goals), and a number of routine documents. The system is used by all levels of the management staff and workers are using the system in their work activities. The team considers the development and application of this computerized internal communication system a good practice.

Plant programmes are generally effective in supporting safe and reliable plant operation. Improvements in housekeeping have recently been made. Much of the success of this housekeeping effort has been due to the high visibility management has placed on this program through dedicating individuals to direct the improvement. Management is encouraged to continue this housekeeping improvement by implementing plans to support the active involvement of the operations department in maintaining the site housekeeping condition.

A programme to achieve a key objective of ISO 14001 certification in 2004 is proceeding well. The program is on an established schedule and has effective ownership. An evaluation of the plant needs to achieve certification has been conducted. Creating programme

awareness throughout the site is beginning. The majority of programmes and procedures important to achieving certification exist. New programs or program enhancements are being developed. Site awareness training will soon be implemented. Site management is encouraged to continue the strong focus on this effort to assure certification by the spring 2004 goal. One change the plant has implemented will significantly benefit the implementation of ISO 14001. The plant has introduced arrangements to limit the risks of dangerous material accidents by conveying dangerous products and materials in accordance with the site's load dependant routing plan. This will help to avoid spills and any resulting environmental impact. The team considers this a good practice.

The Civaux outage management programme continues to make progress in the area of operational safety, quality, radiation protection, environment and performance. The outage management system is the responsibility of the deputy plant manager and is implemented by the outage management department on a full time basis. The management system implementation has resulted in the development of systems, structures, tools and methods such as the outage process information system, the close involvement of operations and chemistry staff in the outage process, and the outage line-up system. All outage activities are coordinated by means of an integrated information system. Additional information on outage management is contained in the Maintenance Area (MA).

Civaux has established a partnership with the Chooz plant in northern France. The partnership between the two N4 sites of the fleet of nuclear plants allows experience to be exchanged, resources and competencies to be shared and progress made in terms of each station's performance. The results have been immediate in the area of fuel handling and I&C testing and should benefit the long term operation of both facilities. The team considers this partnership a positive aspect of site management efforts and encourages continued extension of the partnership..

An exception to the effective programs is the field evaluation program established to monitor activities in the field and plant material conditions. The team has recommended that the program effectiveness should be improved by focusing efforts on observing and correcting adverse conditions, behaviors, and activities in the field, and enhancing the management oversight of field conditions.

The plant has an established smoking policy. The team observed numerous instances of lack of adherence to the policy and inconsistent application of the policy by allowing smoking in the workshop and control room areas. The team recommended the plant reevaluate the policy, set consistent limitations and assure enforcement of the policy.

### 1.3. QUALITY ASSURANCE PROGRAMME

The role and function of quality assurance is clearly defined within corporate and site documents. The plant has developed policies which form the core of their operational and quality philosophy. The President of EDF retains overall responsibility for safety and quality with delegation through the DPN director to the site manager. A comprehensive policy has been developed for the management of quality. Policy requirements are translated to procedures that are implemented at the site. Based upon the interaction of the team, safety and quality are considered important values by the site personnel.

The Safety and Quality Engineering department (SQE) is responsible for implementation of the quality program at Civaux. The program is implemented by established procedures to control the evaluation of quality through audits and evaluations. Daily field evaluations play an important role in the quality function of the department.

Audit areas are established on an annual basis on a June to June cycle. Normally, three to four areas are recommended. Plant management requests additional audits of various areas as they perceive the varying needs of the organization. This number varies but has been as high as twenty in recent years. The audit schedule and any changes are approved by the direction committee composed of the plant manager, deputy plant managers and advisors. The committee is encouraged to continue to challenge the postponement of audits as was evidenced in recent decisions. Audits are conducted in accordance with established plans and procedures. Results are reported to management and action plans are developed as necessary. These reports provide meaningful information to management about the quality and safety of performance on the site.

The SQE performs a daily evaluation of plant conditions for both units in operation. This evaluation is thorough and covers all technical specification requirements and plant conditions. An engineer performs the evaluation and daily, during the week, reports his results on a daily basis to other engineers within the SQE and engineering departments. He also compares his results to those determined by the shift manager in his evaluation of plant conditions. This combined effort by the SQE and operations departments is considered a positive aspect of the program by the team.

The plant has decided to outsource many of the activities of the site related to maintenance and outages. The areas to outsource are determined in accordance with established corporate requirements and the process is controlled and implemented properly. Contracts containing the requirements of performance are established with the various contractors. A determination is made to allow a contractor to perform services using his own quality assurance program or to use the Civaux program.

#### 1.4. REGULATORY AND OTHER STATUTORY REQUIREMENTS

The SQE is responsible on site for maintaining interactions with the regulator. One individual within the department has the primary role. Corporate support is available for this function. A data base is available to support written communications with the regulator. The primary interface is with the regional regulatory office at Bordeaux.

The regional regulator provides oversight for eight reactors at three sites with a staff of seven including regional management. The regulator is focused on the newness of the plant and its design and maturity of the reference documentation. Inspection activities are generally planned and announced with the exception of a number of inspections each year. Inspection results are now posted on the regulatory website.

Written communication between the regulator and the plant are acceptable. Some events have not been reported in a timely manner. A number of requests for waivers from requirements have been submitted by the plant. Some have been approved by the regulator.

The regulator perceives the cooperative agreement between Civaux and Chooz in a positive perspective. It will be reviewed as the partnership matures and experience with the N4 design is accumulated at the plant and corporate EDF interaction increases.

The regulator considers interaction with the plant to be acceptable and no major shortcomings have been identified. Meetings will take place in the near future with the new plant manager and his deputies.



## 1.5. INDUSTRIAL SAFETY PROGRAMME

The industrial safety programme at Civaux is a documented programme managed by the industrial safety and radiation protection department (SRP). The programme addresses the major areas of personnel protection, protective equipment, chemical awareness, and industrial hazards.

The plant manager has overall responsibility for industrial safety at the site. The SRP reports to the plant manager. At Civaux, the workers consider they have a responsibility for the safe nuclear operations of the plant. Unlike the workers' attitude to nuclear safety, it is not clear that the workers consider industrial safety as their responsibility. This lack of responsibility for industrial safety manifests itself in not wearing protective clothing and not adhering to industrial safety policies.

The industrial safety accident rate is substantially higher than international experience. The achievement through April 2003 is 7.1/million work hours for EDF and contract workers (9.6/million work hours for EDF workers). The median performance of the world nuclear plants is 1.5/million work hours (including only utility workers). To address these issues, the team has recommended that the plant should improve industrial safety practices including worker performance in following and implementing established personal protection policy and equipment requirements.

The plant programmes for industrial safety are implemented by the SRP. The SRP, in conjunction with the warehouse, has initiated a programme to review and approve all personnel protection equipment used on site. Each product in use was reviewed for safety considerations and the review and basis have been documented. Approved protection equipment is formalized in a clearly documented binder for reference purposes. Requests for new equipment are evaluated and approved for use in the same manner. The team considers this a positive aspect of the industrial safety program.

The SRP also is responsible for the implementation of a programme to alert workers to chemical hazards in their work environment and respond to workers who have questions in industrial safety, chemicals hazards and radiation programmes. The programme allows workers to call a telephone number and request information about, among other things, chemicals and products in the work place. Based on the team's review this portion of programme is not effective. The team has recommended the plant should ensure all workers have access to, and are aware of, important information related to chemicals and chemical products in their work environment.

## 1.6. DOCUMENT AND RECORDS MANAGEMENT

The plant has instituted a document management system based primarily on an established computer network that meets the quality assurance requirements for records. The centralized system handles essentially all documents generated at the facility. All documents are computerized. Quality controlled electronic signatures are provided as appropriate.

Procedures are the most important of the safety documents coordinated by the system. Use of procedures in the field is controlled through the computer. The procedures are available to all workers at their work stations. Changes to procedures are strictly controlled to ensure that workers can only use the latest approved procedure to conduct work activities.

The computer system is available over the entire site. Care has been taken to ensure there is no interface between this administrative system and the plant operating computers.

## **STATUS AT OSART FOLLOW-UP VISIT**

For the five recommendations from the original OSART mission, the team found that three were resolved and two are making satisfactory progress.

The plant has put in place a framework to promptly address technical problems. Under the Monitoring, Investigation and Performance structure (VIP program) all those involved in developing and implementing engineering solutions come together and work toward closure of identified items. A rapid response team has been instituted to provide more timely actions.

One of the plant strategies is to pursue rigor in performance and the plant has intensified its efforts to encourage the staff to plan activities well and meet the schedule. Coordination with CNEN, CNEPE and Chooz NPP has been enhanced.

A program of management visits to the field has been organized and over 180 field visits have been conducted. In addition, field visits are conducted within the departments and by the industrial safety group. Following the outage, work sites in the plant are checked prior to turnover to Operations.

A policy was adopted that all industrial areas are non-smoking areas. Areas where smoking is allowed have been clearly designated. During a tour of the plant no evidence of smoking in improper areas was observed, although the team was told that some progress is still needed in the administrative buildings. The plant is also providing medical programs to assist people who would like to stop smoking.

The plant now records and investigates all accidents. Greater attention is focused on lost time accidents, but even minor accidents receive a review. The requirements for personnel protection are now clearly listed for each area and building. The safety group conducts risk prevention tours and sees that the identified problems are corrected. And, when workers receive chemicals, they are issued sheets containing safety information about the chemical. These sheets discuss the hazard, the necessary protective measures and what should be done in the case of an exposure.

The process for issuing chemicals has been revised so that unused chemicals must be returned to the warehouse for proper handling. Unused chemicals are no longer left in the field. The team toured the warehouse and found it to be in very good condition. Chemicals were safely stored, properly marked, and generally well handled.



## DETAILED MANAGEMENT, ORGANIZATION AND ADMINISTRATION FINDINGS

### 1.2. PLANT ORGANIZATION AND MANAGEMENT

**1.2(1) Issue:** Plant actions to support correction of identified deficiencies or problems, required analyses, and important new programs are not timely.

- Longer term corrective actions to address the common cause[s] from INES level 1 events in 2002 are not planned for final implementation until January 2004.
- The following long-standing DMPs (temporary modifications) have been seen during plant tours:
  - Unit 2 turbine hall DMP 2CVI 2849 condenser vacuum system which had been in place since 24/7/00.
  - Unit 1 auxiliary building DMP 9571 1RCV 024 MP there are a number of outstanding surveillance test procedures for infrequently performed surveillances. These have been incomplete since plant commissioning.
- Ninety-one deviation sheets (operability assessments) exist in the operations department.
- Long lasting temporary instruction No. 664 issued by RP on 25/04/2001 - administrative (modification of access to orange zone area).
- Higher than normal dissolved oxygen levels existed in the secondary system from November 2002 to April 2003.
- An emergency shower and eye wash station in the bulk chemical storage building not tied into water system for a year.
- While all equipment has nationally and locally developed preventive maintenance programme, twenty-two optimized preventive maintenance programs for important systems have not been developed and the action plan has them completed by EDF corporate (60%), Chooz engineering (20%) and Civaux engineering (20%) over the next two years.

Long time frames to implement corrective actions, establish important programs, and complete required analyses can lead to repetitive events, new events, and unnecessary maintenance activities.

**Recommendation:** The plant should complete the noted items as soon as possible and establish a culture that ensures a timely completion of activities important to improved plant nuclear safety and operations.

#### **Plant Response/Action:**

#### **Root-cause analysis**

An analysis based on different deviation categories has been conducted, revealing an operational management system that is too removed from the field, following the example of a well placed strategic management system.

Strategic principles and decisions:

The efforts made since the OSART mission have focussed mainly on:

- dealing with recurrent technical problems
- monitoring of commitments made following an event report or a safety inspection
- processing of discrepancies observed in the field
- management of temporary installations (DMP)
- adherence to time-scales for dealing with work requests
- management of temporary operating instructions in the control room.

1. Dealing with recurrent technical problems:

- setting up of a Monitoring, Investigation and Performance structure (called VIP) for managing and dealing with technical issues (see TS 5.2.(1))
- site engineering structure managed in close co-operation with that of Chooz NPP
- close co-operation between the CNEN, CNEPE (Corporate Engineering Units), the NPP and headquarters when dealing with issues generic to the N4 plant series.

Examples for 2004:

Number of N4 plant subjects raised by the VIP structure: 68 files opened with nearly half of these having been processed to date.

Progress rate for dealing with recurrent problems: 50% as of the end of September.

Number of times that corporate engineering (CNEN) has been used: 13 files opened, 3 in progress, 10 processed.

Examples:

- addressing failures on fire-detection sensors (see OP 3.7.(1))
  - performance of main feed water pumps, which has significantly improved as seen through better plant availability.
2. The site has introduced a management system based on "cases", as part of a process-based management system. all commitments are monitored via process reviews using performance indicators. marked improvement has been hindered by the oldest files a deadline for updating these files is planned for the end of 2004.
3. Processing of work requests monitored by the power operations structure on a monthly basis:

Priority-based work-request indicators are analysed, and departments are committed to meeting deadlines.

The initial results concerning processing of work requests shows improvements in this area..

The creation of a rapid response team (EIR) has been effective in conducting fast and accurate diagnoses in the field, with the aim of addressing deficiencies more efficiently. The EIR is a multi-specialist team.

4. Operating documents in the control-room are quality-checked; daily operating instructions are monitored and reviewed on a weekly basis in order to check their validity and relevance. The number of daily operating instructions is decreasing.
5. Temporary Installations (DMP).

The management tool in this area was changed in January 2004, providing the opportunity to perform detailed check of the status of DMP's within the departments before transfer to the new system. The department that installs a DMP checks its presence and relevance through the "PRV" module within the SYGMA work control system, allocating a periodicity of 3 months. A global check of plant status before any change in reactor mode is performed by the shift manager reporting via the outage safety committee (COMSAT). The shift manager instructs those departments having installed a DMP to check that there are no DMP's in place that are incompatible with the change in reactor mode. Discrepancies are dealt with immediately and the shift manager is notified.

**IAEA Comments:** The plant has put in place a framework to promptly address technical problems. Under the VIP program, all those involved in developing and implementing engineering solutions come together in a weekly meeting. At this meeting, activities leading to closure of items are identified and scheduled. Management monitors progress on the schedule. A rapid response team has been instituted to provide more timely actions.

One of the plant strategies is to pursue rigor in performance, this strategy fits neatly with this issue and the plant has intensified its efforts to encourage the staff to plan activities well and meet the schedule. Improved coordination with CNEN, CNEPE and Chooz NPP has enhanced performance in this area. A partnership between Civaux and Chooz strengthens the effectiveness in dealing with problems.

These actions have resulted in more efficient response to engineering issues unique to the N-4 series, better progress in dealing with recurrent problems, fewer and better daily operating instructions, and closer control of the temporary installations.

**Conclusion:** Satisfactory progress to date.

**1.2(2) Issue:** While the plant has implemented a field evaluation program to monitor activities in the field and plant material conditions, the program effectiveness could be improved. Numerous observations of worker lack of compliance with established personal protective equipment requirements, trip and spill hazards, equipment and housekeeping issues were identified indicating the field observation program could be more effective. The team identified:

- Minor leaks resulting in water or steam in travel paths that were not barricaded to prevent access.
- Wood and high volumes of paper materials stored in inappropriate areas.
- Trip hazards in walkways and travel paths.
- Missing posting for hearing protection on doors to various areas.
- Extensive observations of workers not wearing personal protection equipment.
- Non-functional eyewash stations and emergency showers.
- Unmarked bottles of unknown liquids or inappropriately marked bottles of liquid found in various locations.
- Worker interviews indicate that management presence in the field is not frequent enough.

The above items are examples of the type of deficiencies that have been missed on plant tours conducted by managers.

Ineffective field evaluation and monitoring programmes can affect the ability to self-identify adverse conditions in the plant, which can lead to higher accident rates, increased fire potential and affect the long term operability of equipment.

**Recommendation:** The plant should improve their field evaluation and monitoring programmes and focus their efforts on observing and correcting adverse conditions, behaviors, and activities in the field.

Some plants have increased the number of field observations, coupled inexperienced observers with more experienced observers, increased interaction with workers in the field, and provided training in observation skills to those managers and supervisors responsible for the field observations.

#### **Plant Response/Action:**

##### **Root causes**

Analysis of observations lead to the identification of the following causes:

- management spends a substantial amount of time in the field, but there is a lack of consistency in terms of observation
- a lack of efficiency is apparent in the way deficiencies are processed
- priorities have not been set for field evaluation and monitoring programmes.

Strategic principles and decisions:

The plant senior management team has reinforced the prime importance of management presence in the field in its long-term business plan.

A number of concrete actions have been implemented:

- Daily field inspection programmes have been set up within each department, with priorities being set by first-line managers from the departments concerned namely EMC, IAE, MSR and LNE.
- A housekeeping team was set up at the end of 2002 and will be maintained in order to ensure that the plant is kept in a good condition.
- Field inspections are conducted by the risk-prevention task force, which deals with all industrial safety and housekeeping-related deficiencies. Example: 80% of deficiencies are processed within less than a week.
- The plant has recently introduced a field evaluation and monitoring programme based on that of Penly NPP, focusing primarily on material condition, plant condition and housekeeping, as well as clearly displayed ownership of specific areas. Inspections are carried out every week, using observation sheets and analysed.
- A training session on the subject of field observation techniques has been held including members of senior management, the rapid response team and the risk prevention task force. These staff members will be in charge of generalising the training on a widespread basis.

### **Results observed**

Results achieved by the departments:

- The departments have set up a field inspection program. The observations made during these field tours are processed within the department and lead to improvement actions decided upon by the department management team.

Results achieved by the plant:

- The plant management team spends 40% of their time in the field.

The processing of observation sheets is managed and monitored. An analysis of reoccurring causes is done by the rapid response team (EIR) and housekeeping team.

**IAEA Comments:** The plant has taken a number of actions to address the points raised in the recommendation. A program of management visits to the field has been organized and over 180 field visits have been conducted. In addition, field visits are conducted within the departments and by the industrial safety group. During these visits, noted deficiencies are recorded and tracked to completion. The plant management group spends about 40% of their time in the field.

Following the outage, work sites in the plant are checked prior to turnover to Operations. These checks insure that the work is done and the area is clean and tidy.

Within the plant, a system has been set up with specific owners listed for each area.

**Conclusion:** Issue Resolved.

**1.2(3) Issue:** Although there is a policy to prohibit smoking in the industrial areas, there is substantial evidence that this policy is not followed or effective. However, smoking is allowed in workshops where significant fire risks exist. Smoking is also allowed in the control room which is inconsistent with international best practices.

Instances of inconsistent administration of the smoking policy were noted:

- Cigarette ends and matches found in various areas of plant where smoking is not allowed.
  - Turbine hall areas.
  - I&C room LD 0903 (controls for reactor control rods).
  - Individual smoking in administration building.
  - Evidence of smoking near unit 1 electrical panels.
  - Cigarette end found in posted hydrogen area where there should not be ignition sources.
- Smoking is permitted within the general workshops. As there are significant levels of combustible material within the building; this presents a significant fire risk.
  - There is no policy prohibiting smoking in the workshops.
  - Cigarette ends were evident throughout the workshop.
  - Ashtrays were provided at various points throughout the workshop.
  - Technicians were observed smoking while walking within the workshops.
  - Although combustible material was reasonably well controlled, there were significant quantities of oil stained rags, wood, cardboard and combustible fluids.

Inconsistent administration of the smoking policy, such as allowing smoking in non-smoking areas and allowing smoking in areas with significant combustible loading and industrial activities such as the workshop, increases the risk of fire.

**Recommendation:** The plant should reevaluate the plant smoking policy, set consistent requirements and assure adherence to the plant smoking policy.

**Plant Response/Action:**

**Root causes**

Analysis of observations lead to the identification of the following causes:

- Low expectations.
- Absence of dedicated areas for smokers in certain buildings.

Strategic principles and decisions:

- Experience feedback has been obtained from several other sites, including GOLFECH and BELLEVILLE
- Smoking policy has been re-examined and the following measures taken:
  - Expectations have been set taking into account health and safety at work regulations, while keeping in mind the aim of reducing fire-related events as

well as the constraints associated with site layout: industrial buildings, administrative buildings

- Defined expectations are posted around the site
- Measures have been taken for smokers. In addition, a programme to help people stop smoking has been implemented in conjunction with occupational physicians
- All industrial rooms are non-smoking areas
- The mechanical maintenance workshop, where discrepancies were observed during the OSART, is now a non-smoking area. An appropriate area for smokers has been set up.

Results/improvements:

Some smokers have signed up to a ‘quit smoking’ program.

In 2004, no fires were started as a result of cigarette smoking

Regular checks are carried out during field tours, revealing a significant reduction in discrepancies, finding cigarette butts is now exceptional.

**IAEA Comments:** To address this issue, the plant developed a simple policy that was discussed at the health and safety committee meetings. This policy stipulated that all industrial areas are non-smoking areas. Areas where smoking is allowed have been clearly designated. During a tour of the plant, no evidence of smoking in improper areas was observed; although the team was told that some progress is still needed in the administrative buildings.

The plant is also providing medical programs to assist people who would like to stop smoking.

**Conclusion:** Issue resolved.

**1.2(a) Good practice:** Enhancing first line managers’ professional standards in shortened management lines.

The plant programme designed to enhance first line managers’ professional standards is based on a “mirror” group comprising ten percent of the first line managers working in the various departments. They express and evaluate their needs so that these can be taken into account in the design of the programmes aimed at enhancing the first line manager’s professional standards.

This “mirror” group allows for the involvement of first line management in a continuous approach focused on improving professionalism and fostering a high level of autonomy. They are first to take part in the developed training sessions and permanently check and collect the comments expressed by their colleagues who follow in the training so as to further improve the programme.

The first stage in the programme focuses on team management, industrial policy, managing contractors and labour law. The second stage focuses on the economic culture and skills development.



This good practice involves first line managers in developing their own professionalism and empowers them to become more autonomous while fostering continuous progress.

**1.2(b) Good practice:** Newcomer's report in order to convey and make use of the experience and professional background of all newcomers to Civaux, a so-called "newcomer's report" is drawn-up 6 months after the newcomer's arrival.

The reception process aims at speeding up the integration of a newcomer, whether he used to work on another plant or in another company. The "newcomer's report" is part of a reception process for newcomers aiming at allowing him to express his thoughts as regards plant practices and status. The newcomer arrives with his own professional background which is used in order to draw the lessons from his past experiences. He has a "fresh vision", and all the items he finds surprising – whether at an operational or functional level – raise questions.

This document must be written and will be used as a basis for the plant answers.

The newcomer's report must be drawn up 6 months after arrival. It is a summary of what the individual considers as strengths and the questions derived from the aspects which surprised him. This report is presented to the department management's team in order to be used as return on experience. When the newcomer's report mentions aspects which are of interest to all, it is presented in a meeting where all departments are represented, in order to discuss them with the other department Managers and the plant management.

Every 6 months, a meeting is organised with all newcomers and allows them to share their "newcomer's report", discuss specific items and even question some processes.

This programme is set up for all new members of the plant, including the management team's members who are responsible for handing a "newcomer's report" to the plant manager.

**1.2(c) Good practice:** Computer system provides all workers in the plant access to key information from anywhere in the plant.

In order to carry out their daily tasks and assignments, workers must be able to access reliable and available information and documents in real time and close to their work station. The Civaux units have implemented a computer system which allows all workers in the plant to have access to any information from anywhere in the plant.

The following is available to workers:

- Working documents including procedures in compliance with quality assurance rules
- Department commitment plans (contracts)
- Performance indicators and goals for the unit and all departments
- Monthly reports on progress to achieving the goals
- Technical information pertaining to the state of units in operation and/or units in outage
- Meeting agendas, minutes and decisions made
- Follow-up of commitments



- A data base of temporary operating instructions that manages temporary operating instructions including writing review, electronic signature approval and fitting.

This good practice fosters a high level of operational and quality communication for all workers.

**1.2(d) Good practice:** Site transport arrangements to limit accident risks. The plant has introduced arrangements to limit the risks of dangerous material transport accidents. Dangerous products or materials are conveyed in accordance with the site's load dependent routing plan in compliance with signs and rules for sensitive areas. These arrangements provide standardized routes, limit the number of oncoming vehicles passing each other and reduce the risks for the plant and storage or warehousing areas located on the route.

At the site entrance, a routing plan based on the type of transport (sludge, chemicals, fuel oil, etc.) is given to the driver. It provides the route for the vehicle on the site plan, general road use instructions as well as what to do in the event of an accident.

The overall analysis was carried out with all the participants including the departments, contractors and drivers. The risks addressed are:

- Pollution by chemical spillage on the road,
- Contamination during conveying of equipment, material or waste from the controlled area,
- Explosion and fire during the conveying of petroleum products,
- Accidents of a staff shuttle bus.

These hazardous material transport arrangements give a good guarantee that the consequences of a transport accident on the plant will be limited.

## 1.5. INDUSTRIAL SAFETY PROGRAMME

**1.5(1) Issues:** While the need to improve the industrial accident rate has been noted by the plant, industrial safety practices remain inconsistent with international best practices. Workers were identified not wearing required personnel protection equipment, the industrial accident rate is significantly higher than average international levels and worker protection policies are not always implemented.

- Numerous instances were noted of personnel not using the required personal protection equipment.
- The 2002 goal for accidents was set at  $\leq 8.3$ /million work hours (including EDF and contractor workers) and the 2003 goal for accidents is  $\leq 7$ /million work hours. The 2002 achievement was 7.8/million work hours [check number] and the achievement through April 2003 is 7.1/million work hours for EDF and contract workers (9.6/million work hours for EDF workers). The median performance of the world nuclear plants is 1.5/million work hours (including only utility workers).
- Instances of the failure to implement worker protection programs were noted. These include inadequate and no hazard barricades of hazards, high noise level areas without requirements for hearing protection, inappropriate implementation of protection from fyrquel hazards, and lack of identification of trip hazards.
  - A steam leak in unit 1 turbine building was not barricaded.
  - Several instances of water on the floor with no containment and not cleaned up.
  - Rooms NA0422-423-424 (RCV charging pumps): two cables on the floor causing tripping hazard.
  - A small door within a larger door at BTE stores (waste treatment building) presents an unidentified trip hazard at the bottom.
  - The door between the rooms NB418 and NB421 (primary sampling room) was left open, hiding the safety instructions on the door.
  - Fluorescent marks on doors were found covered with information sheets. In case of a loss of power the doors can't be located. There are very few fluorescent marks on the floor to find the way out in case of a loss of power.
  - At the entrance door of the turbine building there is no sign requiring hearing protection, although there are hearing protection devices next to the entrance door and our counterpart requested us to use them.

Fyrquel issues:

- Sign on 1GFR 001 BA damaged and part not readable.
- Leak on floor beneath 1 MZZ 539 CR, fyrquel written on floor no other warning signs.
- Standing fyrquel in open drain box in fyrquel room of unit 2 turbine hall.
- Not all workers are trained in the hazards of fyrquel.
- Decanted oils such as fyrquel have no warning labels of hazards on the container.

- Material in plastic container in I&C metrology area was a chemical but did not have a material label on the container.
- Emergency shower and eye wash station in the bulk chemical storage building not tied into water system.
- Emergency lights not working. During work on the electrical trains, work took so long that emergency lighting lost battery power and were not recharged.
- Emergency eyewash shower in acid transfer room (yc4090) of the demineralizer building leaking and no FME (Foreign Material Exclusion) caps installed.
- Ferric acid tanks in (yc4090) have Plexiglas barriers at front to protect workers and equipment but none on the sides.
- Flammable liquids in the valve training room in the warehouse stored in cupboards not approved for them.

Inconsistent application of industrial safety practices leads to high industrial accident rates resulting in decreased worker performance and lowered worker attitude towards industrial safety.

**Recommendation:** The plant should improve industrial safety practices including worker performance and behavior in following and implementing established personal protection policy and equipment requirements.

Some plants benchmark the performance of plants with the lowest industrial accident rates to establish the type of actions that have been used to achieve low rates.

**Plant Response/Action:**

This recommendation, while focusing on personal industrial safety, illustrates a more general recommendation concerning a lack of rigour in the definition of and adherence to our reference standards.

