

Networking activities in ETSON

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Abstract

Nuclear Safety Convention, EU Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations and a number of publications of the IAEA and OECD Nuclear Energy Agency declare the vital role of the state, even in today's market conditions, in the field of peaceful use of nuclear energy, in particular in creating the political, legal and regulatory framework and long-term strategy with a focus on sustainability and public awareness. The key is in particular the regulatory role of the state in the field of nuclear safety and the necessary expertise in this area. In a number of countries operating nuclear power plants there exist independent scientific expert organizations, so called "Technical Safety Organizations - TSO", providing a comprehensive view of the long-term safety of nuclear installations and maintaining a high level of expertise on the basis of research and development activities.

The paper describes the basic mission of TSO organizations - support of state regulatory authority in the form of an independent expert, analytical and research services in the field of nuclear safety and radiation protection - and the ways of its implementing. TSOs are developing and maintaining their expertise and skills by carrying out long-term R & D programs aimed, inter alia, at verification of technical solutions proposed by the nuclear industry and at building a comprehensive knowledge base for assessment of nuclear safety. The paper briefly lists the main research topics which are subjects of the TSOs R&D projects.

Nuclear safety assessment requires a high level of proficiency in safety assessment methodologies and in analysis of operating experience feedback as well as. The need for increased co-operation and reinforced sharing of experience in the field of nuclear safety expertise emboldened the competent organizations with nuclear safety expertise in Europe to establish an ETSON association (European Technical Safety Organisation Network) - a network aimed in promoting close cooperation on harmonized approaches to safety issues and their assessments. The paper describes the structure of ETSON association, methods of its working and summarizes the main recent activities and achievements.

Intruduction

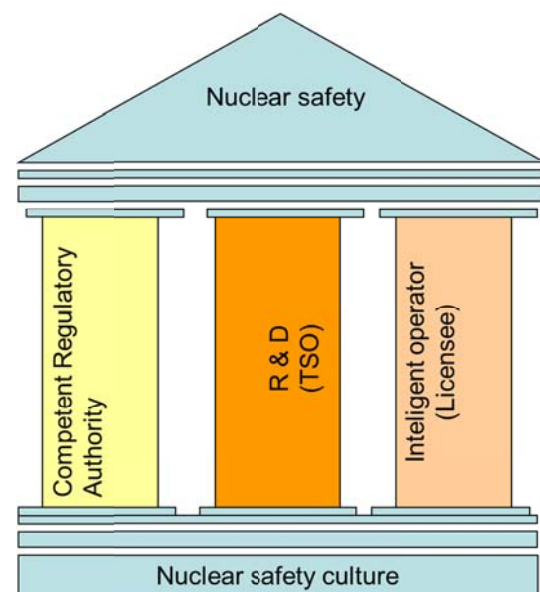
Nuclear Safety Convention, EU Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations and a number of publications of the IAEA and OECD Nuclear Energy Agency declare the vital role of the state, even in today's market conditions, in the field of peaceful use of nuclear energy, in particular in creating the political, legal and regulatory framework and long-term strategy with a focus on sustainability and public awareness. The key is in particular the regulatory role of the state in the field of nuclear safety and the necessary expertise in this area. In a number of countries operating nuclear power plants there exist independent scientific expert organizations, so called "Technical Safety Organizations - TSO", providing a comprehensive view of the long-term safety of nuclear installations and maintaining a high level of expertise on the basis of research and development activities.

Ensuring proper functioning of state supervision of nuclear safety, both by creating a legal framework, as well as by staffing and adequate financial and material support, is the basic duty of every State which has decided to use nuclear energy and ionizing radiation. Such duty is imposed, among others, the Convention on Nuclear Safety, which to date signed 71 signatory states. History of the peaceful uses of nuclear energy shows that among causes of a number of serious events at nuclear facilities there was, among other reasons, also certain underestimation of the role of the state supervision.

