ASSYSTEM 2017
NUCLEAR RISK MANAGEMENT
REPORT

ENABLER OF ENERGY & DIGITAL REVOLUTIONS
INTRODUCTION

In 2017, thanks to all its employees’ commitment, Assystem Energy & Infrastructure teams have striven towards responsible management, technical experience applied to nuclear risk assessment and nuclear safety culture improvement. This report aims to record these achievements, to point out the weaknesses that still need to be corrected and to outline some ideas to keep up the momentum of nuclear safety, in 2018 and the coming years.

The international projects conducted by Assystem have reinforced the common understanding of our Nuclear Safety challenges throughout 2017. To mark this reinforcement, Assystem Energy & Infrastructure CEO, Stéphane Aubarbier has issued a global Nuclear Safety policy. This document serves as a basis for all the Assystem nuclear activities.

This report is addressed to Christian Jeannerau, SVP Nuclear. It was written in close collaboration with John Clark, CTO at Assystem UK, demonstrating the recent improvements in sharing nuclear safety issues on an international scale.

Jean-François Bossu,
head of nuclear risk management
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ASSYSTEM

1. NUCLEAR ACTIVITIES

For the past 50 years, Assystem has been working with French nuclear players on nuclear power plants and fuel cycle installations. Historically focused on the commissioning of facilities, Assystem continues to be a privileged interlocutor for their development, operation and maintenance in operational condition.

With 2500 nuclear experts, among which 150 specialised in nuclear safety, Assystem has become the leading independent European nuclear engineering company.

Its nuclear expertise aims at proposing support to the nuclear operators:
• to bring new developments, including time, schedule and budget optimization;
• to operate performance enhancement and existing facilities life extension;
• to identify lessons learnt benefits to new generations of facilities;
• to raise safety, environmental and securities issues.

Nuclear Safety is a paramount issue for Assystem, as it is a key demand from its customers and from the regulators. Therefore, Assystem has chosen to engage in a proactive policy of risk management. This policy complements the continuous improvement approach of the company. It is consistent with quality assurance, health and safety or environmental protection commitment by Assystem. In 2017, the Assystem policy for Nuclear Safety has been updated and can be summarised as in the following figure:

1. giving the priority to nuclear safety as a paramount issue for the company;
2. promoting development of a common nuclear safety culture, following IAEA recommendations and the social, organizational and human factors best practices;
3. ensuring strong management involvement with objectives flowed down through operational activities, focused on rigour, checking, and vigilance;
4. developing a continuous improvement culture, based on the involvement of all, relying on guidelines that are adapted to ensure the best compliance with local or nuclear operator driven regulations;
5. keeping high expectations on these topics, internally and externally, to promote an exemplary nuclear safety culture as a key stake.

The propagation of nuclear safety principles to Assystem people and to other stakeholders of the nuclear projects is a major issue for the management. Therefore, the nuclear safety policy may be completed with dedicated guidelines, to ensure a strict compliance with the local regulations and nuclear operator prescriptions.

At Assystem, the nuclear safety culture is shared and discussed as part of a constructive exchange, with employees, partners and contractors.

1/ TYPES OF PROJECTS AND ACTIVITIES

ASSYSTEM NUCLEAR SAFETY ASSETS

Assystem Energy & Infrastructure activities can be described through three main specialties dedicated to its customers: Owner Engineer, Project Management Office (PMO) and Architect Engineer. These specialties are declined into service lines, which are presented in the following chart:

The cartography of these activities illustrates the necessity for Assystem to keep Nuclear Safety culture development as a baseline for all the projects, not limiting its influence to nuclear safety studies, within a standalone nuclear safety discipline. To drive its projects with a stress on nuclear safety, both from the discipline and from the regulatory points of view, Assystem relies on its Nuclear Risk Management Direction. To gain efficiency, this direction works very closely with the Quality Assurance Direction, which organizes the working processes, and with the Technical Direction, which structures the knowledge management.

The global approach of Nuclear Safety issues aims at guaranteeing a seamless propagation of the nuclear safety concerns of Assystem customers, such as nuclear operators to all the stakeholders, within Assystem and its partners, at all the levels of the supply chain.

Traceability and transparency are key elements of the trust that nuclear players place in Assystem. The entire management system contributes to these expectations.

UK BUSINESS OVERVIEW

In the UK, Assystem has been closely involved in supporting all of the major nuclear facility owners and operators, over several decades, in the design of new waste management facilities. Assystem Energy &
Infrastructure Ltd (AEIL) also provides support in the operation of legacy plants on the various sites including Sellafield, Dounreay, Harwell, Devonport, Aldermaston and most of the nuclear power generating stations operated by both Magnox and EDF Nuclear Generation.

