

## **Perspective on the "stress tests" (complementary safety assessments) and peer reviews**

### ***the European Nuclear Industry view***

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# who are we?

- **FORATOM** is the Brussels-based association of nuclear industry in Europe:
  - 17 national nuclear associations active across Europe
  - nearly 800 firms represented
- **ENISS** (*European Nuclear Installations Safety Standards*) was set up in 2005 under the umbrella of FORATOM
  - ENISS currently represents the nuclear utilities and operating companies from 16 European countries with nuclear power programmes, including Switzerland

**FORATOM**

**ENISS**  
European Nuclear Installations Safety Standard



# Member Fora



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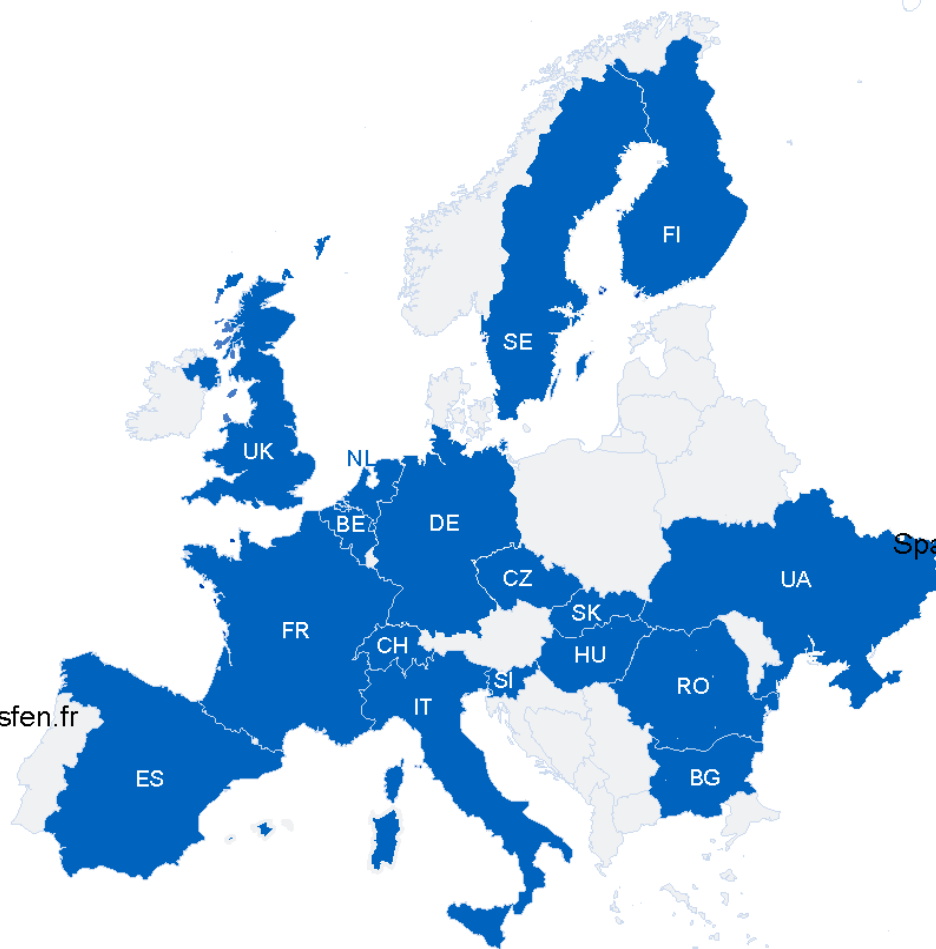
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Ukrainian Nuclear Forum Association



# the Fukushima accident

- the plant **design** did not take into account a tsunami of the size of the one which occurred in March 2011
- the accident resulted in an almost **total lost of safety functions:**
  - electrical supply
  - heat sink
- the consequences of the tsunami and the impact of radiation worsen the accident management
- **several reactors units** on the same site were directly involved in the accident
- the cooling of **the spent fuel pools** (located in each reactor building) was a special concern

# the dawn of the safety reassessment

- *March 15, 2011:* Energy Commissioner Oettinger, industry CEOs and European Regulators meet in Brussels, launch the **safety reassessment** initiative ("stress tests")
  - *from the very start of the process, industry brings its strong support to the initiative and its members are involved in all steps of the process*
- *May 19-20:* ENEF plenary meeting (Prague) endorses the process:
  - assessment to perform by the utilities
  - review to do by the national safety authorities, with guidance of WENRA
  - **objective:** identify what more to do with regard to *prevention, control* and *mitigation* in order to further lower the risks

# safety reassessment: *timeline*

- *Aug. 15<sup>th</sup>*: the *Licencees* published their progress reports
- *Sept. 15<sup>th</sup>*: the *Regulators* issued their progress reports
- *Oct. 31<sup>st</sup>*: the *Licencees* issued their reports
- *Dec. 31<sup>st</sup>*: Final *Regulators* reports
- *Jan. to April 2012*: start and completion of the ***Peer Review process***
- *June 28<sup>th</sup>-29<sup>th</sup> 2012*: European Commission due to globally report to ***European Council***

