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REPORT OF THE

OPERATIONAL SAFETY REVIEW TEAM (OSART) MISSION

TO THE

CHINON NUCLEAR POWER PLANT

FRANCE

27 NOVEMBER TO 14 DECEMBER 2007

AND

FOLLOW-UP VISIT

7-10 DECEMBER 2009

DIVISION OF NUCLEAR INSTALLATION SAFETY

OPERATIONAL SAFETY REVIEW TEAM MISSION
IAEA-NSNI/OSART/09/144F

PREAMBLE

This report presents the results of the IAEA Operational Safety Review Team (OSART) review of Chinon 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 24 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.

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FOREWORD
by the Director General

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

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

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

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

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

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

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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 Chinon Nuclear Power Plant from 27 November to 14 December 2007. The purpose of the mission was to review operating practices in the areas of Management organization and administration; Training and qualification; Operations; Maintenance; Technical support; Operating Experience, Radiation protection; Chemistry; and Emergency planning and preparedness. In addition, an exchange of technical experience and knowledge took place between the experts and their plant counterparts on how the common goal of excellence in operational safety could be further pursued. The Follow-up Visit took place during 7-10 December 2009.

The Chinon OSART mission was the 144th in the programme, which began in 1982. The team was composed of experts from Bulgaria, Czech Republic, Hungary, Japan, Republic of Korea, Russia, Slovakia, South Africa and the United States together with the IAEA staff members. The collective nuclear power experience of the team was approximately 280 years.

Chinon NPP is part of the EDF Group and Nuclear Power Operations Division. The site has four 900 MWe PWR units (B plant) in operation, and three gas cooled units (A plant) under decommissioning. A corporate chemical and metallurgical laboratory of CEIDRE, the group INTRA which deals with robots to be used in the event of nuclear accident and the corporate training engineering unit UFPI are located at the same site. The plant operating the four 900 MW units was the scope of the review. It employs 1270 EDF staff and about 300 contractors work permanently at the plant.

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

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

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

MAIN CONCLUSIONS

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

- The plant is controlling, reducing, and maintaining as low as possible the source term and consequently radiation doses, liquid and gaseous effluent releases and process-generated waste. There is a strong management commitment in this regard, through cross-functional committees and through adherence to the radiochemical and chemical specifications;
- Use of the boric acid valve lineup display has reduced operator occupational exposure due to decreasing the necessity for manual valve lineups on the boron and water make up system;
- Craft Safety Groups contribute to addressing safety issues within a particular profession (craft), based on teamwork;
- The plant has created a programme to reduce scrams from human interface. It includes labeling equipment in the field and the control room as well as electronically identifying equipment and activities that could introduce a risk of plant scrams;
- The practical training presented to employees in the area of radiation protection and the different tools and simulation practices used are deemed very effective in simulating work practices and human actions inside a controlled zone.

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

- The plant should revise the established rules to ensure that at least one authorized reactor operator is present ‘at the controls’ (near the control boards and panels) in main control room at all times during operation of the reactor;
- The plant should reinforce current standards for alarm response and introduce a requirement for logging of unexpected alarms;
- The plant should consider using error prevention techniques more extensively during manipulations affecting reactivity;
- The plant should consider further efforts to minimize the number of temporary modifications and ensure their proper control including their timely resolution;
- The plant should consider enhancing its implementation and control of modifications and configuration to ensure that the original functions, as designed, are not compromised.

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

FOLLOW-UP MAIN CONCLUSIONS

In summary, Chinon NPP has achieved visible improvements since the OSART mission in response to the recommendations and suggestions. About two thirds of the issues have been resolved, one issue has insufficient progress and the remainder have reached satisfactory progress of implementation. The plant also responded to several items of encouragement which is a commendable approach and ensures maximum benefit from the OSART mission results.

The status of plant responses to the most significant proposals of the OSART mission is the following:

- The plant has revised its requirement for the presence of at least one control room operator at all times 'at the controls' area of the main control room. Now several conditions limit the possibility for the operator to stay at the entrance of the common room next to the main control room, Even during this period the operator has to review 7-9 key parameters depending on the operation mode of the reactor at intervals of about 5 minutes.
- The plant has reinforced standards for alarm response including the requirement for logging unexpected alarms. However during the follow-up visit some deficiencies were observed in the alarm response in the main control room and the nuclear auxiliary building control room indicating that there is room for further improvements in this area.
- The plant has developed a new reference standard for reactivity management which provides a systematic breakdown of different error reduction tools to be applied and the number of staff to be involved in all types of operations influencing reactivity. However several tasks are still to be performed in 2010, e.g. incorporating the practices required by the new reference standard into simulator training; analysis of the experience of application by Operations department and setting up a task force in line with the decision of the Plant Safety Committee.
- A comprehensive work plan has been set up by the plant which also relies on a corporate programme to reduce the number of safety significant temporary modifications. The pace of planned elimination of these modifications is reasonable and proportional progress has been reached by the time of the follow-up visit.
- The plant has introduced several changes in the implementation and control of modifications and configuration. These changes have resulted in the corporate modification being now sufficiently embedded in site procedures, improvements in the local modification review process and a change in the site culture with respect to the "smaller" modifications.

1. MANAGEMENT, ORGANIZATION AND ADMINISTRATION

1.2. MANAGEMENT ACTIVITIES

Annual individual evaluation is set as an indicator to evaluate management (pilot) process efficiency. The target for 2007 is to complete 80% of these evaluations, but at the end of October, only 39% were completed and the target will very probably not be met. The individual evaluation is an important tool for managers to improve performance when necessary.

Another indicator is set to evaluate management (pilot) process efficiency defining the percentage of teams, which had presented the team business plan for that particular year. In 2006 it was 94%. The 2007 goal is 90% for this indicator and the reality is 90%. This means that 2 teams did not present their objectives for 2007.

These facts could indicate a potential area of ineffectiveness of the management system and the team is encouraging the plant to apply a more challenging approach to these areas important to ensure plant performance improvement.

STEP2010 is the corporate Programme focused to 10 areas of the fleet performance improvement. One of these areas is the human performance development programme and the plant is in the process of implementing that programme. All staff are involved in the associated training. The plant manager was the first person who passed that training and he was also personally involved in the communication process before the programme started. The training was practically completed.

This programme requires the implementation of the following tools for human performance development: pre-job briefing, “stop and think”, three-way communication, peer check, self-check, and debriefing. With the aim to reinforce the use of these tools in the day-to-day work, about 2000 work practices observations in the field were scheduled in the plant for 2007 and, in fact 2200 had already been completed. The team considers this approach as a good performance at this stage of Programme implementation.

The goal for the human performance development programme according to STEP2010 is defined in a general way – to improve human performance so that all activities are done properly the first time-these goals are not quantified.

The human performance issue is the dominant issue for safe plant operation and its contribution to the plant performance results cannot be ignored.

Among the 35 safety related events (ESS in French abbreviation – events to be reported to the regulatory authority) which occurred this year, only 3 have purely technical causes, the rest of them have a human factor component. This is a 10% increase in comparison with the year 2006.

The plant recognised the importance of human performance issues and is putting adequate effort to enhance the human performance programme. This was evident when the 2008 project implementation plan, that includes also quantitative goals setting, was discussed. In addition to that, the plant has implemented the reactor scram number reduction programme since 2003 on its own initiative.

The plant provided a satisfactory presentation of practical implementation of the human performance programme in the plant and this is considered as a good performance at this stage of programme implementation.

The team is encouraging the plant to continue with the implementation of the human performance programme and to sustain its efforts in the future years.

1.3. MANAGEMENT OF SAFETY

The plant management system is based on the ISO standard 9001, 14000 and the EFQM model, with the top plant policy named "Quality and Environment Policy". However it basically covers all aspects of nuclear power plant operation including safety and radiation protection, and the fact that the nuclear industry is unique and that safety is the first priority is not explicitly stated.

The "Quality and Environment Policy" does not define the safety culture aspects and no formal document related to the safety culture has been elaborated in the plant. The management procedure defining policies and describing safety management systems does not present explicitly the commitment to build a strong safety culture. However, the safety culture aspects are a standard part of the plant personnel training. Activities, strengthening the safety culture are regularly planned and implemented.

The team encourages the plant to present the management commitment to safety as a first priority and safety culture enhancement in a more explicit way.

The plant created Craft Safety Groups (GSM) in 2000, after a period of significant deterioration in safety performance. The OSART team observed four GSM meetings during its mission. The team considers this practical example of a self-learning process as a good practice.

A strong safety culture is comprised of many attributes that collectively demonstrate the safety culture of an organization. The overall experience of the team is utilized to capture, during the review period, those characteristics, attitudes and practices that indicate the level of safety culture at Chinon NPP. The team identified a number of facts related to strengths and weaknesses of safety culture that could assist the ongoing management efforts regarding safety culture at Chinon NPP.

With respect to observed strengths, the team experienced a very open and cooperative attitude from both management and staff at the plant. The OSART mission had been widely publicized throughout the facility and a positive attitude was observed. The staff, at all levels of the organization, who were involved in the review were knowledgeable regarding the aims of the review.

A downward trend in radiation doses received by personnel over the past ten years is a reflection on the high priority given to dose reduction by plant management. From 1996 to 2006, the plant reduced the average outage collective dose per unit from around 2400 person-millisievert to around 600 person-millisievert. As for occupational dose during all power operations, the plant reduced the collective dose from around 1600 person-millisievert in 1997 to a projected 420 person-millisievert in 2007. The plant has shown similar results in decreasing its impact on the environment by reducing its liquid and gaseous radioactive effluents.

In a number of areas, it was also evident that there was strong management support given to the development of innovative techniques and practices. Examples include the establishment of Craft Safety Groups and the use of radiation protection training mockups.

There are other attributes that the team believes could be strengthened to improve the overall safety culture.

A number of handwritten changes to plant labeling and procedures were observed. Further control in this area is necessary to ensure that only suitably reviewed and approved documentation is utilized at all times.

The team also considered that there is an over-reliance, by the plant, on the corporate body regarding practices and systems. There are many instances when having such a huge organization supporting the plant is a distinct advantage. Nevertheless, the team considers that the plant can improve its own resolution of medium term safety issues and take its own initiative with respect to these without compromising corporate decisions.

The close-out of work at worksites was not considered to be performed in a timely manner. Several instances were evident whereby the work had not been properly closed out. The review also indicated that some ‘temporary’ modifications had been in place for a number of years.

1.4. INDUSTRIAL SAFETY PROGRAMME

Based on the 2006 unsatisfactory results, the plant developed an action plan aimed at improving performance in the industrial safety area. It included the commitment to analyse all industrial safety events which led to working days loss. The analysis would be completed within one week (fulfilled for 98% of events up to now) after the event occurred and communicated, within 24 hours, to the concerned team.

The cumulative number of industrial safety events causing lost working days was 22 in 2007 for both EDF and contractor staff. The dominant cause was tripping.

The number of industrial safety events is higher than the industry average and the team encourages the plant to pay constant attention to industrial safety aspects, mainly from the point of view of human behaviour.

During the plant tour, the OSART team identified, among others, 18 facts related to industrial safety risks. Among this number, 9 were in the category related to the problem of not utilising safe routes for walking or not using standard routes for walking (tripping). A further example related to elevated potential for electrical shock risk was also found.

The team encourages the plant to pay attention to safe walking route arrangements and to avoid using unsafe routes. The plant should also strengthen arrangements that eliminate electric shock risk when temporary electrical cabling is installed.

DETAILED MANAGEMENT, ORGANIZATION AND ADMINISTRATION FINDINGS

1.3. MANAGEMENT OF SAFETY

1.3(a) Good practice: Craft Safety Group (GSM) contribution to addressing safety issues within a particular profession (craft) based on teamwork.

Craft Safety Groups are decision-making committees established for each specific profession (craft) in the plant. The aim of GSM is to formulate safety policy fundamentals, to support safety culture enhancement and to address issues fed back from the field using plant, corporate and external operating experience and to avoid addressing events in isolation, event by event, but as a part of the self learning process.

The definition and implementation of improvement measures is a result of the teamwork inside the craft. When necessary, contractors are involved also.

Some examples of positive outcomes include:

- The team attended one GSM while at the plant. At the meeting, field operators explained that they had identified a deficiency associated with improper valve location within some emergency operating procedures. Operations management assigned an action to resolve the issue.
- At the operations GSM, the cause analysis for current weak areas of performance was covered. Input was solicited from operators on the corrective action plan.
- One item already resolved from this forum is the removal of all non-operations related public address announcements; this has contributed to control room serenity.

2. TRAINING AND QUALIFICATIONS

2.1. TRAINING POLICY AND ORGANIZATION

Management observations play a key role as a method to assess and to be used to improve training programmes and the performance of training. Currently the plant relies solely on trainee/instructor feedback to assess and improve the training programme. This feedback is captured by the contractors (UFPI) in charge of training and not by the plant staff members themselves. The management observations on the training programmes are not formalized. There is no requirement to provide official feedback on observed training or existing guidelines on how to perform observations. The only direct feedback that the plant will get on weaknesses in the training programme is when the employee or trainee gives direct feedback to his supervisor when he is not satisfied with the training received. The plant is encouraged to add guidance to and formalize the management observation process to help in tracking and enhancing training programme performance.

The team observed a good performance in terms of skills management, more specifically the approach employed to the mapping of skills. The skills mapping tool is used to develop strategies and action plans, taking into consideration succession planning, retirement losses, unexpected vacancies etc. The plant-produced policy provides a clear and pragmatic description of the requirements, displayed visually in the form of a skills chart.

2.2 TRAINING FACILITIES, EQUIPMENT AND MATERIAL

The team found that in one instance a modification was performed on the plant and it was then identified that the corresponding training facility should be updated. There is however no definite time by which this update should be completed. Without the proper fidelity between training tools used and the actual plant there is the increased probability of providing negative training that could influence and lead to an increase in human performance related plant events. The plant is encouraged to enforce the timely updating of training facilities.

2.3. QUALITY OF THE TRAINING PROGRAMME

The process that deals with competency deficiencies rely on the subjectivity of the observer and his technical knowledge and skill. The documenting of these decisions is not always completed in line with management expectations. Without the guidance to help determine appropriate corrective actions when a trainee has shown weaknesses, the competence of individuals may not be assured. The plant is encouraged to improve the job observation process by adding guidance to ensure the consistent application of establishing actions and guidance that should be followed when less than adequate competence in an individual is observed.

On Job Trainers (Shadow Trainers) at the plant are not trained or authorized to deliver shadow training. Some of the mentors are recognised as mentors by the plant. The management expectation is that all mentors should be officially appointed, but it is not the practice in all departments. Generation Engineering Group launched a project ("Mission") in 2006 to train and qualify all identified mentors with the skills to deliver training to new trainees. This initiative however is still in its early stages and has not delivered any qualified and designated on job trainers. The plant is encouraged to continue with the programme of training tutors.

2.4. TRAINING PROGRAMMES FOR CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

The operations department uses a plant developed database to track all operations employee competencies. It is known as "Observatoire des Compétences" and is a powerful database to provide a snapshot of tasks that the operator has performed, either on plant or on simulator. The database can be used to develop JIT (Just in Time) training for outages and preparation for sensitive or important plant manipulations to see which operators have recently performed the tasks required or require training before engaging in these activities. The team sees this as a good performance.

2.6. TRAINING PROGRAMME FOR MAINTENANCE PERSONNEL

The team observed a good performance in terms of the use of the operational full scope simulator to train the maintenance staff of I&C and testing departments in the use of practicing communications, pre-job briefs and risk assessments in working together with operations. The aim of this training is to reduce the risk of potential human errors in safety or risk significant work, it also helps in the optimization of co-ordination between the crafts.

The team observed a good performance in providing training opportunities to apprentices who are trained to work for EDF contractor companies. The practice ensures that contractor skills are maintained and that the apprentice, once employed by the contractor company, has acquired the necessary plant and plant working methods training.

2.7. TRAINING PROGRAMMES FOR TECHNICAL PLANT SUPPORT PERSONNEL

In the maintenance of the safety engineer's skills, the plant has gone into partnership with two other plants. The benefit is the sharing of experience between the 3 different plants, providing the opportunity to compare practices and experience. This is seen as a good performance by the team.

2.10. GENERAL EMPLOYEE TRAINING

The practical training presented to employees in the area of radiation protection and the different tools and simulation practices used are adding a new dimension to job simulations to train and test the employees. The team sees this as a good practice.