In ensuring nuclear safety a model of three pillars has become common and proven practice in most countries operating nuclear power plants:

- a competent state supervision (regulatory authority)
- an intelligent operator (licensee)
- a scientific research and development support, effectively separated from the licensees by both in terms of ownership and also organizationally with clear mechanisms for preventing conflict of interests between the state and the operators.

Scientific and technical support of the state nuclear safety authorities is necessary especially for the reason that nuclear safety is a multidisciplinary scientific discipline and it is usually beyond the possibilities of the regulatory bodies to employ highly skilled and experienced experts in all professions, which might be needed in assessment of nuclear safety.



Inside vs. outside TSOs

In the models of structuring and functioning of state regulatory authorities there are significant differences among countries. By its size the first stands the US Nuclear Regulatory Commission (U.S. NRC) numbering several thousand workers. The size of US NRC reflects

the fact that in the USA there are more than 100 nuclear reactors in operation, and the fact that the NRC manages its own extensive nuclear safety research, partly with the aim of building its own "know how", partly with the aim of verifying information and technical solutions which are submitted to it for approval. Size of regulators in other developed countries is much smaller – obviously few hundreds of people depending on history, size and range of the nuclear program and on the scope of the regulatory jurisdictions. In a world today, the scope of activity of nuclear regulatory authority obviously includes merging supervision of nuclear safety of nuclear facilities and the supervision of radiation protection covering not only nuclear facilities but also all applications of radiation sources in industry and medicine.

The guideline for the staffing and structure of the state supervision of nuclear safety may serve several documents of the IAEA, especially the Safety Standard Series No. GS-R-1 "Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety" and the IAEA-TECDOC-1254 " Training the staff of the regulatory body for nuclear facilities: A competency framework". The first document defines the powers and functions of the state supervision, the second document provides a basic idea about scope of of competences, which the safety authority should have. The scope of competences directly indicates which type of the expertise is to be represented in the supervisory authority. Amount of nuclear reactors, the need for mutual substitutability, etc. then determine the minimum number of nuclear inspectors of a given profile.

To determine the optimal structure and dimensions of the body of state supervision of nuclear safety there is no a role model. Where the number of inspectors of the state supervision is smaller it is necessary to make greater use of external expertise. Just for this purpose in some countries the state regulatory authorities are supported by the specialized technical safety organizations (TSO) - research and/or engineering organizations, such as the IRSN in France, GRS in Germany, Science and Technology Centre ROSTECHNADZOR in the Russian Federation, and others. Their main mission is to ensure the development of methods for the assessment of nuclear safety through national and international research and development projects and to use these methods in an independent evaluation of nuclear safety and in assessment and verification of safety documentation of nuclear facilities.

Missions, objectives and scope of activities of TSOs

Mission of TSO organizations can be briefly defined as the support of state regulatory authority in the form of an independent expert, analytical and research services in the field of nuclear safety applied for both nuclear facilities in operation and new builds, as well.

TSO objectives can be summarized as follows:

- to build a knowledge based environment with working potential for continuous support of regulatory activities in the field of nuclear safety of existing nuclear facilities as well as in licensing new ones
- to provide experimental infrastructure for verification research (confirmatory research), deepening and dissemination of knowledge and addressing safety issues
- to establish a scientific network to provide expert services
- to build a training infrastructure for long-term on-the-job training of regulatory authorities workers (inspectors).

In order to meet the above objectives the TSOs are actively involved in various activities, in particular in long-term R & D programs aimed inter alia at:

- improving nuclear safety assessment methods ("best estimate + uncertainty evaluation". combined deterministic and probabilistic approach, cfd codes, etc.)
- development of methodologies for the analysis of severe accidents
- developing PSA methodologies and maintaining "living" PSA models for practical applications
- research aimed in resolution of „unresolved“ safety issues (high burnup, PTS, ...")
- development and improvement of methodologies assessing the state of components (aging, radiation damage) and systems important to nuclear safety (mechanical parts, electrical systems, cables, construction parts, etc..)
- development and improvement of methodologies for qualification of structures, systems and components important to nuclear safety
- development and improvement of methods of treatment of radioactive waste
- assessment of the concept of the end of fuel cycle
- analysis of human factors and organizational changes affecting nuclear safety
- development of the nuclear safety concept for new generation reactors
- development of methodologies for the nuclear safety assessment of new generation of reactors, etc.

