Enhancement of safety through self-assessment and teamwork.

Penly NPP has developed periodic reviews of its performance in the area of safety at each managerial level. With regards to plant senior management, the review focuses on plant performance and trends. It also benchmarks performance with other EDF sites.

Thanks to the review process, the plant senior management team shares a common view and management priorities. Consequently, further to these reviews, plant management sets 4 or 5 priority areas for the plant for the following year. The reviews are deployed in every department while taking into account aspects specific to each area of concern and they result in improvement action plans. At department level, this process includes the department manager, team managers and sometimes workers. Human factors are also taken into account. Management field inspection reports are analysed to identify trends, which lead to the main vulnerable areas.

At team level, general training sessions are held every year, bringing together the teams of different departments in order to analyse weaknesses and define future actions for each one of them.

In 2003 the topic was housekeeping and material condition. These sessions have been effective in implementing common plant standards regarding housekeeping.

In 2004 the subject was organisational lines of defence. It helped to finalise the plant safety policy. Many aspects of this policy have been suggested by the teams themselves. A training project is currently being prepared for 2005. It will include some comments and proposals to reinforce the most vulnerable lines of defence.

Training initiatives for plant managers have been developed for that purpose: two training days on housekeeping in 2003, a one-day training session on lines of defence in 2004 and in 2005, a planned training session on exchanging experience from presence in the field.

This comprehensive initiative provides the whole plant with a common perception of safety and progress objectives. It is also based on a common language regarding site priorities and provides some perspective on safety management whilst giving some freedom to individual teams and departments for their own actions.

The plant manager and his management team attend each training day when all teams work together. This presence helps them to better understand the plant and to focus on the importance of safety at the plant, as well as to maintain dialogue with plant workers. The initiative given to departments enables them to put forward innovative actions. A benchmarking exercise is done every year so that the various departments can share best practices and make progress together.

"Safety forums" are also organised, during which work teams present their innovations on a display stand.

Since the introduction of this initiative, overall plant performance has improved.
Plant management has implemented a "Blame free" culture that is open and transparent at all levels of the organization. Staff at all levels are willing to discuss events at the plant, how they recognize the need for improvement in some areas, and they are open to suggestions for improvement.

• Operations management is willing to discuss the shortcomings of their own organization in the past. They described their own "units 1 & 2" vs. "units 3 & 4" silo mentality, and that they were working hard, within the new organization, to overcome this mentality.

• -Operations staff freely admitted that, in the past, the performance at Blayais suffered because their "insular and isolated" attitude led them to disregard opportunities to learn from other plants. They are now actively participating in benchmarking trips to other plants, both in France and abroad. It is a requirement that trainee shift managers participate in at least one benchmarking trip.

• -A tagging supervisor freely volunteered that, as a field operator, he had been responsible for a "wrong equipment" event in during the wrong 6.6 KV safety-related circuit breaker was racked out, thus rendering an essential Water pump unavailable for several minutes. Furthermore, the supervisor team led a field tour to the circuit breakers in question, in order to demonstrate how the error occurred.

• -Members of the human factors department freely discussed the difficulties associated with implementation of a human performance improvement plan. A project outline for the plan was very candid about the issues associated with implementation.

Every two months, the plant’s team leaders or managers spend half a day together with their teams (own staff or contractors) discussing and analyzing activities in the field especially from industrial safety point of view. At the end of the morning, each manager enters the gathered information into the “deficiency” database, under the section “industrial safety day”. Good practices are implemented as soon as possible and problems after the discussion with his/her team are transferred for corrective actions. A Risk Prevention Department’s hotline has been set up to assist managers if an immediate answer to a specific question is required. Senior management involvement demonstrates the importance of the subject. An important factor is to ‘force’ management to go to the plant sometimes at the same time so that managerial expectations and control can be shown simultaneously. This kind of common activity is like a booster to increase awareness for safety topics and it improves contacts between the management and other staff. Also actual difficulties are solved including personnel’s understanding about the industrial safety.
Safety Quality Bulletin
At the end of the safety engineer’s week on duty, the Safety and Quality Department writes up a document (Safety Quality Bulletin) summarizing the key points in the areas of operational safety, fire protection and radiation protection for that week. The bulletin is distributed every week, being sent to 350 staff members down to supervisory level. According to the results of a poll 70% of staff has read it. The bulletin is an important tool for communicating practical everyday safety questions concerning operation, fire protection and radiation safety. It identifies the main points of the safety engineer’s evaluation and it is used also by power operations steering committee. The bulletin provides a summarized overview of operational safety and gives answers to the questions raised. The bulletin has its own place for strengthening the safety culture of the plant.

