

**ETSON**

EUROPEAN  
TECHNICAL SAFETY  
ORGANISATIONS  
NETWORK



ETSON  
ANNUAL REPORT  
2023

The year 2023 has seen various significant events that have undeniably influenced the nuclear field and impacted our TSO activities, on a global scale.

- Sadly, the aggression war of Russia against Ukraine continued to bring up concerns about nuclear safety. It raises very serious concerns for nuclear safety in Ukraine, especially in Zaporizhzhia power plant. Moreover, this aggression jeopardizes the geopolitical stability, encouraging different countries to reevaluate their energy policy approaches including the use of nuclear power.

From that point of view, we noticed growing interest regarding SMRs and AMRs, especially for embarking countries. In combination with the issues raised by climate change, all these evolutions stress even more the importance of nuclear safety.

- I want to emphasize the rise of “embarking countries” on the nuclear scene, thus highlighting new opportunities of collaboration with ETSON members for enhancing expertise capacity, for the benefit of nuclear safety worldwide.

- Finally, in recent years, we have noticed that several experimental facilities used for safety research have closed or are in the process of doing so. States and operators

are gradually withdrawing from financing and modernizing facilities that are deemed costly to maintain, and which would be difficult to rebuild given the cost of the investment required.

To support these facilities, international cooperation is essential, and we should mention the efforts of ETSON and other organizations such as the IAEA, the NEA, and the European Union, to help maintain experimental facilities for the benefit of nuclear safety.

In this context, ETSON has continued to consolidate its work and promote exchanges within its network, including with other international organizations.

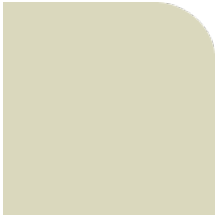
The ETSO Conference was held on 11 and 12 October 2023 at Bel V's Offices with about 50 participants. It was kicked off by an impulse speech from OECD/NEA on the topic "Nuclear renaissance (with special focus on SMR): issues & challenges", followed by a Round Table discussion and a Q&A session. The conference included 4 dedicated sessions covering the following topics: "Competence & Expertise management and capacity building", "ETSON Common Safety Research project", "Interaction & dialogue with stakeholders" and "Interaction & collaboration with international organizations and groups".

As part of ETSO's Junior Staff Programme (JSP), Jacobs RSD welcomed, from the 23 to the 27 October 2023, over twenty young participants to Manchester to discuss the general theme of SMR and AMR technologies.

I am proud that ETSO, with such an event, takes part in the general effort to support the emergence of the next generation of safety experts and researchers, to conserve long-term and high level of nuclear safety to all.



Jean-Christophe Niel  
ETSON President



# CONTENTS

1 ORGANISATIONAL MATTERS	5
1.1 ETSON Membership	5
1.2 General Assembly and Board Meetings	5
1.3 ETSON Strategy	5
1.4 Accounting and Fee Payment	6
2 ETSON ACTIVITIES	7
2.1 Technical Board and Reactor Safety - Expert Groups	7
2.2 ETSON Research Group	9
2.3 ETSON Communication Group	9
2.4 ETSON Knowledge Management Group	10
2.5 Junior Staff Programme	10
2.6 ETSON Conference	11
2.7 ETSON Members Actuality	12
2.8 JSP Summer Workshop	17
3 EXTERNAL RELATIONS	18
3.1 IAEA	18
3.2 European Commission	20
3.3 WENRA	20
4 ANNEX	22
4.1 ETSON organization 2023	22
4.2 ETSON active members	23



# ORGANISATIONAL MATTERS

## 1.1 ETSON Membership

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In 2023, a total of 15 technical safety and support organizations (TSO), mainly from the European Union but also from Japan, UK and Ukraine, belonged to the ETSON network.

In 2023, the activities with SEC NRS, the Russian TSO, are still suspended until further notice due to the Russian aggression in Ukraine.

No new TSO joined the ETSON network.

## 1.2 General Assembly and Board Meetings

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Two General Assembly meetings together with Board meetings were held on 14 June 2023, in Helsinki, and during the ETSON Conference on 11-12 October 2023. Additional Board meetings were held on 06 February, 21 March, 11 May and 25 September 2023.



During the General Assembly meeting in June 2023, elections were held to appoint the following board:

President: Dr. Jean-Christophe Niel (IRSN)

Vice President: (full member): Mr. Michel Van haesendonck (Bel V)

Vice President: (associated member): Mr. Frederic Wheeler (RSD-ESRC)

Secretary: Mr. Uwe Stoll (GRS)

Treasurer: Mr. Léon Cizelj (JSI)

## 1.3 ETSON Strategy

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ETSON continues to develop and deepen relations with international nuclear safety organizations such as DG ENER, JRC, SNETP and WENRA, in order to increase the effective use of ETSON expertise in technical safety assessments and nuclear safety research management in Europe.

Since the TSO Conference, which was planned in October 2022 was postponed, ETSON organized the 2<sup>nd</sup> ETSON Conference in Belgium (see Chap. 2.6). The ETSON Award, which was organized by the JSP, took place during the Conference. Furthermore, the ETSON groups had the opportunity to present their work and every ETSON member presented current activities in its corresponding country.

Additionally, a JSP Summer Workshop was organized in United-Kingdom in October 2023.

## 1.4

### Accounting and Fee Payment

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The Association collected annual fees from active ETSON members. The funds are dedicated to the ETSON Award, the promotion of ETSON and limited research actions among ETSON members.

In 2023, the annual fees were of 3000 euros. They were collected from the 14 of the 15 actives member .



