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REPORT

OF THE

OPERATIONAL SAFETY REVIEW TEAM

(OSART)

MISSION

TO THE

EPZ - BORSSELE

NUCLEAR POWER PLANT

NETHERLANDS

1 - 18 September 2014

DIVISION OF NUCLEAR INSTALLATION SAFETY
OPERATIONAL SAFETY REVIEW MISSION
IAEA-NSNI/OSART/178/2015

PREAMBLE

This report presents the results of the IAEA Operational Safety Review Team (OSART) review of EPZ-Borssele Nuclear Power Plant, Netherlands. It includes recommendations for improvements affecting operational safety for consideration by the responsible Netherlands 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.

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

FOREWORD

by the

Director General

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

An OSART mission, carried out only at the request of the relevant Member State, is directed towards a review of items essential to operational safety. The mission can be tailored to the particular needs of a plant. A full scope review would cover ten operational areas: management, organisation and administration; training and qualification; operations; maintenance; technical support; operating experience feedback; radiation protection; chemistry; emergency planning and preparedness; and severe accident management. 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 organisation 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 organisation and considers additional comments made by plant counterparts. Implementation of any recommendations or suggestions, after consideration by the operating organisation 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.

CONTENT

INTRODUCTION AND MAIN CONCLUSIONS

INTRODUCTION

At the request of the Dutch nuclear regulatory authority - KFD (inspectorate for nuclear safety, radiation protection, safeguards and security), an IAEA Operational Safety Review Team (OSART) of international experts visited EPZ and the Borssele Nuclear Power Plant from 1 – 18 September 2014. The purpose of the mission was to review:

- Corporate functions in the areas of corporate management, support to provide human resources, independent oversight, communication;
- Operating practices in the areas of Management, organisation and administration; Training & qualification; Operations; Maintenance; Technical support; Operating experience; Radiation protection; Chemistry; Emergency planning and preparedness; and Severe accident management;
- The safety culture of the organization, requested by EPZ with the consent of KFD. The methodology of this safety culture assessment is described in Annex 1.

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 Borssele OSART mission was the 178th in the programme, which began in 1982. The team was composed of experts from Canada, Czech Republic, France, Germany, Hungary, Slovakia, Slovenia, Spain, the United Kingdom, the United States of America and the IAEA staff members. The collective nuclear power experience of the team was approximately 370 years.

Before visiting the plant, the team studied information provided by the IAEA and the EPZ-Borssele nuclear plant to familiarize themselves with the plant's main features and operating performance, staff organisation 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 best international practices.

The following report is produced to summarize the findings in the review scope, according to the OSART Guidelines document. For those findings related to Borssele nuclear power plant the term “plant” is used; For those findings related to the EPZ organisation including the nuclear plant then the term “organisation” is used. The text reflects only those areas where the team considers that 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 managers of EPZ - Borssele NPP are committed to improving the operational safety and reliability of their plant. The team found good areas of performance, including the following:

- EPZ has a risk management officer who is responsible for development and control of integral risk management within the organization of EPZ. Integral risk management is the umbrella for all types of risks;
- The establishment of Young EPZ Professionals as a response to rapid demographic changes;
- Process maturity model for monitoring the progress and improvement of the integrated management system;
- The plant organizes six site-wide integrated exercises each year to ensure that all personnel with assigned duties during an emergency participate in an exercise each year;
- Requirements for Severe accident management (SAM) equipment in separate Plant Technical Specifications.

The team found also a number of areas in need of improvement to enhance operational safety performance. The most significant ones include the following:

- Leadership for safety is not recognized throughout the organization to ensure sustainable safety performance;
- The change management process is not effectively used to support changes in the organization;
- An effective Human Performance Programme has not been implemented;
- Expectations are not systematically being met by plant personnel nor reinforced by managers and supervisors, and some of them are not yet set;
- The plant’s expectations and work management process are not robust enough to ensure effective personnel resource usage, completion of risk reviewed work, and safe work schedule stability;
- High standards of material condition in some plant areas are not consistently maintained;
- The process for temporary modifications does not provide adequate arrangements for their review, approval or control, to ensure that temporary modifications are handled in a safe manner;
- Analysis for some events has not been performed adequately to ensure that the root cause is identified and are not consistently completed in a timely manner;
- The plant workers and line management do not always take responsibility for ensuring their own or team’s radiation protection and are not held accountable when the required radiation protection behaviours and work practices are not achieved;
- The on-site emergency arrangements are not sufficient to ensure the timely protection of on-site workers in the event of an emergency;
- The plant’s abnormal operation procedures and EOPs are incomplete and do not address the scope of all credible plant states.

EPZ senior management and Plant 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.

1. MANAGEMENT, ORGANISATION AND ADMINISTRATION

1.1 ORGANISATION AND ADMINISTRATION

Some documents describing the organisational chart have not been updated since 2009, and some job descriptions have been reviewed very recently, although the organisational changes took place more than one year ago. The implementation of the Nuclear Safety Section was undertaken without performing a preliminary safety evaluation due to time pressure. The team encourages the plant to include the documentation updates in the planning for organisational changes.

The functions and responsibilities of processes owners and leaders are not described. Senior managers have been appointed as sponsors for SOERs, but their role is still to be defined. The team encourages the plant to develop and communicate the functions and responsibilities of the staff involved in process management or acting as sponsors in any area.

1.2 MANAGEMENT ACTIVITIES

The team observed weaknesses in the implementation of the plant's Human Performance programme, such as lack of resources, actions from the implementation plan being late and no tracking of its effectiveness by management. The team recommends the plant undertakes the effective implementation of a Human Performance programme and ensures that it is sufficiently staffed and continuously improved.

The plant has developed a process maturity model for easy and timely communication on the developments and improvement of the integrated management system. The team considers this as a good practice.

There is no systematic and formal review of the effectiveness of communications undertaken by the organisation, such as surveys, interviews or assessments. The team encourages the organisation to develop an effectiveness review of its main communications in order to check that messages reach the intended recipient and are properly understood.

1.3 MANAGEMENT OF SAFETY

The team observed examples of the organisation responding reactively in some of the programmes or processes for which no actions have been undertaken until performance has decreased (e.g. SOER implementation, safety culture improvement, work management and corrective action programme). The team recommends the plant implement the necessary tools, programmes, monitoring and trending systems to ensure that a comprehensive and effective Integrated Management System is used to manage and continuously improve performance.

Some examples of deviations from the plant's standards and expectations were observed during plant tours or observations performed by the team. Some expectations in the radiation protection area were not set. Signs of a non-challenging attitude among managers and supervisors were detected. The team recommends the plant ensures that expectations are set and being met by plant personnel and reinforced by managers and supervisors.

The Integrated Management System (IMS) Handbook does not describe the graded approach used to prioritize the improvements needed in the system itself and on the activities within its scope. The satisfaction of stakeholders or interested parties assessment is not included within the IMS scope and there is no formal management review of the overall IMS. The team encourages the plant to develop its IMS in order to cover all these aspects.

1.4 QUALITY ASSURANCE PROGRAMME

Nuclear-grade items, products and services are qualified through the German VGB group list (audits of suppliers by other plant's QA are accepted). This list might not be available after the phase out of the German plants in 2022. The organisation does not perform audits to approve suppliers that provide nuclear-grade equipment or services and are not in the VGB list. Even though the cause of an unplanned outage was a weakness in the quality system of a supplier (it did not configure a design change and supplied a rotor that was not suitable), QA has not undertaken any additional independent check or audit on this supplier. The team encourages the organisation to plan the necessary arrangements in order to ensure that the necessary audits and inspections are performed on nuclear-grade suppliers in the long-term.

1.6 DOCUMENT AND RECORDS MANAGEMENT

The site process for procedures (working instructions) requires review and approve by the line manager and then by the department manager. For various reasons this can mean that the reviewer may have no technical knowledge of the area covered by the procedure, when in some cases it may be more appropriate to ask a peer to undertake the review. For example, a radiological protection (RP) procedure for the calibration of RP instrumentation is reviewed by two people without specific knowledge of what is involved. The team encourages the plant to ensure that safety procedures are reviewed by personnel with appropriate technical knowledge.

DETAILED MANAGEMENT, ORGANISATION AND ADMINISTRATION FINDINGS

1.2. MANAGEMENT ACTIVITIES

1.2(a) Good Practice: Process maturity model for monitoring the progress and improvement of the integrated management system.

EPZ has developed a process maturity model. Its main purpose is to make communication about the status of a (complex) Integrated Management System (IMS) easy and to help process owners and management improve the management system.

The maturity model is a powerful tool because:

- It serves as a common reference for talking about processes, which makes communication about the status of the IMS easier;
- It helps to create awareness about the gaps within the IMS;
- It shows which aspects of a process need the most improvement;
- It stimulates process ownership;
- It helps to make objectives SMART and to make progress visible.

The model is based on six areas that are key for any process: process ownership, process performance, process risk control, process compliance, process structure and process execution. For each area the maturity level is determined periodically. Characteristics of the levels are:

- Not present;
- Activities are only done when necessary;
- Activities are done but not organized as a process;
- The process is well organized and executed;
- Pro-active behaviour and continuous improvement are normal.

In December 2012 two internal auditors assessed twenty processes. The average maturity level of the assessed processes was 3.1. This was communicated to the senior and middle management and created the awareness and sense of urgency required to start the IMS improvement project that is currently on-going. Now the maturity of a process is assessed during the execution of internal audits and progress is monitored and reported by the Quality Assurance Department.

Currently the average process maturity level (same processes as in 2012) has increased to 3.3. The best example of a single process improvement is the ICT process: 2.2 (Dec. 2012), 2.5 (Sept. 2013) and 3.6 (July 2014).

1.2(1) Issue: An effective Human Performance Programme has not been implemented.

The following observations were made:

- A plan for the implementation of the HP programme was approved by the interim Plant Manager in May 2013.The required resources are not in place;
- The HP programme has no metrics to measure effectiveness;
- Approximately 50% of the actions to implement the HP programme are postponed;
- Supervisors are expected to provide informal and verbal feedback to managers about what they observe in the plant. They are only expected to make a formal report when something significant happens. Due to this, no reporting data is available for trending, evaluation or setting improvement actions;
- Only 24 selected people have been trained as HP-leaders two years since the programme was initiated; the training of more HP Leaders is progressing slowly;
- Expected personal behaviours for leaders, supervisors and employees are neither defined nor systematically reinforced;
- The Maintenance Division has 4 indicators for leadership and safety culture. All of them are associated with the revision status of documents and procedures;
- Managers of the plant stated during the interviews that leadership is not demonstrated in the field mainly due to the volume of work that managers must perform in their offices;
- The plant observation programme focuses on plant status and condition rather than on personal behaviours. No feedback on behaviours is provided in the quarterly reports from Class Base or the semi-annual report of WANO observations;
- Task observations are not included in the station toolbox for HP;
- Human Performance is not being tracked by the plant's annual plan and it is not a focus area of the company's business plan;
- Deviations observed during plant tours are assigned to the department responsible for their resolution. There is no follow up by management and no improvement actions are established as a result of the overall program assessment;

Interview with field operator and review of walk down report:

- The Operator had two walk downs with managers in last three month. Only housekeeping and technical details were addressed by the managers during the walk downs. None of the Human Performance expectations, listed in the "red booklet", were addressed;
- A review of the latest report, submitted by a manager following his walk down with field operator contains only 2 comments, both technical. Human Performance of the operator mentioned;
- The team identified that Human Performance and Safety Culture (HPSC) topics are integrated into training programs for Field Operators, HPSC topics are included in the exit test. There is a procedure A09-26-N009 "Human Performance Techniques for employees". The "Learning goals for the Control Room Simulator (CRS)" PO A 11-23-

009 include the use of Human Error Prevention Tools (HEPT) at CRS. However, the observations and interview revealed the following;

– Field operators only partially receive training in HEPT (classroom training only) as they are not part of CRS training;

– Management expectations, recorded in a booklet for plant personnel, require use of 3 way communication when performing activities in step-by-step procedure, switching "ON" or "OFF" equipment, or communicating equipment statuses ("opened/ closed"), but in an interview plant operators stated that 3 way communication has to be used only in a real emergency or in case of misunderstanding, caused, for example, by noisy environment;

– Some managers stated that use of HEPT needs reinforcement, for example by proper coaching in the field;

– Records of trainer's comments/ post job critique after specific CRS session are not available, formal protocols of CRS training "Jahresgesprach" reflect very good use of HEPT by operators during CRS sessions, which contradicts the real performance of MCR and field operators observed during Safety Systems test.

Interview with OE department head and review of OE documentation:

– 77 events out of 79 analysed during 2013 are identified as caused by Human Factors, 57 of which are related to OPS practices;

– When asked why OE is not included in the pre-job briefing (PJB) for surveillance tests of safety systems and not addressed by plant operators during their PJB, an OE manager replied that this is also their concern and expectations to use OE have to be reinforced;

– Review of the latest INES Level 1 event report (Event 13/004) – Electrical short in DA Busbar during insulation resistance measurement (0,4 kV, Safety Busbar) led to Reactor transfer to Mode 5 (Cold shutdown) – caused by a chain of human performance shortfalls, including:

  – Potential for mistake was not discussed in PJB;
  – Lack of attention;
  – Lack of questioning attitude;
  – Lack of self-assessment;

Without implementing of an effective Human Performance programme the probability of events caused by undesired behaviours may increase.

Recommendation: The plant should undertake the effective implementation of a Human Performance programme and ensure that it is sufficiently resourced and continuously improved.

IAEA Bases:

SSR-2/2

3.5. The management system shall integrate all the elements of management so that processes and activities that may affect safety are established and conducted coherently with other requirements, including requirements in respect of leadership, protection of health, human performance, protection of the environment, security and quality, and so that safety is not compromised by other requirements or demands.

4.29. Aspects of the working environment that influence human performance factors (such as work load or fatigue) and the effectiveness and fitness of personnel for duty shall be identified and controlled. Tools for enhancing human performance shall be used as appropriate to support the responses of operating personnel.

NS-G-2.4

6.61. A suitable working environment should be provided and maintained so that work can be carried out safely and satisfactorily, without imposing unnecessary physical and psychological stress on personnel. Human factors which influence the working environment and the effectiveness and fitness of personnel for duty should be identified and addressed. The operating organisation should establish an appropriate programme for these purposes.

1.3. MANAGEMENT OF SAFETY

1.3(1) Issue: A comprehensive and effective Integrated Management System (IMS) has not been applied to manage and continuously improve performance.

The following observations were made:

- 54% of processes have a maturity level in their "Execution Phase" ranked as 3 (on a scale from 1 to 5) or lower, meaning that they have a "reactive response on deviations";
- Only one of the SOERs that were identified in the last WANO Peer Review (2012) as "requiring further action" has been re-evaluated. Around 50% of the SOER's recommendations required further action;
- Operations and Maintenance KPIs do not develop all the plant's KPIs. They are not always specified at the shift/department level, thus losing an opportunity to be used as an accountability tool. Maintenance has no internal measures for some critical activities such as pre-job briefs, post-job debriefs or supervisor observations;
- The company has no active multidisciplinary teams systematically working on continuous improvement of the processes unless it is required for the management. For 2014, four teams were working to improve the existing processes (work package preparation, improvements in the work permits process, financial investments projects and fuel management);
- Some of the main processes have no KPIs (e.g. equipment reliability, emergency preparedness, portfolio management) to determine their efficiency;
- There is no global and shared vision among the managers of the results achieved by each of the processes;
- No metrics or tracking system have been established to measure progress of the work management implementation project;
- In 2013, 17 process owners were requested by the management team to develop a project plan to improve their processes. This request was not met due to lack of sponsorship;
- The status of the annual plans is not formally reported during the year to the corporate management;
- The Integrated Management System does not require a management review of its performance and effectiveness;
- Post job debriefs are not implemented at the site, although they are part of the management expectations;
- There is no plan for embedding the continuous improvement of safety culture in the organisation once the project FOCUS-3 is finished (December 2014);
- Senior managers are not knowledgeable about the progress of the FOCUS-3 project;
- The KPIs of the plant divisions are lagging indicators. Leading indicators are missing. As an example for RP: contamination events per entry to RCA, dose (CRE), total solid waste volume and activity and liquid discharges;

- Overdue corrective actions show adverse trend. Currently 29.6% of corrective actions are late;
- The backlog of work orders is 1846, and it has been increasing over the last four months;
- Without a comprehensive and effective Integrated Management System to manage and continuously improve performance, the plant does not have the opportunity to act to prevent a negative impact or events affecting the safety of the installation;

Recommendation: The plant should implement the necessary tools, programmes, monitoring and trending systems to ensure that a comprehensive and effective Integrated Management System is used to manage and continuously improve performance.

IAEA Bases:

SSR-2/2

4.5. The safety policy of the operating organisation shall include a commitment to achieving enhancements in operational safety. The strategy of the operating organisation for enhancing safety and for finding more effective ways of applying and, where feasible, improving existing standards shall be continuously monitored and supported by means of a clearly specified programme with clear objectives and targets.

GS-R-3

2.1. A management system shall be established, implemented, assessed and continually improved. It shall be aligned with the goals of the organisation and shall contribute to their achievement. The main aim of the management system shall be to achieve and enhance safety by:

- Bringing together in a coherent manner all the requirements for managing the organisation;
- Describing the planned and systematic actions necessary to provide adequate confidence that all these requirements are satisfied;
- Ensuring that health, environmental, security, quality and economic requirements are not considered separately from safety requirements, to help preclude their possible negative impact on safety.

3.1. Management at all levels shall demonstrate its commitment to the establishment, implementation, assessment and continual improvement of the management system and shall allocate adequate resources to carry out these activities.

NS-G-2.4

1.3. The attention to be paid to safety requires that the management recognize that personnel involved in the nuclear power programme should understand, respond effectively to, and continuously search for ways to enhance safety in the light of any additional requirements socially and legally demanded of nuclear energy. This will help to ensure that safety policies that result in the safe operation of nuclear power plants are implemented and that margins of safety are always maintained. The structure of the organisation, management standards and administrative controls should be such that there is a high degree of assurance that safety policies and decisions are implemented, safety is continuously enhanced and a strong safety culture is promoted and supported.

GS-G-3.1

2.36. A strong safety culture has the following important attributes: (…)A proactive and long term approach to safety issues is shown in decision making.

6.76. (…) A process for preventive actions should take proactive steps to ensure that a potential non-conformance does not occur.

GS-G-3.5

2.10. Senior management should establish and promote a set of principles to be used in decision making and promoting safety conscious behaviour. Examples of such principles used in some organisations are as follows: (…) (i) A proactive approach to safety is taken.

2.27. To prevent a significant degradation of safety, a proactive approach to the management of safety and safety culture should be established so that any problem may be detected and acted upon at an early stage.

1.3(2) Issue: Expectations are not systematically being met by plant personnel nor reinforced by managers and supervisors, and some of them are not yet set.

The following observations were made:

- Supervisors are not systematically reporting issues regarding organisational or behavioural aspects observed in the field;
- The Operations Division has no formal feedback of the results of observations performed by shift supervisors or shift managers. There is no information about how many observations are performed, what the conclusions are, and the role of the shift manager in them. As a result, no actions are taken;
- Several deviations in scaffolding were identified by the team during the plant inspections;
- The Managers in the Field programme shows a decreasing participation in several areas down to 53 %. Two of the managers do not participate although they are in the programme;
- A person with no personal protection equipment was observed walking through an exclusion area when the reception of fuel elements was taking place;
- The job description for supervisors does not include functions or responsibilities for the training of their teams;
- A person was observed working in a workshop with a power saw without safety glasses or ear protection, as required by the signs on the entrance door. When highlighted by the reviewer, the person escorting him did not take any action and the reviewer was the one that challenged the behaviour;

In the area of radiation protection, the following was observed:

- Expectations for worker behaviour in the radiation controlled area (RCA) are not set or reinforced by line management;
- Expectations for dose reduction are set at management level, but are not visible to the working teams;
- Local rules do not contain all of the required information and are not well known by the plant workers;
- RCA clearance monitoring routinely identifies unanticipated contamination above action levels on items and equipment and these events are not recorded or trended;
- Contaminated items found inadequately wrapped and with no labelling for radiological results nor ownership, there is no specified standard for this;
- There is no site owned procedure for the control of Radiography;
- There is no training or standards for RP staff on how to apply shielding or to fix signage to it;
- There is no checking, coaching or observation programme for workers entering the RCA to ensure compliance with local rules;
- Contaminated clothing bins and clean clothing storage racks are observed to be located on different sides of the step-over barrier, not in line with a standard approach;

– Persons do not always use the hand & foot monitors after exiting contamination controlled areas as required by the plant.

The team noted the following during observation of safety diesel No1 test:

– No check list was used for the pre-job briefing (PJB);
– The PJB covered technical aspects of test procedure only. No OE or safety aspects were addressed;
– After the completion of the PJB, an electrician came to MCR to check the execution of the test. He did not participate in the PJB;
– No 3-way communication was used during the test, even though management expectations clearly require use of three way communication for safety related activities.

Without expectations being set and systematically met by plant personnel and reinforced by managers and supervisors, undesired personal or organisational behaviours and practices could take place at the plant and result in a risk for individuals and for the installation.

Recommendation: The plant should ensure that expectations are set and systematically met by plant personnel and reinforced by managers and supervisors.

IAEA Bases:

SSR-2/2

4.2. The safety policy shall stipulate clearly the leadership role of the highest level of management in safety matters. Senior management shall communicate the provisions of the safety policy throughout the organisation. Safety performance standards shall be developed for all operational activities and shall be applied by all site personnel. All personnel in the organisation shall be made aware of the safety policy and of their responsibilities for ensuring safety. The safety performance standards and the expectations of the management for safety performance shall be clearly communicated to all personnel, and it shall be ensured that they are understood by all those involved in their implementation.

NS-G-2.4

3.16. This is part of a manager's role in setting the standards and expectations for all staff in all aspects of safe management of a plant. In addition, managers themselves should visibly meet these standards and should help staff to understand why they are appropriate.

GS-G-3.1

2.17. Managers and supervisors should talk to other individuals during workplace tours and should take these opportunities to reinforce awareness of management expectations.

6.3. Managers normally perform oversight reviews and assess the performance of activities through their day-to-day line management activities. Other, more structured mechanisms include:

- Line management monitoring: In order to become proactive and to maintain control over emerging problems, line managers and supervisors should be aware of what is going on in their areas of responsibility and should assess actual performance against expected results. Line management monitoring necessitates that managers be individually involved in assessing the performance of work, posing informed and probing questions and reviewing the results of work completed. To achieve these objectives, line managers and supervisors;
- Should observe the work being carried out to ensure that the applicable standards are being met;
- Should be visibly present and available and should listen to suggestions and complaints from personnel;
- Should examine trends in performance indicators;
- Should review the results and lessons to be learned from self-assessments, independent assessments, observation and surveillance programmes;
- Should carry out pre-job briefings and post-job briefings where necessary;
- Should coach and mentor individuals to improve their performance.

