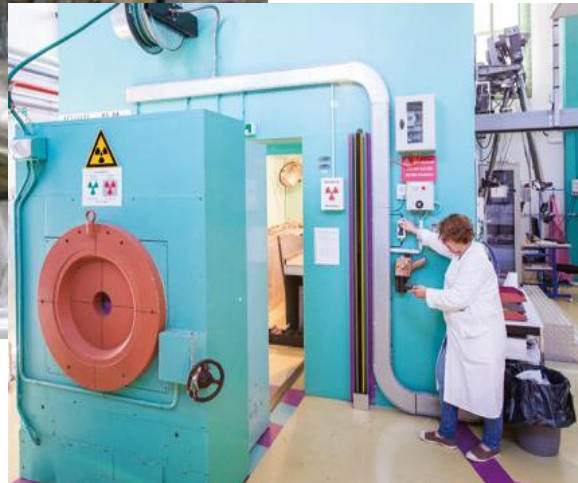


IRSN

INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Enhancing nuclear safety

International efforts on R&D dedicated to safety expertise and decision making



P. Bueso,
Director of Strategy

IAEA International
Conference on Effective
Nuclear and Radiation
Regulatory Systems

2019 Nov. 6th

MEMBER OF

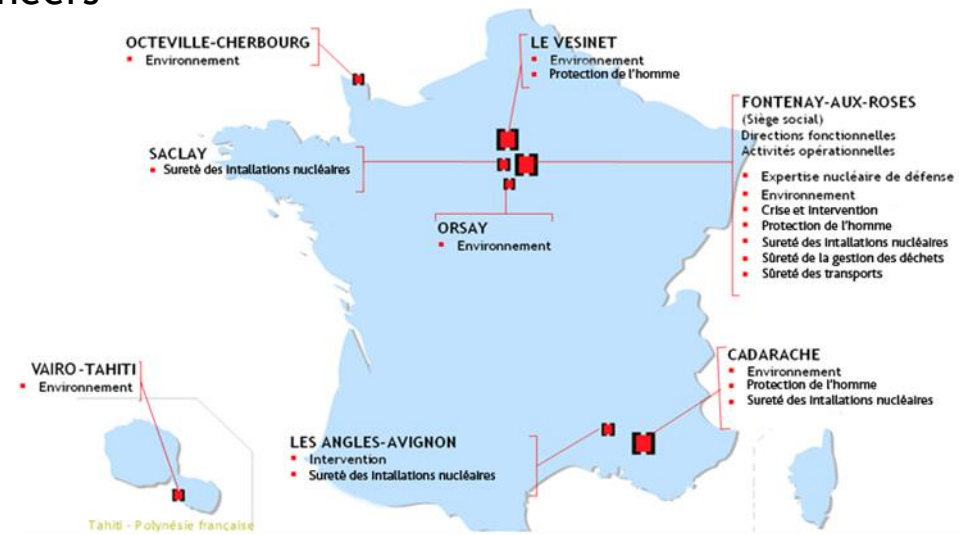
ETSON

EUROPEAN
TECHNICAL SAFETY
ORGANISATIONS
NETWORK

A short reminder about IRSN, the French TSO

Public expert on radiation protection and nuclear safety

- A public body placed under the joint authority of the ministries of Environment, Defence, Energy, Research, and Health
- National public expert for **research and technical support** on radiation protection and nuclear safety risks
- 1800 employees, including more than 1000 specialists: researchers, Ph.D. students, post-docs and engineers