In the UK, Assystem supports clients in the nuclear sector, both on new-build projects and in the maintenance and operation of their existing facilities, through the provision of professional engineering services.

> In the UK, Assystem has a strong knowledge of safety and regulatory compliance, together with experience of managing complex projects in strongly regulated industries.


2/ MAIN ASSYSTEM NUCLEAR SAFETY RELATED PROJECTS

Assystem is involved in the following projects, which illustrate the service lines.

> Nuclear safety is part of the baseline of all the nuclear projects at Assystem.

> NUCLEAR POWER PLANTS (NPP)

Assystem contributes to design studies and to installation and commissioning activities of new reactors, such as EPRs. The nuclear safety related activities must comply with the local regulations and the nuclear operator internal prescriptions.

In Barakah, UAE, Assystem provides on-site engineering support of the four APR reactors. This activity focuses on:

- infrastructure, capacity building and training;
- Project Management services;
- support to licensing process;
- Safety studies, Quality surveillance and Construction Management.

In Turkey, Assystem is involved in the initial design and environmental studies for the four VVER reactors in Akkuyu and the four ATMEA units in Sinop.

With EDF in France and in the UK, Assystem also brings services to the owner for operating NPP maintenance operations, including coordination of works and configuration management. Safety and radiation protection are key issues for these activities. The feedback from operating NPPs is also useful for new projects. Some cross visits are organised between projects in order to develop experience through feedback.

Extending the lifetime of existing generation facilities is another challenge in which Assystem is also deeply involved, though I&C maintenance, PLM and nuclear safety case revisions.

> RESEARCH AND EXPERIMENTAL FACILITIES

On the ITER project, Assystem has performed a variety of engineering and project management services since the very early days of the project. Within that frame, Assystem has formed various partnerships with different international organisations for the delivery of a range of contract requirements. These activities include nuclear safety, design, procurement, construction management and commissioning contracts.

Based in France, ITER project is an international challenge, involving 35 nations. From the nuclear safety point of view, the French regulation applies to the whole facility (INB 174). Nevertheless, the methodologies and the technologies are so diversified that the Assystem specialists involved in the project actually develop an international nuclear safety culture experience.

Assystem also contributes to defence systems and facilities, both in France and in the UK, mainly with CEA and Rolls-Royce.
Waste management for the French nuclear industry is the responsibility of ANDRA, who currently leads the Cigéo project of a deep repository for highly active and long-lifetime nuclear waste. In this context, Assystem, in a consortium with Cegelec CEM and SPRETEC, designs the nuclear systems for transferring and handling the waste packages. Lifetime nuclear safety management is a key challenge in this project.

At Sellafield nuclear site, within AXIOM, Assystem ensures value-added design solutions focused on hazard reduction, taking full account of the complete plant lifecycle. These solutions provide the Client with the benefits of accelerated decommissioning, improved performance of production operations and reductions in lifetime costs.

Innovative projects make it possible to think “out of the box” and to imagine nuclear safety systems that could not be applied to existing facilities.

BUSINESS PARTNER FOR NUCLEAR SAFETY

Nuclear risk management is an important challenge, common to all Assystem activities for the benefit of the major nuclear operators. Consequently, the project managers are encouraged to think and organise their projects, sharing the vision of the nuclear operators towards nuclear safety. This implies that they refer to company experts in the various fields of nuclear safety, and that they organize training and information sharing within their teams and propagate the associated principles to the chain of contractors they deal with. In addition, this enhances the prescriptions of traceability and transparency, as paramount values for a stakeholder in nuclear activities.

To further improve these qualities, Assystem is committed on strengthening the following topics in the coming months:

- Crisis management and local feedback analysis;
- Internal evaluation and e-learning;
- Identification of the risks and graded approach;
- Nuclear safety culture principles sharing.

To reach this goal, an internal nuclear safety discipline network gathers senior specialists from all the types of activities and helps setting methodologies. This network is deeply involved in feedback analysis, training program definition and expert knowledge sharing. They are in direct connexion with the local teams.

3/ COMMITMENT TO NUCLEAR PROJECTS ON INTERNATIONAL SCALE

TYPHOLOGY

Assystem is involved throughout the entire nuclear lifecycle, from production to fuel reprocessing, from design to decommissioning of nuclear facilities, including research projects, mainly in France and the United Kingdom, but also in most countries developing a nuclear industry.