Brunswick, USA
Mission Date; 9-26 May, 2005

The plant has developed a comprehensive and intrusive self-assessment programme within the organization that has lead to improvements in the quality of work across all plant disciplines.
In 2005, Brunswick NP is scheduled to conduct 39 formalized team self-assessments spanning all functional areas. In 2004, the station conducted 41 self-assessments. All self-assessments are required to have a structured outline approved in advance of the assessment activity. Additionally, self-assessments are required to be led by a qualified self-assessment team leader. Team membership is diverse and frequently includes external peers from other nuclear facilities. All of the aforementioned is planned and submitted for management review and approval prior to commencing assessment activities.
The self-assessment team focuses on targeted performance against pre-determined management requirements as well as industry best practices. Deficiencies are categorized as issues, weaknesses, or items for management consideration and documented in the station’s corrective action programme. 2004 self assessment activity identified greater than 100 items which were subsequently categorized in the corrective action program and resolved according with the plant schedule.
The programme promotes self critical behaviors and encourages the identification of deficiencies by the organization itself, versus identification by the Quality Assurance organization or the regulator.
Despite its limited size, EPZ staff is participating in about 40 international working groups and commissions, e.g. in IAEA, WANO and VGB, NEA membership relations.

The EPZ managing director is Governor for the WANO Paris Centre. Additionally, an average of 5 persons of EPZ is yearly involved in WANO, OSART, AMAT and similar missions, resulting in over 90% EPZ management having international experience. The collective experience of the working groups and missions is used to improve the knowledge base, to strive to the international state of the art and to improve the plant and enhance safe work practices by comparison with the best industry practices and by emulating good performers. On the other hand Borssele experiences are shared with the international nuclear community.

There are many examples of major improvements in which EPZ was among the first ones in Europe and in many cases also has been an example for other European plants.

An important contribution was made by EPZ to the establishment of the IAEA guidelines for the equipment ageing management programme.
At INPP 2 systems for monitoring and analysis of safety culture have been developed and implemented. Both systems are effective tools for management in monitoring safety performance and safety culture.

The first system concerns an assessment among staff, using a survey on safety culture that was developed with the aid of the aid of IAEA and experts from UK and Sweden. On average the survey is done every three years. The questionnaire consists of 33 questions. Answers are grouped towards 11 safety culture characteristics, i.e.:
- Leadership and commitment of top management to safety;
- Safety role of line management;
- Strategic business importance of safety;
- Supportive organizational culture;
- Involvement of employees in the process of safety enhancement;
- Study of operating experience;
- Measurement of safety performance;
- Mutual trust and responsibility of management and employees;
- Openness of communication;
- Absence of safety vs. production conflict;
- Demonstration of care for personnel by administration.

Safety culture monitoring consists of 5 stages:
- Detection of problem areas (causes of safety level degradation);
- Prioritization of each problem area;
- Analysis by determining relationships between the problem areas and the safety culture characteristics;
- Detection of low safety culture characteristics;
- Development and prioritization of corrective actions for safety culture development.

In this way trends on safety culture characteristics are available for management to make an assessment and define, if required, corrective actions.

This monitoring and analysis started in 1998 as a first trial among few numbers of staff (30 employees). In 2000 and 2004 the survey was done among 300 employees. The overall results were generally positive.

The second system comprises a set of 6 safety culture indicators. Some indicators are connected with follow-up of safety related corrective actions, others are characteristics to human performance.

The use of the indicators started in 2004. Information on changes of the safety culture indicators is regularly provided to the Director General; it is subject of discussion with the heads of the departments of the plant and a report is also forwarded to the regulatory body.