It has therefore been addressed in a way that is perfectly consistent and in line with that same subject area: having clear reference standards, shared and understood by all, along with reinforced coordination and control of industrial safety measures.

**The root cause analysis reveals:**

- Ambiguous and/or poorly understood expectations.
- Too much tolerance shown when performing supervision in the field.
- Risk prevention is a subject rarely discussed within the plant when compared to operational safety or radiation protection.
- Young age profile of EDF staff: poor awareness of industrial safety risks.
- Incomplete follow-up after accidents occur.
- Lack of awareness of specific risks (asbestos, hazardous products, etc.).
- A lack of common agreement about contractor problems.

**Approved actions:**

- Much more ambitious targets.
- Overall industrial safety accident rate for Civaux in 2003 = 8.8 - Target for 2004 = 4.7.
- Overall industrial safety accident rate for EDF in 2003 = 10.5 - Target for 2004 = 3.5.

- Definition of expectations:

Expectations for the plant have been redefined and transposed onto A4 format. All plant personnel were given a presentation on this subject at the beginning of 2004, followed by a widespread poster campaign around the plant.

The industrial safety film that is used for new arrivals is used to communicate plant expectations.

- Improving risk prevention management:

- Setting-up a new process for risk prevention. This is subject to a monthly performance review by plant senior management.

- An example of an improvement suggested via the review: Use a more hard-hitting visual communication method (based on Anglo-Saxon methods).

- Commitment from department management towards analysing events.

- Initial grouping of facts: 95 % are tracked, approved by the SRP department manager and improvement actions are monitored.

- The content of lost-time accident analyses is reviewed/approved by the department manager from the department in charge.

- Initiating a project in view of gaining OHSAS-type certification for plant management in 2007 to harness long-term gains.

- Management presence in the field programme:

This provides the management framework linked to the various actions agreed on for improving our industrial safety results. It provides an opportunity to share problem areas, to encourage staff in the field to help each other and to deal with shortcomings in behaviour.

The schedule shared out among the department managers is drawn up each Monday in the plant management team meeting. The department managers receive reports on the activities performed.

- Setting up of a risk prevention task force (GAP):

The nominated staff members coordinate risk prevention within their departments. They constitute the link-up between the experts in the industrial safety and radiation protection department and the workers within their departments.

The carry out plant tours with the aim of:

Ensuring that there is a good match between rules and practices.

Giving advice and assistance.

Dealing with discrepancies at grass-roots level.

The recurrent problem of people not wearing PPE's (personal protection equipment) is now characterised by a significant decrease in the number of interviews by their managers in the first half of 2004 as well as a trial with a new ergonomically improved hard hat.

- Setting-up of an Inter-company Worker Safety Committee this committee is for exchanging problems encountered by contractors and its role is to improve working conditions as part of an exchange between the representatives of the contractor companies and the representatives of plant personnel.

Two actions implemented to reduce stress:

Changes to how the industrial safety storerooms within the radiological controlled area are organised so as to reduce waiting time (double flow circulation).

Improving time needed to access the contractors canteen: gain of between 20 and 30 minutes

- Industrial safety forum: Stopping activities at the plant for a half-day period to raise awareness of those involved:
  - presentation of our poor results given to all personnel
  - presentation given looking at the different types accidents.

This day brought about:

- immediate improvement actions:

Decision to implement and perform unannounced field inspections during the 2004 outages.

Adjusting the floor cleaning times

- developing specific training files: training worksite for asbestos.

- The setting-up of industrial safety challenges is an opportunity to involve all players by recognising good and poor practices. It applies to all players during outages (EDF and contractors) and to EDF staff during in-cycle periods.

Modification of closure system on the skylights to avoid accidents.

### **Results/improvements:**

2004 is a key turning point with reversing trends, even if the overall objectives, which are more ambitious than the previous year, are not reached, the EDF industrial safety accident rate is significantly lower.

The EDF industrial safety accident rate at the end of 2003 was 10,5. The figure that we expect at the end of 2004 should be 5 (-53%).

The overall industrial safety accident rate at the end of 2003 was 8.5. The figure that we expect at the end of 2004 should be 7 (-18%).

Plant actions for 2005 provide continuity of actions implemented in 2004 with enhanced participation from members of the risk prevention task force (GAP) when the risk prevention programme was drawn up during a seminar held on 29<sup>th</sup> September.

**IAEA Comments:** The plant now records and investigates all accidents. Greater attention is focused on lost time accidents, but even minor accidents receive a review. Often the person who experienced the accident presents to his work group how the accident occurred and what could have been done to prevent it.

The requirements for personnel protection are now clearly listed for each area and building. During the plant tour, most workers were seen wearing the proper protective equipment, although two people were seen without hearing protection.

The safety group conducts risk prevention tours and sees that the identified problems are corrected.

There was an industrial safety improvement plan in place for 2004 and a new plan with specific actions has been developed for 2005.

The actions of the plant have resulted in a reduction of the number of lost time injuries, so that the number of injuries in 2004 is only about half the number of 2003. Despite this, the plant recognises that there remains room for improvement, particularly in the contract organizations. Despite the progress, the plant recognises that further improvement remains to be achieved with both EDF staff and contractors.

**Conclusion:** Satisfactory progress to date.

**1.5(2) Issue:** The program to provide workers with information about chemical hazards in their work environment is not effective. Although the plant provides a telephone number for workers to call for information on chemical hazards, some problems with identification of hazards were observed.

- Not all bottles in the field that contain chemicals or products are properly labeled.
- Seven unlabelled samples bottles of sodium hypochlorite were found in the demineralizer building.
- Safety data sheets to provide information to workers are only available at several locations away from work areas.
- Containers used to receive decanted fyrquel do not contain hazardous material warnings.
- Signs at the location of use of hazardous chemicals and materials do not always contain directions on calling the plant telephone number where this information can be obtained. Examples include the fyrquel and oil storage rooms in the unit 2 turbine hall, and the demineralizer building.
- Training programs for workers do not always contain reference to the plant telephone number where information on hazardous chemicals and materials can be obtained. An example is the training provided to OSART team members.
- Discussions with workers indicate some workers are not aware of the program.

Worker safety while using chemicals in the work place is dependent on worker knowledge of the hazards of any chemicals and products that may be encountered. The ability for the worker to access such information when the worker has questions can improve the worker's knowledge of the working environment, reduce the potential for accidents, and eliminate potential misuse of chemicals on important systems.

**Recommendation:** The plant should ensure all workers have access to, and are aware of, important information related to chemicals and chemical products in their work environment. Management should re-evaluate the programme, correct problems and provide support, training and monitoring.

**Plant Response/Action:**

**Root causes analysis**

A misunderstanding of the risks at stake concerning chemicals surrounding fieldwork.

## **Actions**

- 1) Industrial safety risk datasheets called FDS are available in binders at the main warehouse and in the SRP department and Medical department.
- 2) For the 7 Carcinogenic Mutagenic, Radiotoxicological products, the user datasheets (called FLU) are available in the software database intranet OLIMP. In the future, all the FLU will be available in the software database intranet OLIMP.
- 3) The FLU for dangerous and most used products are available on paper in the main warehouses and systematically given when the chemical product is distributed.
- 4) The film shown to each newcomer during the security presentation outlines the requirements of the site and takes into account the use of dangerous products.
- 5) By calling 6666, all the workers can have access to FDS and FLU information regarding dangerous products stored on site.
- 6) Presence of the Management in the field is a strong value reaffirmed since 2004. Observations are recorded and actions followed in the computer database "plant presence" (see MOA 1.2.2).
- 7) A risk prevention task force (called GAP) in operation on site since January 2004 (see MOA 1.5.1).
- 8) The SRP department advises plant workers while in the field about the use of the Individual Protective Equipment (EPI) and dangerous products.
- 9) The dangers of Fyrquel are visible on the containers used for its transportation.

## **Results/improvement:**

The action plan of the OSART, reinforced by the ISO 14001 certification, reveals significant progress, observed during field visits on work sites (few discrepancies observed). However, effects in the field are still not significant: a weak number of workers have a questioning attitude regarding risks. Communication in the teams continues to progress.

**IAEA Comments:** Now, when workers receive chemicals, they are issued sheets containing safety information about the chemical. These sheets discuss the hazard, the necessary protective measures and what should be done in the case of an exposure.

In addition, the various tours by management and by the safety group are used to identify concerns in storage, posting or use of chemicals.

The process for issuing chemicals has been revised so that unused chemicals must be returned to the warehouse for proper handling. Unused chemicals are no longer left in the field. The team toured the warehouse and found it to be in very good condition. Chemicals were safely stored, properly marked, and generally well handled.

**Conclusion:** Issue resolved.



## 2. TRAINING AND QUALIFICATIONS

### 2.1 ORGANIZATION AND FUNCTIONS

The training organization at Civaux consists of a training owner and a training provider. The training owner is the administration and skills development department (AGDC). The training provider is mainly the professional training services (SFP), which is another EDF division. The relationship and responsibilities are clearly defined and stated in a partnership agreement between the Civaux NPP and SFP.

The manager of AGDC is responsible for implementing the training policy, coordinating of strategic training activities developing, proposals to external training providers and monitoring the performance and effectiveness of training. A network of departmental training representatives, one for each department is the committee of system for local skills development (SLDC). The training representatives, who work on a part time basis, support the section head. In total there are 15 training representatives, 9 of them are department deputy managers. Through the committee for the system for local skills development (SLDC) the manager of AGDC works closely with managers in all the departments at Civaux. The monthly meeting is led by the administration and skills development department who is the project owner. This enables the manager of AGDC to have a general view and long term strategic vision. The site's managers' involvement in all stages of the training process is an advantage.

The local skills development system (SLDC) maintains the level of skills in addition to individual and collective skill development for all the employees on site and is an essential mission of the managerial staff. The SLDC committee's goals are to analyse the skills needs, validate the request for specific skills development specifications, suggest solutions according to the request and validate the training specifications. Furthermore, they make sure that the suggested solution is relevant by examining the local training actions, suggesting areas for improvement and sharing the experience of each individual in the different aspects of upholding his/her skills, shadowing, equivalence, and the evaluation of skills for authorisations and qualifications. The SLDC is a useful system to develop competences.

Many methods of training are utilized at the plant other than classroom training. This includes; tutoring, shadow training, cross-functional training, situational team training, coaching and individual project development. These activities are all supported and implemented by management staff. This use of different training activities promotes effective development of competences.

A program of shadow training is implemented in all departments, within the training structure. Some of the shadow training programmes observed were very well structured and were based upon learning objectives, to support an effective shadow training. In addition to the above, several team members observed inadequate behavior and not following rules in different organizational areas. Structured and consistent approach in shadow training can effectively enhance good work practice. However, inconsistency in the structure, level and quality of the shadow training was noticed. The plant has identified the problem and an action plan is being implemented. The team suggests the plant to adopt a uniform format and approach of training documents.

Every department has a standard training plan (PTF) per function that consists of training courses, both initial and refresher, identified at corporate level and added to by the site in the site professional adaptation programme (PLAP). The line managers are responsible for the competence of their staff with the support from AGDC and SFP. During interviews, managers

and training representatives demonstrated commitment to their staff's competence and qualification. All personnel at Civaux have an annual interview with their line manager as a part of an individual re-qualification process. During the authorisation and training interview, the individual's competence is confirmed and training needs to maintain and develop competence are discussed. Following the interview an individual training plan for the next three years (PIF) is then compiled, the training identified is recorded. During an interview it was observed that one department has created tools for the analysis of both the present department capability and also the department's need for competence, to support a gap analysis. The team suggested the plant review training related documents in order to get more consistent use of internal good practices such as this.

A yearly training plan is then drawn up and adapted within each department and delivered to AGDC. Based upon the training request from all the departments the AGDC sets up a yearly training plan. The draft training plan is validated and approved by the human resources strategic committee, which consists of the plant manager and a number of department managers.

The plant uses one key performance indicator (KPI) in the training area: the student attendance rate. The KPI is updated every month. The attendance rate this year is between 91% and 100%. Below 90% is not accepted by the plant.

In Civaux the training is reviewed in different ways. Each student evaluates the course attended and the effectiveness of training. At the end of each nuclear safety and quality training course on site, a course evaluation is carried out by a manager. The training report, which is written by the training provider, is validated by the committee of SLDC. The evaluations of training and training effectiveness seem very strong.

The nuclear training division (pôle conduite thermique) within SFP is undergoing a major reorganization due to the fact that each plant will have their simulators located at their sites. In a couple of years there will be 19 local training offices. To ensure a consistent quality level a new QA system has been put in place. The main feature of the system is that every local training office has to respond to weaknesses and strengths that have been identified at a local training office review.

The SFP instructors at the training centre at Chooz, the simulator currently used by Civaux, are mostly recruited from the operation department. Before they enter instructor training they are evaluated in terms of educational skills and attitudes. If they pass this evaluation they enter a six month instructor training programme. The basic training in educational skills is followed by a period of shadow training where the instructor works closely with another experienced instructor. As instructors they are evaluated annually by senior staff. Usually they stay as an instructor for four to five years and then move back to the operations department. The simulator instructors do not visit the site on a regular basis. As a result they do not routinely observe activities during significant operations. The team encourages the SFP to set up routines for "on the job training" for instructors.

Within the framework of the vocational training carried out at Civaux plant, the GRETA (French adult continuing professional training) takes part in the development of knowledge and training on site.

When a trainee is attending a course requiring general knowledge, the GRETA assesses their entry level and draws up an action plan dealing with the gap so that the person has the minimum required level before the course. This is the case for job-specific radiation protection. Moreover, for skills retention a specific learning programme is drawn up and the GRETA assesses the trainees against final objectives, provides the knowledge required and ensures that the training objectives have been achieved.

## 2.2 TRAINING FACILITIES, EQUIPMENT AND MATERIAL

In general the classrooms observed were well equipped to support a quality learning environment. At Civaux they frequently use tools such as SIPACT in operator training. This is a highly efficient tool to demonstrate thermo-hydraulic phenomena during abnormal and accident conditions.

The radiological controlled area and equipment are simulated to conduct radiation protection training. There is also a steam generator mockup for both the technical and radiological training. Laboratories and workshops are well equipped and well arranged to support training. At Civaux training centre there is a library well equipped with reference material as well as cultural literature. A cultural library has been set up in the training department which aims at the opening up of external world and the enrichment of a culture that goes beyond life on the site or its mere professional environment. Consequently, newspapers, magazines, literary works and official and regulations texts can be found in this cultural library.

The corporate and site training material examined was a good quality programme, including training specifications, training objectives, instructor guides, trainee handouts and slides. Training material for operator training observed, contained information about incidents from other French NPPs.

The Civaux operation crews are trained at the simulator at the Chooz training centre. The simulator is functional and physically replicates actual plant design and its capabilities are adequate to support abnormal and emergency events. The instructors are adequately supported by aids for recording operator and system actions and behaviors.

## 2.3 CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

All the control room operators have passed the field operator training programme. Initial training is conducted at the site and at the training centre at Chooz. The initial training programme is developed at a corporate level and is based on a systematic analysis of the training needs. The training programme is a combination of classroom and simulator training modules with shadow training on shift. During the training several student evaluations were carried out. Between the training modules the operators undertake a shadow training programme. The initial training programme for control room operators seems to be well structured and adapted to the job.

The refresher training for operators is based on both national and local (Civaux) requirements. On a yearly basis the DPN defines the national requirements for refresher training. The requirements are based on both tasks and national and international operating experience feedback. In addition to that the Civaux NPP set up a yearly training requirement, based upon identified needs for training. Based on the national and the local requirements a proposal for the refresher training programme is developed. The proposal is validated and accepted by the operational manager. The systematic use of operating experience ensures that the operators will be adequately updated.

On the Civaux plant, there is complementary training for operators, with the use of two specific simulators: SIPACT and SEPIA.

The shift operators receive 20 days' refresher training at the simulator every two years, which complies with national requirements. The simulator training given is limited to three hours per day. In addition to that, the operators are given three hours of classroom training including debriefing. The effective simulator training time is lower than the international average. The operation of a simulator onsite at Civaux in 2004 will increase the training opportunities for the plant.

Refresher training consists of both technical training as well as teamwork training. During the team work training there is a focus on communication. During both technical as well as practical training, operator and shift crew performance is observed. Operator's performance and deviation from the criteria's are noted and reported to the operating manager who will grant the operators authorization. Some weaknesses were observed in the evaluation of operator performance. The team therefore recommends the plant strengthening the evaluation of operator performance during simulator training.

Simulator training on plant modifications is provided in a timely manner.

## 2.4 FIELD OPERATORS

The initial training program is developed at a corporate level and based on a systematic analysis of the training needs. The training program is a combination of classroom training modules and shadow training on shift. During the training several of the students are required to pass a number of evaluations.

In common with the reactor operator-training program the field operators have refresher training associated with radiation protection, first aid and fire fighting.

Field operator initial and refresher training was found to be effective and met the operating departments needs.

During some onsite refresher training for operators using the SIPACT simulator, the field operators perform local tasks (walkthrough). The team encourages the plant to increase the field operators in the operator refresher training at the simulator when the simulator is onsite.

## 2.5 MAINTENANCE PERSONNEL

The training programmes are developed from corporate training requirements and contain local elements. The initial training programmes are structured and contain formal classroom training. The training is performed in on-site and off-site facilities such as the Gurcy training centre. These facilities are fully equipped.

The two shadow training programmes reviewed in maintenance departments varied considerably; one was well structured and one was inadequate. The plant has identified this and is taking action.

The I&C department have created tools for the analysis of both present department competence and future needs. This gap analysis appears to be a strong tool for the identification of competence development needs.

The identification of the training needs both at individual and department level seems to be carried out very well.

## 2.6 TECHNICAL SUPPORT PERSONNEL

The training programme for safety engineers is developed at corporate and based on competencies and skills. A significant part of the initial training is identical to the training given to control room operators and includes both classroom and simulator training. The training programme is based upon a corporate training plan and is locally adjusted depending upon the competence and background of the recruited person. There are good shadow training programs for both safety engineers and quality engineers.

Other technical training programmes such as radiation protection, chemistry and logistics are developed at corporate level. The standard plan specifies the need for initial and refresher training. The process for identification of the training needs, both at individual and departmental level, seems to be carried out very well.

The chemistry and logistics department has implemented a shadow training programme modeled on the programme at Golfech NPP, where it was identified as a good practice. The programme is very well structured and based on learning objectives. Of the six shadow training programmes reviewed, this is considered to be strongest. No other departments use this programme.

## 2.7 MANAGEMENT PERSONNEL

Two complementary training programmes facilitate the managers' professional development. The national programme carried out on corporate level by the (SFP) addresses change management, strategic integration and customized professionalism of managers, in fundamentals via various modules based on individual interviews.

The local programme for first line managers (MPL) is developed by a group of 12 experienced first line managers (the "mirror" group). Today the programme consists of six modules covering topics such as: team management, industrial policy, managing contractors, labor laws, economic culture and skills development. Although these modules are not obligatory, about 75% of the MPL's have attended the first four modules. All MPLs are scheduled to attend all six modules by the end of 2004. The "mirror" group closely monitors the training in order to improve the training programme. This approach is noted as a good practice in MOA area.

## 2.8 GENERAL EMPLOYEE TRAINING

The initial training course, nuclear safety and quality assurance (FISQ) is given to all personnel at Civaux. A written test is used to evaluate the competence level. Personnel working in the radiation-controlled area have to attend a five day radiation protection and risk prevention course. Work coordinators get an additional eight days of training. The course has a refresher cycle of 3 years. Training requirements for contractors working at Civaux are the same as for the Civaux's staff. The training programmes seem to be well organized and adequate.

A management person introduces the nuclear safety and quality assurance courses to set up management's expectations and reinforce safety culture messages. A number of part time instructors support the (SFP) instructors to promote good work practices and safety culture.

The facilities used for practical radiation protection training are well suited to support effective learning. The training session observed was well performed.

## **STATUS AT OSART FOLLOW-UP VISIT**

Effective tools for identification of the need in skills have been developed and implemented by the SLDC at Civaux. Each department's skill needs are a subject for discussion at the interviews that are carried out by the manager with the individual. The results of the interviews are used to drawn up an individual training plan. In the maintenance department, a system has been developed and implemented for shadow training to be connected to individual training plans. The staff that has gone through shadow training is assessed by both the shadow trainer and the manager. Training activities including shadow training are well

documented. The system for shadow training is an effective tool to support good working standards and behaviour.

The simulator at Civaux has been in operation since 4 October 2004, which has given the plant new opportunities to use the simulator. After the set up of this new simulator at Civaux the viewing by management has increased significantly. Routines and aids for assessment of operator training at the simulator have been developed and implemented. The training facilities are well equipped for both training and debriefing of training. The actions set up by the plant have significantly improved the assessment of operator's performance during training.



## DETAILED TRAINING AND QUALIFICATIONS FINDINGS

### 2.1 ORGANIZATION AND FUNCTIONS

**2.1(1) Issue:** Some training programmes are applied inconsistently across the plant. This has led to missed opportunities to enhance performances.

At Civaux every employee has got an individual training plan, based upon the obligatory and complementary training. The individual training plan includes both initial and refresher training. At Civaux the system for shadow training has been implemented at all the different departments. However, during interviews and document reviews the following were noted:

- Some of the shadow training programme observed was very well structured and was based upon learning objectives, to support an effective shadow training. Other shadow training programmes reviewed were not based upon learning objectives. One program observed was of inadequate quality.
- It was observed that one department has created tools for the analysis of both present department competence and the department's need for competence, to support a gap analysis. This was not done on other departments observed.
- At least three different formats of individual training plans have been observed.
- The training activities were recorded in different ways. All the departments observed also use the EDF filing system.
- One department has implemented a shadow training programme adopted from Golfech NPP, where it was notified as a good practice. No other departments use that programme.

The use of different tools and methods is ineffective and does not ensure that the best practice is being used. This can lead to an inadequate and uneven standard on different training related activities, which can lead to competence shortage. It is not an effective use of resources.

**Suggestions:** The plant should consider reviewing the various methods of providing and documenting shadow training at the plant and select the best method for each department.

#### **Plant Response/Action:**

##### **Site analysis**

The process used by Civaux NPP concerning shadow training consists of implementing an innovative action plan to identify skills development within each department-experience feedback from these actions are reviewed by senior management. Senior management decides whether or not to validate and implement this action in the given department and offer to other departments.

##### **Actions carried out:**

- We have requested all SLDC department representatives to identify their departments needs in terms of skills development. We have collected 80 % to date.
- This information permit us to identify the professionals actions by department these acting include shadow training.

- Employee annual reviews done by senior management identify individual skill development needs. These needs are compared to those identified by the department's SLDC representative. And actions are taken to answer the individuals needs.
- Documenting shadow training is a requirement.
- The SLDC department representatives have committed to filing this document in the personal training file before June 2005.

**Responsibilities:**

The responsibility for implementing defined actions is borne by each department's skills development representative.

The site process co-coordinator is in charge of tracking the progress of all actions.

SLDC representative's actions are followed during the monthly performance review.

**IAEA comments:** The SLDC has developed a tool used by the different departments to get a clear picture of present skills and future needs in skills. This tool has been implemented at 80 % to date. Skills in each domain are divided into four different levels depending on the individual's competence. Each department's skills needs are subjects for discussion at the interviews that are carried out by the manager with the individual. The results of the interviews are set up in an individual training plan. The SLDC performs monthly progress follow-up.

In the maintenance departments, a system has been developed and implemented for shadow training to be connected to individual training plans. Both the shadow trainer and the manager assess the staff that has gone through shadow training. Training activities including shadow training are well documented. The system for shadow training is an effective tool to support good working standards and behaviour.

**Conclusion:** Issue resolved.



## 2.3 CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

**2.3(1) Issue:** During simulator training, some weaknesses were observed in the evaluation of operator performance.

At the simulator, the instructors evaluate the operator's performances during the refresher training. Operator's performance and deviation from the criteria's are noted and reported to the operating manager who will grant the operators authorization.

- During most of the refresher-training week, the shift operation manager is on the Chooz premises, but the department manager and his deputy's observation of the training is limited.
- The criteria used are based upon objectives written in the national and local training demands. The criteria are written by the instructor and are not validated by operational management.
- Feedback on communications and other soft skills are just used in specific training sessions.
- For one of the observations undertaken at Chooz, one instructor complied with corporate standard. However, a few comments can be made. Normally during abnormal and accident conditions the four members of the shift team are working with the computer based procedures in parallel. The use of soft screen maneuvering makes it even more difficult for an instructor to follow the operator actions. The instructor booth is equipped with four slave screens, which reflects the actions that are taking place in the control room. Only one instructor was in control of the simulator, the exercise and monitoring of operator's performance. So many duties interfered with his ability to closely monitor and evaluate performance.

Inadequate operator evaluation may not identify weaknesses in skills and knowledge that need to be upgraded to reduce the likelihood of operator errors. Simulator debriefing is an important part of the overall training process and if not completed properly, could result in an overall decline in the standard of training received by the operators which in time could lead to a degradation in operator performance.

**Recommendation:** The plant should strengthen the evaluation of operator performance during simulator training.

### **Plant Response/Action:**

#### **Causes**

The fact that the simulator is located far from the site is not conducive to management presence, with the exception of shift managers, at simulator and summing-up sessions.

Instructors did not have observation sheets that were submitted to the operations department for approval.

#### **Action plan**

- 1) With regard to management presence at simulator sessions, the operations department has drawn up a simulator attendance schedule, which is divided into two stages:

- up until 1 October 2004, attend at least 2 simulator sessions and associated summing-up sessions at CHOOZ
  - as of 4 October 2004 when the Civaux simulator becomes operational, systematic presence of management at least once every six months per shift team (simulator session and summing-up session).
- 2) Regarding criteria that can be observed during refresher training sessions, the professional training department (SFP) has produced observation sheets that are submitted to the operations department for approval.
  - 3) In addition, the operations department has worked together with professional training department staff at Civaux and in liaison with Chooz NPP on the assessment of simulator skills. The first stage consisted of going to see what was done elsewhere, and wherever possible, of setting up a similar process to that of Chooz. This formalized assessment programme will begin in 2005, with trial sessions taking place from October to December 2004.

**Process description:**

1. Criteria being observed during simulator sessions
2. The simulator Civaux has been equipped with a video recorder to observe trainees driving simulation. The professional training department has produced observation sheets based on training-session file sheets. These criteria are submitted to the operations department for approval. Management presence at simulator sessions

Thanks to the presence of shift managers at training sessions, management continues to ensure that training at Chooz is conducted in a satisfactory manner. Two trips to Chooz have been scheduled by the department manager or his representative. Both these trips are documented.

As soon as the Civaux simulator becomes operational, the department manager or his representative will attend simulator sessions and summing-up sessions in accordance with the schedule. Observations and comments will be documented.

These checks focus on:

- achievement of goals and compliance with training specifications (checking the training provider by the owner)
  - training tools
  - instructor observation criteria
  - summing-up sessions.
- 3) Simulator skills assessment

Work has been done on assessing the skills of shift managers, shift supervisors, control-room operators and safety engineers.

Principle:

- a two-yearly mandatory assessment based on pre-established scenarios and observable criteria. During the evaluation, there will be the same number of instructors as trainees and management will also be present. In the event of failure, a four-month period is granted to fill in the gap. Following a review, authorization may be temporarily suspended at the department manager's discretion, depending on the seriousness of the shortfall and the worker's history

- over this two-year period, a formative assessment at each simulator training session aimed at improving skills. Progress assessment sheets have been produced; these are filled in by the instructor at the end of the session.

**Tools:**

A summing-up report is drafted for each observation; a table for monitoring which sessions have been completed on the simulator is also kept.

**Experience feedback:**

After analyzing these reports, we are able to take stock of the past year and use this information to adjust our specifications for the following year.

**IAEA Comments:** The simulator at Civaux has been in operation since 4 October 2004 which has given the plant new opportunities to use the simulator. When the simulator was located at Chooz the management from the Operating department at Civaux very seldom observed training. After the set up of the new simulator at Civaux the presence of management has increased significantly. Training personnel at Civaux has in cooperation with training personnel at Chooz Training Centre improved routines and aids for assessment of the trainees. Clear criteria are in use for the assessment. The criteria are written by instructors and then checked and approved by the management from Operating department. The new simulator is equipped with an advanced video recording system which makes it possible, during the debriefing sessions, to view both videos recorded during the training session as well as manoeuvres on the screens.