# ETSON ACTIVITIES

## 2.1 Technical Board on Reactor Safety - Expert Groups

The Technical Board on Reactor Safety (TBRS) provides Technical Safety Assessment Guides (TSAGs) and technical reviews of proposed publications and workshops. It also provides recommendations on the technical programme and strategy of ETSON.

The TBRS oversees the 15 expert groups (EG) of ETSON. In 2023, a fifteenth expert group was created on the topic of data science. Each EG is dedicated to a specific field of competence where ETSON members seek an in-depth exchange of knowledge and experiences:

N°	Technical issue
1.	OEF Including Incident and Precursor Analysis
2.	Mechanical Systems
3.	External Hazards (Man-Made, Natural)
4.	Severe Accidents
5.	Environmental Safety Related Qualification of Components
6.	Safety Fluid Systems, including Auxiliary Systems
7.	Human and Organizational Factors
8.	Probabilistic Safety Assessment (PSA)
9.	Decommissioning
10.	Thermal Hydraulic Analyses
11.	Safety Concepts, Defense-in-Depth
12.	Fuel Behaviour (operational & accident conditions)
13.	Emergency Preparedness and Response
14.	Waste Management
15.	Data Science

The expert groups focus in particular on safety assessment practices in the respective areas and identify common approaches. These common approaches are then published as TSAGs

which serve as reference point for safety assessments performed by member TSOs and others. TSAGs also contribute to the harmonization of safety assessment practices. Safety assessment principles that are more general are described in the Safety Assessment Guide (SAG). Both the SAG and TSAGs can be downloaded from the ETSON webpage ([www.etson.eu/](http://www.etson.eu/)).

For 2023, discussions within the TBRS focused on the situation and status with respect to fusion energy production, since in some countries projects are ongoing and other countries announced investments. The TBRS members agreed to collect all the activities among members, in a jointly developed survey. This survey, including the TSO activities addressing separately magnetic and laser-based technologies will serve as an overview on fusion activities in Europe/ETSON. For that purpose, it was decided that a template would be put on the TBRS website to collect every ETSON member activities. The template will have 7 columns: Country, Type of action, Goal of action, Status of maturity, TSO involved or not Involvement of Regulatory bodies or Regulatory framework, and additional comments.

Furthermore, the following actions were done in the different expert groups:

- **EG N° 2** is working on a report on warm prestress applications in different ETSON member countries. Different approaches are collected and discussed. The collection of available experimental data started. Finalization of report is still expected for 2025.
- **EG N° 3** worked on a report on the requirements and approaches for the assessment of external hazards impacting the safety of nuclear power plants. The work is ongoing.
- **EG N° 4** prepared a TSAG on Hydrogen risk assessments in light water reactors. The work is still ongoing.

- **EG N° 6** received the answers from the partners to the questionnaire elaborated in 2022. A draft report has been initiated that will be completed during 2024.
- **EG N° 7:** In 2023, the most notable activity for EG7 was the request for closer collaborations with EG1 (REX/AAE), which resulted in an exchange between BEL-V and GRS in June 2023, during which it was agreed to organize the sharing of in-depth event analysis expertise practices between the two groups. This point was raised at the ETSON conference by GRS in autumn 2023 and is therefore official for the year 2023.
- **EG N° 9** worked on a report on “Decommissioning safety aspects of LW-SMRs”. A final version of the report has been presented during a TBRS meeting in October 2023. The report is scheduled for release in 2024.
- **EG N° 10:** In the last quarter of the year 2023, a questionnaire was distributed to EG 10 members regarding the BEPU analyses with the request for filling. It is planned to organize a kick-off meeting for the group to discuss both experiences of the different institutions regarding BEPU as well as a first structure for the state-of-the-art report.
- **EG N°11 :** A technical report on challenges and opportunities for licensing process and safety assessment of LW-SMRs is prepared by EG N°11. The report aims, based on contributions from the various EGs, to identify key issues related the licensing and deployment of SMRs in different countries and within different national regulatory frameworks. It can be considered as a first step before identifying potential needs of review of existing Safety Assessment Guide (SAG) or Technical Safety Assessment Guides (TSAGs) to take into account SMRs or the needs of development of SMRs specific Technical Safety Assessment Guides (TSAGs). It is also a first step towards sharing safety concerns related to SMRs with the TSOs and, if possible, developing common safety positions. Finally, it is an opportunity to identify the need for TSOs to acquire new knowledge on this topic
- **EG N° 12:** The ETSON technical report on "Fuel Assembly Bowing and Safety Demonstration" from EG N°12 collective work was accepted by TBRS and figures on the ETSON Internet Website. Moreover, EG N°12 is contributing to the ETSON report on “SMRs”.
- **EG N° 13:** Several TSOs of ETSON have had some activities regarding the follow up of the situation in Ukraine. Further work to compare assessments have been carried out in EG13. These evaluations rely on various hypotheses and are affected by large uncertainties. This work will be carried on within the EG13 future workplan.
- **EG 15:** This expert group was created in 2023, following a workshop organized by PSI on “data science and artificial intelligence”. Given the interest expressed by ETSON members, it was decided to create an ETSON group on this theme.



## 2.2 ETSON Research Group

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The ETSON Research Group (ERG) aims at sharing information about the member's research programs, to coordinate research activities as well as to identify and prioritize research needs within the ETSON network. The ERG also develops common positions on research strategies that are communicated towards international organizations.