INNOVATION

In addition, some innovative topics are launched as case studies, such as SMRs, visual inspection systems or newly designed hot cells. Nuclear Safety issues are often at the centre of these innovative projects and give an opportunity to bring new concepts that could not be studied in a more conventional environment, where the nuclear safety requirements are very prescriptive. One of the main innovative paths where Nuclear safety is at stake is the thinking of simpler and more reliant systems that will increase the resilience of the facilities while keeping the capital and operating costs at a sustainable level. Anyway, the evaluation of these concepts relies on a proven nuclear safety assessment processes.

Figure 4- at ITER, Assystem is part of MOMENTUM Construction Management JV

Innovative projects make it possible to think “out of the box” and to imagine nuclear safety systems that could not be applied to existing facilities.
2. NUCLEAR RISK MANAGEMENT IN 2017

1/ NUCLEAR RISK MANAGEMENT SCOPE

For five years, Assystem has grouped within the scope of its nuclear risk management direction all the actions that contribute to the protection of the interests defined by French environmental laws. French and British regulations and many other international standards link these interests (security, public health, wholesomeness and protection of nature and the environment) to objectives that are monitored by the quality systems of the stakeholders. This logically extends to radiation protection and protection of the workers, which originally refers to the Labour code in France. From this point of view, actions to develop safety culture and prevention are complementary.

- At Assystem, Continuous Training, Nuclear Risk Management, Quality and Occupational Safety departments work together towards a sound prevention culture.

Tools derived from quality or internal training structures are most effective when linked to nuclear and occupational safety risks reduction actions. This applies to all activities, from design office to on-site interventions. In 2017, the Nuclear Risk Management was closely associated to the Quality management actions towards OHSAS\(^2\) compliance. In that perspective, the radiation protection of Assystem workers is seamlessly integrated within the management of the projects.

In order to prevent the risk of a conflict between nuclear security and operational requirements, the Nuclear Risk Management director reports directly to the General Manager. On a day-to-day basis, the NRM is in direct contact with operational projects and relies on the PCR\(^3\) network and on the nuclear safety technical referents. Oriented towards operations support, these two groups are also the main centres of development of nuclear safety culture for Assystem. The commitment of the operational departments in the same dynamics is the key to this development.

2/ NUCLEAR RISK MANAGEMENT CHALLENGES

The development of nuclear safety culture and, more broadly, nuclear risk control, is a multi-year development. This effort is motivated by the shared concerns of nuclear operators. For them, the risks that could be generated by the use of a service provider with a failing safety culture must be eliminated. Assystem places this concern at the forefront of its actions.

The presentation and understanding of operators’ nuclear safety policies are now extended to all Assystem operations.

- The increase in nuclear operators’ expectations towards their providers corresponds to Assystem’s voluntary and ambitious policy of strengthening nuclear risk management.

This policy extends the continuous improvement approach already strongly developed in the fields of quality, safety and environmental protection. A nuclear safety charter propagates it to all Assystem employees in nuclear. This nuclear safety charter creates a backbone for nuclear safety in internal audits, resource management and training. It also helps keeping everyone in line with nuclear safety prescriptions.

The nuclear safety charter develops the following principles to which Assystem is committed:

- Rigorous application of the laws, rules and safety baselines of its customers, backed up by an internal control adapted to safety issues;
- Continuous improvement of our processes and safety culture, through a constant effort in training and knowledge sharing;
- Inclusion of social, organizational and human factors in our nuclear risk management approach;
- Confidence in technical exchanges and vigilance, which are necessary to ensure transparency of feedback of lessons learned.

The objectives attached to this charter are an integral part of Assystem commitment to responsible management, technical excellence and the development of the company’s safety, security and environmental excellence culture.

3/ FEEDBACK AND COMMUNICATION TOOLS

- At Assystem, feedback collection and internal communication are two sides of the same issue: confident and attentive information sharing.

To improve nuclear safety culture and overall traceability, Assystem uses both “classical” paper communication tools, such as flyers and posters and digital tools, for instance through databases. The main database in use in France is the MADE, an internal tool, which gathers: deviation collection, action plans follow-up, audits and many other processes linked to health, occupational safety and environment. It can be reached through the company web portal.

(2) ISO 18001 certification to be obtained in 2018
(3) Personne compétente en Radioprotection required by French regulations – Radiation Protection Officer
This illustrates how a real feedback (an experimented employee enters a zone without noticing that the conditions have changed and that it is necessary to wear an additional PPE) can be used to promote safety culture and cautious approach of nuclear activities.