2. TRAINING AND QUALIFICATIONS

The organisation lacks an overall quality assured process for staff qualification. Qualification is understood as a formal document certifying that the employee is fully competent to perform the job he/she is assigned to. The policy and process to ensure that all personnel in the organisation are competent for the activities they have to perform are not adequate. The formalization of the qualification process at the organisation level should ensure structure and consistency across the organisation. It could also be extended to main contractors, eventually.

The plant does not reinforce the ownership and responsibility of operational managers and supervisors for both defining training needs and evaluating personnel competencies in the field. The needs and results of managerial observations in the field are not transmitted to the training department (TQ) in a written form. The systematic approach to training loop is presently not always closed and it is not used in the continuous improvement process. The team recommends that the organisation publishes a formal qualification policy and implements the corresponding processes.

2.2 TRAINING FACILITIES, EQUIPMENT AND MATERIALS

The simulator is not a full-scope simulator as its scope does not include all open vessel operations. The nuclear model is presently limited to temperatures less than 700°C. The current core model does not take into account the new fuel configuration of the plant (MOX). The distance between the simulator and the plant does not allow effective just-in-time training on major plant evolutions.

A project to build a Work Practical Simulator on site (WPS or workshop for practical training) approved by the plant management is not yet launched after several years of delay. Without such a facility, acquiring effective work practices in a risk-free environment with the integration of radiation protection requirements is hampered. The current organisation does not facilitate the formalization of all on-the-job training (OJT) activities.

The team suggests that the organisation provide adequate facilities to ensure that practical training (OJT) is effective and documented.

2.3. QUALITY OF THE TRAINING PROGRAMMES

All trainee feedback sheets are managed through an independent external software company (using hand writing recognition), providing within a week, statistics and analysis to the relevant instructor and the TQ manager. The team considers this as a good performance.

2.4 TRAINING PROGRAMMES FOR CONTROL ROOM OPERATORS AND SHIFT SUPERVISORS

An experienced shift manager is integrated in the TQ instructor team to ensure credibility and quality of operator training. The team considers this as a good performance.

The glass simulator helps personnel to visualize physical phenomena during specific transients or during training on the industry main events (e.g. TMI accident). It also enhances training in thermodynamics and hydraulics. Several training scenarios have been developed to provide understanding of the links between plant operations and actual physical phenomena. The team considers this as a good performance.

2.8 TRAINING PROGRAMMES FOR TRAINERS

Trainers must have a technical Bachelors degree to be recruited. They then have to augment their technical experience with a formal degree in adult education instructional skills. This requirement is included in their individual training plan and it constitutes a necessary qualification, which is to be renewed every five years. Instructors are qualified (formal document) after several course deliveries for which the evaluation mark has to be greater than 7.5 over 10. The team recognizes this as a good performance.

2.9 TRAINING PROGRAMMES FOR TRAINING GROUP PERSONNEL

To reinforce understanding of work constraints from different categories of personnel, the organisation has implemented an interdepartmental training support process. For example, an experienced operator undertakes shadow training with a maintenance engineer for a full week and maintenance personnel (including technicians and mangers) and a few managers in the emergency preparedness organisation attend a four-week simulator course. The team considers this as a good performance.

2.10 GENERAL EMPLOYEE TRAINING

The plant has implemented a specific induction programme for newly recruited engineers. This is a flexible three-year training programme with a one year possible extension if necessary. Along with attending all the basic training courses, the engineer spends six to nine months in different departments in which he/she is given a specific project. This project-oriented training allows new engineers to familiarize themselves with day-to-day nuclear safety requirements as well as the soft skills to lead and manage projects. At the end of the programme the engineer makes a choice for his job position, with good organisational awareness and knowledge. The team considers this as a good performance.

DETAILED TRAINING AND QUALIFICATION FINDINGS

2.1. TRAINING POLICY AND ORGANISATION

2.1(1) Issue: The organisation processes do not consistently ensure that all staff have the necessary competencies and formal qualifications for safe operations.

- No overall qualification policy exists at the organisation level;
- No formal procedures exist to provide an assessment of the competence of all personnel (except Operations-Ops, Training and qualification-TQ and Emergency Response Organisation-ERO), including contractor personnel;
- On-the-job training (OJT) practical training is not always assessed. Therefore, controls are not in place to ensure that radiation protection (RP) and maintenance personnel are fully competent;
- Managers and some supervisors do not evaluate work practices and competency deficiencies in the field (tasks observation). Also, there is no requirement for them to provide input for training in written form;
- There is neither formalized OJT, nor formal qualification in the maintenance and monitoring departments;

– A missed re-qualification does not automatically cancel the ERO qualification;

– There are no RP formal qualifications in the maintenance department, only a few basic qualifications.

Without adequate processes to consistently ensure competencies and formal qualification for all staff, the plant cannot ensure competent resources for safety-related tasks.

Recommendation: The organisation should implement processes to consistently ensure that workers have the necessary competencies and formal qualification for safe operations.

IAEA Bases:

SSR-2/2

Requirement 7: Qualification and training of personnel

The operating organisation shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons.

4.17. Suitably qualified personnel shall be selected and shall be given the necessary training and instruction to enable them to perform their duties correctly for different operational states of the plant and in accident conditions, in accordance with the appropriate procedures.

4.18. The management of the operating organisation shall be responsible for the qualification and the competence of plant staff. Managers shall participate in determining the needs for training and in ensuring that operating experience is taken into account in the training. Managers and supervisors shall ensure that production needs do not unduly interfere with the conduct of the training programme.

4.20. Performance based programmes for initial and continuing training shall be developed and put in place for each major group of personnel (including, if necessary, external support organisations, including contractors). The content of each programme shall be based on a systematic approach. Training programs shall promote attitudes that help to ensure that safety issues receive the attention that they warrant.

NS-G-2.8

4.5. The training needs for duties important to safety should be considered a priority, and relevant plant procedures, references, resources, tools, equipment and standards should be used in the training process to ensure, as far as practicable, that errors, omissions and poor practices are not accepted. For these critical duties, the training environment should be as realistic as possible, to promote positive carry-over from the training environment to the actual job environment.

4.8. It should be the responsibility of the plant manager, with reference to each position important to safety, to ensure that:

- Training needs are continuously analysed and an overall training programme is developed;
- the training unit is provided with all necessary resources and facilities;
- The performance of all trainees is assessed at various stages of the training;
- The effectiveness of the training is evaluated;
- The competence of the persons occupying such positions is periodically checked, and continuing training or retraining is provided on a regular basis so that their level of competence is maintained;
- In allocating resources, the implementation of training programmes is given high priority.

4.9. The training unit will be responsible for assisting the plant manager in establishing, verifying and maintaining the competence of plant staff. Line managers and supervisors should be accountable for the qualification of their personnel; they should be involved in defining training needs, evaluating the job performance of personnel, providing feedback to the training department and ensuring that the training provided reflects operating experience. Managers and supervisors should ensure that production requirements do not interfere with the conduct of training programmes.

4.10. The existence of full time training staff should not relieve plant line managers of their responsibility to ensure that their workers are adequately trained and qualified. Supervisors should recognize and make provision for the training needs of their subordinates. The responsibilities and authority of training personnel, as distinct from those of line managers, should be clearly defined and understood.

4.11. Consideration should be given to enhancing training programmes for staff at ageing plants to compensate for losses of personnel due to retirement or job changes and for other reasons. Training programmes should also be adapted to accommodate the special technical, administrative and operational needs of an ageing plant.

2.2. TRAINING FACILITIES, EQUIPMENT AND MATERIAL

2.2(1) Issue: The existing training facilities do not cover all activities which can impact on nuclear and industrial safety.

The team observed the following:

- The simulator in Essen is limited both in scope e.g. no open activities, reactor temperature less than 700°C, and in fidelity e.g. differences with actual control room, no separate instructor cabinet. It is not representative of the plant main control room;
- There is no video recording system;
- There is no extended shutdown state simulation or severe accident capabilities;
- The simulator facility is located 3.5 hours' drive from Borssele. This location is a barrier to effective use as just-in-time training or validation work;
- The long term operation of the simulator is at risk due to Germany NPP's shutdown program. There is no approved project for long term operation of the simulator;
- Not all personnel receive formal practical training in RP. RP requirements are not incorporated in work practices. RP OJT is performed in the controlled area and as such, cannot be risk free;
- Human performance and maintenance OJT are mostly performed directly on the installation increasing potential risk without always allowing for thorough practical learning process;

Without effective practical training, the organisation's personnel cannot demonstrate that they can safely perform all required activities in all plant conditions.

Suggestion: The organisation should consider providing necessary training facilities to cover all activities which can impact nuclear and industrial safety.

IAEA Bases:

SSR-2/2

4.24. Adequate training facilities, including a representative simulator, appropriate training materials, and technical and maintenance training facilities shall be made available for the training of operating personnel. Simulator training shall incorporate training for plant operational states and for accident conditions.

NS-G-2.8

6.3. Representative simulator facilities should be used for the training of control room operators and shift supervisors. Simulator training should cover normal, abnormal and accident conditions.

6.4. In some States, central training facilities are available and have proved to be beneficial. The use of training facilities located in other States may involve the additional need for trainees to learn a foreign language and to master different systems of drawing standards and component identification. The use of non-reference plant simulators, on the other hand, creates an additional need to ensure, by examination or another method, that trainees are aware of the limited usefulness of some of the information given in training on a device with an instrument configuration and performance characteristics that are different from their actual working environment.

3. OPERATIONS

3.2 OPERATIONS FACILITIES AND OPERATOR AIDS

A lot of progress has been made recently by the plant to properly label the technical systems and components, nevertheless discrepancies in the labelling practices still exist. Several different components were found during the OSART plant tour and field observations with no labels, illegible labels, hand written labels, other than those authorized by the plant, or labels corrected manually. The OSART team suggests the plant develops more effective means of identifying and improving consistency of labelling.

3.4. CONDUCT OF OPERATIONS

Field operators effectively monitor equipment and systems status, and verify that important plant parameters support safe operation. Some material condition and housekeeping discrepancies were reported by the field operators, however others were not. The observed field operators walk downs have shown that daily operational practices need improvement, such as reporting minor deficiencies in the field, reducing unmanaged or uncontrolled storage areas, and assuring that operator aids are authorized. The OSART team made a suggestion in this area.

3.5 WORK AUTHORIZATIONS

The plant developed a process to verify that clearance boundaries are intact, system is deenergized, and that plant conditions will support safe completion of planned work. An added benefit of this process is improved teamwork at the plant, as involved work groups verify conditions together. This is considered as a good performance.

Field operations, plant meetings and interviews were conducted at the plant, and the team found that the work management process is not being efficiently implemented. Performance areas needing improvement are effective use of personnel resources, work schedule stability, and completion of risk reviewed work. The team recommends that the plant reinforce its expectations, and improve the work management process to ensure that personnel resources are used more effectively, improve work schedule stability, and complete the risk reviewed work plan more consistently.

3.6 FIRE PREVENTION AND PROTECTION PROGRAM

The plant exhibits good performance in the areas of training fire fighters at the plant and offsite with local fire departments, and performing a site exercise for all firefighting personnel each year. Areas that need performance improvement are personnel behaviours involving the use of fire doors, ensuring that all safety impacts are evaluated prior to propping open fire doors, accounting for combustible loading in areas containing plant safety equipment, and assessing the aggregate impact of all fire system deficiencies to ensure that the plant will be able to combat a fire successfully. The team recommends that the plant reinforce its expectations, and improve the fire protection program, to ensure that personnel behaviours are improved, fire door authorizations are more robust, and safety system integrity is not compromised.

DETAILED OPERATIONS FINDINGS

3.2. OPERATIONS FACILITIES AND OPERATOR AIDS

3.2(1) Issue: Labelling of plant equipment is not consistent in supporting plant operational personnel in proper identification of plant installed components.

Although a lot of effort was spent recently by the plant to properly label the technical systems and components, discrepancies in the labelling practice still exists.

Several different components were found during the OSART plant tour and field observations with no labels, illegible labels, hand written labels, other than those authorized by the plant, or labels corrected manually. Some examples are indicated below:

Plant walk down:

- All three safety diesels EY010, 020 and 030D001 have handmade labelling of I&C cables;
- Label of RL023S032 (emergency feed water valve) on I&C cabinet in 05/314 room is partially hand-written on a piece of paper;
- Room 02.141: HPSI pump TJ043D001 – 6kV cable is hand-written marked "2BV0";
- Room 02.302 (Reactor Coolant Pump's (RCP) oil system) – graffiti labelling of valves;
- Room 02.317. HPSI and TV systems – graffiti labelling of Containment pipe penetrations;
- Room 02.313, RCP oil system, safety valves YD002S017 and YD002S018 have a paper sticker with hand written number "6" and "5" correspondingly. Operations say they should be removed.

Inconsistent labelling can lead to potential operational errors.

Suggestion: Consideration should be given to reinforce and speed up the process of proper identification of plant's installations in order to eliminate labelling deficiencies of plant components.

IAEA Bases:

SSR-2/2

7.12. The operating organisation shall be responsible for ensuring that the identification and labelling of safety equipment and safety related equipment, rooms, piping and instruments are accurate, legible and well maintained, and that they do not introduce any degradation.

5.2. The labelling standards used should be such as to ensure that the labels are suitable for the environmental conditions in the location in which they are to be mounted and that the equipment can be unambiguously identified. The format and placement of labels should allow the operators to identify the component quickly and easily and should prevent the easy or inadvertent removal or misplacement of labels.3.4. CONDUCT OF OPERATIONS

3.4(1) Issue: The plant does not have sufficiently demanding arrangements for daily operational practices, such as reporting minor deficiencies in the field, unmanaged or uncontrolled storage, and use of unauthorized operator's aids.

During the review the team has found the following.
Not reported deficiencies in the field:

- HPSI pump, two I&C cables at TJ041V002 box are repaired with insulation tape;
- Room 02.118, Fire protection barrier in HPSI pump's room is displaced from its original position, fixed in a new place with only 50% of bolts as per design;
- Several plastic protection rings on cable's guide tubes in HPSI and LPSI pump compartments (e.g. TJ023D001) – found broken, fragmented, displaced. None of the above mentioned deficiencies on safety systems were identified during operator rounds.

Uncontrolled temporary storage areas:

- In room 05.225, a spare 6kV switch is stored in an unlabelled / unmarked place, not fixed to prevent inadvertent movement;
- In room 05.224, three spare 6kV switches are stored in an unlabelled / unmarked place, not fixed to prevent inadvertent movement;
- In room 05.227, 4 movable tables with test equipment are stored in a undesignated area, preventing access to electric cabinets of safety system;
- In room 72.301, temporary storage of instruments, personal belongings in a undesignated area;
- Unauthorized storage of materials in room 02/301;
- On the scaffolding Nb. 151329, erected in 25.8.2014- a several scaffold parts were stored on the bottom platform;
- In turbine building at Elevation 0 m., scaffolding parts are stored in an unlabelled place, parts are mixed with other metal pipes.

Unauthorized operator's aids:

- More than 10 uncontrolled copies of technological schemes, diagrams, procedures found fixed to the wall in the Field Reactor Operator's room 03/408;
- Room 10.202, Safety diesel EY030D001: Unauthorized technological scheme on cabinet DK/ UW80-81;
- Room 72.203: Unauthorized copy of a diagram;
- Entrance to 02.125 room (TA032D001) – copy of uncontrolled drawing fixed to the wall;
- Room 10.201: Unauthorized operator's aids on electric cabinet US040H001;

- Entrance to 02.125 room (TA032D001) – copy of uncontrolled drawing fixed to the wall.

Failure to detect and/or report minor equipment defects, accumulation of uncontrolled or unmanaged storage places, and use of uncontrolled documentation could lead to random unavailability of equipment and operator errors that may affect the safety of the plant.

Suggestion: The plant should consider developing and implementing a robust program to improve operational practices, such as detecting and reporting minor events, eliminate unmanaged storage places and use of operational aids.

IAEA Bases:

SSR-2/2

7.4. Operating procedures and supporting documentation shall be issued under controlled conditions, and shall be subject to approval and periodically reviewed and revised as necessary to ensure their adequacy and effectiveness. Procedures shall be updated in a timely manner in the light of operating experience and the actual plant configuration.

7.5. A system shall be established to administer and control an effective operator aids programme. The control system for operator aids shall prevent the use of non-authorized operator aids and any other non-authorized materials such as instructions or labels of any kind on the equipment, local panels, boards and measurement devices within the work areas. The control system for operator aids shall be used to ensure that operator aids contain correct information and that they are updated periodically reviewed and approved.

7.6. A clear operating policy shall be maintained to minimize the use of, and reliance on, temporary operator aids. Where appropriate, temporary operator aids shall be made into permanent plant features or shall be incorporated into plant procedures.

7.10. Administrative controls shall be established to ensure that operational premises and equipment are maintained, well lit and accessible, and that temporary storage is controlled and limited. Equipment that is degraded (owing to leaks, corrosion spots, loose parts or damaged thermal insulation, for example) shall be identified, reported and corrected in a timely manner.

NS-G-2.14

4.35. Personnel assigned the task of carrying out rounds should be made responsible for verifying that operating equipment and standby equipment operate within normal parameters. They should take note of equipment that is deteriorating and of factors affecting environmental conditions, such as water and oil leaks, burned out light bulbs and changes in building temperature or the cleanness of the air. Any problems noted with equipment should be promptly communicated to the control room personnel and corrective action should be initiated.

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

– Deterioration in material conditions of any kind, corrosion, leakage from components, accumulation of boric acid, excessive vibration, unfamiliar noise, inadequate labelling, foreign bodies and deficiencies necessitating maintenance or other action;
– Indications of deviations from good housekeeping, for example the condition of components, sumps, thermal insulation and painting, obstructions, posting of signs and directions in rooms, posting of routes and lighting, and posting and status of doors;

- Deviations in fire protection, such as deterioration in fire protection systems and the status of fire doors, accumulations of materials posing fire hazards such as wood, paper or refuse and oil leakages, or industrial safety problems such as leakages of fire resistant hydraulic fluid, hazardous equipment and trip hazards;
- Deviations in other installed safety protection devices, such as flooding protection, seismic constraints and unsecured components that might be inadvertently moved.

3.5. WORK AUTHORIZATIONS

3.5(1) Issue: The plant's expectations and work management process are not robust enough to ensure effective personnel resource usage, completion of risk reviewed work, and safe work schedule stability.

During the review team has identified the following:

- Meetings during the formal work management process are not consistently attended by all departments, in some observed cases personnel at the meetings did not have the required knowledge or decision making authority;
- Challenges to the work management process are not resolved in the site's corrective action program, leading to recurrences of past problems, and poor performance in completing risk reviewed and scheduled work. This was observed during work order 14856 when personnel propped open a fire door which caused a loss of train separation between class battery rooms. Plant maintenance personnel stated that this had happened before;
- Six planning and preparation steps in the site work management procedure (11, 25, 30, 43, 49, and 58) are being performed after the T-5 week. Not performing planning and preparation steps before T-5 results in less time to review work documents, perform job site walk downs, and to write clearances;
- KPI's for the 12 week process are not being used effectively to measure and detail the plant's performance in execution of the work management process. The root causes of poor performance and needed improvement areas are not fully identified currently.

Without consistent adherence to the work management process, and implementation of the safe work schedule in the field, the plant may be put into unsafe conditions.

Recommendation: The plant should reinforce its expectations, and improve the work management process, to ensure that personnel resources are used more effectively improve schedule stability, and complete the risk reviewed work plan more consistently.

IAEA Bases:

SSR-2/2

8.8. A comprehensive work planning and control system shall be implemented to ensure that work for purposes of maintenance, testing, surveillance and inspection is properly authorized, is carried out safely and is documented in accordance with established procedures.

NS-G-2-14;

7.4. The work control process should ensure adequate interfaces between all work groups. Operations personnel should assist the maintenance department in the planning and execution of work on plant systems and components to ensure that the reliability and availability of equipment are optimized.

7.10. Planning of work on plant systems and equipment important to safety should be well coordinated to ensure that the plant remains in a safe condition at all times and in accordance with the operational limits and conditions.

7.11. Sufficient resources should be provided for operations to guide and assist in the planning and scheduling of major work sequences. The operations management should be actively involved in the process of planning and scheduling work. Additional support should be provided to operations staff for outages and other periods of high workload.

7.9. Efforts should be made to minimize the number of extended work orders. The causes of deviations from the planned schedule should be subject to a thorough analysis to identify any necessary amendments to the system covering the planning and performance of work.

NS-G-2.6

5.36. The review programme should examine the MS&I programme for features such as:

– Adequacy of the schedule and its implementation.

3.6. FIRE PREVENTION AND PROTECTION PROGRAMME

3.6(1) Issue: The plant's fire protection and prevention program, and implementation of the program elements related to authorization of opening fire doors, personnel behaviours, and storage of combustible materials are not effective.

During the review the team has identified the following:

- In support of work order 14856, fire door 05.308 was authorized to be propped open by fire brigade personnel, and this resulted in the loss of train separation between the two safety class batteries and a reduction in ventilation effectiveness;
- The Operations Shift Team Leader was not part of the authorization process for determining if a door should have been propped open as directed by plant procedure A09-26-N022, and the site has no formal program for controlling doors and hatches;
- Plant personnel do not routinely verify that fire doors have closed and latched after they transit through the doors;
- Temporary shielding is not evaluated for fire loading impact prior to being installed in areas of the plant containing safety equipment;
- The aggregate impact of all fire protection system open deficiencies is not being evaluated to ensure fire protection system response will be adequate to meet potential fires on site.

Without improvements to the site's fire protection program, plant events may be worsened by spreading fires due to open fire doors and unintended ventilation flow paths, both of which could jeopardize safety system equipment.

Recommendation: The plant should enhance the fire protection program, to ensure that personnel behaviours are improved, fire door authorizations are more robust, and safety system integrity is not compromised.

IAEA Bases:

SSR-2/2

5.21. The arrangements for ensuring fire safety made by the operating organisation shall cover preventing the spread of those fires that have not been extinguished; and providing protection from fire for structures, systems and components that are necessary to shut down the plant safely.

NS-G-2.1

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

3.1. The operating organisation should establish a comprehensive program for fire prevention and protection to ensure that measures for all aspects of fire safety are identified, implemented, surveyed and documented throughout the entire lifetime of the plant.

6.1. Administrative procedures should be established and implemented for effective control of combustible materials throughout the plant.

7.3. Minimum acceptable levels of availability should be established and documented for all fire protection features identified as important to safety. Interim compensatory measures should be defined for each fire protection feature identified in this way.

4. MAINTENANCE

4.1. ORGANISATION AND FUNCTIONS

The maintenance organisation structure and functions are clearly defined at the plant. Maintenance leaders ensure that work order development and reviews by well-trained department personnel are being performed. The team also noted that personnel capacities and work loading are not always balanced, leading to less than optimum use of resources. Maintenance staff training ensures that qualified personnel are available to perform all scheduled work, but a formal training certificate for completion of training does not exist. The team encourages the plant to develop a method to track staffing availability so that enough work can be scheduled to reduce existing backlog of work orders.