Experience and expertise gained in the above R&D activities is further utilized in a number of practical applications:

- reviewing safety documentation, in particular safety analyses in the framework of licensing process
- independent audit safety analysis of DBA and BDBA (SA)
- review of periodic safety assessment
- review of emergency plans
- drafting safety regulations, guides and instructions
- qualification verification systems and components important to nuclear safety
- specification of inspection procedures
- independent simulation modeling of selected initiating events
- ad hoc support the immediate needs of the inspection and evaluation
- on-the-job training of nuclear safety inspectors.

Many of these review activities need deep expertise and long term experience, therefore it is natural that building and maintaining expertise in the above areas is done through solving research projects funded and coordinated by the regulatory authorities. As obvious, human and financial resources for the above activities are in a small countries rather limited, which significantly limits the development of these activities in their TSO institutions.

The need for networking of TSOs in EU – establishing of ETSON

The limited national human and financial resources to solve current problems and research topics of nuclear safety lead to the need for international cooperation and exchange of information and experience. It is therefore important that the TSO organizations are linked together and support each other in their missions.

For this purpose in European Union the European TSO Network ETSON (European Technical Safety Organisations Network) was established in May 2006 by its founding

members: Bel V (formerly AVN, Belgium), GRS (Germany) and IRSN (France). At present, the ETSON members are:

- Bel V – BELGIUM (www.belv.be)
- Institute of Nuclear Research and Nuclear Energy - INRNE BAS - BULGARIA (www.inrne.bas.bg)
- Centrum vyzkumu Rez - CVR - CZECH REPUBLIC (www.cvrez.cz)
- Technical Research Centre of Finland - VTT - FINLAND (www.vtt.fi)
- Gesellschaft für Anlagen-und Reaktorsicherheit mbH – GRS - GERMANY (www.grs.de)
- Institut de Radioprotection et de Sûreté Nucléaire – IRSN - FRANCE (www.irsn.fr)
- Lithuanian Energy Institute- LEI - LITHUANIA (www.lei.lt)
- VUJE TRNAVA Inc. - VUJE – SLOVAKIA (www.vuje.sk)
- Jozef Stefan Institute - JSI – SLOVENIA (www.ijs.si)
- Paul Scherrer Institut – PSI - SWITZERLAND (www.psi.ch)

