Nuclear Safety Management System

Nuclear Power Plants owned by Endesa follow the approach of IAEA Requirements Document GS-R-3 "The Management System for Facilities and Activities" (July, 2006) in establishing the systematic for the continuous safety and performance improvement through the Integrated Management System (IMS). Safety Instruction IS-19 of CSN on the requirements of the management system of nuclear facilities, issued in November 2008, follows closely the reference of GS-R-3, and Endesa strives for the strict compliance with its requirements.

Integrated Management System (IMS) includes industrial safety, occupational health, environmental, security, quality assurance and economic requirements, which are not considered separately from nuclear safety requirements. All the requirements are defined and implemented in a coherent manner to enable the organization to meet its strategic objectives, integrating all the management requirements so as to prevent the possibility of any of them having a negative effect on safety.

IMS seeks to maintain and improve safety throughout the lifetime of facilities (siting, construction, commissioning, operation and decommissioning), and for the entire duration of activities in normal, transient, and emergency situations in a systematic manner by promoting and supporting a strong safety culture within the operating organizations, aiming that individuals and teams carry out their tasks safely and successfully, by putting in place a systematic of continuous improvement and emulating the practices widely accepted as the pattern of excellence.

Integrated Management is supported by manuals that are in place in each Endesa NPP, bringing together all the phases of the Continuous Improvement cycle (planning, execution, evaluation and follow-up):

- **Planning**: Medium & long term planning is described in the policy document Strategic Lines, Policies and Objectives, and pursues to identify investment needs, to prioritise according to the importance for safety, to programme and assign resources on a multi-annual basis and to implement monitoring and control mechanisms. The short term planning is included in the Annual Operating Plans (annual budget) and the Departments’ Objectives.

- **Execution**: The management system of Endesa plants is based on the "Standard Nuclear Performance Model", a Process Management Approach that has been defined by American Nuclear Electric Institute (NEI). This model enables the description of:
  - Management processes that provide the framework to develop the policies and strategies of the organisation;
  - Core Business Operational processes that make up the added value; and
  - Enabling processes that provide support to the Operational processes. Among the latter, Performance Improvement process consists on evaluating and providing feedback to the rest of the processes.

A comprehensive set of indicators is established to measure the effectiveness and efficiency of each process and also to determine the effectiveness and efficiency of the whole organisation.
**Evaluation:** Evaluation Model is represented through the following pyramid:

Every year an Annual Evaluation Plan should be defined containing the programme of external evaluations, independent in-house evaluations and self-assessment programme of the different departments to be carried out during the year.

External Evaluations of Endesa Nuclear Power Plants include the regulatory inspections performed by CSN, the independent oversight performed by Endesa, those evaluations to obtain or maintain certifications (Environmental, Quality, Industrial Safety, or other certifications) and the evaluations requested to international industry organizations or agencies to guarantee the maximum coherence of operating and management practices with respect to best international practices.

**Follow-up:** The Corrective Actions Programme (CAP) places in a single Data Base all the non-conformities and the corrective actions of each operating organization. It comprises the following phases: problem identification and analysis, categorization of such problems, definition of the corrective actions and, finally, follow up until effective completion of those actions. Problems are categorised according to their importance for safety, radiological protection, physical protection, health and environment. The actions defined to fix them are prioritized according to such importance. Trends, recurrences and the overall CAP performance are monitored through several indicators.
Gradual and systematic approach to a Continuous Improvement Model

Endesa NPPs carry out the practical application of the IMS at all levels (organisation, processes, procedures and people) through a continuous process that seeks to attain the objectives by means of a systematic and gradual approach, so as to deploy appropriate resources on the basis of the consideration of:

- The significance and complexity of each activity,
- The hazards and the magnitude of the potential risk associated with the safety, health, environmental, security, quality and economic elements of each activity, and
- The possible consequences if an activity is carried out incorrectly.

The basic elements of the continuous improvement model are represented in the following figure:

This systematic approach is based on evaluating results and identifying performance gaps with regard to the objectives and expectations. These gaps are analyzed to identify the fundamental problems and then the proper solutions are defined, planned and implemented. Attributes that are fostered to support performance improvement model include the safety culture, leadership and supervision, and workers’ knowledge and skills.

The gradual approach to implement this model gives priority to the processes and activities which have significant impact on safety, security, quality, occupational health,
environment and costs, taking also into consideration the importance and complexity of such processes and activities and the potential consequences of failures and errors.

