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

the European Nuclear Industry view

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Public Meeting
post-Fukushima stress tests & peer review
content

- who are we?
- *Fukushima*: a very specific accident
- *safety reassessment*: timeline / technical scope / methodology / some insights
- which *improvements*?
- Regulators Report, *Peer Review*
- *conclusions*
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
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
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. 15th: the Licensees published their progress reports
- Sept. 15th: the Regulators issued their progress reports
- Oct. 31st: the Licensees issued their reports
- Dec. 31st: Final Regulators reports
- Jan. to April 2012: start and completion of the *Peer Review process*
- June 28th-29th 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)
  - $H^2$: passive catalytic recombiners
  - containment filtered venting
- specific features for *spent fuel pool*: instrumentation, water sources
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.
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 CO₂ 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

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