The actions taken by the plant have significantly improved the assessment of operators performance during training.

**Conclusion:** Issue resolved.

### 3. OPERATIONS

#### 3.1. ORGANIZATION AND FUNCTIONS

The operations department manager reports directly to the plant manager. The operations department consists of two sections – real time operations branch and support and expertise branch. The organization and responsibilities of the operations department are described in administrative procedures and understood at all levels within the department. Duties and responsibilities of each position in the operations department are also clearly defined.

Operations goals and objectives have been established. A set of performance indicators has been developed and is in place and evaluated on a monthly basis. All performance indicators are available in an electronic database and available to all staff members.

There is a high level of co-operation between the operations department and the other departments in particular with maintenance. The “unit in operation” (OTF) is very useful in supporting the planning and scheduling process. The implementation of support and expertise branch into operations department and deferred time shift supervisor into shift crew provides significant support to operations. This structure simplifies the relationship with other departments, helps to optimize the long term and short term planning, together with, incorporation of unplanned activities into the schedule. Experience feedback with French and international power plants have led Civaux NPP to develop an innovative support on expertise structure for on-line processes. The team has recognized this as a good practice.

As a part of a self-assessment process check sheets are used to monitor operations department performance. These check sheets provide an overview of various safety related processes and activities. Weekly evaluation of all areas is conducted. The team judged this as a good practice.

The operations department manager visits the Main Control Room (MCR) at least once a day. However, a few field operators stated, that they seldom see managers of operations department in the field. The team encourages the operations managers to conduct field tours more often and on a regular basis.

The operation department has a long term staffing plan for shift crews indicating the eventual turnover of the personnel, retirement and succession requirements. Staffing of the shift crews is adequate, the safety engineer from safety and quality assurance department supports the shift crew in emergency situations. Operators regularly rotate positions, which gives flexibility in shift staffing. All shift personnel attend well structured theoretical and practical training. However, the team found that no formal requirements for training in case of a long term absence of an operator are in place and suggested an improvement in this area.

#### 3.2 OPERATIONS FACILITIES AND OPERATOR AIDS

The N4 series of French nuclear power plants is equipped with a fully computerized system (KIC) to control the plant from the main control room. There are four identical working stations in MCR each able to control all plant systems. Two stations are typically used by operators to control the process, while the other two can be used by the shift supervisor and safety engineer to monitor plant status.

A mimic panel provides the operators with a very visual and comprehensive overview of the unit status. The auxiliary panel, which is located under the mimic panel is designed as redundancy and back-up with regard to computerized stations in case of total unavailability. The shift manager use this panel in emergency situations. In case of total unavailability of the

MCR, two adequately equipped trains of emergency shutdown panels are available for each unit.

All incoming alarms are displayed in dedicated displays at the operator's work station. The operations department has a policy to minimize the number of pending alarms in the MCR, which is currently monitored by performance indicators.

Operator aids in the control room are well controlled and approved. No unauthorised operators aids were observed in the plant and MCR, all necessary information is validated and put into an electronic form or official hard copy procedures, instructions and other appropriate documentations.

Equipment labeling in the field is generally in a good condition. A number of leaks and other equipment defects as well as overall housekeeping and material condition in the field is addressed in the MA and MOA areas. No deficiency identification tags are used in the field. However, deficiencies identified in the field are expected to be reported via the SYGMA database mainly by field operators. The plant is encouraged to ensure a common understanding between operations, maintenance and other departments on deficiency identification criteria. The team recommended improvements in this area, see issue 4.6(2).

### 3.3 OPERATING RULES AND PROCEDURES

Normal and abnormal operating procedures as well as alarm response procedures are very well developed in electronic and paper version. Both versions are well controlled and kept up-to-date. They are clearly written using the step-by-step diagram structure and well understood by personnel. A computerized form of procedures is integrated into operator's work stations at the MCR and supported by appropriate references to technology in the same display.

Paper copies of the procedures are also available in the MCR. An adequate process to ensure that operations staff acknowledges documentation changes is in place. Hand written notes are allowed when using a paper procedure. Once a paper procedure is used, it is subsequently replaced by a new copy.

An adequate process to report and document procedure errors, temporary or permanent modifications in procedures is established. The number of temporary operating instructions is reasonably low (less than 10/unit - which is the plants goal) and operators have a good overview of them. All temporary operating instructions are effectively managed by means of a user-friendly computerized database. Hard copies are available in MCR.

There are adequate controls and procedures to ensure compliance with Limits and Conditions for Operation (LCO). Entries and exits from LCO are reported and documented in a logbook and electronic database. The planning process incorporates a risk assessment to minimize entry into LCOs. These entries are shown on activity schedule sheets.

### 3.4 OPERATING HISTORY

Units 1 and 2 at Civaux NPP entered in commercial operation on January 29, 2002 and April 23, 2002 respectively. Both units generated about 47TWh from the first connection to the grid to the end of 2002. Unit 1 first went critical on November 29, 1997 and was first connected to the grid on December 24, 1997. In May 1998 at Unit 1 during the reactor shut-down conditions significant leak due to crack on residual heat removal system, train A, occurred. Event was classified as INES 2. After extensive investigation, controls and tests the unit was restarted in September 1999. In June 2001 the Unit 1 periodic test of containment tightness failed. Investigation showed leaks on the inner containment, mainly around the equipment

hatch. After repair, new test in November 2001 was successful. Event was classified as INES 1. Unit 1 started its third cycle in October 2002 after refuelling. The duration of the last outage was 41 days.

Unit 2 first went critical on November 27, 1999 and was first connected to the grid on December 24, 1999. Unit 2 started its third cycle in December 2002 after refuelling. The duration of the last outage was 45 days.

The plant uses a computerized database to record the operational event reports. The plant staff is encouraged to report all operating events and deficiencies. However, more effort should be put into the identification of low-level events and near misses. See more details in technical support area – operating experience topic.

If a deviation is detected due to violation of general operating rules after maintenance activities, periodic tests or for other reasons, a deviation file is opened. If safety rules or safeguard actuators are affected, a significant operating event must be reported to the regulator. The file is addressed in a technical committee and is managed by a designated shift operation manager. A deviation file is managed according to the following phases: detection, analysis, corrective action, experience feedback. The plant uses indicators to improve system reliability.

### 3.5 CONDUCT OF OPERATIONS

There are seven operations shift teams, each managed by an operations shift manager. The team is composed of some twenty workers distributed between the two units. A shift manager, who is supported by a deferred time shift supervisor and a real time shift supervisor is in charge of the operation of both units and acts as manager of the shift team. Each unit has a tagging operator, a reactor operator, a turbine operator and five field operators. The minimum numbers for each position are clearly defined and are sufficient for conducting plant operation. In order to facilitate experience feedback and to maintain a high level of skills, a rotation of operators over both units is organized.

The shifts have logbooks giving clear and comprehensive information of main activities completed during the shift. In January 2003, the operation department introduced a performance indicator monitoring the quality of operational records. However, attention paid to entering the required data in the various logbooks can be improved. The team provided a recommendation to the plant in this area.

A detailed shift turnover is conducted for each position in the MCR. Individual shift turnovers were observed. Turnovers were conducted in a very systematic and professional manner. Exchange of information was effective and complete. Following the turnover the briefing of control room operators with tagging supervisor and field operators is conducted. No signature is provided in the logbook of turnover, but operators have no problem in understanding the exact point when responsibilities are transferred. Entry to the MCR is not allowed for half an hour before the shift turnover. This allows the shift adequate time to conduct the briefing of the next shift including documenting and transferring information on the plant status, work in progress and events during the shift.

Good schedules have been developed for controlling activities in operation, including surveillance tests, core monitoring, chemical analysis, maintenance work, etc. diesel surveillance testing was observed by the team and was generally well organized and properly executed by operators. Performance of the operators during the test and shift supervisor and shift manager when analyzing the results of test was professional.



Field operators monitor the status of the plant, take readings from systems in the field and conduct regular field tours. A computerized palmtop reader is used to take the readings and transfer them in to the database. There are no procedures for field tours, but the draft of the instruction for field tours and systems monitoring walk downs is prepared for approval and implementation.

The observed environment in the MCR during the operation of the unit on nominal power was quiet and appropriate. However, the team noticed that administrative requirements regarding the access to the main control room are frequently not fulfilled. The plant is encouraged to continue improvements in control of access to MCR.

Keys that are safety related (for accessing reactor protection cabinets, switching control room operator work stations onto active operating mode, plant pass key, permissive interlocking) are managed using a computerized key cabinet thus guaranteeing effective monitoring. Access rights are allocated according to position within the shift team. Each member of staff has individual access using a password. Every time a key is taken out or removed, it is recorded on a printer and on the hard disk of the key cabinet computer. It is therefore possible to know who has taken the key and for how long it is kept. These arrangements constitute an additional line of defence for the use of safety significant keys by plant staff. However, some important keys are not controlled by this system and some important doors are not kept locked (e.g. entrance door to reactor protection system, safety injection pumps).

### 3.6 WORK AUTHORIZATIONS

The plant has a work authorization process called SYGMA, based on a corporate computer application to manage work requests. Work and access permits are well conducted and controlled from shift to shift. Daily cross-site meetings, with various departments involved, provide information of plant status and support cooperation between departments on how work is prioritised and scheduled. Operations together with maintenance approve priorities of work requests in daily meetings. No indication of issuing double work requests for the same defect was found. A comprehensive on-call maintenance team exists to support the shifts outside normal working hours.

The tagging supervisor is responsible for carrying out tagging activities and provides support to the shift supervisor and shift manager. Shift crews are aware of systems and equipment out of service. Tagging and isolations activities are well handled via a software application (AIC).

LCOs (Limiting Conditions for Operation) are well managed. LCOs define rules to control availability in the safety systems. The result from risk analysis is included in schedule. The aim is to limit the number of planned group-1 LCOs to one and the number of planned group-2 level LCOs to four. The shift manager always bears responsibility for work being carried out in LCO level-1 conditions. Risk assessment is part of the routine planning process. During outage every shift confirms the availability of safety systems.

Technical modifications are carried out by the SC3M-team (interface between plant and headquarters) with support from headquarters. After comments of every department involved, a summary of the modifications is produced and sent to the operations department. Modifications are ready for analysis four months before start-up. Operating procedures are updated before start-up.

### 3.7. FIRE PROTECTION PROGRAMME

The fire protection programme at Civaux NPP has been developed on the basis of the standards for French plants. Fire fighting is carried out by emergency response teams. The “first-line for response team” is the field operator or any person having discovered the fire. The first-line response ascertains the outbreak of a fire, informs the main control room and ensures automatic isolations of the fire within the fire zone. In the case of a field operator, he also applies pre-established instructions (fire action sheets). The “second line response team”, comprising NPP personnel, ensures that automatic isolations are in place, starts to extinguish the fire and prepares for the arrival of the off-site municipal fire brigade (several brigades off-site) to take actions and command. The tagging operator is the leader of second line response team. An appropriate number (three to four times a year) of drills are organized for off-site fire-brigades.

Adequate facilities are available in the main control room to manage fires. A sophisticated computerized tool (part of KIC) provides graphic information concerning fires. A user-friendly interface document is also available in the main control room, with instructions to be applied in the event of a fire. Local alarm panels are well designed which makes it easy to detect the area on fire.

Initial and refresher training of plant staff, and in particular members of 2<sup>nd</sup> level response teams, is well organized and adequate. Adequate training exercises take place once a week.

The health and fire fighting procedures (PER) were developed to be used by off-site fire brigades and fire action sheets in the field. PER contains necessary and valuable information for the off-site fire brigade to carry out their duties effectively. (See good practice 8.1.(a) in EPP area) - Fire action sheets also help the response teams to carry out fire-fighting actions effectively and unambiguously. However, as a result of the large number of automatic false fire alarms, the team recommends to reduce the number of false fire alarms so that there is no doubt that each alarm is treated as a real fire event.

The plant has carried out fire load analyses for fire zones and other important plant areas. Allowed fire loads are marked on areas with specific labels. Reviews of the fire loading is conducted at two levels i.e. by the owners of the facilities and by industrial safety and radiation protection department. Fire loading in most fire zones were found adequate. However, other reviews of combustible materials in stores, workshops, laboratories and administrative areas revealed some weaknesses. The team has recommended that the plant should improve these areas.

### 3.8 ACCIDENT MANAGEMENT

Roles and responsibilities of all shift staff and other supporting personnel during emergency conditions are clearly assigned by the comprehensive set of emergency procedures. The state based approach (APE) emergency operating procedures and event based beyond design accident and severe accident procedures are developed and used in computerized and paper copy versions. They are of a good quality, easy to use and enable the status of the plant to be followed.

Shift crew composition is adequate for immediate actions during the emergencies. In emergencies, the shift staff is supported by a safety engineer on call. The shift engineer attends the same training as the MCR operators i.e. shadow training, simulator training. Specific training is also provided for safety engineers. In case of an accident the shift manager coordinates the activities until the arrival of the on-call safety engineer, where upon he takes



the role of the coordinator. In addition a group of 70 people from different departments of the plant are on call in case of emergency situation.

Operations staff receive training on the use of emergency procedures during classroom training, and during the training on the full scope simulators. All responsible managers included in different positions in plant emergency response group are also trained on use of these procedures. Three comprehensive emergency drills per year are conducted. There are coordinated with all involved off-site organizations and local authorities.

## **STATUS AT OSART FOLLOW-UP VISIT**

In the operations area there were three recommendations and one suggestion. Two of the recommendations as well as the suggestion were resolved. One recommendation had satisfactory progress to date.

The plant has introduced a comprehensive instruction, which provides detailed requirements and guidance on the evaluation process for retraining needs for shift staff who do not perform their duties for an extended period. Specific evaluation sheets were developed for all shift personnel. Based on the evaluation, operations personnel receive identified training before resuming their duties. The plant has used this procedure effectively in three cases up to date.

The majority of plant activities aimed at resolving the issue concerning entries in operational logbooks were focused on communicating with plant staff and encouraging them to comply with plant management and nuclear industry expectations concerning logbook entries. Specific plant instructions and performance indicators were introduced in 2004. Observed records in surveillance test sheets fully met industry standards. The plant is encouraged to continue its efforts in the area of MCR logbooks.

The plant has made significant efforts to analyse and identify the causes of false fire alarms in industrial and other areas of the site in order to decrease their number. Effective corrective measures were developed and implemented, and the number of false fire alarms was rapidly reduced in the year 2004. The Civaux NPP is currently the leading site in the EDF fleet in respect of this performance indicator. It is the only plant in France where the fire fighting team is sent out to the field as soon as the fire alarm is triggered, which significantly increases the possibility of successful and timely response in case of real fire.

The plant has effectively improved the programme to control fire loading and the storage of combustible materials at the site. Fire loading risk analyses are regularly updated by the owners and validated by the site fire protection supervisor. A specific surveillance test procedure for monitoring of fire loading has been introduced and implemented. In general, the awareness of plant personnel regarding the importance of fire loading issues has significantly improved.

## DETAILED OPERATIONS FINDINGS

### 3.1 ORGANIZATION AND FUNCTION

**3.1(1) Issue:** Insufficient requirements exist to ensure that shift staff, who do not perform their duties for an extended period of time are provided with appropriate on-the-job training prior to resuming their duties.

There is no administrative instruction, which specifies the requirements (content and duration) for refresher training, on-job training or shadow training for the shift staff after return from a long absence. It is left to the judgment of the shift manager what kind of re-training will be performed by returned staff member before resuming shift responsibilities.

Without clear guidance on refresher training requirements shift staff, who have been off shift for an extended period could be assigned duties for which they are insufficiently prepared. International experience shows that shift staff who return to their duties after an extended absence, without proper refresher training, can lack the necessary awareness of plant status (e.g. plant modifications, procedure modifications or new procedures) and consequently perform inappropriate actions, during normal and emergency conditions.

**Suggestion:** The plant should consider establishing clear requirements to ensure that the shift staff who do not perform their duties for an extended period are provided with appropriate training prior to resuming their duties.

#### **Plant Response/Action:**

##### **Site analysis**

Failure to perform daily operating duties combined with a lack of awareness of actual plant status can compromise standards of plant operation (safety, plant capability).

The Civaux operations department has contacted other sites and has drawn inspiration from what has been done (at Golfech, for example) to raise its expectations and clarify prerequisites prior to staff returning to shift following a prolonged absence.

##### **Actions carried out**

The operations department has set up a process enabling management to first check which skills can be utilised, and enabling staff members to feel more at ease when resuming their duties...

This process has to be applied after an absence following one shift cycle i.e. seven weeks. In 2004, this was the case for one staff member.

In the event of shorter absences, application of this process is left to the discretion of management.

Practicalities associated with the resumption of shift duties after an absence exceeding one shift cycle are specified in an operations document. Standard interview forms have been drawn up for each shift position.

A formalized interview between the staff member and his line manager is used as a basis for drawing up the relevant training actions before officially returning to shift (shadow training, briefing, training and refresher training, etc....).

## **Process description**

Using these standard forms as a basis, the manager – in conjunction with the staff member – identifies those actions required for resuming shift duty, from a pre-established list.

This list is personalised by taking into account the length of absence as well as the worker's prior level of professionalism.

Consequently, the length of time preceding resumption of shift duties can vary from a few hours to several days.

## **Responsibilities**

It is the manager's responsibility to:

- work with the member of staff to draw up a list of skills to be worked on before shift activities are resumed,
- make sure that it is fully completed and to officially endorse resumption of shift activities.

## **Tools**

The standard reference sheet is the one corresponding to the staff member's job position. Once the retraining has been completed, the sheet is filed in the individual training log of that staff member.

## **Experience feedback**

Experience feedback will be performed at the beginning of 2005 so as to amend this process.

**IAEA comments:** The plant has introduced the instruction D5057/NS/CDT/47 'Methods of going back on the shift after an absence longer than one cycle' in November 2003. This instruction provides detailed requirements and guidance on the evaluation process for retraining needs. Specific evaluation sheets are developed for all shift personnel. Based on the evaluation, the operations personnel receive identified training before resuming their duties.

The operations staff recognized the benefits of the retraining process after long absences, which is now clearly described and formalized. It minimizes the possibility of insufficient preparedness or lack of awareness of plant status by operating personnel. The plant effectively used this procedure in three cases, of which two are still in progress.

**Conclusion:** Issue resolved.

**3.1(a) Good Practice:** As part of the self-assessment activities carried out by the operations department, a formalized control program has been introduced. This programme monitors the performance of key safety-related operations activities.

Key safety-related operations activities such as surveillance test scheduling, temporary procedures, administrative lock-outs, alarm management, operating documents in the control room, etc. are formally monitored on control sheets.

17 types of check targeting key operating activities have been introduced and are identified by a letter of the alphabet. These internal checks monitor the effectiveness of operations department activities and assess their performance.

They are tracked in independent, stand-alone control sheets including:

- control points,
- the person responsible for carrying out the check,
- frequency,
- processing of deficiencies.

The various checks are systematically discussed at the week-end and during the Monday operations meeting to ensure proper implementation of the process. A comprehensive report is drafted twice a year and presented to operations management.

This control programme has improved performance of key operations activities. In particular, it has helped to reduce the number of temporary operating instructions and the number of alarms in the main control room. Another aspect is that the program has been effective in ensuring that operations staff complete their required training in due time.

**3.1(b) Good Practice:** Civaux NPP has developed an innovative support and expertise structure for the on-line process. This unique structure has the advantage of providing a direct link between the shift team and maintenance work planners and placing the shift-manager at the heart of the decision-making process.

The shift manager is supported by two shift supervisors. The CTTD or deferred-time shift supervisor plans and schedules weekly activities. He provides a direct link between operations staff and maintenance work planners. He relieves the shift manager of planning activities, thereby enabling the latter to focus on operational safety. Unlike other French plants, this position is incorporated into the shift structure.

Thanks to this structure, the CTTR or real-time shift supervisor can focus more closely on daily operations activities, both in the control-room and in the field. He ensures that the interface with maintenance runs smoothly at all times, and has enough time at his disposal to provide the shift team with hands-on support.

This system has proved to be so effective that it has been tested and adopted by other French plants.

With this organization in place, the shift team is truly at the centre of the process.

### 3.5 CONDUCT OF OPERATIONS

**3.5(1) Issue:** The entries in the operational logbooks does not meet the international standards. The team observed the following facts:

- The team found a number of examples where filled-in data in logbooks are overwritten or changed by using correction fluid, corrections are done without any signature or initials (for example in limiting condition for operation log-book, unit 1: KRT 17 from 14 May and KRT8 from 12 May 2003, in both the wording was changed from “unplanned” to “planned”, F over-written to P).
- In secondary side field operator logbook no time is recorded for conducted activities, the only required numerical reading (SEK 101 LD: Relève, Delta) is very rarely filled-in.
- Although the expectations are established and performance is monitored by an indicator (surveillance tests logs, MCR operator logs and LCO logs), inappropriate corrections in logbooks still appears.

Unclear or overwritten data in operator’s logbooks can lead to passing on incorrect information.

**Recommendation:** The plant should enhance communication and verification regarding established requirements to filling the logbooks.

#### **Plant Response/Action:**

##### **Action plan**

In 2003, the operations department at Civaux worked together with shift managers, shift supervisors, control-room operators, field operators and support staff on improving the level of thoroughness within the operations department

The issue of communication and log-book keeping in the control-room was examined and discussed at a meeting held on 6 May 2003.

The OSART mission added substance to our investigation and the reviewers’ recommendations were addressed as part of this effort.

Department management was determined to work together with its staff in a way that would enable workers to renew their sense of ownership with regard to expectations, as well as enable them to redefine the “basic tasks” of each specific craft to ensure that work is performed thoroughly and to the highest of standards.

On 24 November 2003, a feedback meeting on commitments taken at the meeting of 6 May 2003, was held in order to endorse those commitments in the presence of representatives from all operations crafts.

As a follow-up to the work accomplished during this meeting, the associated action plan is provided below.

##### **Process description**

Commitments adapted for each job craft dealing with filling out of control room shift logbooks have been presented to each shift team by the shift manager for that shift team.

Control room operators:

### **Continuity – shift turnover**

Undertakes to keep track of events and activities in the shift logbook.

Undertakes to conduct a specific turnover for the oncoming team (for the first day of shift), using continuity guidelines.

Use of power operations shift log and outage shift log.

Verified by shift manager.

### ***Checking traceability of actions***

This is vouched for by the field-operators' signature in the logbook.

Field operators:

Keep better track of shift turnovers and actions, as well as next shift's objectives in their logbook.

Vouched for by control-room operator's signature.

The department manager and shift managers keep a check on whether commitments are being met, within the scope of the department management control programme. This check on fundamental aspects covered by the respective crafts is formally documented.

### **Responsibilities**

It is every worker's responsibility to meet these commitments when performing his tasks, while it is the responsibility of management to check that the process works properly and efficiently.

### **Tools**

Control-room operator shift logs and field-operator logs.

### **Experience feedback**

Deficiencies are immediately rectified by managers during systematic log checks at the end of shift, in order to avoid any deviations, the aim being to maintain a high standard of record keeping in a craft's key activities.

A review carried out during July and August of 2004 brought to light a new decline in the quality of how shift logbooks are filled out. Operations department management staff reacted consequently by providing reminders of expectations and by setting up second-level checks.

As mentioned in the action plan, a self-assessment looking at adherence to commitments will be conducted at the end of 2004 as part of the team management contract.

We are actually working on a computerized shift logbook following an example of what was done at Blayais NPP.

**IAEA comments:** The majority of plant activities aimed at resolving this issue were focused on communicating with plant staff and encouraging them to comply with plant management and nuclear industry expectations concerning logbook entries. Instructions for proper completion of surveillance test sheets were introduced in February 2004. Recently, in November 2004, the plant developed and introduced the instruction D5057/EXP/NT/4, "Basic Quality Principles for the Completing the Shift

Manager's Logbook". Real time and second level monitoring (using the performance indicator) for all shift crews was introduced to monitor performance in this area.

Interviewed plant personnel are aware of expectations. Use of correction fluid was not observed. All observed records in surveillance tests sheets fully met industry standards. However, several inappropriate corrections of entered data, without any signature or initials, were observed in MCR logbooks. The plant is encouraged to continue its efforts in this area.

**Conclusion:** Satisfactory progress to date

### 3.7 FIRE PROTECTION PROGRAMME

**3.7(1) Issue:** There are many false automatic fire alarms, which can cause unnecessary delays in response of the plant staff to fight a fire.

- From January to March 2003 there were 45 false fire alarms initiated by the automatic fire alarm system. As an immediate response to the fire alarm the field operator is sent to check if it is a real fire and if the fire is contained within the fire zone. Only if the field operator confirms that it is a real fire or if he does not respond in a five minutes period, the 2<sup>nd</sup> level response fire-fighting group (formed from plant shift staff) is initiated and sent to isolate the area and ensure containment.

In case of fire, the first few minutes are very important for successful and effective fire fighting. An excessive number of false fire alarms could lead to the plant treating fire alarms as a routine event and slow the response to a real fire.

**Recommendation:** The plant should reduce the number of false fire alarms so that there is no doubt that each alarm is treated as a real fire event.

#### **Plant Response/Action:**

##### **Root-cause analysis**

The operations and site-security departments made an inventory of all false alarms over a three-month period. This inventory revealed a number of causes:

- optical beams on detectors in the turbine building, diesel-generator rooms, fuel building and workshop are cut out when cranes are used and when scaffolding is put up
- faulty detectors
- hot work-permits incomplete (detectors not inhibited)
- miscellaneous causes (steam leaks, temperature in rooms, exhaust gas from handling equipment, etc.).

##### **Action plan**

- send fire-fighting teams out as soon as alarm goes off (regardless of whether it is a false alarm or not)
- draw up crane operating instructions in order to guard against any false alarms during use
- take measures to deal with false alarms when putting up and taking down scaffolding
- periodically monitor and analyse false alarms so as to define progress actions on a case-by-case basis
- open a plant engineering file to ensure reliability of the fire detection system.

##### **Description of process**

Two processes have been set in place:



- monitoring and monthly experience feedback on false alarms to which fire-fighting teams have been dispatched. This analysis is conducted by the network of fire-protection representatives. Its aim is to identify the causes of false alarms and set up counter-measures. Setting up operating instructions for cranes and installation/dismantling of scaffolding is a prime example of progress actions resulting from these analyses
- joint analysis (Civaux, Chooz, corporate engineering group) of unavailable fire detectors and implementation of equipment modifications. This has already given rise to targeted actions: installation of a relocated fire detection system close to the steam generators and RHR valves.

### **Responsibilities and experience feedback**

The site fire-protection officer chairs a monitoring and experience feedback meeting (with fire-protection representatives from the various departments) and monitors progress actions every two months.

Improvements to reliability of the fire-detection system are monitored by the engineering department. A status progress check is regularly conducted by the monitoring investigation and performance structure (VIP).

2004 annual results have greatly improved:

From 1 June 2004 to 30 September 2004 we have counted 23 calls to the second response team (as soon as the alarm appears):

- 4 linked to behavior
- 19 linked to technical problems 6 in the diesel rooms, 6 in the Turbine Hall and the remaining 7 in various locations

regarding the diesel room technical problems a modification was tested successfully on Unit 2 and will be put in place on Unit 1 during our next partial visit\*

Regarding the Turbine hall the problem has been identified and is being analysed by the engineering department.

**IAEA comments:** The plant has made significant efforts to analyse and identify the causes of false fire alarms in industrial and other areas of the site in order to decrease their number. A more detailed tracking and monitoring process for all false alarms has been introduced. Based on this analysis, effective corrective measures were developed and implemented. As a result, the number of false fire alarms was rapidly reduced in the year 2004.

The Civaux nuclear power plant is currently the leading site in the EDF fleet in respect of this performance indicator. It is the only nuclear power plant in France where the fire fighting team is sent out to the field as soon as the fire alarm is launched, which significantly increases the possibility of successful and timely response in case of real fire.

**Conclusion:** Issue resolved.

**3.7(2) Issue:** The control of combustible materials or fire loading in stores, workshops, laboratories, administrative and other plant areas outside auxiliary building and RCA are not effective.