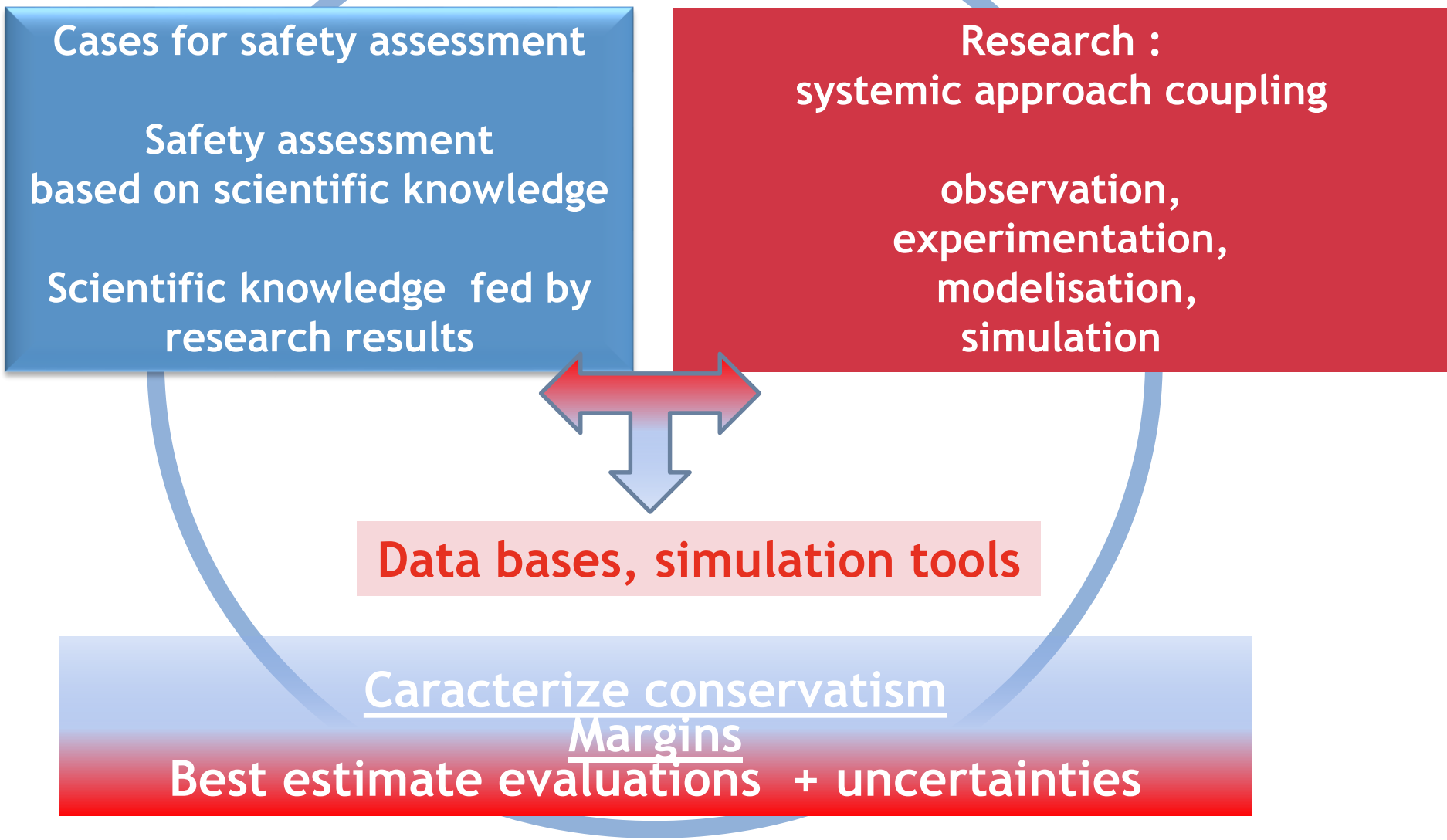
Numerous fields of activity ...

- Nuclear **safety**: reactors, fuel cycle, waste, medical applications and transports
- **Protection** of workers, patients, population and environment against ionizing radiation risks
- **Emergency** preparedness and post-accident operational support
- Protection and control of **nuclear sensitive materials**
- Protection of nuclear facilities and transport of radioactive and fissile materials against **malicious acts**
- **Training and Education**
- **Information** and interaction with stakeholders and civil society

... and a specific model

- IRSN defines and implements **research programs** to maintain and develop its knowledge and skills, tools and methods needed for its **assessment activities**

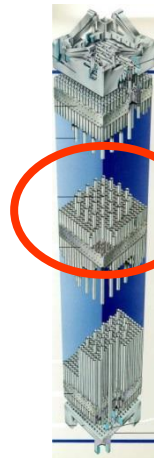
A systemic approach of research and assessment



