



## QUICK BACKGROUND ON EU NUCLEAR POWER PLANT STRESS TESTS

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### Key stress test results for the 2 units of the Cernavoda nuclear power plant in Romania:

- ✓ ..... Romania is one of the most **active earthquake regions** in Europe. Nevertheless, the Stress Tests revealed that this hazard had not been adequately evaluated before. The value for the return period associated to the Design Basis Earthquake (DBE) is considerably lower than the current European practices. But the plant's behaviour under beyond Design Basis Earthquake or margins to cliff edge effects were not evaluated.
- ✓ ..... **Flooding** turned out to be a neglected issue: The Peer Review Team criticized that dangers connected with extreme flooding events have been analyzed only to a limited extent (cliff edge effects and weak points lacking) and pointed out that a number of safety significant equipment is located underground. The protection against flooding needs to be improved.
- ✓ ..... On **extreme weather conditions like heavy winds, snow and rain** and how the plant can withstand their effect, the Peer Review Team found out, that only limited information is available.
- ✓ ..... Station Black-out (SBO) scenarios, i.e. the complete **loss of power** supply situations were not considered in the design basis of the units, thus there is no adequate protection against this threat.
- ✓ ..... The Stress Tests revealed that due to the lack of regulatory requirements, measures to cope with severe accidents were not implemented. The implementation is now ongoing.
- ✓ ..... The Stress Tests found, for example, that the fairly commonly used filtered venting system for containments, which are necessary to reduce the release of radioactive substances during a severe accident, are not installed at Cernavoda. The operator now received a three year deadline to remedy this weakness. The installation is to be finished by December 2014.
- ✓ ..... Equipment to fight against severe accidents at Cernavoda will not be safely stored in seismically safe buildings until 2015: Equipment like mobile diesel generators which are crucial to keep the cooling under emergency situation, mobile diesel engine pumps, fire-fighter engines etc.

### Stress Tests - what is happening now?

There are currently two reactors operating at the only nuclear power plant site in Romania. Unit 1 was completed in 1996 and the second was connected to the grid in August 2007 – both are CANDU 6 reactors, which are the only units in Europe based on the CANDU (CANadianDeuterium Uranium) technology. The operating time of 30 years end in 2026 and 2037, respectively. Nevertheless, the operator (SNN) considered a PLEX procedure for an extension of 20 years. This announcement causes concerns, because already today the design of CANDU 6 reactors is very outdated, for example external threats as airplane crash and other human impacts as terrorism are not considered in the design. Also ageing of the pressure tubes is an issue.

Romania is one of the most active earthquake regions in Europe. Although the probability of an earthquake exceeding the plant's design limit is low, the possibility of a severe earthquake persists, which could trigger a severe accident. The Peer Review Team criticized that margins have not been quantified adequately and seismic upgrading has not been considered. However, the regulator CNCAN sticks to the opinion that the seismic margins are sufficient and further measures are not necessary. Thus, the regulator missed the idea of the Stress Tests. **Flooding protection** improvements: In response to the Peer Review Reports, each country produced a plan on how to upgrade their plants. They are called National Action Plan and the Romanian plan also included potential measures to improve protection against flooding. They suggested design modifications to replace selected doors with flood resistant doors and penetrations sealing in buildings containing safety related equipment in rooms below the plant platform level are to be performed by December 2014.



Also simple measures like sand bags will be made available on site to be used as temporary flood barriers. It is not clarified, whether the sand bags are additional protection devices or the only measure to protect specific areas.

On extreme weather conditions like heavy winds, snow and rain and how the plant can withstand their effect, the Peer Review Team found out, that only limited information is available. Only during 2014 this should be prepared – no date is given on when concrete measures will have been implemented.

More detailed regulatory requirements on the protection against extreme external events, taking account of the lessons learned from the Fukushima accident and of the results of the "Stress Tests" peer reviews are planned to be elaborated by the end of 2014. While not even the requirements exist, no deadlines for the implementation of necessary measures against extreme events which can occur any day, the plants are allowed to operate.

Also very reluctant is the attitude towards the issue of external and the cliff-edge effects, the situation when the plant is on its way towards a severe accident. The peer review highlighted the need of further work for assessing margins to due to external events. It was recommended that CNCAN obtains good quality programs from the operator SNA and ensures that the work is appropriately followed up. CNCAN stated that this work is depending on the development of a common methodology, at EU-level. Thus, no target date for implementation is set.

Because **Station Black-out (SBO)** situations were not considered in the design basis of the units, there is no adequate protection against this threat. **If an earthquake stops the power supply, fuel damage could occur after only 4 hours.** To avoid this scenario operator action (manual opening of the Main Steam Safety Valves) in less than 2 hours is necessary and in addition, in about 2.5 hours, the mobile diesel generators have to be available. Improvements to facilitate the operations actions are implemented. However, the central issue remains unsolved, a relative short time span to prevent core melt in a complex situation after an earthquake.

The National Action Plan also mentioned that an analysis on a key issue is to be completed by 2014: habitability of the main control room (MCR) in the case of a total core melt accident.

**Severe Accident Response** was identified as important, however, a location to store the important intervention equipment (mobile DGs, mobile diesel engine pumps, fire-fighter engines, radiological emergency vehicles, heavy equipment to unblock roads, etc.) that is protected against all external hazards is lacking. A new seismically qualified location for the on-site emergency control center and the fire fighters are to be established by 2015; still the plant is allowed to operate.

Accident management provisions for events in the spent fuel pools were implemented. Improvement of the existing provisions to facilitate operator actions to prevent a severe accident in the spent fuel pool (water level and temperature monitoring from outside the building) are necessary. These are to be performed by 2014. The Spent Fuel Pool (SFP) is located outside the containment, thus in case of a severe accident a major release of radioactive substances threats. Safety analyses for severe accident in the spent fuel pools were announced to be conducted by 2013 however, no information is available on the results and necessary measures. Therefore it is not possible to judge how useful they are.

**Conclusions & Demands:** The Stress Tests proved to be useful for pointing out that the national regulator did not insist on sufficient earthquake protection. Now the “public eye”, politicians and hopefully the national regulator CNCAN need to continue this on a sustainable basis, by issuing regular, transparent and understandable reports as was announced on European level during the Stress Tests. Currently, no information is available on the implementation of the Stress Test results!