In 2023, the ERG was asked to prepare a structure for the R&D position paper and to discuss the issue in the next meeting by considering SMRs related issues. A new internal project "ETSON AMYCO" on hydrogen carbon flame propagation was proposed to be funded. The funds will cover organizational work, workshops, and experimental research. On the other hand, the renewal process of the Memorandum of understanding MOU between the JRC and ETSON group was addressed.

## 2.3 ETSON Communication Group

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The ETSON Communication Group (ECG) was fully established in 2019 in order to increase the recognition of ETSON's values and activities at the international level as well as to support ETSON's internal and external communication.

In the course of the reporting period, the ETSON Communication Group (ECG) continued to prepare and published the monthly ETSON News both in form of a newsletter as well as on ETSON's website. Furthermore, minor contentual modifications of the website were performed and a number of reports and other document published.

One of the main tasks fulfilled by the ECG was to create a new platform for internal communication and collaboration of ETSON members. ETSON's new intranet is based on the Share-Point Online application of Microsoft 365, providing for a more cost-efficient solution which is already known and used by most ETSON members and allows for an easy access for those who already use Microsoft 365. The new intranet also allows for the establishment of exclusive team sites for each of ETSON's expert and other groups. These team sites can be used for internal communication of the group via chat as well as for collaboration (i. e. joint editing and saving of documents).

Moreover, the ECG organized a session within the 2023 ETSON Conference dedicated to providing an exchange on stakeholder involvement – ranging from the interactions with authorities or governments to communication with the broader public or media – among ETSON members. The primary goal of this exchange was to identify common challenges and to learn from approved practices and approaches used by ETSON members. Furthermore, the information gathered might provide input for developing future strategic goals and concrete measures regarding ETSON's external communication. As only five members could present their input during the session, the General Assembly had decided that all members should provide such input on the matter in form of short presentations or texts which shall be collected and made available to all members. The current collection of the information provided has been made available on ETSON's new intranet.

## 2.4 Knowledge Management Group

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The Knowledge Management Group (KMG) is tasked to develop, implement, maintain and manage common knowledge and cooperation tools for exchange of assessment and research and development results among the member TSOs. In addition, KMG aims at developing good practices for knowledge management based on experiences gained in member TSOs.

In 2023 no activities were performed.

## 2.5 Junior Staff Programme

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The Junior Staff Programme (JSP) brings together young experts from all ETSON members. The JSP aims to improve the long-term partnership of the member TSOs, to build a network for cooperation between young experts in different disciplines from different countries, and to promote intercultural interaction.

In 2023, the JSP organized the ETSON Award during the ETSON Conference in Brussels (see Chap. 2.6).

Additionally, the JSP organized a Summer Workshop which took place end of October 2023 in Manchester (UK) (see Chap. 2.7).

## 2.6 ETSON Conference 2023

In the continuity of the 2022 ETSON conference organized by GRS but also of the IAEA conference organized in February 2023 in Abu Dhabi and the statement of the ETSON Board of 22 February 2023 on the renewed interest and initiatives in nuclear energy, the 2023 ETSON Conference was organized by Bel V together with the other ETSON members to look how the different decisions, orientations and changing context may impact the way TSOs have to face and prepare themselves to the threats and challenges ahead.

The ETSON Conference was held on 11 and 12 October 2023 at Bel V's Offices with about 50 participants from different European TSOs, as well as representation on behalf of the Japanese TSO NRA.

The conference was kicked off by an impulse speech from OECD/NEA on the topic "Nuclear renaissance (with special focus on SMR): issues & challenges", followed by a Round Table discussion and a Q&A session. The conference included 4 dedicated sessions covering the following topics: "Competence & Expertise management and capacity building", "ETSON Common Safety Research project", "Interaction & dialogue with stakeholders" and "Interaction & collaboration with international organizations and groups".

The first day started with a welcome message of the ETSON vice-president and host (BelV).



The first session on "Competence & Expertise management and capacity building" was led by TBRS chair, and allowed different expert groups to report on their current activities.

The second session on "ETSON common Safety & Research projects", lead by ERG chair, allowed members to take stock of participations in European research projects.

The ETSON Award Science Slam took place on the afternoon of the first day.



Four nominee-teams of young scientists presented their work within 7 minutes each. This year, the following topics were presented during the science slam:

- Joint Modelling of VVER-1000/320 Containment Specifics for Simulating Pressure Build-Up: A COCOSYS Study. (GRS)
- Digital twinning to assess the performance of aging nuclear concrete containment buildings. (IRSN)
- Characterization of spent fuel directly from measured gamma spectra using deep learning. (HUN-REN)
- Measuring neutron noise in a research reactor using a 3D core mapping system. (PSI)

This year, a young scientific from GRS won the first price and from IRSN the second price of the ETSON Award.

On the second day, session 3 on “Interaction & dialogue with stakeholders”, chaired by GRS, allowed several members to present their work on this topic.

Among other, IRSN presented its work on openness to society, with a focus on lessons learnt from technical dialogue meetings with civil society.

During the closing remarks of the Conference, the following main outcomes of the conference were highlighted:

1. The challenge regarding attracting (and especially keeping) new talents, and associated factors (education & training, funding, fast evolution of technologies like AI);
2. The importance of data science and AI including the need to connect with the (non-nuclear) data sciences community;
3. ETSO's roles and initiatives regarding the assessments & licensing process of SMRs and AMR, which actually combine the two previous highlighted challenges. This includes also the need and importance of interactions, communication and partnerships of ETSO with various stakeholders (R&D, academic, civil society, regulator networks ...).



