Cour des comptes

THE EPR SECTOR: NEW DYNAMICS, PERSISTENT RISKS

Follow-up report

Public thematic report

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Executive Summary

In its report on the EPR (Evolutionary Power Reactor) sector published in July 2020, the Court highlighted multiple failures and errors, which explain in particular the delays and major cost overruns of new generation EPR nuclear reactor projects under construction or in operation, notably the one in Flamanville. To prevent these difficulties from recurring and compromising the future of this French industry, in a context of profound restructuring of this industry following the near bankruptcy of the Areva group, the Court then made nine recommendations.

Since then, the context has changed significantly and a new EPR construction programme was announced by the Government in 2022. A progress report on the implementation of the Court's recommendations is therefore necessary to verify the conditions for implementing this policy with considerable long-term implications in financial, industrial, energy and environmental terms.

This analysis shows that, while the French nuclear sector has begun to organise itself to implement the strategy set out in 2022, it is far from ready and still has to overcome many challenges, some of which are cause for concern.

At the end of its analysis, the Court notes that the recommendation (n° 6), although essential, calling for the calculation of the projected profitability of Flamanville 3 and EPR 2 and for monitoring thereof, has not been implemented. The other recommendations, meanwhile, have been implemented in whole or in part. With regard to EDF's international commitments, the Court has made a new recommendation to take account of the new context and feedback.

The first steps towards a revival of the EPR sector

Following the 'Fukushima' years[1], the nuclear industry has recently once again benefited from a buoyant international context. In France, extensive work on the long-term energy mix has supported the idea that nuclear power is essential for the decarbonisation of the economy. Based on these findings, in February 2022 the Government announced a programme to build three pairs of EPR2 reactors, with the possibility of adding another four pairs later[2].

The French nuclear industry has been restructured around Orano and EDF. Framatome and Arabelle Solutions, both key players in the construction of new power stations, are now under the control of France's main electricity producer. Within EDF, whose capital is once again wholly owned by the State, initial efforts to reorganise and streamline processes have been initiated.

Various legislative and strategic tools have been designed or are in the process of being designed or updated: the law of 22 June 2023 on the acceleration of nuclear power[3], the law of 11 April 2024 aimed at protecting the *Électricité de France* group from being broken up, the draft French energy and climate strategy (SFEC) which includes the draft Third multi-annual energy Programme (PPE) and the draft national low carbon strategy (SNBC).

[1] The Fukushima nuclear accident occurred in Japan following the tsunami of 11 March 2011. This incident is classified as level 7, the highest on the International Nuclear and Radiological Event Scale (INES), the same level of severity as the 1986 Chernobyl disaster.
[2] Speech given by the President of the French Republic in Belfort on 10 February 2022
[3] Law n° 2023-491 of 22 June 2023 on the acceleration of procedures related to the construction of new nuclear facilities near existing nuclear sites and the operation of existing facilities.

At the same time, nuclear governance has been reformed: the nuclear policy Council (CPN) was reactivated in 2023, the interministerial delegation for new nuclear power (DINN) was created in 2022[4], the French Nuclear Energy Industry Group (GIFEN) was strengthened, and the nuclear safety Authority (ASN) was merged with the Institute for radiological protection and nuclear safety (IRSN) in 2024[5].

The use of feedback and risk analysis has been developed. In 2020, the Court had recommended 'conducting a comprehensive feedback exercise on all EPRs built or under construction in France and abroad, with all stakeholders involved, prior to the launch of any new electronuclear reactor construction project' (recommendation n° 8). In general, this recommendation has been implemented, even if it has been done in a fragmented and staggered manner (rather than as a joint exercise involving all the stakeholders concerned). There is still room for improvement.

In addition, a vast audit and cost and constraint assessment exercise has been launched under interministerial coordination and with the assistance of EDF.

Finally, programmes have been launched to develop skills and anticipate the major recruitment needs of the coming years.

