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# Electrabel Plan for Nuclear Safety 2016-2020

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## Policy Declaration regarding

# Nuclear Safety

We attach the greatest possible importance to the protection of all members of personnel involved in the operation of our nuclear power plants, of the public and the environment. Therefore, we actively support a strong nuclear safety policy in all phases of the operating processes of our power plants.

Together with our partners and contractors, we work towards the practical application of this safety policy, based on the following principles:

### Safety = the first priority

- We ensure that safety takes precedence over production, in all circumstances.
- We ensure that safety is present everywhere in all operational processes.
- We anticipate the laws and regulations concerning nuclear safety and apply them scrupulously.
- We develop and promote a high level of safety culture.

### Safety = a process of continuous improvement

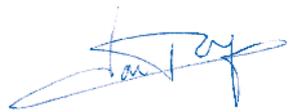
- We set objectives and corresponding action plans to continuously improve nuclear safety.
- We constantly assess the safety level of our activities, and compare them with the best practices and international standards.
- We involve all our personnel in this process of continuous improvement and ensure that they actively participate in it.

### Safety = strict controls

- We maintain a constructive dialogue with the authorities and safety institutions, as well as the other parties involved.
- We constantly measure the effectiveness with which our safety policy is applied.
- We have regular external audits and international comparisons carried out.



Wim De Clercq  
Chief Nuclear Officer



Philippe Van Troeye  
Director-General Manager of Electrabel





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# Rigor, commitment and personal accountability

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We are pleased to present the third edition of our Nuclear Safety Plan for the period 2016-2020. This plan represents the will of our company to be a responsible nuclear operator, and to consider Nuclear Safety as the overriding priority.

This Plan must serve as a roadmap for the nuclear safety matters for the five coming years. We are expecting our teams concerned by the nuclear activities to use this plan and its objectives to develop their own action plans.

I am counting on each and every one of you to demonstrate the rigor, commitment and sense of personal accountability needed to implement this plan.

You may also trust on the unconditional commitment of the entire management team to support this plan.

Philippe Van Troeye  
Director-General Manager of Electrabel


# Electrabel Plan for Nuclear Safety 2016–2020

**The Plan for Nuclear Safety sets the strategy of Electrabel regarding Nuclear Safety for the five coming years. Its goal is to contribute to the implementation of the Electrabel policy regarding Nuclear Safety, taking into account the expected context for 2016-2020.**

**This plan also incorporates the priority improvement focus areas defined in the Nuclear Safety plan 2016–2020 of the ENGIE Group.**



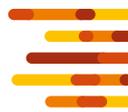
## **2016 to 2020: an important period**

For our nuclear teams in Belgium, 2016-2020 will be a unique and important period. We have to guarantee a very high nuclear safety level for the regular operation of our units, while also carrying out key safety projects. These include the ten-year extension for Tihange 1 and Doel 1 and 2, the completion of safety-related projects (particularly those relating to the aftermath of Fukushima), and the fulfillment of increasingly restrictive requirements and expectations. These activities constitute a situation full of challenges that we will have to overcome. Our safety performance is a vital component of our operational efficiency and a major contributor to our reputation and credibility as a nuclear operator.

Finally, the 2016-2020 period will also be marked by the preparation of the approaching end of the licensed lifetime of our units. In this changing environment, maintaining our expertise and the motivation of our employees will be a decisive element in achieving our safety objectives.

## **Essential to the Group's ambitions**

Electrabel operational excellence is also essential for our Group. ENGIE has the ambition to develop new nuclear projects outside Belgium. With this in mind, Electrabel should be acknowledged as a responsible nuclear operator and make its nuclear expertise available to contribute to the Group's development projects. Nuclear generation remains a key component in achieving the ENGIE Group's objectives in terms of security of supply and emissions reduction.