DETAILED TRAINING AND QUALIFICATION FINDINGS

2.10 GENERAL EMPLOYEE TRAINING

2.10(a) Good practice: The practical training presented to employees in the area of radiation protection and the different tools and simulation practices used are deemed very effective in simulating work practices and human actions inside a controlled zone; the continuous reduction in individual dose received could be attributed to some extent to these innovations which include:

- Actual piping, tank and valve mock-ups that can simulate leakage and industrial hazards.
- Portable radiation monitors, placed at a mock-up work site that can be triggered to alarm from a small control room. From here trainee response and actions to simulated high radiation levels can be monitored.
- Personal radiation monitors at exit of simulated controlled area that can be triggered to alarm and indicate contamination on the body of the trainee; the trainee response in decontamination actions can be monitored.
- The use of “fluoricine” to simulate contamination that can be detected by the use of UV light, the trainee response and actions can be observed.
- Remote controlled feature added to the portable radiation monitors and the personal radiation monitors to allow the instructor to directly observe the trainees in situ when activating these alarms.

3. OPERATIONS

3.1. ORGANIZATION AND FUNCTIONS

The operations line organization is staffed with knowledgeable and competent individuals that comprise a team that is achieving good levels of performance. Several strategic positions have been allocated off shift to ensure operations involvement in the planning of on-line and outage activities. Succession planning is well developed and implemented in the operations department, the plan is forecasted for several years to ensure staffing of the department is not jeopardized. The department has a healthy rotation programme for senior positions that creates a strong learning environment while operators interface with other departments and processes. The department is fortunate to have employees with high levels of ownership and pride; this attribute is evident throughout the department from the managers through to the field operators. Several operations working groups exist that have instituted performance-improving changes based on control room and field operator feedback. The team recognizes these working groups as an area of good performance.

The operations department has a comprehensive self assessment programme that involves the shift manager conducting crew level self assessments that feedback to overall operations department performance as well as providing the crew with improvement recommendations. This programme is coupled with a management presence in the field programme that sets expectations for and monitors line management time in the field. The managers provide real time feedback to individuals as well as consolidated feedback to the entire department. The information is used for input into the department's performance and to recommend any changes in priorities to catch low-level performance issues before they become bigger issues. The team views this as good performance that could provide swift improvements in areas where performance is not up to standards.

A teleconference is conducted each working day that includes line management from virtually every department as well as a member of senior management to discuss the priorities as stated by the shift manager's. The meeting was conducted very efficiently and clearly communicated the Shift Managers direction for the priorities of the day. The team sees this as an area of good performance.

The plant has created a technical file database that contains the intricacies of current issues that are being investigated and resolved. The database is accessible to all parties involved in resolving the issue. The team recognizes this as a good practice.

There are numerous examples of damaged piping insulation and conduits that are indicative of workers using these as access devices instead of seeking appropriate access devices. The examples cover the entire spectrum of equipment including safety related devices. These behaviors can lead to piping stress that is beyond the analyzed design, potentially causing damaging fatigue to piping systems as well as causing electrical faults due to damaged conduits. The team encourages the plant to expedite the plan in place to prevent any further equipment damage.

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

The department has taken the fleet lead on implementing the SCRAM risk potential placard system. The system is recognizable from the field as well as from the tagging office. This allows the plant staff that interface with sensitive equipment to take the needed precaution to prevent unanticipated SCRAMS. The team considered this as a good practice.

There are a variety of informal markings on plant equipment that ranges from secondary test panels, to temporary test equipment, all the way to safety related equipment. The plant has a sound process for temporary labels while permanent labels are being constructed, however the staff has no method of creating improvements to panel mimic displays. The plant is developing an operator aid process that is thorough and complete with the exception of identifying the use of operator aids in place of the informal markings on plant control panels. The team encourages the plant to add a method to enhance panel mimics within the process under development.

3.3. OPERATING RULES AND PROCEDURES

The department has created a single document for operator reference in the event of non-equipment related emergency such as:

- Fire
- Flooding
- Personnel emergency and rescue
- Chemical spills and items of environmental impact
- High radiation exposure
- Mischievous Tampering

The document is easily accessible to operators and is user friendly. The team sees this as an area of good performance.

Several members of the team observed alarm response behaviors during the evaluation period. In many cases the outcomes of those observations resulted in recognition of performance below standards. The team is making a recommendation to reinforce standards associated with alarm response that require operators to reference alarm response sheets for unexpected alarms. Also, the plant might consider some form of expected alarm demarcation during testing that would allow operators to quickly identify expected alarms.

3.4. CONDUCT OF OPERATIONS

The team made several observations of control room activities during the review. Reactivity management principles implemented by the plant are lacking in comparison to IAEA standards for conduct of operations. The team suggests that the plant should consider using error prevention techniques more extensively during manipulations affecting reactivity.

During the team's visit, several observations were made in regards to serenity in the Main Control Rooms. The plant has made progress in this area of performance, however, the culture at the plant prevents achievement of the necessary level of control room serenity. The plant has developed a robust set of expectations that are not completely being adhered to. The team suggests that the plant should enforce expectations regarding serenity in the control room.

Several observations of control room conduct were undertaken that resulted in comments regarding the lack of continuous control board observation and activities conducted during shift briefings. The team has made a recommendation that management should revise the established rules to ensure that at least one reactor operator is present at the controls in the main control room at all times during operation of the reactor. Also, activities conducted during shift briefings and turnover should be managed to keep the control room operators focused on reactor safety responsibilities.

3.5. WORK AUTHORIZATIONS

The team recognizes that the plant has initiated efforts directed towards minimizing the number of temporary modifications, however, the number is still high. The team suggests that the plant should consider further efforts to minimize the number of temporary modifications and ensure their proper control including their timely resolution. Sufficient attention should be paid to ensure that implementation of temporary modifications at the plant is made with the proper control and expiration time of temporary modifications.

The plant has designed a method to deliver outage safety messages to the organization on a daily basis that is rich with content centering on outage risk and managing lines of defense that minimize those risk situations. The team recognizes this as a good performance.

3.6. FIRE PREVENTION AND PROTECTION PROGRAMME

The plant has implemented significant modifications to enhance the fire detection and mitigation systems. The design has made significant improvements to lines of defense in the event of fire at the plant. The plant is also supported well from offsite agencies in the event of fire. The combination of these two items is considered good performance.

However during plant tours, reviewers found challenges to a sound fire prevention and protection programme. A few examples of unapproved combustibles were observed along with occasional breaches in fire barriers such as unauthorized openings of fire doors. The team encourages the plant to close this minor gap in performance.

CHINON NPP FOLLOW-UP SELF ASSESSMENT:

The OSART findings have helped us to bring about improvements in key areas affecting operational safety.

Indeed, the expected improvements have prompted us to review our own practices, whether these have to do with standards governing control-room environment, the level of formality and care required when conducting reactivity-related operations, or alternatively, alarm response practices.

This review has been conducted by our staff of control-room operators, who are key players in this improvement process.

They have been a driving force in developing and implementing our new and improved set of standards.

Thanks to the application of these standards, combined with the use of error reduction techniques, improvements will be sustained through committed and continuous management presence in the field, the effect of which will be to change behaviours and work practices for the better.

STATUS AT OSART FOLLOW-UP VISIT:

All recommendations and suggestions made by the OSART team have been either resolved or addressed by the plant with satisfactory progress by the time of the follow-up visit. The general approach applied by the plant was to prepare the response actions in consultation with the shift staff, the work of whom will be affected by the new requirements.

Some of the corrective actions require long implementation times because of their complexity (e.g. reducing the number of temporary modifications) or by the feature of the company culture that adherence to a new requirement can be expected if the staff involved is convinced about the rationale of the new requirement (e.g. systematic application of human error reduction tools to operations influencing reactivity). These actions with long implementation time have to be followed by management attention to ensure their proper implementation.

DETAILED OPERATIONS FINDINGS

3.1 ORGANIZATION AND FUNCTIONS

3.1(a) Good Practice: The plant has created a technical file database that contains the intricacies of current issues that are being investigated and resolved. The database is accessible to all parties involved in resolving the issue.

The practice proves beneficial for several reasons.

- Important information regarding the issue is not lost during periods of turnover.
- The information is accessible by all disciplines involved in the issue to view a running tally of issues faced and resolved with the issue
- The documents stay within the database for reference in case of repeat problems with other unit's equipment, which minimizes the "re-learning" process.

In the past 4 years, 892 equipment files have been created and are in use today, many of which have provided rich information to swiftly move through like situations with plant equipment.

Results of the database include the implementation of lessons learned on similar issues associated with:

- Air in-leakage to the Boron and water makeup tanks on Units 3 and 4. The evolution was expedited by implementing lessons found in the database from a similar occurrence on Units 1 and 2.
- Another case used was for an air system leak into the reactor building on Unit 4. This occurrence was repaired previously on another unit. The use of the database allowed input to the development of schedules, dose assessments, and trouble shooting plans to expedite the repairs.

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

3.2(a) Good Practice: The plant has created a programme to reduce scrams from human interface that includes labeling equipment in the field and the control room as well as electronically identifying equipment and activities that could introduce a risk of plant scrams. Over 240 items per unit have been identified for easy identification.

The plants isolation (tagging system) specifically alerts the operator that a scram risk is present when conducting isolation activities. The work order that the craftsman receives clearly identifies the potential for scram risk as well.

These activities are clearly identified on the plants daily schedule through interface with an operations supervisor that is allocated to the TEM (on-line work management) structure.

All activities that are flagged as a plant scram risk are subject to a pre-job brief for the department involved and operations. Several activities have “standardized” pre-job briefing sheets that are available for use by individuals that will be performing such risk significant maintenance.

At the time of the OSART mission, and since the program inception in 2005, there have been no plant scrams due to human interface. However, this was not the case at the time of the follow-up mission : in particular, a scram was directly caused by human interface on April, 20th 2009 on the U1 reactor.

3.3 OPERATING RULES AND PROCEDURES

3.3(1) Issue: Alarm response behaviors in the Main Control Room are not consistent with the plant's control room monitoring plan and there is no plant requirement for logging unexpected alarms.

For operations surveillance procedures that test alarms in conjunction with the equipment being tested, the alarms are documented as required and no issues are noted in this area. The control room monitoring technical guide for the plant (D.5170/C12/GTH.07.046) requires all operators to use the respective alarm response sheets for unexpected alarms.

However alarm response deficiencies discovered during the evaluation period include:

- Operators do not consistently conduct a full scan of the alarm panels when a single or multiple sets of alarms are received. In one occurrence, a maintenance technician alerted the operator that another alarm needed to be cleared for the test being conduced on the reactor protection system on Unit 4.
- Operators do not log all unexpected alarms. In MCR 2, a red alarm window 2GGR013AA has been lit for some time. The time of first alarm was not recorded in the control room log.
- Alarms were received in the common area between the control rooms on Units 1 and 2 on 2 occasions where alarm response procedures were not referenced.
- The maintenance craft conducting surveillances in the main control room have been diligent in providing the control room operators with the list of expected alarms. Control room operators do not consistently consult these lists of expected alarms when expected alarms are received.
- Auxiliary control room ND248/248 unit 8: yellow alarm window "electronic fault in level sensor" related to the solid radioactive waste treatment system is lit; there is no expectation to log when it became active. Work request to repair fault was prepared on 23 May 2006.

Failure to respond properly to alarms could lead to misdiagnosis of plant conditions that might require emergency actions.

Recommendation: The plant should reinforce current standards for alarm response and introduce a requirement that requires the logging of unexpected alarms.

IAEA Basis: DS347

5.26 "Unexpected alarms should be…logged."

5.31 "Whenever an alarm is acknowledged, even when expected, a scan of all annunciator panels is conducted to ensure that other alarms occurring simultaneously do not go unnoticed."

50-SG-Q13

302. "Good practices in operations should be applied and include…Acknowledging, analyzing for priority and responding to alarms [and] eliminating the causes of alarms;

Plant response/Action:

A specific reference standard pertaining to control-room environment and monitoring (ref. NR 387) has reinforced expectations regarding alarm response in the main control room.

"Alarms must be responded to as soon as they appear. They must be analysed using an alarm response sheet, and any necessary actions must be taken. Alarms that have not been identified prior to a scheduled activity must be recorded in the shift log".

The reference standard was produced by control-room operators, under the supervision of operations department management. It is in line with the respective EDF policy.

Shift crews have been briefed on the reference standard by their line management. It is specifically geared towards operators working in the main control room and field operators working in the control room of the nuclear auxiliary building.

The coaching and guidance provided by management in the implementation of this more stringent standard has shown that real progress has been made. In instances where deficiencies still persist, these are specifically addressed and resolved through the operations departments' deficiency management programme. In addition to managerial reinforcement and guidance, alarm response and alarm management remain one of the major focuses of simulator training provided to control-room operators.

IAEA Comments:

The requirement for reinforcing alarm response (as part of a reference standard for control room serenity and supervision) entered into force on 30 September 2009, 21 months after completion of the OSART mission.

The review of entries into the control room log of unit 1 for the period 1-6 December 2009 confirmed appropriate handling of those alarms which were logged. Management reviews and independent reviews address the subject of alarm logging and provide feedback when the improved expectations are not met, e.g. checking by shift manager of alarm handling practice of operators is not sufficiently frequent.

However the following situations were observed, indicating that there is room for further improvements in the alarm response :

- In the main control room of unit 1 the computer alarm "1CVF030EC is inoperable" relating to the cooling tower fans became active at 10:03 and existed until 14:44 on 7 December 2009. The alarm was not logged by the morning shift into the control room log or the shift turnover sheet. They did not identify as potential consequence the appearance of the 1CVF006AA alarm. The plant expectation for a full check of computer alarms about unavailable equipment is to do it once after shift takeover by the incoming shift. It is not expected to do it more frequently or to do it for example before shift turnover by the outgoing shift. When the computer alarm “1CVF030EC is operable” was activated at 14:44 and caused the alarm window 1CVF006AA to be lit, then the afternoon shift started the analysis of the phenomena. Later it was revealed that it was caused by a planned maintenance intervention;

– In the nuclear auxiliary building control room logbook no information related to alarm windows is registered during the reviewed period 2-7 December 2009;

– In the auxiliary control room a yellow alarm window 9TES513AA relating to high level in a tank used as service tank for manipulation with resins has been lit since July 2008. The operation of removing the resin from this tank into drums is done every two years so the status of the tank as filled up is justified. In principle the appearance of a yellow alarm window requires action to be taken, but in this case no further action is required after initial response, even though the alarm remained lit for 17 months. However this information is not readily available to the operators. This could be done for example by listing this alarm in a log of “long standing alarms”.

Conclusion: Satisfactory progress to date.

3.4 CONDUCT OF OPERATIONS

3.4(1) Issue: The plant does not sufficiently use error prevention techniques during manipulations affecting reactivity.

The EDF Nuclear Power Plant Operating Safety Handbook states that reactivity control is the most important safety function to mitigate the consequences of operational events. The plant has no specific rules for human interface with the reactor controls that govern all reactivity management related activities. The plant has developed guidance for some reactivity management related activities called sensitive transients, however, many activities are conducted with the absence of pre-job briefs and peer checking. Observations during OSART evaluation include:

- The operations department record of deviations in the control room documents several cases of consequential reactivity occurrences including a dilution event that resulted in a change in reactor conditions in October of 2007 and one instance of operating the wrong set of control rods in May of 2007.
- 8 operational occurrences related to reactivity have occurred as documented in the Safety Departments Analysis Report between January of 2006 and December 2007. Some examples are highlighted below:
  - Reactor Power was noticed to be at 36.38% when actual limits were imposed at 35% during post outage testing. The operator was observing thermal power instead of neutron power.
  - On one occasion, the operator at the controls diluted the reactor coolant system beyond the required power band. Power stopped at 10% nuclear power when the prescribed stopping point was 8% nuclear power.

The following observations were conducted in accordance with EDF standards, but not in accordance with IAEA standards.

- On Unit 4 an operator was adjusting control rods for alignment mismatch and to balance reactor power for an afternoon surveillance on power comparisons. The evolution was conducted without the presence of a peer checker or supervisor.
- Operations to the reactor controls were conducted, including a rod withdrawal and a boron dilution with no direct supervision or peer checking verification. Unit 2 high power physics testing post outage was in progress.

- The following are examples of process deficiencies when comparing the plant's standards to IAEA standards.
  - Pre-job briefs are not required for all reactivity manipulations at the plant. There are some requirements for specific activities called sensitive transients.
  - The plant has stated that no procedure requirement exists for peer checks during reactivity changes other than those on the sensitive

transient list, and no specific requirement exists for reactivity changes during shift turnover.

  – The number of evolutions conducted without peer checking and pre-job briefs far exceed the number of evolutions conducted with these human performance tools.

  – The operations staff stated this is a recognized problem with a corporate corrective action plan as defined in document PP54 and soon to be document PP62. The corporate corrective action plan does not address the requirements for peer checking and pre-job briefing for all reactivity management related activities.

Without a comprehensive reactivity management plan, operations outside the specified power band could continue and could possibly become more significant than current performance.

Suggestion: The plant should consider using error prevention techniques more extensively during manipulations affecting reactivity.