## 2.7 ETSON Members Actuality

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Over the course of 2023, ETSO members have shared the most significant events in the nuclear field and their related TSO work:

- In the **Czech Republic**, the Government announced the extension of the tender for the completion of the Dukovany NPP from 1 to 4 new large units. The final contractor will be selected by the end of 2024. So far, Westinghouse AP 1000 has been excluded from the tender due to its inability to meet the required criteria. The bids of KHNP APR 1200 and EDF EPR 1200 remain. Other current challenges include, among others, the assessment of the safety aspects of new nuclear fuel (such as Westinghouse's Robust Fuel Assembly, NOVA E6) and the extension of the Temelin NPP fuel cycle from 12 to 18 months. Special attention is paid to the continuous development of human resources for state supervision. In addition to the fuel challenges and the 4 new units, CEZ and other Czech/international investors plan to initiate a small modular reactor programme with the aim of building several units in the Czech Republic. As a result, a significant change in legislation is expected in 2025 with a specific revision of the Atomic Act and related implementing decrees.
- In **Germany**, on 15 April 2023, the last three nuclear power plants (NPPs) were shut down after several months in stretch-out operation. The shutdown of Emsland, Isar 2 and Neckarwestheim 2 – so-called Konvoi plants, which were built in the late 1980s – marks the end of over six decades of electricity generation from nuclear energy in Germany. During this time, 37 NPPs were operated commercially, most of them pressurised and boiling water reactors. By the end of 2022 they had produced almost 5,600 terawatt hours (TWh) of electricity. This corresponds to about 10 times the current total

annual consumption in Germany (approx. 550 TWh in 2022 according to the German Environment Agency (Umweltbundesamt – UBA)).

Even after the shutdown of the last three German NPPs, there will still be a need for strong safety expertise in the field of nuclear technology in the long term. There are many reasons for this. In Germany itself, the safety of the dismantling of all decommissioned NPPs and the operation of the storage facilities must be ensured – the latter probably for many decades to come. In addition, research reactors continue to be operated in Germany. In view of the numerous foreign NPPs operating in the European neighbourhood, maintaining emergency preparedness and response at the highest level in Germany is another long-term task. This requires continuous safety research – for example, to simulate possible accidents and their radiological consequences for Germany as realistically as possible – as well as the best possible knowledge of the specific technical design of these plants. This aspect is becoming even more crucial due to the plans of a number of European countries to build new NPPs or extend the operational lives of existing ones, especially since new concepts are also to be realised there in some cases. And finally, strong technical and scientific expertise is needed if relevant impulses for improving safety are to continue to come from Germany in the future – in the form of safety-promoting rules and recommendations, as formulated at the IAEA or EU level, but also, if necessary, in the form of concrete technical concepts for safety-related retrofits.

- In **Romania**, the refurbishment project for Cernavoda Unit 1 lifetime extension is continuing, with creation of a new Consortium (Candu Energy and Ansaldo responsible for designing the nuclear reactor system and turbine generator system and purchasing equipment, respectively, and Korea Hydro & Nuclear Power responsible for the overall construction as well as

infrastructure construction, including radioactive waste storage facilities), and a pre-project work that will include long lead and front-end engineering services for the unit.

Related to SMR deployment in Romania, the national regulatory body (CNCAN) issued an official approval letter in August 2023, confirming the NuScale Licensing Basis Document conformity with the Romanian regulatory requirements. A FEED (Front End Engineering Design) phase 1 study was conducted, to analyze the preferred site (a former coal plant in Doicesti) of the first VOYGR-6 SMR power plant.

- In **Finland**, a new operating license was granted for both units of the Loviisa nuclear power plant in the beginning of 2023, extending their lifetime until the end of 2050. At the Olkiluoto site, the new EPR unit (Olkiluoto 3) has been in commercial operation since May 2023. An environmental impact assessment procedure concerning a possible operating licence extension by at least 10 years and a potential power uprating by some 10% of the two older units (Olkiluoto 1 & 2) has been initiated by the license holder. At the moment, the plant units rated at 890 MW each, are licensed until 2038. Operating license of the final disposal facility is under review by the regulatory authority, with the operation anticipated to commence in 2025.

The Ministry of Economic Affairs and Employment is working on reforming the Nuclear Energy Act by 2026, and simultaneously the Radiation and Nuclear Safety Authority is renewing its regulation to make it more goal-oriented and risk-conscious and to enable different plant solutions.

- In **France**, in March 2023, EDF announced the discovery of a deep stress corrosion crack (23 mm, for a total thickness of 27 mm) on a weld of the safety injection circuit connected to the primary circuit of reactor n°1 at the Penly nu-

clear site. Subsequently, during the search for other possible faults on other reactors, the operator detected thermal fatigue cracks on other reactors, which led to their shutdown. The operator finished in 2023, the inspection and repair of all units affected by this phenomenon, and these reactors were restarted in 2023. The nuclear safety authority, in collaboration with IRSN, supported EDF in dealing with and gaining a better understanding of this phenomenon. With a view to the start-up and commissioning of the Flamanville EPR in 2024, the safety report and general operating rules have been submitted for review by EDF, in support of the application to the commissioning of the reactor. The reactor's overall tests and specific start-up tests have begun in 2023.

France is pursuing the preparation of its new nuclear program, including the construction of 6 new EPR 2 reactors (2 at Penly site, 2 at Gravelines site and 2 at Bugey site), and an option for 8 more, as well as the development of SMRs.

