Technical expertise: a rare and crucial resource for nuclear safety enhancement in Europe

Jacques REPUSSARD
Director general of IRSN
President of ETSON and IAEA TSO forum
Member of SNETP Excom
President of MELODI

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Summary

- Brief introduction to IRSN
- Key goals of nuclear safety in Europe, a small and densely populated continent caring for its environment
- Science and expertise in support to ongoing safety enhancement
- Cooperation and mutualisation to optimize action
  - Evolution of the European regulatory framework
  - Access to expertise, and the development of ETSON
  - The European Operating Experience “Clearing House”
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Brief introduction to IRSN

Key goals of nuclear safety in Europe, a small and densely populated continent caring for its environment

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IRSN: the French nuclear safety expert body

- **Research** in the fields of safety and radiation protection
- **Technical expertise** in support to Safety and Security Authorities, and other administrations concerned by ionizing radiation nuclear material and proliferations issues
- **Radiological surveillance** of exposed people and of the environment
- **Support to public authorities in nuclear emergencies**
- **Public information, education and training**
- **Services** to foreign or national clients
French institutional nuclear safety environment

Designers and contractors

Operator

Parliament

Public authorities

ASN, ASND

Public

authorities

Research

into risks

IRSN, Public expertise

Stakeholders

(CLIs)

THE PUBLIC

National Committee for Transparency and Information on Nuclear Safety - HCTISN

THE PUBLIC
IRSN: a state-owned institution with 1700 personnel at 11 sites, a budget of around 300M€
Brief introduction to IRSN

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• « practically eliminate » the risk of major environmental releases: This requires a change of paradigm in nuclear safety approach.

  • Integrate security and extreme plausible hazards into the defence in depth conception (relegate the concept of « beyond design conditions »)
  • Prefer systematically forgiving technologies and designs
  • Upgrade emergency preparedness (at both operator and state levels)
  • Improve societal vigilance to ensure a long term good safety record (transparency and cooperation with stakeholders to be preferred to « public communication »)

• Resolve the complex issue of understanding the biological and (un)likely health effects of low dose/low dose rate exposures: this requires innovative and multidisciplianr research approaches

• Resolve operationally the issue of HL/LL waste management
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Ongoing safety enhancement process

- Better technologies and operating procedures
- Better trained technical staff
- Better understanding of risks, in relation to societal expectations
- Better risk prevention
- Better accident mitigation procedures and resources
- Better public information

Can be derived from:

- careful operating experience analysis: to learn from the past and identify precursor events
- research programmes: new knowledge for new approaches and solutions
- operator independant and science based cross-cutting expertise in support to safety authorities: to enable the regulatory process beyond static conformity, towards requirements for state of the art safety, security and radiation protection improvement
- Upgraded knowledge management and training resources
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Evolution of the european regulatory framework

In the aftermath of Fukushima, the EC proposes to upgrade EC directive on nuclear safety, first adopted in 2009

- Strengthening obligations of Member States with respect to the role of Safety Authorities (independence, legal attributions, resources including expertise)
- Reinforcing and harmonising the regulatory processes (generic requirements to operators, periodic safety reviews,
- Increasing transparency
- Setting common goals for nuclear safety: the « practical elimination » of major accidents with large environmental radioactive releases
- Principle of peer reviews between Member States, and of periodic reporting by the EC on the state of implementation of the directive

Ongoing discussions on the need to balance preservation of national prerogatives and progress of EU level interactions
Expertise capability at the highest level requires permanent, carefully coordinated management and appropriate resources.
Technical Safety Organisations have Formalized their organisation to optimise their collaborations

- ETSON started in 2006 with informal agreement and is now a legal entity
- Current ETSON membership includes ten TSOs: Bel V (Belgium), GRS (Germany), INRNE (Bulgaria), IRSN (France), JSI (Slovenia), LEI (Lithuania), PSI (Switzerland), UJV/CVR (Czech Republic), VTT (Finland), VUJE (Slovakia)
- And three associated members: JNES (Japan), SEC-NRS (Russia), SSTC (Ukraine)
- Other organizations are interested to join ETSON
- Board of ETSON: J. Repussard (IRSN), F-P. Weiss (GRS), E. Uspuras (LEI), B. De Boeck (BelV), G. Gromov (SSTC-NRS)
ETSON objectives