The posters communicated to the local teams by mail in order to be printed and displayed are short and focused on the correct practices to be remembered rather than on the errors and mistakes. Nevertheless, a stress is put on the fact that these events can be avoided easily if ones keeps a cautious and rigorous approach and a permanent questioning attitude.

**> GETTING DIGITAL**

As already mentioned, reporting is an essential line of action for safety culture. To help operational teams to collect and report any deviation, digital tools are also being developed. The main purpose of these tools is to make reporting as easy as possible, in order to focus on the analysis of the facts.

Despite of all the efforts put on enhancing the tools, some points still require some improvement efforts. In the perspective of an update of the quality system and the integration of new norms such as ISO 19443, the traceability of all the actions taken to improve nuclear safety culture must be consolidated.

In the main Assystem engineering offices (i.e. in Lyon, Tours, Marseille or Paris) some company experts organise informal training sessions, where young engineers can share issues and learn new methodologies to solve their problems. Some of these workshops will be recorded and will be shared as MOOCs, using internal networks.

On nuclear sites, all activity changes give the opportunity to propagate the best practices to all the teams. The feedback analysis shows that the same mistakes or wrong practices often happen in remote facilities almost simultaneously. This reveals the common roots of these discrepancies and illustrates the benefit of cross-site internal information sharing.

At Assystem, internal communication tools, such as video conferencing or document online sharing, make experience exchange very easy to organise. The internal network of nuclear safety specialists already uses communication tools in addition to physical meetings to work more efficiently, with a better knowledge of all issues.

**> BUILDING THE NUCLEAR SAFETY COMMUNITY**

In 2017, Assystem organised its yearly Nuclear Safety and Quality observatory meeting in Paris. It gathered more than one hundred nuclear safety and quality company experts. In addition to general talks such as a presentation of the regulatory evolutions, the theme of the day was I&C keeping nuclear safety related information within the global continuous improvement system tool makes reporting easier for operational teams.

This is why the local management of the projects is asked to organise “causeries” (tool box talks) as often as possible, in order to comment and explain various feedbacks, in addition to more traditional communication. The following pictures illustrates the kind of feedbacks that the teams can work on:

**The Assystem philosophy is that nuclear safety related information must be accompanied by a direct exchange and talking session.**

**> PROPAGATING INFORMATION**

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**> Internal communication appears to be the pillar of nuclear safety culture where the improvement potential is the greatest for Assystem teams.**

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CRISIS COMMUNICATION

In order to be able to deal with unexpected and dangerous situations linked to Health, Safety and Environment, Assystem has set a crisis organisation procedure. A crisis management cell that gathers managers, experts and operational structures, assesses the situation; helps local teams taking proper actions and prepares decisions and communication.

In 2017, the Assystem crisis cell was activated twice in anticipation of a potential radiation protection issue. Finally, these events had no impact, but they were all analysed and explained. The most significant conclusions were propagated to all the company, through the flash posters presented in paragraph Propagating information and discussed locally.

4/ UK PERSPECTIVE

The AEIL Nuclear Safety Charter is the principal document relating to AEIL’s commitment to nuclear safety and security. The charter is embedded into the Quality Management System and is available to all of staff, on the company portal (ICE) and on notice boards. All existing and new AEIL staff are made aware of the importance of abiding with the document for all work relating to nuclear projects. The charter sets the Nuclear Security policy on which the business is based and is endorsed by the Managing Director. It draws on world-recognised sources of experience such as the World Association of Nuclear Operators and the Institute of Nuclear Power Operations.

5/ NUCLEAR SAFETY CULTURE

Assuming that knowledge management is key as qualification and experience in nuclear safety are at stake, Assystem as a long experience in internal training. During the first years, Assystem followed a two-axis action plan:

- nuclear operator or regulatory training, on a mandatory basis;
- internal knowledge development, with the Assystem Nuclear Institute, animated by company senior experts.

Of course, these two directions are still at the heart of Assystem knowledge development strategy. They have even been reinforced by a recent partnership between the French institute for Nuclear Techniques (INSTN) and Assystem. Regular exchanges between INSTN and ANI enable experts to share experience, either on technical or on teaching practices.

This strong partnership is reinforced by the involvement of Assystem as a founding member of INSTN Foundation, which aims at developing innovative projects, among which:

- Knowledge transfer regarding low-carbon energy sources, including nuclear and renewables;
- Disruptive educational and digital solutions for modern and effective training;
- Creation of national and international research and teaching chairs.