The team observed inappropriate storing of combustible material in several areas:

- oil cans stored in wooden cabinets in I&C metrology standard laboratory,
- there is cardboard box for cardboard waste and carts with wood in oil storage facility,
- combustible chemicals stored in cupboards which explicitly were not for this purpose in chemical storage (BEIT Bâtiment Exploitation Inter-Tranches, level -1),
- combustible material ignition sources stored in maintenance workshop,
- walls in two lifts in turbine hall of unit 1 are covered with wooden boards.

The control of combustible materials or fire loading are organised on level of the owners of the facilities and on the level of industrial safety and radiation protection department (SRP). However, no previous records of SRP reviews are available and first systematic walk-down is planned in July 2003.

As mentioned in the MA and MOA section of the report, evidence of smoking was observed in unauthorized locations of the plant. Smoking and inappropriate storage of combustible material or excessive fire loading increase both the possibility and severity of fire.

**Recommendation:** The plant should improve effectiveness of the established control related to the storing of combustible materials or fire loading in storage areas, workshops, laboratories, administrative and other plant areas outside auxiliary building and RCA areas.

**Plant Response/Action:**

**Root cause analysis**

The plant has identified the following causes concerning poor control of fire loads:

- standards for tidiness in the field have been defined but they are not sufficiently shared by all
- non-smoking policy at the plant is not clearly defined
- certain equipment is needed (fireproof cabinet for chemistry).

**Processing methods**

In order to resolve these shortcomings the following decisions have been taken and implemented:

- the senior management team have been reminded of all standards of expectations
- a non-smoking policy has been written for the plant (see MOA 1.2.3)
- monitoring of fire loads is done by the owner department's
- an action plan for store rooms and storage enclosures has been drawn up. Other rooms are dealt with via a general tidiness action plan (MA 4.2.1).

This action plan, approved by the plant senior management team, is implemented by the fire protection representatives within the departments.

### **Assessing effectiveness**

Our corporate services performed an inspection in May 2004 looking how effectively reference standards are being implemented. The action plan following the OSART mission has been strengthened and is still being implemented.

The effectiveness of the action plan is monitored via the following two indicators:

- Progress made with the action plan:
  - renewed risk assessment by designated owners of storage enclosures: 80 % at end of September
  - the fire loading sheets have been modified to guarantee a better tracking of monitoring in the storage enclosures 100 % completed
- The results and trends of surveillance activities performed by the industrial safety and radiation protection department These show a significant improvement in the management of storage enclosures.

**IAEA comments:** The plant has implemented a comprehensive programme to identify all storage areas with flammable materials and to designate owners for these areas. Risk analyses for fire loading are regularly updated by the owners and validated by the site fire protection supervisor. In general, the awareness of plant personnel regarding the importance of fire loading issues has significantly improved.

A specific surveillance test procedure for monitoring of fire loading has been introduced. On the basis of this procedure, regular checks of fire loading are conducted by the owner, and independently by the SRP representative.

**Conclusion:** Issue resolved.

## 4. MAINTENANCE

### 4.1. ORGANIZATION AND FUNCTIONS

The organizational structure at Civaux Nuclear Power Plant has been arranged such that maintenance responsibilities are divided across several different departments each reporting to the plant and deputy manager. In addition the corporate resources department and other external groups provide significant support to the power station.

For each of the maintenance departments there is a clearly defined set of maintenance objectives, mission statements, and performance indicators. The performance indicators are well maintained and presented in a structured manner, which allows easy access for all staff.

Each maintenance department is self-contained with the skills and resources necessary to carry out the preparation, execution, control and analysis of each of their specialities. Each department defines its business plan in terms of a formal contract to the plant manager. There are however, several notable differences in the way in which the various maintenance departments operate and the team encourages Civaux to benchmark across the departments to ensure that performance is optimised.

There is a strong corporate influence on the operation of Civaux Nuclear Power Plant. This interface is well defined and enables the power plant to gain access to large and technically competent support functions. There is, however, evidence that the corporate influence is effecting the responsiveness of the power station and the team encourages EDF and Civaux to assess ways in which the level of responsiveness could be improved.

Effort has been directed towards improving the interface with the operations department. Evidence of an effective working relationship with operations was observed and the team recognize this as a good practice described in the operation chapter of this report.

The relationship with main contractors is considered acceptable.

### 4.2. MAINTENANCE FACILITIES AND EQUIPMENT

There are a number of workshops across the site allowing work to be conducted both inside and outside the radiological controlled area. These workshops are operated directly by the maintenance departments. Facilities are also provided to enable decontamination of tools and equipment. It is considered that adequate maintenance facilities are available to enable work to be carried out in an effective and efficient manner.

Training facilities and mock-ups are available for major activities.

General housekeeping within the workshops and associated facilities, was on the whole reasonable, however there were several specific areas of concern.

Smoking is permitted within the workshops. As there are significant levels of combustible material within the building this presents a significant fire risk. This issue is addressed further in the MOA section of the report.

It was also observed that the control of the storage and inspection of maintenance equipment and tools was not meeting international standards. This could result in an increase in industrial safety risk to personnel and the potential for damage to safety-related equipment. The team has therefore recommended to Civaux that the standards for the control and storage of maintenance equipment and tools should be improved.

#### 4.3. MAINTENANCE PROGRAMMES

It is considered that Civaux has a well-defined preventative maintenance programme. A significant part of the preventative maintenance programme is controlled at corporate level to ensure consistency across the N4 series of reactors. Inputs to programme are provided at local level for non-safety-related systems. These local preventative programmes are written by the maintenance departments and validated by engineering. The preventative maintenance requirements are recorded in a computer database called PROSUR. This database is an effective tool for ensuring configuration control between the requirements of the maintenance programme, the surveillance procedures and the main work management tool SYGMA.

A significant sub-set of the preventative maintenance programme is the In Service Inspection (ISI) programme. This programme is clearly defined, implemented and reviewed in accordance with regulatory requirements, plant requirements and general operating rules. A number of the longer term ISI procedures have not yet been produced, however this is not considered to be a significant problem given the configuration control systems in place.

The main maintenance management tool is SYGMA, this system manages all the essential phases of a maintenance activity, and integrates the preventative and corrective maintenance programmes. Each individual maintenance department undertakes its own works coordination, however the coordination between the different departments is considered to be effective.

All identified corrective maintenance activities are controlled effectively once a work request has been made, however as highlighted in section 4.6 there is concern that a number of plant defects are not formally reported via the SYGMA system.

#### 4.4. PROCEDURES, RECORDS AND HISTORIES

Maintenance tasks are performed via work orders, which contain the full package of information necessary to perform the maintenance activity, including, as appropriate, risk assessment, procedures, tagging information, etc. Procedure adherence within the maintenance departments was considered to be acceptable and the work packs were understood and effectively controlled.

There exist a number of outstanding deviations on surveillance requirement procedures, however an effective configuration control system is in place to ensure compliance.

History files are well maintained, but there are a large number of history reviews pending. This has been previously identified and substantial progress has been made in clearing the backlog.

#### 4.5. CONDUCT OF MAINTENANCE WORK

There is effective control over the issuing and setting to work of maintenance personnel. Detailed training programmes and records are provided to ensure that maintenance personnel are adequately trained to perform the maintenance work. The records provide comprehensive information regarding authorizations for work.

It was, however, observed that some maintenance activities were not being performed to best international industry standards and practices. In particular the team observed that industrial safety practices and work place tidiness at times did not meet best international standards. The team recommended that Civaux should improve its maintenance standards and practices.

#### 4.6. MATERIAL CONDITIONS

Material condition at Civaux is of a reasonable standard. However, the team made a number of observations, which if not acted upon would cause material conditions to decline. In particular it was noted that the leak management programme is not yet fully effective, which is leading to a degradation in the material condition, greater potential for personal contamination spread and an increase in industrial safety risk. This problem was most obvious within the turbine halls where in several cases the hazards resulting from the leaks were not adequately marked and protected against. The team has therefore recommended to Civaux that the plant should improve their focus on the identification and rectification of leaks.

The team also noted that a number of defects had not been formally reported in the SYGMA maintenance management system. Tolerance of plant defects has the potential to significantly impact material condition and impair the performance of equipment. This was particularly the case for low-level material condition defects. The team has recommended that improvements should be made in the level of defect reporting.

#### 4.7. WORK CONTROL

A planning and work control process is in place to ensure work is prioritised and controlled within each of the maintenance departments.

Emergent problems were discussed at the various planning and work control meetings and incorporated into the work plans. Safeguards are in place to ensure the risk was minimised from coincident equipment unavailability.

Effective long, medium and short term planning processes are in place with appropriate communication between the various stages of the process.

Performance indicators are in place in each of the maintenance departments such that an adequate overview of performance can be obtained.

Work conducted via the work order control process is adequately documented and risk assessed, however the team encourages Civaux to continue to review how operational experience feedback from low level events can be incorporated into the work packages.

#### 4.8. SPARES PARTS AND MATERIALS

The organization and management of spare parts and materials at Civaux is considered to be of a high standard. In particular the team recognised as a good practice the environmental processes in place.

The flow of goods and equipment is arranged to minimise traffic onto the site and to minimise the risk of contamination spread on or off site.

In order to optimise the preservation of all the spare parts in the general stores climate control is provided. Temperature and humidity are strictly regulated to maximise shelf life.

Segregation is provided in the chemical stores. Oil and grease are also acceptably stored in a separate building.

Procurement of all safety-related spare parts is undertaken at EDF corporate level, and, the procedures in place to ensure the goods are traceable on site are well defined and effectively implemented.

#### 4.9. OUTAGE MANAGEMENT

Civaux has adopted a project-based approach to the management of outages. The organization structure is well defined with team members seconded from various departments to ensure appropriate knowledge and skills are available in the preparation phases of the outage. Integrated information and planning systems are also provided thus enabling the plant to make continued progress in the areas of operational safety, quality, radiation protection, environmental safety and overall outage performance. The team recognized as a good practice the combined systems, structures, tools and methods used within outage management at Civaux.

The outage project is divided into a number of modules with effective monitoring, review and follow-up at each stage of the project.

A ten-year project group is in place, which provides an effective link between the outage and power operations project. This provides a clear strategic vision to on-site personnel, support functions and major contract organizations.

Effective use is made of computer systems for outage scheduling and work control. In particular, the use of a configuration management tool (SIAT) helps control the changes in reactor states during outage periods. This ensures compliance with operations and maintenance requirements during outages and safeguards nuclear safety.

#### **STATUS AT OSART FOLLOW-UP VISIT**

Managers in Maintenance department have clarified the responsibility for different members of the department. Housekeeping inspections are scheduled and carried out by managers. The findings are documented and promptly addressed. All equipment in the store rooms inspected was well labelled and stored in a tidy way. The fire load in areas inspected was at a reasonable low level. The amount of material stored on floor areas have been minimized to avoid tripping hazards. Tracking of measuring equipment and tools are now managed by one single database. Instrument administrator performs regular check against printouts.

The actions taken have been very efficient to improve the control of storage and inspection of maintenance equipment and tools.

At the Maintenance department at Civaux a reorganisation have been carried out in order to clarify the responsibility for managers and increase the managements efficiency: the plant use the attendance of managers at work site as a tool to improve compliance with maintenance standards and behaviour. Behaviour problems are addressed immediately and are also discussed during team meetings. The results of a large number of work sites visits carried out by managers during the third quarter of 2004 shows the maintenance standard and behaviour has improved significantly.

In order to improve the diagnosis of leakage and to speed up corrective maintenance actions, a multi-disciplinary team have been formed. The team will act as a support for the field operators during daytime. Personnel from both operations and maintenance are on the team. The team is a useful link between maintenance and operations and have lead to a higher trust between both disciplines. At the Maintenance department at Civaux a reorganisation has been carried out in order to clarify the responsibilities of managers and increase the management's efficiency. The responsibilities of different members of the department have been clarified. Housekeeping inspections are scheduled and carried out by managers. The findings are documented and promptly addressed. All equipment in the storerooms inspected was well labelled and stored in a tidy way. The fire load in areas inspected was at a reasonable low



level. The amount of material stored on floor areas has been minimized to avoid tripping hazards. Tracking of measuring equipment and tools are now managed by one single database. The instrument administrator performs regular check against printouts. The actions taken have been very efficient to improve the control of storage and inspection of maintenance equipment and tools.

The plant uses the presence of managers at work site as a tool to improve compliance with maintenance standards and behaviour. Behaviour problems are addressed immediately and are also discussed during team meetings. The maintenance standard and behaviour have improved significantly.

The creation of the multi-disciplinary rapid response team has improved the diagnosis of leakages and sped up corrective maintenance actions. The team is a useful link between maintenance and operations and has lead to a higher trust between both disciplines.

A housekeeping team performs rounds on a regular basis that has resulted in higher housekeeping standards. The actions taken have been effective to decrease the number of leaks as well as decrease potential contamination of personnel and industrial safety risks.

The actions taken have been effective to decrease the number of leaks as well as decrease potential contamination of personnel and industrial safety risks.



## DETAILED MAINTENANCE FINDINGS

### 4.2 MAINTENANCE FACILITIES AND EQUIPMENT

**4.2(1) Issue:** Control of the storage and inspection of maintenance equipment and tools are not meeting international standards.

Examples of poor practices included:

- A number of slings were left piled on the floor of the maintenance tool store.
- Although inspected and fit for use a number of slings had not had the inspection labels updated. This could result in workers becoming tolerant of using lifting equipment outside the inspection period.
- Tools and equipment at several work sites were not stored in a tidy manner.

During the performance of major civil works in the demineralizer building it was observed that:

- Tools and equipment were piled randomly into the tool box.
- An extension cord was trailed across the floor in an unrestrained manner without clear identification, therefore resulting in a tripping hazard.
- Wood was used in abundance at the work site for covering the floor, walls and barriers. The wood was not fire retardant.

Housekeeping in the IAE (I&C department) metrology laboratory was unsatisfactory; examples identified include:

- Issues room equipment stored with handles protruding.
- Wood and cardboard stored in the “Issues” room and “Return for Repair” room.
- In the calibration room a large number of oil cans were stored on a wooden pallet.
- Plant equipment was stored alongside test equipment in the “Return for Repair” room.
- Cables and cards were stored on shelves in a haphazard way.
- A number of transmitters were stored on the floor in the centre of the laboratory.
- Air bottles, leak detector and sealant lubricant were all stored together in a desk drawer.

Two databases are used for the tracking of I&C standards and equipment (SYGMA and GEMO). Discrepancies were noted between the two databases for a pressure calibration standard (Reference No 0 ZAE-009LP) i.e. the calibration date on one system was recorded as 17/05/03 and the other as 13/05/03.

I&C equipment used “out of hours” is recorded in a log within the metrology laboratory. A number of entries within the log were incomplete.

Inappropriate control over the storage and inspection of maintenance equipment and tools could result in an increase in industrial safety risk to personnel and increases the potential for damage to safety-related equipment

**Recommendation:** Standards for the control and storage of maintenance equipment and tools should be improved. The following are examples of what other plants have included in their improvement efforts:

- Improving the housekeeping in the maintenance stores and metrology lab.
- Improving work place tidiness.
- Ensuring inspection/calibration dates are correctly identified on equipment.
- Improving attention to detail in formal logging/database systems.
- Ensuring sensitive/safety-related equipment is stored in a correct manner.

**Plant Response/Action:**

**Storage of equipment**

**Root-cause analysis**

We consider that this shortfall is essentially due to the fact that jobs are not closed out properly, combined with the fact that standards are low and that expectations are not clearly defined for store and workshop users and the associated equipment.

**Action plan**

The site began by taking stock of the various stores and workshops together with users, in order to discuss these observations face to face. First stage improvements have been carried out.

Managers of those departments concerned have assigned responsibilities to their team members. They have clarified these responsibilities and exhibited their housekeeping expectations in their respective work areas during team meetings.

A housekeeping inspection schedule has been drawn up for the respective plant areas. Shortfalls identified during these inspections are then dealt with.

A management walk-down routine provides the ultimate guarantee that plant areas are kept in satisfactory condition.

**Process and initial results**

Workers are responsible for ensuring that workshops are kept in a satisfactory condition. The first line supervisor checks their condition during his inspections. He detects discrepancies and initiates corrective actions. Reports compiled by the co-ordinator show a significant improvement. These reports are submitted to the department manager as an aid to taking the appropriate actions.

Performance indicators are currently being set up to ensure the long-term monitoring of these measures.

**Responsibilities**

Responsibility for this aspect is borne by the department manager. Those departments responsible for the management of measuring instruments essentially include EMC, GAM, IAE, LNE and MSR.

**Tools**

Exhibition of standards regarding housekeeping in work areas.

Managerial checking routine.

Performance indicators

## **Experience feedback**

Reports are drawn up as part of the department contract system. These reports are analysed by each department's senior management, in order to identify those points where improvements are expected.

## **Measuring instruments**

### **Root-cause analysis**

Observed discrepancies are due to the use of two management databases leading to inconsistencies, as well as low standards and poorly defined expectations between the users and those looking after measuring equipment and tools.

### **Action plan**

Amalgamation and standardisation of practices has brought about:

- clearer standards and expectations in conjunction with contractors
- measuring equipment and tools being managed through one database
- the instrument administrator performing regular checks against a printout.

### **Process**

The department responsible for the management of measuring instruments performs checks on how instruments kept in the stores are controlled. One of its tasks is to check the operation of available instruments. Reports are compiled by the co-ordinator appointed by the respective department manager. These reports are submitted to the department manager as an aid to taking the appropriate actions.

Performance indicators are currently being set up to ensure the long-term monitoring of these measures.

### **Responsibilities**

Responsibility for this aspect is borne by the department manager. A person from each department is nominated as being in charge of monitoring contractors. Those departments responsible for the management of measuring instruments essentially include GAM, IAE and SRP.

### **Tools**

GEMO computer application.

Stores checking report.

Performance indicators.

### **Experience feedback**

The analysis of shortfalls detected by these checks has helped to define areas for improvement in the management of measuring instruments.

**IAEA comments:** Managers in Maintenance department have clarified the responsibility for different members of the department. Housekeeping inspections are scheduled and carried out by managers. The findings are documented and promptly addressed. All equipment in the store rooms inspected was well labelled and stored in a tidy way. The fire load in areas inspected was at a reasonable low level. The amount of material stored on floor areas have been minimized to avoid tripping hazards. Tracking of measuring equipment and tools are now managed by one single database. Instrument administrator performs regular check against printouts.

The actions taken have been very efficient to improve the control of storage and inspection of maintenance equipment and tools.

**Conclusion:** Issue resolved.

## 4.5 CONDUCT OF MAINTENANCE

**4.5(1) Issue:** Some maintenance and support activities were not being performed to acceptable industry standards and practices.

Maintenance technicians were seen taking unnecessary and inappropriate industrial safety risks during performance of their work:

- A technician was noticed cleaning his lathe with compressed air (eye protection was also not worn).
- In progressing the civil works in the demineralizer building, technicians were seen descending ladders whilst carrying significant loads.

Work place tidiness on several maintenance tasks observed did not meet acceptable standards. For example:

In preparation for the pressure testing of the auxiliary boiler (0 XCA-002-CH, 0 XCA-030-BA, 0 XCA-020-DZ), it was observed that there was insufficient sheeting out of the work area. Tools, equipment and cladding which had been removed were not stored in a controlled manner.

In several places ineffective Foreign Material Exclusion (FME) precautions were noted:

- A pipeline on the auxiliary boiler had not been blocked off during the preparatory work for the over pressure test.
- FME protection was incorrectly fitted i.e. clear sheet polythene was inserted into a pipeline during performance of civil works in the demineralizer building.

There were noted to be a significant number of leaks from four bolt flanges, pump seals, and valve glands (see issue 5.6.1) this could be attributed to ineffective maintenance.

In addition to the above, maintenance technicians were frequently not wearing the correct personnel protection e.g.:

- EMC (electro-mechanical department) technician in the radiological controlled area was not wearing his hard hat.
- Technician in the workshops was observed not wearing gloves whilst handling sheet metal.
- A technician in the workshops was operating a lathe without wearing eye protection.

A number of workers involved in maintenance activities within the turbine hall basement were not wearing hearing protection.

Below standard maintenance performance could result in an increase in industrial safety risk, and degradation in material condition.

**Recommendation:** Maintenance standards and practices should be improved. The following are examples of what other plants have addressed in their improvement efforts:

- Reinforcing management standards.
- Improved use of the various human performance tools.
- Enhanced inspections/plant tours.

- Targeted training programmes.

### **Plant Response/Action:**

The analysis of causes shows:

- Requirements are not defined in detail and the management is overly tolerant of discrepancies.
- An insufficient hierarchical presence in the field.
- The shared responsibilities in the management of the work teams is not clear.
- The quality of daily gestures within activities has diminished due to habit.

### **Action Plan**

The reorganization of the maintenance departments has led to a decrease in the number of first line managers, in order to increase efficiency.

Each department is identifying specific skills development needs. We have completed 80 % as of the end of September. This identification will be used to create a cartography of skills by craft.

For example in 2004,

- Technicians from EMC department have worked, hand in hand with the people responsible for the EMC reference, on activities linked with the evolution of their reference in order to expand their knowledge in this domain.
- Work coordinators work in rotation with each other on different worksites so as to maintain and develop skills.

Annual reviews address skills development needs individually. In the end of 2004, the skills identified during these annual reviews will be compared to the cartography each craft and additional professionalism actions will be put in place.

Department have organized work site visits and the means of treating behaviours of situation observed during these visits. To improve the respect maintenance standards and behaviours, a monitoring plan was established and reports are presented to each work team. The manager can then decide actions to be taken to address root causes.

Individual behaviour problem are addressed during a meeting face to face with the technicians manager. In the first half of 2004 these meetings decrease notably.

### **Results**

The analysis of 100 visits during the 3<sup>rd</sup> quarter of 2004 reveals exemplary practices; the discrepancies are discussed and analysed during daily department team meetings. Immediate corrective actions are taken for each discrepancy. In 2004 management privileged dialogue with the workers instead of sanctions. Observed improvements are encouraging.

**IAEA comments:** At the Maintenance department at Civaux a reorganisation have been carried out in order to clarify the responsibility for managers and increase the managements efficiency: the plant use the attendance of managers at work site as a tool to improve compliance with maintenance standards and behaviour. Behaviour problems are addressed immediately and are also discussed during team meetings. The results of a large number of work sites visits carried out by managers during the third

quarter of 2004 shows the maintenance standard and behaviour have improved significantly.

The plant should consider using this lesson learned in the Human Performance Improvement Program.

**Conclusion:** Issue resolved.

## 4.6 MATERIAL CONDITIONS

**4.6(1) Issue:** The leak management programme is not yet fully effective, which is leading to a degradation in material condition, greater potential for personal contamination spread and an increase in industrial safety risks.

It is station policy not to place defect tags on identified leaks (or other defects). It is, therefore, not clear to personnel in the field whether or not a defect has been reported.

There are a particularly large number of leaks evident in the turbine hall e.g.:

- Unit 2 Moisture Separator Reheater System, for example  
2 GSS 113 SN
- Unit 2 Feedwater Chemical Sampling System, for example  
2 SIT 011 PO
- Unit 2 High Pressure Feedwater System, for example  
2 AHP 123 VL

A number of the leaks were not barriered off resulting in a risk to plant operators i.e. steam burns and slip hazards. Examples include:

- Unit 2 Moisture Separator Reheater System  
2GSS 367 YT
- Unit 2 Auxiliary Steam Distribution System  
2 SVA 999 VV
- Unit 2 Conventional Island Liquid Waste Collection System  
2 SEK 429 GT
- Unit 1 Water on the floor between sumps in the basement of the Auxiliary Building (source unidentified).

There was a number of leaks in the auxiliary building which as well as degrading material condition also increases the risk of personnel contamination. Examples include:

- Unit 1 Nuclear Auxiliary Building Ventilation System, for example  
1 DVN 274 VN
- Unit 1 Chemical and Volume Control System, for example  
1 RCV 352 AQ
- Unit 1 Safety Injection System, for example  
1 RIS 529 VP

A number of the leaks were emanating from flange joints and pump glands, which could be evidence of poor maintenance practices. For example:

- Unit 1 Safety Injection System, for example  
1 RIS 529 VP
- Unit 1 Chemical and Volume Control System  
1 RCV 172 PO.
- Unit 2 Feedwater Chemical Sampling System  
2 SIT 011 PO



## 2 SIT 023 PO

Also on the unit 2 turbine driven feedwater pump (2 APP 101 PO) a drain was blocked off with tape i.e. 2 APP 257 YP.

There are no formal programmes to trend and monitor the total number of leaks. Processes are not in place to trend the degradation of steam and water leaks.

The control and monitoring of leaks is essential to preserve the material condition of the power station, ensure equipment reliability and minimize the risk to personnel.

**Recommendation:** The plant should improve their focus on the identification and rectification of leaks.

Some plants have undertaken the following actions to improve their focus on leak management:

- Labelling of all leaks at the site of the leak.
- Identification of a performance goal and associated performance indicators.
- A leak management and control process that is continually monitored to ensure temporary provisions are in place to protect personnel.
- Analysis of the cause of various sources of leaks.
- An organization could be put in place to address minor plant problems.

### **Plant Response/Action:**

#### **Processing methods – action plan**

##### **Causes**

Detection and handing of leaks on the plant relies on the field operator walk downs this is not sufficient. The detected leaks are recorded in the SYGMA database and work request (DI)/work order (OI) module. This computer process used today is too complicated. This field operator do not record all discrepancies identified.

In the light of the various findings, it was decided to enhance leak-detection resources by setting up a rapid response team and dedicated housekeeping team. In addition, the site has put together a risk-prevention task force (GAP) which carries out plant inspections, during which leaks are also detected.

Management presence in the field has proved an effective means of monitoring the efficiency of implemented actions. Based on quantitative and qualitative criteria, this programme focuses on three aspects (housekeeping, management inspections, worksite inspections).

The rapid response team is a multi-disciplinary team whose role is to complete diagnoses, ensure that deficiencies are promptly dealt with and register work requests so that these are appropriately addressed. This may result in permanent repair by the department in charge, specific monitoring or temporary repair (leak reduction method using thermosetting paste), with permanent repairs scheduled to be carried out under appropriate operating conditions.

The dedicated housekeeping team is responsible for collecting leaks in conjunction with the rapid response team.

#### **Implementation progress report**

To date, the number of leaks (steam and water) found on the plant is small. There are no leaks that have not been addressed. However, traces of oil must be monitored, with special emphasis on oil leakage recovery, which remains a weakness.

### **Factual evidence**

A 60K€ budget has been set aside for leakage reduction in year 2004. A special leak monitoring programme has been set in place for GRE002VV and GCT016VV (turbine governing valves and turbine bypass valves respectively).

Performance review of plant housekeeping team: all leaks are currently collected.

(to follow).

**IAEA comments:** In order to improve the diagnosis of leakage and to speed up corrective maintenance actions a multi-disciplinary team has been formed. The team will act as a support for the field operators during daytime. Personnel from both operations and maintenance are within the team. The team is a useful link between maintenance and operations and have lead to a higher trust between both disciplines.

A housekeeping team perform rounding on a regular basis. One of the tasks for the team, as well as for the rapid response team and the field operators, is to collect leaks.

During the plant tour less than ten leaks was found in the turbine building. All of them have been reported into the SYGMA system and diagnosed.

The actions taken have been effective to decrease the number of leaks as well as decrease potential contamination of personnel and industrial safety risks.

**Conclusion:** Issue resolved.

**4.6(2) Issue:** A number of plant defects are not formally reported in the SYGMA maintenance management system. Tolerance of plant defects has the potential to significantly impact material condition and impair the performance of equipment.

It is not clear to personnel in the field whether or not a defect has been reported, as a formal defect tagging system is not used.

Discussions with maintenance personnel revealed that recurring problems are not reported. Significant leaks on the following pumps were regarded as acceptable as several attempts had been made to rectify the original problem without success.

- Unit 2 Moisture Separator Reheater System
  - 2 GSS 301 PO
  - 2 GSS 302 PO

Discussions with maintenance personnel indicated that defects were not reported when there was judged to be a significant risk from intrusive maintenance and where the performance of the component was not judged to be significantly impaired. For example:

- Unit 2 Low Pressure Feedwater Heater System
  - 2 ABP 001 PO

The number of outstanding work requests issued and not worked was standing at 229. Although the material condition of the plant was judged to be reasonable this is considered to be a low number for the observed plant condition.