- To be a forum for exchanges on safety analyses and R&D in the field of nuclear safety
- To foster the convergence of technical nuclear safety practices in Europe, including elaboration of safety assessment technical guides
- To further the definition and the implementation of nuclear safety research programmes
- To ensure the availability of expert services in all the fields of nuclear safety, radiation protection, waste management, taking into account the scarcity of high level experts.
TSO key values

**Independence of judgment** to ensure that technical analyses and judgment are not unduly influenced by external interests
- Non-profit organisation
- Value charter and Code of ethics to avoid conflicts of interest
- Transparency to national safety authorities and beyond

**Holistic approach to safety expertise:**
- Capability to perform safety analysis with a global vision, on a regular basis, and with a broad scope
- Provide broad services to regulatory authorities on a regular basis

**Maintain a high level of competence**
- Training and knowledge management
- R&D programs and exploitation of operating experience
- Networking of experts

Those values federate TSO’s beyond differences in technical domain of competence, and differences in national regulatory organizations
ETSON members commitments

- Mutual support when needed
- Joint development of elements of technical doctrine (assessment guides, joint seminars, ...)
- Coordinated actions in the field of knowledge management and competence development: EUROSAFE, ENSTTI, ...
- Concerted contributions to the implementation of EU policies: R&D programmes, « OEF Clearing House », technical support (RISKAUDIT), ...
- Coordinated contributions to IAEA initiatives: Conferences, training, technical working groups, network development, infrastructures, ...
The first ETSON technical safety guides are available on: www.etson.eu

- **ETSON published first a generic Safety Assessment Guide**
- **Technical assessment Guides** provide guidance for reviewing (no requirements), anchoring state of the art knowledge and competence, TSAG are updated periodically; 3 TSAGs available
- **ETSON WG’s are preparing further guides**
ENSTTI for training nuclear safety experts

- EEIG created by European TSO’s to optimize the training of their professionals

- Vocational training and tutoring on assessment in nuclear security, nuclear safety and radiation protection

- Relies on European TSOs’ expertise to maximize the transmission of knowledge, practical experience and culture

- A curriculum structured in 3 parts: Induction Course; courses for specialists; tutoring

- In 2013 ENSTTI has organised 21 weeks of courses and 30 months of Tutoring for around 250 fellows.

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Cooperation and mutualisation: The European Operating Experience “Clearing House”

**TECHNICAL BOARD**

- International Data available
  - Incident Reporting System (IRS)
- Additional Sources
  - TSO Data bases
- Good practices found relevant for preventing events
- National investigation reports

**EUROPEAN CLEARINGHOUSE**

- Coordination
- Information storage
- Dissemination
  (EC/JRC Petten)

**SAFETY AUTHORITIES**

**EUROPEAN TSO**

- In-depth analysis of specific topics
- Statistical analysis of NPP OEF
- Analysis of particular events
- Contribution to increase number
  And quality of event reports
  (GRS/IRSN contract)
Cooperation and mutualisation: The European Operating Experience “Clearing House”

- European Information Service Centre (EC/JRC) to coordinate the OEF System work and to operate a European data warehouse on operating experiences
- European Expert Network composed by TSO & RB experts to carry out the technical analysis within their respective home organizations to benefit from their corresponding resources and working tools resulting in “technical opinions”
- Technical Board composed of representatives of the participating TSO & RB and the Service Centre head with a task to ensure proper function of the network
- Each national RB and each operator must judge by itself and decide what actions they should take based on recommendations!
Cooperation and mutualisation: an evolving policy framework for European research