IAEA Basis: DS347.

5.23 "…The supervisor should monitor the reactivity and the plant …while planned reactivity changes are carried out."

5.24 '…other operations relating to reactivity should be initiated only after a pre-job briefing on the expected effects of the change."

5.25 "…error prevention techniques, such as the stop, think, act, review (STAR) methodology and peer checking, should be used during reactivity manipulations."

Plant response/Action:

Further to the suggestion issued by the OSART team, the plant took part in a WANO reactivity management workshop. Chinon NPP reviewed best international practices in order to assess its own performance and to draw up a strategy for addressing the suggestion. The strategy comprises two main strands:

– Defining and implementing expectations pertaining to manipulations affecting reactivity, including error reduction techniques.

– Adopting a more aggressive approach to reactivity management by setting up a self-assessment task force to monitor improvements.

In 2008, the plant defined a specific expectation pertaining to the judicious use of error reduction techniques during the performance of consequential tasks. The list of 13 consequential task categories includes critical monitoring activities, tests, and changes to reactor control parameters.

In 2009, with a view to raising this expectation even higher, the plant embarked on the definition of a "reactivity management" reference standard, which encompasses key operations activities pertaining to reactivity control. This set of standards is currently being internalized and implemented by shift crews.

For each activity listed, the standard specifies which prerequisite conditions must prevail, which mandatory documents must be used, and which good practices must be applied.

Generally speaking, these conditions essentially include:

- The readiness and focus of personnel involved in either the preparation, performance, checking or independent verification phases of an activity relating to reactivity, is a recommended, if not a mandatory prerequisite. This readiness must be guaranteed by the presence of two control-room operators in the main control room during sensitive phases of an activity, such as the preparatory phase (pre-job brief with both control-room operators in order to determine what type of monitoring is required while the activity is being performed), all or some of the performance phase, and the checking phase (peer check).
- Specifying which error reduction techniques should be applied in order to avert human error and reduce operator disruptions during the performance of reactivity-control tasks. A review of our deficiencies has shown that several of them are due to a failure to use error reduction techniques.
- Strict application of mandatory requirements. These requirements are set out in operating procedures (general operating instructions, operating procedures, etc.), their purpose being to prepare and guide the control-room operator during the performance of reactivity-control tasks.
- Initial classroom training and full-scale stimulator training sessions are an effective means of maintaining skills, especially for activities that are performed on an occasional basis throughout the year (e.g. achieving criticality).
- Stipulating good practices to be implemented and/or sustained.

The second strand of the strategy still needs to be converted into concrete actions.

IAEA Comments:

The reference standard for reactivity management was prepared by the plant on 9 September 2009 and it entered into force on 1 December 2009. It was explained that the long time for the preparation was required not only by the complexity of the subject but also by the decision to prepare it in consultation with the shift staff, the work of whom will be affected by this new reference standard. This decision was taken to ensure ownership and consequently better adherence.

The standard provides a systematic breakdown of different error reduction tools to be applied and the number of staff to be involved in all types of operations influencing reactivity. Small changes of power (20-40 MW electric) are not included in the list since they are implemented in automatic control mode without human intervention.

The following tasks are still to be performed in 2010:

- Incorporating the practices required by the new reference standard into simulator training;
- Analysis of the experience of application by Operations department;

Setting up a task force in line with the decision of Plant Safety Committee.

Conclusion: Satisfactory progress to date.

3.4(2) Issue: The plant has developed a robust set of Control Room Access rules that are not being adhered to consistently.

Main Control Room access rules are not effectively reinforced. There are specific rules associated with accessing the control room posted on a large folder outside the control room. One rule in particular requires personnel to request permission to access the control area. Several occasions were noted where this requirement was not adhered to as well as not reinforced.

The plant has initiated efforts to make the control room environment more serene. The operations managers have made rounds to remind all crafts that the rules need to be adhered to. The following observations were commonplace during the OSART mission at the plant:

- A maintenance technician was reminded to remove his hard hat when he was already inside the control room.
- 2 Members of the plant staff walked through the control room with hard hats on.
- Several personnel entered the control area without permission on Unit 3-4.

Control Room operators could be distracted from their primary duty of monitoring plant parameters.

Suggestion: The plant should reinforce the implementation of its reference standards for the access in order to guarantee serenity in the Main Control Room.

IAEA Basis: DS347

6.3 "… Consideration should be given to administrative measures to minimize unnecessary distractions for the control room staff. … Arrangements should be established to exclude unnecessary personnel from the control room."

Plant response/Action:

Rules governing control-room access are set out in the policy procedure referenced "NR 387, Control-room environment and monitoring".

These rules have been reviewed by a task force led by control-room operators.

Changes made to the rules have been reviewed by the site-wide operations technical committee and approved by the decision-making groups of both operations departments (units 1/2 and 3/4).

This cross-departmental involvement in approval of the rules has helped to embed them more uniformly and effectively, through a standardized approach to their implementation.

The challenge still lies in the strict application of these rules by all personnel. A specific coaching plan led by the Operations Departments of units 1/2 and 3/4 has been implemented.

This plan is based on the following two strategies:

- Improving the way in which rules governing control-room access are communicated, through:
  - Daily messages delivered by shift managers on the occasion of inter-departmental telephone conferences and during coordination meetings
  - Weekly messages delivered by shift managers on the occasion of site performance meetings
  - Electronic “screen saver” messages
  - Message in the "Chinon Express" newsletter
- Closer managerial monitoring of compliance with control-room access rules, with managers physically coaching and guiding personnel in the meeting of expectations.

The updated procedure and related coaching plan appear to be of adequate scope for enforcing control-room access rules for non-essential personnel, as enshrined in the IAEA reference standard.

While real progress has been made, the regular reinforcement of the respective rules has proven necessary.

IAEA Comments:

The requirement for reinforcing control room access (as part of a reference standard for control room serenity and supervision) entered into force on 30 September 2009.

This requirement includes expected rules of behaviour to be followed for the three categories of access to the main control room:

- Regulated access;
- Limited access;
- No access.

The rules to be followed and the cases when each category should be applied are sufficiently detailed to avoid potential misinterpretation.

Visits to main control rooms confirmed that the desired quiet environment is indeed maintained, rules of access are followed.

Conclusion: Issue resolved.

3.4(3) Issue: Established plant rules are not rigorous enough to ensure that at least one authorized reactor operator is present at the controls in the main control room at all times during operation of the reactor. Scheduled test activities and other potential distractions during shift turnover and briefings are not adequately minimized to keep the control room operators focused on their reactor safety responsibilities.

- Observation of shift turnover of U1&2
- There was an important safety system test conducted by an I&C group during the shift debriefing – with only one operator in the MCR of U1. This operator during the time of debriefing was processing the work permits or talking with the maintenance staff.
- MCR Operator in U2 during the shift debriefing was standing for 10 minutes at the door between the MCR and the debriefing room. There was no other operator in the MCR U2 during this period. The same operational practice of MCR operators was observed during the next day morning shift debriefing in U1.
- During one shift briefing on Units 3 and 4, there were periods when no operators were present at the controls area on Unit 4.
- According to the plant's procedures, at least one reactor operator is to be present in the Main Control Room to monitor and to react in times of off-normal occurrences. However, both control room operators are allowed to be at the door of the briefing room located between the Main Control Rooms.

Without rigorous control room monitoring plan, operators could miss important parameter changes that could lead to more serious consequences.

Recommendation: The plant should revise the established rules to ensure that at least one authorized reactor operator is present at the controls in main control room at all times during operation of the reactor. Scheduled test activities and other potential distractions during shift turnover and briefings should be minimized to keep the control room operators focused on their reactor safety responsibilities.

IAEA Basis: DS347

3.7. Irrespective of the reactor type and organizational structure…at least one authorized reactor operator should be present at the controls in main control room at all times during operation of the reactor.

4.2 Scheduled activities and other potential distractions should be managed to reduce simultaneous activities and to avoid overloading the control room operators to keep them focused on their responsibilities for ensuring safety.

4.3 The management should ensure that distractions to the shift personnel are minimized to enable the crew to remain alert to any changes in plant conditions.

Plant response /Action:

In response to the recommendation issued by the OSART team, the plant has revised its rules in order to ensure that one control-room operator is present at the controls.

During the start-of-shift brief, one of each unit's two control-room operators is allowed to stand at the control-room boundary, subject to the status of the unit.

Policy procedure no. 387, rev. no. 2, now stipulates the following requirement:

One control-room operator must be present at the controls.

This operator may stand between the doors leading into the unit common room providing that:

- No sensitive transients are in progress,
- No evolutions are taking place on the unit (load increase or load reduction, changes within the pressure/temperature range, water transfers, etc.),
- Unit status does not require the implementation of directive PP54,
- Control-room monitoring is not being disrupted by nuisance alarms, and that all other alarms have been acknowledged and responded to,
- No controls are in manual mode,
- The crew considers that things are under control and that problems are unlikely to occur,
- He is only stationed at the common room entrance for a limited period of time.

If an alarm comes in during the start-of-shift brief, it must be immediately responded to by the control-room operator stationed at the control-room boundary.

The reference standard was produced by control-room operators, under the supervision of operations department management. It incorporates the set of EDF reference standards. Shift crews have been briefed on implementation of these standards by their line management. Progress has been observed.

Furthermore, the extensive joint effort made by the staff of control-room operators together with the power-cycle project team, aimed at improving the scheduling and achieving a more balanced work load of operations surveillance tests, has been effective in reducing the amount of activities taking place in the control-room during the weekday morning and afternoon shifts. These scheduling improvements have helped us to reduce the number of simultaneously performed activities and thus avoid excessive control-room operator burden.

In addition, we are currently making efforts to increase the control-room operator staffing level through the addition of a third control-room operator, who is specifically assigned to control-room monitoring, for instance where certain operating transients make it difficult to effectively control operator burden.

These measures have enabled us to better satisfy maintenance needs while maintaining an adequate level of plant monitoring in the main control room.

Finally, the maintenance departments are aware of the need to minimize their demands during shift turnovers and briefs. There is compliance in this area.

IAEA Comments:

The requirement for the presence of at least one control room operator at all times ‘at the controls’ area of the main control room (as part of a reference standard for control room serenity and supervision) entered into force on 30 September 2009.

The plant explained that the “limited time” mentioned in the new reference standard for which the operator can be stationed at the entrance of the common room next to the main control room is understood as the duration of the briefing after shift turnover which lasts no longer than 20 minutes. Even during this period the operator has to review 7-9 key parameters depending on the operation mode of the reactor at intervals of about 5 minutes. This periodic review is performed by leaving the entrance of the common room and performing a ’walk down’ of measurement devices or viewing a computer screen summarising these key parameters.

It was explained that the long preparation of this change was needed as adherence to a new requirement can be expected if the staff involved is convinced about the rationale of the new requirement.

Conclusion: Issue resolved.

3.5 WORK AUTHORIZATIONS

3.5(1) Issue: The number of temporary modifications is not minimized and the proper control and the timely resolution of temporary modifications is not always ensured.

It is recognized that the plant has initiated efforts directed towards minimizing the number of temporary modifications, but the number is still high. Several cases were found where the implementation of temporary modifications at the plant shows insufficient attention to the proper control and expiration time.

- The number of temporary modifications at the plant is relatively high – for example for Units 3 and 4 – the number of DMP (safety significant) temporary modifications is 57 and the number of MTI (non safety significant) is 105.
- During walk down of the Unit 3 turbine building, in the Rx protection system (I&C) room, 6 temporary modification tags were found. 5 of them were issued on 25/10/96 at the same time (N 8RI 1844) and another one was issued on 15/07/2003(N 8RI 50375).
- In the U4 MCR a label for temporary modification related with a deficiency of the SG level measuring device with expiration date 30.09.2009 was observed. It was explained that this is related to corporate policy of changing such devices and this activity has been planned for "10 years outage".
- The plant does not apply a system for control to ensure that operators are familiarized with the temporary modifications and temporary procedures.

Without taking appropriate measures for keeping the number of temporary modifications and their expiration time as low as possible, as well as assuring that all operators are properly and timely acquainted with the actual condition of the plant the opportunity to prevent event precursors could be missed.

Suggestion: The plant should consider further efforts to minimize the number of temporary modifications and ensure their proper control including their timely resolution.

IAEA Basis:

NS-R-2

7.6. Temporary modifications …shall be clearly identified at the point of application and any relevant control position. Operating personnel shall be clearly informed of these temporary modifications and of their consequences for the operation of the plant, under all operating conditions.

NS-G-2.3

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

DS347

5.41 Control room operators should maintain a listing of the temporary modifications that have been made. The listing should identify each modification by its number and should include copies of the description of the modification made and of its reviews and approvals.

Plant response /Action:

Further to the suggestion issued by the OSART team, the plant has embarked on an action plan to work down the number of longstanding temporary modifications. This initiative has also been incorporated into the plant's operational safety action plan.

A staff member has been designated to take the lead in the capacity of:

- Operational coordinator for temporary modifications placed within the scope of Chinon's operational safety action plan for year 2008. He periodically reports to the plant's safety technical committee on the progress of these actions.
- Chinon's temporary modification representative for the corporate action plan.

In July 2008, the updated list showed a total of 143 temporary modifications in place for more than one year. 32 temporary modifications have since been removed, bringing the current total to 111.

44 of these will be removed by the end of 2009 and 30 more will be removed in 2010, 13 of which will be removed during the unit-4 ten-year outage.

22 temporary modifications still have no defined timeframe or planned final resolution. This aspect is still under review with the involvement of corporate level in some instances.

The corporate reference standard (directive no. 74) is due to be updated (to revision no. 2). It will include the MTI category of temporary modifications and will readopt the original definition for the temporary modification process. Once this directive is fully deployed, some DMP-type modifications will then be able to be reclassified as MTI-type modifications. The question of their removal will still need to be addressed, either through the application of our reference standards, or by performing a local or corporate permanent modification, or alternatively, by returning to initial configuration.

The work-down plan is under control and is reviewed on an annual basis by the plant's safety technical committee.

The list of currently-installed DMP and MTI-type temporary modifications is electronically managed, enabling each and every staff member to view all current modifications or to select all those installed on a specific plant system.

The risk assessment performed when installing a DMP or MTI is used to identify the risks and countermeasures associated with the temporary modification. Depending on how the temporary modification affects the plant, the assessment determines whether documents need to be updated in order for operations to be clearly informed.

IAEA Comments:

A comprehensive work plan has been set up by the plant which also relies on a corporate programme to reduce the number of safety significant temporary modifications (DMP). All DMPs are categorised into five groups:

1. to be transferred into permanent modifications by a programme at corporate level;
2. to be eliminated by plant level (local) permanent modifications;
3. to be eliminated by maintenance action;
4. to be transformed into non safety significant temporary modifications (MTI);
5. no solution found yet, therefore there is no fixed deadline for elimination.

The pace of planned elimination of DMPs is reasonable and proportional progress has been reached by the time of the follow-up visit.

At the same time over 20 new DMPs have been generated since December 2007, therefore it could be useful to set a long term target value for the acceptable number of DMPs in existence.

Conclusion: Satisfactory progress to date.

4. MAINTENANCE

4.1. ORGANIZATION AND FUNCTIONS

The plant has administrative controls in place to log equipment defects in the work management system (Sygma). Important equipment defects and deviations are referenced in Sygma but not tagged on the equipment.

Interface with operations could be more effective through the use of defect tags on equipment and not by only referencing important defects in Sygma. The tagging of all equipment defects is not always performed.

Minor equipment and structure deficiencies are identified on the equipment and tagged, but not referenced with a work management tool. Without tagging all deficiencies observed during plant operations, managers' walkdowns might not be fully effective.

The team considered that the defects are not readily apparent to operations personnel who conduct plant rounds and observations and therefore the team issued a suggestion in this area.

The team recognized a good practice in the area of contractor's management where a distinction is made between the role of contractor's supervisors and other persons whose role is to process deficiencies observed in the field. This ensures that the maintenance department staff is not placed under pressure for dealing with corrective actions at the contractor's management level. In addition, the plant is making a big effort to support the contractor's qualification.

4.2. MAINTENANCE FACILITIES AND EQUIPMENT

The store for large mechanical maintenance tools is in very good condition. The tools are well maintained and updated documentation for the equipment can be found in the store. Before being returned to the store, the equipment is checked by the store manager on the worksite. Maintaining this excellent condition is a good basis for safe maintenance work and for avoiding delays on the outage schedule. The team also recognizes it as a good performance.

Non-compliant spare parts are stored separately in a restricted access area to prevent them from being used. The team also recognizes this as a good performance.

4.6. MATERIAL CONDITIONS

During walkdowns the team observed that the material condition of some items of safety related equipment, and of equipment which could have an impact on safety, was not in optimal condition. However, the plant is implementing a comprehensive long-term project to obtain an exemplary material condition throughout the plant. The team encourages the enhancement of the material condition project by expediting the current project related to the improvement of material condition of safety related equipment and equipment which could impact on safety.