4.2. MAINTENANCE FACILITIES AND EQUIPMENT

The plant has developed some equipment to be used during outages that results in lower doses received by workers. The plant has introduced a specific manipulator to perform ultrasonic testing of control rod drive tube welds on the reactor vessel head. The team identified this as a good practice.

4.3. MAINTENANCE PROGRAMMES

The plant use of KPI's for the maintenance organisation is only marginally effective due to not tracking key areas such as rework and not accurately reflecting the status of maintenance backlogs. The present support activities such as other maintenance in the preventive maintenance backlog are currently increasing. The team encourages the plant to perform analysis and categorization of the preventive maintenance backlog and the rework statistics in order to establish an action plan for the reduction of both.

4.4. PROCEDURES, RECORDS AND HISTORIES

The plant writes high quality work packages for complex jobs, but does not apply the tool pouch approach for minor maintenance activities, resulting in limited planning resources being used inefficiently. The plant does not effectively use technician feedback provided to improve work packages when work is completed, as there is no formal method for this feedback to be used and for resulting actions to be captured (for example changing spares requirements or procedure steps or further corrective maintenance requirements). The team encourages the plant to implement a work package process using a graded approach to work preparation, and develop a process to formalize and use feedback from technicians to improve the work packages and future planning.

4.5. CONDUCT OF MAINTENANCE WORK

The plant has a procedure and program for FME, work packages identify FME risks, and FME is covered in PJB prior to work performance. However there are some examples when high standards of FME requirements were not fully met. These examples indicate that overall principles and possible consequences are not fully understood by staff and implemented in practice. The team has made a recommendation for improvement in this area.

The team observed work in progress in the field, and on some occasions, parts and materials associated with the work package were not properly controlled, and the working area was not well marked to keep other workers out of the area. The team encourages the plant to reinforce expectations regarding control of material and work areas to protect employees and plant equipment.

4.6. MATERIAL CONDITIONS

The team performed observations and noted that the plant material condition supports safe operations. Standards and requirements related to material conditions are established in procedures, which also state how to maintain the plant and how to register and label leaks. In some cases, the team noted that high standards for material conditions were not always maintained, and examples include leaks, material corrosion, small deficiencies on equipment, and practices related to poor material selection. The team has made a suggestion in this area.

DETAILED MAINTENANCE FINDINGS

4.2. MAINTENANCE FACILITIES AND EQUIPMENT

4.2(a) Good Practice: Manipulator used for ultrasonic testing of reactor control rod drive tubes.

The plant has introduced and developed a specific manipulator for the ultrasonic test of several welds located on reactor head control rod drive tubes.

More inspections are required on the reactor control rod drive tubes, due to the latest version of the ASME code and the enhanced requirements of the ageing management program. An assessment of the material properties and behaviours has been made for all reactor control rods tube welds with and without the thermal sleeve with the new ultrasonic inspection tool, to ensure that the mechanisms and changes in material properties are known and there are no internal changes or degradation on the inside of the tubes.

The lower welds of the reactor vessel tubes are located under the thermal insulation and can only normally be reached by removing the insulation. This would give high radiation exposures and so welds were not inspected. Previously, the upper welds have been inspected several times with radiographic and penetrant method.

With the use of this new manipulator, ultrasonic inspections can be carried out for lower welds, as the manipulator is placed below the head and the probes can reach all welds on all the tubes. The manipulator includes two manipulators reaching both required diameters of 147.2 mm and 55 mm.

The inspection method was fully qualified using blind and open calibration blocks on basis of European Network for Inspection Qualification (ENIQ) requirements.

Using this new inspection manipulator the inspection time and radiation exposures received are significantly reduced.

4.5. CONDUCT OF MAINTENANCE WORK

4.5(1) Issue: Foreign material exclusion (FME) principles are not fully understood and a comprehensive FME program is not implemented.

The team made the following observations:

- One section of safety barrier around the fuel pool at 24m elevation of reactor building was missing. Incomplete barriers can allow items to be kicked or to roll into the pool;
- On the refuelling machine, at the 24m level of the reactor building, there are three folders with procedures. This results in loose paper stored above the pond which could fall in;
- A sensitive pressure measurement device (perskar) and its tools, nozzles and hose ends were not covered or plugged;
- A flange on UL02S012 and UL01S019 in the Turbine hall was found open and not protected against ingress of foreign material;
- Some components in the central warehouse and maintenance "kippenkot" have no FME protection caps;
- A four foot section of piping on the floor in the demineralization plant was found on the floor in the corner of the room and a flange of the pipe was not covered;
- Plant personnel do not always remove their equipment from working areas when work is interrupted or finished. This was observed in many rooms (including the diesel generator room). This loose equipment and tools left without appropriate controls has the potential to cause or contribute to FME events;
- FME training (Z3-EW electronic learning) is available but not used by plant staff and there is no specific authorisation for FME practices for workers.

Without effective FME program implementation and tracking, the plant is not mitigating foreign material risks which can impact safe and reliable plant operation.

Recommendation: The plant should ensure that FME principles are understood and a comprehensive FME program is implemented.

IAEA Bases:

SSR 2/2:

7.11. An exclusion programme for foreign objects shall be implemented and monitored, and suitable arrangements shall be made for locking, tagging or otherwise securing isolation points for systems or components to ensure safety.

NS-G-2.5:

3.9. The areas for the handling and storage of fresh fuel should be maintained under appropriate environmental conditions (in respect of humidity, temperature and clean air) and controlled at all times to exclude chemical contaminants and foreign materials.

3.19. Inspections should neither damage the fuel nor introduce any foreign material into it. Inspectors should identify any foreign material already present in the fuel and should remove it.

4.6. MATERIAL CONDITION

4.6(1) Issue: High standards of material condition in some plant areas are not consistently maintained.

The team made the following observations:

- EY010, 20, 30; there is oil accumulation under the diesel generators, left over from the last diesel yearly maintenance;
- All of the Turbine Bypass Steam Dump Valves have oil leaks, and some of the valves have multiple oil leaks;
- Three leaks were identified in the HP injection pump rooms (TJ44D001 – outer seal leak, TJ80S009 - leakage at drain valve plug onto floor and TJ43S020 - leakage at drain valve plug onto floor);
- In room 04/210, the safety water cooling system (VF), there is leakage on a valve flange and a pump;
- Some cables are not properly and safely terminated (one electrical cable not insulated lying on the cover of the generator and another at the hydrochloric acid tank building);
- Corrosion on components in the NaOH and HCL dosing pump area in room 09.102;
- A leak on a pipe (UA045Z001) in the Demineralization Station;
- The blind flange (RS021G003) was mounted together to the pipe stainless steel flange with very corroded carbon steel bolts and nuts;
- There were bolts missing on the cabinet covers of the electrical cabinets ER020, MD072X400 and MD072Y400 in room 72.104;
- Several examples were found where equipment or small pipe was not correctly fixed by supports (SZ20S070 in the turbine hall, pipe in the room 03/125);
- Several examples were found where stainless steel material was not correctly stored and maintained against degradation.

Degraded material conditions could lead to deterioration of safety system availability and reliability.

Suggestion: The plant should consider consistently maintaining high standards of material condition.

IAEA Bases:

SSR -2/2

Requirement 28:

The operating organisation shall develop and implement programmes to maintain a high standard of material conditions, housekeeping and cleanliness in all working areas.

7.10. Administrative controls shall be established to ensure that operational premises and equipment are maintained, well lit and accessible, and that temporary storage is controlled and limited. Equipment that is degraded (owing to leaks, corrosion spots, loose parts or damaged thermal insulation, for example) shall be identified, reported and corrected in a timely manner.

NS-G-2.6

10.17. A visual examination should be made to yield information on the general condition of the part, component or surface to be examined, including such conditions as the presence of scratches, wear, cracks, corrosion or erosion on the surface, or evidence of leaking. Any visual examination that requires a clean surface or decontamination for the proper interpretation of results should be preceded by appropriate cleaning processes.

NS-G-2.14

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

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

5. TECHNICAL SUPPORT

5.6 ORGANISATION AND FUNCTIONS

The team found that there are only 3 performance indicators in use within the Technical Support department. There are no performance indicators on the number of open modifications, or the length of time between implementing a modification and updating all documentation. The team encourages the plant to review where performance indicators may be beneficial to maintaining a strong focus.

The team found that there is no directed reading programme in place in either the Technical Support department or the Monitoring department. Therefore the team encourages the plant to implement a directed reading programme to ensure that workers are made aware of new or revised procedures.

5.7 PERIODIC SAFETY REVIEW

The recent Periodic Safety Review (PSR) (10EVA13) performed a thorough evaluation of safety systems and procedures against multiple international standards and guidelines, beyond what was required by national regulations. Additionally the review considered current state of the art technology and methods, and lessons learned from previous PSRs. The team considers this to be a good performance.

5.8 PROGRAMME FOR LONG TERM OPERATION

The plant's Long Term Operation programme made a thorough assessment of all components and the associated ageing mechanisms. The use of feedback from a SALTO review, and the assessment of active components provided good performance in this area.

5.9 SURVEILLANCE PROGRAMME

The team observed that the lack of coordination of ownership and reporting for systems, structures, and components (SSC), is leading to an incomplete overview of the status of SSCs. Operations have ownership of the testing of SSCs, Maintenance have ownership of maintaining SSCs, and Engineering have ownership of in-service inspections, however these groups do not review each other's reports. Additionally the trending and analyses of the results of maintenance, surveillance, and testing activities is inadequate, and reporting is only done on failures. This means that the opportunity to perform maintenance on deteriorating equipment before it fails could be missed. The team has made a suggestion in this area.

5.10 PLANT MODIFICATION SYSTEM

The team observed that the process for temporary modifications is not providing the necessary assessments or controls. There is no categorisation system for temporary modifications to allow for a graded approach to safety, and the initial safety assessment is not performed according to an established procedure. There is no expectation on the number or time limit for temporary modifications, and there are inconstancies in the temporary modifications database. This could lead to unapproved modifications on safety related SSCs. Additionally the labelling of temporary modifications was inadequate. The team has made a recommendation in this area.

The plant employs the Portfolio Management System in order to assess the risks associated with each proposed modification and assist in their prioritisation. The system also aides in the management of resources, and shows the availability of key resources to perform each stage of the modification. This allows for the allocation of funds and resources to the modifications which are either of the highest urgency or which will provide the most value. The team considers this to be a good performance.

It was observed by the team that the level of knowledge of the modification system of some staff who are indirectly involved in plant modifications was lacking. The team therefore encourages the plant to increase the non-expert staff's level of knowledge and awareness of the modifications system requirements and procedures.

The team observed that there are some shortfalls in the plant's programme for the control and modification of computer based systems. It was observed that small changes to the Process Presentation System (PPS) were being performed out with the modifications systems and that some of these small changes do not undergo verification. Also there is not a disaster recovery procedure for the restoration of a backup. It was found that whilst error logs were kept for the PPS these error logs did not typically undergo annual review in order to assess trends or reoccurring faults or errors. There is no offline version of the PPS on site to allow for testing of changes before they are applied to the main system, and access to the engineering terminal for the PPS was not adequately controlled. Therefore the team encourages the plant to improve its programme for the control and modification of computer based systems.

5.11 REACTOR CORE MANAGEMENT (REACTOR ENGINEERING)

The plant has no capability for core modelling. This limits the on-going assessment of core parameters which can be performed throughout a cycle. Additionally the plant has no facility to model a Xenon transient based on the actual reactor power history and conditions. The team encourages the plant to implement a core modelling and transient modelling system.

The plant currently has no route for the dispatch of failed fuel to a hot cell facility. This does not allow for the post irradiation examination of failed fuel, to establish of the cause of the fuel failure. The team encourages the plant to implement a route for the dispatch of failed fuel, so that root cause analyses can be performed on fuel failures.

DETAILED TECHNICAL SUPPORT FINDINGS

5.4. SURVEILLANCE PROGRAMME

5.4(1) Issue: The plant does not have a program which provides an adequate analysis of the results of Maintenance, Surveillance and Inspection (MS&I) activities.

The following observations were made:

- System ownership is fragmented between Maintenance and Operations, with input from Engineering;
- MS&I reports are not produced, and reporting is extremely fragmented. There is no integrated assessment of system MS&I providing a system overview;
- The owners of one aspect of a system don't read the reports of the owners of other aspects;
- Operations have developed a list detailing what aspects of each system should be prioritized but it is not distributed to Maintenance or Engineering;
- Battery voltage test results were not trended for use in preventative maintenance;
- An Operations Technician believed that the diligence of trending of test results varied over shifts;
- Operations system owners are only required to check test results against an acceptance criteria and previous result – no trending over time;
- There is no formal procedure for the trending of in-service inspection results (again results are compared to an acceptance criteria and previous results and not trended over time);
- System reports are reported by exception. They only focus on things that went wrong and don't review other areas to identify issues before they develop (reactive not proactive);
- Plant walk downs are performed on a type of component basis e.g. to look at pipe hangers, but there are no walk downs to look at individual systems;
- There is no formal process to assess equipment availability; it is performed as a set of separate functions which are not integrated.

Without an adequate analysis of MS&I activities the ability to assess adverse trends is compromised which could lead to the failure of safety related systems.

Suggestion: The plant should consider implementing a programme to provide a comprehensive assessment on the results of MS&I activities.

IAEA Bases:

SSR-2/2

8.1. Maintenance, testing surveillance and inspection programmes shall be established that include predictive, preventative and corrective maintenance activities. These maintenance activities shall be conducted to maintain availability during the service life of structures, systems and components by controlling degradation and preventing failures.

8.11. Coordination shall be maintained between maintenance groups and operations groups and support groups.

NS-G-2.6

4.12 The plant management should establish a group on the site to implement the MS&I programme.

5.24 Effective co-ordination should be established:

- Among different maintenance groups (mechanical, electrical, instrumentation and control, and civil engineering maintenance groups);

- Among the operations, radiological protection and MS&I groups; (c) Among the plant departments and contractors.

6.10. The results should be examined, where appropriate, for trends that may indicate the deterioration of equipment.

6.11. Histories of past MS&I should be used for supporting relevant activities, upgrading programmes, and optimizing the performance and improving the reliability of equipment.

6.12. Historical records of MS&I should be periodically reviewed and analysed in order to identify any adverse trends in the performance of equipment or persistent problems, to assess impacts on system reliability and to determine root causes.

5.6. PLANT MODIFICATION SYSTEM

5.6(1) Issue: The process for handling of temporary modifications does not provide adequate arrangements for their review, approval or control, to ensure that temporary modifications do not adversely affect safety.

The following observations were made:

- There is no categorisation system for temporary modifications;
- There is no plant limit or expectation on the number of temporary modifications;
- The review of temporary modifications by Technical Support is at their discretion, and no process exists to alert Technical Support to new temporary modifications before implementation;
- There are inconsistencies in the temporary modifications database;
- There is no limit on the number of extensions a temporary modification can receive;
- The Operations Manager decides whether a temporary modification is extended with no further technical review;
- The Technical Support department is not on the review list for any procedure change regarding temporary modifications;
- Maintenance technicians are the typical initiators of temporary modifications and a maintenance technician had never read the procedure for temporary modifications, and there has never been any training or directed reading on the procedure;
- Some temporary modification labels were not filled out correctly;
- A temporary modification was in the database but there was insufficient information to find the temporary modification on the plant.

Without an adequate process for the review, approval, and control of temporary modifications a modification could be implemented with an unintended negative effect on nuclear safety.

Recommendation: The plant should implement a process which provides for adequate review, approval, and control of temporary modifications, to ensure that temporary modifications are handled in a safe manner.

IAEA Bases:

SSR-2/2

4.39. A modification programme shall be established and implemented to ensure that all modifications are properly identified, specified, screened, designed, evaluated, authorized, implemented and recorded.

4.40. Modification control shall ensure the proper design, safety assessment and review, control, implementation and testing of all permanent and temporary modifications.

4.41. Temporary modifications shall be limited in time and number to minimize the cumulative safety significance.

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.

6.4. The procedure for obtaining approval to implement a temporary modification should be the same as that for a permanent modification. In the procedure for authorization of proposed temporary modifications, it should be ensured that they do not result in an unreview safety issue. In the review of proposed temporary modifications and planned permanent modifications, any existing temporary modifications and the effects of the proposed change should also be considered.

6.7. The process for temporary modifications should allow for rapid review and assessment of any proposed modifications that have to be undertaken urgently. Such urgent actions, however, should neither reduce levels of safety nor bypass the obtaining of regulatory approval as necessary.

6.9. An appropriate procedure should be established to control temporary modifications on the plant. The following areas should be covered in this procedure:

– Requirements for technical reviews, in particular safety reviews to be performed before temporary modifications are made. Temporary modifications to structures, systems and components and process software important to safety should be independently reviewed by personnel not involved in the design or implementation of the temporary modification and should be submitted for regulatory approval, as required, before implementation;

– Control of documentation, to ensure that all documentation — such as operating flow sheets, operating manuals, maintenance manuals, emergency procedures — reflects temporary modifications, to ensure that the plant continues to be operated and maintained safely while the modification is in place.

6. OPERATING EXPERIENCE FEEDBACK

6.1. ORGANISATION AND FUNCTIONS

The plant's operating experience (OE) program is not effectively identifying corrective actions needed to improve performance in a timely manner. Contributing to this performance are gaps in identifying the types of reviews required for some events, a database system that is used for trending but does not track issue owners, actions to be taken, or due dates. The team recommends that the plant should enhance its expectations and provisions in the area of OE feedback to ensure that in-house and external OE are utilized comprehensively, in a timely and effective manner.

6.5. INVESTIGATION AND ANALYSIS

The team found that analysis of some events did not always ensure that root causes are identified and consistently corrected in a timely manner. The plant procedure governing this process does not contain all needed requirements to ensure the appropriate reviews are completed. This performance gap has resulted in repeat events. The team recommends that the plant improves the quality, timeliness, and causal analysis of events.

DETAILED OPERATING EXPERIENCE FINDINGS

6.1. ORGANISATION AND FUNCTIONS

6.1(1) Issue: The plant expectations and provisions in the area of operating experience feedback do not ensure that in-house and external operating experience (OE) is utilized comprehensively, in a timely and effective manner.

- The plant safety policy lacks a statement devoted to utilization of in-house and external OE;
- The plant does not have a formal OE program;
- Qualification criteria and training requirements for the personnel reviewing OE are not established at the plant;
- OE procedures do not always include definitions, references to international standards or other plant procedures, or responsibilities of OE personnel and managers;
- Definitions and criteria for low-level events and near misses are not specified at the plant.
- The plant uses separate data bases for internal events, external events, Low Level Events (LLE), and Near Missess (NM), making it difficult to identify common issues.
- The plant's "Class Base" database does not track the person responsible for lessons learned associated actions, feedback, and final status of NM and LLE;
- The plant last performed a QA audit for the OE program in 2010/2011;
- There are nine total external events in the OE backlog from 2007, 2011, 2013, and 2014, including 1 WANO SOER, several SERs and other events. These events have not been reviewed to identify if actions are required at the plant.

Without a robust OE programme, the plant may miss opportunities to learn from in-house and external experience, which could result in diminished plant safety.

Recommendation: The plant should enhance its expectations and provisions in the area of OE feedback to ensure that in-house and external OE are utilized comprehensively, in a timely and effective manner.

IAEA Bases:

SSR-2-2

5.33. The operating experience programme shall be periodically evaluated to determine its effectiveness and to identify any necessary improvements.

NS-G-2.11

2.9. There should be a commitment from the management in the various participating organisations involved in the national operational experience feedback programme to ensure that it is efficient and effective.

2.12. A detailed procedure should be developed by the operating organisation on the basis of the requirements for a national system established by the regulatory body. This procedure should define the process for dealing with all internal and external information on events at nuclear installations. The procedure should precisely define the structure of the system for the feedback of operational experience, the types of information, the channels of communication, the responsibilities of the groups and organisations involved, and the purpose of the documentation produced. Organisations that have various roles within the national process for the feedback of operational experience usually include operating organisations, the regulatory body, plant designers and research organisations. The procedure should be made available for review or approval by the regulatory body, if so required.

10.12. Reports in the system for the feedback of operational experience should be stored in such a manner that the information they contain can be easily sorted and retrieved by both the operating organisation of the nuclear installation and the regulatory body, as appropriate. The information should be organized to facilitate frequently needed searches for, for example:

- Events at similar units;
- Systems or components that failed or that were affected;
- Identification of the causes of events;
- Identification of lessons learned;
- Identification of trends or patterns;
- Events with similar consequences for personnel or for the environment;
- Identification of failure types or human factor issues;
- Identification of recovery actions and corrective actions.

NS-G-2.4

6.67. The responsibilities, qualification criteria and training requirements of personnel performing activities to review operating experience should be clearly defined. Personnel who conduct investigations of abnormal events should be provided with training in investigative root cause analysis techniques such as accident investigation, human factor analysis (including organisational factors), management oversight and risk tree analysis, change analysis and barrier analysis. Event investigators should be...

6.64. The operating experience at the plant should be evaluated in a systematic way, primarily to make certain that no safety relevant event goes undetected. Low level events and near misses should be reported and reviewed thoroughly as potential precursors to degraded safety performance. Abnormal events important to safety should be investigated in depth to establish their direct and root causes. Methods of human performance analysis should be used to investigate human performance related events. The investigation should result in clear recommendations to plant management, which should take appropriate corrective action without undue delay to prevent recurrence.

6.5. INVESTIGATION AND ANALYSIS

6.5(1) Issue: Analysis of some events did not always ensure that the root cause is identified and are not consistently corrected in a timely manner.

- Authorized procedures, containing instructions and guidelines, for performing a full root cause analysis (RCA), an apparent cause analysis (ACA), and a trend analysis do not exist;
- The plant has a large long standing backlog of analyses of internal and external events. The backlog of unfinished analyses decreased from 77 in 2011 to 68 in 2013, and 50 in 2014;
- A procedure for performing RCA and ACA exist in a draft version at the plant;
- The plant has a backlog of category 3 and 4 reviews, which require ACA, that have not been completed within the three month plant target. The unfinished analyses include 3 from 2012, 10 from 2013, and 28 from 2014;
- Plant procedure PU-N01-07, "Analysing Internal and External Events", does not consider all the necessary factors or criteria to determine the correct type of investigation to perform;
- The plant has experienced a large number of repeat events, including 18 in 2011, 17 in 2012, 25 in 2013, and 6 events as of September 2014. This indicates that OE reviews are not resulting in lesson learned to prevent recurrence of events;
- The plant is not performing the required number of RCA due to missing requirements in the plant procedure for classifying the level of review that is needed. Examples include repeat plant events, complex plant events, and INES category 1 events;
- Between 2009 and 2011 no plant events were analysed with RCA, although 3 events were classified as meeting the INES 1 criteria;
- Analyses performed between 2009 and 2012 were not performed in a systematic manner, and the documentation for these reviews cannot be extracted from the plant database;

Plant KPI's indicate poor performance in the following areas:

- Approval of recommended actions from the OE department by the responsible departments. The target for satisfactory performance is 20 days, but the site average performance is 50 days for 2014;
- Time from receipt of OE to when recommended actions are submitted for approval. The target for satisfactory performance is 150 days, but the average for 2013 was 239 days, and 312 days for 2014.