For the first time in 2023, a joint early review has been carried out by three European safety regulators (ASN-France, SUJB-Czech Republic and STUK-Finland) and two TSOs (IRSN-France and SURO-Czech Republic) on the safety options of the NUWARD SMR reactor project, developed by a subsidiary of EDF.

The NUWARD SMR project is an electricity production unit concept consisting of two pressurised water nuclear reactors of 170 Mwe each.

The group of initial safety authorities has been joined at the end of 2023 by the regulators from Sweden (SSM), Poland (PAA) and the Netherlands (ANVS) for the second phase of the review.

As a member of ETSO and as part of Maison Irene et Frédéric Joliot Curie (MIFJC) - the Brussels base of several major French research institutions - IRSN organized on February 2023

in partnership with CEA, Inserm and CNRS, a conference dedicated to the contribution of research on the use of ionizing radiation to the fight against cancer. The presentations and debates among scientists, academics and representatives from government and international organizations highlighted the challenges, progress made, and future prospects of scientific research in medical applications such as imaging, nuclear medicine, or radiotherapy where radiation technologies are used for diagnosis and/or therapy.

On December 2023, IRSN also organized at MIFJC a seminar dedicated to the ongoing contribution of ASTEC code to a high level of nuclear safety in Europe and on the future role in addressing emerging nuclear safety challenges. This event gathered over 50 participants representing major organizations to nuclear safety across Europe. The primary aim was to explore perspectives and strategies regarding ASTEC's potential pivotal role in Europe. Productive discussions led to ambitious proposals, paving the way for tackling new challenges in the evolving European nuclear landscape, notably in the domain of Small Modular Reactors (SMRs) and Advanced Modular Reactors (AMRs).

- In **Belgium**, the Doel 3 and Tihange 2 reactors were definitively shut down in September 2022 and February 2023 respectively, and entered the post-operational phase. Preparations for the definitive shutdowns of the Doel 1 & 2 and Tihange 1 reactors, scheduled for 2025, began in 2023.

In 2023, the licensee performed a Chemical System Decontamination (CSD) of the Doel 3 primary circuit, including several auxiliary circuits (e.g. the chemical and volume control system). During the CSD no safety significant deviation was observed and the CSD resulted in a mean Decontamination Factor of the cir-

cuits superior to 100 largely above the initial target.

2023 was also marked by the agreement reached between the operator and the Belgian state on the 10-year life extension of the Doel 4 and Tihange 3 reactors, with a commitment to produce electricity during the winters of 2025/2026 and 2026/2027, the so-called Flex-LTO.

In addition to the design improvements, the following topics were also addressed as part of this life extension: 'Preconditions', which deals with various management programmes that need to be in place before the plant can restart, 'Ageing', which addresses ageing issues, 'Tests & Inspections' which identifies large-scale tests that confirm the proper functioning of the plant before restart, 'Knowledge, Competence & Behaviour', which focuses on the human capabilities required to perform an LTO, and the 'Periodic Safety Review'.

- In **Lithuania**, the dismantling of both NPPs will be finalised by 2036, and the site demolition will be done by 2038. SMR is considered a possible solution to compensate for the lack of energy generation, which arose in 2009 with the shutdown of the two NPPs Ignalina 1+2, which arose in 2009 with the shutdown of the second and the last, Ignalina NPP unit. Therefore, they are active in corresponding SMR projects.

In 2023, the Lithuanian Nuclear Energy Association, in cooperation with the Lithuanian Academy of Sciences, organised the international conference "New Trends of Nuclear Reactors: Small Modular Reactors. Experience of Leading Countries and Developers". The conference's main objectives highlight the attractive features of SMRs, major challenges, the current status of SMR technology and near-term deployment plans. Lithuanian and foreign businesses also contributed to the organisation of the conference.

Four Horizon Europe EURATOM projects (one LEI coordinated) were under implementation in 2023. The coordinated HARMONISE project deals with the harmonisation and standardisation of methodologies, codes, and standards, as well as the assessment of nuclear reactor components while considering stakeholder engagement.

- In **Italy**, Italy witnessed in 2023 a renewed interest for the nuclear option, partly because of the decarbonization goals by 2040 and 2050, and partly because of the need of increased energy security and lower electricity prices.

In May, two motions were voted at large majority in the Parliament, giving mandate to the Government to understand the necessary pre-conditions, the needed investments, the available technologies, the possible deployment times, the available infrastructures, the ways of strengthening the universities and the research centres, the infrastructures for nuclear safety, the legal framework, and the status of the Italian supply-chain system, in order to have all the data possibly useful to take further steps and decisions on nuclear. To answer to this mandate, the Ministry of Environment and Energy Security created a platform, called National Platform for Sustainable Nuclear (PNNS), managed by ENEA and Ricerca di Sistema Energetico (RSE), to collect the views of the largest possible number of Italian stakeholders, and to prepare a synthesis document.

- In **Switzerland**, all the fuel elements have been removed from the Mühleberg Nuclear Power Plant (KKM). Less than four years after the reactor was taken off the grid, the fuel elements are now in dry storage at the ZWILAG facility.

The Federal Council has agreed to write a report on the necessary measures to allow for a safe long-term operation of the existing NPPs. In addition, an evaluation of the evolution of the cost of electricity will be performed. This analy-

sis will namely comprise the commissioning of new NPPs.

- In **Hungary**, two new units (WWER 1200) will be built at the Paks site. In June 2020, the application for the construction license has been submitted to the Hungarian nuclear regulatory authority, which was issued in August 2022. The construction is expected to start within a few weeks.

Additionally, preparations are ongoing to extend the operating license of the existing units in Paks at least by another 10 years.

