Joint Project – Nuclear Risk & Public Control

Webinar

The EPR – the future of nuclear expansion or rather a failed technology?

September 19, 2022

Report

For this webinar, 39 **participants** from 15 countries registered.

Yves Marignac, a consultant with the French Institute negaWatt held his presentation about the history of the Flamanville-3 EPR (European Pressurized Reactor) project, a Generation III+ reactor type. The EPR design development started in 1992. Until now, two EPR units are operating in China (Taishan-1 and -2), one unit might start commercial operation in December 2022 (Olkiluoto-3 in Finland), two units are under construction in UK (Hinkley Point C) and two reactor projects are pending for the site at Sizewell. In his presentation, Yves Marginac highlighted that the safety improvements of the EPR led to increased complexity; higher reactor output of the largest reactors of 1700 MWe mean increased loads. Using several safety issues of the Flamanville-3 project, he showed some of the EPR`s design deficiencies (problems with the head and bottom of the reactor pressure vessel, quality issues of the welds of the secondary loops, anomaly with set-in of auxiliary piping on the primary loops).

Oda Becker, independent German expert on nuclear safety and security, explained in detail the corrosion problems that were found in some of the operating French reactors (Civaux) in October 2021. The cracks detected in welds on the elbows of the pipes of the emergency cooling system were not expected to be found at all in stainless steel lines. Such cracks can lead to leaks and accidents. Four reactors have been shut down due to these findings (Civaux-1, -2, two at Chooz-B = reactors of the N4 series). This might be a generic anomaly which might affect all 56 French reactors: The EPR design is based on the N4 series and thus might be affected. Oda Becker continued by speaking about current problems at the Flamanville-3 reactor, which is under construction in France, about the vibration problems of the Finnish EPR Olkiluoto-3 and the fuel problems in Taishan-1 that are generic deficiencies of the EPR design. These issues have not been fully resolved for the current EPR design and it is not clear how the EPR 2 design will cope with them.

Both speakers raised the question whether the EPR-2 reactor which EDF announced as the next reactor type with its reduced safety features might be a step backwards for safety. The simplified safety features include the replacement of the double shelled containment used now by a single containment. To finish the EPR 2 design which is to replace the failed EPR will take a long time before its design is complete and a first-of-a-kind can be built. A major constraint is the state of the crippled French nuclear industry with its very limited industrial capacity. Yves recalled that first industry demanded new reactor projects, now they got them, but now French industry demands a Marshall plan first before being able to construct those reactors.

Yves Marignac's and Oda Becker's **presentations** can be downloaded from our website: http://www.joint-project.org/.

The webinar **recording** is now available on our YouTube channel (https://youtu.be/5IFIbCFAk3Y)

Discussion

Status of the EPR-2 design

Reactor design is prepared in three steps:

- Basic design: The safety options document is rather a summary of principles EDF intends to put in place as safety requirements without technical details.
- Development of the generic design
- In the next step the site-specific design for each EPR project will be developed.

EDF started building Flamanville-3 before having completed the specific design in detail.

EDF will not be ready to start construction work for an EPR-2 before 2027.

According to leaked Government's estimates, EDF has spent until 2021 only 1 million hours of engineer time out of 20 million that were estimated to be needed for developing the EPR-2 design; this means they are only very early in the process of detailed designing.

Shrinking the EPR?

The Czech Republic will start the tender for new reactors and the state aid documents submitted to the European Commission in August 2022 includes three reactor types which are not to have an output over 1200 MWe, also an EPR-1200 is mentioned. However, the design of the EPR-2 far from completed, the necessary engineering and design efforts to develop a smaller version will take a few more years on top.

Yves replied to the question concerning the industry's "degraded scenario": This scenario was not described exactly in the memo. The new build programme was based on the assumption that new orders would create dynamics throughout the entire supply chain; "degraded" therefore means a situation where this would not take place as easy as previously assumed but likely.

Sizewell C

EDF's latest financial report stated that the company's involvement in the project consortium is now 80%, however, EDF does not intend to reach over 20% in any of the upcoming investment projects to avoid having to consolidate this in the group's accounts.

Passive and active safety systems

There is no announcement that there will be an increase of passive systems in the EPR-2. Contrary to Westinghouse's AP1000 reactor, the EPR mostly relies on active safety systems.

Yves informed the participants that a briefing on alternative designs to EPR-2 and their pros and cons has been commissioned to IRSN as part of the preparation of the coming national debate on this new programme which will start in October 2022.

Finances

The amount EDF is accumulating aside for waste management and decommissioning remains insufficient. Around 330 million euros per unit are dedicated for decommissioning, however, a more realistic figure would be approx. 1 billion euros. This simple fact forces EDF to keep the units operating and to postpone the final shut-down of the old reactor fleet.

Can the EPR design problems be fixed?

Can the problems of the EPR be fixed before Hinkley Point C (HPC) starts operating? HPC will be prone to the same kind of problems that have been found in Flamanville and will be found in the future; only some issues can be addressed.

It is not clear yet what problems will arise in Olkiluoto-3. It is commonly accepted that reactors have "childhood illnesses", most important are problems affecting the reactor core; the corrosion problem and the war in Ukraine result in ASN being forced to allow EDF to operate its reactors despite of the stress corrosion problem that is not understood yet. Under which circumstances the reactors are allowed to operate is up to ASN's decision. Theoretically they act independently however find themselves currently under high pressure to alleviate the electricity situation in winter which reduces their leeway for decision making.

12 reactors have been in operation with cracks unnoticed for decades (the stress corrosion likely appeared in their first years of operation) on piping systems that would have been crucial to prevent a catastrophe in case of a loss of cooling accident (LOCA).

This event was organized by the Joint Project – Nuclear Risk & Public Control (http://www.joint-project.org/)

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