

Review of the National Action Plans (NAcP)

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Vienna, April 17, 2015**

European Stress Tests

To understand the larger framework of the stress tests, firstly a short overview of the set-up of the EU stress tests:

- **The *first phase*** of the EU stress tests started in June 2011 – the *operators* of the NPPs prepared a *self-evaluation* of their plants by 31 October, 2011.
- In the ***second phase***, the national regulator *reviewed* reports submitted by the operators. The national stress test reports were handed over to the EU Commission by 31 December, 2011.
- Then the ***third phase*** started: the peer review, which was conducted by experts nominated by the national states to review the national reports. This **peer review teams** reviewed the national reports. The peer review was completed with a main report and 17 country reports.

European Stress Tests

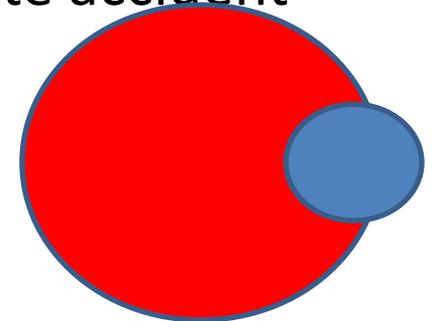
The EU stress tests comprise three topics:

1. The response of a NPP when facing different extreme situations (earthquakes, floods and extreme weather events, and the combination of such events)
2. Capabilities to cope with the consequences of a loss of power (Station Black-Out – SBO) and a loss of heat removal via Ultimate Heat Sink (UHS);
3. Capabilities to prevent major radioactive emissions in case of a severe accident: the Severe Accident Management (SAM).

SHORTCOMINGS AND LIMITATIONS

The EU “Stress tests” have the following important shortcomings and limitations:

- The scenarios (earthquake, flooding, extreme weather) under review are incomplete; internal fire and airplane crash, for example, are missing.
- Safety features to prevent an accident are not taken into account. As a matter of course, it is always better to prevent accidents in advance, rather than dealing with the consequences of an accident.
- Important factors, which could trigger or aggravate accident sequences, are not considered:
 - Ageing effects of structures, systems and components
 - Safety management of the nuclear power plant
 - Quality of training



SHORTCOMINGS AND LIMITATIONS

- **The Stress tests do not provide a method for comparing the safety of the different plants, nor do they answer the question how safe European plants actually are.**
- **The operating European nuclear power plants (NPPs) differ in age and design. None of the NPPs complies with the requirements of an accident preventing defence-in-depth concept that corresponds to the state-of-the-art requirements.**
- Thus, the EU “Stress tests” should be complemented by a second part that assesses the capability of the nuclear power plants to prevent accidents. The safety objectives of WENRA for new reactors are an appropriate basis for this assessment.
- This was one of the recommendations of the Expertise **“The European Stress test” for Nuclear Power Plants** on behalf of the Parliamentary Group of the Greens in the European Parliament, October 2011, Renneberg Consult in cooperation with Wolfgang Neumann (intac GmbH) and Oda Becker

SHORTCOMINGS AND LIMITATIONS

- The public and independent experts were pointing out that the stress tests were mainly set up to improve the confidence in the safety of the NPPs.
- Nevertheless, the **stress tests revealed a number of shortcomings regarding the plants' capability to withstand several external hazards and the lack of possibilities to cope with the consequences.**
- However, the outcomes of the stress tests consist only of **recommendations for “further improvements”**.

Example France

CRITICAL COMMENTS ON THE COUNTRY REPORT

- The peer review team has not assessed the current safety level of the French NPPs, but only the increased safety level which should have been achieved in 2018. (now not earlier than 2020)
- Currently, there are several known shortcomings regarding the protection against earthquake and flooding as well as the known impossibility to cope with a severe accident – especially in the event of an earthquake or flooding affecting all units of the site.
- The reviewers have only described the weaknesses, but do not present an overall assessment of all facts. This is necessary for politicians to be able to assess the risk.

National Actions Plans (NAcPs)

- To implement the stress tests findings, an *ENSREG action plan* had been developed to track the implementation of the recommendations.
- **By the end of 2012, the national regulators had provided NAcP to remedy the shortcomings identified during the stress tests.**
- An ENSREG workshop to discuss the NAcP took place in Brussels from 22 to 26 April 2013.
- **By the end of 2014, the national regulators reported the status of the implementation of these actions.**
- The updated NAcPs have been published on the ENSREG website. *Stakeholders had the opportunity to put questions regarding the Peer Review of NAcPs from 8 January to 28 February 2015*
- **The 2nd ENSREG Post-Fukushima NAcPs Workshop will take place from 20 to 24 April 2015.**

Critical Review of the National Action Plans (NAcP)

**Study commissioned by Greenpeace
Oda Becker, Patricia Lorenz
Vienna, Hanover, April 2013**

Critical Review of the NAcP

- The “**Critical Review of the National Actions Plans (NAcP)**” published in April 2013 evaluates the result of the stress test process.
- It is the follow-up of the “***Critical Review of the EU Stress Test performed on Nuclear Power Plants***” report published in May 2012.
- The report of 2012 discussed the main weaknesses as identified by operators, the national regulator and peer review teams during the stress tests process.
- Furthermore, the report pointed out those issues and important shortcomings not mentioned in the stress tests.