- In **Slovakia**, Mochovce 3 unit commissioning started in September 2022. Reactor reached criticality in October 22nd 2022 and finally reached 100% power in September 22, 2023. Currently two WWER-440 units are in operation in Bohunice and 3 Units in Mochovce. The units Bohunice A-1 and V1 are being dismantled. The unit Mochovce 4 are under construction and expected loading of fuel in 2025. Finished construction of dry interim Spent Fuel Storage (ISFS) facility in Bohunice area.

VUJE – activities on construction of Unit4 in Mochovce, the dismantling of Bohunice A-1 and V1 continues, documentation for the new unit and activities on licensing process of the new fuel for VVER 440.

- In **Slovenia**, discussions about the newbuilt of NPP were continued. A new state secretary for the national nuclear program was appointed in the office of the prime minister. An idea for referendum about nuclear new NPP unit was announced.

In October 2023, the NPP Krško was shutdown due to identified leakage on the safety injection line direct to the reactor pressure vessel. The leaking pipe was replaced and the power plant returned to operation in November 2023 after preliminary root cause analysis was performed. Detailed root cause analysis is still in progress.

- In the **UK**, during 2023, was announced life extensions for 2 of its 4 AGR stations (Heysham 1 and Hartlepool). Its single operating PWR at Sizewell continues to operate with a high load factor.

The build of Hinkley Point C (2 EPRs) continues successfully and the plans for the twin unit at Sizewell are progressing.

The UK Government set up Great British Nuclear with the aim of delivering its long-term nuclear programme and supporting its ambition to deliver up to 24 GW of nuclear power in the UK by 2050

The ONR has been delivering Generic Design Assessments of the Rolls-Royce SMR, Holtec SMR-160, and supporting the evaluation of other AMR and SMR designs in support of Government investment plans.

Major expansion of the UKs capability to support defense projects was also announced for Derby and Barrow.

The increased nuclear activity is starting to lead to an increase in regulatory activity and requirement for TSO support as programmes are pursued in parallel.

- In **Japan**, the reviews and inspections concerning the conformity to the new regulatory requirements are still ongoing. Of 25 units applied by utilities, 17 units have been approved officially by NRA for conformity and 12 units (all PWRs) have restarted for commercial operation.
- Considering the situation in **Ukraine**, SSTC NRS, though an active ETSON member, could not provide an update on their current activities.



## 2.8 JSP Workshops

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As part of ETSO's Junior Staff Programme (JSP), Jacobs RSD welcomed, from the 23 to the 27 October 2023, over twenty participants to Manchester to discuss the general theme of SMR and AMR technologies.

The aim is to encourage interaction between young people from TSOs (Technical Safety Organizations), to exchange ideas on safety practice and approach in different countries, to discover the cultures of other organizations, and to help expand one's professional network. This 2023 edition brought together young researchers and engineers from 11 ETSO members, as well as participants from ONR (the UK safety authority) and the National Nuclear Laboratory (NNL).

The program featured interactive case studies and contributions from participants (some of a high scientific level).

Participants also had the opportunity to visit the Heysham power plant (north-west England) featuring two Advanced Gas-cooled Reactors (AGR).





# ETSON EXTERNAL RELATIONS

## 3.1 IAEA

### TSO Forum

ETSON representatives from BEL V and GRS are chair and vice-chair of the TSO Forum. This forum has the following goals:

- Strengthen the role of the scientific and technical capabilities in the member states,
- support technical and scientific capabilities in countries expanding or embarking on a nuclear program,
- promote the coordination and collaboration among the members,
- foster the scientific and technical capabilities,
- share safety and security research as well as the development, experiences and lessons learned,
- share feedback of the use of IAEA safety standards and other publications.

As chair and vice-chair of the TSO Forum, the ETSON was involved in the preparation of the next TSO conference of the IAEA, originally scheduled to take place on 13-15 October in St. Petersburg and hosted by SEC NRS. IAEA decided in summer 2022 to postpone the conference to 2024. It will be held from December 2 to 6, 2024, in Vienna.

In 2023, several ETSON members were involved in preparatory meetings for the TSO Conference (Planning committee meeting / Program committee meeting). ETSON President, Jean-Christophe Niel, will also chair the Conference.

### General Conference 2023

ETSON participated in the IAEA General Conference, which took place on 25-29 September 2022 in Vienna. ETSON representatives met the DDG of IAEA, Lydie Evrard, JRC and DG ENER, Massimo Garribba, and WENRA Board.

### ETSON Support for the IAEA TSO Forum and the TOSCA Methodology

#### 1. IAEA / ETSON Practical Arrangement

Based on the Practical Arrangement (PA) between IAEA and ETSON from 2021-2024, ETSON primarily supports in this context the TSO Forum. The TSO Forum is a very active network in the GNSSN (Global Nuclear Safety and Security Network) and serves to strengthen the role of and the technical expertise of IAEA member states in both radiation protection and nuclear safety. In addition to the ongoing activities, preparations for the TSO conference to be held in Vienna in December 2024 are now entering the realisation phase.

Ongoing work on the further development and application of the self-assessment tool for technical and scientific expertise to support regulatory functions (TOSCA Methodology) is progressing.

In 2023, the experience gained in the application of the TOSCA tool from the national, regional and international workshops in Norway and Tajikistan was discussed and analysed. A further phase of consolidation and simplification of the application will now take place in dialogue with users in meetings or online (e-mail exchange, video conference, etc.) to answer any questions that arise and possible expansion of the database environment both on the scientific and operational side.