As a relevant general framework, the Convention on Nuclear Safety that was drawn up in Vienna on September 1994, and was signed and ratified by Spain on October 1994 and June 1995 respectively, entered into force on October 1996. The objectives of this Convention are to achieve and maintain a high level of nuclear safety worldwide through the enhancement of national measures and international co-operation; to establish and maintain effective defences in nuclear installations against potential radiological hazards in order to protect individuals, society and the environment from harmful effects of ionizing radiation from such installations; and to prevent accidents with radiological consequences and to mitigate such consequences should they occur.

**Specific Management Systems**

Nuclear Power Plants owned by Endesa are adopting international best practices aiming the reduction or elimination of unplanned shutdown and other significant incidents and events, which are frequently related whether to inadequate condition of Systems, Equipment and Components or to Human Performance shortfalls.

Systems, Equipment and Components are subject of a continuous surveillance, that include periodic testing to assess they are able to perform their expected functions. On the other side, Operating Experience program provides inputs that are used to update design and procedures based on the lessons learned from internal or external events. For the case of events caused by human factors, comprehensive root cause analysis are performed in order to identify proper preventive measures. Overall, several operating parameters are trended and compared to industry references to identify potential improvements.

Some relevant processes and initiatives are supporting the implementation of industry best practices in Endesa NPPs and contributing to enhance plant and personnel performance:

**Work Management**: Following INPO guideline AP-928, this process is instrumental to deal with the timely identification, selection, planning, coordination, and execution of work necessary to maximize the availability and reliability of plant systems and equipments, aiming an optimum use of station resources and assessing all risks associated to the conduct of work, to protect personnel health and plant equipment.

**Equipment Reliability**: Following INPO guideline AP-913, through the Equipment Reliability process the performance and condition of systems, equipment and components critical for nuclear safety and operation are systematically tracked by means of System Health Reports. Risk insights, based on Probabilistic Safety Analysis, and feedback from operating experience, provide the base for maintenance programs, paying particular attention to preventing ageing effects.

**Organization and Human Factors** programmes are in place with particular focus on implementation of error reduction tools, prompt investigation of events caused by human
factors, field observations by managers ("managers in the field" program) and coaching, aiming to operate event-free by minimizing human errors. There are specific tools in place in Endesa NPP’s, like the Human Factor Simulators, where staff and contractors are trained to understand and manage properly the specific risks and potential consequences of the works conducted in different plant settings.

**Operating Experience** process covers the review, screening and dissemination of internal and external events, relevant information from suppliers and inputs from regulators, to determine specific applicability to the plants. The process also include communication of in-house events to the worldwide nuclear community through the event reporting system operated by WANO (World Association of Nuclear Operators). In-house events are screened and classified according to their importance, and proper event analysis methodology for each case is defined. Reportable events and other relevant ones are analyzed using formal root cause analysis techniques for comprehensive determination of underlying problems and contributing factors. Consequently, actions are defined and processed through CAP to fix those problems and to avoid recurrence. With regard to external Operating Experience, the OE teams produce internal reports and briefings for staff to consider how it applies to work activities or plant operations. From all external inputs, SOERs (Significant Operating Experience Reports), SERs (Significant Event Reports) or JITs (Just-In-Time briefing), produced by WANO or INPO, are of particular interest.

**Training** improvement is a strategic cornerstone in Endesa NPPs. Main Objective of Training Programs is to maintain and update knowledge, qualification and skills of the staff to perform safely and reliably the tasks and functions assigned, fulfilling the company expectations. SAT methodology supports Endesa NPPs Training Programs, based on determining training needs from job and task analysis, defining training objectives according to job performance requirements, developing training materials, methods and instructor guides are to address learning objectives, implementing training and trainee evaluation consistently with those objectives and, finally, evaluating the overall program through trainee feedback, observations of training, training performance and plant performance

Regulatory framework for training is defined by CSN safety instructions IS-11 and IS-12, which regulate the requirements for, respectively, licensed personnel training and non-licensed training, the latter including regular staff, contractors and subcontractors. Additionally, Endesa NPP’s training improvement is inspired by the objectives and criteria for accreditation, as defined by the National Academy of Nuclear Training (ACAD) supported by INPO.

A set of meaningful performance indicators is established to assess the effectiveness of the specific management systems on a periodic basis, and the achievements are yearly reviewed through a self-assessment.