The team recognized a concern with respect to the material condition area because the plant has no action plan for the elimination of seepage of groundwater into the fuel building of

Units 1 and 2. The plant has been aware of the seepage problem since 1990. In 2000, a five year initial inspection programme was set up to monitor and assess the phenomena. The plant repaired some places of leakage between 2001–2005. Since this problem is not only experienced by Chinon NPP, the plant has sent the results of the analysis of the inspection programme to the corporate engineering organization of EDF, asking for expertise and elaboration of a long-term technical solution. The team suggests that the plant should consider finalizing an action plan with appropriate deadlines for the elimination of the seepage of groundwater into the fuel buildings of units 1 and 2. In some plants such problems are avoided by the permanent operation of a network of groundwater wells around the main industrial building.

4.7. WORK CONTROL

Before preparing and installing a maintenance temporary modification, a risk analysis is carried out. This determines if it is a safety related temporary modification or a modification without safety impact. The installation is carried out in accordance with Sygma work orders. The installation is controlled with special software and through labels placed on the assigned storage area. This ensures a safe installation and an effective control. This was recognized as a good performance by the team.

4.9. OUTAGE MANAGEMENT

The team recognized a good practice in the area of outage organization and control. An effective risk management process is used for the preparation of outages and in the scheduling of outages. This document sets out the various operational safety risks likely to be encountered at various stages of the schedule; the specific conditions for carrying out activities, enhanced by lessons learned in previous years, can thus be found.

For the management of worksite logistics, the plant uses a programme called EPSILON. This programme assures awareness of the logistics equipment installed, in particular the scaffolding and allows a better identification of risk significant structures. A real time overview of logistical activities progress results in more efficient supervision and relieves the workload of EDF supervisors. The link between the outage schedule and the EPSILON schedule is the maintenance activity with the date and the time. The plant has strong modular planning of outages which incorporates long-term aspects. It provides a detailed description of targets for each of the main planning stages. The planning schedule for the cycle is drawn up with the crafts and takes the type of outage into account. Outage preliminary schedules are drawn up 10 years in advance. In addition, there is a document which specifies, craft by craft and outage by outage, the main activities scheduled for the next 10 years.

CHINON NPP FOLLOW-UP SELF ASSESSMENT:

In 2008, Chinon NPP drew up its “Maintenance Project” which sets out the guiding principles aimed at:

- enhancing maintenance’s contributory role towards operational safety, industrial safety, environment, availability and plant life extension questions,
- reinforcing the partnership between the players and gaining benefits from the size of the EDF nuclear fleet,

– reducing interfaces and improving collaboration on the site,
– enhancing the role of crafts as key players for performance.

The suggestions and encouragements issued during the OSART mission fed Chinon NPP self-assessment and led to improvements in the condition and the monitoring of equipment. The identification of good performances increased Chinon NPP awareness with regards to sustainability of strengths.

Following the discussions during the OSART about the number of work requests and rework items, the site is implementing an action plan to address rework issues. Emphasis is placed on the professionalism of work supervisors, supported by a network created in 2009. Partnership agreements with our main suppliers, in the areas of quality or industrial safety, are also aimed at a common improvement of the quality of maintenance activities.

The importance of plant condition, in terms of safety and plant life extension, is also reinforced by the implementation of the housekeeping improvement programme (OEEI). This year's self-assessment showed an improvement in plant and material condition, while revealing some difficulties in maintaining an excellent standard.

Management presence in the field, encouraged by the OSART team, has enhanced the quality of work activities and improved equipment condition.

The coordination role of the in-cycle and outage projects has been reinforced by the creation of common teams to work on cross-functional technical issues, the appointment of rapid-response teams, adherence to modular planning of outages and the reinforcement of long-term scheduling of work.

STATUS AT OSART FOLLOW UP VISIT:

The Chinon NPP has put much effort to respond to the OSART team's suggestion and to set up a consistent tagging practice. The plant initiated the housekeeping improvement program OEEI which, among several areas, also incorporated the leakage management program performed in the plant. The good practices gained during further development and applying leakage management practices helped the plant to effectively tackle the deficiency tagging issue. Keeping a standardized approach to the entries of the work management tool and the tags attached to equipment deficiencies assists the plant operations and managers in their walkdowns to overview the current state of the equipment. The team determined that the issue has been resolved.

The OSART team suggestion regarding the plant's overall response to ground water seepage has been approached systematically by Chinon NPP. Upon collection of experiences and evaluation of actions done in the past to cope with the issue, the plant has developed a detailed action plan and started implementing it. The plant has also made use of the experience of other members of the EDF fleet facing the same problem. Regarding each location an appropriate and proven solution has been identified and scheduled in the plan. Some part of the work has been carried out, but the major part of the plan remains to be implemented in the next two years. A post-work effectiveness review of the completed actions is foreseen by means of visual inspections, however, until the time of the OSART follow-up, that effectiveness could not be determined, since the ground water level has been low. The team determined that its suggestion has been resolved.

DETAILED MAINTENANCE FINDINGS

4.1 ORGANIZATION AND FUNCTIONS

4.1(1) Issue: Tagging of all defective equipment and structures is not consistently performed.

The plant has administrative controls in place to log the equipment defects in the work management tool Sygma, however it is found that:

- Important equipment defects and deviations are referenced in the work management tool Sygma, but not tagged on the equipment.
- Minor equipment and structure deficiencies are identified on place and tagged, but not tracked with a work management tool.

Examples are:

- 2GRE 010VV, oil leak, not tagged, entered in Sygma 14 June 2007
- 2AGR001PO, multiple oil leaks, not tagged, entered into Sygma 23 February 2007
- 2GRE016VV, oil leak, not tagged, not in Sygma
- Coupling between main generator and HP turbine on Unit 2, oil leak under coupling, not tagged, not in Sygma

Without tagging all deficiencies observed, plant operations and managers walkdowns can not be fully effective.

Suggestion: The plant should consider improving their equipment defect management by installing defect tags on defective equipment and structures to make observations more effective.

IAEA Basis:

DS347

5.50. Deficiencies in equipment should be clearly identified to make them readily apparent to operations personnel who conduct plant rounds and observations. A system of tagging for deficiencies and/or cautions should be implemented to mark problems with equipment.

Plant response/Action:

Chinon NPP is implementing a long-term plan in order to obtain high standards of plant condition throughout the site; this project is called OEEI. This program is aimed at several technical areas, including leak management. Leak management is therefore covered by a specific initiative, performed by the Mechanical Department.

Following a cross-functional review throughout the departments, the site chose to implement a system which specifies the responsibilities of the staff who detect, monitor or repair leaks.

This set-up was tested in 2008, and rolled out in 2009 to cover every visible equipment deviation. It is described in the implementation procedure “Addressing defective plant and material conditions”, referenced D.5170/NA.022. Any worker who identifies a visible equipment defect must make the area safe (leak recovery, cleaning, any necessary barriers) and input his observation via a Sygma work request. The craft responsible for the equipment performs an expert appraisal and, if the repair is not performed within the following week, the craft tags the equipment with the work request number.

All communication related to this set-up takes place within the OEEI group that represents all site departments, and is coordinated by the OEEI project manager. Department representatives are in charge of cascading OEEI policies within their department, and have to ensure that requirements are being complied with.

The use of tags to identify visible equipment defects improves equipment monitoring and the efficiency of field operator rounds, and ensures defects are addressed by the appropriate craft.

IAEA Comments:

The Chinon NPP initiated the 2007-2011 housekeeping improvement program OEEI which, among several areas, also incorporated the leakage management program performed in the plant. By the extension of good practices gained with leakage management to other areas the OEEI effectively tackled the deficiency tagging issue. The team performed a random check and concluded that tagging is systematically performed. The tagged equipment deficiencies are introduced to the Sygma work management tool.

Tags are placed on such visible deficiencies where the expected existence duration of which exceeds one week. Tagging practice is periodically checked during the different walk downs. In effect all plant condition-related deficiencies with an impact on nuclear and industrial safety, availability, environment or radiation protection are documented in the Sygma system. In addition, other condition-related deficiencies with no impact on these areas are also tagged and entered into a different (housekeeping) database.

Conclusion: Issue resolved.

4.1(a) Good practice: Contractors management.

Distinction is drawn between contractor oversight and processing of deficiencies. Support is provided in terms of contractors qualification.

- Distinction drawn between contractor oversight and processing of deficiencies:
- The contractor supervisor applies the oversight programme produced during the work planning phase. He performs field observations in various areas (nuclear safety and quality assurance, work practices and work quality, worker skills, industrial safety, environmental protection, contract management, compliance with labour regulations, etc.)
- In the event of a serious deficiency, the contractor supervisor is required to suspend the job and alert management, who will then take measures to rectify the deficiency.
- The contractor relations team and department management process the complaint:
  - meeting with management of the company responsible for the deficiency,
  - contractual penalties if applicable,
  - reminder of EDF requirements pertaining to the incident,
  - statement of what is required to rectify the situation,
  - approval of action plan produced by the contractor,
  - feedback to corporate level (UTO),
  - definition of reinforced supervisory actions to be applied by the contractor supervisor,
  - status of contractor's action plan tracked through periodic exchanges,
  - Chinon safety/quality department or UTO asked to audit work performance.

This system is an effective means of "protecting" the contractor supervisor by helping to maintain the legitimacy of his position.

- Support provided in terms of contractor qualification:
- Chinon NPP contributes actively to the qualification of new contractor companies. Every year, 5 to 10 new contractor companies are qualified by Chinon for working on EDF plants. The contractor relations team also supports contractor companies by providing them with guidance on how to draw up skills assessment documents and helping them to incorporate OE into their reference base, in close cooperation with UTO, the EDF entity in charge of qualification. If the need arises, the plant is able to provide guidance and support when it comes to professional enhancement training of workers (OMEXOM for containment penetration tests, PNS for the cleaning of conventional cooling/conventional sampling heat exchangers).

4.6 MATERIAL CONDITIONS

4.6(1) Issue: There is no action plan with appropriate deadlines for eliminating the seepage of groundwater into the fuel building of unit 1 and 2.

The plant is aware of the seepage problem since 1990. In 2000 a five year initial inspection programme was set up to monitor and assess the phenomena. Periodic inspection No. 1 was performed in 2004–2005. The plant repaired some places of leakage during 2001–2005. Since this problem is experienced not only by Chinon NPP, the plant has sent the results of analysis of the inspection programme to the corporate engineering organization of EDF asking for expertise and elaboration of a long-term technical solution.

- In 2001–2002 the seal between the containment building and the fuel building was repaired by installing a flexible membrane and injection of water resistant resin into the adjacent walls, however the resin injection did not have a long lasting effect and the water again entered the annular space below –8,5 m level between the containment building and the fuel building of unit 2. At present there is about 60 cm of water in this space;
- On the wall and floor of BK building of unit 1 and 2 there are several places where ground water seepage takes place;
- Seepage can be observed around the wall of containment building of unit 2 at –8,5 m;
- In the room housing pump 1 EAS 002 PO there is seepage from the floor, therefore the repainting of a part of the floor had to be suspended, pending a solution to the seepage problem.
- At the moment there is no action plan and deadline to eliminate the groundwater seepage into the fuel building.

Without eliminating the groundwater seepage into the fuel building, some surfaces cannot be covered with paint suitable for decontamination and in case of contamination there will be additional radiation dose that otherwise could have been avoided. While the seepage is present, the volume of liquid effluent will be increased.

Suggestion: The plant should consider establishing an action plan with appropriate deadlines for eliminating the seepage of groundwater into the fuel building of unit 1 and 2.

IAEA Basis:

NS-G-2.6.

2.1. The maintenance programme for a nuclear power plant should cover all preventive and remedial measures, that are necessary to …mitigate degradation of a functioning SSC or to restore to an acceptable level the performance of design functions of a failed SSC.

3.5. Minimizing existing latent shortcomings in working practices or plant conditions is … vital in avoiding more serious events.

Plant response/Action:

Following the findings made during the December 2007 OSART, Chinon NPP asked the EDF corporate engineering group (CIPN), to set up an action plan aimed at reducing water seepage into the fuel buildings.

Following an expert appraisal of defects observed on the site and a benchmarking exercise with other nuclear plants displaying the same type of issues (in particular Gravelines NPP), the corporate engineering group set up a detailed action plan in a study report “Pre-project – seepage into fuel buildings at Chinon”, referenced EMEGC080798.

The complete repair solution will have three phases:

- block incoming water seepage and guarantee water tightness and fire resistance of openings between the fuel building and essential service water tunnel (SEC) of Unit 2:
  - block incoming water seepage of water-stop seals: inject water-reactive resin,
  - weather-strip the seals,
  - weather-strip the openings;
- expert appraisal of defects after works;
- repair seal between reactor building and fuel building on all 4 units;
  - inject resins into leak zones,
  - install a new mechanical leak-tight waterstop.

The progress of repair activities for water seepage is described in the table below:

<table>
<tr><th colspan="2">Action</th><th>Status</th></tr>
<tr><td colspan="2">Definition of action plan</td><td>Closed out on 21st April 2009</td></tr>
<tr><td colspan="2">Treatment of water-stop seals and openings in fuel building and essential service water system (SEC) in unit 2</td><td>Closed out on 12th March 2009</td></tr>
<tr><td colspan="2">Expert appraisal of seal and opening deviations in fuel building and essential service water system (SEC) in unit 2</td><td>Planned for November / December 2009</td></tr>
<tr><td rowspan="4">Repair seal between reactor building & fuel building on all 4 units;</td><td>Proposal by corporate engineering group</td><td>Planned for the 2nd half of 2009</td></tr>
<tr><td>Contract notification</td><td>Planned for the 1st half of 2010</td></tr>
<tr><td>Start of work on units 2 & 4</td><td>Summer 2010</td></tr>
<tr><td>Start of work on units 1 & 3</td><td>Summer 2011</td></tr>
</table>

Follow-up of action plan established by corporate engineering group (CIPN) enhances understanding of deadlines and repair procedures for penetration problems in the fuel building.

IAEA comments:

A detailed action plan has been prepared and is being implemented related to the groundwater seepage problem in Chinon NPP. The plan addresses the problem in a systematic manner at each location. The actions include:

- block incoming water seepage and guarantee water tightness and fire barriers between the fuel building and essential service water tunnel of Unit 2;
- expert appraisal of defects after works;
- repair the seal between reactor building and fuel building on all 4 units;
- install a new mechanical waterstop to protect the seal.

The plant implemented the measure regarding seepage between the fuel building and the special service tunnel in March 2009. Its result cannot be assessed, because the groundwater level has been low since that time. At the other location between the containment and the fuel building the plan schedules the work for the summers of 2010 (unit 2 and 4) and of 2011 (units 1 and 3). Upon work completion (and at a time when the ground water table is high), the plant will check for efficiency of the repair via visual inspections.

Conclusion: Issue resolved.

OUTAGE MANAGEMENT

4.9(a) Good practice: Integrated outage risk significant activities schedule.

Effective risk management in the preparation and in the schedules of outages:

- In the area of operational safety, the outage activities schedule presents operational limits and conditions (OLC) classified by type, in chronological order, on the shutdown unit and the twin unit. The schedule is thus an accurate and "dynamic" snapshot of all current or imminent events. Also, the operational safety schedule is enhanced by the operational safety risks schedule. This document sets out the various operational safety risks likely to be encountered at various stages of the schedule; the specific conditions for carrying out activities, enhanced by lessons learned in previous years, can thus be found.

- With a view to reducing errors related to the Corporate Alert Code (CNA), activities which could trigger the CNA are given in a specific schedule. This shows the status of CNA inhibition signals or activities which will trigger a CNA, over time.

  - There is a reactor building gas or iodine risk schedule. This schedule draws the reactor building coordinator's attention to sensitive risk-related operations in this area. This document is used by the area supervisor in charge of the reactor building to draw up his coordination plan.

  - The outage activities schedule displays also a schedule of radiography surveys. All gamma surveys are scheduled and there is an overall schedule for these surveys. This document is used by the area supervisor and the current reactor building coordinator to give information on and to monitor ongoing or scheduled surveys. It is used by the Deputy Project Manager in charge of identifying interfaces between gamma radiography surveys and other maintenance or operations activities. The radiography survey schedule is also a very effective means of providing information to relevant NPP personnel.

  - Finally there is a schedule for risks of interruption of the service compressed air distribution system. This shows all activities which could interrupt the reactor building working air supply. It is used by the reactor building coordinator and maintenance crafts whose activities require non autonomous breathing equipment.

These different schedules are discussed daily in risk significant activity meetings.