## 2. Short description of the TOSCA Methodology

The methodology for self-assessment of technical expertise (TOSCA Methodology) both within and outside a regulatory authority has been developed by the IAEA TSO Forum and is aimed at all member states both those with a nuclear energy concept including decommissioning and disposal and those with a comprehensive radiation protection concept, even without the intention of establishing a nuclear energy programme.

There are many ways to organize, deliver and manage the technical support to national regulators that may be required in key areas such as training, technical assessments and regulatory research. The organisation can be a formal technical support organisation (TSO) that is centralised or decentralised. It may also consist of one or more units located within the regulatory authority. TSOs can be organic (established by legislation) or contract/project-based (national/international). Their financing system can be favourable or unfavourable for their long-term sustainability.

- All options have some key challenges in common:

The expert organisation should have procedures in place to avoid conflicts of interest and contribute demonstrably to the independence of the regulatory process from industry interests and to its credibility with all key stakeholders.

Technical support should be available when needed and its input should be relevant (in terms of scientific basis and nuclear safety/radiation protection), timely and readily usable for regulatory purposes. It should cover a broad range of scientific disciplines to meet the needs of the regulator and be able to work with inbuilt multi-disciplinarity.

The technical assistance capability should be sustainable over long periods of time as it is able to regenerate expertise and evolve over time in line with regulatory needs, technological and societal developments and scientific progress,

The funding system for technical assistance should be designed in such a way that it contributes to the independence and sustainability of the organisation.

To assist Member States in addressing this issue, the Agency has co-developed a methodology and associated web-based tool (TOSCA) for the self-assessment of the capabilities of national technical and scientific organisations supporting regulatory bodies as part of its TSO Forum initiative. Member States are invited by a resolution of the 2022 and 2023 IAEA General Conference to make use of this new development, which includes a preparatory outreach by the IAEA to support the relevant Member States and their organisations in preparing for, conducting and taking decisions from this self-assessment.

- What are the TOSCA self-assessment concepts?

Based on the requirements for safety standards for regulators described in the IAEA publication series and TECDOC-1835, the TOSCA concept proposes a questionnaire for self-assessment of expert capabilities in conjunction with a SWOT analysis embedded in a web-based programme.

By using the tool, the organisation can gain essential insights into the status in its own national context. In addition to the self-assessment of their own level of knowledge and expertise, the technical focus of the tool is the provision, updating and mutual exchange of

knowledge on the various regulatory functions - e.g. on the basis of case studies, development steps, national workshops, etc. The relevant information and documents can be made available to member organisations. The relevant information and documents can thus be made available to the member states (MS).

Thus, through cooperation and information sharing, the organisation and the MS can continuously improve the collective infrastructure for the preparation and provision of implicit and explicit knowledge and skills. In addition, this national and international co-operation allows the ETSON network and the TSOF to make a significant contribution to an effective working environment for the continuous improvement of nuclear safety for upcoming projects, ongoing operations including decommissioning and final disposal.

Ultimately, this methodology and associated tool can be seen as an essential supporting element with regard to the harmonisation of the TSO approach within the framework of international cooperation between regulators on the basis of a common platform within a diverse information and knowledge landscape.

- What are the outcomes?

Through the leadership of ETSON representatives in the Steering Committee of the TSO Forum, significant achievements have been made: the creation of the TOSCA core group fully dedicated to the implementation and the improvement of TOSCA, the performance of several international/regional and national workshops leading to future cooperation activities (Norway, Ghana, EuCAS network, Tajikistan, Saudi Arabia) contributing to the promotion of TOSCA and ETSON vision among the TSOF members.

## 3.2 European Commission

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ETSON members plan a common project on harmonization of licensing procedures, codes and standards for future fission and fusion plants within the HORIZON-Euratom-Programme. 12 Institutions mentioned its interest, including 9 ETSON members.

ETSON representatives met the DDG of the European Commission, Massimo Garribba, at the IAEA General Conference in September 2023 in Vienna.

Several areas have already been identified by the Board, including the strengthening of exchanges with the JRC/EC, as discussed with Massimo Garribba during the meeting in Garching in October 2022. This is important and serve as a useful example to further convince the authorities to develop a collaboration with ETSON.

The HARMONISE project (harmonize fusion and fission, Horizon Europe), involving many ETSON members, would also be an opportunity to highlight the contribution of ETSON and TSOs, as the latter will be presented to the ENSREG group active in the EU SMR (pre)partnership WS2 on licensing.

## 3.3 WENRA

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The year 2023 was marked by a desire to revitalize exchanges between ETSON and the network representing safety authorities, WENRA. To this end, the Boards of both organizations met on the margins of the IAEA General Conference on September 27, 2024.

The focus of the discussion was on the presentation of ETSON and WENRA, the situation in Ukraine, SMR and possible common technical topics and the revision of the reference levels.

These topics notably include LTO, with the aim of organizing a meeting between WENRA's RHWG and ETSON's TBRS, to discuss a pilot study and a common approach.

The development of SMRs is also a subject of growing interest for both Safety Authorities and TSOs, and this is why the two networks wish to pursue the joint identification of safety objectives.