Tihange nuclear power plant



ENGIE Tower, Brussels



Doel nuclear power plant

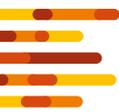
### **Nuclear Safety Culture and personal accountability**

Achieving ever-higher levels of Nuclear Safety is not only a matter of technical means and procedures. This objective requires in particular the development of a strong nuclear safety culture within the organization. The Nuclear Safety Culture is the organization's values and behaviors—modeled by its leaders and internalized by its members—that serve to make nuclear safety the overriding priority. This culture implies the sense of personal accountability and commitment of each individual. It also requires the awareness of the specific stakes and risks of nuclear activities, and the fostering of a work environment with the trust to raise concerns and to address them in an transparent way.

### **Scope of the Plan for Nuclear Safety**

The Plan for Nuclear Safety represents and concretizes the commitments of the Nuclear Generation Division of Electrabel. It is based on our dynamic risk management and is in line with our general approach for reinforcing the rigor and the expectations within our organization. This Plan must be shared by all services and departments involved in Electrabel nuclear activities. Furthermore, companies such as Tractebel Engineering, Transnubel, Synatom, Laborelec and other suppliers also play a part in implementing the Plan for Nuclear Safety, given that these Group companies carry out support activities at the heart of the nuclear generation. Only when we share all together the objectives of the Plan, we can strive for excellence in a coherent way.

**This Plan must be implemented in each nuclear entity, taking the specific local aspects into account. Each entity will have to integrate the objectives of the plan into their own successive annual plans, and define the necessary actions to assure the continuous improvement of nuclear safety.**



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# The objectives of the Plan for Nuclear Safety 2016-2020

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## 01 Nuclear Safety Culture & Leadership

### Leadership

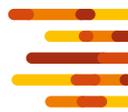
**A strong Nuclear Safety Culture is required in order to achieve zero-incident operation. This means everyone has—and indeed must acutely feel—personal accountability for Nuclear Safety and contribute to human performance excellence. All managers and team leaders are the leading advocates of Nuclear Safety and demonstrate their commitment in word, behavior and action. To achieve this target, we must carry out the following objectives over the next five years:**

- Guarantee to solve problems affecting the Nuclear Safety in a timely manner. Effective leadership requires fast, but considered decision-making and a results-driven, personal accountability.
- Increase the commitment and behavior of every individual regarding nuclear safety, by ensuring the presence of managers in the field to better communicate expectations and coach and provide constructive feedback to the teams.
- Highlight and reinforce good practices observed during field observations, as well as react in an adequate and systematic manner when inappropriate behavior is noticed.