Critical Review of the NAcP

- It was **not** the aim to make a **systematic review of all points** which are to be addressed.
- The report investigated whether the actions/activities set out in the NAcP are the foundation to **remedy the main weaknesses** the stress tests revealed.
- These evaluations do not claim to be exhaustive.

The overall aim was to assess whether an incident comparable to the Fukushima accident could happen in Europe even after the stress tests or, to put it in a nutshell:

Lessons learnt from Fukushima?



Critical Review of the NAcP

- The studies deal with 13 NPPs in 10 countries.

Country	Nuclear Power Plants
Belgium	Doel, Tihange
Czech Republic	Temelín
France	Cattenom, Fessenheim, Gravelines
Germany	Gundremmingen
Slovak Republic	Mochovce
Slovenia	Krško
Spain	Almaraz
Sweden	Ringhals
Switzerland	Muehleberg
UK	Wylfa

Conclusions of the

CRITICAL REVIEW OF THE NATIONAL ACTIONS PLANS (NACP)

Conclusion (1)

- On 12 October 2012, TEPCO **admitted that the company had failed to prevent the Fukushima accident**, reversing its earlier statement that the accident could not have been foreseen. A TEPCO task-force identified several factors that had led to the accident:
 - TEPCO **did not learn a lesson** from the incident in France due to **flooding at the Blayais NPP on December 27, 1999**
 - no safety measures aimed at preventing and mitigating a severe accident had been adopted since 2002.
- The task force attributed those facts to multiple root causes:
 - The management assumed a **severe accident was extremely unlikely** in Japan, and **feared that retrofitting safety systems would increase anxiety among the public**, especially among the residents near the plant.
 - TEPCO also feared safety retrofitting would require a **costly shutdown period**.
- The task force also underlined that there were **not enough engineers at the site who were familiar with safety systems' designs, operation manuals** and their locations.

Conclusion (2)

- The **risk of flooding events or earthquakes exists to a different extent for all NPPs.**
- Also common to the EU NPPs: the **operators insist on the low probabilities**, to avoid high investments and anti-nuclear activities of the public.
- The EU tried to respond to this “new experience” of Fukushima by conducting the stress tests and hoping that the results will lead to higher safety.
- **Transparency** is another important tool to control nuclear risks; while ENSREG certainly recognizes this fact, not all national nuclear regulators and operators act accordingly to fulfil this need of higher transparency.
- It is evident that some countries **treated this task rather as a formality or paperwork than a plant safety upgrade program.**

Conclusion (3)

- In general, there are different possibilities for the operator and nuclear authority to “remedy” the shortcomings the stress tests revealed:
 - A **quick response**, but without any guarantee that the measures are sufficient (e.g. Wylfa, UK).
 - A **comprehensive evaluation** of possible hazards and protective measures, which will take more than ten years (e.g. Gravelines and Cattenom, France).
 - **Business as usual** (e.g. Temelin, Czech Republic). The idea of the stress tests is more or less ignored. Instead, the already ongoing measures are listed, major hardware improvement are avoided.
- **None of these possible variants increases the nuclear safety to an acceptable degree.** The more than obvious solution – the permanent shut-down – needs to be considered and is in several cases the only safe option.
- The NAcP are heavily relying on the new magic solution: **mobile equipment**, which is a cheaper solution compared to comprehensive measures.
- Under severe accident conditions, it is very unlikely that the proposed mobile equipment can be put to work as quickly as necessary; to rely to such a large extent on manual actions is irresponsible in regard of the consequences of a severe accident.

Conclusion (4)

- Furthermore, the new mobile equipment is useless if the staff response during the accident is not perfectly according to plan. However, not only the “**know-how**” but also the “**know-why**” is very important. *This is also one important lesson learnt from the Fukushima accident.*
- **Limited back-fitting measures** do not significantly improve the safety level because they cannot compensate the increasing flood hazards (e.g. by climate change) and ageing effects.
- **Comprehensive plant modifications** are technically impossible or would be done only in exchange for prolonged operation times, at the same time carrying the risks of ageing plants as mentioned above.

PLEX Programs are ongoing at several plants

Thus, our conclusion: **Still** no lessons learnt from Fukushima.

At all European nuclear power plants severe accidents can occur – any time.