Without timely and adequate reviews and analysis of OE, the potential exists for repeating plant events or having events that challenge plant safety.

Recommendation: The plant should improve the quality, timeliness, and causal analysis of events.

IAEA Bases:

SSR-2-2

5.28. Events with safety implications shall be investigated in accordance with their actual or potential significance. Events with significant implications for safety shall be investigated to identify their direct and root causes, including causes relating to equipment design, operation and maintenance, or to human and organisational factors. The results of such analyses shall be included, as appropriate, in relevant training programmes and shall be used in reviewing procedures and instructions. Plant event reports and non-radiation-related accident reports shall identify tasks for which inadequate training may be contributing to equipment damage, excessive unavailability of equipment, the need for unscheduled maintenance work, the need for repetition of work, unsafe practices or lack of adherence to approved procedures.

NS-G-2.4

6.64. The operating experience at the plant should be evaluated in a systematic way, primarily to make certain that no safety relevant event goes undetected. Low level events and near misses should be reported and reviewed thoroughly as potential precursors to degraded safety performance. Abnormal events important to safety should be investigated in depth to establish their direct and root causes. Methods of human performance analysis should be used to investigate human performance related events. The investigation should result in clear recommendations to plant management, which should take appropriate corrective action without undue delay to prevent recurrence.

NS-G-2.11

4.2. Accordingly, the operating organisation or licensee, as appropriate, should have procedures in place specifying the type of investigation that is appropriate for an event of any particular type. Such procedures typically outline the conduct of an investigation in terms of means of initiation, duration, composition of the investigation team, terms of reference for the investigation team and format of the final report. A typical outline of an investigation process is given in Appendix III.

4.3. The level of the investigation carried out should be commensurate with the consequences of an event and the frequency of recurring events. Significant factors that would influence the magnitude of an investigation may include the following:

- The consequences of the event and the extent of damage to systems, structures and components;
- Any injury to on-site personnel;
- Whether a similar occurrence has taken place earlier at the same installation or at an installation of a similar type;
- Whether a significant radiological release or an overexposure of personnel has occurred;
- Whether plant operation exceeded the operational limits and conditions or was beyond the design basis of the plant;
- Whether there is a pattern that is complex, unique or not well enough understood.

4.4. The scope of investigations of events should vary appropriately:

- In the case of a single serious event there should be a Panel or a Board of Inquiry chaired by a senior officer, involving many people and making extensive use of root cause analysis techniques;
- For an event with no consequences or a minor event, or for adverse trends, a relatively quick and simple investigation should be conducted by an individual trained in event investigation techniques; this latter type of investigation may result in the identification of an apparent cause only (rather than a true root cause).

4.10. The analysis of any event should be performed by an appropriate method.
It is common practice that organisations regularly involved in the evaluation process use standard methods to achieve a consistent approach for the assessment of all events. These standard methods usually involve different techniques. Each technique may have its particular advantages for cause analysis, depending on the type of failure or error. It is not possible to recommend any one single technique. Either one technique or a combination of techniques should be used in event analysis to ensure that the relevant

7. RADIATION PROTECTION

7.1 ORGANISATION AND FUNCTIONS

The Radiation Protection Programme is making progress to improve their standards and procedures. The RP department proactively seeks to support other departments in the development of procedures of work plans to improve the safety of the workers. However most of the remainder of the organisation is not currently actively contributing to efforts to reduce radiation exposure or prevent the spread of contamination. The team has made a recommendation that individuals and the other departments take greater ownership and accountability for ensuring radiological risks and exposure are maintained ALARA.

The QA programme (Radiation protection Programme) contains goals, objectives, legislative, and international references, supporting documentation references. There is no site wide approved dose reduction programme or RP improvement programme. There is an internal draft document for the RP department, but the plant is encouraged to make this a site owned programme.

Dose constraints or KPI target settings for tasks and outages are not currently independently reviewed or challenged. Authorisations for RP roles are only given in-line by one person and there are no prescribed standards for plant knowledge, attitudes or behaviours which need to be attained for the various authorisations. The plant is encouraged to review its independent oversight of these key RP activities.

Within the RP department, there are dedicated persons, who have a very high regard for personal and worker safety. They actively manage and support workers in the RCA to ensure that radiological controls are applied. They maintain a very good knowledge and overview individually and within the team about what work is going on, through the RP weekly lead, attendance at the relevant meetings and very proactive information sharing. The team has considered this as a good performance.

For RP staff, there are no practical linking training materials, courses or OJT guides which relate the learning of radiation protection to its application on a nuclear power station. The plant has started to bridge this gap and the team encourages this to continue. There is no specific radiation worker training programme to enable workers to know and understand the local rules and practical behaviours and practices which would enable them to apply better prevention techniques in the RCA for contamination control. The team encourages the plant to develop a radiation worker training programme.

7.2 RADIATION WORK CONTROL

The plant’s standards & expectations for behaviours and work practices for work in the RCA are not always set nor visible enough and are not adhered to by all workers, nor reinforced by coaching or observation in the RCA. There is a recommendation in the MOA area which reflects the team’s recommendations in this area.

The plant’s routine work in the RCA is controlled largely by a basic requirement for persons to “check-in” at the RCA entrance with a lead RP technician. This allows good conversations and face-to-face acknowledgement of the controls being imposed on the work. Nevertheless, experience at the plant and elsewhere shows that front-end planning and discussion with the radiation workers and RP together, allows better deployment of ALARA practices as is seen in the current arrangements for higher risk work. The team encourages the plant to review the arrangements for the lower risk work (e.g. RWP for routine work to contain appropriate precautions).

There are currently problems with using the work management software (asset suite 7) effectively to create the kind of Radiological Work Permits (RWPs) and instructions required. The plant is encouraged to deliver the next version of the software in collaboration with RP to ensure that it meets the needs of a functional radiological work permit system (including interaction with the EPDs).

Generally there are increasing controls applied as the radiological risk increases. The methodology of the zoning can result in a lack of appreciation of high risk areas (>2mSv/h) as they are not clearly delineated from medium risk areas (>50uSv/h) as the red zone doserate boundary is very low. The ISO standard required radiological risk signage is not currently used on all doors into the RCA and some doors can be opened to exit the RCA from the inside inadvertently by unauthorised persons without detection. The plant is encouraged to review these arrangements for protecting against spread of contamination and inadvertent entry of persons to controlled or higher risk areas.

7.3. CONTROL OF OCCUPATIONAL EXPOSURE

Routine monitoring of the plant rooms and the associated trending allows very simple and quick identification of changes in dose rates and zoning. These are well communicated through a variety of means to the whole organisation and are identified as a good performance. The availability of the 3D photographic model of the plant to ensure that workers can visualise, measure and check their work planning prior to entering high radiation zones is also a recognised good performance.

Worker practices show a disregard for the importance of radiological exposure and contamination control. Recent plant events (person entering a high neutron area and personal contamination events) demonstrate that there are deficiencies in this area. The team has made a recommendation in this area.

The current KPIs for RP assess significant events, but the plant is encouraged to trend lower level events and near misses in RP, such as contaminated items and equipment, plant contamination above action levels and capturing more detail on personal contamination events to enable detailed trending, analysis and cause identification.

7.4 RADIATION PROTECTION INSTRUMENTATION, PROTECTIVE CLOTHING, AND FACILITIES

The frequency of routine function checks (simple testing against a source) does not meet current industry standards as it is not high enough. Also there is no complete QA system supporting the tracking of equipment use and checks carried out. The team encourages the plant to review this area for improvements.

7.5. RADIOACTIVE WASTE MANAGEMENT AND DISCHARGES

There is a build-up of historical equipment (which may be contaminated) in a room in the RCA. This equipment is not labelled with any radiological or owner information nor wrapped. Active waste is segregated from “potentially clean” wastes. However, there is a lack of segregation of wastes at the source in the RCA, which results in increased amounts of sorting required later, using resources and incurring dose. The team encourages the plant to consider improving the management of active waste.

Although the plant's discharges are well within authorized levels, the plant has voluntarily set themselves lower internal targets. Performance is monitored and improved within this target, even though not required by the regulator. This is a good performance.

7.6. RADIATION PROTECTION SUPPORT DURING EMERGENCIES

There is a lack of instrumentation available for intervention teams departing from the "bunker" facility (only one teletector, meaning that only one team can deploy and only one very small contamination instrument for checking of all persons at a control point). The plant is encouraged to review (in line with the EP issues) the adequacy of monitoring instrumentation.

The fence monitoring system owned and monitored by the site is mainly passive and only contains one on-line gamma detector. Plans and funding are in place to replace this system in the next two years and the plant is encouraged to pursue this project with benefits for environmental, operational and emergency radiation protection.

DETAILED RADIATION PROTECTION FINDINGS

7.1 ORGANISATION AND FUNCTION

7.1(1) Issue: The plant workers and line management do not always take responsibility for ensuring their own or their team's radiation protection and are not held accountable when the required radiation protection behaviours and work practices are not achieved.

The team made the following observations:

- Some radiation workers do not understand the differences between radiation and contamination, nor the ways to prevent contamination spread;
- Recent events show that workers have not taken basic, simple measures to prevent personal contamination spread;
- There are very few supervisor observations of radiation workers in the RCA and no clear expectations that this should be undertaken. There is also no training given to enable them to undertake this effectively;
- A large quantity of equipment is regularly abandoned at the entrance to the hot workshop over night or over the weekend, without identification of owners, contravening management expectations for notification;
- There are only few dose reduction methods being undertaken by departments without RP initiation;
- Radiation workers did not undertake actions to reduce their dose without being prompted by RP staff (e.g. moving away from areas of elevated doserate);
- A recent significant event (entry into a room with high neutron doserate) demonstrates a lack of consideration of the importance of dose by an individual when entering a room;
- There is no requirement for departments to undertake investigations for their own staff when site dose constraints are exceeded or persons are contaminated;
- There are only department levels KPIs for dose in maintenance, not for contractors. Operations, projects or chemistry.

When workers and line management are not taking responsibility for their own radiological safety, dose is not controlled or reduced and contamination events will continue to occur.

Recommendation: The plant should take measures to ensure that all workers and line management take responsibility for ensuring their own and their team's radiation protection and should be held accountable when the required behaviours and practices are not achieved.

IAEA Bases:

SSR-2/2

5.13. All plant personnel shall understand and acknowledge their individual responsibility for putting into practice the measures for controlling exposures that are specified in the radiation protection programme. Consequently, particular emphasis shall be given to the training of all site personnel so that they are aware of radiological hazards and of the necessary protective measures.

GSR Part 3

3.79 Employers, registrants and licensees shall take such administrative actions as are necessary to ensure that workers are informed that ensuring protection and safety is an integral part of a general occupational health and safety programme in which they have specific obligations and responsibilities for their own protection and the protection of others against radiation exposure and for the safety of sources.

Requirement 22;

Compliance by workers;

Workers shall fulfil their obligations and carry out their duties for protection and safety.

NS-G-2.7

2.41. All site personnel are responsible for practicing measures to control radiation exposure.

7.3. CONTROL OF OCCUPATIONAL EXPOSURE

7.3(1) Issue: The plant's dose reduction and contamination control techniques and practices are not effective in ensuring doses and contamination spreads are as low as reasonably achievable (ALARA).

The team made the following observations:

- EPD doserate alarm is not set or used to allow individuals to be alerted to areas of higher doserates and hence reduce their doses;
- The definition of a hot spot is very high (>2.5mSv/h) which in a green zone (<10mSv/h) could represent a significant unexpected exposure;
- There is a high number of personal contamination events being recorded at the final exit of the RCA (More than 400 in the period Jan – Aug 2014);
- There is no plant wide dose reduction programme;
- Waste is sorted, handled and moved without adequate checks or labelling for doserate and contamination levels, additionally, there is a lack of use of long-handled tools and no use of extremity dosimetry where high doserates exist;
- No benchmarking is performed to other plants for outage dose reduction techniques;
- Only one camera was deployed during the 2014 outage and no remote communications were used;
- Remote monitoring of the primary circuit was undertaken in the last outage, but only one detector was deployed;
- Practical dose reduction techniques for RP staff are not used e.g. remote monitoring, cameras & communications devices;
- Limited and inconsistent production of post-job radiological survey reports;
- Loose contamination above expected levels is routinely found during surveys and when carrying out RCA clearance monitoring of tools and equipment;
- Observed behaviours during CVCS pump overhaul demonstrated a lack of good contamination control practices e.g. the following where not used: wiping, monitoring, glove changes, restriction of potential spread during search for tools;
- Room signage (zoning) is small and hard to read and is not routinely used by workers prior to room entry. It is often placed out of the line-of sight of persons entering high doserate rooms;
- Inconsistent labelling of hot-spots does not allow individuals to understand easily where the risk and hazard is and where low doserate areas are;
- The layout of the laundry does not allow a flow from a contaminated sorting table through to a clean area and contamination is often found in this area during routine surveys;
- The hot workshop & decontamination facility has no air sampling routinely undertaken.

Without utilising adequate dose reduction and contamination control methods, tools & techniques, additional unnecessary dose is accrued, workers are contaminated and contamination can spread around the plant and into the environment.

Recommendation: The plant should utilize various tools and techniques to reduce doses and control contamination more effectively in normal operations, during projects and in outages.

IAEA Bases:

SSR-2/2

5.11. The radiation protection programme shall ensure that for all operational states, doses due to exposure to ionizing radiation in the plant or doses due to any planned releases of radioactive material from the plant are kept below authorized limits and are as low as reasonably achievable.

NS-G-2.7

3.67. For the control of radiation exposure of personnel, consideration of the optimization of radiation protection is required in the design and operation of a nuclear power plant in order to keep doses as low as reasonably achievable, economic and social factors being taken into account. In line with this requirement, in examining working procedures and activities, the reduction of doses should be given the highest priority. A hierarchy of control measures should be taken into account in optimization. Firstly, removal or reduction in intensity of the source of radiation should be considered. Only after this has been done should the use of engineering means to reduce doses be considered. The use of systems of work should then be considered and, lastly, the use of personal protective equipment.
Methods of dose reduction that should be considered include:

- Reducing radiation levels in work areas, for example, by the use of temporary shielding;
- Reducing surface and airborne contamination;
- Reducing working time in controlled areas;
- Optimizing the number of workers in the work team;
- Increasing the distance from the dominant radiation source;
- Identifying low dose areas where workers can go without leaving the controlled area if their work is interrupted for a short time.

8. CHEMISTRY

8.3 CHEMISTRY SURVEILLANCE PROGRAMME

The chemistry program for radiochemical and chemical parameters to be analysed is well developed and used effectively, however the pH of feed water is not in the parameter list. The conductivity of steam generator blow-down has only one action level and no corrective actions in the parameters' list to be taken in the event of a deviance. The team encourages the plant to improve the quality control program in the Chemistry Department.

The team identified as a good performance the development of a software tool which will give advice to the technicians how to change the hydrazine dosage for control of secondary water quality.

8.5 LABORATORIES, EQUIPMENT AND INSTRUMENTS

The team identified as a good practice the environmentally controlled room in the nuclear laboratory. The accuracy of the chemistry instruments used for the analysis of samples related to plant safety is improved by their use in the environmentally controlled room.

8.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

The team identified as a good performance that the plant has access to an international database maintained by the plant designer which contains information about approved materials. The plant also has a software module for Asset Suite, the Material Safety Data Sheet, which is used to manage the receipt of goods that have possible chemical impact on the plant. The data contained in the Material Safety Data Sheet is accessible to all staff and provides easy access to chemical data for inclusion into work order packages.

The team found examples of insufficient labelling, storing, handling chemicals and hazardous materials. The plant work practices used when handling chemicals and other hazardous materials are not always effective in ensuring that risks of personnel injury and equipment damage are minimized. The team has made a suggestion in this respect.

DETAILED CHEMISTRY FINDINGS

8.5. LABORATORIES, EQUIPMENT AND INSTRUMENTS

8.5 (a) Good practice: Environmentally controlled room in the nuclear laboratory

Chemistry instruments used for analysis of samples related to plant safety are located in an environmentally controlled room. This produces more accurate and consistent results for analysed parameters on the RCS and boron storage tanks.

This room also functions as a cleanroom, because there is a continuous ventilation exhaust system, which reduces the likelihood of contaminating the samples and equipment. Better working conditions are also guaranteed, because temperature and humidity are stable and comfortable. Heat produced by the equipment in the room is removed efficiently.

The plant implemented this room in 2013 as a part of laboratory renovation. In this room the measurements that are the most sensitive to variations in temperature and humidity are undertaken. The most important measurement is for B-10 in nuclear systems, which is performed on the Inductive Coupled Plasma- Mass Spectrometer (ICP-MS). The ICP-MS is also used to measure metals in both nuclear and conventional systems. Another device in this room is the Milli-Q, which produces pure water from tap water, and is used for preparation of standard solutions used for QA checks of the ICP-MS and other equipment. Ever since operation with the ICP-MS in this room, all of the standard and background checks have been within specification.

8.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

8.6(1) Issue: The plant work practices used when handling chemicals and other hazardous materials are not always effective in ensuring that risks of personnel injury and equipment damage are minimized.

The team made the following observations:

- Face shields and gloves in building 09 were noted to be stored in a manner that would allow contamination and potential exposure to personnel when wearing the equipment;
- The plant's labelling requirements for chemicals and other hazardous materials are not met in all instances. Examples include resin samples in the building 09, hazardous materials being stored in building 70, cleaning tanks for plant security cameras, chemicals used for training and a plastic can containing petrol in building 15;
- The plant is not effectively controlling hazardous materials in all cases;
- Storing painting supplies in an unlocked container (11-283);
- Storing open iron-sulphate bags in the turbine hall;
- There is a barrel containing solid waste chemicals in the laboratory chemical store room. There is no listing of current contents of the barrel;
- The plant procedure for receipt of hydrazine allows the new chemical to be received prior to completing analysis for all contaminants. The quality certificate of the incoming hydrazine did not contain the sodium and fluoride parameters. Currently, the plant analyses for sodium and fluoride after receipt, which could lead to contamination of the entire tank;
- The plant does not consistently take pre-emptive actions to preclude the spread of hazardous chemicals to plant drainage systems during chemical offloads. There were two uncovered surface water drains near a hydrazine truck while it was being offloaded into the storage tank;
- The current method for obtaining iron-sulphate tank samples does not provide convenient access to make sure samples are taken in safe conditions.

Without following appropriate work practices with chemicals and other hazardous materials, there is a risk of personnel injury and equipment damage.

Suggestion: The plant should consider improving the work practices used when handling chemicals and other hazardous materials to reduce the risks of personnel injury, releases to the environment, and equipment damage.

IAEA Bases:

SSR-2/2

7.17. The use of chemicals in the plant, including chemicals brought in by contractors, shall be kept under close control. The appropriate control measures shall be put in place to ensure that the use of chemical substances and reagents does not adversely affect equipment or lead to its degradation.

SSG-13

9.3. The use of chemicals and other materials at the plant, including those brought to the plant by contractors, should be controlled in accordance with clearly established procedures. The intrusion of non-conforming chemicals or other substances into plant systems can result in deviations in the chemistry regime, leading to component and system damage or increase of dose rates. The use of uncontrolled materials on the surfaces of the components may also induce damage.

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

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

9.13. Management should periodically carry out walk downs of the plant to evaluate the effectiveness of the chemistry programme and to check for uncontrolled storage of chemicals.

ILO - SAFETY IN THE USE OF CHEMICALS AT WORK.

6.9.3. (b) The handling of contaminated containers. Empty containers which have not been cleansed of hazardous chemicals should be closed and stored to await disposal or reuse, and treated as if they contained those hazardous chemicals. Empty containers should retain the identification, marking and labelling of their previous contents.

9. EMERGENCY PLANNING AND PREPAREDNESS

9.1. GENERAL

The plant has created basis planning documents that identify the emergency response requirements for different scenarios. These documents cover a large spectrum of internal and external events, including security threats. However, they do not provide a justification for the timing of the activation of the Alarm Organisation or the timing of the protective actions on-site and off-site. The team encourages the plant to review the timing requirements for emergency response.

9.2. RESPONSE FUNCTIONS

There are over sixty members of staff that are trained fire-fighters. In addition, professional fire-fighters from the town Borssele, and voluntary fire-fighters from the region are mobilized quickly in the event of a fire. The team has recognized these arrangements as a good performance that gives depth to the fire-fighting organisation.

Several of the plant procedures describe arrangements that may introduce significant delays in the implementation of protective actions for on-site workers. The team recommended a review of these arrangements to ensure that on-site workers are protected in a timely manner.

9.3 INFRASTRUCTURAL ELEMENTS

Although the plant exercises regularly, there is no systematic process to ensure that all response functions are tested in exercises within a reasonable time period. In addition, some of the emergency arrangements have not been validated during an exercise and may not be effective during an emergency. The plant does not take full advantage of key performance indicators and operating experience to improve emergency preparedness. The team made a recommendation relative to the use of tools to validate all emergency functions and response capabilities.

The training arrangements for on-site personnel and external fire-fighters, ambulance, and security services are good, however the plant is encouraged to analyse the training needs for contractors potentially required to restore essential services on site or off site.

The Plant organizes six full scale drills each year to ensure that all personnel with assigned duties exercise each year. The drills include the participation of one of the shift crew at the simulator, a complete on-site response organisation and full deployment of beyond design basis emergency mitigation equipment (diesel generators or pumps). The team recognized this as a good practice.

The Plant invites a professional trainer from the local fire training centre and a trainer from the local hospital for some of the on-site drills. The team recognizes this as a good performance.

The plant organizes an annual field exercise with a brigade of the Army of the Netherlands. These exercises provide training, test and validate the arrangements for support from the Army during a severe accident. The team recognized this as a good practice.

DETAILED EMERGENCY PLANNING AND PREPAREDNESS FINDINGS

9.2. RESPONSE FUNCTIONS

9.2(1) Issue: The on-site emergency arrangements are not sufficient to ensure the timely protection of on-site workers in the event of an emergency.

The following observations were made:

- The plant's fire-fighters do not have electronic dosimeters or gamma dose rate meters at the fire-station or in their vehicles. The electronic dosimeters are only available at the entrance of the radiation controlled area;
- There are no visible numbers on buildings or doors outside the production facility. This may delay the response of emergency services such as the fire-fighters from the town of Borssele who come to assist the plant;
- There are no emergency muster points for non-essential personnel inside the perimeter fence. In an emergency, non-essential personnel must exit through the access control system at the main gate, up to three at a time, and assemble at the canteen. When all exit gates are available, it takes 20 min to evacuate 250 people. With two gates available (a common issue) and more people on-site (during an outage), it could take 45-60 min to evacuate non-essential personnel. During that time, they would be lining up outside, unsheltered;
- The procedures of the Shift Team Leader in the main control room include criteria for an orderly evacuation of the personnel in each building. However, his procedures do not allow for the urgent escape from the radiation controlled area, bypassing the inter-zone monitors. The procedure of the Site Emergency Director is the only one that contains instructions for such an escape;
- There are no habitability criteria for the main control room after the ventilation has been placed in recirculation. If the measured dose rate in the main control room > 10 μSv/h, the operators put the ventilation into recirculation to protect from ingress of contamination to the control room. However, the dose rate could remain high because the large windows in the main control room provide little shielding to exposure from the outside.