As expected in such a partnership, Assystem employees benefit from this knowledge sharing initiative. For instance, they have access to internal online training, the principle of which was inspired by INSTN tools, such as MOOCs.
> INDICATORS

In 2014, Assystem published nuclear safety charters both in the UK and in France. These charters present commitments and indicators to be followed on a yearly basis.

In France

The key indicators are measured and analysed in order to help steering the nuclear risk management policies and actions.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2017 performance</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of exceedances of Assystem radiation exposure limits</td>
<td>0</td>
<td>Assystem annual radiation exposure limit is 5 mSv. 4</td>
</tr>
<tr>
<td>Number of annual audits concerning nuclear safety on Assystem projects</td>
<td>78</td>
<td>including 29 on radiation protection</td>
</tr>
<tr>
<td>Number of action plans opened on reduction of nuclear risks</td>
<td>118 (72% completion)</td>
<td>including 109 on radiation protection</td>
</tr>
<tr>
<td>Safety and radiation protection management field visits</td>
<td>162</td>
<td>new monitoring activity developed in compliance with OHSAS</td>
</tr>
<tr>
<td>Opened progress tracks in the field of nuclear safety</td>
<td>27</td>
<td>These items have been raised by operational teams</td>
</tr>
<tr>
<td>Number of trainings or experience sharing meetings in the field of radiation protection and nuclear safety</td>
<td>367</td>
<td>all Assystem employees in nuclear trained or sensitized</td>
</tr>
<tr>
<td>Non conformities linked to nuclear safety</td>
<td>18 (67% completion)</td>
<td>83% Assystem internal control detection</td>
</tr>
<tr>
<td>Non conformities linked to radiation protection</td>
<td>76 (78% completion)</td>
<td>97% Assystem internal control detection</td>
</tr>
<tr>
<td>Number of evaluations by clients or nuclear operators, reflecting atypical situations or significant changes in the response to nuclear risks</td>
<td>5</td>
<td>These alerts have all been integrated in the Assystem internal feedback analysis tools. Therefore, they are followed by the assessment of corrective actions.</td>
</tr>
</tbody>
</table>

Table 1 - nuclear safety culture indicators

These indicators show a good responsiveness in the non-conformances and field involvement of the managing teams. The global results remain good thanks to this effort. Meanwhile, the training actions need to be reinforced and also to get a more reliable recording.

From a technical point of view, the relatively high proportion of actions concerning radiation protection reveals some weak points in the practices, mostly in contaminated areas. The corrective actions focus on the behaviour of everyone facing contamination risks.

4 In France, the regulatory limits are 6 and 20 mSv /12 running months, depending on workers categories.

In the UK

The use of e-learning tools in 2018 will ease the practical organisation of trainings and secure their recordings.

In addition to these necessary improvements, an effort must be lead towards positive feedback. The next challenge Assystem needs to achieve is to focus more on achievements and not only on non-conformities.

AEIL believes that a rigorous approach to Quality is essential to deliver Safety in its operations. AEIL’s Quality processes ensure that team members are suitably qualified and experienced for their roles and that, when leading and delivering projects, teams have appropriate non-advocate mentoring and review. This is provided by a small team of experienced Technical Governance experts and Heads of Engineering Discipline. The team reviews nuclear and product safety issues on a monthly basis and reports to the Directors through the CTO. Where necessary, it can call on the support of the Group Nuclear Safety Director.

The table below shows how AEIL performed against five metrics for nuclear and product safety in 2017. These metrics are defined in the AEIL Nuclear Safety Charter.

In this way, the charter reminds employees how they each contribute to our culture and gives a set of measures by which we can show progress.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2017 performance</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design reviews</td>
<td>74</td>
<td>This includes all internal non-advocate design reviews including technical touchpoint reviews.</td>
</tr>
<tr>
<td>Nuclear safety or product safety incidents</td>
<td>1 LFE 2 potential alerts</td>
<td>LFCE event was in response to a third part issue. The 2 potential alerts were investigated and managed to avoid an incident.</td>
</tr>
<tr>
<td>Training courses in nuclear safety and radioprotection</td>
<td>64</td>
<td>Includes four group-wide presentations and an estimated 60 individual staff training and induction events.</td>
</tr>
<tr>
<td>Safety-related audit findings</td>
<td>0</td>
<td>Excludes occupational health aspects, discussed later.</td>
</tr>
<tr>
<td>Lessons learned and Continuous Improvement events held</td>
<td>19</td>
<td>Includes internal Lessons Learned reviews and 8D investigation and improvement projects.</td>
</tr>
</tbody>
</table>

AEIL understands the need to stay competitive and it plans to put increasing emphasis on continuous improvement activities at all levels in the business to drive progress.
6/ RADIATION PROTECTION

> OPERATIONAL RESULTS

Due to the typology of the activities conducted by Assystem in the UK, the exposure of UK workers to radiations is extremely limited and therefore not significant. Nevertheless, the radiation protection teams in France are ready to support UK teams in case of any anomaly or unusual activity.