Conclusion (5)

(Hope)

- A key issue which is still open is how comprehensively the peer review of the national action plan will be conducted.
- This might be seen as an opportunity to force the nuclear regulators to formulate mandatory requirements which need to be fulfilled in a rather stringent time schedule; in contrast to the years or even decades currently planned in many countries.
- This could make operators decide to shut down old and unsafe nuclear power plants.
- ***The ENSREG peer review hopefully will insist on introducing additional measures to the national plans in those cases where the national regulator required less safety measures than the stress tests peer review recommended.***

Critical Review of the updated National Action Plans (NAcP)

**Study commissioned by Greenpeace
Oda Becker, Patricia Lorenz
Vienna, Hanover, April 2015**

Critical Review of the **updated** NAcPs

First conclusions of the Study “Critical Review of the updated NAcPs”, which will be published in June 2015:

- Nearly no information is provided
- It is nearly not possible to identify the progress
- Thus, there is no transparency at all
- Operators and regulators do not care so much about ENSREG’s recommendations
- Some of the unknown risks have changed to known risks – and nobody cares?!
- It is “very interesting “ to recognize the deals between the regulators and the operators taken in account the remaining operation time
- A lot of necessary measures, and in particular the most important ones, are postponed or even cancelled (for example Mühleberg , Krsko, Tihange)

Example: Muehleberg NPP, Switzerland

- In operation since 1972, located at the Aare River, only 14 km west of Bern.
- According to the NAcP, comprehensive measures are necessary, among others: back-fitting measures of the spent fuel pool and the installation of an alternative ultimate heat sink was to be completed in 2017.
- However, according to the updated NAcP, this necessary backfitting measures are **cancelled**. Because the operator (BKW) announced in October 2013 it had chosen to close Muehleberg in 2019, to avoid making long-term investments in the plant.
- **The Muehleberg NPP combines a high number of serious safety issues: the seismic hazard for both the plant and the close-by dam is high, severe design shortcomings of an old reactor plus operational weaknesses and an inefficient ageing management allow for only one recommendation: immediate shut-down.**

Example: Tihange NPP, Belgium

- Tihange, operated by Electrabel, comprises three pressurised water reactors (PWR): Tihange 1, commissioned in 1975, Tihange 2 (1983) and Tihange 3 (1985).
- The site is located on the Meuse river, at 25 km southwest of Liege and at about 80 km southeast of Brussels.



Tihange 3

Tihange 2

Tihange 1

Example: Tihange NPP, Belgium

Flooding hazard:

- Today, in case of an extreme flooding the water level at the Tihange site will reach **nearly two meters; all safety systems of the three units would be flooded**. The staff – moving around between and within the buildings **on boats** – would have to prevent severe accidents using mobile equipment.
- **A protection wall is planned: however although the flooding hazard will obviously increase in the next decade, sufficient safety margins are probably not used.**
- In case of a flood beyond-design, or when the wall would fail and the conventional equipment is rendered unavailable, the non-conventional means (NCM) equipment, i. e. mobile equipment, should be used.

Example: Tihange NPP, Belgium



Figure 2: Peripheral protection of the site of Tihange against beyond-design flooding

Example: Tihange NPP, Belgium

The limited measures to protect the NPP against the flooding hazard according to the NAcP are postponed or even cancelled according to the updated NAcP:

- NAcP: A peripheral protection of the site (first level of flood protection) which shall consist of a wall including coffer dams to close the opening necessary for normal operation is to be implemented by the end of 2014.
According to the updated NAcP, the wall (with limited safety margins) will be ready for commissioning not earlier as by September 2015.
- NAcP: Additional to the wall, a second level of flood protection (local volumetric protection) is required.
According to the updated NAcP, the second level of protection is cancelled.

Conclusion:

Flooding will remain a dangerous hazard for the Tihange NPP.

Example: Krško NPP, Slovenia

Situation:

- In line with US NRC standards the peak ground acceleration (PGA) of 0.3 g was used for the safe shutdown earthquake (SSE).
- Seismic hazard assessments in 1994 and 2004 led to raising the PGA values for the SSE: In 1994 to PGA= 0.42g and in 2004 to a PGA= 0.56g, which is nearly twice the original PGA.
- **Today Krško NPP complies only with the current requirements for the original design basis of 0.3g.**
- Additional systems, structures and components (SSCs), which will be implemented within the Safety Upgrade Project (SUP), will be designed in accordance with the design extension conditions (DEC) requirements.
- **However , the extended design condition seismic value is 0.6 g PGA. This value offers nearly no seismic safety margin (0.04 g).**
- SNSA claims that in case of an earthquake with a PGA over 0.6 g, core cooling can be assured by alternative means, but pointed out that implementation of alternative means requires that manual actions are performed in relatively short time.
However, it seems to be quite impossible to prevent a core melt accident with alternative means after an extreme earthquake taking into account the destruction of the NPP and the infrastructure.

Example: Krško NPP, Slovenia

Limited actions according to the National Action Plan (NACp):

- In **conjunction to the ongoing lifetime extension process** (for additional 20 years), the comprehensive **safety upgrading program (SUP) is to be finished by 2016.**
- But the key issue will remain: Despite the Nuclear safety authority, SNSA, and the operator being fully aware that Krško NPP is situated in a seismically active zone, obviously insufficient measures are taken.
- **Even after implementation of the SUP, the resistance against earthquakes will not have reached the necessary safety level: The plant operates and will continue operating for two more decades with an almost zero seismic margin.**
- Furthermore, a beyond design earthquake could also cause a dam break and a consequential flooding of the site.

But additionally, the limited backfitting measures are postponed or perhaps even cancelled:

- According to the **updated** NACPs, the measures of the SUP are postponed to 2018, or postponed to “after 2018”, because of financial constraints.

Conclusion

Lesson learnt from Fukushima?

NO

Thank you for
your
Attention!