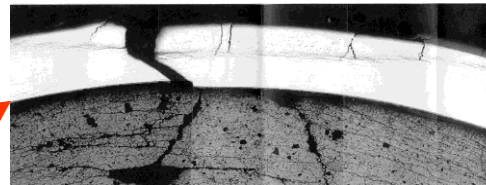
A synergy example: damage to cladding

The question asked by the assessment sector:

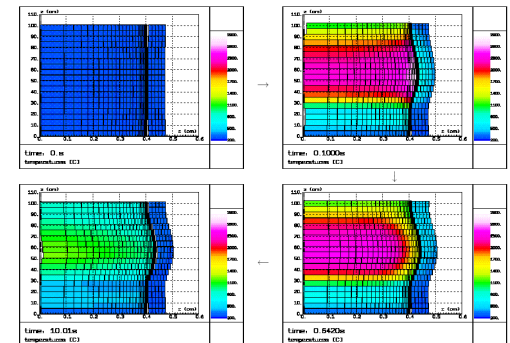
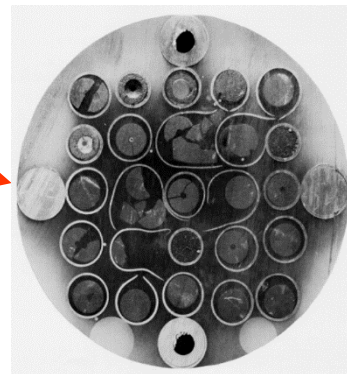
- Do we have all the knowledge we need to assess the risk of damage to the fuel cladding (first barrier) under normal and accident situations, taking account of the changing operating conditions for the fuel in the reactor and in the back-end cycle?



Power excursion



Loss of cooling



A synergy example: damage to cladding

The corresponding investment in research activities:

- Collaboration with various universities and CNRS: MIST joint laboratory
- Development of simulation tools: DRACCAR (APRP), SCANAIR (RIA)
- Proposition of new programs of interest: Fukushima feedback (PERFROI, DENOPI)
- Leadership in international programs: CIP program (OECD framework)
- Maintenance of experimental platforms e.g. Cabri reactor in Cadarache



High-level expertise requires large research capacities



In the field of safety:

- Severe accidents
- Nuclear fuels behaviour
- Containment
- Explosion and fire
- Criticality/neutronic
- Ageing
- New generations of reactors (SMR...)
- Human and Social Sciences

Threats on large research facilities ...

- They are **ageing**
- Some have closed down (e.g. Halden reactor)

... require a coordinated response

- An **international cooperation** is needed to guarantee the availability and to optimize the use of research capacities (and related skills).
- The **global nuclear research community** (authorities, TSO, research organizations, industry, intergovernmental organizations) is concerned.
- **TSOs are essential partners** among the different stakeholders and have a specific role to play to achieve these goals.

A focus on NEA/SESAR « SFEAR2 report »

- SFEAR report (2007) considers **large research facilities** for nuclear safety
- High level review of existing facilities focused is on water-cooled reactors currently deployed in NEA member
- The report gives a **list of criteria** (replacement costs, priority of issues addressed, uniqueness, etc.) meant to determine which facility has to be preserved.
- In 2007, the group identified facilities at risk among which:
 - **Halden BWR** (closed down in June 2018)
 - IRSN **GALAXIE** (fire) facilities currently supported by programme PRISME 3

Recommendations for facility at risk

- Continue the support through research **programmes**
- Preserve **key experiments** in international databases

How to go further ?

At national level

- a better coordination of global nuclear research community (safety authorities, TSOs, research organizations, industry, intergovernmental organizations)

At AIEA Member States level

- Based on IAEA resolution on Nuclear and Radiation Safety adopted on 2019 September 19th:
 - *Pp (k): Acknowledging that research, development, the introduction of innovative methods and technologies and the availability of research and testing facilities are of continuing and long term fundamental importance in improving nuclear safety worldwide,*
 - *Op 59: [the IAEA General Conference] encourages Member States to share information on research programmes needed to ensure availability and durability of scientific expertise to support nuclear safety*
- A reflexion on **preserving key facilities and skills through international research programmes**

Thank you for your attention

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