### Human Performance

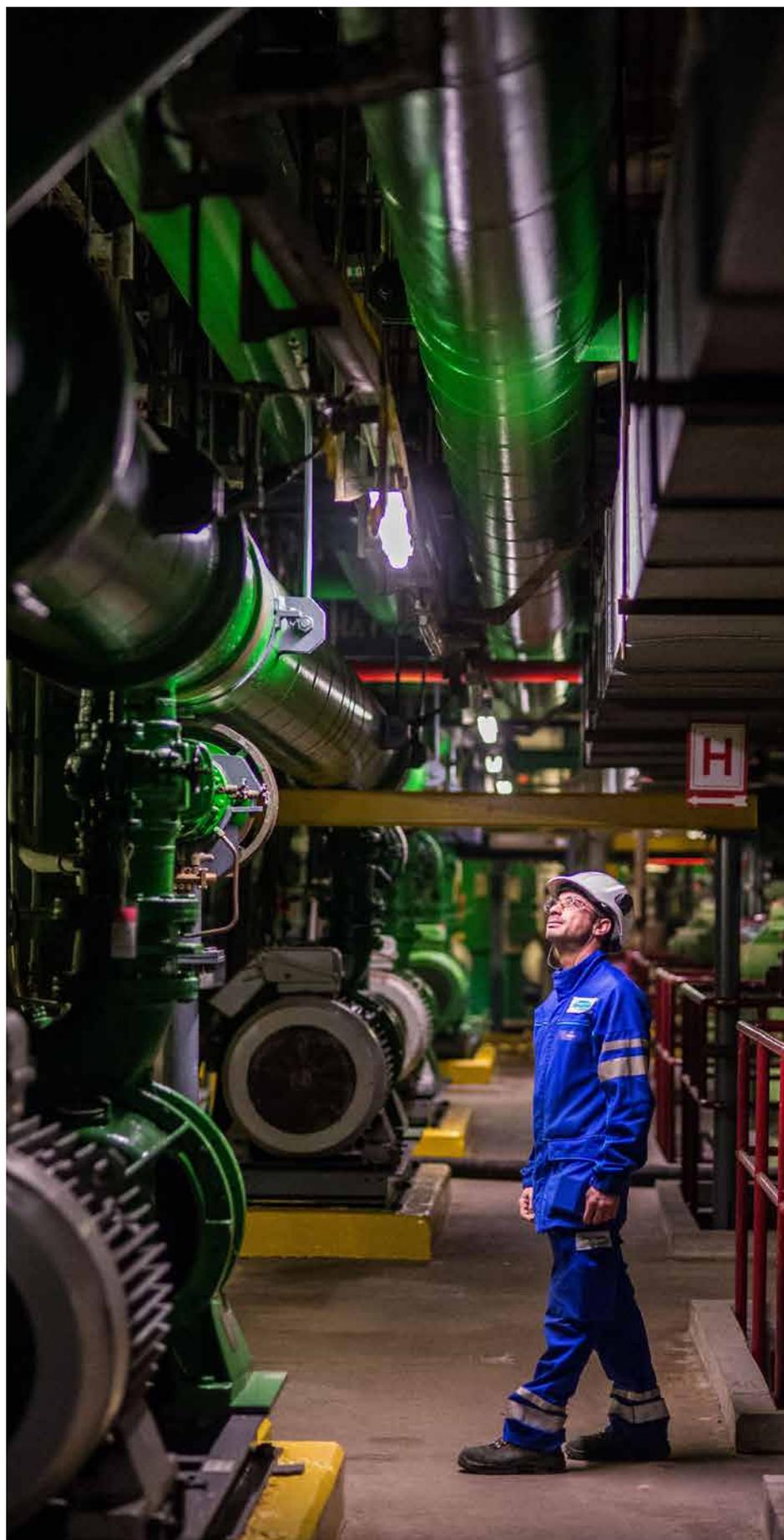
**Our nuclear activities depend strongly on human intervention. Striving for excellence also necessitates acknowledging that humans make mistakes. Therefore, it is essential to prevent these mistakes to a maximum extend. Everyone must therefore demonstrate the expected professional behaviors. In the coming five years we focus on the following objectives:**

- Performing our duties with rigor and commitment to nuclear safety.
- Rigorously using the following human error prevention tools :
  - Communicate to create a shared understanding of the messages and the expectations.
  - Demonstrate a questioning attitude.
  - Work with rigor and ensure the quality of the deliverables.
  - Adhere to the procedures.
  - Consult and use the operating experience before any intervention.



**Continuous improvement of Nuclear Safety performance**  
The process of continuous improvement plays a key role in striving for excellence in Nuclear Safety. Our objectives for the next five years in this area are:

- Approach continuous improvement of the Nuclear Safety Culture as a process. Establish specific action plans for Doel, Tihange and Corporate and develop a monitoring tool to measure the progress made.
- Continue the development of the Nuclear Safety Management System by using it as a tool for continuous improvement of processes and of the quality of our activities.
- Consider internal assessments as an essential component for the improvement of our nuclear safety performance. It implies an effective consideration of the facts and recommendations of the internal assessments to correct the identified weaknesses.
- Use the Independent Nuclear Safety Oversight (INSO) as an additional driving force in our strive for excellence in our nuclear activities.