The need for increased european R&D efficiency through:
• better European integration
• Improved public/private sector partnerships

leads the EU to promote
• Wide ranging European platforms able to gather all stakeholders
• Defining R&D strategic agendas (SRA’s) to steer major programmes at EU and national level on a medium/long term basis
• Experimenting new approaches and instruments to facilitate integration, for the implementation of the « Horizon 2020 » Euratom research programme

Safety and radiation protection research is a major component of such strategies, in view of the corresponding scientific challenges, and of high societal expectations in this area.
A holistic vision of Fission R&T at EU level

**Public-Private mode**
EU RT Technology Platforms for:
- Safer nuclear technologies and operations
- Optimal and harmonised regulatory oversight

**Public-Public mode**
EU RT Radiation Protection Platform for:
- Optimized radiation protection practice
- Enhanced and harmonised emergency preparedness
- Adequate response to societal concerns on low dose health issues and environmental protection

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ETSON members are committed to research because today’s research is tomorrow’s safety.

ETSON partners share research efforts with all the other stakeholders in the nuclear energy activities. They maintain their independence by keeping separate safety assessment related R&D activities.
PRIVATE, PRIVATE-PUBLIC and PUBLIC-PUBLIC programming several research platforms for fission

- Reactor designs: SNETP/ESNII
- Systems and components: SNETP/NUGENIA, IGDTP/SITEX
- Severe accident mitigation: NUGENIA/SARNET
- Off site radiological management of accidents: NERIS
- Low dose effects: MELODI
- Environmental issues: Radio ecology Alliance

TSOs are involved in all fields of research
ETSON involvement in SNETP

This paper available on www.etson.eu presents the views of ETSON on European R&D priorities for nuclear safety.

ETSON members participate actively in governance and activities of SNETP.
GEN 2&3 NUGENIA: thematic areas and leaders

1. Plant safety and risk assessment
2. Severe accidents
3. Core and Reactor operation
4. Integrity assessment and ageing of systems, structures and components
5. Fuel and spent fuel
6. Innovative Gen III design
7. Harmonisation

ETSON members participate in NUGENIA governance and activities.
ETSON participates in all thematic areas for GEN 2&3 research.
IRSN is involved in all NUGENIA thematic area; leader on SAM and Harmonization.
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**Barrier effectiveness and defense in depth**
- Design safety of processes, components and safety equipment
- Neutronics/criticality
- Ageing
- Radiation protection design
- Discharge and waste management
- Integration of concepts

**Barrier integrity during accident situation**
- Natural phenomena (earthquake, flooding...)
- Predictable technological events (internal: fuel, external: grid...)
- Fire
- Human and organizational factor
- Malicious acts
- Theft of nuclear materials/radioactive sources

**Societal approach to risk**
- Communication/information/transparency
- Pluralism/risk control
- Risk perception
- Economics of nuclear risks
- Local economy sensitivity

**Emergency situations**
- Current and future state of safety barriers, components and safety equipment
- Mitigation systems
- Anticipation of radioactive releases and environmental dispersion

**Technical diagnostics**
- Metrology/Dosimetry
- Workers
- Patients
- Public
- Environment
- Polluted sites

**Understanding chronic exposure situations**
- Radioecology
- Radiobiology/low doses effects
- Epidemiology

**Human/ecosystem exposure**
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To prosper in the long term in highly demanding and fast evolving European energy markets, nuclear energy needs to be both safe (and perceived as adequately so by society, including for waste management solutions), and competitive. Safety needs to be achieved to the “highest standards” because Europe cannot afford a major nuclear accident. Competitiveness concerns not only the industry, but also the organization of safety supervision and licensing processes, as well as radiation protection practice. To achieve such a goal requires all actors to work closely together, and support each other to create and implement the necessary knowledge and knowhow, across Europe.

None of the above can be accomplished successfully without a lot of 2 rare ingredients: money and top level experts!
Thank you for your attention
OPERRA project federates MELODI, ALLIANCE and NERIS activities

OPERRA: Open Project for the European Radiation Research Area

MELODI: effects of low dose radiation on Human

ALLIANCE: radio-ecology european network

NERIS: off-site post-accidental emergency management network