In France, the records confirm the constant decrease of the radiation doses. In particular, the average of the exposure for the workers who actually register non null doses is now under 0.3 mSv/yr.

![Figure 6 - Evolution of exposure to ionising radiation (France)](image)

This result partly reflects some changes in Assystem activities and the reduction of some projects generating higher doses, in particular in the fuel cycle activities. As a consequence, all Assystem workers now stay under the category B exposure limit. This is why the internal Assystem objective has been lowered to 5 mSv/yr for all the employees.

The dose reduction trend also reflects the efforts of all the teams, in particular in the NPPs, to analyse the working situations and to find exposure reduction solutions.

The efforts made to anticipate and to challenge all the activities from the radiation protection point of view must be underlined.

Accordingly, Assystem will be able pursue the reduction of the categorised personnel, which is in line with a general prescription in nuclear: the graded approach. This is a direct benefit of the improvement of our anticipated dose analyses.

> RADIATION PROTECTION AUDITS AND ASSESSMENT

To help improve these results and the reliability of the management system of the radiation protection, Assystem conducts internal audits as shown in Tableau 1 - nuclear safety culture indicators.

In addition, Assystem has chosen Qualianor as an external auditing body. The auditing references for this external assessment are:

- Article R. 4451-122 of the French Labour code;
- 27 November 2013 Order on external companies carrying out nuclear activities and temporary employment agencies concerned by these activities.

In 2018, Assystem was certified by Qualianor (certificate n°244 R).

7/ OCCUPATIONAL SAFETY

> IN FRANCE

Even if it is not directly linked to nuclear safety, at Assystem, occupational safety is traditionally looked at as an indicator of the care put into working situations. The official indicators in France take into account all the injuries occurring at work or during the employee’s journeys between home and work.

The important efforts that have been undertaken during the last years have not given significant results in the long term. The trend remains steady, with a TF (frequency rate) between 2.5 and 3.0.

The gravity of the injuries remains low, but the difficulty encountered in lowering the rates is significant of a lack of prevention culture.

> THE UK PERSPECTIVE FOR OCCUPATIONAL SAFETY IN THE NUCLEAR FIELD

The team is largely office-based and so the HSE approach is tailored to that. The business takes a proactive stance in identifying and managing the risks that they face and involving the staff in the process as much as possible. This has the twin benefits of helping to protect employees and also in general building a "safety always in mind" culture with the whole team.

A key part of this is the monthly safety and assurance briefing which is given to every team member. These cover subjects such as risks that employees may face at work or at home and also safety-related topics within engineering design operations.

The health and safety of AEIL staff at work is of prime importance and the aim of the business is to have zero accidents.
Safety Performance

The accident and near-miss performance of AEIL and E&I over recent years is summarised below.

<table>
<thead>
<tr>
<th>EXPOSURE</th>
<th>Current Year</th>
<th>Year -1</th>
<th>Year -2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Man hours worked</td>
<td>466888</td>
<td>480720</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAFETY</th>
<th>Current Year</th>
<th>Year -1</th>
<th>Year -2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatalities</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HSE Reportable Injuries</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lost time incidents (1-7 days)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Incidents requiring medical treatment (MTI)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Incident requiring first aid</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dangerous Occurrences</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Near Hits/Misses</td>
<td>9</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>HSE/HSA or equivalent improvement notices</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HSE/HSA or equivalent prohibition notices</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HSE/HSA or equivalent prosecutions</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENT</th>
<th>Current Year</th>
<th>Year -1</th>
<th>Year -2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Non-reportable incidents</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Reportable incidents</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Enforcement action i.e. Warning letters, prosecutions</td>
<td>0</td>
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</tbody>
</table>

The statistics in the above table reflect the performance of AEIL and, before its separation from AUK, the E&I team within AUK. The team is focused on maintaining and improving its good performance with respect to Occupational Health & Safety. Each office has a local Health & Safety Representative, who reports to the HSEQ manager and is responsible for monitoring and reporting performance and encouraging good behaviour. An important part of this is to identify near-misses and learn the lessons from them in order to prevent future accidents. The increased reporting of near misses over the last two years is due to the team’s increased level of vigilance in this respect.