5. TECHNICAL SUPPORT

5.2. SURVEILLANCE PROGRAMME

A plant specific probabilistic Safety Analysis (PSA) has been developed and PSA applications have been developed and implemented at EDF headquarters to optimize plant operation including surveillance testing and the modification of the safety related SSCs. The plant safety engineer is designated to handle PSA but his role is limited to the coordination between the plant and the corporate. Therefore living PSA is not utilized in the safety analysis for scheduling of activities such as surveillance testing modification, etc. at the plant level. The team encourages the plant to consider the utilization of the living PSA, calculating on-time plant risk quantitatively, to help in the decision making process.

A pocket-size information leaflet containing the most penalising transients in view of plant life is provided to operators. This booklet is used to integrate transient precautions into outage activity planning and reduce the number of penalising transients, thereby providing for plant life extension. The team considers this as a good performance.

5.3. PLANT MODIFICATION SYSTEM

The plant modification procedures sufficiently guarantee that all controlled documents are adequately revised. However, the team discovered some modifications not properly implemented and controlled to achieve the original function. The plant does not have a configuration management system identifying documented design requirements and thereby ensuring that design is properly implemented and plant changes are controlled throughout the life of the plant. The team made a suggestion in this area.

5.4. REACTOR CORE MANAGEMENT (REACTOR ENGINEERING)

The plant has developed and used a unique computer database software for fuel management. This software is used for complete fuel management, extensive core process parameters, extended fuel cycle, fuel movements and criticality monitoring. The plant can carry out the trend analyses efficiently to monitor that core operation parameters are within the safety range and the necessary data are archived correctively. The team considers this as a good practice.

5.5. HANDLING OF FUEL AND CORE COMPONENTS

The plant is preparing its foreign material control programme according to the newly developed corporate guideline. The plant will launch this programme in January 2008. This programme includes many activities including behaviour principles in the fuel building such as tidiness in some important areas, no hard hats allowed in the spent fuel pool area, etc. Nevertheless during the OSART mission, some concerns such as dirty refuelling machine basement, vinyl tape abuse, improper compartment keeping and an opened lamp cover, were disclosed. The team encourages the plant to adopt the programme as early as possible and to consider the modification of the lighting system in the vicinity of the spent fuel pools.

The plant has set up a rigorous organization for the management of all representative factors related to fuel integrity. The plant monitors important parameters relating to core management by running an appropriate software everyday. The plant has achieved good performance for an extensive period of time. The team considers this as a good performance.

CHINON NPP FOLLOW-UP SELF ASSESSMENT:

Chinon NPP has continued to work on the Technical Support improvements implemented during the preparation for OSART mission, aimed at enhancing nuclear safety.

The OSART mission enabled a reinforcement of the actions implemented in several fields of Technical Support, and more specifically:

- strengthening the modification process through the creation of a new organization which has led to an improvement in the identification and analysis of proposed plant modifications (for local and corporate modifications).

- where necessary, formal requests are submitted to the corporate engineering unit in order to justify new modifications suggested by the plant.

- Furthermore, the following encouragements were issued during the OSART mission:

- to develop the daily use of probabilistic safety analyses. The use of probabilistic safety analyses on French reactors is regulated by Essential Safety Rule no. 2002-01, approved by the French safety authority. The safety of French reactors is based on deterministic rules. The probabilistic safety analyses are a way to compliment standard deterministic analyses thanks to a specific investigation method. Specific probabilistic safety analyses can be requested by the plant operator for specific situations encountered during plant operation.

- to further enhance the foreign material exclusion program. The plant has continued to roll actions set in place as part of its FME programme.

STATUS AT OSART FOLLOW-VISIT:

The plant addressed the issue of modification relating to plant configuration from two aspects i.e. corporate and site specific modifications. It was considered that the corporate modification process was not sufficiently embedded in site procedures.
More ownership is now given to the departments for the responsibility and control of modifications.

Weekly information meetings to discuss current modifications, and any difficulties encountered, are now held between the modification lead department, operations and craft maintenance. It is planned for 2010 that problems encountered will also be reviewed during this meeting.

An onsite engineer is now responsible for the review and progress of modifications and to provide feedback to corporate on these modifications.

The Technical Operating Review Committee, meeting on a monthly basis and made up of deputy department managers, is now responsible for the approval of modifications.

The above has resulted in more in-depth reviews of “smaller” modifications, responsibility at department level, improvements in the local modification review process and a change in the site culture with respect to the “smaller” modifications.
This issue is considered as resolved.

DETAILED TECHNICAL SUPPORT FINDINGS

5.3 PLANT MODIFICATION SYSTEM

5.3(1) Issue: Some modifications relating to plant configuration are not properly implemented and controlled to achieve the original function.

The plant modification process guarantees sufficiently that all controlled documents are adequately revised and the configuration kept the same as related documents and SSCs. However, some modifications were found not to be properly implemented and controlled as follows.

- Hermetic doors 1 JSK 103 QE and 1 JSK 104 QE have a considerable air flow passing through their seal on the side of the hinge. These doors were subject to a fire resistance upgrading modification in 2006 as part of the modification package EMEGC97044 / PNXX1188 for the fire doors of the fuel building of the 900 MW French units. The modification related to the sealing and the latching mechanism. The modification package does not have a requirement to test the sealing function after the completion of the modification. Such tests by checking the pressure difference between the rooms isolated by these doors are performed in a regular schedule once every four years, on last occasion in July 2005. Since the modification in 2006 there was no deficiency report filed and no maintenance performed on these doors. Therefore there is no assurance since then that these doors perform the sealing function as required.

- A protection plate on the valve rotating shaft (014VB) in containment spray system (EAS, unit 3) has been in place since about 1985 during the construction period. This installation could affect the operation of this valve during a seismic event.

- MIP 21 GAMMA detectors 1MRP001ED and 1MRP005ED for control of radiation level of the filters 1RCV03F1 and 1RCV04FI are installed without following proper modification procedure.

Without properly implemented and controlled modifications the plant safety may not be maintained at all time, as designed, throughout the life of the plant.

Suggestion: The plant should consider enhancing its implementation and control of modifications relating to plant configuration to ensure that the original functions, as designed, are not compromised.

IAEA Basis:

NS-G-2.3

4.18. Modifications relating to plant configuration should conform to the provisions set forth in the safety requirements for design NS-R-2, and the associated Safety Guides. In particular, the capability of performing all safety functions shall not be degraded.

5.31. All safety related SSCs which were changed from their normal states should be returned to normal operational states. Their configuration should be verified by authorized personnel in accordance with prescribed procedures before the system is returned to operation.

Plant response/Action:

The suggestion made by the OSART team has corroborated the actions implemented by the plant with a view to improving the control of plant modifications and use of new equipment.

These improvements include the following changes:

- changes in the interface between the Nuclear Engineering Division (DIN) and the Nuclear Operations Division (DPN).
- changes in French legislation with the implementation of the main decree of the law concerning “Transparency and safety in the nuclear industry”: “Regulatory procedures regarding nuclear installations”

The findings made during the OSART mission have been taken into account and the phase to ascertain whether they are justified is nearly completed:

- concerning the deficiency identified in the sealing function of doors 1 JSK 103 QE and 1 JSK 104 QE, a leak test has been performed. This leak test will be performed on all similar doors of the four units.
- the temporary installation of MIP 21 gamma detectors ref. 1MRP001ED and 1MRP005ED for radioactivity control on filters 1RCV03FI and 1RCV04FI is currently going through the justification process.
- the protection plate on the valve rotating shaft (014VB) in containment spray system (EAS, unit 3), in place since about 1985 during the construction period, is currently going through the justification process which was mentioned during the OSART mission.

Since the OSART mission, the plant has reinforced its organisation in order to improve the identification and analysis of modifications through:

- designating a modification representative within each department so as to control equipment changes. Deputy department managers participate in the technical operating review committee (CTE) responsible for the approval of modifications. These representatives are the best-suited to identify new modifications proposed by the craft.
- formally requiring a modification package for each equipment modification.
- implementing new requirements related to the preparation of modification packages, by revising the format used for the presentation and analysis of the suggested equipment modification.

- presenting every corporate modification before they are deployed at plant level, in order to clearly identify operational and maintenance responsibilities and to perform impact analyses before their implementation.
- having the technical operating review committee perform a systematic review of plant modifications which are not coordinated at corporate level before their approval.
- assessing the potential impact of every modification on the plant before it is approved. For local modifications, if the required approval items are not at hand, a justification document must be requested from the corporate engineering unit before the technical operating review committee can take its decision.

IAEA comments:

The plant addressed this issue from two aspects i.e. corporate and site specific modifications as two of the facts related to corporate modifications and one fact related to a local or site specific modification. It was considered that the corporate modification process was not sufficiently embedded in site procedures.

More ownership is now given to the departments for the responsibility and control of modifications although the Maintenance departments are not yet fully and routinely involved in post-modification testing.

Weekly information meetings to discuss current modifications, and any difficulties encountered, are now held between the modification lead department, operations and craft maintenance. It is planned for 2010 that problems encountered will also be reviewed during this meeting.

An onsite engineer is now responsible for the review and progress of modifications and to provide feedback to corporate on these modifications. Examples were given with respect to corporate feedback by the plant.

The Technical Operating Review Committee, meeting on a monthly basis and made up of deputy department managers, is now responsible for the approval of modifications.

The above has resulted in more in-depth reviews of “smaller” modifications, responsibility at department level, improvements in the local modification review process and a change in the site culture with respect to the “smaller” modifications.

Conclusion: Issue resolved.

5.4 REACTOR CORE MANAGEMENT (REACTOR ENGINEERING)

5.4(a) Good Practice: The plant has developed and used a unique integrated computer data base used by many departments for fuel management. This data base is used for:

- Complete fuel management
- Management of extensive core process parameters, such a pellet-clad mechanical interface, fuel integrity, in-core measurements, etc.
- Management of extended fuel cycle
- Fuel movements and criticality monitoring with forecast capability
- Update of ex-core detectors
- Control rod drop time trending for proactive decision to replace guide tube
- Parameter setting for nuclear instrumentation

The plant can predict, in advance, potential deviations of the core parameters from the safety range and archive the necessary data.

In view of its advantages and efficiency since 2003, and this data base will be deployed on the whole French fleet under the name SILLAGE.

6. OPERATING EXPERIENCE FEEDBACK

6.6. CORRECTIVE ACTIONS

The implementation status of corrective actions is traced with a tracking system; however, some corrective actions have not been fully completed by the deadlines set by corporate and new deadlines have not been systematically set. As of 15 November 2007, 26 corrective actions recommended by corporate had not been fully implemented (i.e. carried out, checked, and approved) although the deadlines of the actions had passed. The team encourages the plant to improve the process of the implementation status of corrective actions.

6.8. DATABASE AND TRENDING OF OPERATING EXPERIENCE

The plant developed a database that focuses on risk significant activities (called "REX-ADR"). This database enables plant personnel to easily access important operating experience data and the risk assessment results of risk significant activities. It is used effectively by shift crews, maintenance, and outage shift managers to identify the risks of their activities in advance. The team considered this as a good performance.

6.9. ASSESSMENT AND INDICATORS OF OPERATING EXPERIENCE

The self-assessment of the operating experience process is conducted every two years to identify any areas for improvement; however, it does not address all the steps of the operating experience programme. The self-assessment in February 2006 did not evaluate the overall effectiveness of corrective actions. Performance indicators related to the operating experience programme are reported monthly; however, they are not used efficiently to track and systematically trend the effectiveness of the operating experience programme. The team suggested that the plant consider improving its self-assessment and routine monitoring regarding the effectiveness of the operating experience programme.

CHINON NPP FOLLOW-UP SELF ASSESSMENT:

The suggestions and encouragements issued by the OSART team in the area of operating experience have proved useful in helping the plant to improve its OE system.

The plant has started conducting annual effectiveness reviews of its OE programme, which are critiqued and approved by the technical operating review committee. The purpose of these reviews is to identify aspects of the OE process that require improvement, and to initiate the corresponding improvement actions.

An external assessment of our OE programme by the EDF Nuclear Operations Division (DPN) has corroborated the plant's improvements in its contribution to corporate OE.

The plant has also introduced a programme designed to improve the process by which deficiencies are identified and resolved, by standardizing and simplifying deficiency reporting tools and corrective action tracking methods.

Furthermore, in response to the OSART encouragement, the plant has stepped up its process for incorporating actions demanded by the corporate engineering structure, by appointing a dedicated engineer to oversee and coordinate the various relevant specialist areas.

STATUS AT OSART FOLLOW UP VISIT:

The plant addressed both aspects of this issue i.e. self-assessment and trending.

With respect to self-assessment, the plant now performs an operating experience effectiveness review in conjunction with the site Technical Review Committee review and the corporate review. Three main areas of investigation were the outcome of the plant effectiveness review undertaken during the period from January 2008 to June 2009. These included the site's operating experience organizational structure, capturing external Operating Experience(OE) and the site's contribution to the corporate Operating Experience Programme (OEP). The corporate review of Chinon's OEP determined that it had made a positive contribution to the corporate OE process as well as timeliness in the plant's response to corporate requests. It also determined that improvements could be made with respect to the general quality of significant event reports and also the timeliness in reporting such events.

Considering the trending aspect, a database for this was created in July 2009, specifically for performance indicators and there is trending taking place. This is updated on a monthly basis and circulated to all members of the OE network to give feedback on their performance and, if necessary, for improvement in their performance.

The plant has gone beyond the issue originally raised and has ambitious plans for future OE activities. This issue is considered as resolved.

DETAILED OPERATING EXPERIENCE FEEDBACK FINDINGS

6.9 ASSESSMENT AND INDICATORS OF OPERATING EXPERIENCE

6.9(1) Issue: The self-assessment and routine monitoring of the effectiveness of the operating experience programme is not sufficient to identify areas for improvement of the programme or any deterioration in the performance of the programme.

The self-assessment of the operating experience process is conducted every two years. However, the self-assessment conducted in February 2006 did not address all the steps of the operating experience process. For example:

- The reporting status of low level events or near miss events was not mentioned in the self-assessment although trending of these events is conducted on a six monthly basis and reported to the plant safety technical committee.
- The overall effectiveness of corrective actions was not evaluated in the self-assessment - it was independently performed by each department responsible for the corrective actions, without any integrated approach.

Performance indicators related to the operating experience programme are reported monthly. However, they are not used efficiently to track the effectiveness of the operating experience programme. Examples include:

- The performance indicators are compared with the annual goals; however, these indicators are not always trended. Moreover, these indicators are not systematically trended by the department responsible for the indicators.
- Some indicators that show the effectiveness of the operating experience programme, such as the number of low level events and minor events, are not considered in the plant performance report.

Without effective self-assessment and monitoring of the operating experience programme, opportunities for continuous improvement of the programme could be missed and the potential of recurrence of events would not be minimized.

Suggestion: Consideration should be given to improving self-assessment and routine monitoring regarding the effectiveness of the operating experience programme to ensure that any weakness in the programme can be readily identified.

IAEA Basis:

NS-G-2.11

8.1. “A periodic review should be undertaken of all stages of the process for the feedback of operational experience to ensure that all of its elements are performed effectively.”

Plant Response/Action:

Further to the suggestion issued by the OSART team, Chinon NPP has introduced an annual effectiveness review of its OE programme. This review is critiqued and approved by the plant's technical operating review committee. The review includes long-term trending of OE performance indicators. This annual review is in addition to the annual safety review conducted by the plant, as well as the external assessment conducted by the EDF Nuclear Operations Division.

The results of the OE process are tracked by means of monthly indicators and are discussed within the engineering network. They essentially focus on the plant's contribution to the corporate OE programme.

These new measures have helped the plant to identify areas for improvement regarding its OE process, such as the collating of events in the Saphir database. The plant has also set up a common database for improving the effectiveness of the OE programme and the pooling of external events.

The plant has also embarked on an initiative to standardize and simplify the reporting of deficiencies and tracking of corrective actions. This initiative will enable the plant to improve its deficiency management process, firstly in terms of detection capacity and secondly in terms of its ability to process actions.

Starting in 2009, the NPP is introducing a new process-based management system in which operating experience has been granted the status of a fully-fledged sub-process. OE will thus undergo annual sub-process reviews that are submitted the plant's technical operating review committee for appraisal.

This new initiative will be deployed in line with a corporate OE improvement project due to be rolled out across the EDF nuclear fleet as of 2010.

IAEA comments:

The plant addressed both aspects of this issue i.e. self-assessment and trending.

With respect to self-assessment, the plant now performs an operating experience effectiveness review in conjunction with the site Technical Review Committee review and the corporate review. Three main areas of investigation were the outcome of the plant effectiveness review undertaken during the period from January 2008 to June 2009. These included the site's operating experience organizational structure, capturing external Operating Experience (OE) and the site's contribution to the corporate Operating Experience Programme (OEP). The corporate review of Chinon's OEP determined that it had made a positive contribution to the corporate OE process as well as timeliness in the plant's response to corporate requests. It also determined that improvements could be made with respect to the general quality of significant event reports and also the timeliness in reporting such events. The plant stated that the overall effectiveness review has allowed a clarified overview of the status of the process to be undertaken.

