Lifetime extension of French 900 MWe NPPs: IRSN's role

IRSN FACT SHEETS

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RP4-900 and IRSN

Expertise
> 40 public opinions

> 200,000 hours of work, i.e. over 130 full-time equivalents

> 250 different experts

Exchanges with CLIs and the population
> 23 meetings with Anccli, CLIs, and the population across France

Contributions from exchanges
> Frequently asked questions organized into 44 themes resulting from questions from the population

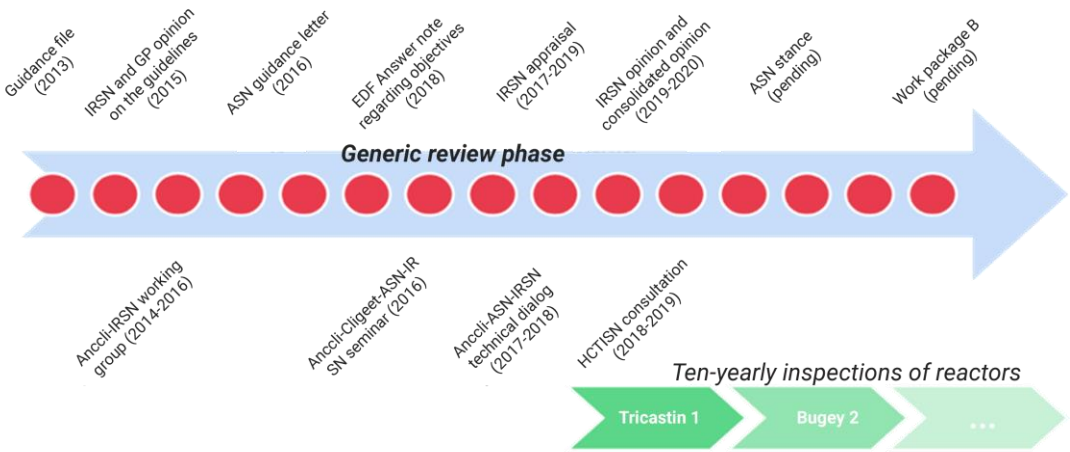
> 4 videos

> 9 opinions explicitly answering questions from CLIs and the Accli

> and 2 commented and illustrated opinions

A major challenge concerning more than half of the French nuclear power reactors

Built in the 1980s, the 32,900 MWe reactors of the French nuclear fleet are all gradually arriving at the 40-year service life used as an assumption when they were designed. EDF wished to extend their service life beyond 40 years. Through its technical expertise applied since 2014 on this subject, as part of the periodic review associated with the fourth ten-year safety reassessment of these reactors (RP4-900), IRSN supports the Nuclear Safety Authority (ASN) in its decision-making. The safety objectives of this review, defined by ASN, are specifically aimed at getting closer to the level of safety of new generation reactors – in France, the EPR reactor located at Flamanville (north-west of France) – i.e. improving the prevention of fuel meltdown accidents as well as the protection of facilities against external loads and mitigating the consequences of accidents for people and the environment.



IRSN's safety assessment and its findings

At this stage, IRSN's assessment shows that the safety objectives should be able to be achieved, subject to significant additions to the safety demonstration and additional modifications to the facilities, and subject to the specifics of the sites to be inspected at a later date.

- In particular, IRSN's analysis highlights:
  - improvement, by the operator, of its organization and its processes relating to control of the facility compliance with the applicable safety requirements and aging, this improvement must be further consolidated in order to detect and handle deviations quickly and improve the risk assessment of maintenance operations;
  - the desire to get closer to the level of safety targeted for new generation reactors and to integrate feedback from the Fukushima-Daichi accident, which led EDF to plan a significant program of modifications to its facilities;
  - the modifications and justifications expected are of larger extent for the reactors of the Bugey power station than for the other 900 MWe reactors.