At the end of each year completed actions are analyzed and a progress report is made, which is also submitted to the regulatory authority. This information can be found on the intranet and is available to the staff.

This safety culture monitoring system allows top management and line managers to determine trends in nuclear safety performance and culture and corrective actions can be defined if needed.
Personnel feedback tool.

A specialized live, on-line database for communication and tracking of personnel comments on various safety aspects of the NPP operation has been developed.

Accumulated operating experience showed that it would be beneficial to strengthen the feedback between personnel and management. It was one of the results of the KhNPP management self-assessment in February 2007. A personnel feedback committee has been established consisting of deputies department managers for personnel. The committee is focused on promoting a personnel feedback system to evaluate and address suggested issues. The plant staff has the opportunity and is encouraged to address issues to the plant senior managers by means of an electronic on-line database. Special software has been installed at work places based on departments’ requests. Appropriate managerial and administrative documentation have been approved to support the system. The system also includes a special evaluation tool to assess the importance of the suggestion on ten-point scale. It helps to motivate people to provide their concerns because the most valuable suggestions are rewarded. Under the review period, 36 suggestions have been already received. The system allows anonymous application as well. There are no limits on topics. There are clear examples that the system brings safety benefits to the plant and builds desired ownership to the safe operation.

Two examples:

1) When analyzing the quality assurance (QA) guidelines of the NPP and the outside Maintenance Enterprise (contractor) documentation and job descriptions it was found that there was not clearly defined responsibilities for certain staff to provide information about discovered equipment defects. The engineer on duty is not responsible for reviewing department supervisors’ logs.


2) KhNPP operating staff schedules #3 and #43, currently in force with 36 working hours, for electrical department electricians, electrical shift supervisor (senior electrical engineer and electrical engineer) do not include extra-training days (a specific working day when personnel is not on shift).

Existence of such days will permit to do activities with operating staff like training, briefings, technical training, exams, plant meetings, medical examinations during the working hours. With the existing schedules, the only issue of refresher training for electrical shift supervisor, senior electrical engineer and electrical engineer is resolved.

Schedules #3 and #43 that were in force till 1999 provided 1-2 extra-days per month. Management is considering the possibility of coming back to that schedules to provide 1-2 extra-days per month to use them for above mentioned purposes.
Craft Safety Group (GSM) contribution to addressing safety issues within a particular profession (craft) based on teamwork.

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

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

In order to support the operating organization, the Safety and Quality Service SSQ has developed an easily accessible database with the answers to significant safety related questions.

This database called FQRL (local question/answer form) centralizes all relevant safety related questions, especially those related to the understanding of the general operational rules (RGE).

Every staff member has very easy access to this database, which is structured by safety function and then by system, one finds the question, the answer, references and, if needed, a deeper analysis.

These forms are very helpful in work preparation and in the real time decision taking process. It is an efficient tool to disseminate safety on the site. The database enables everybody to input new questions.
The KEPCO and their NPP sites developed a comprehensive process to assess their own safety culture every year. From this assessment issues were identified and countermeasures are planned, implemented and reviewed.

Methods of assessment:

1. The plant assess the awareness and behaviour of personnel and/or organization in the focus of three key points of safety culture, ‘the commitment by the top management’, ‘communication’ and ‘learning organization’. Each of three key points is assessed through several questions. For example, ‘the commitment by the top management’ is assessed using following four questions in FY2008.
   (1) Does the senior management clearly show the ‘safety is the first priority’ policy to the staff?
   (2) Are the responsibility and the authority of each organization clear and appropriate?
   (3) Do the front-like workers understand the view and concept of the top management and put it in practice?
   (4) Are the amount and allocation of resource proper?

   In order to assess more objectively, relevant parameters, information, activities and results of questionnaire are collected and trended for each question. For example, following items are collected for question (1).
   - Number of the messages given directly from the top management
   - Number of the messages given through e-mail from the top management
   - Results of the questionnaire
   - Contents of the business plan and management plan etc.

   The opinion from the employees, management and contractors are also collected and used for the assessment of each question.