Considering the trending aspect, a database for this was created in July 2009, specifically for performance indicators and there is trending taking place. This is updated on a monthly basis and circulated to all members of the OE network to give feedback on their performance and, if necessary, for improvement in their performance.

It should also be mentioned that the plant has a defect reporting system and this is well used e.g. there are over 2500 low level event collected in 2008 and this has been attributed to an increased level of 'Managers in the field'.

The plant has gone beyond the issue originally raised and has ambitious plans for future OE activities.

Conclusion: Issue resolved.

7. RADIATION PROTECTION

7.2 RADIATION WORK CONTROL

During the most recent Unit 2 refueling outage, the plant incorporated conservative radiation protection techniques to minimize personnel contamination, both internal and external sources. As a result, there were only two such instances during the outage, neither of which exceeded the threshold for assigning a dose consequence (500 microsieverts). During refueling outages on the other units, such conservative techniques had not been employed, and, the plant experienced more internal and external personnel contamination events. As for Unit 2, none of those contamination events exceeded the threshold for assigning a dose consequence. The team encourages the plant to incorporate conservative radiation protection techniques to minimize personnel contamination events in all four units during refueling outages, as well as for work performed during normal periods of operation.

7.3. CONTROL OF OCCUPATIONAL EXPOSURE

The team has, in the area of control of occupational exposure, found that the plant's use of an automatic display of the boron and water make up system manual valve alignment has reduced operator exposure by approximately 5 millisieverts per year across all four units. The team, therefore, identified the use of the automatic display of the boron and water make up system manual valve alignment as a good practice.

The team considers that the plant's development and use of the "Savoir Voir" (See How to See) software programme is an example of good performance. This teaching tool is used to increase awareness of industrial safety and radiation protection standards.

During plant tours, the team observed plant staff enter a room in which elevated radiation levels were expected (greater than 100 microsieverts per hour), in order to conduct surveys in preparation for work activities later in the week. The room was not an area of routine entry. Although the initial entry into the room included the use of a telescoping radiation detector, a hand held detector was used for the remainder of the survey. Although the collective and individual doses for persons on the radiation work permit for the survey were within the pre-job estimates, there was an opportunity to further minimize their exposure by using the telescoping radiation detector for accessible areas of the room. As the plant continues to make significant progress in its goal to reduce occupational exposures, the team encourages the plant to expand the use of available radiation protection equipment, when appropriate, to support those goals.

7.5. RADIOACTIVE WASTE MANAGEMENT AND DISCHARGES

The team has, in the area of radioactive waste management and discharges, found that the plant's oversight and control over the transportation of radioactive materials and wastes, including the use of the Final Control Building has been an effective means of continuing improvement in the transportation of radioactive materials and waste. The team, therefore, identified the oversight and control over the transportation of radioactive materials and wastes, including the use of the Final Control Building, as a good practice.

DETAILED RADIATION PROTECTION FINDINGS

7.3. CONTROL OF OCCUPATIONAL EXPOSURE

7.3(a) Good practice: Use of the boric acid valve lineup display has reduced operator occupational exposure due to performing manual valve lineup operations on the boron and water make up system.

Previously, the plant experienced numerous operational, safety significant events concerning boron and water make up system valve lineup errors, which resulted in a loss of functionality of the system. Each valve lineup configuration of this system required field operators to check and manipulate over 50 separate manual valves located in numerous areas of the plant, some with elevated ambient radiation levels. A field operator proposed the idea of using a dynamic display to check valve lineups on this system.

The online monitoring system does not actuate individual valves, but displays the position of each valve in the system relative to specific lineup configurations. In this way, the field operator only needs to manipulate the valves required to be repositioned for the lineup and does not need to check the position of the remaining valves in the system. The display, in addition to valve position indications, provides positive indication of main voltage supply, voltage supply to each channel, voltage supply to valve position sensors, and sensor faults.

As a result of installing the valve lineup display in each of the four units, the plant has reduced the exposures of operators by a total of 5 millisieverts each year. The display system is unique to the plant.

7.5. RADIOACTIVE WASTE MANAGEMENT AND DISCHARGES

7.5(a) Good Practice: The oversight and control over the transportation of radioactive materials and wastes, including the construction and use of the BUC "Bâtiment Ultime Contrôle" (Final Control Building), has significantly reduced the number of reported transportation-related events and provided an effective means of continuing improvement.

As a result of numerous transportation-related events reported to the French regulator, EDF was banned from making certain shipments of radioactive waste in 1998. The plant appointed an advisor for transportation to ensure compliance with regulatory requirements. Follow up actions included placing the transport of radioactive materials and waste under a Quality Assurance programme, and organizing a specialized transportation section that is responsible for all organisational, scheduling, administrative, and regulatory aspects regarding the transportation of radioactive materials, excluding spent nuclear fuel.

In calendar year 2007, the plant completed construction of the BUC, a building specifically designed and used for activities pertaining to the transportation of radioactive materials and waste. The building is equipped with a truck reception plant protected from the elements, a crane for transferring containers to the container monitoring station, which includes container drying equipment (to facilitate surveys for removable contamination) and enables full survey coverage of all six sides of the container, and new equipment to facilitate radiological surveys. In the past, surveys of vehicles transporting radioactive wastes and materials were performed outside, without protection from the elements. Furthermore, transport containers were surveyed on the transport trailer, which limited access to the top of the container and a large majority of the bottom surface of the container.

As a result, the plant's focused oversight of transportation activities and the use of the BUC has been an effective means of continuing improvement in the transportation of radioactive materials and waste. This is demonstrated by a significant reduction in the number of reported transportation-related events. In addition, this has helped the plant cope with the processing of approximately 1000 shipments of radioactive materials and waste each year, including wastes from the Irradiated Materials Laboratory (AMI), and the decommissioning of Chinon Units A2 and A3. This oversight programme and the BUC facility are unique to the plant.

8. CHEMISTRY

8.1. ORGANIZATION AND FUNCTIONS

The team identified as good performance that the internal interface in the Chemistry group is well organized. Good coordination is established between the chemists and other groups. Established communication tools are used to keep Operations informed of chemistry specifications.

8.2. CHEMISTRY CONTROL IN PLANT SYSTEMS

The team encourages the plant to follow the recommendations of IAEA (DS 388 (Part 4) and TECDOC 489) which stipulate that all chemical parameters should be divided into control and diagnostic parameters. Technical specifications for Chemistry and Radiochemistry in the plant do not include such a division.

The team identified, as a good practice, that through three cross-functional committees (As Low As Reasonably Achievable / Effluents and Waste Committee / Waste Reduction Group) and through adherence to the radiochemical and chemical specifications, the plant is capable of controlling, reducing and maintaining as low as reasonably achievable the source term (dose), liquid and gaseous effluent releases (volume, activity, quantity of chemicals) and process-generated waste.

The team encourages the plant to modify the mimic panel in the control room of the Demineralised water plant which does not match the actual installed equipment (it does not show the mixed bed filters).

The Lithium concentration for Lithium-Boron coordination is measured manually with an atomic absorption spectrometer. Boron concentration is measured on-line. If the lithium concentration is lower than the optimal pH(T), a volume of added lithium solution is calculated by a software programme. If the lithium concentration is higher than the optimal pH(T), the calculation (time of treatment on the ion exchange filters) is made with a calculator. The team encourages the plant to use software for this calculation.

On some occasions, the lithium concentration is outside the optimal range. Lithium is injected by batch every time a laboratory analysis of the primary circuit sample shows a deviation from the optimal area. Operations Dept and chemistry are not immediately aware that the lithium concentration (pH value) is too low or too high (although for rather short periods of time). The team encourages the plant to enhance efforts in optimizing the lithium management of the primary circuit.

The plant has currently a concern with SG clogging (blockage of water flow).

The deposits have common characteristics:

- construction from bottom part of water pass quatrefoil area.
- on the tube as well as in the quatrefoil area, almost centripetal progression.

This phenomenon affects other units in the EDF fleet, conditioned with low pH morpholine. In this context EDF/CEIDRE are investigating other types of conditioning such as ethanolamine. The decision has been made to eliminate in the long term the copper alloys in order to enable the increase of pH (CEIDRE/EDF opinion). Deposits consist mostly of iron and copper compounds. However, according to the Chemical Specifications, the plant determines the concentration of iron and copper in SG blowdown water only twice a year. The team encourages the plant to conduct the measurements of iron and copper concentration more often than twice a year.

8.3. CHEMICAL SURVEILLANCE PROGRAMME

The team identified, as a good performance, an application of Laboratory Information and Management System (MERLIN) for trend tracking, evaluating, recording, documenting and archiving the results of analyses and quality control measurements.

8.5. LABORATORIES, EQUIPMENT AND INSTRUMENTS

The team found examples where laboratory equipment was not properly calibrated or was not properly functioning. The team suggested to improve the quality control Programme applied in the Chemistry department to ensure the correct calibration and check of laboratory measuring equipment.

The team encourages the plant to enhance efforts in improving housekeeping because some problems concerning equipment storage and lighting were found in some laboratories.

The team encourages the plant to enhance efforts in improving industrial safety in the chemistry department because some problems of dangerous chemical leakages and leaking valves were found.

8.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

The team found examples when a procedure to control chemicals and consumables was not followed. The team suggested that the plant should improve the control process to ensure that proper labeling and shelf life control of chemicals and consumables are adequate.

CHINON NPP FOLLOW-UP SELF ASSESSMENT:

The improvements brought about in the chemistry area further to the OSART review cover a number of aspects.

To begin with, the close involvement of operatives in the OSART preparatory phase was instrumental in helping to tighten up procedure adherence and reinforce rules governing the labelling of on-line analyzers, instruments and laboratory chemicals. During the preparatory phase, a great deal of effort went into improving laboratory housekeeping standards, which have since been sustained.

After the OSART mission, we addressed the corresponding suggestions and more specifically, those pertaining to the labelling of hazardous substances on the site. The importance of proper labelling practices has filtered through to the maintenance crafts, and this realization has brought about marked improvements in nuclear safety.

We have also made efforts to address encouragements. One example is the development of a small-scale software application designed to calculated ion-exchange resin pass time (for lithium removal), by monitoring – in accordance with a corporate requirement – iron and copper in the secondary circuit on a weekly basis instead of twice a year as we were doing previously, and by optimizing lithium hydroxide dosing activities in conjunction with operations personnel, in order to obtain optimal pH values.

Plant chemistry fundamentals defined prior to the OSART mission have now been thoroughly assimilated by plant personnel. In addition, a self-assessment has been conducted in order to ensure their continued implementation.

STATUS AT OSART FOLLOW UP VISIT:

With respect to the suggestion on calibration of chemistry instruments, all instruments have now been calibrated according to the corporate calibration programme requirements. The calibration procedures are updated on a regular and frequent basis from operating experience in this area. The plant programme, MERLIN, reflects the current calibration status of all the necessary instruments. This issue is considered as resolved.

The plant evaluated the suggestion on labelling and determined that the majority of facts related to the issue of labelling related to chemicals in use outside of the Chemistry department. For those internal to the department, there is an effort to ensure that the necessary labelling systems are embedded in the staff by management walkabouts, reinforcement of expectations and staffing changes.

With respect to labelling of chemicals in other departments and the various maintenance departments in particular, a task group was set up to determine the labelling needs and information required by the users. A new set of labels were produced for use outside of the chemistry department. These were in trial operation for about six months and the feedback received on their use was positive. The oil store keeper or the maintenance staff, who issue chemicals, mark the chemicals according to its effects as determined from manufacturers supply information.

A self-assessment of the labelling was undertaken in September 2009 and the results indicate that there was still room for improvement although there was overall satisfaction with the progress made so far. It was considered that the plant had made satisfactory progress to date on this issue.

DETAILED CHEMISTRY FINDINGS

8.2 CHEMISTRY CONTROL IN PLANT SYSTEMS

8.2 (a) Good Practice: Through three cross-functional committees - As Low As Reasonably Achievable / Effluents and Waste Committee / Waste Reduction Group and through adherence to the radiochemical and chemical specifications, with strong management commitment, the plant is capable of controlling, reducing, and maintaining as low as possible the source term (dose), liquid and gaseous effluent releases (volume, activity, quantity of chemicals) and process-generated waste.

Over the years since 1990, the plant has progressively implemented a specific organisation structure which, in 2001, gave rise to the creation of three cross-functional committees to which Operations, Chemistry, Waste, Radiation Protection, among others, make their contribution.
These three committees make it possible to control and minimise the source term and its effect on the dose rate and releases into the environment, whilst controlling the production of process solid waste. To do so, within the committees:

- the origin of the dose rate, effluents and waste is closely monitored
- leakages are timely identified and eliminated
- objectives are defined, followed and reprioritised if necessary
- an action plan is implemented and its efficiency is measured
- regular reporting to Plant Management takes place

Plant results demonstrate:

- Extremely low levels of activity in the primary circuit (oxygenation peaks, etc…)
- Actions to improve the source term: replacement of rod clusters, pump bearings
- In terms of liquid waste, released activity has continually diminished over the last 10 years to reach very low asymptotic conditions
- The volume of process waste is controlled

8.5 LABORATORY MEASURING EQUIPMENT STATUS AND CALIBRATION

8.5(1) Issue: The chemistry quality programme does not always ensure in a satisfactory manner that calibrations are effective in maintaining the accuracy of the analytical results.

Although the plant has developed a good chemistry surveillance programme to monitor the effectiveness of chemistry control in plant systems, the team found the following:

- BAN Laboratory Unit B3 and B4 (same for BAN Laboratory Unit B1 and B2): Calibration of devices for measuring chloride and fluoride: Reference concentrations for calibration curve are 100 and 500 ppb. Actual measured values approximately 30- 40 ppb, expected value 50 ppb - out of calibration range (limit value is 150 ppb).

- Portable conductivity meter (0 OLA 174 MG) was used to measure H-conductivity of SG blowdown water (Unit B2, SG 2) during failure of main on-line H- conductivity meter (from 23.11.07 to 04.12.07). The only information about maintenance of this portable conductivity meter in MERLIN system indicates, that the device was put in operation on 11.07.2002. There is no additional information about calibration/checks of this device since 11.07.2002. There is also no labelling about calibration/ checks on this device.

- PHM 240 devices are used for measuring chloride in the primary circuit. These devices use sensitive electrodes type XS200 (manufacturer: RADIOMETER). According to the manufacturer's manual, the threshold (minimal limit) of chloride concentration is 35.5 ppb. It means that a concentration lower than 35.5 ppb could not be measured with such a device. Input values in MERLIN system (for example for Unit B1 since January 2007 till now) show that the concentration of chloride is always equal to 30 ppb. Measured concentration should be registered as "< 35.5 ppb" or "below sensitivity threshold".

- SIT Laboratory Unit B2: Manual pH-meter (N 237) (pH of feed water) – air is present in the KCl-tube, connected to the reference electrode (prevents correct measurements to be made).

Without rigorous control of equipment calibration and verification, the accuracy and validity of analytical results and, consequently, the chemistry of the plant could be adversely affected.

Suggestion: The plant should consider improving the quality control programme applied in chemistry's department to ensure the correct calibration and control check of laboratory measuring equipment.

Basis: 50- C/SG-Q13:.

"403. Chemistry and radiochemistry work normally consist of: … evaluating chemistry data to identify control problems and analytical errors, and to correct them/ controlling of laboratory conditions, practices, equipment and materials to ensure the accuracy of the analytical results…"

DS 388:

"6.33. Adequacy and accuracy of procedures should be checked regularly by intra- and inter-laboratory tests, to identify analytical interferences, improper calibrations, analytical techniques and instrument operation. These test results should be evaluated to determine the causes of unacceptable differences and deviations, tacking into account short-term and long-term effects"

Plant response/Action:

Recommendations issued by the corporate chemical engineering entity pertaining to measuring instruments and more specifically to on-line analyzers and laboratory equipment have been deployed within the chemistry department's internal arrangements as well as being incorporated into the MERLIN database. These documents were updated further to the OSART mission, in order to address review findings (labelling of instruments, for example).

All measuring instruments, and more specifically conductivity meter 0 OLA 174 MG, are now covered by a monitoring programme that is tracked via the MERLIN database (three-monthly check of this equipment).

As regards the weekly monitoring of chloride and fluoride parameters in the primary circuit using a specific electrode instrument, the site has introduced more accurate monthly measurements. These measurements are performed using liquid-phase ion chromatography in order to achieve very discreet detection limits. Weekly measurements are still being taken in accordance with the current calibration rules, the latter helping to ensure that these parameters remain below corporate specification thresholds (150 ppb and 300 ppb).