Without on-site emergency arrangements that allow timely interventions, the protection of on-site workers in the event of an emergency may be jeopardized.

Recommendation: The plant should revise its on-site emergency arrangements to ensure that the on-site workers can be protected in a timely manner.

IAEA Bases:

GS-R-2;

3.14. In designing a threat category I, II or III facility "[a] comprehensive safety analysis is carried out to identify all sources of exposure and to evaluate radiation doses that could be received by workers at the [facility] and the public, as well as potential effects on the environment…The safety analysis examines… event sequences that may lead to [an emergency]. On the basis of this analysis… requirements for emergency [preparedness and] response can be established.

3.15. [...] The threat assessment shall be so conducted as to provide a basis for establishing detailed requirements for arrangements for preparedness and response by categorizing facilities and practices consistent with the five threat categories shown in Table I.

4.12. When circumstances necessitate an emergency response, operators shall promptly determine the appropriate emergency class (see para. 4.19) or the level of emergency response and shall initiate the appropriate on-site actions. The operator shall notify and provide updated information, as appropriate, to the off-site notification point.

4.20. [...] The criteria for classification shall be predefined emergency action levels (EALs) that relate to abnormal conditions for the facility or practice concerned, security related concerns, releases of radioactive material, environmental measurements, and other observable indications (see para. 4.70). The classification system shall be established with the aim of initiating a response prompt enough to allow for effective management and the implementation of emergency operations, including mitigation by the operator, urgent protective action and the emergency protection of workers.

4.62. Arrangements shall be made for taking all practicable measures to provide protection for emergency workers for the range of anticipated hazardous conditions (see para 4.61) in which they may have to perform response functions on or off the site.

9.3 INFRASTRUCTURAL ELEMENTS

9.3(a) Good practice: The plant organizes six site-wide integrated exercises each year to ensure that all personnel with assigned duties during an emergency participate in an exercise each year.

Each exercise includes the participation of one of the shift crews at the simulator, a complete roster of personnel at the Alarm Coordination Centre, the security organisation, the maintenance organisation, the deployment of emergency mitigation equipment (diesel generators or pumps) which may involve the assistance of off-site contractors or the Army. In addition, the exercises are coordinated and conducted in collaboration with the external Emergency Response Organisations, which include: the Regional Centre of the Safety Region of Zeeland (VRZ), the nuclear regulatory body (KFD), the National Institute for Public Health and the Environment (RIVM), the National Nuclear Assessment Team (EPAn), and the crisis centre of the plant designer (Krisenstag Areva). These organisations appreciate the opportunity for all their personnel to participate to an exercise.

Once every five years, a national large scale exercise includes the participation of all ministries involved in the response to a large scale emergency, in addition to the participants to the annual exercises.

9.3(b) Good practice: The plant organizes annual exercises with the 13 Armoured Brigade of the Netherlands Armed Forces. The tests involve support by the Army for the deployment of beyond design basis emergency mitigation equipment, security, and decontamination.

After the Fukushima accident, the plant made arrangements with the 13 Armoured Brigade to provide support in crisis situations. The 13 Armoured Brigade possesses a wide range of mobile equipment and means of transport to deliver resources anywhere. Its personnel is equipped and trained to operate under harsh conditions such as those encountered during a nuclear emergency.

The agreement between the plant and the 13 Armoured Brigade includes participation in a yearly exercise where these arrangements are tested in the field. In 2012, the exercise involved the delivery of diesel fuel, a large mobile diesel generator, and operating crews during a simulated flood. During the 2013 exercise, the 13 Armoured Brigade performed monitoring and decontamination for 60 employees. It also arranged an emergency communication network. In November 2014, a third exercise is planned, which will involve radiation protection support on-site, and the off-site decontamination of vehicles that evacuated from the plant. The annual exercises also integrate a security component.

These arrangements increase the robustness of the mitigation measures that were put in place by the plant as part of the Complementary Safety-margin Assessment – the European Union stress-test.

9.3(1) Issue: The plant does not use all available tools to comprehensively validate the adequacy of the emergency functions and response capabilities.

The following observations were made:

- There is no multi-year exercise plan to ensure that all response functions are tested within a given time period;
- When workers are found to be contaminated at the outer gate, or when the gates go into dose rate alarm, workers have to be checked manually for contamination. These arrangements have not been tested recently during an exercise;
- The plant has not validated the current arrangements for radiation protection personnel during an exercise that involves contamination throughout the site;
- The iodine thyroid blocking tablets (ITB) are stored at the security office, near the main gate. According to the procedure of the Manager Support Services (MOD), the security personnel will distribute the ITB to emergency workers that remain on-site and to non-essential personnel at the canteen, which may introduce significant delays. The plant has not validated these arrangements during an exercise;
- The plant identified a pond near the coal fired station that could be used to provide cooling water; however it has never tried to draw water from it using the fire pump truck from the on-site fire station. Experience shows that strainers at the water intake point can become clogged when such alternate sources of water supply are used;
- Performance indicators for EPP are focused on exercises and training. There is a need to develop improved performance indicators that measure the effectiveness of the emergency preparedness programme;
- There is no formal review of the operating experience database during revisions of the emergency management programme. The emergency preparedness group relies on the operating experience group for issues that may require actions.

Without using all available tools to comprehensively validate the adequacy of all emergency functions and response capabilities, the plant may miss opportunities for improving the safety during emergencies.

Recommendation: The plant should comprehensively validate the adequacy of all emergency functions and response capabilities considering exercises, effectiveness reviews, performance indicators, and operating experience.

IAEA Bases:

GS-R-2

3.16. Operators, the national co-ordinating authority (see para. 3.4) and other appropriate organisations shall periodically conduct a review in order to ensure that all practices or situations that could necessitate an emergency intervention are identified, and shall ensure that an assessment of the threat is conducted for such practices or situations. This review shall be undertaken periodically to take into account any changes to the threats within the State and beyond its borders, and the experience and lessons from research, operating experience and emergency exercises (see paras 5.33, 5.37 and 5.39).

5.33. Exercise programmes shall be conducted to ensure that all specified functions required to be performed for emergency response and all organisational interfaces for facilities in threat category I, II or III and the national level programmes for threat category IV or V are tested at suitable intervals.

13. SAFETY CULTURE

13.1 GENERAL

13.1.1 Descriptive analysis

As result of the safety culture assessment at EPZ Borssele NPP for the descriptive analysis of the team identify the following:

– Artefacts

A theme of inconsistencies was observed across several parts of the organization. Specific examples are presented in the technical areas of the report.

– Shared values

Some examples of the organizations shared values include “Get it done”, “We need to be better to survive”, “We are very knowledgeable” and “My opinion is important”.

– Basic assumptions

Some examples of the organization include “We are safe”, “We are not very different from other power production companies” and “We have control”.

– Self-Image

These three elements of artefacts, shared values and basic assumptions create a “self-image” that drives the organizations performance and operate in a self-perpetuating mechanism that condemns the organization to repeat and to maintain the same inconsistencies, values and basic assumptions that provide a barrier for improvement. The non-challenging environment within the organization creates a further barrier that prevents the organization from effective and sustainable change.

The self-image in believing that we are safe regardless of what we do, contributes to an environment of acceptance. Combined with the non-challenging aspect of the culture the inconsistencies are sustained without questioning safety. “Are we safe?” should be the challenge.
This self-perpetuating mechanism challenges the organization by not considering all possible impacts on safety. The basic assumption of being safe is not challenged enough. Basic assumptions are by nature not conscious in an organization; the team believes this is the case for this organization as well.

13.1.2 Normative analysis

Once the descriptive analysis was completed the team compared the overarching themes with the IAEA Safety Culture Normative Framework and identified four themes.

– Communication

– Learning organization

– Organizational Change

- Leadership

These themes reinforce the self-perpetuating mechanism. In this way the four areas are prevented by the organizational culture to effectively contribute to continuously improve safety by not challenging the self-image.

13.2 COMMUNICATION

The Young EPZ Professionals (YEP) was established as a response to rapidly changing employee demographics, this is recognized as a good practice.
Examples of good performance in communication, identified by the team, include the Lencioni team building initiative, effective communication at the working level between different groups, a shared value that everyone's opinion is important and experienced employees openly share their views with others.
However the team also identified that the organization's communication practices do not ensure that the importance of nuclear safety is understood in all parts of the organization. The team made a recommendation in this area.

13.3 LEARNING ORGANIZATION

Examples of good performance of a learning organization, as identified by the team, included the use of operating experience in several instances, reporting mistakes is encouraged, that the threshold for reporting is perceived to be lower than in the past and safety culture activities have been initiated.
The team also identified that the organization does not realize and reinforce the importance of learning from experience. The team has made a recommendation in this area.

13.4 ORGANIZATIONAL CHANGE

A positive aspect, identified by the team, was that formal documentation on organizational change reflects an appropriate understanding of risk implication.
The team identified that changes in organizational structure, function, leadership, policies, programmes, procedures and resources do not always consider safety implications and are not effectively communicated and implemented.
The team made a recommendation in this area.

13.5 LEADERSHIP

Good performance was identified by the team in the positive relationship between supervisors and their immediate workers, and by employees expressing satisfaction and pride in working for the organization.
The team also identified that leadership for safety is not recognized throughout the organization to ensure sustainable safety performance and made a recommendation in this area.
The team recognizes that the organization has initiated several improvement activities related to human and organizational factors. These initiatives related to management, leadership and culture for safety have been formulated in a compartmentalized manner and demonstrate a lack of understanding of the necessity to consider the interaction between human, technical and organizational factors in a systemic approach to safety. Subsequently the team

encourages the organization to consider the self-perpetuating mechanism that has been identified and described in its improvement process.

DETAILED SAFETY CULTURE FINDINGS

13.2 COMMUNICATION

13.2(a) Good practice: The Young EPZ Professionals (YEP) was established as a response to rapidly changing employee demographics. YEP provides young employees with an opportunity to discuss, comment, exchange knowledge and contribute to the development of EPZ.

The arrival of many new colleagues at EPZ the past years considerably reduced the average age of employees. The particular processes and the department-oriented thinking at EPZ, however, makes it rather difficult to meet with other colleagues with whom one is not working together on a daily basis. In response to this, Young EPZ Professionals (YEP) was established by a group of motivated colleagues to help increase the communication and interaction in the organization. A kick-off meeting was held in December 2012. The target audience consists of all EPZ employees under the age of 35 which currently consists of 102 people. Fifty five of these individuals currently belong to YEP.

YEP provides young EPZ colleagues the opportunity to exchange knowledge and experience as they often face similar challenges in their daily work. By meeting regularly and facilitating discussions on current issues and developments within EPZ, YEP works to contribute positively to achieving the organization's goals to enhance personal development on the other. Discussions, think tanks and workshops are facilitated on issues such as "how to improve FME policy", "how to apply and communicate EPZ' rules of conduct" and "how to improve EPZ if you were a manager". The results of such activities are documented and formally presented to the relevant EPZ employee for his or her consideration. YEP further contributes to strengthening EPZ communication by arranging regular informal meetings with members of the EPZ management, communication with professional and functional levels within EPZ as well as various teambuilding events for EPZ members. YEP also facilitates communication and cooperation with young professional peers outside of EPZ.

Examples of results in relation to nuclear safety:

- YEP discussed the FOCUS 2 with the Senior Management team. Based on this discussion, the action plan was modified.
- YEP had a presentation on Lean Six Sigma, and after that, YEP asked for a more structured approach to implement Lean Six Sigma at EPZ. Due to this request, 4 lean six sigma projects started in 2014, and these projects are anticipated to help make significant improvements in 4 processes.
- YEP discusses with managers and workers all over the company about organizational and cultural issues. They try to break organizational barriers.

13.2(1) Issue: The organization's communication practices do not ensure that nuclear safety is understood in all parts of the organization.

The following observations were made:

- The lack of direct and open communication within and between the various management levels (corporate organization and the plant) can jeopardize nuclear safety. There are essential problems of:
  - Lack of trust;
  - Power dynamics;
  - One-way communication;
  - Top-down communication;
  - Discussions rather than dialogues.
- The lack of direct and open communication vertically throughout the organization is a critical problem due to the similar aspects mentioned above.
- The working level of the organization is not sufficiently kept formally informed, which creates a window for rumours and lack of trust. Some examples of lack of information are:
  - The vision of the future;
  - The organizational changes;
  - The departure of some managers;
  - The conditioned licence to operate, i.e. to be in the first quartile; and
  - What is going on in other departments?
- The organizations approach to communication does not close the loop to ensure that people have a shared understanding. There is:
  - Lack of three way communication;
  - Lack of requesting and providing feed-back;
  - Overreliance on email, intranet, posters, and booklets.
- The organization needs to revise the communication provided to contractors about radiological risks as there is evidence of people being concerned about working in a nuclear power plant.
- There is an attitude that problems should not be raised without solutions. This has to be attended to as it can create a "good news" culture, which filters out important safety related information.
- Many individuals, both workers and managers perceive that too much time is spent in meetings which take time away from doing work in the field.

Without clear, open and interactive communication through all parts of the organization, nuclear safety might not be fully understood.

Recommendation: The organization should improve its communication practices to ensure that the importance of nuclear safety is understood by all organization staff.

IAEA Bases:

GS-R-3

2.5. The management system shall be used to promote and support a strong safety culture by:

- Ensuring a common understanding of the key aspects of safety culture within the organization;
- Providing the means by which the organization supports individuals and teams in carrying out their tasks safely and successfully, taking into account the interaction between individuals, technology and the organization;
- Reinforcing a learning and questioning attitude at all levels of the organization;
- Providing the means by which the organization continually seeks to develop and improve its safety culture.

GS-G-3.5

2.10. Senior management should establish and promote a set of principles to be used in decision making and promoting safety conscious behaviour. Examples of such principles used in some organizations are as follows:

(a)Everyone has an impact on safety.
(b)Managers and leaders must demonstrate their commitment to safety.
(c)Trust and open communication permeate the organization.
(d)Decision making reflects putting safety first.
….
…..
(i)A proactive approach to safety is taken.
(j)Safety is constantly under review.

Appendix I

I SAFETY IS A CLEARLY RECOGNIZED VALUE

(a) The high priority given to safety is shown in documentation, communications and decision making

II LEADERSHIP FOR SAFETY IS CLEAR

(c) There is visible leadership showing the involvement of management in safety related activities

(h) Management shows a continual effort to strive for openness and good communication throughout the organization

(i) Relationships between managers and individuals are built on trust

III ACCOUNTABILITY FOR SAFETY IS CLEAR

(b) Roles and responsibilities are clearly defined and understood

IV SAFETY IS INTEGRATED INTO ALL ACTIVITIES

(a) Trust permeates the organization

(f) Factors affecting work motivation and job satisfaction are considered

(h) There is cross-functional and interdisciplinary cooperation and teamwork

V SAFETY IS LEARNING DRIVEN

(a) A questioning attitude prevails at all organizational levels

(b) Open reporting of deviations and errors is encouraged

13.3 LEARNING ORGANIZATION

13.3(1) Issue: The organization does not realize and reinforce the importance of learning from experience on the basis of an effective process.
While there are some examples that operating experience is identified, the organization is missing opportunities to use this information as part of a learning process.

The following observations were made:

- There is a perception among some employees that not enough use of operating experience from other industries is used at the plant;
- There is no human factors expertise in the organization, e.g. in the OE team;
- Use of internal and external OE is not systematically integrated into routine activities, e.g. PJB, turnovers, revision of plant's documents;
- The value of a comprehensive and effective Corrective Action Program (CAP) for plant performance improvement is not being realized;
- Managers are required to report at least 10 near misses (NM) and low-level events (LLE) per year. Other personnel must report at least 2 near miss (NM) and low-level events (LLE) per year. This information is not being tracked or trended and in several departments the managers are not meeting the requirements;
- There is reluctance on the part of supervisors to report any issue regarding organisational or behavioural aspects observed in the field;
- Corrective actions from repeat events are not always identified and Common Cause Analysis is not conducted;
- System health reports are not produced and the reporting of different aspects of systems is fragmented. There is no integrated assessment of system health provided for use in learning and understanding the status of the overall plant;
- Some of the plant's important processes do not have appropriate KPIs (EPP, risk management, and portfolio management). The use of KPIs by themselves does not ensure quality of work and this needs to be better understood and evaluated;
- There is a perception among some employees that the historical and organizational knowledge in the organization is rapidly diminishing. The implications for learning and maintaining a good knowledge base in nuclear safety is troublesome. Examples identified include:
    - Many senior people with most of the plant experience and knowledge are leaving;
    - The Engineering Department is concerned about lack of experienced engineers and knowledge with respect to the design basis of the plant;
    - There is lack of experience in core design at the plant;
    - Some skills rest with only one or two people.
- An individual's annual dose report is sent to their home but many individuals have identified that they don't know how to interpret the information.

Without realizing and reinforcing the importance of learning from experience on the basis of an effective process the organization is missing the opportunity to learn and continuously improve safety.

Recommendation: The organization should realize and reinforce the importance of learning from experience on the basis of an effective process

IAEA Bases:

GS-R-3

2.5. The management system shall be used to promote and support a strong safety culture by:

– Ensuring a common understanding of the key aspects of safety culture within the organization;

– Providing the means by which the organization supports individuals and teams in carrying out their tasks safely and successfully, taking into account the interaction between individuals, technology and the organization;

– Reinforcing a learning and questioning attitude at all levels of the organization;

– Providing the means by which the organization continually seeks to develop and improve its safety culture.

GS-G-3.1

Safety is learning driven:

– A questioning attitude prevails at all organizational levels.

– Open reporting of deviations and errors is encouraged.

– Internal and external assessments, including self-assessments, are used.

– Organizational experience and operating experience (both internal and external to the facility) are used.

– Learning is facilitated through the ability to recognize and diagnose deviations, to formulate and implement solutions and to monitor the effects of corrective actions.

– Safety performance indicators are tracked, trended, evaluated and acted upon.

– There is systematic development of individual competences.

GS-G-3.5

Appendix I

II LEADERSHIP FOR SAFETY IS CLEAR

(c) There is visible leadership showing the involvement of management in safety related activities.

(e) Management ensures that there are sufficient competent individuals.

IV SAFETY IS INTEGRATED INTO ALL ACTIVITIES

(d) The quality of processes, from planning to implementation and review, is good.

(e) Individuals have the necessary knowledge and understanding of the work processes.

V SAFETY IS LEARNING DRIVEN

(b) Open reporting of deviations and errors is encouraged.
(c) Internal and external assessments, including self-assessments, are used.
(d) Organizational experience and operating experience (both internal and external to the installation) are used.
(e) Learning is facilitated through the ability to recognize and diagnose deviations, to formulate and implement solutions and to monitor the effects of corrective actions.

13.4 ORGANIZATIONAL CHANGES

13.4(1) Issue: Changes in organizational structure, function, leadership, policies, programs, procedures, and resources do not always consider safety implications and are not effectively communicated and implemented.

The following observations were made:

- The reason for change, whether it be organizational, process, personnel or technical are not clearly communicated or understood;
- Transition of the coal plant personnel into the nuclear plant is perceived to be lacking a clear strategy. Management has not yet told the staff when it will present the plan;
- The reorganization (FOCUS 2) is perceived to be necessary because of the pressure of cutting costs to be able to operate until 2034. Concern about how to manage the pressure has resulted in rumours that management will shut down the nuclear plant earlier;
- The work management system is still not understood. Small jobs are described as difficult to perform since they have to be done in the same way as large jobs;
- There are a lot of ongoing changes such as technical modifications and organizational changes that are still not finished and it is not clear why;
- Since 2010 a considerable number of managers have changed, including 4 different plant managers, and it was not understood by plant personnel how it would improve the organization;
- The Change Management Procedure has not been applied to key organizational projects.
- Even though several information meetings with the personnel have taken place, many of the personnel believe that the organization has already implemented FOCUS 2 but in fact that change has not yet been officially conducted;
- The process of change in the organization does not consider the impact of the change on the personnel that are involved;
- Personnel describe that they are generally not involved in the organizational change process;
- Operators in the control room are getting many questions about how to do work within the new software system and work management system because of incomplete implementation and inadequate training for the personnel who must do their jobs with these systems;
- The root causes identified in the significant event related to valve in TJ031 were linked to the implementation of the work management system. Standards were insufficiently communicated, jobs were understaffed, there was insufficient management involvement, and delays in implementation;
- Decisions to implement change are originating from the upper level in the organization without the input from those who will be impacted by the change. After implementation it becomes too resource intensive to formally change the process;

- Change is often made more complex and complicated than it should be because of the informality and lack of clarity in implementation;
- AP928 originally had 35 steps when it was first implemented. After all departments provided their input (RP, CH, OPS, MA) it ended up with 75 steps. The original system had more flexibility but by adding more detail and moving away from the formal system it became more complicated;
- When people say "there has been a reorganization", people first ask- "which one"?
- The change to the work permit system has worked well in other companies but not in this organization. The personnel that knew the system the best left the company and there are a lot of things still required to complete the system. Many personnel have made their own informal modifications to make the system work for them.
- The value that everyone's opinion is important is perceived not to be in balance. It is expressed that peoples involvement in the decision-making process sometimes is hindering from moving forward. There is a difference between the less experienced personnel who want to make decisions and changes quickly with the more experienced personnel who would like to take more time.
- The plant has implemented organisational changes that impact on safety. Implementation of the Nuclear Safety section was not analysed.

Focus 3 is currently in implementation and concerns safety culture and the basis for improvement in the organization. Personnel are not aware that FOCUS 3 is ongoing and some management indicates that the new organizational structure and processes are required to start this programme. The confusion around the status of FOCUS 2 and FOCUS 3 is symptomatic of the problems in change management in the organization. Organizational changes need to be planned, controlled, communicated, monitored, tracked and recorded to ensure that safety is not compromised.

Recommendation: The organization should incorporate safety consideration in changes in organizational structure, function, leadership, policies, programs, procedures and resources and effectively communicate and implement these changes.

IAEA Bases:

GS-R-3

5.28. Organizational changes shall be evaluated and classified according to their importance to safety and each change shall be justified.

5.29. The implementation of such changes shall be planned, controlled, communicated, monitored, tracked and recorded to ensure that safety is not compromised.

GS-G-3.1

5.56. When organizational change is necessary, no reduction in the level of safety achieved should be acceptable, even for short periods of time, without appropriate justification and approval.