There is evidence that many minor defects are not reported e.g.:

- Unit 2 Moisture Separator Reheater System.
  - 2 GSS 342 VL (small leak)
- Unit 2 Generator Seal Oil System
  - 2 GHE 027 VH (small leak)
  - 2 GHE 026 VV (small leak)
  - 2 GHE 035 YT (small leak)
- Unit 2 Condenser Vacuum System
  - 2 CVI 002 PO (damaged guard)

Several other miscellaneous defects/outstanding work on safety-related equipment was not reported in the SYGMA work management system e.g.:

- The emergency shower and eye wash system in the chemical store, although not connected was not reported in SYGMA.

Tolerance of plant defects has the potential to significantly impact material condition and impair the performance of equipment.

**Recommendation:** Improvements should be made in the level of defect reporting. The following examples have been addressed by other plants in their improvement efforts:

- Management reinforcement of defect reporting standards.
- Enhanced plant tours focused on defect identification.
- Joint systems walk downs with maintenance and operations personnel.

- Increased focus on the root cause of recurring defects.

### **Plant Response/Action:**

#### **Root-cause analysis**

A search for root causes was carried out by performing joint plant walk-downs conducted by maintenance and operations staff and by talking to field operators.

Taken overall, the observations and discussions revealed that some discrepancies were leaks that the operations department was monitoring but had not been reported in SYGMA:

- => The main reasons for which defects are not reported into SYGMA are:
- leaks deemed to be acceptable (2/3) and that are being monitored
  - lack of responsiveness from maintenance staff's when it comes to dealing with minor defects, due to a somewhat heavy work request/work order scheduling process and work being carried over for the outages (1/6)
  - need to improve field-operators' first-level diagnosis (1/6).

#### **Action plan**

The setting up of a rapid response team (EIR) makes it possible to:

- increase our ability to promptly address minor defects in order to restore the trust of operations staff
- simplify the work request/work order scheduling process for minor defects
- improve quality of OPS diagnosis by obtaining assistance from maintenance staff
- monitor the processing of work requests according to their priorities and which departments are involved.

The operations department has instigated an initiative with the rapid response team to improve the identification and diagnosis of discrepancies.

#### **Description of process**

Following benchmarking with other sites, a multi-disciplinary team (operations, electrical maintenance, mechanical maintenance, I&C, etc.) was set up which, on a daily basis, deals with minor defects on non safety-related equipment, using a simplified process (other than SYGMA) and conducts more in-depth diagnoses on all equipment.

This structure is conducive to joint field inspections by operations and maintenance staff. It is designed to improve defect identification.

The rapid response team is overseen by the duty shift supervisor. Members of this rapid response team stay in touch with planners from their specialist area.

At the same time, the management presence in the field program provides a means of gauging progress in this area.

#### **Experience feedback**

A tracking process for managerial checks has been implemented.

A feedback session on the working methods of the rapid response team has shown progress in terms of responsiveness to processing of discrepancies.

**IAEA comments:** Same as for 4.6(1).

**Conclusion:** Issue resolved.

## 4.8 SPARE PARTS AND MATERIALS

**4.8(a) Good Practice:** High standards of stock control and good warehouse management contribute towards effective and efficient environmental practices and reduce the likelihood of contamination spread. Examples of how this was highlighted include the following:

- In order to minimize traffic flow on site and to control the entrance and exit of goods and equipment a buffer store is located at the site perimeter. Thus delivery vehicles are not required to enter the site. All the deliveries and shipments are recorded. The store management personnel then take the parcels to the work sites.
- There are gamma radiation monitors at the entrance and exit to the buffer store constituting an additional barrier to minimize the risk of contamination spread on and off site.
- In order to optimize the preservation of all the spare parts in the general stores, climate control is provided, thus reducing packaging, waste, inspection time and hence cost. Temperature and humidity are strictly regulated to maximize shelf life.
- All chemicals are segregated. Thus in the unlikely event of a chemical leak the consequences to other stored chemicals and equipment are limited and the impact on the environment is minimized.

## 4.9 OUTAGE

**4.9(a) Good practice:** Outage Management.

Civaux has adopted a project-based approach to the management of outages. The organization structure is well defined with team members seconded from various departments to ensure appropriate knowledge and skills are available in the preparation phases of the outage. Integrated information and planning systems are also provided thus enabling the plant to make continued progress in the areas of operational safety, quality, radiation protection, environmental safety and overall outage performance.

Outages are managed by plant senior management, with a high level of support provided by specialist departments. Responsibilities are clearly defined in terms of operational safety, risk prevention, environmental safety and performance.

Outages are coordinated by a multidisciplinary team whose members are assigned from the following areas: maintenance, operations, safety-quality, chemistry, scheduling and industrial safety/radiation protection, as well as nuclear and conventional logistics.

The outage project is divided into a number of modules with effective monitoring, review and follow-up at each stage of the project.

The ten-year project group provides the link between the outage and power operations project teams. It is a cross-functional team in charge of scheduling inspection and maintenance activities. It gives a ten-year strategic vision to site management, support functions and major contract organizations.

Hence it provides a clear understanding of:

- Scenarios adopted and outage content for coming years to the outage project team.
- Competencies and skills need to be acquired and developed internal and external to the organization
- Outage strategy and effective transfer into medium and short term planning.
- Workload balanced out for EDF and contract staff.
- Activities to be carried out during power operations to the power operations project team.

Computer tools are used to ensure national and international operating experience feedback is incorporated into the planning process.

A rigorous configuration management tool (SIAT) has been developed on-site to control the change in reactor states during outage periods. This ensures compliance with operations and maintenance requirements during outages and hence safeguards nuclear safety.

Results:

Operational and industrial safety results during outages have been improving constantly since 2000. Excellent results are being achieved in the areas of radiation exposure and the environmental safety.

- Reduced number of significant operating events for which the outage structure is responsible.
- No safety-significant events reported as a result of deficiencies in the planning of activities.
- Reduction in the number of industrial accidents.
- Lowest integrated exposure levels during outage, compared with all other French plants.

Compliance with radioactive effluent production targets.

## 5. TECHNICAL SUPPORT

### 5.1. ORGANIZATION AND FUNCTIONS

The plant technical support group consists of a core group of support engineers for analyzing the performance of specific equipment such as computers, reactor core, turbine generator primary circulation. In addition each group such as operations, I&C, chemistry, have specific support engineers within their departments. The technical staff were found to be very knowledgeable in their respective areas.

The number of staff that are providing technical support appears to be sufficient to support day to day operations and emergent tasks

The technical support group has clear line accountability through a department manager and assistant director to the plant manager. This organization is also supported from a large central engineering organization from corporate headquarters. Interfaces with corporate and other plant organizations is well defined.

The large corporate group has the advantages of providing a solid support infrastructure based on experience of other EDF plants. The disadvantage to a corporate support structure is that plant modifications are done in a batch, serialized process which can take several years to be developed into permanent modifications at the NPP'S.

Sometimes a long turn around time for corporate is accepted by the staff.

The staff have indicated a close working relationship with their peers and supervisory involvement and interaction is evident from their comments.

### 5.2. SURVEILLANCE PROGRAMME

The surveillance testing program is very comprehensive based on specifications designated from corporate headquarters. Individual departments have the accountability for carrying out each of their specified tests on the periodicity required. This includes physically carrying out the test, recording and analyzing the results.

All tests are scrutinized and verified immediately after their execution to ensure specified test parameters have been met. Any testing deviations are analyzed and approved prior to continuing the test. Completed tests are also analyzed and any equipment degradation or predicted failure is assessed.

There is a very good communication process between operations and technical support via the (OTF) database and daily feedback at a team daily meeting which is facilitated by the safety engineer. The work management tool (SYGMA) schedules all tests, records results and manages the periodicity of the testing.

In combination with "PROSUR" the surveillance program is very comprehensive, governed well and adequately documented.

"PROSUR" is a single database reference which encompasses all maintenance, operations and technical activities in the plant. The "PROSUR" tool was identified as a good practice by the team.

The test equipment used for surveillance testing is documented and proven to be accurate for the required program. There were some observations with the metrology program itself. This is covered in further detail in the maintenance section of the report.



The team also suggested a more comprehensive method of system condition evaluation reporting which would fully utilize all the plant data available. A more comprehensive indicator would aid in evaluation and mitigation of potential equipment degradation on a more regular basis.

### 5.3 OPERATIONAL EXPERIENCE FEEDBACK (OEF) SYSTEM

The operating experience feedback system is managed by a plant committee COREX (operational feedback committee) with representatives from each of the departments charged to promote OE activities within each service. The committee is chaired by the engineering manager and meets monthly. This committee plays a key role in both the arrangements for dealing with events on-site and the interface with corporate activities.

The team suggest to enhance active participation of all department representatives in operating experience activities at coordinating level and systematic implementation of field procedures to feedback experience, such as pre-job briefing and post-work report at field level to effectively capture and promote the operating experience feedback.

The COREX meeting observed during the mission was very well managed and the dynamics effective. The agenda was very dense. The average delay time for addressing actions resulting from operating experience committee is increasing. A chart presented by staff on a number of cumulative actions shows an increasing cumulative backlog. The plant may consider to increase the frequency of the meeting.

The selection by the COREX committee of events coming from the Inter Department Collaboration (CID) and distributed for the local treatment is satisfactory. The team recommends lowering the threshold of reporting and analyze low-level events and near misses to capture human factors and related issues.

The human factors coordinator makes a positive contribution to the analysis of high level (DI19) events. Analyzing human factors is significant because the number of reactor trips while critical in Civaux is above industry average with most of root causes related to human factors. The team encourages the plant to increase the amount of attention dedicated to human factors coordination. This support tasks will increase when lower level events are included in the system to identify lessons learned and precursors.

Assessment by corporate and some initiatives at the plant have been implemented. On the initiative of the Civaux "REX" (OEF) committee and for the first time in France, a survey was carried out in 2002 to measure the level of OEF knowledge on the site. A sample of personnel was interviewed on 3 points: the interest of OEF, OEF organization and the tools used for OEF, using a questionnaire. Analysis of the results of the survey, carried out by the REX committee, was presented to the site management team. A REX committee seminar held in February 2003 highlighted the main lessons to be learnt from this survey; it reveals insufficient knowledge of OEF goals and its organization, in particular for collecting experience from the field. For this reason, department managers decided to reflect within their disciplines on how to improve the functioning of the local OEF loop. Some experiments, such as the introduction of a department REX committee or a short daily meeting (1/4 hour) involving technicians and managers for a round-up on activities carried out the day before, are already under way.

In addition to this one-time assessment initiatives, the team recommends implementation of a systematic self-assessment programme and management indicators to evaluate the

effectiveness of the operating experience feedback process which will be very beneficial for continuous improvement of the OE program.

The team suggest that the plant expand the review of external international experience and good practices. Consideration of OE international events is made by the corporate organization but it is not clearly relayed to the plant. The international operating experience shared worldwide by the nuclear industry is very significant and awareness of the lessons learned should be highly promoted at the plant.

The plant has recently prepared a guide for risk analysis. Operating experience history is not clearly identified in this guide as one of the sources to consider when performing the analysis. Operating experience is not always introduced in the pedagogical packages of refresher training for Safety Quality and Risk Prevention (RSQPR). The review limit date of some operating experience procedures is overdue.

Overall performance of the plant show very good performance on collective radiation exposure. In addition to human factors contributing to plant scrams, the plant has identified certain areas needing attention, in particular safety performance of safety injection system, auxiliary feedwater system and safeguards sources where indicators for 2002 are above the median of EDF plants and of world PWR plants. Special maintenance attention is needed for systems such as computerized operating system, mimic panel in control room and fire detectors, due to premature aging. Also for plant radiation monitoring system and nuclear sampling systems. Closer comparison with system performance of sister plant Chooz and continuous support from corporate is advised.

#### 5.4. PLANT MODIFICATION SYSTEM

All permanent plant modifications for safety related systems are developed at the corporate level and the modification developed will cover all affected units in the EDF fleet. Corporate ensures that all its modifications meet all the codes and standards that govern the modification process and as well the design modification meets the design basis.

Permanent modifications are done in a batched series process across all applicable units in the EDF fleet with enough time between installations to develop a good feedback on the installation. Again this results in a long time period to adapt the permanent modification to the plants which can extend to several years.

The plant has responsibility for modifications which are not safety related called (local plant modification). The plant modification process develops the design documents which then develop into an executable modification document. There is only one such modification that has been done at Civaux. This modification was the addition of drip trays inside a cabinet.

Temporary modifications in Civaux have recently been divided into two categories called DMP and MTI.

This program was just recently introduced to Civaux as all temporary modifications were previously classified as DMP. The separation was based on a recommendation from EDF internal reviews in the preparations for this OSART.

DMP modifications are temporary modifications primarily based on spare part availability and surveillance test adjustments. There are currently 70 DMPs in the database. An MTI modification is a temporary modification awaiting a permanent modification from corporate.

There are currently 1373 MTIs in the database most of which are divided into 421 request sheets. Many are associated with computer minor changes such as temperature compensation

changes based on length of cable runs. Tagging in the field to discriminate the two types was approximately 80% complete at the time of writing this report.

## 5.5. REACTOR ENGINEERING

Reactor core physics and core management are studied at the corporate level. The details of reactor core physics and core management are performed by computer codes and tools common to EDF.

The core loading strategy is produced at the corporate level and reviewed by the fuel manufacturer and then checked via a quality review.

All reactor physics surveillance tests during start-up and operation are executed by plant operations and maintenance personnel. These are very proceduralized and reviewed by corporate.

There is a very strong bond to corporate for this surveillance.

“Libellule” is a software tool used at Civaux for core transient management. It is very comprehensive in forecasting reactivity, criticality, axial offset and operating margins during power maneuvers. It is also good for grid availability.

## 5.6. FUEL HANDLING

The fuel handling activities are very proceduralized with good quality surveillance. There is a strong link with corporate about any department or plant issues with regards to fuel handling activities and procedures.

A discussion took place with fuel handling and chemistry about the recent event of failed fuel in unit 1. It was evident that through the continuous radiochemistry analysis that a trend was developing indicating a localized fuel failure. The monitoring program was sufficient to develop a good analysis of the event. Plans are in place to repair the defect during a subsequent outage. Procedures are in place if any mitigation is needed such as a shutdown if the analysis triggers this action point. There will also be a further analysis by the fuel manufacturer and corporate when the fuel rod is extracted during shutdown.

The spent fuel pool area and associated equipment are in good condition and well maintained and good FME (Foreign Material Exclusion) practices were observed in this area.

## 5.7 COMPUTER APPLICATIONS IMPORTANT SAFETY

Civaux utilizes the N4 standard computer surveillance application. This an extremely powerful hardware and software application for control of the essential systems and monitoring of all required parameters. It incorporates a strong man machine interface and visual graphics to enhance operation.

Currently an upgrade of the (KIC) system to a V7 application is being designed with an implementation date for the first unit at Civaux in 2007. This version will remove nuisance alarms during maintenance or shutdown activities in the main control room to help operator surveillance. It will also add procedural instructions to assist the operators.

Computer software or hardware changes are also qualified with the site spare computer prior to application in the field. Good redundancy and separation is designed into the computer systems.

There is strong site support for any problems with the equipment which employ rescue/response procedures for the main hardware and software. The plant, as well as corporate, maintains a local controlled copy of the files.

The ISO 14001 program is still in development at Civaux. The plans for the program implementation appear to be progressing well with full implementation scheduled for early 2004.

The program has full support of site management which also encompasses a communication campaign through such media newsletters as “Echo de Civaux”, “Civaux en Bref” and “Panache à La Une”

The program includes environmental operating feedback from other stations and a crises management plan in event of a chemical pollution emergency response. This response comes from existing internal committees already in place.

Training plans with a scheduled implementation period have already been rationalized, including an actual workshop and as well refresher training every 3 years has been adopted.

## **STATUS AT OSART FOLLOW-UP VISIT**

In the Technical Support area the team felt that all three recommendations and both suggestions were fully resolved.

In the process of preparing and reviewing the system surveillance reports, the system performance is rated green, orange or red. All systems are analyzed and given a preliminary rating. Those that receive an orange or red rating are selected for further review. The review of system performance at Civaux is also coordinated with the performance of the same systems at Chooz NPP. This program has resulted in several improvements that have increased system reliability.

A low level events initiative was started in May 2003. In 2004, after lessons learned from the trial use had been incorporated in the process, it was put in use. Several activities at the plant have been improved following the analysis of low-level events.

The plant has acted to increase participation in operating experience activities. The department coordinators of operating experience meet at the COREX meeting twice each month. The plant has improved the process used to inform workers of operating experience information that could help them avoid events. In particular, the plant focused on those events that may cause an automatic shut down. The pre-job briefing sheets for activities where there is a risk of scram now contain specific information about past events at the plant.

The plant has set up a good self-assessment program to gauge the performance of the operating experience program. This program includes the use of performance indicators.

The plant has increased its responsiveness to international OEX events. The people responsible for initiating actions for international OEX events now have better access to the information. The team observed that there is a greater receptiveness to using international OE information to improve practices at Civaux.

## DETAILED TECHNICAL SUPPORT FINDINGS

### 5.2. SURVEILLANCE PROGRAMME

**5.2(1) Issue:** System surveillance reporting via system condition evaluation reports (system health reports) are not prepared for all systems. Systems are not rated and the present schedule is to prepare the reports only once per year.

- Out of all the plant systems, 323 are monitored by engineering, of which 100 are currently given a system health report.
- No ranking of health is given to the system by plant standard performance indicators.
- No backlog corrective maintenance is included in the report.
- The engineering report is submitted once per year.
- System health reporting is a fundamental tool to evaluate and mitigate potential equipment degradation by use of a comprehensive reporting program for all plant systems on a more regular basis.

All plant systems and their health contribute to indication of trends and conditions to promote safe reactor operation, personnel and public safety.

**Recommendation:** Management should ensure that system health reporting is fully utilized to evaluate and mitigate potential equipment degradation by use of a more comprehensive reporting program for plant systems, on a more regular basis.

#### **Plant Response/Action:**

##### **Root-cause analysis**

1. The breakdown of N4 functions into main plant systems is very detailed. The drafting of a regular bill of health for all N4 plant systems is complex.
2. A technical review (“analysis of high-priority systems and functions”) is conducted once a year.
3. While data exists and is available, it is stored in several different databases, thus hampering a concise overview of this data.

#### **Action plan**

##### **The Technical Review**

Conducted on an annual basis, the technical review – covering the areas of maintenance and operations – is designed to provide a report on system (or function) operability and notable or potentially sensitive events, identify progress actions and set associated priority levels, gauge their results, improve surveillance programmes and propose technical upgrades where necessary. This review has been jointly conducted with Chooz NPP since 2003.

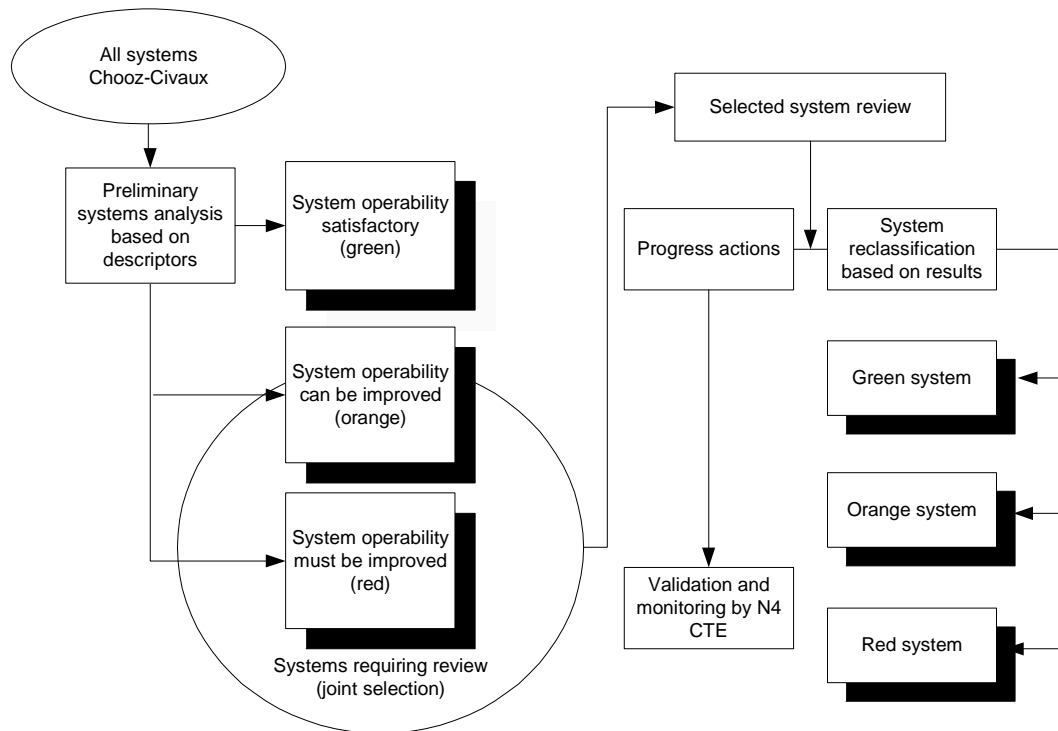
Analyses are conducted on the basis of the following data: significant operating events and safety-related events, the number of instances of availability loss, the number of unscheduled and preventive maintenance operations, cost, resultant production losses, equipment reviews and corporate reviews. Systems are classified according to the

diagram below in order to select those which will be analysed in depth with a view to proposing progress actions.

Action plans resulting from technical reviews, as well as monitoring of selected actions, are submitted to the Plant Operating Review Committee (CTE) for approval and appointment of co-ordinators.

The first technical review jointly conducted by Chooz and Civaux was submitted to the corporate technical division in October 2003. Assistance with some selected actions is provided by corporate engineering units.

System screening and classification principle:



### Review of safety-related systems by Operating Experience Committee

Trends in safety-related events (EIS) affecting all safety-related equipment are periodically reviewed at COREX meetings, using data extracted from SAPHIR (corporate event reporting database), over a 2-month period.

By analysing trends in the number of safety-related events for each safety-related system, the following trends can be identified:

- a large number of events, of a stable nature over the period in question, reveals the presence of a recurring problem. An investigation into the causes of this problem is then initiated (root-cause analysis)
- an increase in the number of events over the period in question reveals deterioration in the system’s condition. An investigation into the causes of this deterioration is then initiated (root-cause analysis)
- a drop in the number of events over the period in question reveals an improvement in the system’s condition. This trend corroborates the effectiveness of actions taken.

The quality of these analyses depends on the quality of event reporting into SAPHIR. In order to improve this, headquarters started upgrading data-processing tools in 2004 (creation of links between the SYGMA maintenance database and SAPHIR).

### **Improvements to the plant engineering structure**

A self-assessment conducted by the plant engineering structure at the end of 2002, combined with a diagnosis conducted on behalf of the site project spanning the period of 2004/2007, resulted in the creation of a structure known as VIP (Monitoring – Investigation – Performance).

This structure relies on engineering staff to fulfill the following duties:

- monitoring: Updating of technical reference documents, taking regulatory developments into account (inside and outside the company) – analysis of external OEF (events, good practices, etc.)
- investigation into technical matters: Providing support to power operations and outage structures, processing of recurrent technical problems
- improved performance: Plant health performance reviews – setting order of priority for processing of technical matters

Members of this structure meet on a weekly basis. Meetings are chaired by the Technical Director and are also attended by the duty shift manager and/or unit off-shift supervisor in order to provide a direct link with plant operating activities.

A track is kept of the various items being investigated, using a database common to Chooz and Civaux, with a view to improving technical competence in the operation of N4 plants.

**IAEA Comments:** Because of the large number of systems, the plant has grouped similar systems. Periodic surveillance reports are prepared for these groups of systems. The review of system performance at Civaux is also coordinated with the performance of the same systems at Chooz NPP. This provides a larger amount of data and allows comparison of system performance.

In the process of preparing and reviewing the system surveillance, the system performance is rated green, orange or red. All systems are analysed and given a preliminary rating of green, orange or red. Those that receive an orange or red rating are selected for further review. This review entails the determination of actions for improvement, closer monitoring and reclassification based on results.

This program has resulted in several improvements that have increased system reliability. Because Chooz is included in the analysis, consistent feedback on performance is presented to the corporate engineering departments that allow them to provide more timely assistance.

**Conclusion:** Issue resolved.



### **5.2(a) Good practice: PROSUR and SIAT Programs**

It is important that document and procedure configuration controls be managed closely to adequately promote reactor safety. The PROSUR and SIAT programs provide important elements of this control.

The PROSUR program is a single reference program that encompasses all plant system activities, for example: maintenance, operations, chemistry, surveillance tests. The PROSUR program provides configuration document and procedure management controls. These controls apply to technical specifications, procedures, and governing documents for the applicable equipment.

SIAT is a rigorous configuration management tool especially for outages. It was developed to control the change in reactor states during outage periods. This ensures compliance with operations and maintenance requirements during outages. Prior to any change in reactor state during the outage, coordination files are prepared via SIAT, reviewed by the outage safety committee and validated by the shift operations manager. SIAT is linked with the outage work schedule i.e.: work windows, milestones and outage safety committee hold points.



### 5.3 OPERATIONAL EXPERIENCE FEEDBACK (OEF) SYSTEM

**5.3(1) Issue:** Systematic program and procedures for analysis of low-level events and near misses are not in place to capture human factors related issues.

A sample of 112 significant events included last year in the SAPHIR database under DI 30 (safety-related events) by one department shows that there is no human factor related events identified and reported for operating experience feedback. Root cause analysis of low level event events is therefore not performed to identify precursors of human performance and set action plans for improvements.

During the OSART the Safety Technical Group (GTS) meeting discussed the implementation of human factor identification, tracking and analysis of low level events. An interdepartmental task force including operating experience manager was decided to be implemented to prepare an action plan for this topic.

Use of systematic procedures would be beneficial to facilitate the identification of recurrences, trending analysis and root causes from a group of events particularly for human factors. If not done, the plant will miss opportunities to determine lessons learned and appropriate corrective actions for improvement.

**Recommendation:** The in-house operational feedback programme should be improved by lowering the threshold to report and analyze low-level events and near misses to capture human factors related issues and precursors.

#### **Plant Response/Action:**

#### **Root-cause analysis**

1. No system established for the identification, capture and processing of low-level events, precursors and near-misses.
2. Root causes are not examined in sufficient depth during event analyses, thereby obstructing identification of human-factor issues.

#### **Action plan**

#### **Low-level events**

In order to align itself with other French plants, the site has approached headquarters, which is initiating a programme.

Three trial initiatives have been implemented:

1. Review of all observations made on the site (regulatory inspections and internal audits). This review comprises 300 to 400 observation reports involving potential low-level events. Observation reports are divided into groups: operational safety, radiation protection, industrial safety, availability, environment and cost. This analysis concurs closely with the conclusions of the safety/quality analysis conducted over the period spanning mid-2002 to mid-2003 (different processing methods and resources leading to the same result). This trial is now complete.
2. Scope of event analysis broadened by means of a clearly defined outline. The trial involves 4 departments: IAE (I&C/testing), operations (CDT), joint modifications structure (SC3M) and safety/quality (SQE). The aim is to detect and rectify a malfunction. The method applied by IAE differed slightly from the other three

departments in the holding of workshop meetings and post-job briefings. This trial is now complete. As at 01/07/2004, the following results were recorded:

- SQE: 100 events processed
- CDT: 40 events processed
- IAE: 10 events processed
- SC3M: 10 events processed.