8/ REGULATORY WATCH

To integrate flawlessly the latest regulations, Assystem uses an external dedicated service. This service enables nuclear safety specialists and managers to focus on the implementation of the regulations in their businesses rather than on the collection of the regulations themselves. The following figure illustrates the portal interface of this tool:

Figure 7 - the Amadeo regulatory watch tool

The near miss approach conducted in the UK illustrates how internal benchmarks between activities and countries can help improving Assystem global prevention performance.
3. FUTURE DEVELOPMENTS

In a recent statement, IAEA Director General Yukiya Amano shows the necessity of nuclear technology for sustainable development. In that perspective, nuclear energy will develop if the two following conditions are met: it must be safe and competitive. For a long time, these two aspects seemed contradictory, as cost is not to be opposed to nuclear safety. Thus, nuclear safety has reached the highest standards and the design of the latest generation of nuclear facilities has been almost exclusively lead by nuclear safety.

New developments in nuclear engineering can lead to even higher nuclear safety standards, while keeping the costs at a reasonable level for the nuclear operators. Assystem is deeply involved in this necessary evolution, on an international basis.

The future developments of nuclear engineering made possible by new tools and new norms and regulations. But they will make the achievement of safety and competitiveness possible only if the people, designers, constructors and operators are associated to this new vision of nuclear. At Assystem, the project management and the nuclear safety teams share this common vision, which starts at a project objective and propagates to the most detailed requirements of safety components.

1/ GOING DIGITAL, SAFE AND COMPETITIVE

The digital transformation has a strong impact on engineering and operating activities, which are taken by Assystem as innovative ways to improve the quality of the design and therefore, nuclear safety at a reasonable cost.

Digital can help reduce design, construction and commissioning phases in order to help cost limitation through a better use of data and increased efficiency. Modularity can be promoted in construction, as for SMRs\(^6\), or in design phases, with integrated platforms enabling configuration information sharing. This illustrates how the IMS\(^7\) contributes to nuclear safety, as all the disciplines share nuclear safety requirements seamlessly from the first drawings to the commissioning trials. When applied to nuclear, system engineering also helps traceability, with a more efficient feedback collection. The nuclear safety monitoring activities can be integrated into the design tools at the first stages of the projects.

Assystem innovation teams lead projects in modular design and integration of all kinds of requirements within the project. When extended to the operating phases, this can have a significant positive impact on maintenance and future dismantling.

Moreover, the integration of nuclear safety requirements as early as possible in the project model helps the managing engineers concentrate on the nuclear safety culture of their teams. Then, attention can be focused on detailed and efficient safety requirements, without dilution in a wide spectrum of safety classified equipment or assemblies. At this stage nuclear safety performance can be kept in the first row. Development tools only come as a support to the safety demonstration.

All these evolutions require management involvement and nuclear safety assessment based on:
- the knowledge of regulations;
- the methodologies and feedback;
- a robust requirement management process, including propagation to all stakeholders with an operational vision of all project phases.

Assystem Nuclear Institute currently prepares new internal trainings to spread this knowledge, which is essential for the understanding of this holistic approach of nuclear safety.

At Assystem, digital tools in projects are used as an opportunity to develop nuclear safety culture and understanding and not as a purpose in itself.

The efficiency of the exchanges through digital tools will also help using the operating feedbacks. For instance, the designers will have access to a wide engineering experience, helping to think of the maintenance of the facilities from the beginning of design phase. Crisis management thinking is another example of this anticipation made possible by digital tools. Assystem takes advantage of its position in system engineering to anticipate these emerging opportunities.

2/ TOWARDS PEOPLE, WORLDWIDE

The development of international projects opens up an opportunity for Assystem to get crossed views of nuclear safety and prevention cultures. Methodologies and practices are now collected worldwide and analysed. Our policy and our nuclear safety charter help local teams in this discipline knowledge sharing approach.

Understanding different standards and the way they need to be implemented within internal processes is a key issue for Assystem international growth in nuclear.

The human dimension of this international development comes from the cultural aspects of nuclear safety. All the studies and policies relative to nuclear safety culture underlie the importance of management involvement in that matter. The international aspects of knowledge sharing implied by nuclear safety culture make management actions even more important.

Management involvement must be extended to all responsibility levels, so that practices enhancing really comes from detailed processes and safe working gestures.