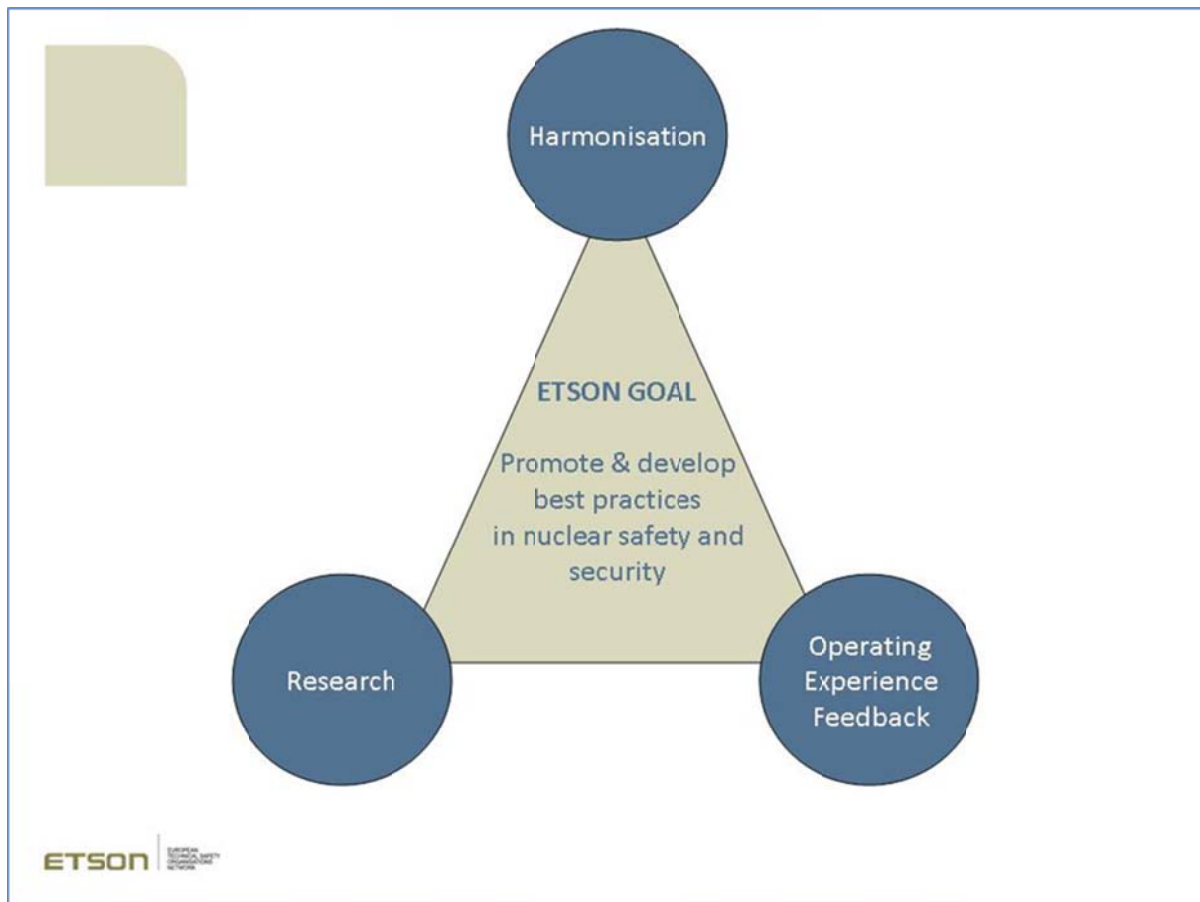
For TSOs from non-EU countries which expressed interest to join ETSON a status of so-called associated members have been created. Currently to the associated members belong:

- State Scientific and Technical Center – SSTC –UKRAINE (www.sstc.kiev.ua)
- Scientific and Engineering Center for Nuclear and Radiation Safety - SEC NRS - RUSSIA (www.secncrs.ru)
- Nuclear Regulation Authority –NRA – Japan (www.nsr.go.jp).

The membership in ETSON is restricted to independent public or private non profit organizations actively involved in safety assessments in support of their national nuclear safety authorities, and performing, as much as possible, their own R&D. Membership is open to organizations from the European Union and from the European Free Trade Association (e.g. Switzerland, Norway) provided that they fulfill the requirements for membership defined by the ETSON partners and laid down in their Statutes. Other organizations that are not part of the geographical zone mentioned above may apply to act as associate members. All the applicants have to present an application file with a justification of their conformity with the characteristics of a TSO defined in the ETSON Statute.

Main objectives of ETSON are as follows:

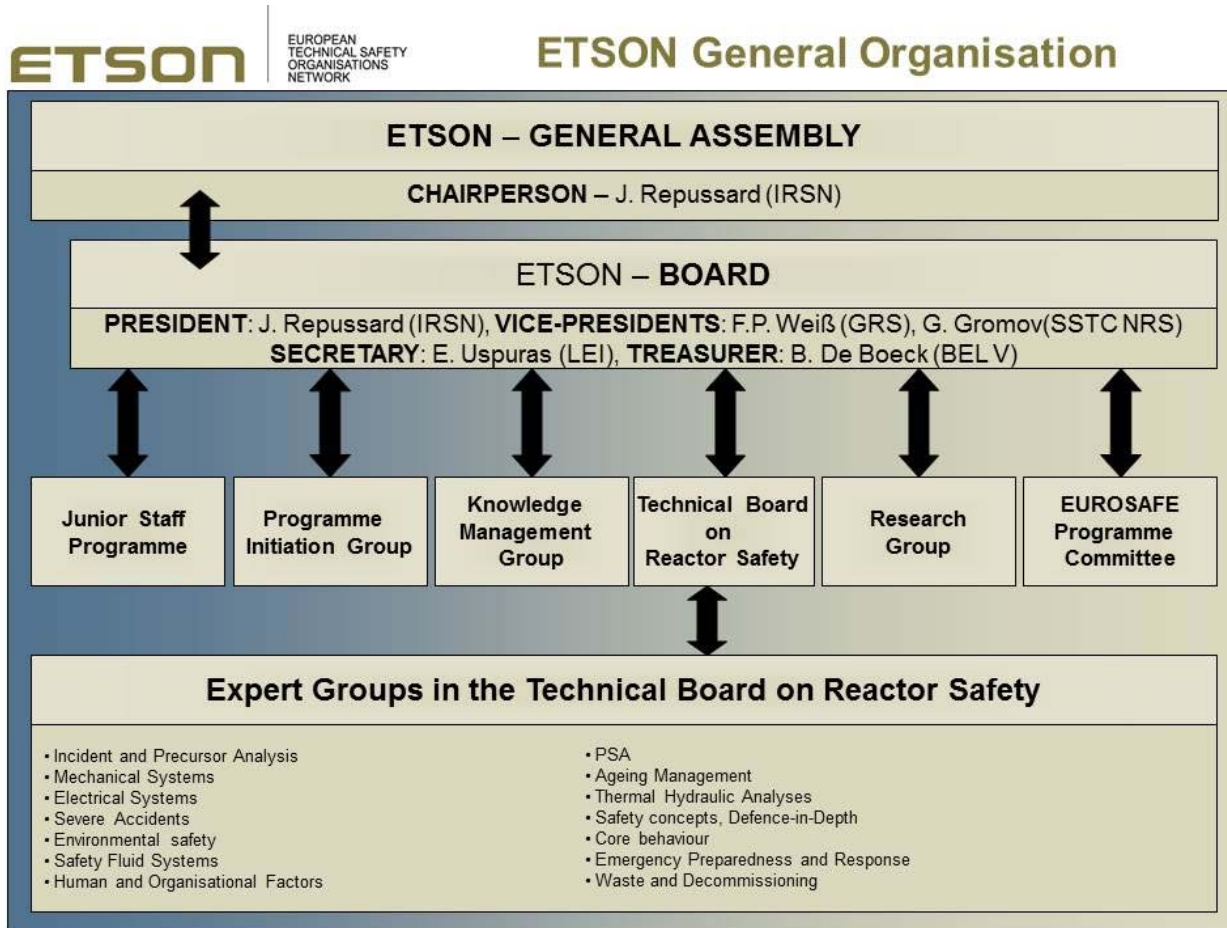
- Form a suitable forum for voluntary exchanges on analyses and R&D in the field of nuclear safety by sharing experiences and exchanging technical and scientific opinions,
- Contribute to fostering the convergence of technical nuclear safety practices within the European Union and beyond,
- Further the planning of nuclear safety research programmes and facilitate their implementation,
- Facilitate the application of the European directive on the nuclear safety,
- Work together in safety assessment and research projects.



International relations of both the regulatory authorities and their TSOs are extremely important because they allow to acquire new knowledge, confront their own activities with the practice of other similar institutions and harmonize approaches to the assessment of nuclear safety. ETSOM members understand that nuclear safety philosophy and practice to its implementation is a dynamic field whose development is taking place on the international stage. Who stands in this process aside, is coming necessarily to isolation.