A few examples:

- IAE - Process data monitoring: this low-level event, identified following several malfunctions experienced during surveillance tests, was due to incomplete monitoring of process data. It is being dealt with by the deputy department manager with the deadline for completion set for the end of 2004.
  - LNE - Primary activity levels taken into account when carrying out chemistry activities: this low-level event, identified following three malfunctions was dealt with in two stages:
    - modification to the procedure
    - modification to craft-specific work practices. Setting up of a daily work meeting bringing together both environment and plant chemists, replacing the previous practice of separate meetings for each sub-craft.
  - action plan regarding appropriate input of data for surveillance tests: Several malfunctions lead to an action plan co-ordinated by the operations department. An internal inspection was carried out by the safety and quality evaluation department for the three months between March and May. The effectiveness of the action plan was assessed.
3. Increased presence in the field. This is a site-wide programme; each department has to periodically conduct a specific number of work-site inspections, using “standard” inspection forms (inspection guidelines) to record malfunctions. These malfunctions are then analysed internally and may be reviewed at VIP meetings. This trial was first implemented in August 2004. The programme is periodically reviewed by the senior management team.

Based on the three trial initiatives above, this programme is co-ordinated by the safety/quality department manager. It will be reviewed in 2005 as part of experience feedback on presence in the field, after which the officially approved structure will be described in detail.

**IAEA Comments:** A low-level events initiative was started in May 2003. The first activity was to define what was meant by a low level event. A process was developed and trial runs of the process were attempted in the fall and winter of 2003.

In 2004, after lessons learned from the trial use had been incorporated in the process, it was put in use. Because of the initiative to spend more time in the field, more low-level events were known. Department management selected the most important, to analyse.

Several activities at the plant have been improved following the analysis of low-level events. The Safety Technical Group monitors on-going activities for the program within the departments.

The program is well developed in the operations and maintenance departments, but further development is still required in other plant departments.

**Conclusion:** Issue Resolved.

**5.3(2) Issue:** Active participation in operating experience activities at the coordination level and systematic-implementation of field procedures at the field level are not adequate to capture and promote the operating experience feedback

- A central committee on operating experience (COREX) is implemented for OE process management. Resource allocation to this committee is a part time dedication of a representative in each discipline promoting and expediting operating experience activities inside the department. The level of dedication, responsiveness and commitment varies very much from group to group in the monthly operating experience committee (COREX) meeting.

For example: A chart presented by the staff on frequency of attendance to COREX meeting shows that out of 13 department representatives, two did not attend any meetings in the first quarter of 2003, four attended one meeting and six attended all meetings. Attendance in January 2003 was 69%, decreasing to 62% in February and 54% in March.

- Activities where pre-job briefings need to be performed are not systematically identified in all departments. A list of seven major activities for sensitive transients has been identified in the operations area. In other departments there is no evidence of a similar list. Enhancement of this list of activities using operating experience feedback could be beneficial to improve the effectiveness of the operating experience programme.
- A systematic procedure to feedback non-technical operating experience in work orders is not in place. The work order format does not have a specific chapter for directly introducing human and organizational lessons learned after performing the work. As a consequence the collection of feedback from the field is not sufficiently effective.
- Departmental operating experience feedback methodology has been not implemented as a result of a systematic and coordinated approach but rather as individual department initiatives. While operations department has implemented a local operations committee for operating experience (OPS-COREX), in other departments different approaches have been chosen, such as daily meetings in I&C. Although approaches do not need to be necessarily the same at each department and may be adapted to specific needs, the lack of coordinated approach contributes to a wide variety of dedication and effectiveness.

Without active participation by all departments and systematic implementation of the program, some opportunities to learn from experience may be lost.

**Suggestion:** Active participation in operating experience activities at coordinating level and systematic-implementation of field procedures at field level should be enhanced to effectively capture and promote the operating experience feedback.

**Plant Response/Action:**

March 2004, screening and selected actions are validated at the weekly plant engineering meeting.

**Setting up of an OEF co-ordination structure within the crafts.**

Following a survey entitled “OEF for all” and as a result of the OSART conclusions, the creation of an OEF co-ordination structure within the crafts has led to the following department actions being taken:

- appointment of a designated OEF representative; this takes the form of a mission letter
- setting up of a permanent structure designed to promote OEF (internal and external), its purpose being to capture craft-specific OEF, analyse it, implement corrective actions and monitor their effectiveness.

A status check on these actions is periodically conducted by the COREX committee.

### **Implementation of pre-job briefings**

During the second half of 2003, all operations and maintenance departments identified activities having a significant impact on operational safety (potential reactor trips in particular) and implemented pre-job briefings for these activities. They are identified as such on the activity schedules for power operations and for outages. The lists of pre-job briefings and their content are added to and improved through experience feedback from the crafts.

### **Incorporation of OEF from maintenance work**

Expectations governing the drafting of job reports are listed in a plant memorandum. They specify, among other things, expectations pertaining to operating experience. These expectations are reiterated in the form of a concise document (double-sided A4) making it easier to apply them in the field.

*These actions address points 1 and 2 of the root-cause analysis.*

**IAEA Comments:** This issue dealt with increasing the level of participation in operating experience review within the coordinating department and at the working level. The plant has acted to increase participation. The department coordinators of operating experience meet at the COREX meeting twice each month. This allows them to respond more quickly to new events and monitor actions more closely.

The plant has improved the process used to inform workers of operating experience information that could help them avoid events. In particular, the plant focused on those events that may cause an automatic shut down. The pre-job briefing sheets for these activities now contain specific information about past events at the plant that occurred during the activity.

In the case of external operating experience, the departmental coordinators review the external events and select the most appropriate events for further dissemination within the department.

**Conclusion:** Issue resolved.

**5.3(3) Issue:** Self-assessment programme and management indicators to evaluate the effectiveness of the operating experience feedback process are not systematically implemented at operating experience coordination level and at each departmental level

A comprehensive set of management indicators is not identified to proactively monitor efficiency of OE process. Where indicator exists, they are not always presented clearly enough to facilitate a quick follow up analysis and prompt response. For example:

- (1) The chart presenting closing work time for different priorities of interventions do not allow directly identification of the ratio of delayed events by priority.
- (2) 50 % of the DI 19 events were reported to the regulatory body with delays in 2002, the required time for reporting was less than 2 months.

Self-assessment programmes to evaluate the effectiveness of the operating experience feedback process are not periodically implemented at the plant operating experience coordination level and at each departmental level. Self-assessment could be beneficial for the continuous improvement of the effectiveness of the operating experience programme.

Without thorough self-assessment, the operating experience programme will not be fully effective in enhancing performance.

**Recommendation:** The self-assessment programme and management indicators to evaluate the effectiveness of the operating experience feedback process should be systematically implemented at operating experience coordination level and at each departmental level. The results of this self-assessment should be used to continuously improving the OE programme.

**Plant Response/Action:**

**Root cause analysis**

1. There is no self-assessment programme for operating experience.
2. There are no performance indicators for gauging the effectiveness of corrective actions.

**Action plan**

**Establishment of management indicators for the OEF process**

A number of performance indicators have been set up in 2004 to gauge the performance of the OEF process:

- number of recurrent significant operating events
- number of recurrent causes within significant operating events
- corporate appraisal of the quality of plant event analyses.

Performance indicators have been set up to assess the efficiency of plant-specific OEF:

- time taken to analyse significant operating events, local events and safety-related events
- number of actions selected from analysis of external OEF
- ratio of closed-out OEF actions/selected actions

- number of “DI 103” instances (reliability of safety-related equipment) reported into SAPHIR
- department attendance at COREX meetings.

Initial trends for 2004 show stronger craft commitment to the OEF process:

- greater attendance at COREX meetings (average attendance has gone up from 60% to 70% in a year)
- drop in number of outstanding OEF actions (50 actions in progress at the end of May 2003 – 30 actions in progress at the end of September 2004)
- significant operating event analyses produced more quickly (over a 12 month sliding scale, 16% of event reports take more than the allocated 2 months whereas this figure was 50% in 2002)
- increase in number of reported DI 103 instances, ( increasing from an average yearly figure of 30 at the end of 2002 to 100 in 2004).

The number of automatic reactor scrams when critical has decreased (2.5 per unit per year in 2003 – 1 per unit per year at end of September 2004). The number of safety events is decreasing (9.5 per unit per year in 2003 – 5.5 per unit per year at end of September 2004). The setting up of an overall safety performance indicator from mid-2004 now allows closer trend monitoring; this being discussed during the monthly safety performance review.

### **Self-assessment of OEF process**

A self-assessment programme for the OEF process was initiated in 2004. This programme comprises:

- self-assessment of OEF efficiency within the crafts, to be conducted annually using a standard assessment form
- annual self-assessment of OEF process conducted by the COREX committee. This took place on October 27th for year 2004.

The self-assessment programme is designed to identify areas for improvement for enhancing OEF efficiency within the crafts and within the site OEF co-ordination structure.

*These actions address points 1 and 2 of the root-cause analysis.*

**IAEA Comments:** The plant has set up a good self-assessment program to gauge the performance of the operating experience program. This program includes the use of performance indicators. For example, one of the indicators is the number of recurrent problems. When this indicator was judged to be too high, the plant undertook an analysis of the problem that revealed the causes for performance.

Actions were undertaken to address the causes and the number of recurrent events has decreased.

As discussed in the plant response, an annual self-assessment of the OEF process is performed and self-assessment of OEF efficiency within the crafts is also performed.

**Conclusion:** Issue Resolved.

**5.3(4) Issue:** External international operating experience is not sufficiently considered.

From 17 international OE events analyzed by the corporate since 2002, 4 have been analyzed by Civaux. Events such as SER and SOER selected and issued by the nuclear industry as significant international operating experience are not always included in Civaux OE feedback program. Consideration of OE international events is made by the corporate organization but it is not clearly relayed to the plant.

Good practices issued by the international nuclear industry are not systematically included in the operating experience feedback program and distributed for analysis to the plant departments.

As a result limited knowledge of world events and good practices is present at the plant and some opportunities to learn from significant experience may be lost.

**Suggestion:** The plant should expand their review of external international experience and good practices.

**Plant Response/Action:**

**Root-cause analysis**

1. The modus operandi of the plant OEF committee is based around a selection of international events screened by EDF corporate level (CID).
2. Lack of awareness of WANO website.
3. Site exhibits limited receptiveness to international practices.

**Action plan**

**Updating of plant OEF committee (COREX) programme**

As of 2004, an annual meeting is scheduled in order to review international issues. This meeting is attended by:

- COREX members
- One or more corporate OEF specialists.

For year 2004, the meeting is scheduled to take place on 22 September. The following points will be broached:

- review of international OEF over the past year: events, OEF and good practices
- presentation of WANO database and its modus operandi
- structure and organisation of international OEF
- processing of international OEF by EDF
- EDF contribution to international OEF
- from the end of October 2004, simplified access to the WANO database will be made available to all staff members with an engineering function. Working methods for using the WANO database will be explained at the end of the OEF committee meeting.

*This programme addresses points 1 and 2 of the root-cause analysis.*



## **Site involvement at international level**

The site has implemented a number of actions at international level:

- senior management benchmarking exercise on management of Vandellos NPP (visit on 17/02/2004)
- benchmarking exercise on shadow training and skills development, carried out by a senior management advisor (JP Minette) at Beznau NPP (Switzerland) in November 2003
- IAEA consultancy meeting (in Vienna) attended by safety/quality department manager (P. Vaillant) and engineering department manager (R. Cassan) in September 2003, with a view to drafting a technical document on OEF (TECDOC “Effective Corrective Actions”)
- engineer (P. Glane) drafted onto Wylfa (UK) Peer Review Team in June 2004, as a reviewer in the area of fire protection
- systems engineer (N. Greim) involved in a benchmarking exercise and audit on system health reporting at Pickering NPP (Canada), in October 2003.

Improvements made to the site's organisational structure were based on good practices observed on the occasion of these international assignments.

*This response addresses point 3 of the root-cause analysis.*

## **Pooling of experience feedback (PEX)**

Held on a regular basis, this corporate meeting is attended by all OEF representatives from each site. At the meeting held in 2004, presentations were made on the following subjects:

- international OEF by the Corporate Experience Feedback Committee (GRE)
- OEF structure by ELECTRABEL.

*This addresses point 3 of the root-cause analysis for all EDF plants.*

## **Simplified link-up to WANO database**

As part of the international OEF programme, corporate services (CAPE/GRE) have simplified the link-up to the WANO database. All staff members involved in the COREX process can also have quick access to the WANO database and discuss international OEF and good practices within their departments and within the COREX committee.

*Simplified link-up to the WANO database addresses point 2 of the root-cause analysis.*

**IAEA Comments:** The plant has increased its responsiveness to international OEX events. The people responsible for initiating actions for international OEX events now have better access to the information. They have also shown greater receptiveness to using the information to improve practices at Civaux.

The corporate OE activities are also better understood at the plant and these activities serve as a second line of defense in insuring that OE is effectively used.

Plant personnel participate in many meetings and other activities where international OE events are analyzed and discussed.

**Conclusion:** Issue Resolved.

## 6. RADIATION PROTECTION

### 6.1. ORGANIZATION AND FUNCTIONS

For the last few years, EDF corporate management has expressed the desire to bring radiation protection to the same level of importance as nuclear safety. As the Civaux plant is a new plant, this new policy has been implemented right from the start of the operation of the plant. As a result, it can be seen throughout all activities and policies that considerable attention has been paid by management and workers to radiation protection issues.

In general, the performance of the plant with regard to radiation protection (collective dose, number of contamination events,...) is very good.

Objectives and goals are established on a yearly basis, in accordance with the mid-term strategic plan. Performance indicators are used at the plant management level to follow up the performance of the plant. This is done during 3-monthly strategic committees. These committees are an expression of the strong involvement of the plant management in radiation protection. The team encourages the plant to have a strong focus in this committee on the evolution of the indicators and to monitor the related actions on their effectiveness. As an example, the effectiveness of some proposed actions concerning the number of personnel contamination events, as well as the actions to prevent significant RP related events, should be monitored.

Responsibilities and authorities concerning radiation protection are clearly defined and understood by workers. On the other hand, management expectations on the correct behavior in the Radiation Controlled Area (RCA) with regard to radiation protection are not always defined or followed by workers. Hence, the team recommended the plant to establish and enforce clear management expectations on the correct behaviors in the RCA.

The radiation protection group is independent and adequately staffed and there is a good cooperation and interaction with other departments. A comprehensive set of performance indicators measuring the effectiveness of the RP group has recently been developed. RP workers have received a good training and have a good knowledge of their job.

Some elements at the RP improvement program are not completely known or supported by RP workers on the floor. The team suggests the plant consider involving RP workers more in these issues. This was already the intention of the RP management.

Health of individuals is taken into consideration while assigning work in the RCA. Good medical surveillance and advice is available when needed.

### 6.2 RADIATION WORK CONTROL

In general, the radiation work control system is adequate. Radiological hazardous work is planned and discussed in advance between the RP and maintenance departments. Especially for the outages, there is a very good interaction between the RP department and other departments involved in the outage, and this starts well in advance of the beginning of the outage.

According to the rules, there is no need for approval of the radiation work permit by RP below a predefined value of the predicted dose, but in practice this approval is asked for on a voluntary basis for almost any work that involves some radiological hazard. Maintenance work supervisors received adequate training in radiation protection, so they are able to perform themselves the necessary measurements and decide themselves which collective or

personal protection has to be applied. This raises the awareness and enhances the involvement of non RP personnel for radiation hazards. In practice, work sites are also often visited by RP personnel to give advice to and control the work crews.

Entry in high and very high radiation areas is very well controlled through keys, that are controlled by RP for entry in high radiation areas and by the plant management team for entry in very high radiation areas.

Labeling of the radiation and contamination levels is done in all the rooms, although in some rare occasions it was noted that these labels were not very clear.

On the other hand, improvements are still possible in contamination control. The program for contamination control is well established, dividing the radiation controlled area in different areas (A-B-C-D) related to the level of contamination. However, some specific improvements could be made to the program.

The team noted that labeling of material temporarily stored in the BTE (waste treatment building) store is poor: no signs warning for possible radioactive contamination, no uniform identification and some boxes have no identification at all (content, owner...).

Another example where improvement is possible is the hot lab in the BEIT operations building. There are no requirements to measure small material leaving the hot lab in this building. In the lab, there is a possibility that material could be passed to the cold side without contamination measurement. The team encourages the plant to install measuring equipment to facilitate a contamination check of small material leaving the hot lab.

Frequent use is made of adhesive strips on the floor, when passing from one room to another, which is good, but in some cases it was noted that the strips should be changed more frequently.

Furthermore, the team encourages the plant to pay more attention in detail to contamination checks of tools. On one occasion, it was noted that no check was made of a tool that could have been contaminated after opening a filter.

Monitoring for airborne contamination is adequate for aerosol and iodine contamination hazards. The team encourages the plant to investigate whether the same approach could be used for noble gas contamination.

The physical layout of the wardrobes to access the radiation controlled area is very good. Adequate personnel contamination monitoring is installed.

Radiation and contamination surveys are conducted on a regular basis in the radiation controlled area. Frequency is adequate, but could be reconsidered for the RCA exit points (wardrobes, material exit).

### 6.3. RADIATION DOSE CONTROL

The plant developed a user-friendly software (called “EDP”) to make dose estimations and provide experience feedback for ALARA purposes. This software is used by all departments for planning, monitoring and integrating radiation exposure operating experience for all work in the radiation controlled area. The introduction of this software has led to close involvement of each department in addressing radiation exposure at the planning stage and in monitoring their work sites. The team considered this to be a good practice.

It was also noted that plant staff, in their daily work, paid good attention to radiation levels and hot spot locations.

For work in very high dose rate areas (SG, reactor cavity decontamination), no teledosimetry is used and no second person is in place to follow up the individual dose of the workers who are working in the high dose rate area. According to the general principle, the workers themselves are supposed to take care of their individual dose. The team considers this to be difficult in these extreme working conditions and encourages the plant to think about a dose follow up independent from the worker in these rare occasions.

The plant could also consider installing more lead shielding during the outages in the reactor building on a routine basis.

External dose monitoring is adequate for all workers. Internal dose monitoring is very good, as workers are screened in the “C3” monitors each time they leave the site.

#### 6.4. RADIATION PROTECTION INSTRUMENTATION, PROTECTIVE CLOTHING, AND FACILITIES

The plant possesses a large number of portable dose rate and contamination measurement instruments. All these instruments, as well as others, are very well managed by means of a dedicated software. Responsibilities for managing these large number of instruments in the different tool stores are well defined.

For portable dose rate measuring instruments, a source check facility is in place in the neighborhood of each tool store. Provisions to perform regular source checks for fixed installed equipment, as for example the contamination monitor at the RCA material exit, are however not easy to use. There are also no requirements to perform a regular source check on this equipment. The team encourages the plant to reconsider this.

Individual dose meters and fixed radiation monitoring equipment, as well as environmental monitoring equipment are adequate.

There is an adequate inventory of protective clothing and respiratory equipment.

Air supply for breathing air suits is provided through an emergency supply/alarm unit, where the air is filtered and an alarm sounds in case of low air supply pressure. Also, an emergency air supply bottle is in place. However, the volume of air in this bottle may only give supply for a very short time. Caution should be taken of that this does not give a wrong feeling of safety.

The quality of air supply hoses could be improved, as the hoses that are used can obstruct airflow in the event that they become stuck somewhere.

Quality and adequacy of supplies such as shielding, signs, ropes, stands, etc. are good.

Laundry, storage and shower facilities are well maintained.

#### 6.5. RADIOACTIVE WASTE, MANAGEMENT AND DISCHARGES

A program for radioactive waste management exists, dividing the radiation controlled area in two different areas (A-B-C and D) in relation to possible contamination. Goals and objectives are established and the quantities of solid waste are followed up by a performance indicator. The yearly quantity of solid radioactive waste is good compared to the rest of the French units, but it is rather large compared to the rest of the world. The quantity of solid waste for 2002 included waste from containment repair; however the goal for 2003 is set at the same level. Furthermore, the team observed some situations where the quantities of waste could be reduced. Therefore, the team suggested to the plant to consider performing an analysis to

evaluate whether some practices should be changed or not in order to reduce the amount of solid waste.

The control of liquid and gaseous releases is well established. Goals and objectives exist and quantities are followed up and discussed regularly. There is a good program for managing the liquid releases in relation to the flow of the Vienne river.

The environmental monitoring programme is also well established, instrumentation is adequate and trending is performed.

#### 6.6. RADIATION PROTECTION SUPPORT DURING EMERGENCIES

Adequate provisions are made to have sufficient RP personnel on site during an emergency situation. Procedures exist for a limited number of tasks RP personnel could be performing during an emergency. Equipment and supplies are available to support emergencies.

Training to RP personnel is provided on basis of 4 exercises each year that are attended to by personnel on call at that very moment. This seems to be adequate enough.

RP personnel has little knowledge of the changing radiological conditions during a severe accident. This information is only available at the Paris headquarters. It was also noted that the biological shield on the reactor building airlock was not completely closed. When questioned, plant staff couldn't immediately provide an answer as to whether this could cause a problem during an emergency or not. The team encourages the plant to have the information about possible radiological conditions inside the radiation controlled area during a severe accident on site and to make sure that RP personnel have knowledge of these precautions.

#### STATUS AT OSART FOLLOW-UP VISIT

The goals, which should be reached per year are defined and explained for every specialty. Action plans exist, which contain all projects to be worked on in the current year and the names of the responsible persons for these projects. A working group is installed from members of all departments including RP. This group visits the controlled area every two weeks for inspection purposes to find weaknesses in housekeeping, industrial safety and radiation protection. These weaknesses are given to the responsible departments to be resolved until a given date.

The organisational structure of the RP department has been changed as the number of managers was dropped from 7 to 2. This was done to give the workers reliable and clear attachment figures wherefrom they get their advices.

The presence of technicians advising and supervising working methods on the spot was improved. This led to an overall improvement of RP performance.

To involve the RP workers more in the improvement program, in addition to the performance indicators set by the plant management additional indicators were defined within the department.

Staff of all levels is directly involved in reaching the goals by defining personal responsibilities in the action plans and communicating the results of the improvement program to the members of the department.

The workers are encouraged in communicating e.g. errors, inconsistencies or weaknesses they find in working procedures when working in the field.

As a result of a study on reduction of solid radioactive waste corrective actions were taken and the production of solid waste dropped down.

According to the WANO indicator on solid waste Civaux is now number one of the French NPP fleet.

As a pilot program in 2005, entry will be allowed to parts of the controlled area in the Civaux NPP without changing clothes. To reach this goal the team encourages the plant to check the common behaviour of all workers in detail, if it is in line with this managements expectation, and correct it by giving rules, if it is not.

## DETAILED RADIATION PROTECTION FINDINGS

### 6.1. ORGANIZATION AND FUNCTIONS

**6.1(1) Issue:** Management expectations on the correct behavior in the Radiation Controlled Area (RCA) with regard to radiation protection are not always defined or followed by workers.

A number of observations were made where radiation workers did not behave in a correct way as to limit spread of possible contamination.

Following examples show occasions where existing expectations were not followed:

- Leaving the hot lab in the BEIT building, workers are instructed to perform a contamination check of their clothing by means of a frisker. In several occasions it was observed that this was not done.
- In two occasions, radiological workers were observed not performing a source check before use of dose rate monitoring equipment.
- In several occasions, workers were observed in the RCA not wearing their film dosimeters visibly, although this is the expectation.
- “VIP/expert” entrance to RCA: apart from the automatic dose registration, a file has to be completed with the received dose by the escort, which is not always done
- During the plant tour, contamination was detected on someone’s shoes when exiting the RCA in the C1 portal monitor. No record was kept of this event, although there is a clear expectation to do this.
- Two workers were observed removing plastic gloves in a way that could have lead to contamination of their protective clothing. The right way of doing this is explained during the RP training.
- A worker used a telephone in the RCA, sometimes with his protective gloves, another time without gloves.
- One worker removed a glove to handle a procedure. This seems to be an exception to the general rule that is tolerated without a clear statement about it.

Following behaviors show a lack of clear management expectations on the right behavior:

- Two workers were observed shaking hands, one of them being inside the RCA (after having removed his gloves), the other outside the RCA.
- Posted instructions on how to use the first, manual contamination check before leaving the radiation controlled area are not detailed (how long to measure, whole body frisk or just hands and feet..). Moreover, in the training given to all personnel, the instructions are not clear either.

In several occasions, it was also noted that supervisors or other plant staff did not correct incorrect behavior of workers.

Incorrect behavior may lead to spread of contamination or unnecessary dose.

**Recommendation:** Clear management expectations should be established and enforced by management on the correct behaviors in the RCA.



## **Plant Response/Action:**

### **Action plan**

- 1) A reminder of expectations regarding worker behavior inside and outside the RCA was given at the beginning of 2004. Following this, the reference standards were posted at numerous locations around the site.

#### **EXPECTATIONS**

##### **Moving around the site**

- upon arrival at the site (before main entrance), pedestrians must only use protected walkways and pavements. Vehicles must comply with traffic signs
- inside the monitored area, after the main security entrance, pedestrians have right of way. Vehicles must abide by the 30 km/h speed limit and keep to roadways. Seatbelts must be worn.

##### **Fire protection/housekeeping**

- smoking is prohibited in all industrial areas of the plant. This rule also applies to all other rooms, with the exception of designated smoking areas
- cigarette butts must be placed in ashtrays
- graffiti is prohibited on walls and in lifts.

##### **Personal protection**

- personal protective equipment (PPE) must be worn in all industrial areas of the plant, with the exception of the route leading from the operations building to the electrical building on the way to the control room, the 15-m level of the electrical building and the entrance to the cold change rooms
- hard hats must not be worn in the control room, around the fuel pool, in the hot lab inside the operations building or around the pool in the reactor building during loading/unloading operations
- hard hats do not have to be worn by warehouse staff, airlock security staff, laundry staff at their workstations or any other workers whose are incompatible with the wearing of a hard hat
- gloves must be worn in the RCA and adapted to the type of work being performed outside the RCA.

##### **Behaviour within the RCA**

- the full set of basic protective clothing must be worn in the RCA
- film badges and electronic dosimeters must be worn at chest height, where they can be seen
- one radiation meter is required per worksite. The lead worker must always be aware of changes in dose rate on his worksite
- green overboots must be worn when moving between differently classified plant areas
- at RCA exits, gloves and shoe soles must be checked using the MIP21 monitor, strictly in that order and as a minimum requirement. If in doubt, a more extensive check must be carried out.



2) A risk-prevention task force has been set up on the site. Each department is represented. One of the co-ordinator's duties is to issue reminders of instructions within his department and also check that these are complied with, either by means of a two-monthly inspection or during time spent in the field. Each co-ordinator has received a mission letter defining his exact responsibilities in terms of risk prevention.

If an EDF worker's behavior is found to be non-compliant, he is reminded of the basic rules. If appropriate, the worker's line manager is notified in order to check that the worker is well aware of basic industrial safety rules.

If a contractor's behavior is found to be non-compliant, he is reminded of the basic rules. If appropriate, the requesting department is notified and it is then up to that department to notify the contractor's line manager.

### **Description of process**

The rules defined in §1 are displayed at numerous locations around the site in order for each worker to familiarise himself with them. In addition, in order to ensure that contractors coming to work on the site during outages are aware of the rules, a reminder is issued to contractor companies on the occasion of kick-off meetings, as well as upon the workers' arrival.

### **Responsibilities**

It is every worker's duty (EDF worker or contractor) to meet these commitments when performing their work; it is management's duty to ensure that the process is complied with.

### **Experience feedback**

Initial feedback is already available. Following various inspections conducted by the "Risk Prevention Task Force", some deviations from the rules were observed during the first quarter of 2004. Five cases have been dealt with on the spot by department managers. There is a significant drop for the second half of the year (zero cases).

EDF regularly contacts contractor companies managers in order to remind them of expectations pertaining to contractor behavior.

**IAEA comments:** In the document D5057/OEX/NT/04/041 the goals, which should be reached in 2004 are defined and explained for every specialty. Action plans exist, which contain all projects to be worked on in 2004 and the names of the responsible persons for these projects. A working group (group animateur prevention, GAP) is formed from members of all departments including RP. This group visits the controlled area every two weeks for inspection purposes. Weaknesses in housekeeping, industrial safety and radiation protection are documented. In the debriefing immediately after the inspection round these weaknesses are discussed and given to the responsible departments to be resolved until the next meeting or to a date which is fixed in this meeting.

The organisational structure of the RP department has been changed as the number of managers was dropped from 7 to 2. This was done to give the workers reliable and clear attachment figures wherefrom they get their advices.