5.57. The drive to improve efficiency and reduce costs can result in organizational changes that can have significant safety implications. Examples of such changes are:

- Mergers of organizations, leading to a drive for harmonized standards and procedures;
- Changes in the arrangements for providing central support services;
- Reassignment of work activities, thereby increasing the likelihood that expertise in critical areas will be lost;
- Changes in the policies for recruitment, selection, induction and training of individuals;
- Reductions in the number of management levels and in the grades of individuals carrying out activities in the organization.

5.58. When major organizational changes are planned, they should be rigorously and independently scrutinized. Senior management should remain aware that it has the ultimate responsibility for safety and should ensure that safety considerations are given a priority commensurate with their significance during any process of major change.

5.60. For changes for which it is judged that potentially significant effects on safety could arise, assessments should be carried out to ensure that the following factors are considered:

- The final organizational structure should be fully adequate in terms of safety. In particular, it should be ensured that adequate provision has been made to maintain a sufficient number of trained, competent individuals in all areas critical to safety. It should also be ensured that any new processes introduced are documented with clear and well understood roles, responsibilities and interfaces. All retraining needs should be identified by carrying out a training needs analysis of each of the new roles. The retraining of key individuals should be planned. These issues are especially important if individuals from outside the organization are to be used for work that was previously carried out internally, or if their roles are to be otherwise substantially extended;
- The transitional arrangements should be fully adequate in terms of safety. Sufficient personnel with knowledge and expertise that are critical to safety should be maintained until training programmes are complete;
- Organizational changes should be made in such a way as to maintain clarity about roles, responsibilities and interfaces. Any significant departures from pre-planned transitional arrangements should be subject to further review.

5.61. Senior management should develop a specific process to manage and review organizational changes. The process should ensure that there is no degradation in the safety culture of the organization.

5.62. A safety assessment should be developed for any changes that have the potential to affect safety. For more significant changes, advice should be sought from internal and external experts.

5.64. Communication with interested parties, including individuals, should be carried out honestly and openly, addressing the safety implications and other implications of the changes and explaining the steps being taken. The appropriate mechanisms for the feedback of information to monitor the effects of the changes that are implemented should be set up.

5.65. For each change, the project leader should apply a systematic and transparent project management process, the rigour of which should be commensurate with the significance of the change. In parallel, senior management should consider the overall integration of all changes, and should oversee very significant changes that are imposed and the cumulative effects of smaller changes that may interact with each other. Effects on ongoing activities during the implementation of changes should be studied well and given careful consideration.

5.66. For each project for change proposed, the risks to the objectives of the organization, including safety, health, environmental, security, quality and economic risks, should be identified and evaluated.

5.67. The interactions between different changes should be given careful consideration. Changes that on their own may have only a limited effect on safety may combine and interact to produce much more significant effects. Where possible, different initiatives for changes that are pursued at any one time and that may affect safety should be minimized. In addition, the total workload imposed on the organization to implement the changes in parallel with continued operational activities should be given careful consideration.

5.68. The individual who has the authority to approve changes to be implemented should be clearly designated. For each change, and on the basis of the significance of the change, controls should be applied to ensure that it is possible to identify the individual in the organization who is authorized to approve the change.

GS-G-3.5

2.25. Major initiatives for changes that affect the safety culture should not be launched prematurely. A careful approach should be taken initially to ensure that everyone understands the new way of thinking and working, and to consider how the existing culture could help or hinder the new culture. The desired changes should build on the existing culture. It should be considered how the individuals who are the targets for change could be motivated to want to change, but such individuals should not become so anxious about learning new things as to resist change. Consideration should be given to how the existing culture can help the learning process and make individuals feel secure.

2.26. A major challenge in changing the safety culture is to develop a learning organization that will continually be able to make its own diagnosis, and to self-manage whatever transformations are necessary as the environment changes. An organization of this type is likely to be far more resilient and successful in dynamic, fast changing economic conditions. Ideally, all individuals should be involved in proactively contributing ideas for improvements. More sustainable approaches would involve encouraging individuals to work in teams and continually seek improvements by identifying and prioritizing actions to enhance safety in their own work areas. To facilitate this, individuals should be given the opportunity to compare their way of working with that of others, so that they are aware of what constitutes excellence in their area of work

3.23. Organizations should promulgate a policy for promoting and managing change that encompasses their vision and values. This policy for change management:

(a) Should give priority to safety;
(b) Should address all types of change;
(c) Should introduce the process for change management;

(d) Should state that only approved changes will be implemented;
(e) Should promote effective communication.

GS-G3.5
Appendix

II LEADERSHIP FOR SAFETY IS CLEAR
(g) Safety implications are considered in change management processes.

III ACCOUNTABILITY FOR SAFETY IS CLEAR
(a) An appropriate relationship with the regulatory body exists that ensures that the accountability for safety remains with the licensee.

IV SAFETY IS INTEGRATED INTO ALL ACTIVITIES
(d) The quality of processes, from planning to implementation and review, is good.
(f) Factors affecting work motivation and job satisfaction are considered.

13.5 LEADERSHIP

13.5(1) Issue: Leadership for safety is not recognized throughout the organization to ensure sustainable safety performance.

The following observations were made:

- The organization has a culture of allowing people opinions after decisions are made. This is expressed to be adding complexity as layers of details are added. This often creates delays in the implementing process, which can have a negative impact on safety;
- Personnel coming from other industries are puzzled that people at the nuclear power plant are not expected to take accountability for their actions. For example:
- Many managers do not take their role as leaders to follow up that agreed upon actions have been fulfilled;
- Several employees have stressed the fact that it is accepted that people avoid taking ownership;
- There is a general acceptance of not meeting timelines (delays in the inputs to the work management process, crane in the reactor building);
- In the survey 19% of the respondents answered that they don't think management communicates effectively about safety.
- The communication and enforcement of consequences when personnel are not fulfilling expectations or adhering to rules not being done, e.g. when a new procedure was going to be implemented an additional procedure was written on how to handle the situation when the new procedure was not followed. While there are a few examples of good leadership for safety it must be stressed that most of the managers do not spend sufficient time in the field or with the personnel. The following have been expressed by working level personnel:
    - Personnel seldom or never see managers in the field, even their own department managers;
    - The perception that managers prefer to be in meetings or hiding behind their desk;
    - Plant KPIs for managers in the field shows a decrease in the participation in several departments;
    - There is also evidence for this in the survey results as in the area within 'leadership for safety is clear' the most negatively answered question is about management visibly present in the field (negative 46%).
- Most of the interviewees and participants in the focus groups would like to see a change in the management and leadership to become better in :
    - giving clear direction and taking the lead in decisions;
    - providing personal feed-back;
    - talking to people;

  - be better in listening;
  - utilize people's knowledge before implementing new systems;
  - be more transparent (referring to rationale behind decisions and terminations of some managers);
  - resolving the collaboration problems in the senior management team;
  - understanding how to manage a power plant with reference to nuclear knowledge;
  - explain the rationale behind crucial decisions;
  - focusing on the nuclear power operations
- In general there is an underestimation of the value and importance of leadership for safety. This is described above and in the lack of program for leadership development.
- Confidence concerning operational safety in some of the senior management team despite of lack of experience.
- All levels of personnel aggressively question the management structure and its functionality. It is referred to as an upside down triangle or rowing a boat with one man rowing and seven men giving directions. A tension exists between the corporate management and the nuclear plant management, which is creating a lack of trust.

Without an effective leadership clearly expressing the value of safety in the organization there is a risk that safety does not have an overriding priority.

Recommendation: The senior management should establish an effective leadership that clearly express the value of safety to ensure sustainable safety performance.

IAEA Bases:

SSR-2/2

3.5. The management system shall integrate all the elements of management so that processes and activities that may affect safety are established and conducted coherently with other requirements, including requirements in respect of leadership, protection of health, human performance, protection of the environment, security and quality, and so that safety is not compromised by other requirements or demands.

4.2. The safety policy shall stipulate clearly the leadership role of the highest level of management in safety matters. Senior management shall communicate the provisions of the safety policy throughout the organization. Safety performance standards shall be developed for all operational activities and shall be applied by all site personnel. All personnel in the organization shall be made aware of the safety policy and of their responsibilities for ensuring safety. The safety performance standards and the expectations of the management for safety performance shall be clearly communicated to all personnel, and it shall be ensured that they are understood by all those involved in their implementation.

GS-G3.5
Appendix

I SAFETY IS A CLEARLY RECOGNIZED VALUE

(f) The high priority given to safety is shown in documentation, communications and decision making.

(g) Safety is a primary consideration in the allocation of resources.

(d) Individuals are convinced that safety and production go hand in hand.

(e) A proactive and long term approach to safety issues is shown in decision making.

(f) Safety conscious behaviour is socially accepted and supported (both formally and informally).

II LEADERSHIP FOR SAFETY IS CLEAR

(h) Senior management is clearly committed to safety:

(i) Commitment to safety is evident at all levels of management:

(j) There is visible leadership showing the involvement of management in safety related activities:

(k) Leadership skills are systematically developed:

(l) Management ensures that there are sufficient competent individuals:

III ACCOUNTABILITY FOR SAFETY IS CLEAR

(d) Management delegates responsibility with appropriate authority to enable clear accountabilities to be established:

(e) ‘Ownership’ for safety is evident at all organizational levels and for all personnel.

IV SAFETY IS INTEGRATED INTO ALL ACTIVITIES

(a) Trust permeates the organization.

(f) Factors affecting work motivation and job satisfaction are considered.

(g) Good working conditions exist with regard to time pressures, workload and stress.

(h)There is cross-functional and interdisciplinary cooperation and teamwork.

(i) Housekeeping and material conditions reflect commitment to excellence.

V SAFETY IS LEARNING DRIVEN

(a) A questioning attitude prevails at all organizational levels.

(b) Open reporting of deviations and errors is encouraged.

(f) Safety performance indicators are tracked, trended and evaluated, and acted upon.

(g) There is systematic development of individual competences.

14. SEVERE ACCIDENT MANAGEMENT

14.1 OVERVIEW OF SEVERE ACCIDENT MANAGEMENT

The development of the plant SAM Programme uses experience and results from the Pressurised Water Reactor Owners Group (PWROG). This can be considered as an optimum decision, since the PWROG approach is internationally recognized as a comprehensive and consistent set of strategies for addressing all challenges associated with severe accident. Implementation of PWROG generic guidelines to original SIEMENS KWU design required some plant modifications and support from the original plant designer (AREVA). The team encourages the plant to continue its cooperation with the supplier of original Emergency Operating Procedure (EOPs) and Severe Accident Management Guidelines (SAMG) to implement new experience and results from PWROG.

14.2 ANALYTICAL SUPPORT FOR SEVERE ACCIDENT MANAGEMENT

The original strategies are based on analyses performed during the development of the generic strategies and modified (when necessary) on a plant specific basis. The plant specific analyses used for strategy development are (a) deterministic analyses performed by AREVA during design modification, (b) PSA insights and supporting analyses performed by NRG, SCIENTECH etc. and (c) analyses for licence purpose performed by AREVA. The supporting analyses cover the progression towards severe accidents in the reactor core (both at power conditions and shutdown reactor) as well as in the spent fuel pool.
Major upgrades that are foreseen based on identified measures in the Complementary Safety Margin Assessment (CSA) will significantly influence the selection of severe accident management strategies, their timing, prioritization and effectiveness. The team encourages the plant to update the relevant analyses to address all possible influences from the proposed measures in CSA.

14.3 DEVELOPMENT OF PROCEDURES AND GUIDELINES

Accident management extends from the preventative part in the EOPs domain to the mitigating part, known as the SAMG domain. The plant specific Westinghouse based EOPs and functional restoration procedures have been implemented for preventing core damage. When working in the EOP-domain, there is a person (Deputy Shift Leader) in the main control room who monitors critical safety functions and triggers the transfer to function restoration, when exceeding a set of critical safety function criteria. The criteria for entering the SAMG domain are precisely specified for both the reactor core and the spent fuel pool. As long as the Technical Analysing Group (TAG) is not staffed or not ready to respond, the control room operators follow the severe accident control room procedures (two procedures for at-power plant initial state). The third procedure specifically for plant shutdown states is not developed yet.

Not all abnormal operation procedures and EOPs are implemented and hence the abnormal operation procedures and EOPs do not address all possible plant states. Also no formal procedure for SAM procedures and guidelines development exists. A suggestion was made by the team in this area.

Requirements for availability, allowed outage times, required actions and surveillance requirements of some SAM equipment are included in a separate Plant Technical-Specifications (BTS). The team considers this as a good practice.

The SAMGs contain attachments with system line-ups that can be used to achieve certain flow paths (mostly the non-standard flow paths not familiar to the personnel). The plant has a complete set of up-to-date process diagrams available for every system line-up that is mentioned in the SAMG and a software tool to maintain them. The team considers this also as a good practice.

14.4 PLANT EMERGENCY ARRANGEMENTS WITH RESPECT TO SAM

SAM functions and responsibilities are included in Emergency Response Organisation (ERO) and are clearly described. The ERO is structured to support all required SAM functions in the preventive and mitigative phases. The criteria, responsibilities and required time response for activation of the SAMG users are adequate. All SAMG users available would be involved if accident was progressed to severe accident. If the SAMG users are not mobilized when the transition from EOPs to SAMG is required, the control room operators use dedicated procedures until ERO members responsible for SAM are present and ready to assume their function.

The access and habitability of the corresponding locations of the teams of evaluators and implementers have been assessed from the points of view of security, industrial safety and radiation protection. The team has recognized as a good performance that information about dose rate predictions in locations of the teams of evaluators and implementers is described in the corresponding procedure.

The team has recognized as a good performance that all teams of the emergency response organisation are provided with on-line data from the process computer. On-line data is available in the main control room, in the TAG room in the ERC, in the KFD`s office and also in AREVA, Krisenstab. If normal communication means are lost, then alternative communication means are available (implemented in the scope of post-Fukushima measures).

14.5 VERIFICATION AND VALIDATION OF PROCEDURES AND GUIDELINES

EOPs are validated on the control room simulator (CRS) during operators training and there are no special sessions for validation. CRS capabilities are restricted and do not allow validation of the full range of EOPs.

Verification of the SAMGs was performed within the vendor`s QA process during the development of the guidelines. In addition the guidelines were independently reviewed by the plant staff. The validation included demonstration by analysis of feasibility and effectiveness of the proposed SAMG actions. The “table top” exercises were mainly used for a limited scope of validation.

SAM procedures and guidelines verification and validation are regularly performed, however no dedicated procedure for validation exists. The conclusions of the validation are documented in the internal database only and no systematic approach for validation process documentation exists. The plant SAMGs are not reviewed and updated on a regular basis and the plant does not use international feedback from the PWROG. When new severe accident issues occur, Westinghouse updates their generic SAMG, but this information is not systematically used at the plant. It should be emphasised that updating the SAMGs and validating them will be necessary in connection with the planned upgrading of the plant hardware features for mitigation of severe accidents. A suggestion was made by the team in this area.

14.6 TRAINING NEEDS AND TRAINING PERFORMANCE

Several kinds of training are provided to individuals and groups involved in the application of the SAMGs. The SAM personnel have adequate qualification and training to provide qualified support. The training is focused on all aspects of SAM including the analysing of a real accident by TAG and expectations from AREVA Krisenstab. Also new information is regularly provided during refresher training.

The team has recognized a good performance that the handbook for the alarm organisation specifies the requirements for qualification and training (both initial and refresher) for personnel involved in SAM.

The plant uses a specific severe accident simulator model that runs on a personal computer on a RELAP/SCDAP platform to train the ERO personnel in the use of the EOPs and SAMGs. The team considers this as a good practice.

14.7 SEVERE ACCIDENT MANAGEMENT UPDATING AND REVISIONS

The overall assessment of all existing plant SAM procedures and guidelines and the verification of the validity of existing analyses is a part of the PSR. The latest PSR (10EVA13) was finished in 2013.

As new information has become available and based on the Complementary Safety Margin Assessment the plant recognized that some procedures and guidelines needed improvement and hence the corresponding measures to enhance SAM program have been included into the stress tests action plan and approved by KFD. These measures are either focussed on the overall assessment of the existing SAM procedures and guidelines and identification of possible gaps and the enhancement or the development of additional new procedures and guidelines. The survivability of some equipment that has been installed in the past for implementation of the SAM strategies has not been analysed to ensure that during all internal and external events it will remain functional. This deficiency has been recognized by the plant and the requirements for systems enhancement are included in the stress tests action plan. The team encourages the plant to follow the requirements of the action plan and to implement all required measures.

The team has recognized as a good performance that, together with the original vendor of the plant, a comprehensive matrix was developed to relate the individual stress test measures to each other and to demonstrate that all objectives are met. The matrix demonstrates that for all the defined plant states (full power, mid-loop operation, refuelling and reactor core fully unloaded) the vital safety functions are fulfilled.

DETAILED SEVERE ACCIDENT MANAGEMENT FINDING

14.3 DEVELOPMENT OF PROCEDURES AND GUIDELINES

14.3(a) Good practice: Requirements for SAM equipment in separate Plant Technical Specifications.

Plant equipment and features intended to be used for Severe Accident Management are described in the Plant Technical Specifications (BTS in Dutch). This is a set of Technical Specifications that is separate from the formal set of Technical Specifications of requirements for the safety systems of the plant (based on NUREG 1431), but they use the same structure and layout. Availability requirements, allowed outage times, required actions and surveillance requirements are prescribed by this BTS in the same way as it is done by the formal Technical Specifications (TS). The authorisation of the BTS is carried out by the plant's Nuclear Safety Manager. Deviations from these self-imposed requirements are primarily reported to the Nuclear Safety Manager who is also authorized to grant exemption requests. The management expectation is that staff makes no distinction between the use of the TS requirements and the BTS requirements.

Benefits associated with the use of Plant Technical Specifications.

The availability of SAM equipment is controlled in a similar way to the plant's safety equipment. The management expectation that the BTS requirements must be considered as important as the Technical Specifications requirements guarantees that the SAM equipment is not neglected but well maintained. The BTS also ensures clear requirements and SMART actions to maintain or restore AM availability.

14.3(b)Good practice: Management of Severe Accident Management Guidelines (SAMG) process diagrams (PIDs) with coloured flow paths

The SAMGs contain attachments with system line-ups that can be used to achieve certain flow paths (e.g. the non-standard flow path to inject water from the containment sump into the spent fuel pool by use of a residual heat removal pump). In order to assess and to configure these possibilities during an emergency, staff will mark the flow paths on process diagrams. This work is time consuming when several flow paths are to be assessed. Therefore EPZ has a complete set of up-to-date process diagrams available for every system line-up that is mentioned in the SAMG with the intended flow path marked by a coloured line.

To consistently maintain a second set of PIDs and to keep them in accordance with the as built PIDs that are normally used is challenging. Deviations between almost identical sets of documents can easily occur. EPZ uses a CAD program to draw and alter all drawings including PIDs. The process diagrams are multi layered drawings. The coloured SAMG process diagrams are produced by using the existing digital PID layers of the according process diagrams and adding one additional coloured layer representing the intended flow path of the SAM guideline. Every time a process diagram is changed this is recorded in a database which directly informs the engineer which SAMG PIDs must be changed. Because almost all modifications to the process diagrams are minor changes, the SAMG PID can be changed by simply printing new copies of it based on the modified underlying PID and the existing coloured layer. Occasionally the coloured flow path has to be altered when a major change is made to a system. The use of the database ensures that every SAMG PID is revised when the underlying process diagram is changed. The revision number and date of the original PID are also printed on the SAMG PID this enables an easy check whether the drawing matches its source.

Benefits associated with the management of SAMG process diagrams.

The use of coloured SAMG PIDs guarantees easier and quicker assessment and configuration of possible flow paths and error reduction in the interpretation of possible system line-ups described by the SAMG attachments. The QA process for the management of the SAMG PIDs guarantees that the information in these drawings is also up to date after a plant modification and in compliance with the as built PIDs.

14.3(1) Issue: The plant abnormal operation procedures and EOPs are incomplete and do not address the scope of all possible plant states.

The team made the following observations:

- External event procedures are event oriented and do not address the impact of external events on safety functions;
- No transitions from external event procedures to SAMG are identified and implemented;
- The procedure for transition from the main control room to the emergency control room is very general and does not provide criteria and other necessary information for making the transition;

Not all sets of SAM procedures and guidelines are implemented. The following deficiencies were identified:

- EOP for spent fuel pool does not exist, only an alarm card for low spent fuel pool level is included in alarm response procedure;
- Manuals for TAG to support CR personnel if "consult plant engineering staff" in EOPs is required, do not exist.
- The plant specific procedures and guidelines have been developed based on the generic documentation and experience of staff. There is no formal procedure for their development (like plant specific author guides).

Without a full set of SAM procedures and guidelines addressing all internal and external events SAM could be ineffective.

Suggestion: The plant should consider enhancing abnormal operation procedures and EOPs to ensure that procedures are complete and address all plant states.

IAEA Bases:

Requirement 19: Accident management programme

5.8. An accident management programme shall be established that covers the preparatory measures and guidelines that are necessary for dealing with beyond design basis accidents. The accident management programme shall be documented and periodically reviewed and revised as necessary. It shall include instructions for utilization of the available equipment — safety related equipment as far as possible, but also conventional equipment — and the technical and administrative measures to mitigate the consequences of an accident. The accident management programme shall also include organizational arrangements for accident management, communication networks and training necessary for the implementation of the programme.

5.9. Arrangements for accident management shall provide the operating staff with appropriate systems and technical support in relation to beyond design basis accidents. These arrangements and guidance shall be available before the commencement of fuel loading and they shall address the actions necessary following beyond design basis accidents, including severe accidents. In addition, arrangements shall be made, as part of the emergency plan, to expand the emergency response arrangements, where necessary, to include the responsibility for long term actions.

NS-G-2.15

2.14. The approach in accident management should be based on directly measurable plant parameters or parameters derived from these by simple calculations.

2.16. Severe accidents may also occur when the plant is in the shutdown state. In the severe accident management guidance, consideration should be given to any specific challenges posed by shutdown plant configurations and large scale maintenance, such as an open containment equipment hatch. The potential damage of spent fuel both in the reactor vessel and in the spent fuel pool or in storage should also be considered in the accident management guidance. As large scale maintenance is frequently carried out during planned shutdown states, the first concern of accident management guidance should be the safety of the workforce.

3.27. Priorities should be set between strategies, because possible strategies can have a different weight and/or effect on safety, and because not all strategies can be carried out at the same time. In the preventive domain, the priority of the strategies should be reflected in the priority established for the critical safety functions. In the mitigatory domain, priority should be given to measures that mitigate large ongoing releases or challenges to important fission product barriers (where ‘large’ means releases with levels of radioactivity that are above the general emergency levels, as defined in the plant emergency plan). The basis for the selection of priorities should be recorded in the background documentation. An example is a set of priorities that follows the evolution of many severe accidents; that is, the first priority is to the first fission product barrier to fail if no mitigatory measures are taken. The setting of priorities should include the consideration of support functions (vital auxiliaries such as AC and DC power and cooling water).

