

Analyzing seismic risk assessment evolutions in an historical perspective: French nuclear safety after the Fukushima Daiichi nuclear accident

IRSN

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Faire avancer la sûreté nucléaire

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What happened after the Fukushima accident ?

■ Stress Test

- Initiated by ENSREG, scope defined by WENRA
- Implemented as ECS in France

■ Peer review (IAEA - ENSREG)

Safety evolutions concerning the seismic risk

- Hardened Safety Core of material and organisational measures to allow control of the basic safety functions in extreme situations

[ECS-ND7]

L'aléa sismique, à prendre en compte pour les SSC¹ du noyau dur, défini par un spectre de réponse, doit :

- *être enveloppe du séisme majoré de sécurité (SMS) de site, majoré de 50 % ;*
- *être enveloppe des spectres de site définis de manière probabiliste avec une période de retour de 20 000 ans ;*
- *prendre en compte pour sa définition, les effets de site particuliers et notamment la nature des sols.*

Pour les SSC nouveaux du noyau dur, l'exploitant retient un spectre majoré par rapport au spectre de réponse défini ci-dessus.

Evolutions background ?

- Hardened safety core as an answer to Fukushima accident (Extreme event beyond the design that cause a loss of coolant and power supply functions)
- SMS + 50% according to the French safety approach
 - EDF proposal
 - RLE + ECS themselves shows a robustness factor of 1.5
- PSHA 20 000 years according to international standards
 - Peer review recommandation

Why the necessity of probabilities?

- Probabilist safety assessment is supported by IAEA, WENRA, ENSREG, EUROCODE 8, other risk industries, conventional buildings, etc...
- But French nuclear safety do not

History of French deterministic approach

- 1970s: construction of the NPPs French fleet composed of PWR from Westinghouse license, based on US regulatory guides
- 1975-1981 : development of a French approach (RFS 1981)
- 2001: RFS updated following knowledge and instrumentation improvement. Still determinist
- 2007: RESONANCE trial
- 2008-2011 : first French PSHA in St-Alban (by EDF)
- 2011-nowadays: PSHA are at the heart of the debate

Conclusion

- There were an impact of the international scale on the French nuclear safety after Fukushima
- To be confirm in the next RFS update ?
- Making the History of Nuclear Safety is useful to get a deeper understanding of present issues

Thank you !

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