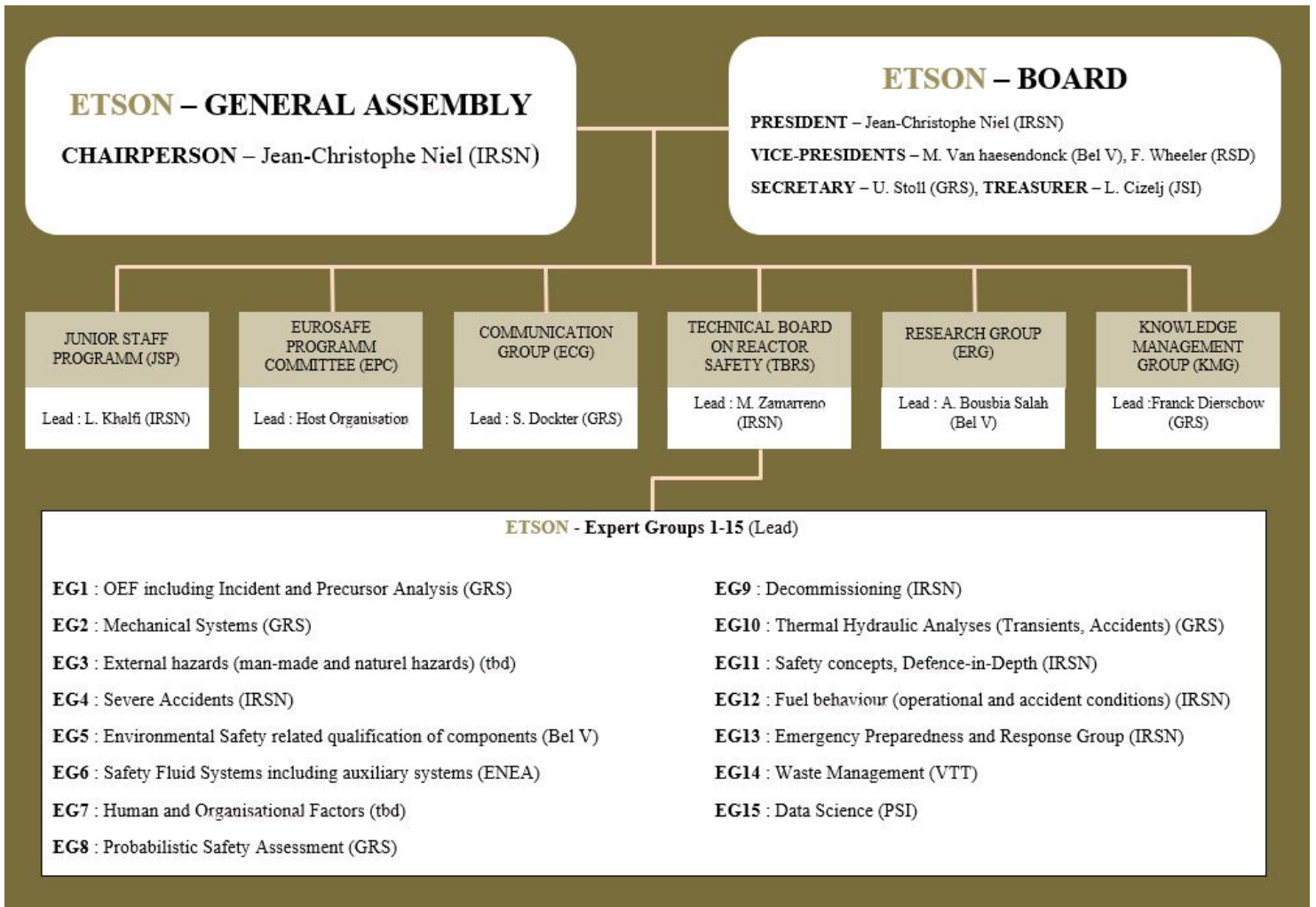
Finally, discussions also touched on stress corrosion cracking updates and artificial intelligence.



# ANNEX

## 4.1

### ETSON Organization (as June 2023)



## 4.2 ETSON active members

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**BELGIUM**  
Bel V  
[www.belv.be](http://www.belv.be)



**CZECH REPUBLIC**  
National Radiation Protection  
Institute (SÚRO)  
[www.suro.cz](http://www.suro.cz)



**FINLAND**  
VTT Technical Research Centre of  
Finland  
[www.vtt.fi](http://www.vtt.fi)



**FRANCE**  
Institut de Radioprotection et de  
Sûreté Nucléaire (IRSN)  
[www.irsn.fr](http://www.irsn.fr)



**GERMANY**  
Gesellschaft für Anlagen- und  
Reaktorsicherheit (GRS)  
[www.grs.de](http://www.grs.de)



**HUNGARY**  
Centre for Energy Research  
(EK-CER)  
[www.ek-cer.hu](http://www.ek-cer.hu)



**ITALY**  
ENEA  
[www.enea.it](http://www.enea.it)



**LITHUANIA**  
Lithuanian Energy Institute  
[www.lei.lt](http://www.lei.lt)



**ROMANIA**  
RATEN ICN  
[www.nuclear.ro](http://www.nuclear.ro)



**SLOVAKIA**  
VUJE  
[www.vuje.sk](http://www.vuje.sk)



**SLOVENIA**  
JSI  
[www.ijs.si](http://www.ijs.si)



**SWITZERLAND**  
Paul Scherrer Institut (PSI)  
[www.psi.ch](http://www.psi.ch)

## ETSON associated members



**JAPAN**  
**Nuclear Regulation Authority (NRA)**  
[www.nsr.go.jp](http://www.nsr.go.jp)



**UNITED KINGDOM**  
**JACOBS**  
[www.jacobs.com](http://www.jacobs.com)



**UKRAINE**  
**State Scientific and Technical Center (SSTC)**  
[www.sstc.ua](http://www.sstc.ua)

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