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As a public expert, IRSN advances scientific knowledge to manage all nuclear and radiation risks. Through its research, methods, and interactions with all stakeholders, IRSN assesses these risks and their consequences independently. It thus contributes to their prevention, detection, and the limitation of their possible effects, in order to protect the population and the environment.

- IRSN also recommended:
  - **additional checks** on safety-relevant equipment, and **special tests**, in addition to those carried out periodically. In this respect, the decommissioning of the Fessenheim power plant's two reactors could make it possible to carry out assessments on equipment difficult to access on reactors in operation;
  - **additional studies** relating to the risk of clogging of water recirculation systems required to cool reactors in the event of an accident as well as modifications intended to reduce this risk;
  - **additional modifications** necessary to achieve the objectives defined by ASN in 2013 for the continued operation of reactors beyond 40 years.

- Regarding the prevention of core meltdown accidents, IRSN notes:
  - the installation of Emergency Diesel Generators (EDG), as part of the post-Fukushima "hard core", which has significantly improved safety;
  - the planned improvement of protection, on each site, against extreme natural events, such as flooding or high winds;
  - the planned reinforcement of the back-up water supply to the steam generators;
  - the need to improve the supply of boron water to the reactor core to control its reactivity in certain situations similar to those of the Fukushima-Daiichi accident.

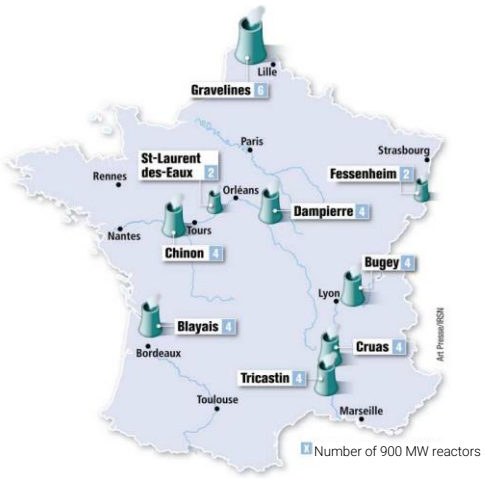
- Regarding the mitigation of the consequences of core meltdown accidents, IRSN notes:
  - the means available to cool the corium (melted core) in the containment, following vessel breakage, and the need to continue studies with a view to reinforcing certain concrete aprons;
  - the new system allowing heat removal from the containment, without resorting to the venting and filtration system installed (sand filters), and the need to diversify and strengthen the means of adding water to the containment to avoid venting.

Dialog with civil society

Continuous interaction between civil society and IRSN from the start of the assessment, both as part of the consultation organized by the French high committee for transparency and information on nuclear safety (HCTISN) and as part of the technical dialog co-organized with the National Association of Local Information Committees and Commissions (Anccli), have shown the reciprocal benefit drawn by the nuclear safety expert and the population of such an approach, in particular:

- the possibility of dialog between them on complex subjects with high technical content;
- enrichment, through the perspective of civil society, of IRSN's safety assessments relating to RP4-900 and the project to extend reactor service life.

IRSN considers it necessary to continue exchanges between all stakeholders through technical dialog organized in connection with the Local Information Committees (CLIs) in the regions concerned by these reviews.



The French 900 MWe fleet

- *At the end of 2020, 56 reactors were in operation, 32 of which had a power of 900 MWe. Both reactors in Fessenheim (northeast of France) were shut down in February and June 2020.*
- *Commissioned between 1977 and 1987, the 900 MWe reactors were designed, for some of their components, on the basis of an assumption of a 40-year service life.*
- *They are subject to ten-year inspections intended to verify their compliance with their safety standards and to upgrade them in order to bring their safety level up to state-of-the-art standards.*
- *The operating permit for a reactor is issued for an unlimited period of time, but is reviewed every ten years, in accordance with the 2006 French law on transparency and security in the nuclear field.*
- *In 2016, ASN defined the major objectives to be achieved in order to manage the fourth periodic review of 900 MWe reactors.*