HARMONISATION OF THE SAFETY APPROACH FOR FUTURE REACTORS

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GENERATION IV REACTORS : CONTEXT

- GIF (Generation IV International Forum) has defined ambitious technical objectives for fourth-generation reactors:
  - Sustainability:
    - minimization of high-level long-lived waste
    - optimal use of natural resources
    - new applications such as hydrogen production
  - Competitiveness
  - Safety and reliability
  - Resistance to proliferation
  - Physical protection

GENERATION IV REACTORS : CONTEXT

- Six promising technologies have been selected by GIF:
  - **Gas-Cooled Fast Reactor System** **GFR**
  - **Lead-Cooled Fast Reactor System** **LFR**
  - **Molten Salt Reactor System** **MSR**
  - **Sodium-Cooled Fast Reactor System** **SFR**
  - **Supercritical-Water-Cooled Reactor System** **SCWR**
  - **Very-High-Temperature Reactor System** **VHTR**

  ↳International cooperation is organized to implement R&D necessary for their deployment
- In France, development of:
  - SFR (AREVA, CEA, EDF)
  - HTR (AREVA, CEA)
  - GFR (CEA)

  ↳Involvement in projects sponsored by European Union

SAFETY APPROACH FOR GEN IV REACTORS

- Deliberations on the safety guidelines for future plants are conducted at both international and national level
- In France, creation of "*Groupe Consultatif Français de Sûreté*" (GCFS – French Advisory Group on Safety):
  - AREVA, CEA and EDF
  - providing safety guidelines in support to French development
  - interacting with:
    - *Risk and Safety Working Group* (RSWG) set up by the GIF
    - IAEA
    - EU development (e.g. SFR)

SAFETY APPROACH FOR GEN IV REACTORS

- GCFS works in particular on:
  - defining safety guidelines common to fourth generation concepts
  - establishing requirements for specific technology on the basis of this technologically neutral framework
  - supporting dialog with the French Safety Authority
- Safety harmonization performed by RSWG and GCFS ensures that R&D work at national and international level is relevant and optimised

SAFETY APPROACH FOR GEN IV REACTORS

- Main guidelines recommended by GCFS:
  - the safety requirements should be defined at the earliest stages of the design process and anticipate future licensing evolution,
  - in the continuity with nuclear background, the design should be based on the "Defense-in-Depth" principle, particularly required for innovative reactors. Indeed, the lack of knowledge and of experience feedback limits the early use of PSA for the design,
  - the general safety objectives and principles should be consistent with the ambitious ones used for EPR (European Pressurized water Reactor),
  - the safety demonstration should be robust, e.g., improved consideration of hazards.