3.40. Interfaces between the EOPs and the SAMGs should be addressed, and proper transition from EOPs into SAMGs should be provided for, where appropriate. Functions and actions from strategies in the EOPs that have been identified as relevant in the mitigatory domain should be identified and retained in the SAMGs. Preferably, there should be no formal transition back from the mitigatory domain (SAMGs) to the preventive domain (EOPs), once the EOPs have been exited, although EOPs may still be used as judgement dictates. Where this is nevertheless applied, it should be ensured that the EOPs considered are applicable and valid in the core damage domain, and that the decision making process includes all features necessary in the core damage or mitigatory domain. As EOPs have been designed for a reactor with an intact core, they lose, in principle, their design basis in the mitigatory domain and, hence, should be exited.

3.43. The transition point from the preventive domain to the mitigatory domain should be set at some time prior to ‘imminent core damage’ or at the ‘beginning of core damage’, or at some other well defined point (e.g. the execution of preventive measures has become ineffective or impossible). The selection of the transition point may influence the magnitude and/or sequence of subsequent challenges to fission product barriers. In such cases, this should be taken into account in the selection of the transition point which, therefore, should be placed at a point that is optimal for accident management. Where the transition point is specified on the basis of conditional criteria (i.e. the transition is made if certain planned actions in the EOPs are unsuccessful), the time necessary to identify the transition point and the possible consequences thereof should be taken into account. For example, the rise in core temperature and the associated core damage that will occur during the attempts to prevent core damage should be considered.

3.45. Procedures and guidelines should be based on directly measurable plant parameters. Where measurements are not available, parameters should be estimated by means of simple computations and/or pre-calculated graphs. Parameters that can be obtained only after carrying out complex calculations during the accident should not be used as the basis for decisions.

3.46. Procedures and guidelines should be written in a user friendly way and such that they can be readily executed under high stress conditions, and should contain sufficient detail so as to ensure that the focus is on the necessary actions. The procedures and guidelines should be written in a predefined format. Instructions to operators should be clear and unambiguous.

3.69. For dedicated or upgraded equipment, there should be sufficient confidence in the equipment and, where possible, demonstration of its capability to perform the required actions in beyond design basis and severe accident conditions should be provided. Demonstration of the capability of equipment should be provided where other assessment methods cannot provide sufficient confidence. However, the level of qualification applied to such equipment need not necessarily be the same as that typically required for components and systems that cope with design basis conditions. Similarly, requirements on the redundancy of such systems may also be relaxed compared to the requirements applied in the design basis domain.

3.71. Since the SAMGs depend on the ability to estimate the magnitude of several key plant parameters, the plant parameters needed for both preventive accident management measures and mitigatory accident management measures should be identified. It should be checked that all these parameters are available from the instrumentation in the plant. Where instruments can give information on the accident progression in a non-dedicated way, such possibilities should be investigated and included in the guidance.

14.5 VERIFICATION AND VALIDATION OF PROCEDURES AND GUIDELINES

14.5(1) Issue: Verification and validation of the SAM procedures and guidelines are not comprehensively described in any dedicated procedure and are not systematically conducted or documented.

The team made the following observations:

- The CRS is not able to simulate all plant states (e.g. shut down states);
- There is incomplete validation of major changes of EOPs at CRS before implementation;
- Formal cooperation with SAM technical owner (WEC) was terminated in 2004 and since then the EOPs maintenance has been done by plant personnel. The alignment with PWR OG EOPs changes has been lost and hence the procedures may not be at the current industry standard;
- There were no dedicated sessions organized for EOPs validation at the full scope simulator, EOPs are validated during standard operators training;
- A process for EOPs modification is implemented and used, however no dedicated procedure for verification and validation exists;
- SAMG verification was performed only during the development phase based on vendor`s QA program, no later independent verification was conducted;

Without systematic verification and validation the procedures and guidelines could lose integrity and potentially will not accomplish the original goal.

Suggestion: The plant should consider implementation of the systematic verification and validation of SAM procedures and guidelines.

IAEA Bases:

NS-G-2.15

3.99. All procedures and guidelines should be verified. Verification should be carried out to confirm the correctness of a written procedure or guideline and to ensure that technical and human factors have been properly incorporated. The review of plant specific procedures and guidelines in the development phase, in accordance with the quality assurance regulations, forms part of this verification process. In addition, independent reviews should be considered, where appropriate, in order to enhance the verification process.

3.100. All procedures and guidelines should be validated. Validation should be carried out to confirm that the actions specified in the procedures and guidelines can be followed by trained staff to manage emergency events.

3.101. Possible methods for validation of the SAMGs are the use of a full scope simulator (if available), an engineering simulator or other plant analyser tool, or a table top method. The most appropriate method should be selected. Onsite tests should be performed to validate the use of equipment. Scenarios should be developed that describe a number of fairly realistic (complex) situations that would require the application of major portions of the EOPs and the SAMGs. The scenarios encompass the uncertainties in the magnitude and timing of phenomena (both phenomena that result from the accident progression and phenomena that result from recovery actions).

3.103. The findings and insights from the verification and validation processes should be documented and used for providing feedback to the developers of procedures and guidelines for any necessary updates before the documents are brought into force by the management of the operating organisation.

14.6 TRAINING NEEDS AND TRAINING PERFORMANCE

14.6(a) Good practice: Plant specific Severe Accident Simulator

The plant has a specific severe accident simulator model that runs on a personal computer. The model runs on a RELAP/SCDAP platform with a user friendly interface consisting of 3 separate screens. One screen is an instructor screen to control the simulator, the other two screens only present plant parameters that are also presented in the main control room. The RELAP model is copied from a RELAP model that was used to perform formal safety analysis of the plant design by the original plant designer. Necessary safety systems and a simple secondary system were added to the original model to make a working simulator for training purposes. The simulator was tested and validated against the safety analysis reports made by the vendor. Overheating, gap release, melting and relocation of the model's reactor core are simulated by the SCDAP part of the model.

Benefits associated with the Plant specific Severe Accident Simulator.

This SAM simulator is used to train the Emergency Response Organisation in the use of the EOPs and SAMGs. The simulator is also used to develop severe accident scenarios for exercises in which the CRS is used. The CRS stops before fuel damage starts so exercises with use of the CRS can only be extended into core melt region when pre calculated data from the SAM simulator is used to 'simulate' the part of the scenario from where the simulator is stopped. Accident progression can also be studied with the SAM simulator to estimate the possible outcomes before formal analyses are requested from contractors.

15. CORPORATE FUNCTIONS

15.1 CORPORATE MANAGEMENT

The organisational structure including responsibilities and lines of authority have been defined and communicated in relevant documents of the organisation. It is divided between the organisation, the plant and the supporting organisation. Tasks and responsibilities are described in task descriptions and processes and procedures of the management system. The Management Board consists of the Chief Executive Officer (CEO), (who is also the license holder for Borssele NPP and represents the operating organisation) COO, CFO, head of support services, referred to collectively as the organization. Fuel Cycle Management, Nuclear Safety, Quality Assurance, Procurement, Regulatory compliance and legal affairs and communication report directly to the CEO. A Chief Nuclear Officer CNO is not part of the organisation. The CEO reports regularly to the Shareholders meeting on behalf of the Board of Directors.

The shareholders agreement does not contain separate rules about Nuclear Safety. The shareholder agreement enables the CEO to have the authority to work and react in respect to nuclear safety and is appropriate to his position as license holder.

Key senior management changed considerably since 2010. The position of the plant manager has changed four times during that time. In 2012 the position of the plant manager was divided between the responsibility for production and nuclear safety. This was necessary due to an interim manager having no nuclear experience. The Head of Nuclear Safety is not part of the independent oversight. A list of changes from organisation and plant managers in the last 5 years was observed. Organisations managers have less experience (2 years) in nuclear operation, while plant managers have gained experience between 7 and 10 years in nuclear operation.

A systematic approach for succession planning of corporate and line managers was implemented in August 2014 based on a set process (see Human Resources).

ESTABLISHING POLICIES, EXPECTATIONS AND INFLUENCING PRIORITIES, PRACTICES, BEHAVIOURS.

A 3 year business plan is issued yearly by the organisation. It is a result of the objectives of the shareholders and the organisation’s own objectives, it is communicated to the staff of the organisation and its implementation is reviewed by the organisation quarterly. Existing and possible risks are assessed in an integrated risk management methodology, sorted into different risk classes and associated with the objectives. The team recognized a Good Practice in this respect.

The results of the 3 year business plan are transferred to middle and long term actions. Attached to the business plan is a list of the planned investments. Non-technical projects, known in the plant as programmes are not included in a summarized list. The plant’s annual plan by Nuclear Operation, Financial sector and Support Services are elaborated every year. For departments more specific objectives and indicators are listed. Low level indicators are not developed at this stage due to the on-going implementation of the Integrated Management System. The annual plans also include the rough resource planning of the department. Non-technical projects in which staff members participate are mentioned. The ratio between daily operational work and additional work for non-technical projects (programmes) and technical project is not obvious. An increased work load could lead to a reduced attention on Nuclear Safety. The team made a suggestion in this respect.

Objectives in the performance evaluation forms of the staff often use high level indicators or general tasks, which are not or not easily translated in reasonable personnel contribution to Nuclear Safety. Individual Performance Indicators (IPI) or objectives for applying HP tools for workers and IPI's for supervisors to encourage workers to use HP tools are not sufficiently included in task descriptions and performance evaluations. Without implementing an effective communication of objectives and goals, the contribution of individuals will not meet the expectations of the management. The team made a recommendation in this respect.

Organisations managers participate in a "Managers in the Field Programme" (process PU-N01-03 from 31.03.2014). In 2014 for Management walk downs, 3 of 5 organisation managers and 10 of 66 managers missed the goals substantially.

MONITORING, DECISION MAKING AND CORRECTIVE ACTIONS.

A system of inspections, evaluations and assessments is implemented to ensure, that activities, processes and performance of Nuclear Operation is in compliance with existing requirements. The organisation monitors this in different steps.

The organisation is informed daily about the plant status using a form. Relating to Nuclear Safety, only one Fundamental Safety Function (Confinement of radioactive releases) is mentioned. The team encourages the organisation to address all three Fundamental Safety Functions to get a comprehensive view on Nuclear Safety.

An integrated management system is in the implementation stage. Process owners are dedicated to the processes; processes reviews are not systematically conducted by all process owners to ensure continuous improvement. Some processes do not have indicators to evaluate their effectiveness. The status of the indicators is reported monthly to the organisation. Indicators are highly aligned to the KPIs from e.g. WANO. Low level or process indicators do not exist in a structured way at this time due to the development of the Integrated Management System. The result of review and analysis of indicators is sent monthly to plants management and process owners and quarterly reviewed by the organisation. The team observed that the PIs are not always assessed in a stringent matter.

A QA programme for audits performs 10 to 15 audits / year on average. For 2014, 11 out of 12 audits have been performed to date. The number of audits in 2014 is reduced, because external assessments like WANO, OSART and Lloyd are considered in the program. In a database the results and non-conformances are recorded. Two major non-conformances from 2011 and February 2014 are still pending. Also some minor issues from 2009 are not resolved.

2 yearly and 10 yearly report of self-evaluation of changes and results in organisation, staff, operations and technique have been performed since 1994. The team reviewed the last 2 yearly reports from 2011/2012. The report includes a considerable number of suggestions for improvement made by the plant and is shared with the regulator. Some suggestions from the report have not been added to the corrective action list of plant management as required.

A structured form is used for decision making in the organisation. 41 decisions have been performed in 2014. The effectiveness of this has not been evaluated up to now. The team encourages the plant to review the effectiveness of the decisions and the decision making form appropriately.

A corrective action list is maintained by the plant management (process A01-24-N201). Since 2011 remaining actions are decreasing slowly (209 – 127). The status is reported monthly to the plant management and the indicator owners and monitored by 4 indicators; three of them are not meeting their required values. The process description describes input, output, task owners and the use of success/efficiency criteria. 127 active actions are grouped in three priorities A (4), B (97), C (4), 22 are not prioritized. The list is updated on demand, the performance indicators (PI) are updated monthly. The process requires that corrective actions of the 2 yearly reports have been integrated in the related plant management list. Due to missed input data like the owner of the action and execution date, this is not done. Performance indicators are reviewed in the organisations management quarterly. No effective corrective actions were taken by the organisation related to this issue. The team has issued a recommendation in this respect.

PROVIDING RESOURCES CONSISTENT WITH RESPONSIBILITIES.

The 3-year business plan and the annual plans of the sectors provide the scope for the investment plan and the staffing plan. Since 2009 staff has greatly increased especially in those departments related to the plant.

The organisation does not include a Chief Nuclear Officer. Functions related to Nuclear Safety are the CEO as license holder, the Head of Nuclear Safety as member of Plant Management and the Nuclear Safety Officer as member of Quality Assurance in the role of independent oversight. The Head of Nuclear Safety has to review the Nuclear Safety related activities independent from costs and schedule considerations. His operational unit has no directly assigned work forces to allow him to have flexible focus on important issues additional to his daily work. This has been recognized in the FOCUS 2 project and assigned workforce is planned in this context. The organisation is encouraged to keep this and to support the Head of Nuclear Safety discharge his responsibilities.

MANAGEMENT OF CHANGE.

For organisational changes affecting Nuclear Safety the plant performs an organisational change process PU-A01-08. The objective is to assure that the organisational changes concerned will not reduce or have a negative impact on Nuclear Safety. This safety assessment is performed by the plant quality assurance (QA) department. The process has been used twice in the frame of FOCUS 2. The last resulting report is focused on the comparison of the proposed change related to national and international regulations and existing plant documentation and does not comprehensively assess the impact on Nuclear Safety. The team has made a recommendation in this respect.

15.2 INDEPENDENT OVERSIGHT

The Independent Nuclear Oversight Officer (INO) reports to the manager of the Quality Assurance department. His role as INO is not a full-time position, as he is also developing QA tasks and functions. He has formally got direct access to the CEO, although this access has never been used to discuss safety issues to date. Direct access to the CEO would only be used if escalation was needed. Safety issues are in the first instance discussed with the plant management or with the Head of Nuclear Safety or, in some occasions, in the Plant management meetings. These options have been used several times.

There is no formal plan for the INO inspection tasks during normal operation; an “organisation-sensitive” approach is followed instead of periodically assessing standard processes. The INO focusses on the areas providing some kind of weakness or potential issue. The process to conduct his role is described in the procedure PU-A02-31. According to this procedure, the inspection plan is based on organisational goals, risks, incidents and signals coming out from operation and the organisation. For every outage period, an INO inspection plan is issued.

The recommendations issued by the INO officer in his reports are not always incorporated into the corrective action programme and are not always traceable. INO does not track them for completion, as that is the responsibility of the individual departments.

The status or results of the Human Performance Programme, leadership and culture issues and the adequacy of human resources are assessed in the yearly safety assessment in the Internal Reactor Safety Committee in which the INO officer holds an independent position. Another person in the QA department (the Operational INO officer) focuses on plant operations, whereas the INO officer assesses the fulfilment of safety policies.

The INO officer does not perform a systematic follow-up of some of the main challenges of the station, such as the FOCUS-1 project and the implementation of the work management process. INO has reviewed some technical projects, such as the MOX-project (report 1403). No process to assess the effectiveness of the independent nuclear safety oversight activities has been defined.

The team encourages the organisation to further develop the role of the INO and to reinforce all the above mentioned tasks in order to ensure that the INO assesses the level in which safety standards are maintained and improved.

15.3 Human Resources

The organisation supports the plant management by the Human Resources department in the area of strategic recruitment, management of change and organisational development (team coaching, individual coaching). Those issues are also part of the non-technical projects FOCUS 1/2/3.

Key competences are kept internalized and made accessible by a register of core functions, for which 36 have been developed. Task descriptions include a job profile with requirements for the job (including soft skills) and how they are or will be fulfilled. These documents are easily available in the document management system of the company. To ensure the availability of the appropriate number of competent staff a systematic approach is in use within the process for the succession planning PU-A11-04. The process has been implemented in August 2014, up to now 5 of 7 steps have been performed.

PROVIDING COMPETENCE, KNOWLEDGE MANAGEMENT.

The organisation sees their role in providing the register of competence. A more specific knowledge management is performed in the TQ section in 2 fields:

- Educational and work experience;
- Plant specific experience.

The organisation has implemented an individual performance assessment to evaluate annually the performance for each staff member. This is validated by an indicator, which is well in line with the required value.

The objectives in the task description observed to Nuclear Safety are not always based on the direct contribution of the employee to Nuclear Safety or easily translated into personnel objectives. The team observed that individual objectives are often issued as high level indicators like Total Core Damage Frequency, number of scrams, reports to the regulator, or unavailability. A survey from Human Resources in the task descriptions or performance evaluation forms shows that the use of Human Performance Tools, which contributes directly to Nuclear Safety, is not sufficiently included. The organisation has already started a non-technical project to provide support to the staff identifying their contribution. The team has issued a recommendation on this topic.

LABOUR RELATIONS AND UNION AFFAIRS.

A manager of the organisation is the designated spokesman to the workers' council and the unions. He communicates mainly with WENB for the collective bargaining (now a contract for two years) and the EPZ worker's council (how to reward performance assessments). Alcohol tests are randomly performed at the entrance "loge" or 100 % on the access road. Until now, drug tests are not performed. The plant is not concerned about expected strikes of key operational personnel.

Employee surveys have been performed yearly from 2005 to 2010 and in 2013. 407 out of 550 staff member participated. No surveys were planned for 2012 and 2014 due to the scheduled SCAV and OSART missions. A large number of the results of the last survey are in known range of other employee surveys done in the Netherlands. Organisation and the plant are considered as good employers, but more than half of the employee feel affected by the reorganisation. The organisation is using this information to adjust communication and performance assessments.

15.4 COMMUNICATION

The communication department reports directly to the organisation. It was founded in 2001 and since the event in Fukushima an additional person has been employed;

It is active in the area of internal communication, external communication and crisis communication. Communication is established as process A21. Its maturity has been checked. Stakeholders' satisfaction (internal/external receivers) has been checked since 2011.

The communication staff are professionals. They are included in training courses to better understand the surroundings they report on and can attend any meeting they would like to attend.

The Intranet provides channels to encourage, monitor and address employees providing feedback on the organisations/plant initiatives e.g. on FOCUS 2. A considerable number of messages were given by the organisation via the Intranet about FOCUS 2. The management asked for response, but did not receive any;

The communication department strives for the participation of general company staff in communication to open channels to get feedback about staff opinions on plant action. The organisation is encouraged to enhance its efforts to receive feedback on its programmes and initiatives;

The communication department uses own company staff for communication and development of communication tools. This increases the acceptance of the tools and makes messages more authentic. The team has issued a good practice on that topic;

Based on the areas for improvement from WANO and SCAV reviews, the communication department is participating in the development of the tool "My contribution to Nuclear

Safety”. The objective is to translate global objectives for Nuclear Safety into the contribution of the different levels of the staff. The development of the methodology has started with a first pilot and will be rolled out for the objectives in 2015;

Communication is part of the crisis management organisation. A crisis communication plan is established and used for drills. It is available in the document management system. s The document is reviewed every year. A contractor is available to support communication in the case of a crisis.

15.5 CORPORATE SUPPORT FOR INFORMATION TECHNOLOLGY (IT).

Safety related IT systems are utilized in EPZ in the Business application (BIS), Technical application (FIS) and Security application (SIS). None of these systems have a direct connection to the reactor control or the reactor protection systems.

In the CM area the BIS was observed, which is conducted by the department Information Technology. An annual plan with performance indicators (PI) is issued for incident management, problem management, configuration management, version management, change management and license management. Monthly reports about the status of the indicators in these of the areas are sent to the organisation. The indicators were checked without concerns.

The organisation has outsourced the service (servers/network, clients, infrastructure) to OGD and the Technical Application Management (TAM) of software to ATOS. These tasks are monitored by weekly or monthly meetings.

A document which includes adequate rules governing the testing and acceptance of new software is in the development phase (70 to 80% readiness of the Use Cases) at the plant. The team encourages the plant to further enhance the development of these rules.

Backup processes are performed by OGD on a daily and weekly basis. A clearly arranged procedure for back up processes exists in the QS system of CO. The tape backups are stored in fire proof safe in the CO archive and the NO archive. The CO archive is not equipped with fire detectors or fire extinguishers.

Specific training is given to the staff for new applications and how to preserve knowledge about exist applications to maintain knowledge in Borssele NPP.

15.6 CORPORATE SUPPORT IN PROJECT EXECUTION

The organisation created a department for the management of projects in 2011. The term project is understood clearly by the organisation as the execution of a technical modification or change. Changes, e.g. in the organisation, in Human Performance or continuous improvement are conducted in plant management. Those non-technical projects often are communicated as programmes.

Technical projects are recorded in common lists (e.g. Long Term investment List). Budget, milestones and risks are reassessed and communicated.

The organisation has realized that an extensive and improved reporting for technical and non-technical projects is needed. The team encourages the organisation to continue the started improvement in project management and to assess if the intended objective of creating a project department has been achieved.

For non-technical projects (programmes) the team observed a less effective approach. Not executing non-technical projects, especially in changing organisation and behaviour of staff not in an effective manner may impact Nuclear Safety in continuing operation. The team has issued a suggestion in this respect.

15.7 LICENSING AND REGULATORY INTERACTION

The organisation and the plant management has regular meetings and contacts with the regulator. This is mainly performed by the CEO, the Head of the Quality Assurance and the Head of Nuclear Safety. Actions resulting from regulatory visit or assessments are transferred in a database, which follows the actions and reports to the organisation.

The regulator does not intervene in the daily nuclear operation, but monitors the progress of modification e.g. if the modifications on the polar crane, the portal crane outside of the reactor building and the turbine building exceed the deadline the regulator will impose a penalty.

Following the plant's process for Change Management, the regulator is informed about those changes and a decision is expected. During interviews managers stated, that the regulator or conditions in the license do not require a decision or approval of the regulator as a result of the information. The organisation should define clearly its process in relation to the expected response of participated parties or organisations. The team has issued a recommendation in this respect.

DETAILED FINDINGS IN CORPORATE FUNCTIONS

15.1 CORPORATE MANAGEMENT

15.1 (a) Good Practice: Integral risk management

EPZ has a risk management officer who is responsible for development and control of integral risk management within the organisation. Integral risk management is the umbrella for all types of risks.

The starting point for the risk management is the strategic goals in the business plan. Integral risk management has the scope nuclear safety, industrial safety, plant availability, finance, compliance and employee satisfaction and assesses strategic risks, process risks, project risk and aspect risks as security and fraud.

The objective of EPZ is to integrate risk management in the processes. Risk management is already in use in the business planning process, the management decision making process, the portfolio management process (prioritizing), project management, operational experience (prioritizing), the administrative organisation and information security.