## 02 Competence and knowledge management

**Competence and knowledge management contribute to the safe and reliable operation of nuclear power plants. It ensures that there are sufficient resources available (direct employees of Electrabel as well as those of contractors) and that they have all the necessary knowledge, behavior, competence and experience to carry out their work.**

**The knowledge management must also ensure that all information and experience acquired while operating the units is easily accessible in up-to-date documentation and is integrated within the management system. Our objectives in this area for the next five years are:**

- Accurately determine requirements in terms of human resources (both for operational tasks as well as for all projects in progress). This must ensure that we have the appropriate resources, expertise and knowledge to guarantee safe operation for the full lifetime of our nuclear units.
- Maintain, internally within Electrabel, an in-depth knowledge of the safety-critical equipment. Therefore, we enhance further the development of the competency of our engineers and technicians.
- Improve training so that it has significant added value and retains the acquired knowledge. We focus on the quality of the content, the professionalism of the trainers, and optimize the training time. Learning by doing is preferred to develop the individual skills and competencies.
- Expand the qualification system that validates the skills and competencies of each worker (including contractors) in accordance with the standards required to perform a job.
- Stimulate collaboration between the different teams to make good use of the knowledge, competency and experience already present within the organization.
- Promote internal mobility and rotation of the staff between the two nuclear sites and the Corporate departments.





## 03 Operating experience

**The ability to draw lessons from the process of operating experience feedback is crucial in reducing the recurrence of incidents, thereby improving performance.**

**Our objectives for the next five years in this area are:**

- Correctly assess as soon as possible all events and incidents by searching for the root causes within the three components of nuclear safety (technology, organization and the human behavior) in order to identify and implement the most appropriate corrective and preventive actions.
- Increase the sharing of the operating experience between the two nuclear sites and the Corporate departments.
- Enhance our monitoring of external (international) events and incidents and implement the necessary lessons as quick as possible.
- Use internal return on experience (such as post-job briefings) as a driver to improve the quality of our interventions and ensure the effectiveness of corrective actions by tracking recurring events.
- Establish benchmarks with other nuclear operators in order to adapt and improve, where necessary, our practices and methods, especially for safety-critical activities.
- Share our internal operating experience with the international nuclear community.

## 04 Operations

**Achieving zero-incident operation is a priority for ensuring reactor safety during power plant operation. Our objectives for the next five years in this area are:**

- Be more demanding in our role as responsible operator. 'Operations' has the responsibility to evaluate at each moment whether the plant can be operated safely or not, taken into account the actual status. Therefore, Operations must demonstrate high attention and constant rigor to be aware of the precise configuration and status of the installations.
- Maintain a robust defense-in-depth protection by ensuring the availability of the necessary protective means and systems required, depending on the operational modes of the unit.
- Guarantee a rigorous and constant monitoring of the compliance of the equipment and systems with the technical specifications during operation of the plant. It implies among other actions, ensuring adequate locking and pad-locking of the equipment and systems.



ENGIE  
Electrabel

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Electrabel

Raphael  
Duray

CVT2



## 05 Chemistry

**Chemical conditioning and limitation of chemical contaminations contributes to the control of corrosion phenomena and hence increases primary and secondary system integrity while reducing radiological source terms. Our objectives for the next five years in this area are:**

- Monitor the variation of the chemical and radiochemical parameters and ensure their traceability in order to anticipate the degradation of the safety systems and optimize the conditioning in the primary and secondary circuits.
- Resolve and prevent the problems caused by the corrosion phenomena, like Denting and Flow Accelerated Corrosion.
- Reduce chemical contaminations in primary and secondary systems consistent with the new international recommendations (EPRI<sup>1</sup>, WANO<sup>2</sup>).