Keeping equipment in sound working order and checking for the absence of air bubbles are good professional chemistry practices and form part of chemistry fundamentals. Management has performed checks to ascertain that these fundamentals are properly implemented.

IAEA Comments:

All instruments have now been calibrated according to the corporate calibration programme requirements. The calibration procedures are updated on a regular and frequent basis from operating experience in this area.

The plant programme, MERLIN, reflects the current calibration status of all the necessary instruments. Plant tours revealed no calibration deficiencies.

Conclusion: Issue resolved.

8.6 LABELLING CONTROL OF OPERATIONAL CHEMICALS AND OTHER CHEMICAL SUBSTANCES

8.6(1) Issue: The plant's procedures are insufficiently implemented to ensure the adequacy of labelling and shelf life of chemicals and other consumables used by plant staff.

Although the plant has established a procedure to control chemicals and chemical substances, it is not always followed in the field. Examples include:

- There is no correct labelling for coolant of diesel motors (four cans) in Main oil storage (only a simple handwritten label "COOLELF").
- There is no correct labelling for oil (two cans) in Main oil storage.
- In Auxiliary oil storage, the labelling for coolant of diesel motors (one red tank) is not visible as it is placed on the side of the tank.
- In Auxiliary oil storage, the labelling for oil (one blue tank) is not visible as it is placed on the side of the tank.
- BAN Laboratory Unit B3 and B4: Chemical reagent LiOH (crystal) in one bag is opened and date of opening is not shown.
- Can with decontaminant ALCATUM NEDF in Hot Laboratory Unit B1 and B2 has no expiry date.
- Three containers of about 3 litres each in spent fuel pool of unit 3 fuel building have no label to identify the content (probably decontamination liquid).
- Tub (possible with lubricant) has no correct labelling in Hot Laboratory B1 and B2.
- One container of about 3 litres in Hot Laboratory B1 and B2 has no label to identify the content (probably chemical cleaning effluent).
- Nine containers (approx.3 litres each) with sample from cooling circuit are placed on the table in Hot Laboratory B1 / B2 and have no date of sampling**.**

Without rigorous control of chemicals and consumables, the accuracy of analytical results of chemistry in the plant could be adversely affected.

Suggestion: The plant should consider fully implementing the procedures to ensure that proper labelling and shelf life control of chemicals and other consumables are adequate.

Basis: 50- C/SG-Q13:

"403. Chemistry and radiochemistry work normally consist of: …controlling of laboratory conditions, practices, equipment and materials to ensure the accuracy of the analytical results/ ensuring the proper handling, storage, use and disposal of bulk chemicals, spent resins, laboratory chemicals, corrosive agents and cleaning agents."

DS 388:

"8.6. Chemicals and substances should be labelled (under responsibility of the plant) according to the area where they can be used, so that they can be clearly identified. The label should indicate the shelf life of material and application area of the material (system contact/ no-system contact etc.).

8.7 If it is necessary to fill a certain amount from a stock container to smaller flask, this flask must be properly labelled with name of chemical, date and pictograms to indicate the risk and application area."

Plant response/Action:

Subsequent to the OSART mission, a task force comprising the site's main operationally-focused departments and headed up by the chemistry department, set to work on producing common labels for site-wide use, so that work teams could be provided with the adequate means for labelling chemicals and samples.

User needs and their compliance with regulations were taken into account.

Label prototypes were submitted and approved by the task force. Whenever labels are requested by the crafts, they are now printed out by the risk prevention department and placed in strategic site locations such as the oil store and the warehouses, as well as being given to contract staff coordinators.

Department monitoring plans call for regular checks in order to ensure that labels are appropriately used.

IAEA comments:
The plant evaluated the issue and determined that the majority of facts related to the labelling of chemicals in use outside of the Chemistry department. For those internal to the department, there is an effort to ensure that the necessary labelling systems are embedded in the staff by management walkabouts, reinforcement of expectations and staffing changes.

With respect to labelling of chemicals in other departments and the various maintenance departments in particular, a task group was set up to determine the labelling needs and information required by the users. A new set of labels were produced for use outside of the chemistry department. These were in trial operation for about six months and the feedback received on their use was positive. It was determined that the crafts had favourably accepted the system. The oil store keeper or the maintenance staff, who issue chemicals, mark the chemicals according to its effects as determined from manufacturers supply information.

A self-assessment of the labelling was undertaken in September 2009 and the results indicate that there was still room for improvement although there was overall satisfaction with the progress made so far.

Conclusion: Satisfactory progress to date.

9. EMERGENCY PLANNING AND PREPAREDNESS

9.1. EMERGENCY PROGRAMME

Emergency preparedness activities are coordinated by an inter-departmental committee, called the Emergency Planning and Preparedness (hereafter referred to as EPP) committee, which is recognized by the OSART team as a good performance. The EPP committee is led by the associate director for safety and quality, who is also the strategic coordinator. Committee composition and craft accountability ensure that emergency planning and preparedness at the plant remains on a path of continuous improvement. The committee manages the effective monitoring of actions and coordination between command centres, draws up the yearly schedule of exercises, reviews feedback from exercises, draws up organisational amendments for approval by the plant management and tracks the progress of actions by means of performance indicators. An action plan is maintained where the status of the decided actions is tracked on a continuous basis. All data relevant to EPP management is published for personnel on the computer network of the plant. The EPP improvement is indicated by the successful national exercise conducted in November 2006 and by the 152 actions that were completed by the EPP committee in one year.

9.2. RESPONSE FUNCTIONS

Efficient sharing of information between local and corporate EDF levels and responsive information to the media and other external stakeholders, elected representatives and the public and the authorities is recognized as a good performance by the OSART team. During emergency situations, a shared database is used by the communicating parties of the different response organizations. It is provided with press release information, questions from the media and is used to assess information passed on to the media. Continuous contact between EDF communication units and telephone conferences between different spokespersons from EDF local and corporate levels enhance the consistency of EDF communication. Public information is delivered via the authorities, with a clear indication of individual roles and responsibilities-answers are provided to direct media questions and through the repetition of official communiqués available to all EDF units and/or State and Nuclear Safety Authority's services. Feedback from the national emergency exercise held on 9 November 2006 has demonstrated the effectiveness of the communication equipment and procedures of the plant.

9.3. EMERGENCY PLANS AND ORGANIZATION

The plant is prepared for identifying if the criteria that necessitates the on and off-site response are met. The plant is also prepared for the provision of the necessary information to the off-site authorities, as well as for the implementation of protective actions for its personnel. However, it is not scheduled in the plant procedures to have an authorized person on the site at all times to declare the emergency promptly and without consultation, and if the appropriate conditions are met, to notify the off-site authorities. This might jeopardize the timely implementation of the protective actions, both within the plant site and for the public. The OSART team recommends that a duly authorized person be on the site at all times, who may, promptly and without consultation, declare the emergency situation and, if necessary, initiate the off-site response.

9.4. EMERGENCY PROCEDURES

In case of on-site emergency the personnel of the plant who do not have roles in the emergency response are to go to and remain at one of the twelve designated muster points. At each muster point there are staff on duty designated as responsible for the protection of and accounting for the people and to exchange information with the emergency management teams. The counting of persons at the muster points is done manually, which is not effective; however, the plant has decided to implement a more effective, electronic counting system in 2009. The next step is to locate and recover those unaccounted for. The plant has no written strategy or procedure for this process. The OSART team encourages the plant to elaborate possible methods for locating and recovering those who should but, for any reason, cannot go to the muster points, as well as the circumstances and conditions that should be considered during the locating and recovering actions.

The emergency preparedness activities are covered by the plant's quality assurance programme as a whole. Within this programme, the organization of several types and number of exercises and drills appear. The exercises and drills are included into an annual plan and a report is prepared every year on the implementation of the exercises; these documents are appropriately approved. A plan is prepared before each exercise, where the objectives, framework and usually the observers are designated. A number of staff from different plant departments are required to take part in the planning process. Although the practice followed during this process is appropriate, it is not covered by the plant's quality assurance programme. This may allow for deviations from the followed practice and differences between the preparation, conduct and evaluation of exercises and further it is not ensured that the timely and adequate feedback of exercise experiences into the emergency preparedness process is correct every time. The OSART team encourages the plant to create a formal process for exercise preparation, conduct and evaluation, which addresses the related deadlines, responsibilities and involvement of plant resources, and to include this into a separate procedure.

9.5. EMERGENCY RESPONSE FACILITIES

The plant's medical preparedness for handling and decontamination emergency casualties is acknowledged as a good practice by the OSART team. The Medical Service has set up a robust organization for taking charge of contaminated and/or exposed casualties. The strong commitment of the medical staff and the strong external relationships, the regular training and furthermore the use of locally developed innovative techniques contribute to the continual readiness of this organization for an effective medical response.

9.6. EMERGENCY EQUIPMENT AND RESOURCES

The plant has appropriate equipment directly designated for emergency use. The variety, the number and quality of these tools are appropriate for the necessary life-saving and decontaminating actions. An important portion of the protective clothes, respirators, breathing-apparatus, stretchers, dose-meters, probes, detectors and other equipment are kept prepared in a designated store. The store is located close to the reactor buildings of Units 3&4, downward of the prevailing wind-direction which, in case of a radioactive release from the units may hinder or prevent their effective use. The OSART team suggests that the plant considers the relocation of the equipment to a more distant store, the access of which is possible even if a release and potential contamination occurs.

Management of on and off-site environmental radiological measurements is carried out by mobile laboratories. The environmental vehicles take measurements on the basis of the meteorological conditions and following pre-established routes determined in conjunction with the authorities. The off-site routes are organized into 12 triangular areas taking into account the topography of the Loire, and the monitoring around plant units is formally set out. On each route permanent measuring points are identified. The effective communication with and use of the results of the vehicles is provided from the emergency management building. The practice has showed its effectiveness and performance in local and large-scale corporate emergency exercises. The OSART team acknowledges this system as good performance.

CHINON NPP FOLLOW-UP SELF ASSESSMENT:

As a result of the considerable efforts made by the plant in preparation for the OSART mission, Chinon NPP has made progress in the areas of organisation and emergency management.

The reinforcement of coordination practices for managing the on-site emergency plan, the commitment of the various crafts and the deployment of the appropriate equipment, especially in the personnel muster rooms, has lead to a clear improvement in emergency management at Chinon. This progress, resulting from the momentum created by the OSART, was recognized during an EDF internal audit, performed by the nuclear inspection department in February 2008.

Furthermore, the OSART conclusions in this area have led to improvements in operational aspects of emergency management in several areas:

- in the quality assurance program, by stipulating requirements for performing emergency drills within a procedure.

- in the area of first aid, with the transfer of the casualty treatment and sorting equipment to an area sheltered from the prevailing winds.

- in the area of triggering the emergency plan, by streamlining internal arrangements and by obtaining delegated authority for the on-call management team from the local authority (Préfecture) to initiate the ‘reflex’ mode of the off-site emergency plan.

A missing persons search procedure, similar to the one suggested by the OSART team, will also be implemented in parallel to the deployment of the counting system in muster areas, which is planned for the second half of 2009.

STATUS AT OSART FOLLOW UP VISIT:

Is response to the OSART recommendation, Chinon NPP has implemented two major actions to meet the respective IAEA requirements. In some cases, these modifications have made the process for declaring on-site emergency and notifying off-site authorities quicker, however these arrangements are not effective in each case of fast developing emergency scenarios. Emergency arrangements of Chinon NPP still do not provide for a duly authorized person on the site at all times to declare the on-site emergency and to notify the off-site authorities. According to information provided by the plant and the EDF representatives, it is not intended to modify the current situation, which is why the OSART team concluded that this issue is in a state of insufficient progress.

The OSART team suggestion regarding the location of emergency equipment store has been considered by the plant staff. After assessment of potential buildings within the site, a new location has been identified which is further away and is not downward the prevailing wind direction from the units. Since the suitability of new equipment store has been justified via exercises, the OSART team determined the suggestion as resolved. By this arrangement the effective use of equipment can be attained for life-saving actions and prevention of radiation health effects.

The OSART team has also acknowledged that the plant recognized the importance of the encouragements concerning the EPP area and drew up the respective procedures, thereby further enhancing the effectiveness of emergency exercises and the survey of missing persons from muster points in an emergency assembly.

DETAILED EMERGENCY PLANNING AND PREPAREDNESS FINDINGS

9.3 EMERGENCY PLANS AND ORGANIZATION

9.3(1) Issue: It is not required by the plant procedures to have an authorized person on the site at all times to declare an emergency and to notify the off-site authorities promptly and without consultation.

There are no written quantitative time objectives in the plant procedures for identifying the emergency conditions, to declare the emergency situation and to notify the local authorities.

The shift manager, who is the first to identify the occurrence of the conditions that necessitate the declaration of the on-site emergency or the notification of off-site authorities, is not allowed to promptly do these without consultation.

The potential emergency manager on duty (PCD1) authorized to declare the on-site emergency and to notify the off-site authorities is not required to be on the site outside working hours.

Outside working hours it may take more time to contact the PCD1.

After the shift manager has identified the criteria for declaring the emergency he is required to consult the PCD1 and the PCD1 is required to recheck that the criteria are met. The procedure is the same for the criteria to initiate off-site notification.

There has not been any exercise for the PCD1s to check the above-mentioned criteria outside the site.

The delay in declaration of on-site emergency and in notification of off-site authorities may reduce the possibility to timely implement the necessary protective actions for both the plant personnel and the public.

Recommendation: There should be a person on the site at all times who is authorized to initiate an appropriate on-site response and to notify the appropriate off-site authorities promptly and without consultation.

Basis:

GS-R-2

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

NS-R-2 Sec. 2.32.

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

GS-G-2.1 Appendix VI, Response time objectives, Threat category I, Facility level

Identifying, notifying and activation (the objective is timed from the time at which conditions indicating that emergency conditions are detected)

Classify the emergency: < 15 min.

Notify local authorities (PAZ and UPZ) after classification: < 30 min.

Plant response/Action:

The emergency management policy of Chinon NPP is derived from the corporate emergency management policy, approved by the French nuclear regulatory authority (ASN). It is therefore a common policy that applies to every EDF nuclear power plant.

The recommendation issued during the Chinon OSART is currently being investigated by the corporate emergency management services, as part of a comprehensive overhaul of its emergency management reference base. This will be implemented on the nuclear sites in 2011.

In addition to these corporate actions, Chinon NPP has made changes to its arrangements and procedures in order to address the OSART recommendation. We have gone about this in the following way:

1- The procedure used by on-call senior management to raise an alert has been improved in order to save time, by directly incorporating the telephone numbers of all entities that need to be alerted for initiating the emergency plan, without having to refer to telephone directories.

2- The prefecture has now granted the plant delegated authority to trigger the off-site emergency plan in situations requiring immediate action ('reflex' mode), i.e. triggering of response for those accidents involving early releases. In such circumstances, the on-call management team triggers the public alarm sirens, and warns the population by the 'Sappre' phone system, dedicated for this purpose. Therefore, if there is a risk of early radioactive release, it is the plant that initiates measures for protecting the population, without requiring immediate authorisation from the Préfecture. This phase can therefore be implemented more quickly. This delegated authority has been transposed into the procedure applied by on-call senior management.

These two actions were completed in 2008.

3- So as to shorten the time period between detection of a valid EPP criterion and its activation, amendments to the shift manager call-up procedure are underway. In the event of being unable to successfully call up PCD1 or PCD0, the shift manager, who is on duty at the plant around the clock, triggers the alerts himself so as to mobilise plant on-call staff and to protect those people present on the plant. The PCD1 succession list (5 people) is no longer used to mobilise plant on-call personnel.

A firm commitment has been taken concerning this action, which will have been finalised by the time of the OSART follow-up.

IAEA Comments:

According to the plant response, two relevant modifications have been implemented:

1- The prefecture has granted Chinon NPP the delegated authority to trigger the off-site emergency plan in situations requiring immediate action ('reflex' mode), i.e. triggering of response for those accidents involving early releases. In such cases, the on-call management team (PCD1 or PCD0, the latter is actually the plant manager) may trigger the public alarm sirens, and warn the population by the 'Sappre' phone system, dedicated for this purpose. This delegated authority has been transposed into the procedure applied by on-call senior management.

2- The PCD1 succession list (5 people) is no longer used to mobilize plant on-call personnel. In the event of being unable to successfully call up PCD1 or PCD0, the shift manager (PCL1), who is on duty at the plant around the clock, triggers the alerts himself so as to mobilize plant on-call staff and to protect those people present on the plant.