The presence of technicians advising and supervising working methods on the spot was improved. This led e.g. to a significant drop in the number of alarms at the

contamination monitors at the exit of the controlled area and to an excellent result of lowering the amount of solid waste produced in the controlled area.

As a pilot program in 2005, entry will be allowed to parts of the controlled area in the Civaux NPP without changing clothes. To reach this goal the team encourages the plant to check the common behaviour of all workers in detail, if it is in line with management's expectation, and correct it, if it is not.

**Conclusion:** Issue resolved.

**6.1(2) Issue:** The RP improvement program is not completely known or supported by RP workers on the floor.

PI's for the RP service are very recently established and not yet used.

A monthly meeting with the RP technicians and their supervisors, where subjects other than daily routine can be discussed, is also only very recently established.

Workers have only little knowledge of the RP improvement program. They are not invited to discuss the program and possible contributions they could make.

RP workers have no complete knowledge of the objectives to which they could contribute in their daily work.

Not involving workers on the floor in the improvement program can lead to delayed realization of objectives and less than optimal actions.

**Suggestion:** Consideration should be given to involve RP workers more in the RP improvement program.

### **Plant Response/Action:**

#### **Action plan**

- 1) Greater involvement of various RP department members in the improvement of radiation protection.
- 2) The risk prevention programme involves the entire department, including support staff as well as technicians. It relies on the department's action database, which provides all people involved with an overview of commitments.
- 3) Setting up a performance indicator for the radiation protection department.

#### **Process description**

Essential to achieving this goal is the involvement of as many department members as possible in the establishment of a risk-prevention programme. The second step entails keeping them informed of the programme's progress so that they can gauge their contribution to the site's results.

A department seminar was held where each worker was given the opportunity to express his thoughts and contribute to the drawing up of a risk-prevention programme. This method is an effective means of making all department members more accountable. The programme was then deployed among all department members using action sheets designed to track the progress of actions.

Once the programme is in place, the progress of actions needs to be monitored. This requires the following:

- a department performance indicator
- an indicator designed to monitor actions defined within the scope of the risk prevention programme.

All these results are regularly presented to staff members:

- during weekly and monthly meetings between technicians and supervisory staff members (MPCAs) in order to increase their contribution to site results. These meetings have a dual purpose: inform them about subjects beyond the scope of their daily concerns; give them time in which to become actively involved in the RP process (example: presenting current issues to technicians and control-room operators)
- during department meetings, the department manager provides an update on the above-mentioned indicators.

### **Responsibilities**

Performance and monitoring indicators are the responsibility of the department manager.

Meetings are arranged by the MPCA in charge of medium and long-term activities. The same MPCA is in charge of informing all participants of the month's results.

Depending on the current situation, he selects the subjects to be presented by technicians. This approach to involving all staff is an effective means of boosting their self-esteem. In addition, it enables them to take a closer look at issues that generally cause them problems.

### **Tools**

As far as department performance indicators are concerned, results are tracked month by month on an A4 chart posted on the department bulletin board.

### **Experience feedback**

As regards the monitoring of actions within the scope of the risk prevention programme, this chart provides an extremely accurate means of tracking progress of current actions and of meeting resolution deadlines, compliance with which could not be guaranteed in the past.

With regard to briefings, initial informal feedback is available. Following various discussions with technicians, it emerges that most of them are aware of results, with the immediate effect of involving them more closely in the tracking of jobs assigned to them.

A mid-year report has been submitted to the financial management advisor and deputy director for production. Their comments have been taken into consideration as part of the effort to improve the programme and its associated monitoring process for the second half of the year.

**IAEA comments:** To involve the RP workers more in the improvement program, in addition to the performance indicators set by the plant management additional indicators were defined within the department. These indicators were discussed and set in working groups, where members of all levels were participating.

To reach the yearly goals addressed with the indicators, action plans, in which among other things personal responsibilities are defined, are installed. So staff of all levels is directly involved in reaching the goals.

The results of the improvement program are communicated to the members of the department in the meetings of the different levels, but also in form of diagrams and tables that can be found in the computer system.

First line managers lead the meetings of the workers and technicians. This supports a

good information flow top down and bottom up as well. The workers are encouraged in communicating e.g. errors, inconsistencies or weaknesses they find in working procedures when working in the field.

Special items out of daily work are discussed in extra meetings.

**Conclusion:** Issue resolved.

**6.3(a) Good practice:** The plant developed a user-friendly software (called “EDP”) to make dose estimations and provide experience feedback for ALARA purposes. This software is used by all departments for planning, monitoring and integrating radiation exposure operating experience for all work in the radiation controlled area.

For the planning of the plant’s first outage, the management decided to introduce software designed to make optimised dose estimates for each job. Everyone can consult this user-friendly software on the computer network.

EDP is used by all departments for:

- The calculation of dose estimates which can go as far as the work order grid,
- The formalization of the ALARA approach used (ALARA check-list),
- The monitoring of the dose for the work site,
- Easy comparison between radiation exposure at the work site and the objectives for the work,
- Analyses by department, activity, work site, elementary system, etc. for monitoring, control and operating experience purposes,
- Reporting good practices or any unforeseen circumstances encountered,
- Benchmarking between units and outages,
- Optimisation through consideration of operating experience from previous work.

The radiation protection department advises, approves and controls the different stages of the process. The radiation protection department analyses the results of previous outages with the other departments to optimise radiation exposure for the following outages.

The EDP file is printed out and placed in the work package file on the work site. The workers fill in the integrated doses, comparing them with dose objectives. At the end of the work, the doses which have been recorded and entered in the computer software by the workers are compared with the objectives and the file provides operating experience feedback on the work.

The introduction of this software has led to close involvement of each department in addressing radiation exposure at the planning stage and in monitoring their work sites.

It is a tool for operating experience feedback and progress which has resulted in better refuelling outage results for the fleet.

## 6.5. RADIOACTIVE WASTE MANAGEMENT AND DISCHARGES

**6.5(1) Issue:** The plant is missing opportunities to reduce the amount of solid radioactive waste.

In 2002, 93 m<sup>3</sup> solid radioactive waste were produced per unit. The goal for 2003 is set to 90 m<sup>3</sup> per unit. This is more than in most other power stations (last known WANO median value was 48 m<sup>3</sup>, best quartile 19 m<sup>3</sup>).

In the BTE building, two persons were observed wearing “tyvek” protective clothing. When questioned why they used this supplementary personal protective clothing, they answered that it was not necessary; they couldn’t give any reason for wearing it.

The systems at the worksite in room NB0717 (unit 2) were closed for already two weeks. The temporary enclosure was still in place leading to continued use of personal protective clothing. When questioned about the reason, the supervisor said that he left the enclosure in place not for radiological reasons but to protect the environment against the dust that could be generated while replacing the insulation.

With exception of the most important work sites, the use of plastic protective film is not restricted.

At the RCA material exit of unit 2, a cardboard box containing electronic equipment was present.

When disassembling a diaphragm in a demineralized water system, the workers used protective film and tyvek protective clothing.

In the laundry, incoming contaminated protective clothing is first sorted according to the contamination level. The threshold for deciding that no further attempts will be made to decontaminate the clothing is low (500 Bq). This results in the disposal of protective clothing that could be cleaned and reused.

For work in contaminated areas, only disposable protective clothing is used (tyvek coverall, plastic overshoes...); no use is made of clothing that can be washed.

As a result of this, unnecessary solid waste is produced.

**Suggestion:** Consideration should be given to perform an analysis to evaluate whether some practices should be changed or not in order to reduce the amount of solid waste.

### **Plant Response/Action:**

#### **Root cause analysis:**

- in its initial years of operation, the site focused on radiological cleanliness in these areas, which sometimes had the adverse effect of producing solid waste as a result of protective measures being taken
- quantifying of solid radioactive waste (resulting from power generation or maintenance activities) does not comply with fleet practice.

#### **Action plan:**

- production of solid radioactive waste is factored in to the work planning phase, particularly during outage periods, with the identification of a pilot work site

- shifts for technicians from the nuclear logistics and technical department (LNE) have been lengthened during outages (2 x 7 hours) in order to provide advice and support to lead workers, as well as to ensure that compliance with standards governing the availability of consumable goods is monitored
- an investigation has been carried out in conjunction with UTO (Corporate Technical Support Entity), in order to report volumes of radioactive waste in compliance with fleet practice.

#### **Affected processes:**

##### ⇒ **Maintenance practice:**

- work supervisors factor the aspect of radioactive waste production in to their work planning activities
- in addition to providing lead workers with advice and support, LNE technicians also monitor compliance with standards in time slots that are compatible with job performance.

##### ⇒ **Radiation protection process:**

- SRP work supervisors adapt working conditions to actual risks.

##### ⇒ **Waste process:**

Setting up of a radioactive waste production indicator with:

- a forecast validated by the CSQE committee at the beginning of each year
- long-term forecast submitted to corporate level.

#### **Results:**

The volume of process-related waste has gone down. For example, 12.76 m<sup>3</sup> of solid waste was produced during the refuelling outage on unit 1 in 2002. In 2004, the same type of outage produced 9.54 m<sup>3</sup>.

In 2003, the average volume produced for the plant was 34.1m<sup>3</sup> per unit. For purposes of comparison, Chooz power plant produced 52.3 m<sup>3</sup>

Results from the 2004 outages show that targets for 2004 should be met.

#### **Operating Experience:**

The LNE department's outage work supervisor oversees an action plan which forms part of the LNE department's business plan. The aim of this plan is to:

- identify sensitive jobs
- adapt resources for performance of these jobs.

The "radiological cleanliness" project manager is responsible for identifying pilot work sites for outages, with a view to factoring radioactive waste into the plant housekeeping programme.

**IAEA Comments:** A study on reduction of solid radioactive waste was carried out even before the OSART mission 2003. As one result it was found that many workplaces were not equipped according to the real risk of contamination but were "overprotected". In the outages of 2003 a technical support team of two employees from Civaux and one contractor was formed. They were assigned to permanently (three shifts, 24 hours) visit all worksites in the controlled area to see if problems occurred and to support the workers in contamination protection, decontamination,

environmental aspects and other items. As a result, the production of solid waste dropped down.

Since 2003 the Civaux NPP reports the WANO indicators concerning radioactive waste due to demand from corporate level. According to the indicator on solid waste Civaux is number one of the French NPP fleet.

The comité stratégique en qualité exploitation, CSQE, which initially developed methods of reducing radioactive effluents only, is now minimizing the amount of liquid waste by taking the amount of solid waste in account, which is produced due to these efforts, so in fact the total amount of waste is optimized.

**Conclusion:** Issue resolved.



## 7. CHEMISTRY

### 7.1. ORGANIZATION AND FUNCTIONS

The chemistry section at the Civaux NPP is part of the technical and nuclear logistics department (LNE). The chemistry section is responsible for chemical and radiochemical surveillance of primary, secondary and auxiliary systems, environmental surveillance, the control and reporting on liquid and gaseous effluents and the chemical supervision of the demineralised water plant.

Chemistry personnel are well informed on the organization structure of the department. The functions, job specifications, responsibilities and authorities are clearly defined and understood by the people for themselves as well as for those of their colleagues and supervisors. There are strong intentions of the management to build and keep the chemistry section as well as the LNE department as a team. Nevertheless having ten supervisors with equal rights and same power of decision in the chemistry section sometimes leads to decisions being delayed.

Information on plant policy, goals, objectives and performance indicators is given by the computer network of the plant.

In yearly interviews the LNE department manager gives feedback on the last year to the chemistry personnel. Contracts on prospective duties and responsibilities are made and training issues and personnel career development are discussed. The chemistry personnel feel these interviews are a positive tool for discussion in an open minded and constructive manner.

The computerized follow up on work to be done by the personnel is a strong tool used by supervisors and the department management.

The corporate EDF department GDL is responsible for national and international experience feedback, development of new analysis methods, contacts between the staff of the EDF NPP's etc. GDL organizes yearly experience feedback meetings for all chemistry departments of the EDF NPP's. The chemists of the Civaux NPP cultivate good contacts with GDL. Problems are immediately discussed with GDL. GDL on the other side asks the plants for development of new practices, often by initiating working groups. In spite of these good contacts to GDL, the team encourages the plant personnel to cultivate their own initiatives, as e.g. evaluating a strategy on treatment of tritium releases, what the team found inline with good nuclear industry methods.

An often problematic interface in nuclear power plants is the interface between the chemistry and the I&C department, as the responsibilities for online analysers are often not clearly defined and understood. In the Civaux NPP this is not a problem: the chemistry department group "automates" is responsible for the function of all measuring devices of chemical and radiometrical values including the equipment installed in the systems for online monitoring. The I&C department supports the chemistry department on request.

Two persons from the chemistry department are responsible for the contact with the operation department, one for power operation and one for outage preparation, performance and experience feedback. This results in very good communication between these departments, a good perception of chemistry concerns in the operations department as well as effective performance of common work items. These good contacts between the chemistry and operation department are described as part of a good practice in the operation review section.

Effective devices are installed to survey chemical parameters. These allow timely response to variations of chemical parameters. A good example is the continuous lithium monitoring.

The personnel of the chemistry department are well trained, as adequate training and qualification programs including shadow training in new areas are performed. Training goals have to be reached before people are allowed to work on their own. Job rotation of the personnel enables them to get broad knowledge on all chemical concerns of the plant.

Work practices, procedures and equipment are well provided and systematically checked. This is an indication for good performance in general.

In daily meetings all information needed for the work is exchanged. Computerized tools also provide a good information flow.

## 7.2 CHEMISTRY CONTROL IN PLANT SYSTEMS

The laboratory information and management system MERLIN installed on the plant is a powerful tool for managing chemical laboratory performance. The program strongly guides the complete analytical work in the laboratory to be done in an appropriate manner.

The MERLIN data base is used by all chemistry laboratory staff for metrological monitoring of equipment and on-line analysers and for ensuring compliance with corporate and local chemistry and radiochemistry specifications. This guarantees optimal tracking of the whole analysis chain (sampling, staff, equipment, on-line analyser, analysis, computerized round). This data is accessible to operations, safety-quality and engineering departments. The team found the installation of MERLIN in line with good industry methods. Nevertheless indications were found that sometimes this strong tool for quality control and quality assurance could be used more systematically and rigorously. Therefore the team suggests a rigorous and systematic approach whilst using this tool (see 7.3).

The EDF chemical surveillance programs and specifications do not perfectly match Civaux due to design changes and they are not very precise in some cases. New specifications and surveillance programs for the different plant states are in progress for the N4 plants Chooz and Civaux. The MERLIN program at Civaux site is based on the validated EDF specifications and is also adjusted to the new expected specifications, here the limit values are more strict.

The monitoring of the lithium concentration in the primary coolant is performed continuously by an online conductivity measurement. The online data is transferred into the main control room. Corrective actions can be taken in timely manner by the operators.

Nevertheless devices needed to inject lithium hydroxide automatically are not yet completely installed and running.

## 7.3 CHEMICAL SURVEILLANCE PROGRAMME

Sampling agenda are properly defined and followed. This is supported by the MERLIN system.

Due to the support by MERLIN the instrumentation calibration is well done and monitored, but the quality control charts for long term trending of the instrumentation performance are not systematically evaluated. Therefore the team suggests a systematic approach whilst using this tool (see 7.2).

In all laboratories appropriate chemical and radiochemical standards were found to be used. No expired standards were found. This is an indication for good performance in general.

Online monitoring of lithium in the primary coolant and the strategy of eliminating tritium by doing releases from the boric acid recovering system has a direct positive impact on the primary circuit dose rate and generates low activity effluents to be released into the environment. The team found this in line with good nuclear industry methods.

The state of the art quality assurance tools (correction of values, tracing of actions, ..) are implemented in the MERLIN program and used. The performance of the online analysers is periodically checked by inter-comparison with manual analyses.

Chemical values which are out of limits are determined with the help of the MERLIN programme and corrective actions are taken in timely manner. However, in some cases the importance of chemical surveillance does not seem to be fully understood. This sometimes results in not systematically tracking for small deviations and trends of values within the limits. Therefore the team recommended to develop methods of making chemistry staff understand better the importance of every single step of chemical surveillance.

Chemistry results are quality assured by double checking when they are entered on the computer system. The long and medium term trends of the results are communicated to the whole plant staff. This openness helps to promote the good perception of the role of chemistry on the plant.

#### 7.4 CHEMISTRY OPERATIONAL HISTORY

Responsibilities for reporting and assessment of chemical parameters are clearly defined and carried out.

Operational experience feedback is done at a corporate level by GDL (see 7.1).

#### 7.5 LABORATORIES, EQUIPMENT AND INSTRUMENTS

In the chemical laboratories adequate and redundant analytical facilities and equipment for chemical surveillance are provided. The storage of hazardous chemicals in the laboratories was mainly found to be adequate, however in the main chemical storage areas some weaknesses were found which are described in an industrial safety recommendation in the MOA reviewer section. Some labelling of chemical analysis samples, hazardous chemicals samples and performed instruments calibration is not performed in a rigorous manner. The team therefore recommends to implement measures to check if chemicals and instruments are labelled correctly.

The sampling equipment (REN, EAS Sorbonne) for normal operation is also used in the event of an accident. In addition, specific equipment and trained specialists are sent to the plant from corporate level (GDL). The assessment of the radiological situation after an accident is done using information from high level dose rate meters in the containment.

#### 7.6 QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

Corporate policy prescribes the quality of operational chemicals to be used in different plant systems, taking into account the material quality requirements, safety and health risk. This PMUC program is implemented at the plant. The approved chemicals are found listed in the

PMUC list and labeled with a PMUC sticker. The responsibilities concerning quality control, storage and periodic sampling of approved chemicals are clearly defined and understood. However, the team observed some problems in the application of this policy; see recommendation in the MOA area.

### **STATUS AT OSART FOLLOW-UP VISIT**

The quality control of all chemical analyses is now described in a procedure. Periodicity, kind of quality control and action in case of deviations are described. Quality control charts are in use to find small deviations of analytical instruments before the measured results are out of range. Therefore the chemical analyses performed with these instruments give very reliable results.

A quality controlled process for data input of analytical results into the Merlin system ensures that all stored data are double-checked.

Due to changes in the organisational structure of the department responsibilities are now defined more precisely. The technical training is clearly structured and supports good performance of the laboratory staff.

About once per week the chemistry staff is informed on external events and small events that occurred on the plant. The discussion of these events could even be done systematically, but in fact all people of the department are completely informed.

The team encourages the plant to train the questioning attitude by discussing e.g. small events more systematic.

Labeling expectations are defined and presented to all chemists and in addition to other departments that are in charge of labeling. The design of the labels supports the correct labeling.

In the weekly rounds the control of the labeling performed in the laboratories and other chemical working places is directly addressed and documented.

## DETAILED CHEMISTRY FINDINGS

### 7.3. CHEMICAL SURVEILLANCE PROGRAMME

**7.3(1) Issue:** The plant has the MERLIN computer software for managing analytical data and for surveying the performance of measuring equipment. However the team observed that sometimes these tools are not rigorously and systematically used.

The data input to the MERLIN program is quality checked by the system. If a value typed in the computer is out of the specified limits the value is marked red on the computer screen (barrier one) and a window appears which warns the operator that the value is out of range (barrier two).

- The data quality control functions of the MERLIN system are not always used. On a computer printout of the MERLIN system dated 13/05/2003, a technician recorded a value of 0.43 for steam generator. The lower limit for this value is 9.2. Another out of limit value for conductivity of steam generator water behind cationic filter (1.05 microS/cm) was also recorded. The limit value is <1.0 microS/cm. The two MERLIN quality control barriers were not used.
- Evaluations were made on 15/12/2002 on the quality control charts for chloride, fluoride and calcium analyses equipments for the last three months. All the diagrams including 15 or more measuring points each showed obvious trends which could be detected much earlier using a systematic approach.
- There is no procedure describing the industrial state of the art for evaluating quality control charts.
- The quality assured chemical analyses data stored on the MERLIN data base are transferred to an Excel file to perform the long and medium term trending of the data. In this Excel file the data are handled manually. Automatisation of this process could avoid possible mistakes.

Not using quality control tools rigorously and systematically when dealing with chemical analyses data and surveying the performance of measuring equipment can result in lack of quality of chemical surveillance.

**Suggestion:** The plant should consider a more rigorous and systematic approach to quality control of chemical data management and trending analysis of measuring equipment performance with the existing tools.

#### **Plant Response/Action:**

#### **Root-cause analysis**

In order to analyse the causes of this problem, a mirror group was formed and two meetings were held in January 2004. Diagnosis of the problem brought the following points to the fore:

- Technicians are not sufficiently familiar with the Merlin procedure describing the various data quality-control phases. Insufficient coaching was provided at the time of implementation.
- The procedure is not applied.

- Some parts of the procedure need to be revised as they are no longer relevant to the current organisational structure:

Example:

- the way in which on-line analysers are distributed does not comply with the application
- it is no longer necessary to manually create unscheduled analyses for lab measuring instruments; these analyses are generated automatically by the computer software
- the procedure no longer reflects the way in which responsibilities are divided up
- no description exists regarding the use of data readings and their associated QA process
- no methodology or expectations have been established for the use of MERLIN data used to monitor measuring instruments and on-line analysers. Responsibilities for the trending of plant monitoring data have not been defined.

### **Action plan**

- Definition of expectations pertaining to the trending and analysis of data designed to guarantee high-quality performance of measuring instruments and on-line analysers.
- Setting up of a double-checking process for analyses and data readings.
- Explanation of content and various stages involved in data checking process, as well as the importance of each staff member's role throughout the analysis or measuring process in order to guarantee that data is of a high quality.
- Overhaul of document content.
- Training given to two technicians and two senior staff members (MPCA), covering all functions of the MERLIN computer application.
- Reduction in number of managers in charge of supervising technicians.

### **Processes affected**

#### **Analysis process**

Every morning, managers distribute work to all laboratory staff, as well as the necessary information required to perform this work.

Technicians perform their work, including self-checks.

Technicians designated on a weekly basis carry out a double check..

Managers are responsible for carrying out a first-level analysis (completeness of work, consistency of results with plant status, deficiency processing).

Planners are responsible for carrying out a second-level analysis (trend analysis, factoring in OEF).

## **Monitoring process**

Senior chemistry staff (MPCA) are responsible for monitoring the analysis process. For the year 2004, each of them carries out 4 actions, which are included in the monitoring plan of the LNE department's performance contract for year 2004.

### **OEF**

One of the duties of the deputy LNE department manager is to draw up a summary of actions included in the monitoring plan of his department's performance contract. This summary is added to the information used to draw up the department's performance contract for year Y+1.

The deputy department manager and management support staff produce appraisal reports documenting their assessment of professional standards on the occasion of work inspections. On the basis of this document, the department manager conducts individual appraisal interviews with senior staff members (MPCA) resulting in the renewal of work authorisations and/or progress actions.

The department's OEF representative attends and contributes to daily midday meetings (monitoring of events on other French plants, questions/answers on daily activities, reports back on processing of events, presentation of quarterly reviews of operational quality).

**IAEA comments:** In the procedure D 5057 CE GASU 4200 the quality control of all chemical analyses is described. Periodicity, the kinds of quality control and actions in case of deviations are described. Quality control charts are in use to find small deviations of analytical instruments before the measured results are out of range. Therefore the chemical analyses performed with these instruments give very reliable results. But the daily and weekly trending, which is done by the technicians and the corrective actions, which have been undertaken, are not documented systematically. This makes the review of quality control measures done in the past difficult or impossible.

A quality controlled process for data reading with an electronic device (TSP "terminal specialize portable") and input of analytical results into the Merlin system is installed. The manager checks the correctness of the data put into the system every evening. As a result all stored data are double-checked.

**Conclusion:** Issue resolved.



**7.3(2) Issue:** In some instances, the importance of chemical surveillance doesn't seem to be fully understood. This results sometimes in a lower commitment on performance of chemical work as: not thoroughly checking why some parameters are out of the expected range.

– During daily rounds, the saturation of the cation exchanger resins of the online conductivity analysers have to be checked. When a maximum saturation level is reached, that can be seen by a mark on the resin container, the resins have to be changed in order to secure that the online conductivity analyser can work correctly. In one case an online conductivity analyser measured values which were out of the specified limits due to saturation of the resins. A technician entered this value into the computer before changing the resins.

– A chemical analysis result value for conductivity of steam generator water behind cationic filter of 1.46 microS/cm was found on a protocol output of the MERLIN system. The limit value is <1.0 microS/cm, so the value was out of range. This value was corrected by the supervisor to a value of 0.17 microS/cm when doing the quality control check to validate the data entered to the computer system by a technician. For this purpose the supervisor called the main control room to ask for the actual value, thanks to his experience he realized that the value was not correct. It was either a typing error or lack of performance of the measuring equipment.

To explain the change of the value, a supervisor entered "typing error" in the computer. He stated that the technician should only have typed a value into the system after having maintained the measuring equipment to re-establish good performance.

In fact the value typed in the computer by the technician was correctly transferred from the continuous measuring instrument. Due to lack of performance of this instrument, the value was out of range. The reason for changing the data in the computer system therefore was not correctly indicated.

– A supervisor stated that no evaluation documents exist which describe the possible events concerning chemical pollution of safety related systems, how an event can be narrowed down due to the analytical values and which correction actions must be taken in case of an event. He stated that it was the duty of the chemists to know what should be done in case of an event, and that these documents were in progress. Two days later he stated that a document which was validated in the Chooz NPP in the year 2000 is in use in the Civaux NPP and he presented the document.

– A daily rounds procedure with specific items to be signed off exists but a supervisor stated that the chemists used this procedure just as a reminder.

– He also stated that the quality of the 'second level' daily rounds of the chemistry staff depends on the professionalism of the performing chemist.

– When observing the gamma spectrometric measurement in the hot chemistry laboratory a protocol of a measurement of a primary systems sample No. "1H10514A" was found. The measured Co-58 activity concentration (7 MBq/m<sup>3</sup>) was a factor of four lower than the activity measured two days before (30 MBq/m<sup>3</sup>). No evaluation was done to find the reason for the "drop" of the measured Co-58 activity concentration.



A technician stated as long as the values would not rise by this factor it was not worth to look for reasons.

If the importance of every measured chemical value and its interpretation is not taken into account the quality of chemical surveillance can deteriorate.

**Recommendation:** The plant should develop methods of making chemistry staff better understand the importance of every single step of chemical surveillance, and so improve their commitment on performance of chemical work.

## **Plant Response/Action:**

### **Root-cause analysis**

- young laboratory staff with high standard of technical performance, but a lack of questioning attitude in daily activities
- lack of rigour
- division of roles and responsibilities within the management team are not sufficiently clear, making it difficult for technicians to perceive their contribution to attaining high standards of performance.

### **Action plan**

- in 2003, a joint endeavour was undertaken to divide up lab management roles and responsibilities among the 10 (MPCA'S). Three roles were identified:
  - three designated managers
  - five designated planners
  - two designated work controllers
- skill development process redefined and monitored (skills profile drawn up for the laboratory)
- redefinition and monitoring of rigorous work practices
- case files and planning of technical reports assigned to planners and work controllers in order to allow managers time to go into the field
- two daily meetings held to co-ordinate technicians' activities:
  - work distributed in the morning
  - briefing and update at midday.

### **Processes affected**

#### **Management process**

Managers are responsible for workers and their activities.

Planners are responsible for:

- scheduling and quality of work files
- use of analyses

Work controllers are responsible for scheduling activities taking place during power operations and outage.

#### **Monitoring process**

The “management presence in the field” programme associated with the monitoring plan included in the LNE department's performance contract is designed to enable the department manager, the deputy department manager and management support staff to ensure that everyone's duties are properly fulfilled.

#### **OEF**

- one of the duties of the deputy LNE department manager is to draw up a summary of actions included in the monitoring plan of his department's performance contract. This summary is added to the information used to draw up the department's performance contract for year Y+1

- the deputy department manager and management support staff produce appraisal reports documenting their assessment of professional standards on the occasion of work inspections. On the basis of this document, the department manager conducts individual appraisal interviews with senior staff members (MPCA) resulting in the renewal of work authorisations and/or progress actions
- the department's OEF representative attends and contributes to daily midday meetings (monitoring of events on other French plants, questions/answers on daily activities, reports back on processing of events, presentation of quarterly reviews of operational quality).