ETSON Structure

By signature of the statutes of the “ETSON Association” on 23 August 2010, the ETSOM partners prepared the transition to a legal entity. By its registration in Paris on 5 March 2011, ETSOM became a non-profit-making “Association” according to French law with registered office in Châtillon near Paris. In accordance with the statutes, the governing bodies of the Association are the General Assembly, where all members are represented, and an elected Board consisting of the president, vice president, secretary and treasurer.



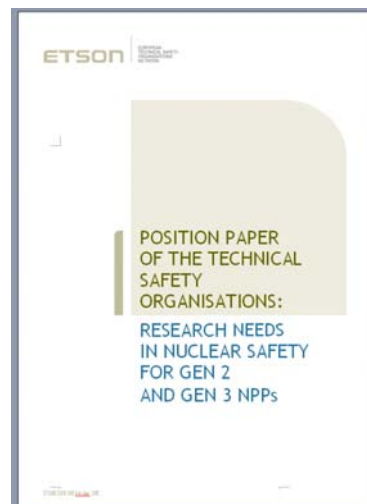
ETSON activities are managed by dedicated working groups composed of representatives from all member organizations, in particular:

Technical Board on Nuclear Safety (TBRS)

TBRS coordinates fourteen Expert Groups on different technical issues (see figure 2). The Expert Groups are the technical and scientific base of ETSON, bringing together leading experts from all ETSON members and thereby contributing to the harmonization of safety standards and to the strengthening of nuclear safety practices in Europe.

Research Group (ERG)

ETSON Research Group is in charge of ETSON coordination concerning the common R&D policy and projects and participation in EURATOM European Framework Programmes. The ETSON paper, so called “Position Paper of the Technical Safety Organisations: Research needs in nuclear safety for GEN 2 and GEN 3 NPPs”. This position paper aimed at presenting ETSON views on the safety issues associated with the different generations of nuclear plants and the definition of relevant priorities for future research programmes. The Annex presents the EURATOM Fission 2013 projects and illustrates the ETSON participation. ETSON and its members have been involved in 72 % of the recent EURATOM FP7 projects.



Programme Initiation Group (PING)

The aim of the ETSON Project Initiation Group (PING) is to support the establishment of ETSON as international providers of nuclear safety, radiation protection, waste management, decommissioning and security expertises to national and international organisations. It should foster and improve the ability of the ETSON to offer and manage projects in a consortium with combined resources and know-how.

Knowledge Management Group (KMG)

The task of the Knowledge Management Group (KMG) is directed to develop, implement, maintain and manage ETSON common necessary knowledge and cooperation tools for voluntary exchange of assessment and R&D results in the field of nuclear safety. The statutes of the ETSON association highlight the need of ETSON members to increase co-operation and to encourage sharing of knowledge and experience. To create, share and diffuse knowledge is one of the pillars of nuclear safety enhancement and constitutes a powerful tool to enforce the network and the collaboration between ETSON members.

EUROSAFE Programme Committee (EPC) The EPC is a body organizing annually the EUROSAFE international forum for discussions and exchange of information among experts from TSOs, research institutes, safety authorities, utilities, the industry, public authorities and non-governmental organisations concerning the status and recent achievements in nuclear installation safety, waste management, radiation safety and nuclear material security. The EUROSAFE Forum 2012 took place in Brussels (Belgium) with the topic "Towards Enhanced Robustness in Nuclear Safety". The EUROSAFE Forum 2013 took place in Cologne (Germany) with more than 350 participants from 28 countries. It dealt with "Safe disposal of nuclear waste".

Junior Staff Programme (JSP)

The ETSON Junior Staff Programme (JSP) brings together young experts from all ETSON members and associates. The JSP aims at improving the long-term partnership of the member TSOs, establish a network for cooperation between young expert from different countries, and to encourage intercultural interaction. The main yearly events within this framework are the ETSON Junior Staff Summer Workshops. Two last JSP workshops organized in 2013 and 2014 were devoted to "Accident Management" (hosted by LEI Lithuania in 2013) and to "Fuel Management" (hosted by VTT Finland).