2. The plant also evaluates the results of safety status, including plant safety, industrial safety and compliance status, and determines whether or not there are any problems in the awareness and behaviour of personnel and organization based on the results. This evaluation is implemented as a supplement for above 1 assessment.

3. The plant estimates perception of society, based on outside opinions from the local society and Nuclear Maintenance Reform Verification Committee.

   The plant identifies ‘Issue’ and ‘Concern’ through these assessments. Action plan is developed for the identified ‘Issue’ and implemented from next FY. The status of these action and ‘Concern’ is followed up in the next safety culture assessment.
Senior Management Support for Operational Safety

Senior Plant Managers are improving Operational Safety by their daily visible support for staff behaviours that enhance Nuclear Safety.

The Plant Director stopped an outage in 2007 after 3 events occurred. He met with the Shift Supervisors as a group and declared his personal support to stop any tasks that could negatively impact safety.

In 2008 plant management made a decision to extend an outage by proactively plugging tubes in two non leaking Steam Generators on Unit 2 after a leak occurred in a tube in the third Steam Generator.

In 2008, the plant pressure boundary inspection department were asked to assess a leak on the secondary side of the plant. They found a weld defect and raised a concern that the whole weld could fail and cause a serious non radioactive steam release. The Inspection Manager was supported in her concern by plant management. The line was isolated and the plant was shutdown to repair.

In March 2009, the Shift Supervisor made a conservative decision to delay the restart of Unit 1 by 8 hours. The person felt confident that the decision would be supported by management and in fact both the manager and the Plant Deputy Director for Production complimented the action.

The Plant has several ‘Safety Engineers’ who inspect equipment in the field and in the control room and bring concerns to the attention of the Control Room Operators. The Safety Engineers have trained over 400 staff to improve their understanding a compliance with Technical Specifications. Safety Engineers write a weekly newsletter to all staff discussing current Nuclear Safety issues and are very active in supporting safe execution of outages. There is a monthly private meeting between a Safety Engineer, the Safety Department Manager and Plant Director that is frank and self critical.

Automatic Reactor Scrams were reduced from 3.5 per unit per year in 2006 to zero in 2008 through a comprehensive program of human performance improvements and equipment changes.
The web-based system the utility uses for its NPP fleet for Safety Performance Indicators (SPI's) is sophisticated, but still easy to access and use. It provides information of safety performance of the whole fleet unit by unit with clear definitions of the indicators and good graphics to support trending.

The system is provided as part of fleet requirements and regulatory requirements but this system goes beyond that.

This information system allows the SUNPP:
- briefly provide information about the current safety level to all SUNPP managers and specialists in the large organisation that was earlier provided only as large reports that most of the managers had no time to read;
- keep track of the indicators' trends and ensure maintaining of the achieved or higher safety level;
- timely notification about the safety issues at the whole plant and for each unit
- monitor and compare results and performance of other plants of the fleet

Currently there are 40 safety indicators in use in the system (23 for regulator + 17 own). The system has been in use for 2 years now and is accessible by more than 1000 users at SUNPP.
Independent nuclear safety oversight organisation at utility level

The independent nuclear safety oversight is provided by the Nuclear Oversight Department (NOS) for both nuclear plant sites of the utility. The department is independent of operation, maintenance, engineering and safety departments and only reports to the General Director.

– NOS mission: To identify opportunities for improvement in order to achieve excellence in operational safety.
– NOS rules: NOS activities are governed by requirements specified in the following documents:
  – IAEA NS-R-2: Safety of Nuclear Power Plants: Operation, §2.4
  – IAEA GS-R-3: The management system for Facilities and activities, §6.3, §6.4, §6.5