# safety reassessment: *technical scope*

- to focus on issues highlighted by the Fukushima accident: *initiating events, loss of safety functions, accident management*
- ***initiating events*** (IE):
  - earthquake
  - flooding and other extreme natural conditions
- consequential ***loss of safety functions***:
  - prolonged total loss of *electrical power*
  - prolonged total loss of the main ultimate *heat sink*
  - combination of both situations
- ***accident management*** issues:
  - prevention of some accident conditions
  - core melt accident management



# safety reassessment: *methodology*

- safety reassessment to be based on:
  - existing and available *studies / walk downs*
  - *engineering judgement* to evaluate the adequacy of the available margins and means
- a ***four step approach*** to identify potential improvements:
  - review the current *design basis*
  - review the existing preventive and mitigation *protection measures*
  - review the vulnerability of the plant with due regard to *hazards exceeding the design basis*
  - if needed, *beyond design* studies

# safety reassessment: *insights (1)*

- all Nuclear Operators applied the methodology as defined in ENSREG May 24 letter
- through their reports, the Methodology and the ***Terms of Contents*** are *very similar*; most of their content is available to public consultation
- ***European plants are globally safe***; no need to curtail the operation of some of them
- industry considers that the safety reassessments were not *lenient* but rather *stringent*
- ***beyond design situations*** have been analysed to check NPP robustness [It does not mean that any natural hazard –whatever its probability– has to be taken into account: ***how safe is safe enough?*** (*i.e.* which limits to the process, and by whom?)]

## safety reassessment: *insights* (2)

- the ***analysis*** of each and every NPP is ***very specific***:
  - the *external events* to be considered might be rather different, depending on local specific features and environment
  - the *original designs* were not all similar
  - *improvements* already implemented after Plan Safety Review vary from one to another NPP
- the review of these reports was done carefully in detail under every ***National Regulator*** responsibility

# safety reassessment: *NPP robustness*

- ***Defence in Depth*** is one of the basic principles of Nuclear Power Plants safety (prevention, control, mitigation)
- thanks to permanent safety improvements and to the programs previously and currently implemented on a regular basis:
  - maintenance
  - ageing
  - changes
  - Plan Safety Review

*the recent safety reassessment initiative by EC and the Regulators added up to a regular and repetitive process and did not totally arise as a fundamental breakthrough in industry's practices*

# some proposed improvements (1)

- case by case (because of each NPP particularities), better protect ***the safety functions*** (from flood, earthquake):
  - protection of buildings (sealed perimeters)
  - reinforcement or rising of dams, dikes
- ***organizational & human factor***: even in the case of natural hazards, ***human beings*** stay at the core (which implies to deeply care for design, training, procedures, emergency planning, etc.)
- possible ***design improvements***:
  - further diversify electrical supply
  - provide for additional water
  - heat sink
  - emergency center

## some proposed improvements (2)

- portable components / *plug and play* systems and equipment
- **severe accidents management:** (in particular, keep enough flexibility to be able to deal with different situations):
  - multi reactor unit crisis management (organization and features – e.g. FARN Nuclear Rapid Action Force in France)
  - H<sup>2</sup>: passive catalytic recombiners
  - containment filtered venting
- specific features for **spent fuel pool:** instrumentation, water sources

# the Reports of the National Regulators

- European NPPs have **substantial margins** and **robustness**
- the measures implemented so far for SAM provide for **further margin** to protect the public and the environment
- assessment by the Regulators :
  - the nuclear installations subject to the Safety Reassessment are **sufficiently safe to continue operation**
  - the **safety level** must continuously be **improved**

# the Peer Review process

- *worldwide experience* in many other sectors gives the industry credit for using **Peer Review** processes (incl. WANO - World Association of Nuclear Operators)
- *industry believes that Peer Review allows for sharing best practices and contributes to global improvement*
- the exchanges with non nuclear EU Member States increases the interest of the process
- *for industry, each safety requirement has to be individually considered (which implies not necessarily linearly "adding up" all requirements)*
- *industry is strongly supportive of the European Safety Analysis Process, which could help strengthening the public trust in favour of a decisive technology in the EU low carbon energy mix and lowering CO<sub>2</sub> emissions*



# Conclusions

- *each and every NPP is very specific, but some generic insights have been spotted:*
  - *design level*
  - *portable components*
  - *SAM features*
- the available Regulator Review confirms NPPs high safety performance; additional measures to increase robustness should be further assessed
- industry hopes the Peer Review Process contributes to improving public trust and confidence by demonstrating that
  - NPPs are operating safely
  - safety is regularly updated through a continuous improvement process