Evaluation of actions

According to the IAEA recommendation based on the IAEA requirement: there should be a person on the site at all times who is authorized to initiate an appropriate on-site response and to notify the appropriate off-site authorities promptly and without consultation.
According to the above arrangements.
- the shift manager (PCL1) is authorized to initiate the on-site response after he has consulted with (got support from) the PCD1 who is off site outside working time. If PCD1 cannot be reached, PCL1 is authorized to initiate the on-site response (which is then not a prompt action).
- PCL1 in neither case is authorized to notify the off-site authorities.

During the follow-up mission a letter from EDF confirmed that the above arrangements (1 and 2) are intended to be implemented at the corporate level, i.e. in each plant of the fleet with a minor modification: in arrangement 2 the PCD0 need not be called.
In the letter, EDF has also declared that it does not intend to delegate the authority for the shift manager to notify the off-site public bodies.

Conclusion: Insufficient progress to date.

9.5. EMERGENCY RESPONSE FACILITIES

9.5(a) Good practice: Medical facilities, equipment and procedures for the treatment and transportation of contaminated casualties in emergencies.

The plant's Medical Service has set up a robust organization for taking charge of contaminated casualties on site until their decontamination in the decontamination facility of the medical service or to transfer them to hospital.

The strong commitment of the medical and nursing staff as well as the strong relationships maintained with hospitals, the good involvement of medical service staff in exercises and training courses, the involvement of doctors at national level, and the well-organized duty roster for continuous medical cover contribute to the continual strength of this organization.

Furthermore, care of casualties is enhanced by locally developed innovative techniques, including:

- Facilities for decontamination of multiple casualties, regardless of their ambulatory conditions.
- Equipment and procedures to survey potentially contaminated wounds.

The medical personnel as well as the plant volunteers receive regular practical training and exercise, which ensures the effective deployment of the medical arrangements.

9.6. EMERGENCY EQUIPMENT AND RESOURCES

9.6(1) Issue: Equipment, specifically designated for emergency use, may not be fit for purpose following a release from the plant as it is in a position which is close to Units 3&4 and is downstream of the prevailing wind-direction.

Protective clothes, respirators, breathing apparatus, stretchers, dose-meters, probes, detectors and other equipment are kept in a prepared state on trailers for emergency use to provide for first-aid, casualty transportation and on-site decontamination. The trailers are stored in the store of CTS (casualty treatment and sorting) centres.

Prompt access to this would be important during emergencies for life-saving actions and the prevention of radiation health effects.

The prevailing wind direction (53%) at the location of the plant is to the north-east.

The CTS store is located close to the reactor buildings of Units 3&4, to the north-east of these units. The building is not leaktight.

A radioactive release may easily contaminate the stored equipment and its access routes and thus its effective use cannot be ensured.

If the use of the equipment in an emergency situation cannot appropriately be provided then effectiveness of life-saving actions for plant personnel and of prevention of radiation health effects may substantially decrease.

Suggestion: The plant should consider relocating the emergency equipment stored in the CTS store to another store located at a longer distance from the reactor buildings of the plant and in a direction that allows the effective use under the postulated emergency conditions.

Basis:

GS-R-2

5.25. Adequate tools, instruments, supplies, equipment, communication systems, facilities and documentation (such as procedures, checklists, telephone numbers and manuals) shall be provided for performing the functions specified in Section 4.78....These support items shall be located or provided in a manner that allows their effective use under postulated emergency conditions.

NS-R-1

5.30. Any equipment necessary in manual response and recovery processes shall be placed at the most suitable location to ensure its ready availability at the time of need and to allow human access in the anticipated environmental conditions.

Plant response/Action:

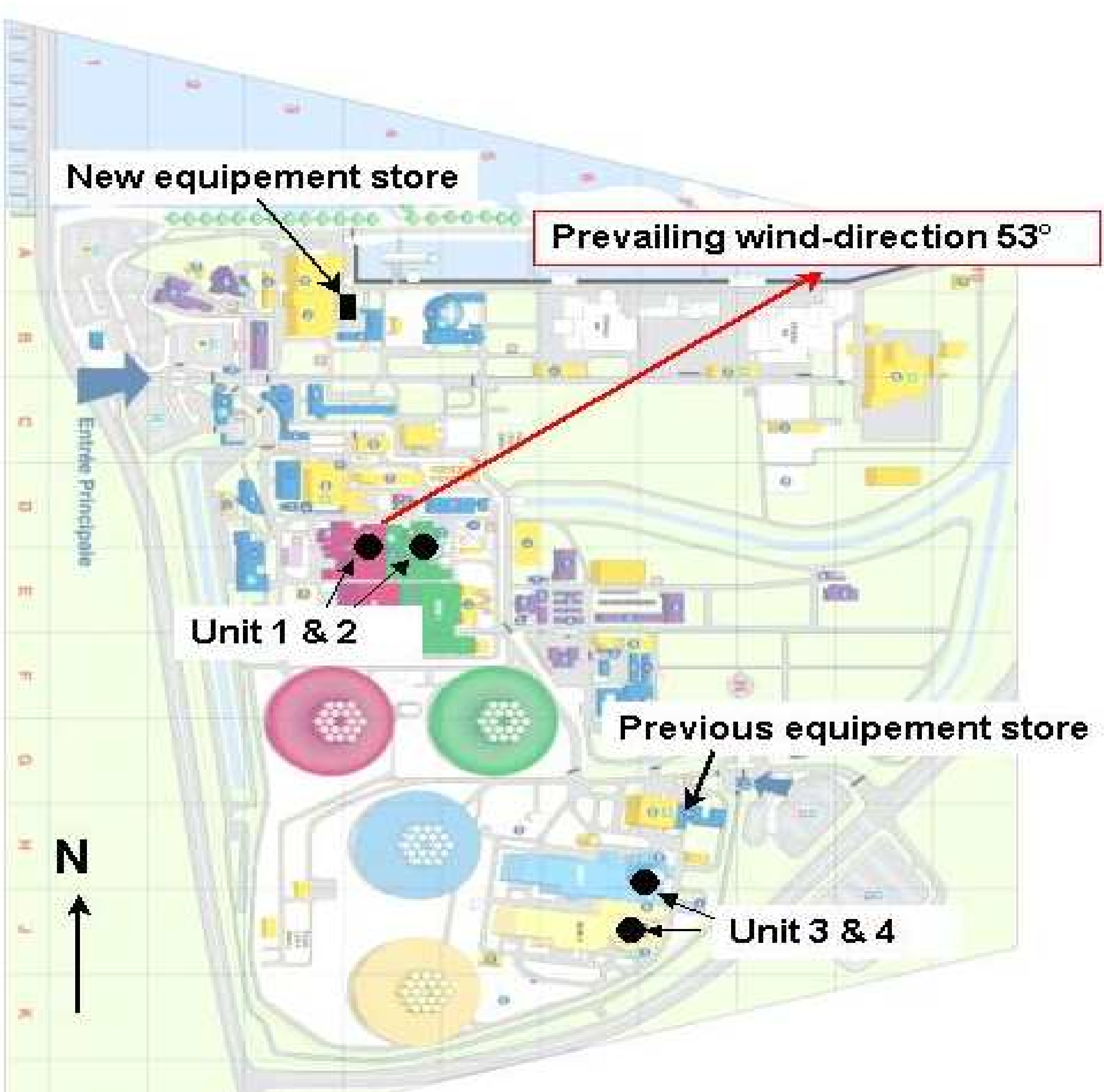
Following the suggestion made by the OSART team, the EPP committee transferred the equipment of the casualty treatment and sorting centre and decontamination room to the EPP building, which is sheltered from the prevailing winds.

This building also contains the mobile equipment of the team in charge of crisis management. The risk-prevention department is responsible for housekeeping in the building, as well as for the equipment in the casualty treatment and sorting centre and decontamination room, if necessary.

Since this relocation has taken place, one EPP drill has been performed with the equipment of the casualty treatment and sorting centre, and its results were satisfactory.

The following illustration shows the new location of the equipment with regards to the prevailing winds:

ILLUSTRATION:



IAEA comments:

Chinon NPP evaluated the recommendation provided by the OSART team and specified a new location for the emergency equipment concerned. The new location is on the site, at a longer distance from the units being not in the prevailing wind direction. The deployment of a new equipment location has been tested during exercises, and the feedback has been favorable. The risk of contamination at the new location is much lower even in the event of a major radioactive release, therefore effective use of the equipment can be attained for life-saving actions and prevention of radiation health effects.

Conclusion: Issue resolved.

SUMMARY OF STATUS OF RECOMMENDATIONS AND SUGGESTIONS OF THE OSART FOLLOW-UP MISSION TO CHINON NPP

	RESOLVED	SATISFACTORY PROGRESS	INSUFFICIENT PROGRESS	WITH-DRAWN	TOTAL
Management, Organization & Administration	- -	- -	- -	- -	- -
Training and Qualification	-	-	-	-	-
Operations	1R 1S	1R 2S	- -	- -	2R 3S
Maintenance	2S	-	-	-	2S
Technical Support	1S	-	-	-	1S
Operating Experience	- 1S	- -	- -	- -	- 1S
Radiation Protection	- -	- -	- -	- -	- -
Chemistry	- 1S	- 1S	- -	- -	- 2S
Emergency Planning and Preparedness	- 1S	- -	1R -	- -	1R 1S
TOTAL R (%)	1 (33%)	1 (33%)	1 (33%)	-	3
TOTAL S (%)	7 (70%)	3 (30%)	-	-	10
TOTAL	8 (61%)	4 (31%)	1 (8%)	-	13

DEFINITIONS

DEFINITIONS – OSART MISSION

Recommendation

A recommendation is advice on what improvements in operational safety should be made in that activity or programme that has been evaluated. It is based on IAEA Safety Standards or proven, good international practices and addresses the root causes rather than the symptoms of the identified concern. It very often illustrates a proven method of striving for excellence, which reaches beyond minimum requirements. Recommendations are specific, realistic and designed to result in tangible improvements. Absence of recommendations can be interpreted as performance corresponding with proven international practices.

Suggestion

A suggestion is either an additional proposal in conjunction with a recommendation or may stand on its own following a discussion of the pertinent background. It may indirectly contribute to improvements in operational safety but is primarily intended to make a good performance more effective, to indicate useful expansions to existing programmes and to point out possible superior alternatives to ongoing work. In general, it is designed to stimulate the plant management and supporting staff to continue to consider ways and means for enhancing performance.

Note: if an item is not well based enough to meet the criteria of a 'suggestion', but the expert or the team feels that mentioning it is still desirable, the given topic may be described in the text of the report using the phrase 'encouragement' (e.g. The team encouraged the plant to…).

Good practice

A good practice is an outstanding and proven performance, programme, activity or equipment in use that contributes directly or indirectly to operational safety and sustained good performance. A good practice is markedly superior to that observed elsewhere, not just the fulfillment of current requirements or expectations. It should be superior enough and have broad application to be brought to the attention of other nuclear power plants and be worthy of their consideration in the general drive for excellence. A good practice has the following characteristics:

- novel;
- has a proven benefit;
- replicable (it can be used at other plants);
- does not contradict an issue.

The attributes of a given 'good practice' (e.g. whether it is well implemented, or cost effective, or creative, or it has good results) should be explicitly stated in the description of the 'good practice'.

Note: An item may not meet all the criteria of a 'good practice', but still be worthy to take note of. In this case it may be referred as a 'good performance', and may be documented in the text of the report. A good performance is a superior objective that has been achieved or a good technique or programme that contributes directly or indirectly to operational safety and sustained good performance, that works well at the plant. However, it might not be necessary to recommend its adoption by other nuclear power plants, because of financial considerations, differences in design or other reasons.

DEFINITIONS - FOLLOW-UP 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.

LIST OF IAEA REFERENCES (BASIS)

Safety Standards

- **SF-1**; Fundamental Safety Principles (Safety Fundamentals)
- **Safety Series No.115**; International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources
- **Safety Series No.117**; Operation of Spent Fuel Storage Facilities
- **NS-R-1**; Safety of Nuclear Power Plants: Design Requirements
- **NS-R-2**; Safety of Nuclear Power Plants: Operation (Safety Requirements)
- **NS-G-1.1**; Software for Computer Based Systems Important to Safety in Nuclear Power Plants (Safety Guide)
- **NS-G-2.1**; Fire Safety in the Operation of Nuclear Power Plans (Safety Guide)
- **NS-G-2.2**; Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (Safety Guide)
- **NS-G-2.3**; Modifications to Nuclear Power Plants (Safety Guide)
- **NS-G-2.4**; The Operating Organization for Nuclear Power Plants (Safety Guide)
- **NS-G-2.5**; Core Management and Fuel Handling for Nuclear Power Plants (Safety Guide)
- **NS-G-2.6**; Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (Safety Guide)
- **NS-G-2.7**; Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (Safety Guide)
- **NS-G-2.8**; Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (Safety Guide)
- **NS-G-2.9**; Commissioning for Nuclear Power Plants (Safety Guide)
- **NS-G-2-10**; Periodic Safety Review of Nuclear Power Plants (Safety Guide)
- **NS-G-2.11**; A System for the Feedback of Experience from Events in Nuclear Installations (Safety Guide)
- **NS-G-2.12**; Ageing Management for Nuclear Power Plants (Safety Guide)
- **NS-G-2.13**; Evaluation of Seismic Safety for Existing Nuclear Installations (Safety Guide)
- **NS-G-2.14;** Conduct of Operations at Nuclear Power Plants (Safety Guide)

- **NS-G-2.15**; Severe Accident Management Programmes for Nuclear Power Plants Safety Guide (Safety Guide)
- **GS-R-1**; Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety (Safety Requirements)
- **GS-R-2**; Preparedness and Response for a Nuclear or Radiological Emergency (Safety Requirements)
- **GS-R-3**; The Management System for Facilities and Activities (Safety Requirements)
- **GS-G-2.1**; Arrangement for Preparedness for a Nuclear or Radiological Emergency (Safety Guide)
- **GS-G-3.1**; Application of the Management System for Facilities and Activities (Safety Guide)
- **GS-G-3.5**; The Management System for Nuclear Installations (Safety Guide)
- **RS-G-1.1**; Occupational Radiation Protection (Safety Guide)
- **RS-G-1.2**; Assessment of Occupational Exposure Due to Intakes of Radionuclides (Safety Guide)
- **RS-G-1.3**; Assessment of Occupational Exposure Due to External Sources of Radiation (Safety Guide)
- **RS-G-1.8**; Environmental and Source Monitoring for Purpose of Radiation Protection (Safety Guide)
- **WS-G-6.1**; Storage of Radioactive Waste (Safety Guide)
- **DS388;** Chemistry Programme for Water Cooled Nuclear Power Plants (Draft Safety Guide)

▪ ***INSAG, Safety Report Series***

- **INSAG-4;** Safety Culture
- **INSAG-10**; Defence in Depth in Nuclear Safety
- **INSAG-12**; Basic Safety Principles for Nuclear Power Plants, 75-INSAG-3 Rev.1
- **INSAG-13**; Management of Operational Safety in Nuclear Power Plants
- **INSAG-14**; Safe Management of the Operating Lifetimes of Nuclear Power Plants
- **INSAG-15**; Key Practical Issues In Strengthening Safety Culture

- **INSAG-16**; Maintaining Knowledge, Training and Infrastructure for Research and Development in Nuclear Safety
- **INSAG-17**; Independence in Regulatory Decision Making
- **INSAG-18**; Managing Change in the Nuclear Industry: The Effects on Safety
- **INSAG-19**; Maintaining the Design Integrity of Nuclear Installations Throughout Their Operating Life
- **INSAG-20**; Stakeholder Involvement in Nuclear Issues
- **INSAG-23**; Improving the International System for Operating Experience Feedback
- **Safety Report Series No.11**; Developing Safety Culture in Nuclear Activities Practical Suggestions to Assist Progress
- **Safety Report Series No.21**; Optimization of Radiation Protection in the Control of Occupational Exposure
- **Safety Report Series No.48**; Development and Review of Plant Specific Emergency Operating Procedures

▪ ***Other IAEA Publications***

- **IAEA Safety Glossary** Terminology used in nuclear safety and radiation protection 2007 Edition
- **Services series No.12**; OSART Guidelines
- **EPR-EXERCISE-2005**; Preparation, Conduct and Evaluation of Exercises to Test Preparedness for a Nuclear or Radiological Emergency, (Updating IAEA-TECDOC-953)
- **EPR-METHOD-2003**; Method for developing arrangements for response to a nuclear or radiological emergency, (Updating IAEA-TECDOC-953)
- **EPR-ENATOM-2002**; Emergency Notification and Assistance Technical Operations Manual

▪ ***International Labour Office publications on industrial safety***

- **ILO-OSH 2001;** Guidelines on occupational safety and health management systems (ILO guideline)
- Safety and health in construction (ILO code of practice)
- Safety in the use of chemicals at work (ILO code of practice)

TEAM COMPOSITION OF OSART MISSION

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Review area: Maintenance

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