## 06 Maintenance

**Maintenance must be carried out in such a way that the performance and condition of materials and equipment ensure the safe and reliable operation of the power plant. Maintenance must also contribute to the facility configuration management. Our objectives for the next five years in this area are:**

- Ensure flawless quality from the very first corrective or preventive intervention, which necessitates, among other things, an enhancement of preparation practices, of the pre-job and post-job briefings and the quality of the maintenance procedures.
- Strict adherence to the maintenance and intervention planning to limit risks resulting from unexpected or last-minute changes in the schedule.
- Optimize the maintenance strategy and policies and guide the changes made by implementing these new policies.
- Be more vigilant and anticipate problems related to the obsolescence and ageing of equipment (e.g. relating to I&C<sup>3</sup> equipment).
- Select efficient and competent suppliers of goods and services; enhance the supplier qualification and certification process; augment the close monitoring of contractors and provide regular feedback on the quality of their performance; establish beneficial, long-term partnerships with critical suppliers to ensure the long-term availability of their services and expertise.
- Master the process of supply and control of qualified components.

<sup>1</sup> EPRI: Electric Power Research Institute

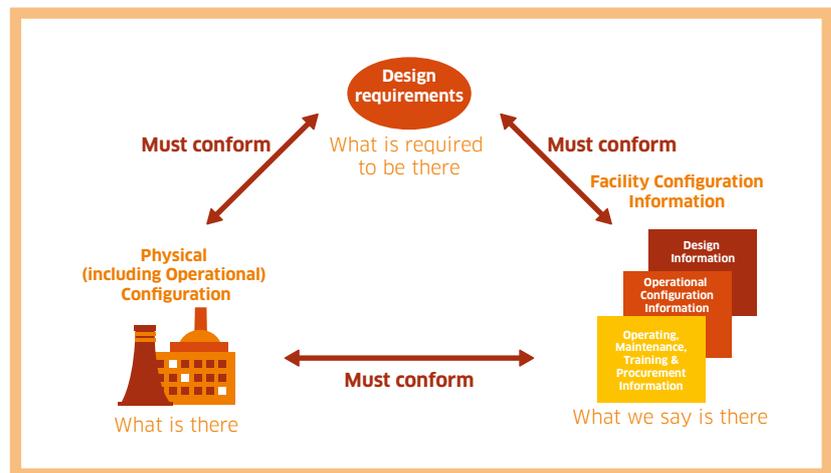
<sup>2</sup> WANO : World Association of Nuclear Operators

<sup>3</sup> I&C: Instrumentation and Control

# 07 Facility configuration management

The operator must, at all times, manage the configuration of each installation to ensure they remain within the operating limits set by the operating margins and design limits. Our objectives for the next five years in this area are:

- Guarantee that the actual and physical configuration of the installations matches their design requirements.
- Deal with the configuration management issues, identified during inspections, projects or events. This implies correction of the detected issues, looking for similar situations which may be present elsewhere within our plants and take actions to prevent their recurrence.
- Ensure that safety-critical information is available, and easily retrievable.





## 08 Engineering

**Engineering activities must be carried out in such a way that the performance of equipment supports the safe and reliable operation of our nuclear power plants. Engineering provides the technical information necessary for correct operation and maintenance within the design limits defined by the safety analyses. In addition to the basic mission of the Design Authority (assumed by Electrabel) and the Responsible Designer (assumed by Tractebel Engineering), engineering must also assure the technical improvement of installations in order to continuously enhance their level of safety. Our objectives for the next five years in this area are:**

- Continue development of the System Health Reports<sup>4</sup> by ensuring that the results of this approach are integrated within the organization and that anything that may have an impact on the reliability of safety-critical systems is taken into account.
- Carry out the safety-related projects (BEST<sup>5</sup>, Long-Term Operation, Fire Hazard Analysis, Periodic Safety Reviews, WENRA<sup>6</sup> action plan, et cetera) and ensure proper management of these projects.
- Continue developing the Ageing-Life Cycle Management project aimed at ensuring the availability of our equipment over the longer term.
- Ensure that the probabilistic safety analysis tool becomes a standard, fully-fledged tool used in all operations for risk management.
- Specify, communicate and assume the roles and responsibilities of the Design Authority and Responsible Designer within the organization.

