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Long term operation in France – context and perspectives

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The French nuclear fleet

3/4 of the French nuclear fleet has been constructed between 1979 and 1990

Average age of the NPPs (first criticality)

- 29 years for the 34 900MWe reactors
- 23 years for the 20 1300MWe reactors
- 13 years for the 4 1450MWe reactors

Average age of the French fleet :

- 26 years (first criticality)
- 24 years (connexion to the grid)

■ Réacteur de 900 MWe
▲ Réacteur de 1300 MWe
▼ Réacteur de 1450 MWe
▲ Réacteur de 1600 MWe (en construction)

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Regulatory framework

In France, the regulation does not require to set a limit for service operation for a nuclear installation :

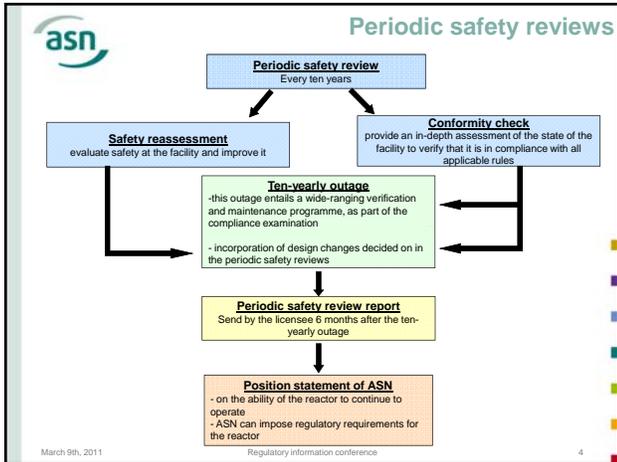
- Pursuant the TSN act (13th June 2006), the creation of a nuclear facility is subject to authorisation delivered by decree
- The authorisation decree does not set a limit for service operation

In France, the regulation requires a periodic safety review every ten years (TSN act)

ASN exercises a continuous oversight of the nuclear installations.

In case of serious and immediate hazard, ASN can stop the installation at any time.

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- French NPP initially designed for a service life of 40 years. EDF wishes to « extend the service operation significantly beyond 40 years »
- The periodic safety reviews have allowed a continuous improvement and an homogenisation of the safety level of the different reactors
- In the coming years, EPR type reactors will be commissioned in France. The design of those reactors aims to achieve a significant safety improvement compared to the reactors currently in operation.
- Technologic and scientific developments show possible ways to improve safety level of the reactors currently in operation, especially concerning potential radioactive releases from accidents with core melt
- **In what condition can ASN accept operation beyond 40 years of existing reactors, given that new designs are available, which comply with more stringent safety objectives?**

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Main stakes

- **Check and maintain the conformity of the reactors**
 - Realise an extended compliance examination ; correct the conformity anomalies and demonstrate the exhaustive qualification for the fourth ten-yearly outage (at the latest)
 - Justify the ageing management of non-replaceable items (ex: containment building, pressure vessel)
 - Anticipate the massive replacements of components
 - Maintain skills and knowledge
- **Improve the safety level of the reactors**
 - Safety level to be defined with respect to the safety objectives defined by WENRA in 2010 for new reactors (similar to EPR safety objectives)
 - Safety level to be defined taking into account the operation term planned
 - EDF wishes to « extend the service operation significantly beyond 40 years »
 - EDF doesn't exclude to continue operation beyond 60 years

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Operation beyond 40 years

Technical issues to improve the safety level

- Define safety objectives to reduce
 - The frequency of severe accidents
 - The potential radioactive releases resulting from all conceivable accidents
- Evaluate the behaviour of the reactors currently in operation for the incidental and accidental situations that have not been taken into account at the design stage, but that have been considered for the EPR reactor
- Investigate provisions with strong impact on the reduction of severe accident frequency and potential radioactive releases resulting from severe accident
- Reinforce the prevention of the risks : climatic, fire, flooding, seismic risk...
- Extend the application domain of probabilistic safety assessments

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Operation beyond 40 years

Key dates

Definition of the study programme by EDF

- Beginning of 2012 : position statement of ASN on the main points of the study programme, after an advisory committee meeting at the end of 2011

Position of ASN on continued operation beyond 40 years

- From 2019 until 2029 (for 900MWe reactors) : Position statement for each reactor and incorporation of design changes

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Conclusion

- ASN exercises a continuous oversight of the nuclear installations
- Periodic safety reviews are major steps in the process of continued operation of the reactors
- Continued operation beyond forty years
 - Pursuant the WENRA statement, ASN aims an ambitious safety level taking the safety objectives defined for the new reactors as a reference
 - Strengthen and maintain the conformity of the installations
 - Define a decisional process and a shared schedule with the different stakeholders

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