EUROSAFE Tribune

Since the EUROSAFE Forum 2001, GRS and IRSN have published a new magazine called "EUROSAFE Tribune". Currently all ETSON members participate in the publication of the magazine. This publication creates a link between the different EUROSAFE annual congresses. It provides readers with a means of tracing past and prolonging existing discussions and initiating new debates. The EUROSAFE Tribune is destined to become a reference tool for the international scientific and technical community. EUROSAFE Tribune 23, published in July 2013 focused on the theme "Nuclear safety: Towards enhanced robustness", EUROSAFE Tribune 24, published in November 2013 focussed on "Stress tests for enhancing nuclear safety".



European Nuclear Safety Training and Tutoring Institute (ENSTTI)



In an unprecedented joint initiative, several ETSON members (IRSN from France, GRS from Germany and LEI from Lithuania) created in 2011 ENSTTI, the European Nuclear Safety Training and Tutoring Institute. The Institute offers short applied training sessions and longer tutoring periods for university graduates and for those with some professional experience in the nuclear sector. Its focus will be on transmitting European research and assessment know-how in the fields of nuclear safety and radiation protection.

Harmonization of safety assessment practices as pursued by the ETSON

The development of the European Union including its gradual enlargement requires closer collaboration between technical safety organisations and even more convergence in European nuclear safety practices. In order to intensify the technical and scientific dialogue between the ETSON partner organizations and to organize joint projects ETSON installed 14 topical expert groups in the main fields of competence:

- EG1: OEF, including Incident and Precursor Analysis
- EG2: Mechanical Systems
- EG3: Electrical Systems
- EG4: Severe Accidents
- EG5: Environmental safety related qualification of components
- EG6: Safety Fluid Systems, including auxiliary systems
- EG7: Human and Organizational Factors
- EG8: Probabilistic Safety Assessment PSA
- EG9: Lifetime-Management (Ageing Management)
- EG10: Thermal Hydraulic Analyses (Transients, Accidents)
- EG11: Safety concepts, Defence-in-Depth
- EG12: Core behaviour (operational and accident conditions)
- EG13: Emergency Preparedness and Response Group
- EG14: Waste and Decommissioning

The groups should in particular exchange information on different safety practices and make to harmonise them as far as practicable. One of the tangible outcomes of these expert groups is a series of safety guides. On the top of this series there is a generic “Safety Assessment Guide” (SAG) which provides recommendation to expert bodies on reviewing and assessing the safety questions raised in nuclear activities.

This general SAG is to be completed by several “Technical Safety Assessment Guides” (TSAG) specialised in different domains., such as mechanical systems, electrical systems, incidents, severe accidents, safety systems, human factors, organizational analysis, and transient/accident analysis. So far four TSAGs have been issued :

TSAG on Event review and precursor analysis
TSAG on Deterministic severe accidents analysis
TSAG on Human and organisational factors in nuclear
facilities design and modification processes
TSAG Transients and Design Basis Accidents Analyses.

The goal of this safety guides is to set down the harmonised principles applied within ETSON organisations to ensure that, whatever the technical analysis should be, safety assessments are performed by each ETSON member according to the same principles and can therefore be used with the same confidence by the people concerned. In this way, ETSON contributes to the promotion of a harmonisation of nuclear safety practices in Europe.



Conclusion

The presented brief overview of ETSON activities is meant to provide evidence that ETSON association is an everyday reality in Europe with its clear mission and vision about its future. The tangible outcomes – forums, workshops, publications and joint projects - demonstrate that its members work together with aim to enhance their capabilities in assessment nuclear safety and to harmonize their practices. Co-operation among ETSON members has shown that beyond the national and international standards and recommendations, ETSON organisations have a very similar approach and way of working to ensure an independent, objective and technically strong evaluation of the safety of nuclear installations.

ETSON & FP7 EURATOM FISSION 2013