In the coming years, nuclear safety culture development will be central in Assystem’s approach of international projects.

\(^6\) Small and Modular Reactors  
\(^7\) Integrated Management System
3/ NEW REGULATORY PRESCRIPTIONS

In 2017, the Assystem Quality system has been reviewed in order to comply with ISO 9001:2015 standard. In accordance, the company is going to seek ISO 45001 certification for occupational safety, which includes radiation protection and follows ISO 18001 certification.

For nuclear safety, the process system has historically been built in order to comply with French regulation (mainly 2012 INB Order) and ISO 9001 standard. The prescriptions of the nuclear operators (e.g. EDF) are propagated through internal dedicated processes such as PQSs (specific quality plans). This system is now challenged by international growth.

To accompany the international development, it is necessary to integrate new standards, even if it is technically destabilising to seek different certifications at the same time. So, Assystem has chosen to analyse the compliance of its internal system with the major international standards. The resulting compliance matrices show that the system based on French prescriptions and ISO 9001 widely covers these standards.

Nevertheless, some international operators and national authorities require an explicit compliance with norms such as NQA-1 standard. To answer this kind of request while keeping a high level of coherence with ISO 9001:2015 system, Assystem has chosen to work on the convergence with the future ISO 19443 standard.

ISO/FDIS 19443 is still under development. Inspired by the aeronautics NQAG, its purpose is to propose specific requirements for the application of ISO 9001:2015 by organizations in the supply chain of the nuclear energy sector supplying products and services important to nuclear safety (ITNS)\(^8\). To put it in other words, it imports the IAEA GSR 2 and the ASME NQA 1 safety rules into the ISO quality standard. This leads to the following logical sequence:

![ISO 19443 process approach of risks and reduction measures](image)

In addition, ISO 19443 will take management involvement and nuclear safety culture as paramount and will require a regular assessment of their development. Assystem is already working on these subjects, so that everyone feels and behaves as an actor of nuclear safety.

For instance, an internal project has been initiated in order to get a crossed vision of the top requirements and their application in the regular activities. Instead of a top down approach where norms and prescriptions are propagated in every process, with the risk of a narrow vision, the SIEM approach proposes to local team leaders a method to link their day to day constraints with a global and systemic vision of nuclear safety and of reference standards. The conclusions of this project are expected in 2018 and will help converging on ISO 19443 prescriptions.

\(^8\) [http://www.iso.org](http://www.iso.org)
At the beginning of 2018, Nuclear Safety related activities here at Assystem have reached a turning point. The processes, the tools and the trainings that have been created and internally promoted for years, are now fully part of our nuclear projects. The stage the company now meets is to measure and demonstrate the benefits of these actions in the projects and nuclear activities, internally, but also with partners and suppliers on an international scale.

Among the objectives of this policy, the perfect balance between project quality, nuclear quality and nuclear safety is key to offer safe and sustainable nuclear engineering solutions to the nuclear operators around the world. The ISO system is the frame of this change, which will imply every Assystem resource in nuclear.

1/ MAIN 2017 ACHIEVEMENTS

In 2017, for Assystem, the key completions for nuclear safety were:

- Training engineering development, with new modules labelled by the French national nuclear institute (INSTN);
- Qualianor certification for radiation protection monitoring system;
- Development of internal procedures such as crisis management;
- Publication of a global nuclear safety policy;
- Internal nuclear safety discipline structure development and commitment to nuclear safety culture spreading;
- Constant reduction of exposure to radiation and better follow-up of workers and activities.

Of course, Assystem teams will carry on these continuous improvement actions in 2018 and the coming years.

2/ DIRECTIONS FOR 2018

In 2018, Assystem will aim at delivering to its customers projects at the highest level of nuclear safety, while keeping the associated requirements sustainable. This objective will be managed with the following directions:

- Evolution towards ISO 9001:2015 and 19443 standards, implying process and risk analysis of the activities and the development of nuclear safety culture assessments;
- Reinforcement of a systemic approach of the activities, with in-depth understanding of the prescriptions and requirements, from design to maintenance, operation and dismantling, with a global supply chain and IMS understanding;
- Reverse evaluation of internal procedures in order to strengthen the understanding of the link between in house processes and global nuclear safety prescriptions (SIEM project).

To achieve these objectives, Assystem will keep the most coherent approach of nuclear safety along with project and safety quality. This seamless transition between quality and safety is differentiating for Assystem, as it lies between prescriptions of operators and regulators, and internal processes.
ENABLER OF ENERGY & DIGITAL REVOLUTIONS