## 09 Nuclear fuel management

**We will continue our objective of operating without any fuel-related incidents.**

Our objectives for the next five years in this area are:

- Guarantee the reliability and integrity of the nuclear fuel in the reactors and in the pools.
- Ensure the safety of the nuclear operation while taking into account the requests for a higher fuel cycle flexibility, related to the anticipation of the potential Long-Term Operation or the decommissioning of the units.
- Adapt the management of the nuclear fuel in a safe way to anticipate the different operational modes, for instance resulted from the more frequent power modulations.
- Remove non-fissile materials present in the storage pools and prepare solutions for the management of future leaking fuel elements.
- Enhance the competency and knowledge of all workers involved within the nuclear fuel area (design of the fuel elements, fuel handling tools, specific risks of intervention concerning the fuel handling, operation requirements)



<sup>4</sup> System Health Report: Global method to assess and improve the reliability of the systems

<sup>5</sup> BEST : BELgian Stress Tests

<sup>6</sup> WENRA: Western Nuclear Regulators Association

## 10 Radiation Protection

**Radiation Protection aims to reduce radiation doses, contamination, radioactive waste and releases to a level that is as low as reasonably achievable. Our objectives for the next five years in this area are:**

- Maintain the good dosimetry results for each nuclear power plant and remain in the top 25% of the world's nuclear power plants (WANO Collective Radiation Exposure indicator).
- Consolidate the significant reduction of the contamination within the controlled area, achieved over the past years.
- Identify and eliminate the sources of contamination (Contamination Tracking).
- Ensure that radiation protection and metrology equipment does not become obsolete, and function correctly.
- Find sustainable solutions to maintain the resources and means, necessary to store and transport our nuclear material safely (with a special focus on the containers).

## 11 Fire protection

**Fire protection aims to prevent fire ignition, to rapidly detect any fire, and to take immediate actions to minimize the potential consequences of fires. Our objectives for the next five years in this area are:**

- In terms of prevention: enhance the culture of vigilance by all employees regarding fire and explosion risk including management of fire loads, reduction of the sources of ignition, close monitoring of all hot work.
- In terms of mitigation: ensure absolute compliance with compartmentalization requirements, inspection and monitoring of performance of fire protection equipment.
- In terms of fire fighting capabilities: develop and maintain a fire fighting team on both nuclear sites. This teams have the additional mission to perform awareness training of all personal regarding fire and explosion risks.





## 12 Emergency plans

**The emergency plan is the last line of defense-in-depth. It only comes into play when the measures to protect against the risk of radioactive releases have been ineffective at either the prevention, controlling and/or protection stage. In that event, the plan must limit the impact of an accident and protect staff, the public, and the environment as much as possible. Our objectives for the next five years in this area are:**

- Organize more ambitious and realistic emergency exercises at site and Corporate level in order to enhance the ability of the organization to respond to a wide range of potential emergency situations.
- Use the simulator to train emergency teams to effectively manage various critical emergency situations.
- Strengthen our emergency infrastructure and means to cope with beyond design basis accidents and any locally severely degraded situation (for instance: damaged infrastructure or severe radiological contamination of a site).
- Develop and implement a strategy for management of radiation protection in emergency situations (including habitability of key emergency centers and protection of the workers during an intervention).
- Train and improve the new Corporate Nuclear Logistic Support Cell.

## 13 Nuclear security

**On nuclear sites, nuclear security consists of guarding against the danger of malicious acts and against the risk of proliferation of nuclear materials. This risk is constantly changing and regularly hits the headlines. It is therefore essential that we give these areas our full attention. In this regard, we want to:**

- Adapt the security of our sites as much as possible in line with the evolution of the threat and foresee the means necessary to repel it.
- Develop and implement the specific plan to protect against the Insider Threat.
- Implement the plan developed in order to enhance the Nuclear Security Culture for all Electrabel entities and sub-contractors active in the nuclear area. It is expected of everyone to demonstrate the adequate behaviors regarding nuclear security risks.



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