

Regulatory challenges in nuclear safety

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(1993 – 2012)**

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1. ASN Establishment

- **ASN, the French Nuclear Safety Authority, became an independent administrative authority in 2006 by the Act on transparency and security in the nuclear field (TSN act)**
 - **ASN is not within a ministry but is a State Authority**
 - **ASN reports to the French Parliament.**
 - **ASN is managed by a board of 5 Commissioners created by the TSN act.**
 - ✓ **Full time job, non-dismissible**
 - ✓ **6 year term, non renewable**
 - ✓ **Since 13 November 2012, Pierre-Franck CHEVET is the new ASN President**
- **Core duties**
 - **Regulations**
 - **Authorizations**
 - **Inspection**
 - **Information**
- **ASN benefits from the expertise of a major TSO : IRSN**

1. Activities and installations regulated by ASN

- **Regulation of a wide range of activities and installations, including**
 - **58 operating nuclear reactors**
 - Standardized fleet
 - Generate ~80% of French electricity
 - One operator (EDF)
 - **EPR reactor under construction**
 - **All French installations involved in the fuel cycle, from enrichment to reprocessing**
 - **Several thousand installations and activities using sources of ionizing radiation for medical, industrial or research purposes;**
 - **Several hundred thousand consignments of radioactive materials shipped nationwide, every year**
- **Some key figures**
 - **More than 450 staff**, with about half of them in ASN 11 regional offices.
 - **A total budget of 142 million Euros**, including 76,5 million devoted to assessments
 - **More than 800 inspections per year** on nuclear installations and transport of radioactive material.

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2. The Post Fukushima actions

- There is a **before and after** the Fukushima accident
- **About 10 years** could be needed to take full account of all lessons learned from the accident
- **Stress tests have been performed** in a large number of countries
- **Action plans** have to be drawn up and followed over several years
- Avoiding stress tests being a **one-shot exercise**

Post Fukushima actions at French and European levels (1/2)

5th May 2011

- ASN's resolutions to require licensees to perform stress tests according to **detailed stress test specifications**, consistent with EU ones

3rd January 2012

- **ASN's formal report** and **ASN's opinion** about stress tests

Jan. – April 2012

- **European peer review**

26th June 2012

- **ASN issued legally binding requirements** (licence conditions) to EDF on improvements to be implemented:
 - 19 site specific resolutions with about **40 licence conditions in each of them**
 - Compliance deadlines : from 2012 to 2018.
Improvements are expected as soon as possible, without waiting the next periodic safety review (EU peer review recommendation)
- Letter signed by ASN's DG with **41 additional requests to EDF**

Post Fukushima actions at French and European levels (2/2)

Immediately after the accident, ASN launched:

- A campaign of **targeted inspections**
- **“Stress tests” (i.e. complementary safety assessment)**
 - Are a **complementary approach to the continuous improvement process** of safety pursuant to the law and overseen by ASN (periodic safety reviews (PSR) and integration of operating experience feedback)
 - Cover all **French nuclear installations** (~120), including EPR reactor under construction, with priority given to the most important ones (NPPs, La Hague fuel reprocessing plant...)
- Stress tests aim at checking the **robustness of plants to beyond-design Fukushima-related situations**: extreme natural events, loss of safety systems (heat sink, electrical power), severe accident situations.
 - **In addition, French stress tests also address human factors**

Outcomes in France (1/5) No immediate shutdown but ...

- **ASN's position** : *“the facilities examined offer a safety level that is sufficient for ASN not to request the immediate shutdown of any of them [...]. At the same time, ASN considers that continued operation of the facilities requires that their robustness to extreme situations be increased beyond the existing safety margins, as soon as possible.”* (issued on 3rd January 2012)
- EDF made proposals to enhance its NPP's safety
- For some other nuclear installations, shutdowns were already decided

Outcomes in France (2/5)

Confirming Periodic Safety Review benefits

- Importance of the **periodic safety review (PSR)** process and significant operating experience feedback
 - Seismic improvements
 - Wide ranging set of hazards considered for flooding risk assessment
 - Severe accident measures implemented on all the sites

- PSR process is in addition to routine safety assessment
- 2 steps in the PSR process:
 - 1) **Extensive compliance check** with the (latest) applicable licensing basis
 - 2) **Safety re-evaluation**: reviewing licensing basis, to identify the reasonably practicable improvements

Outcomes in France (3/5)

Improvements expected

- Need for a « **hardened safety core** »
 - technical and organizational measures which remains operational under conditions considered in the stress tests

- Set up a « **Nuclear rapid response force** » for NPPs
 - specialist crew and equipment within 24 h to the site

- **Reinforced measures** to reduce the risk of **dewatering of the spent fuel stored in pools**

- Feasibility studies to **protect the groundwater and surface waters** in case of severe accident

- **Organizational & Human Factors** are essential to nuclear safety

Outcomes in France(4/5)

« Hardened safety core»

- **3 objectives for the situations studied in the stress tests**
 1. prevent or mitigate the progress of an accident with fuel melt,
 2. mitigate large-scale radioactive releases,
 3. enable the licensee to perform its emergency management duties.
 - **Limited number of strengthened equipment including**
 - ✓ an **additional ultimate electricity generating set** for each reactor;
 - ✓ a **diverse emergency cool-down water supply** for each reactor;
 - ✓ **new emergency management premises**, offering greater resistance to hazards and remaining accessible and habitable at all times and during long-duration emergencies
 - ✓ **mobile devices** and **means of communication** essential to emergency management
 - ✓ technical and environmental **instrumentation**
- ① File submitted by EDF (June 2012), currently under assessment by ASN and IRSN