**IAEA Comments:** The concentration of the responsibility for training of the personnel on two instead of ten managers and the systematic approach of setting goals improved the action of defining and monitoring the staff training. For each specialty in the chemistry area training items have been defined in three levels. Depending on their levels the workers can get specific training or can train other workers in the shadow training.

Once per week the chemistry manager visits the daily meetings held by the chemistry staff to inform the members on e.g. external events and discuss them. Small events are also addressed in these meetings. But these managers' visits are not fixed and therefore not completely reliable for the members. Therefore the discussion of external and internal (small) events is not performed as systematic as it could be done. Nevertheless, the information communicated to the people is complete.

Actions have been taken to improve the technical performance of the staff, but not automatically their commitment and their questioning attitude. Some examples were found on plant tours within this follow up indicate that. The team therefore encourages the plant to train the questioning attitude by discussing e.g. small events more systematically.

**Conclusion:** Satisfactory progress.

## 7.5 LABORATORIES, EQUIPMENT AND INSTRUMENTS

**7.5(1) Issue:** Some labelling of chemical analysis samples, samples of hazardous chemicals and performed instruments calibration is not performed in a rigorous manner.

- Seven samples of sodium hypochlorite were found in the demineralised water plant without any labelling of their content. A worker stated he would label the samples after lunch.
- At the 15<sup>th</sup> May 2003 a label was found on the total gamma counter in the room NB 0422 indicating the next instruments calibration check had to be done at the 9<sup>th</sup> May 2003. In the MERLIN computer program the calibration was documented as to be performed at the 10<sup>th</sup> May 2003.
- In the report “Prop\_Nov\_2 SIT” dated 07/11/2002 remarks were found indicating missing labels of quality control checks on the conductivity meters CAX 1 and 2 even when the quality control checks were done. A supervisor stated that as a consequence of this report improved field visits were foreseen in the action plan 2003.
- In the hot chemical laboratory a sample containing primary coolant was found with corrections (for system where the sample was taken from and sampling time) on the label which could hardly be read. Another sample in the hot chemical laboratory and three more samples were found where information on sampling time was missing.
- Two paper sheets “contrôle de la cellule de mesure boromètre neutronique D5057CE, GASU 2666” dated 14/05/03 and 29/04/03 were found with overwritten/corrected values of analyses results.

Missing labelling of hazardous chemicals can cause personal injury. Inadequate labelling of analytical samples, instruments and protocol sheets can lead to confusion concerning the labelled subject.

**Recommendation:** The plant should implement measures in order to check if analytical samples, samples of hazardous chemicals and instruments are labelled correctly.

### **Plant Response/Action:**

In order to analyse the causes behind the problem, a “thoroughness” project was conducted throughout the summer of 2003, involving technicians, managers and a supporting officer. The diagnosis brought the following points to the fore:

- provided labels are standardised; they are not suited to the various types of labelling
- lack of thoroughness in the filling-out of labels when these exist
- lack of expectations with regard to labelling
- samples taken by other departments.

### **Action plan**

- the work group has identified various types of label and stipulated their usage and content

- labelling expectations have been described and presented to all chemists by technicians involved in the work group and by managers
- presentation of labelling principle applied to samples taken by maintenance departments.

**Processes affected:**

**Analysis process:**

Technicians apply new expectations when performing their work.

**Monitoring process:**

Labelling checks have been incorporated into the MPCA field monitoring programme.

**OEF:**

A trial labelling exercise has been carried out and some labels have been modified before being permanently affixed.

At the end of the year, a work control summary is used as a basis for drawing up the action plan for year Y+1.

**IAEA Comments:**

A labeling note D 5057 LNE COF 11 prescribes various types of labels for all kinds of chemicals to be labeled. So labeling expectations are defined and presented to all chemists and in addition to other departments that are in charge of labeling. The design of the labels supports the correct labeling.

In the weekly rounds the control of the labeling performed in the laboratories and other chemical working places is directly addressed and documented.

**Conclusion:** Issue resolved.

## 8. EMERGENCY PLANNING AND PREPAREDNESS

### 8.1. EMERGENCY ORGANIZATION AND FUNCTIONS

Emergency preparedness arrangements in Civaux rely on a national doctrine established at the EDF corporate level. This national doctrine has been recently reviewed to take into account new off-site emergency arrangements (so-called reflex mode, i.e. initiation of automatic actions in the case of an event with a rapid evolution leading to quick radioactive releases off-site), to give consistency to the on-site EPP arrangements for all EDF plants, to incorporate experience feedback gained from exercises and real events (especially the Blayais flooding event in December 1999) and to integrate into a single emergency plan different kinds of emergency situations, such as a transport accident or chemical pollution.

The Civaux plant played a leading role in development of this new EDF corporate doctrine. A specific corporate EPP network has been established. Regular meetings with the appointed representatives from all EDF nuclear sites are organized. Within this network, coordinated by the corporate level, an information exchange forum improved and encouraged the exchange of experiences and the streamlining of resources among the different EDF nuclear sites by exchanging drafted documents, educational material, etc. This contributes to general acceptance and common understanding of the arrangements. The EDF corporate level intends to sustain this network and its functionalities.

A complete review of the on-site plan according to the reviewed national doctrine has been produced, including the associated training. This reviewed on-site plan is expected to be instituted at the beginning of July 2003 after approval by the French Nuclear Safety Authority. During this review process, strong commitment of the plant management resulted in efficient involvement of the concerned staff and efficient running of the on-site organization dealing with EPP arrangements. Moreover, the ISO14001 certification approach has been incorporated into this EPP review by adding an ISO14001 coordinator in this on-site working organization.

The responsibilities within the EPP arrangements at the Civaux plant level and also at the corporate level are clearly defined and the staffing of both sides is adequate to perform the assigned duties.

For the specific case of reflex mode, the warning sirens could be actuated by the plant emergency director under the responsibility of the Prefect.

The relationships between Civaux NPP and off-site entities, especially rescue services (medical assistance, hospitals, fire brigades, ...), are extremely well developed and continuously maintained through regular contacts leading to an efficient and common response. These relationships promote teamwork and common understanding of the concerned parties as part of an ongoing improvement process. These strong long-term relationships with off-site entities were identified as a good practice by the team.

### 8.2. EMERGENCY PLANS

The on-site emergency plan is part of the QA manual of the plant. The plan, called PUI (Plan d'Urgence Interne), is based on an organization supported by a formalized structure, enforced by plant management: a strategic manager (environmental & nuclear safety advisor), an operational coordinator (from the safety quality assurance department), supporting staff (for external relationships, for telecommunication means, for health and fire areas, ISO-14001, ...) and finally a network of representatives of each command centres. This internal

structure generates motivation, good acceptance and common understanding of the EPP arrangements ensuring proper awareness of EPP.

The Prefect of the Vienne département, responsible for the off-site response, uses the off-site emergency plan (PPI: Plan Particulier d'Intervention) reviewed to take into account the ministerial instruction issued in 2000, asking to implement the so-called "reflex"-phase and to establish at least 2 different locations for the local operational command centre (PCO). In the case of the PPI for Civaux NPP, 3 different PCOs can be set up, each of them located beyond a 10 km radius (Fleuré, Chauvigny and Gençay).

### 8.3. EMERGENCY PROCEDURES

The on-site emergency procedures are included in the PUI file containing actions sheets and support documents. In each command centre, the necessary documents (PUI, check-lists, support documents, technical documentation, ...) are provided and regularly checked.

The various types of emergencies (fire, medical, radiological, intrusion, ...) are included in the PUI and the associated documents and instructions.

The general procedure to be followed by persons who do not have emergency response duties is included in the PUI. These instructions are given to each employee by means of a specific training session.

The organization and verification of the on-call organization are adequate. The redundant callout system using radio connexion is currently being improved (renewal of equipment) in order to reach a minimum of 80% on-call coverage. Preliminary tests were successful (85% on-call coverage). Implementation is expected to begin as of next July, in conjunction with the reviewed PUI enforcement.

### 8.4. EMERGENCY RESPONSE FACILITIES

The on-site emergency centres, called command posts (PC), were found to be well equipped and in good state. The management, logistic and assessment PCs (PCD, PCM and PCC) are located in a special building, called BDS (Bloc de Sécurité). This building is equipped with air-conditioning, iodine filters and emergency power supply (diesel and batteries). In the BDS there are also food supplies for about ten days.

There are 7 emergency assembly points inside the building distributed through the site with good marking and indications. However, due to the manual accounting process, the need to carry equipment to these emergency assembly points, and the possible confusion between these emergency assembly points and the outside muster points to be used in case of a fire, the team suggests improving the effectiveness of the assembly and accounting process.

The medical centre on site is well equipped and organized to take care of injuries, irradiated or contaminated persons. A special agreement exists with the Poitiers hospital for further care of affected persons. As part of this agreement, joint training and assistance of radiological protection on call staff to cope with contamination and radiological hazards in the hospital are included. The thyroid blocking agents policy is adequately implemented at the different locations on the site (emergency assembly points, medical centre, radiation monitoring vehicles, PCs, ...).

A press briefing centre inside the Public Information Centre is designed to accommodate the press. It contains educational and support materials.

A back-up centre is provided in Lhonnaizé about 5 km away from the plant to manage the evacuation of non-essential personnel from the site and to organized the turnover of the EPP teams, when these actions could not be performed on the site due to high background radiation. This back-up centre is well equipped and covered by adequate arrangements (monitoring and decontamination facilities, clean replacement clothes, ...). Water collected from the decontamination facilities is collected into a special tank for further processing.

## 8.5. EMERGENCY EQUIPMENT AND RESOURCES

There is a substantial range of dedicated equipment and resources at different locations on the site: in the BDS PCs, at the on-site medical centre, in the back-up centre in Lhonnaizé, etc. The periodic check of the material dedicated to EPP is performed according a well structured approach ensuring proper tracking. The sealing of the cupboards inside the radiation monitoring vehicles is particularly note worthy.

The data from most of the radiation monitoring stations located around the site (20 out of 28) are not transmitted automatically to the assessment command centre (PCC), leading in the case of an emergency, to a delay and unnecessary personnel exposure. EDF corporate level has initiated a corrective action plan aiming to install automatic transmission of off-site RM-stations at all EDF NPPs in the following years (between 2003 and 2007).

The team encourages the plant to take initiatives aimed to improve the effectiveness of the on-site and/or off-site monitoring processes: automatic transmission of off-site radiation monitoring data, installation of a GPS in the vehicles and supplying of electronic dosimeters with alarm threshold for the RM-teams.

Off-site vehicles for fire fighting and medical assistance, monitoring, sampling and analysis are well equipped, including adequate personal protection equipment. The personal protection equipment dedicated to the Poitiers hospital personnel is managed by the plant staff using sealed boxes, maintaining relationships between the plant and hospital staff.

## 8.6. TRAINING, DRILLS AND EXERCISES

For employees who do have an emergency response duties, detailed training and refresher programmes exist.

Specific training for each of the emergency roles and functions are performed by the appointed representative of each PC. For several roles and function, national level training sessions, like communication skills, accident management, ... are also organized.

The training attendance is systematically recorded and centralized at the Training department. The PUI operational coordinator follows regularly the training records in order to detect any deviation in the training requirements as early as possible.

For local technical crisis team members in charge of technical assessment of the reactor during an emergency, a yearly training session is organized using the SIPACT tool. The training is also organized in such a way as to promote exchanges between team members with different roles. This allows a common understanding of the overall process, tasks and goals of this crisis team, including a consistent approach to be applied by them.

A well-developed and comprehensive exercise programme associated with a strong commitment of management and of appointed representatives of each PC is applied at the Civaux plant. The number of exercises, their scope and systematic evaluation and feedback



are worth being highlighted. The team identified this exhaustive and comprehensive exercise programme as a good practice.

## 8.7. LIAISON WITH PUBLIC AND MEDIA

The organization set up at corporate level to deal with public communication in the case of an emergency is well structured and equipped. In particular, the development of computer graphics which can be adapted in real time is in progress. This covers different kinds of information: safety systems & functions, health & environment, ergonomically user-friendly maps and 3D-virtual pictures. This information material will be made available to all EDF sites. The use of this information material could be helpful for the representative of the Civaux plant sent to the off-site local authority (Préfecture).

The on-site infrastructure for public information is incorporated in the PUI, including necessary human and material resources.

The Civaux communication staff is proactive regarding internal and external communication using different kinds of media supports (press releases, information sheets, information magazines, ...).

A toll-free number, allowing 3 possible simultaneous calls, is used either in daily basis as in emergency situations to spread regularly updated messages. The toll-free number is systematically mentioned on published documents (information brochures, ...).

It should be noted that, for security reasons (“Vigipirate” plan), the public information centre is currently closed to the public; only VIPs can have access or visit the plant. However, the plant does receive a lot of requests from the public every week.

## **STATUS AT OSART FOLLOW-UP VISIT**

In the area of emergency planning and preparedness there was one suggestion, which was found to be resolved.

The plant has effectively focused its efforts on shortening the time necessary for activation of assembly points, reducing the time required for accounting of personnel at assembly points during emergencies, and implementing better communications between assembly points and the logistics command centre. All corrective actions were tested during three emergency drills in 2004.

## DETAILED EMERGENCY PLANNING AND PREPAREDNESS FINDINGS

### 8.1. EMERGENCY ORGANIZATION AND FUNCTIONS

**8.1(a) Good practice:** Strong long term relationships with off-site entities, especially rescue services, lead to an efficient and common response.

Relationships with off-site entities (local authorities, medical assistance, hospitals, fire brigades, ...) are extremely well developed and continuously maintained through regular contacts.

In the case of external fire brigades, this leads to the following actions and results:

- Set-up of a common mixed commission, called “fire commission”, which meets every 2 months in order to confirm the arrangements and to initiate corrective actions if needed.
- A document has been developed jointly by Civaux and the off-site fire brigades to optimise fire fighting on the site.

This document (“PER” in French) is used by the off-site fire brigades. It gives an accurate indication of all plant locations, including details regarding sensitive plant equipment like main and auxiliary power transformers. It also lists the main industrial safety and radiological risks encountered on the plant.

After receiving a phone call from the plant, the relevant fire brigades simply need to refer to a detailed chart indicating the number of human and material resources required to fight a fire according to its specific conditions and location. Especially for sensitive equipment, fire-fighting plans included in the document have been drawn up by the off-site fire brigades. Moreover, this plan has been drawn up using standard formats and wording used by the fire brigades.

This document has the added advantage of directing fire-fighters to the location of the fire even before arrival at the plant. The document also provides a clear definition of responsibilities assigned to the fire fighters and to Civaux staff.

The PER is an important tool for fire-fighting since it defines the resources to be used and ensures that fire fighters and the site are using the same frame of reference. It makes it easier for fire fighters to operate and meets their expectations.

It is reviewed periodically (every 2 months) not only for updating purposes but also for raising awareness of the concerned personnel. This includes regular joint visits of the installations.

The document is available at the main entrance building, in the vehicles of the off-site emergency services, the second response team vehicle (PCOM) and at the logistics command centre (PCM).

The off-site fire brigades thus have a high quality, updated operational document.

- Review of on-site EPP-arrangements to involve a management function (PCD2) in the field to become Civaux interlocutor with the fire brigade officer.
- Organization of more exercises with external rescue services than required by the national doctrine (3 per year instead of 1) with effective deployment on the site.

- Organization of common training (plant staff and fire brigades) to promote mutual exchanges, discussions and common understanding.
- Organization, if needed or in function of turnover of personnel, of educational exercises with various specific objectives, such as the protection and decontamination measures to be taken in the case of interventions in RCA.
- Establishment of a training centre, located near to the Civaux site and partially funded by EDF, to perform most of the common training sessions.

Concerning the relationships with the hospital of Poitiers, similar arrangements are in place also to perpetuate the relationships between the plant staff and the medical rescue teams. Examples are:

- mixed training at the plant and at the hospital of Poitiers,
- 2 of 3 exercises per year with a specific medical section,
- management of the personal protection equipment dedicated to the Poitiers hospital personnel by the Civaux plant staff using sealed boxes, contributing to perpetuate the relationships between the plant and the hospital staffs.

Finally, close contacts exist between the plant staff and the local authorities (prefecture, mayors of the villages within the 10 km EPZ, local information commission, ...). In that frame, proactive communication from the Civaux NPP would limit the adverse effects of inappropriate response of the population in case of an emergency.

These relationships promote team working and common understanding of the concerned actors as part of an ongoing improvement process.

## 8.4. EMERGENCY RESPONSE FACILITIES

**8.4(1) Issue:** Assembly and accounting process is not fully effective.

- On-site personnel accounting is manually performed, leading to a delay of 1 to 1.5 hour before a first overall assessment of the situation.
- The necessary steps to activate the 7 emergency assembly points inside the building require moving material (RM-monitor, ...) from the emergency on-site facilities located near the main site entrance to the concerned assembly points.
- There is no general or dedicated means to spread on regular basis information at the emergency assembly points. The useful information about the evolution of the situation is given by the logistics command centre (PCM) using phone to the responsible of the point. He spreads afterwards the collected information using megaphone.
- Despite good marking and indications of the 7 emergency assembly points to be used in case of a radiological emergency, the use of similar signing and labelling of other outside muster points to be used in case of a fire or health emergency (6 spread through the site) could lead to possible confusion between both types of muster points. In addition, at least in one case, outside muster point is located too close to fire hydrant to be used by fire brigades. This could perturb the intervention teams.

It should be noted that some steps have already been taken by the Civaux plant staff to fix some of the above facts using, as a basis, the arrangements in place in another EDF-plant (Blayais).

Ineffective assembly and accounting of personnel in case of an emergency could lead to unnecessary personnel exposure and/or inadequate emergency response.

**Suggestion:** Consideration should be taken by the plant staff to improve the effectiveness of the assembly and accounting process.

### **Plant Response/Action:**

#### **Causes**

Causes are due to the following factors:

- the fact that accounting time exceeds one hour and that the coordinator retrieves equipment from the logistics command center (PCM) before going to his muster point, results in a delay of up to 30 minutes
- tools utilized; paper documents and a PCM3 telephone line for 7 muster points
- accounting personnel; staff appointed to provide accounting assistance.

#### **Actions (improvements since the OSART)**

Improvements have been implemented in the following order:

- fitting out of muster points in order to accommodate the coordinators equipment ; installation of cabinets, electrical socket, padlock, transfer of workstations. Documents updated with coaching provided at workstations. Implemented since 4 June 2004

- a benchmarking exercise was carried out using Penly, Blayais, Golfech and Chooz plants as references, in order to study the accounting system at muster points. Fax machines were opted for as the chosen means of communication
- PCM3/muster point liaison test using fax machines after these were installed.

### **Validation (and improvement)**

In July 2004, the PCM3/muster point fax liaison test did not produce the results expected.

On the occasion of the drill scheduled for November 2004, one of the goals will be to account for personnel at muster points. Achieved and potential benefits will be gauged in order to determine and validate progress actions.

### **Responsibilities**

The EPP coordinator coordinates these progress actions. These are disseminated among the corporate network of EPP representatives, with the support of specialist entities (SEISO), the site IT department and the site security department.

### **Tools**

Documents pertaining to muster point management together with associated action sheets. Drill reports. Set of specifications pertaining to the study and conclusion submitted to senior management.

**IAEA Comments:** The plant has focused its efforts on shortening the time necessary for activation of assembly points, reducing the time necessary for accounting of personnel at assembly points during emergencies, and implementation of fax communications between assembly points and the logistics command centre.

Placement of cupboards with the necessary tools and equipment significantly shortened the time required for activation of assembly points. The plant was also able to reduce the time necessary for manual accounting of personnel to 40 minutes on average. Fax communication has been tested, but is not yet fully implemented.

The above-mentioned corrective measures were tested during three emergency drills in 2004; another drill is planned in January 2005.

**Conclusion:** Issue resolved.

## 8.6. TRAINING, DRILLS AND EXERCISES

**8.6(a) Good practice:** A well-developed and comprehensive exercise programme associated with a strong commitment of management and of the appointed representatives of command centres leads to a good state of preparedness of involved plant staff members.

Five types of exercises are organized. These exercises are validated by the Technical Safety Group indicating a strong commitment of the management for these activities:

- Global exercises: technically oriented or fire/health oriented – 6 per year (3+3), of which 1 per 3 years the national crisis teams of EDF participates.
- National exercise with participation of local and national organizations and authorities: 1 per 3 years (next in December 2003).
- Mobilization exercises (with effective moving to the site): 2 per years outside working hours – criteria: full activation of the PCs in less than 1 hour
- Assembly exercises (for all personnel): 1 per year during working hours. 1 every 3 years with activation of the back-up centre with (partial) personnel effective evacuation.
- For each unit, effective test of reactor building evacuation per each outage.

Moreover, additional drills are also performed:

- 4 communication tests at home (outside working hours) with acknowledgment and verification followed by immediate corrective actions, if needed.
- 6 security oriented exercises (intrusion risk).
- A weekly fire oriented drill exercise for the on-site second intervention teams (supervised on field by management).

Effective participation in exercises is systematically recorded ensuring the necessary tracking in order to respect the requirement of at least 1 exercise/2 years for each of the involved people.

The number of exercises, their scope and systematic evaluation and feedback are worth being highlighted.

**SUMMARY OF STATUS OF RECOMMENDATIONS AND SUGGESTIONS  
OF THE OSART FOLLOW-UP MISSION TO CIVAUX NPP**

**6-10 December 2004**

	RESOLVED	SATISFACTORY PROGRESS	INSUFFICIENT PROGRESS	WITHDRAWN	TOTAL
Management, Organization and Administration	R - 3 S - 0	R - 2 S - 0	-	-	R - 5 S - 0
Training and Qualification	R - 1 S - 1	R - 0 S - 0	-	-	R - 1 S - 1
Operations	R - 2 S - 1	R - 1 S - 0	-	-	R - 3 S - 1
Maintenance	R - 4 S - 0	R - 0 S - 0	-	-	R - 4 S - 0
Technical Support	R - 3 S - 2	R - 0 S - 0	-	-	R - 3 S - 2
Radiation Protection	R - 1 S - 2	R - 0 S - 0	-	-	R - 1 S - 2
Chemistry	R - 1 S - 1	R - 1 S - 0	-	-	R - 2 S - 1
Emergency Planning and Preparedness	R - 0 S - 1	R - 0 S - 0	-	-	R - 0 S - 1
<b>TOTAL R</b> (%)	R - 15 (79 %)	R - 4 (21 %)	-	-	R - 19 (100 %)
<b>TOTAL S</b> (%)	S - 8 (100 %)	S - 0 (0 %)	-	-	S - 8 (100 %)
<b>TOTAL</b> (%)	23 (85 %)	4 (15 %)	-	-	27 (100 %)

## DEFINITIONS

### DEFINITIONS - OSART MISSION

#### **Recommendation**

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

#### **Suggestion**

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

#### **Good Practice**

A good practice is a proven performance, activity or use of equipment which the team considers to be markedly superior to that observed elsewhere. It should have broad application to other nuclear power plants and be worthy of their consideration in the general drive for excellence.

### DEFINITIONS - FOLLOW-UP VISIT

#### **Issue resolved - Recommendation**

All necessary actions have been taken to deal with the root causes of the issue rather than to just eliminate the examples identified by the team. Management review has been carried out to ensure that actions taken have eliminated the issue. Actions have also been taken to check that it does not recur. Alternatively, the issue is no longer valid due to, for example, changes in the plant organization.



### **Satisfactory progress to date - Recommendation**

Actions have been taken, including root cause determination, which lead to a high level of confidence that the issue will be resolved in a reasonable time frame. These actions might include budget commitments, staffing, document preparation, increased or modified training, equipment purchase etc. This category implies that the recommendation could not reasonably have been resolved prior to the follow up visit, either due to its complexity or the need for long term actions to resolve it. This category also includes recommendations which have been resolved using temporary or informal methods, or when their resolution has only recently taken place and its effectiveness has not been fully assessed.

### **Insufficient progress to date - Recommendation**

Actions taken or planned do not lead to the conclusion that the issue will be resolved in a reasonable time frame. This category includes recommendations on which no action has been taken, unless this recommendation has been withdrawn.

### **Withdrawn - Recommendation**

The recommendation is not appropriate due, for example, to poor or incorrect definition of the original finding or its having minimal impact on safety.

### **Issue resolved - Suggestion**

Consideration of the suggestion has been sufficiently thorough. Action plans for improvement have been fully implemented or the plant has rejected the suggestion for reasons acceptable to the follow-up team.

### **Satisfactory progress to date - Suggestion**

Consideration of the suggestion has been sufficiently thorough. Action plans for improvement have been developed but not yet fully implemented.

### **Insufficient progress to date - Suggestion**

Consideration of the suggestion has not been sufficiently thorough. Additional consideration of the suggestion or the strengthening of improvement plans is necessary, as described in the IAEA comment.

### **Withdrawn - Suggestion**

The suggestion is not appropriate due, for example, to poor or incorrect definition of the original suggestion or its having minimal impact on safety.

## **ACKNOWLEDGEMENT**

The Government of France, and the staff of Civaux Nuclear Power Plant provided valuable support to the OSART mission to Civaux. Throughout the whole OSART mission, the team members felt welcome and enjoyed excellent cooperation and fruitful discussions with Civaux Nuclear Power Plant managers and staff, other local and national authorities. Information was provided openly and in the spirit of seeking improvements in operational safety. There was a rich exchange of knowledge and experience which contributed significantly to the success of the mission. It also established many personal contacts that will not end with the completion of the mission and submission of this report. The efforts of the plant counterparts, liaison officers, interpreters and the secretaries were outstanding. This enable the OSART team to complete its mission in a fruitful manner.

The IAEA, the Division of Nuclear Installation Safety and its Operational Safety Section wish to thank all those involved for the excellent working conditions during the Civaux Nuclear Power Plant review as well as during the follow up mission in Civaux.

## TEAM COMPOSITION OSART MISSION

### EXPERTS:

#### **HANSSON Bertil – IAEA**

Team Leader

Years of nuclear experience: 35

#### **COOK John – IAEA**

Assistant Team Leader

Years of nuclear experience: 34

#### **MELLOR R. - USA**

ShipsRock Consulting LLC

Years of nuclear experience: 31

Review area: Management, Organization and Administration

#### **LJUNGQUIST, B. – SWEDEN**

KSU AB

Years of nuclear experience: 27

Review area: Training and Qualification

#### **MARTINSUO, M. – FINLAND**

Fortum Power and Heat Oy, Loviisa NPP

Years of nuclear experience: 23

Review area: Operations I

#### **TOTH, A. – IAEA**

Years of nuclear experience: 16

Review area: Operations II

#### **HARRISON, M. – UK**

Maintenance Manager

Years of nuclear experience: 24

Review area: Maintenance

#### **MILLER, M. - CANADA**

Ontario Power Generation – Pickering “A”

Years of nuclear experience: 25

Review area: Technical Support

#### **PERRAMON, F. - IAEA**

Years of nuclear experience: 25

Review area: Operating Experience

**MEULEMANS, P. - BELGIUM**

Doel NPP

Years of nuclear experience: 14

Review area: Radiation Protection

**BOETTCHER Dr, F. - GERMANY**

Gemeinschaftskernkraftwerk Neckar GmbH

Years of nuclear experience: 12

Review area: Chemistry

**DEGUELDRE, D. - BELGIUM**

AVN (Association Vinçotte Nuclear)

Years of nuclear experience: 15

Review area: Emergency Planning and Preparedness

**OBSERVERS:**

**PORTUGAL, F. – BRAZIL**

Years of nuclear experience: 6

Review area: Observer

**SPIEGELBERG PLANER Rejane - IAEA**

Years of nuclear experience: 25

Review area: Observer

## TEAM COMPOSITION OSART FOLLOW-UP VISIT

### **COOK John – IAEA**

Team Leader

Years of nuclear experience: 34

### **TOTH Alexandre – IAEA**

Deputy Team Leader

Years of nuclear experience: 18

### **LJUNGGUIST, B. - SWEDEN**

Maintenance Manager

Years of nuclear experience: 27

Review area: Maintenance

### **BOETTCHER Dr, F. - GERMANY**

Gemeinschaftskernkraftwerk Neckar GmbH

Years of nuclear experience: 14

Review area: Chemistry