Risks for the strategic goals are classified with the EPZ risk matrix. The impact areas in the risk matrix are linked to the strategic goals and severities of the impact areas are balanced. As a result of this the response strategy is balanced. Risks are registered in a database. Main risks are reported every 3 months and discussed in the management team and in the shareholders meeting.

15.1(1) Issue: The expected contribution to Nuclear Safety for the achievement of the organisation's objectives is not effectively determined, communicated to and understood by the staff.

Although the organisation has started to develop a related programme the team observed the following:

- Objectives in the performance evaluation forms often use high level indicators (e.g. Total Core Damage Frequency, number of scrams, number of INES reports) or general tasks (preparation of OSART mission), which are not or not easily to translate in reasonable personnel contribution to Nuclear Safety;
- Reviewed performance evaluation forms from staff members on different working levels shows vague or more global goals on the lower working levels;
- Low level process based indicators, which could be used as an objective in task descriptions, are not yet developed;
- A survey by EPZ Sector Human Resources showed that the use of Human Performance Tools, which contribute to Nuclear Safety, is not implemented and required yet in the performance evaluation forms of the staff.

Without implementing effective individual objectives and goals the contribution of individuals will not meet the expectations of the management.

Recommendation: The organisation should enhance the awareness of individuals concerning the relevance and importance of their activities and of how their activities contribute to Nuclear Safety in the achievement of the organisation's objectives.

IAEA Bases:

SSR-2/2

3.2 Promoting a strong safety culture.

Strategies and management objectives shall be developed in accordance with the policy in order to put the policy into effect.

Policy making for all areas of safety, which includes:

- Setting management objectives;
- Establishing the policy for safety;

– Developing management and staff who value learning, have skills in creating, acquiring and transferring knowledge, and can adapt the organisation on the basis of new knowledge and insights; corrective actions and making improvements;

– Promoting a strong safety culture.

GS-R-3:

3.2. Senior management shall develop individual values, institutional values and behavioural expectations for the organisation to support the implementation of the management system and shall act as role models in the promulgation of these values and expectations.

3.3. Management at all levels shall communicate to individuals the need to adopt these individual values, institutional values and behavioural expectations as well as to comply with the requirements of the management system.

3.4. Management at all levels shall foster the involvement of all individuals in the implementation and continual improvement of the management system.

3.8. Senior management shall establish goals, strategies, plans and objectives that are consistent with the policies of the organisation.

3.9. Senior management shall develop the goals, strategies, plans and objectives of the organisation in an integrated manner so that their collective impact on safety is understood and managed.

3.10. Senior management shall ensure that measurable objectives for implementing the goals, strategies and plans are established through appropriate processes at various levels in the organisation.

4.4. Senior management shall ensure that individuals are competent to perform their assigned work and that they understand the consequences for safety of their activities. Individuals shall have received appropriate education and training, and shall have acquired suitable skills, knowledge and experience to ensure their competence. Training shall ensure that individuals are aware of the relevance and importance of their activities and of how their activities contribute to safety in the achievement of the organisation's objectives.

15.1(2) Issue: Corrective actions are not treated in accordance with plant procedures and not controlled effectively by the organisations management

- In plant management corrective action list is used (process A01-24-N201). The process is reviewed by four indicators; 3 of 4 indicators do not meet their threshold;
- 3 priorities (A, B, C) are defined. In priority A two non-conformances from 2011 (outage preparation) and February 2014 (EPP responsibilities) are pending, which are not fully implemented and dated;
- The CEO as license holder and representative of the operating organisation uses the indicators of the plant management list to review quarterly the corrective actions. Although 3 of 4 indicators for the plant management corrective action list did not meet their objectives no action was taken by the organisation;
- The process requires that corrective actions from the 2 yearly evaluation report for the years 2011/2012 are collected in the plant management list. The report is requested by the regulator. A considerable number of deviations have been recorded in this 2 yearly report. The suggestions made by plant management have not been recorded as corrective actions in the plant management list as required by the plants process. This is due to missed input data like owner of the action, success criteria and finalization date.

Without implementing, regularly reviewing and assessing corrective actions to carry out the activities connected to nuclear safety in the organisation, the plant will miss opportunities achieving its goals and objectives and improving safety performance.

Recommendation: The operating organisation should implement, regularly review and assess an appropriate corrective action programme to monitor and review the safety performance.

IAEA Bases:

SSR-2/2

Requirement 9:

Monitoring and review of safety performance

The operating organisation shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organisation.

4.37. The appropriate corrective actions shall be determined and implemented as a result of the monitoring and review of safety performance. Progress in taking the corrective actions shall be monitored to ensure that actions are completed within the appropriate timescales. The completed corrective actions shall be reviewed to assess whether they have adequately addressed the issues identified in audits and reviews.

GS-R-3:

6.11. The causes of non-conformances shall be determined and remedial actions shall be taken to prevent their recurrence.

6.12. Products and processes that do not conform to the specified requirements shall be identified, segregated, controlled, recorded and reported to an appropriate level of management within the organisation. The impact of non-conformances shall be evaluated and non-conforming products or processes shall be either:

- Accepted;
- Reworked or corrected within a specified time period; or
- Rejected and discarded or destroyed to prevent their inadvertent use.

6.13. Concessions granted to allow acceptance of a non-conforming product or process shall be subject to authorization. When non-conforming products or processes are reworked or corrected, they shall be subject to inspection to demonstrate their conformity with requirements or expected results.

6.14. Corrective actions for eliminating non-conformances shall be determined and implemented. Preventive actions to eliminate the causes of potential non-conformances shall be determined and taken.

6.15. The status and effectiveness of all corrective and preventive actions shall be monitored and reported to management at an appropriate level in the organisation.

6.16. Potential non-conformances that could detract from the organisation's performance shall be identified. This shall be done: by using feedback from other organisations, both internal and external; through the use of technical advances and research; through the sharing of knowledge and experience; and through the use of techniques that identify best practices.

15.1(3) Issue: The change management process is not effectively used to support changes in the organisation.

Although a change management process (PU-A01-08) is part of the Integrated Management System (IMS) of the station the team observed the following:

- FOCUS 2 is processed as a non-technical project (operational programme). The resulting document for FOCUS 2 assessing the impact on Nuclear Safety does not address for example the total workload imposed on the organisation to implement the changes in parallel with continued operational activities;
- Steps in the process are not defined appropriately (e.g. classification of importance of changes, integration of and expectation to the regulator, feedback cycle for given comments) and could be misinterpreted;
- Task descriptions, which include functions and responsibilities of sections that had changes in 2009 (e.g. Plant Manager NO and Head of Nuclear Safety) have not been promptly updated. Some task descriptions have been reviewed with a considerable delay;
- No preliminary safety evaluation was performed prior to the implementation of the role of the Head of Nuclear Safety Section;
- The Internal Nuclear Safety Committee has given comments on the proposed changes. The feedback about resolving their comments is rated as not satisfied.

Without conducting an appropriate change management processes the organisation cannot ensure a safe and effective transition.

Recommendation: The organisation should use and implement the process for managing complex organisational changes.

IAEA Bases:

SSR-2/2

3.2 The management system, as an integrated set of interrelated or interacting components for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner, shall include the following activities:

(b) Allocation of responsibilities with corresponding lines of authority and communication, for:

- Allocating resources;
- Providing human resources with the appropriate level of education and;

– training and material resources;
– Retaining the necessary competences;
– Approving the contents of management programmes;
– Developing procedures and instructions, and having a strict policy to;
– Adhere to these procedures and instructions;
– Setting policies on fitness for duty;
– Establishing a programme to make the necessary changes to any of these
– Functions on the basis of the performance in achieving objectives.

GS-R-3

5.28. Organisational changes shall be evaluated and classified according to their importance to safety and each change shall be justified.

5.29. The implementation of such changes shall be planned, controlled, communicated, monitored, tracked and recorded to ensure that safety is not compromised.

GS-G-3.1

5.60. For changes for which it is judged that potentially significant effects on safety could arise, assessments should be carried out to ensure that the following factors are considered….

5.61. Senior management should develop a specific process to manage and review organisational changes. The process should ensure that there is no degradation in the safety culture of the organisation.

5.67. The total workload imposed on the organisation to implement the changes in parallel with continued operational activities should be given careful consideration.

15.4 COMMUNICATION

15.4(a) Good Practice: Engagement of own employees in the performance of internal and external communication / virtual tour on the organisations website

– DEVELOPMENT OF COMMUNICATION TOOLS.

EPZ consult staff for suggestions or new tools for communication, as they know best where improvement is needed in the communication on the shop floor to develop their engagement.

On safety communication a working group, which consists of representatives of several departments "It is your safety too!" comes up with suggestions for the communication of actual safety themes (e.g. special toolbox presentations, articles for the internal magazine, illustration for the screens). An example is the short movie about Nuclear Safety, which marked the start of the yearly outage and was highly appreciated by employees.

– CONDUCTING INTERNAL & EXTERNAL COMMUNICATION.

EPZs Communications department uses only EPZ's own employees in all internal and external communication tools. In this way the tools are recognizable for EPZ staff, the public and interested parties. The use of pictures of colleagues creates both engagement with their colleagues and pride. Employees can show their contribution to a corporate culture

– THE ORGANISATIONS WEBSITE INCLUDING FACT SHEETS AND VIRTUAL TOUR.

Organisations website offers a virtual tour with plant pictures and pictures of their own employees. EPZ website is open for questions from the public, which are promptly addressed with reliable, factual information in a comprehensible way. EPZ factsheets and illustrations are often used by the media and will be used by the regional authorities for purposes of crisis communication.

15.6 CORPORATE SUPPORT IN PROJECT EXECUTION

15.6(1) Issue: The management (planning, coordination and treatment) of non-technical projects (called programmes) is not structured consistently with the treatment of technical projects.

Operational projects include technical and non-technical initiatives e.g. to enhance Human Performance or to implement organisational changes. For the coordination of technical projects a specific department was founded, it uses a structured process and professional methodology as base for its work. However the team observed the following facts:

- In interviews managers described the different treatment, definition and information between technical and non-technical projects (called programmes);
- No integrated action plan with a complete list of non-technical projects is available at the corporate management;
- Resources required from departments for projects are assessed in depth only for several large technical projects;
- Middle management stated that they receive less periodic or comprehensive information on the status of budget, the results, risks or mile stones of the non-technical projects;
- Priorities for non-technical projects and contributions are not based on a risk assessment and not fully identified.

Not to coordinate and treat non-technical projects in accordance to appropriate standards may impact Nuclear Safety in continuing operational activities.

Suggestion: The organisation should consider reinforcing the coordination and treatment of operational non-technical projects appropriately.

IAEA Bases:

GS-R-3

5.1. The processes of the management system that are needed to achieve the goals, provide the means to meet all requirements and deliver the products of the organisation shall be identified, and their development shall be planned, implemented, assessed and continually improved.

5.28. Organisational changes shall be evaluated and classified according to their importance to safety and each change shall be justified.

5.29. The implementation of such changes shall be planned, controlled, communicated, monitored, tracked and recorded to ensure that safety is not compromised.

GS-G-3.1

5.60. For changes for which it is judged that potentially significant effects on safety could arise, assessments should be carried out to ensure that the following factors are considered.

5.61. Senior management should develop a specific process to manage and review organisational changes. The process should ensure that there is no degradation in the safety culture of the organisation.

5.67. The total workload imposed on the organisation to implement the changes in parallel with continued operational activities should be given careful consideration.

ANNEX 1: THE OSART SAFETY CULTURE ASSESSMENT METHODOLOGY

INTRODUCTION

Safety culture assessment differs from other types of assessment in that it requires a deeper understanding of the underlying organizational and cultural issues behind what is explicitly observed and reported. A safety culture assessment does not lead to a clear-cut and easily actionable result, but will lead to an increased understanding of why different issues related to safety appear.

Safety culture needs to be understood in the light of its complexity. No safety culture is perfect; every organization has its areas for improvements. The objective of a safety culture assessment is to identify positive practices and areas that need attention.

METHODOLOGY

The methodology used for the safety culture assessment is divided into two parts sequentially divided:

A descriptive part to identify the cultural expressions (facts[1]) and themes -; and

A normative part to evaluate cultural themes (issues[2]) against the IAEA framework of safety culture.

The critical aspect of the methodology is to hold the descriptive and the normative analyses separate until the final part of the assessment. This ensures the identification of the vital aspects of the culture before the scope is narrowed into the fixed normative framework. It is essential to avoid a check-list-type-of-audit, where the assessors are directly comparing the findings against the normative framework in the initial part of the assessment.

The following six methods are used to collect data:

- Document review;
- Questionnaire;
- Interviews;
- Focus groups;
- Observations;
- Team findings.

The figure below describes the methodology analysis process. Each method for collecting data is treated separately to ensure validity of the results. The normative analysis starts when the overarching issues are identified. Earlier in the process the data collection and analysis are performed in a descriptive manner.

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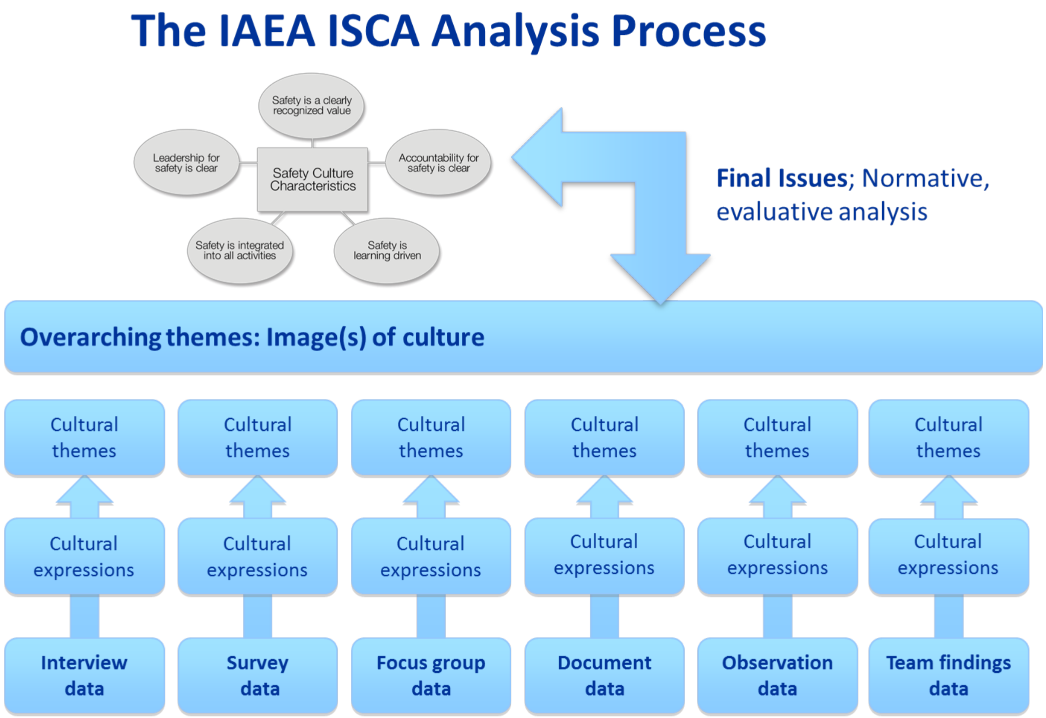
1 To align with the OSART terminology cultural expressions will be named **facts**

2 To align with the OSART terminology normative cultural themes will be named **issues.**



Proper implementation of a safety culture assessment requires five critical elements:

– Theoretical basis;
– Valid methodology;
– Appropriate expertise ;
– Descriptive data;
– Internationally recognized safety standards.

Within the assessment three senior management workshops are conducted to ensure a shared understanding of the findings and results.

BASIS OF THE RESULTS

The results of the safety culture assessment are based on:

– Document review of the Advanced Information Package for the OSART as well as additional documentation requested during the on-site data collection;
– The IAEA Safety Culture Perception Questionnaire administered to all the employees associated with the organization;
– Interviews representing all different functions and organizational levels;
– Focus groups conducted across the organization representing all departments and levels;
– Observations including regularly scheduled meetings, shift turn-overs, work activities and plant tours;
– All the team findings in the daily reports of the OSART missions were included.

DESCRIPTIVE ANALYSIS

The descriptive analysis was conducted using the Schein (1992) model of culture.

According to Schein's three-level model, an organization's culture can be assessed by evaluating the organization's artefacts, values, and basic assumptions. The metaphor of an iceberg is often used to help explain the concepts. Above the level of the water, on the first level of the model the organization's artefacts are found. Artefacts are the observable signs and behaviours of the organization and represent only a small portion of the whole culture. Below the surface of the water is the second level that consists of the organization's values. Examples of values might include such things as, "safety first" or "maintaining an open reporting work environment." Deep in the water and the majority of the iceberg is the third level which contains the basic assumptions of the organization. Examples of basic assumptions may include, "safety can always be improved" or "everyone can contribute to safety." The organization's basic assumptions are less tangible than the artefacts and values. They are often unconscious and taken for granted within the organization sharing the culture.

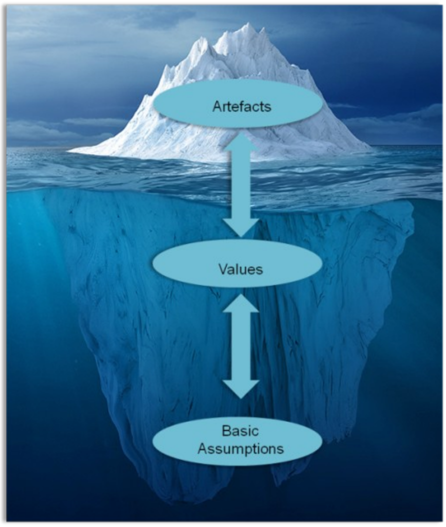


Figure 1: Schein's model of the levels of culture

NORMATIVE ANALYSIS

Once the descriptive analysis was completed the team compared the overarching themes with the IAEA Safety Culture Normative Framework describe in the Safety Standards GSR3, GS-G-3.1 and GS-G-3.5.

DEFINITIONS

DEFINITIONS – OSART MISSION

Recommendation

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

Suggestion

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

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

Good practice

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

- Novel;
- Has a proven benefit;
- Replicable (it can be used at other plants);
- Does not contradict an issue.

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

Note: An item may not meet all the criteria of a ‘good practice’, but still be worthy to take note of. In this case it may be referred 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.

– LIST OF IAEA REFERENCES (BASIS)

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– SAFETY STANDARDS

- **SF-1;** Fundamental Safety Principles (Safety Fundamentals);
- **GSR Part 3;** Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, Interim Edition;
- **SSR-2/1;** Safety of Nuclear Power Plants: Design (Specific Safety Requirements);
- **SSR-2/2;** Safety of Nuclear Power Plants: Operation and Commissioning (Specific 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 Organisation 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-2.11;** 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);
- **SSG-13;** Chemistry Programme for Water Cooled Nuclear Power Plants (Specific Safety Guide);

- **SSG-25;** Periodic Safety Review for Nuclear Power Plants (Specific Safety Guide);
- **GSR;** Part 1 Governmental, Legal and Regulatory Framework for Safety (General Safety Requirements);
- **GS-R-2;** Preparedness and Response for a Nuclear or Radiological Emergency (Safety Requirements);
- **GS-R-3;** The Management System for Facilities and Activities (Safety Requirements);
- **GSR Part 4;** Safety Assessment for Facilities and Activities (General Safety Requirements 2009);
- **GS-G-4.1;** Format and Content of the Safety Analysis report for Nuclear Power Plants (Safety Guide 2004);
- **SSG-2;** Deterministic Safety Analysis for Nuclear Power Plants (Specific Safety Guide 2009);
- **SSG-3;** Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants (Specific Safety Guide 2010);
- **SSG-4;** Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants (Specific Safety Guide 2010);
- **GS-R Part 5;** Predisposal Management of Radioactive Waste (General Safety Requirements);
- **GS-G-2.1;** Arrangement for Preparedness for a Nuclear or Radiological Emergency (Safety Guide);
- **GSG-2;** Criteria for Use in Preparedness and Response for a Nuclear and Radiological Emergency;
- **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);
- **SSR-5;** Disposal of Radioactive Waste (Specific Safety Requirements);
- **GSG-1;** Classification of Radioactive Waste (Safety Guide 2009);
- **WS-G-6.1;** Storage of Radioactive Waste (Safety Guide);
- **WS-G-2.5;** Predisposal Management of Low and Intermediate Level Radioactive Waste (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;
- **INSAG-25;** A Framework for an Integrated Risk Informed Decision Making Process;
- **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;
- **Safety Report Series No. 57**; Safe Long Term Operation of Nuclear Power Plants.
  - 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).

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– TEAM COMPOSITION OF THE OSART MISSION

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- **GEST, Pierre – IAEA**
- Division of Nuclear Installation Safety
  Years of Nuclear Experience: 35
- Review area: Team Leader
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- **MARTYNENKO, Yury - IAEA**
- Division of Nuclear Installation Safety
  Years of nuclear experience: 30
- Review area: Deputy Team Leader
-
- **BASSING, Gerd - Germany**
- Years of nuclear experience: 44
- Review area: Corporate functions
-
- **GALLES, Qim - Spain**
- ANAV (Asociación Nuclear Ascó-Vandellòs)
- Years of nuclear experience: 15
- Review area: Management, Organisation and Administration
-
- **BISCHOFF, Gerard - France**
- Slovenske elektrane, a.s.
- Years of nuclear experience: 32
- Review area: Training and Qualification
-
- **POLYAKOV, Alex– IAEA**
- Division of Nuclear Installation Safety
  Years of nuclear experience: 29
- Review area: Operations 1
-
- **SHARRETT, Lance– United States of America**
- Palo Verde Nuclear Power Plant
- Years of nuclear experience: 31
- Review area: Operations 2
-
- **BUJAN, Miroslav- Slovak Republic**
- Slovenske Elektrarne
- Years of nuclear experience: 26
- Review area: Maintenance
-
- **LE GROVE, Rob – United Kingdom**
  EDF Energy – Hinkley Point B Power Station
  Years of nuclear experience: 6

- Review area: Technical Support
-
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- **PAVLIN, Darko – Slovenia**
- Slovenian Nuclear Safety Administration
- Years of nuclear experience: 9
- Review area: Operating Experience
-
- **HALE, Heather– United Kingdom**
- EDF Energy – Nuclear New Build
- Years of nuclear experience: 12
- Review area: Radiation Protection
-
- **LENGYEL, Andras - Hungary**
- MVM Paks Nuclear Power Plant LTD.
- Years of nuclear experience: 10
- Review area: Chemistry
-
- **LEMAY, Francois - Canada**
- International Safety Research
- Years of nuclear experience: 29
- Review area: Emergency Planning and Preparedness
-
- **HONCARENKO, Radim – Czech Republic**
- CEZ, a.s.
  Years of nuclear experience: 28
- Review area: Severe Accident Management
-
- **HAAGE, Monica – IAEA**
- Years of nuclear experience: 11
- Review area: Safety Culture
-
- **HABER, Sonia – United States of America**
- Human Performance Analysis, Corp.
- Years of nuclear experience: 25
- Review area: Safety Culture