Outcomes in France (5/5)

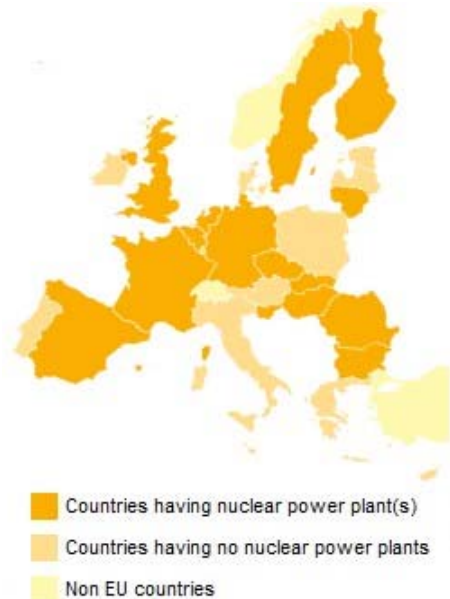
« Nuclear rapid response force »

- For the nuclear power plants, ASN required the progressive creation of the "Nuclear rapid response force" (FARN) proposed by EDF.
- The FARN is a national response system including **specialist crew** and **equipment**, able to take over from the personnel of a site affected by an accident and deploy additional emergency response resources **in less than 24 hours**.



Outcomes in Europe (1/3)

European peer review



- **European stress test process (limited to NPPs) involved**
 - **Countries with NPPs:** 15 EU countries + Switzerland + Ukraine
 - **5 EU countries without NPPs**
 - **European Commission and observers** (IAEA, USA, Canada, Japan, UAE, Croatia)
- **Peer review :**
 - 80 experts from all over Europe
 - A full process lasting 4 months
 - **First-of-a-kind opportunity to share results and compare practices between European countries**

Outcomes in Europe (2/3)

European level recommendations

<http://www.ensreg.eu/EU-Stress-Tests/EU-level-Reports>

- **Periodic safety review (PSR) are extremely beneficial to the continuous improvement of safety**
 - Necessity to re-evaluate natural hazards **at least every 10 years**
- **Need for European guidance on assessment of natural hazards and margins**
- **Need to strengthen the robustness of NPPs to beyond design situations**
 - Bunkered equipment,
 - Mobile equipment and off-site rescue teams to assist a crippled site...
- **Need to maintain containment integrity**
 - Urgent implementation of recognized measures (H2 explosion prevention...), for NPPs where they are not yet implemented

Outcomes in Europe (3/3)

- Full understanding of the TEPCO Fukushima accident will be a **long term process extending over several years, possibly a decade.**
- One of the important results of the public interaction is a strong demand for a European initiative on **off-site emergency preparedness.**
 - This subject was not part of the mandate of the European peer review.

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Responsibilities for nuclear safety

The prime responsibility for safety and radiation protection must rest with the person or organization responsible for facilities and activities that give rise to radiation risks

Principle 1 : Responsibility for safety

from Fundamental Safety Principles - Safety standards SF-1 IAEA (2006)

The regulatory body is responsible for the regulation of nuclear safety and radiation protection

Core values for a regulator (1/2)

➤ Competence and rigor

- **Skilled and trained staff**
 - external expertise sources: Advisory committees and possibly TSO
- **Human and financial resources appropriate** for the activity scope and associated challenges
- Extreme attention given to **domestic and foreign operating experience feedback**
- **Openness to foreign practices and positions of foreign regulators**

Core values for a regulator (1/2)

➤ Independence

- **Freedom of judgement, action and expression**
- **Ability to work on its own terms and in complete impartiality**
- **Doesn't mean isolation.** Strong need of contacts and discussions with stakeholders, in particular operators for in depth technical discussions before taking decisions

➤ Transparency (strongly linked with independence)

- **Public information, media communication**
- **Stakeholders' participation**
- **Parliament's involvement**

A real implementation of these 4 core values is needed for the credibility, legitimacy and efficiency of the regulator

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Conclusions & challenges (1/2)

- The accident at Fukushima confirmed that, **despite all the precautions that are taken for safety, an accident remains possible.**
- It now appears clearly, and has been endorsed in the conclusions of the extraordinary meeting of the Contracting Parties to the CNS, that **“nuclear power plants should be designed, constructed and operated with the objectives of preventing accidents and, should an accident occur, mitigating its effects and avoiding (long-term) off-site contamination. The Contracting Parties also noted that regulatory authorities should ensure that these objectives are applied in order to identify and implement appropriate safety improvements at existing plants.”**

Conclusions & challenges (2/2)

- **The actual improvement of safety according to these principles relies, in part, on the action of the regulators, for example by having the licensing basis updated.**
 - ↳ The independence, the transparency and the rigorous action of the regulators are a necessary key to this process.
- **But first of all, the licensees, who have the prime responsibility for safety, must take their share and be active in the process of improvement.**
 - ↳ This is to be done at an **individual level**, but also at a **collective level**, through national organizations such as INPO and JANSI, and international organizations like ENISS and WANO.