ASN's actions in GEN IV reactors and Sodium Fast Reactors (SFR)

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ASN's actions: summary

- ASN is involved in 3 actions concerning GEN IV:
  - Overview of nuclear reactor GEN IV systems
  - Specific analysis about transmutation
  - Prototype reactor ASTRID (SFR)
- Theses actions are in the beginning (no conclusions or results available)

Overview of nuclear reactor GEN IV systems

Reactors GEN IV technologies

- R&D cooperation within "Generation IV international Forum" (GIF) concerning the new generation of reactor
- 6 nuclear reactor systems for GEN IV with possibilities of an industrial development identified by GIF:
  - sodium fast reactor (SFR),
  - gas fast reactor (GFR),
  - molten salt reactor (MSR),
  - very-high-temperature reactor (HTR/VHTR),
  - lead fast reactor (LFR),
  - supercritical water reactor (SCWR).

ASN's requirements

- ASN doesn't promote one technology in particular.
- Choice of one reactor's technology should be based on:
  - considerations of environmental protection and nuclear and radiation safety,
  - a safety level higher than the 3rd generation of reactors (EPR),
- Specific focus on transmutation of long-lived radioactive elements.
- ASN needs elements concerning every technologies to make its opinion regarding these criteria.

Comparison of the 6 technologies

- 2 analysis from nuclear operators requested by ASN:
  - advantages and drawbacks of the 6 technologies of reactor (nuclear and radiation safety, environment protection, R&D needs, possibility of transmutation, constraints related to the fuel cycle...),
  - SFR operating feedback (in particular from Phenix and Superphenix) examined within Astrid project's expertise.
- Concerning the analysis of advantages and drawbacks:
  - Technical expertise by IRSN : first report of 21st March 2012 which should be updated in the comings months.
  - Meeting of the ASN Advisory Committee is scheduled on 28st November 2013

Specific analysis about transmutation

Transmutation

- Transmutation and separation of long life radioactive elements have to be studied at the same time as the research into new generation of reactor (Law of 28st June 2006).
- Some of the 6 reactors systems identified by GIF wouldn't be suited to transmutation.
- Specific analysis about transmutation submitted by CEA by the end of 2012.
- Technical expertise should be requested in 2013.

ASTRID prototype reactor (SFR)

ASTRID project

- ASTRID (Advanced Sodium Technological Reactor for Industrial Demonstration):
  - project begun in 2010 by CEA,
  - SFR prototype whose power will be lower than the future GEN IV reactors but significant as experimental reactor,
  - purpose is to test options of future GEN IV reactors,
  - transmutation's experiments would be continued.
- ASTRID's safety level has to be at least the same as the GEN III reactors (EPR) but the prototype has to make progress the safety experience to prepare GEN IV.
- Technical meetings in 2011 and 2012 (CEA, IRSN, ASN) about accidents, initiating events…

ASTRID safety orientations

- ASTRID's general safety orientation file:
  - submitted to ASN in June 2012 by CEA ;
  - voluntary step which precedes the safety options file and the licensing procedure.
- Technical expertise ongoing :
  - in September 2012, ASN asked a technical expertise by IRSN and Advisory Committees ;
  - concern in particular: orientations chosen, taking account feedback from SFR operational experience, main safety principles and approach, preliminary list of initiating events…
  - conclusions expected around the middle of 2013 (meeting of Advisory Committees on 27st June 2013).

Thank you for your attention

More information available at www.asn.fr