NOS actions:
– in accordance with IAEA Safety Standards and international good practices (NS-R-2, GS-R-3, WANO GL 2006-02-9), to monitor and review the field of nuclear and operational safety of SE, a.s. independently and critically; to identify opportunities for improvement and thus to assist in reaching excellent levels of nuclear and operational safety.
– to establish a supportive proactive environment in relation to the Slovak National Regulatory Authority (ÚJD SR) by providing timely information on planned activities in SE, a.s. and to receive information on activities of ÚJD SR related to development of legislation and safety criteria.
– to promote a proactive approach to the implementation of IAEA and WANO good practices in SE, a.s.
– to receive inputs from units or individual workers of the company for effective management and continuous improvement of the nuclear and operational safety of the nuclear installations in SE, a.s.
– to prepare and present proposals leading to improvement of the nuclear and operational safety of the nuclear units of SE, a.s.
– to provide the top management of SE, a.s. and ENEL ATN with a feedback on the reviews of nuclear and operational safety of the nuclear units of SE and identified areas for improvement resulting from comparison with nuclear power engineering industry Nuclear Safety Advisory Committee (NSAC)

The NOS scope of actions includes the Nuclear Safety Advisory Committee. NSAC is an advisory body to the Board of Directors and is directly responsible to the Board of Directors. NSAC evaluates the performance of SE, a.s. staff and proposes solutions to nuclear safety issues identified in SE, a.s. nuclear installations.

The NSAC membership structure includes the Chairman (Independent person), the Vice-Chairman (Independent person) and no more than four independent Members (including International expertise). All of them have nuclear industry experience from countries and companies all over Europe.

The NSAC team meets twice a year in one of two NPP localities.

Activities of NOS:
– According to annual work plan for 2009 and 2010 six areas based on WANO PO&Cs were reviewed. NOS work plan is approved by CEO, CNO, plant directors.
– NOS reviews are based on WANO PO&C methodology. During 2009, there were totally 51 findings from NOS independent reviews presented to SE management.
– long term and yearly work plan for the NPP.
– list of pending questions with ÚJD SR.
– annual, quarterly and monthly reports on NOS results.
–reports of particular planned and unplanned reviews of selected fields of the nuclear and operational safety.
–coordination of corrective actions on NSAC recommendations.

Reports are presented to CEO, COO, CNO, Nuclear Power Plant Directors, Director of Safety and Environment Section, NSAC members and NSO ENEL.

**Rajasthan, India**

Mission Date; 29 Oct.-15 Nov., 2012

Area Co-ordinators for Improvement of housekeeping at the Station.
Area Co-ordinators are identified and earmarked for each specific area of the station operating island. They are responsible for good housekeeping in their designated areas. Display boards, mentioning the names and photographs of the area co-ordinators, are placed in the respective areas. Area co-ordinators patrol their respective areas frequently, raise any deficiencies in the computerised work management system and follow-up the status. Plant management interacts with the area co-ordinators in daily meetings to discuss and expedite any issues related to their respective area.
In addition, during the plant tours and field observations activities conducted by the team, good housekeeping was noticed in many areas of the plant indicating that area co-ordinators are having a positive influence on this aspect of the station's operational safety performance.

**Clinton, USA**

Mission Date; 11-28 Aug., 2014

The implementation of Nuclear Oversight at Clinton Power Station is comprehensive and well integrated. It covers Audits (on areas with regulatory significance), Comprehensive Performance Assessments (for activities without regulatory aspects) and quality verification.
Audits are conducted by multiple teams at different sites using the same scope and plan, covering the entire Exelon nuclear fleet over a six week period.
Comprehensive Performance Assessments are similarly performed simultaneously across the whole nuclear fleet during a single 2 week period.
The periodicity of the audits and assessments is graded depending on the topic area. Emergent issues early in the roll-out of each audit or assessment are noted for possible inclusion in the next audit in the sequence. Preparation of the resulting reports is very timely: within 3 working days after each audit or assessment.
The use of the same scope and the close timing of the audits, assessments and reports means that CPS and the rest of the Exelon nuclear fleet gains a highly consistent view of common, current issues. Findings are fed into each site’s corrective action programme but also ‘rolled-up’ to identify common themes so that senior executives and Corporate Functional Area Managers can ensure a consistent response across the nuclear fleet. The result is that fleet-wide solutions can be created and implemented in a resource-efficient manner in accordance with the Exelon Nuclear Management Model.
The way the audits and assessments are scoped, planned and executed also provides management with credible cross-fleet performance comparisons.
Additional benefit is gained from the use of specialist auditors, some from outside the company. This spreads the experience of ‘aiming for excellence’ more widely and promotes learning from fresh perspectives.