Too many additional costs, delays and uncertainties requiring responses from the public authorities and the industry

In 2020, the Court recommended that "*the projected profitability of the Flamanville 3 reactor and the EPR2 be calculated and monitored"* (recommendation n° 6). EDF has not communicated this information, meaning that this recommendation can be considered as not having been implemented. The calculations carried out by the Court show poor profitability for Flamanville 3, below the company's weighted average cost of capital, based on a total construction cost estimated at around €23.7 billion in 2023 (including interest during construction).

With regard to the EPR2 programme, its technical maturity was deemed to still be insufficient at the end of 2023 to envisage the transition from initial design to detailed design. Having reached this milestone in July 2024[6], it would be advisable, among other things, to review the costs and deadlines of the EPR2 programme, taking into account the reasons for and consequences of the postponement of this deadline.

The projected profitability of the EPR2 programme remains unknown at this stage, in particular given that the financing conditions for this programme have not yet been finalised. Once they have been finalised, an additional year (if not more) will be needed to obtain approval from the European Commission. These delays and uncertainties (which also relate to the number of power stations to be built) reduce the visibility that the players in the sector need in order to commit to industrial projects of this scale and obtain funding. The accumulation of risks and constraints could lead to the failure of the EPR2 programme.

The additional construction costs and uncertainties regarding the profitability of EPRs pose a risk to the shareholder, i.e. the State.

As the EPR2 programme continues to suffer from design delays, the lack of a finalised cost estimate and financing plan, and with EDF still heavily in debt, the Court makes a new recommendation: to postpone the final investment decision for the EPR2 programme until its financing has been secured and detailed design studies have progressed in line with the planned timeline for the first nuclear concrete milestone. The aim is to avoid the overruns

[4] Decree no. 2022-1411 of 7 November 2022 establishing an interministerial programme delegation for new nuclear power.
[5] Law of 21 May 2024 on the organisation of the governance of nuclear safety and radiation protection to meet the challenge of reviving the nuclear industry.
[6] At the Review Committee meeting of 22 July 2024.

observed for the EPRs in Olkiluoto in Finland, Hinkley Point in the United Kingdom and Flamanville in France.

EPR reactors in operation in China and Finland have experienced multiple technical malfunctions in recent years, with significant financial impacts and damaging consequences for the credibility of the EPR2 programme. In 2020, the Court recommended that "*before international projects are undertaken, their levels of risk and expected profitability, as well as their financing conditions, should be defined and complied with*" (recommendation n° 7). As international projects face a very diverse range of situations, this recommendation has been replaced by a more targeted one.

In the UK, EDF is facing a considerable increase in costs at the Hinkley Point EPR site, accompanied by a further two-year delay, and a heavy financing constraint caused by the withdrawal of the Chinese co-shareholder. EDF had to record a provision for impairment of this asset in its 2023 accounts, which reduced its earnings by €11.5 billion. As for the EPR project in Sizewell, delays are already accumulating even before the investment decision has been made, with initial negative consequences in organisational and financial terms. The Court therefore recommends that a final decision on EDF's investment in Sizewell C should not be approved until a significant reduction in its financial exposure in Hinkey Point C has been achieved.

The EDF group's strategy of continuing to promote EPR internationally should no longer lead the group to make equity commitments or take excessive risks in terms of profitability and operational coordination between the various projects (particularly in a context of limited availability of technical skills).The Court therefore recommends ensuring that any new international project in the nuclear sector generates quantified synergies with the EPR2 programme and does not slow down the schedule of this programme in France.

With regard to the design procedures for EPR reactors, the technical and regulatory frameworks have tended to change frequently in recent years. Stabilising them is crucial to give industry stakeholders greater clarity and to ensure that any future changes align strictly with actual needs — at the very least throughout the design and construction phase of the first three pairs of EPR2 reactors.

Intended to strengthen the management of the new nuclear programme, EDF's internal reorganisation has been effective since April 2024, although not fully completed. It envisages a clarification of responsibilities between project management and project ownership on the one hand, and between project management and engineering but also the supply chain[7] on the other hand, as previously recommended by the Court. However, this new organisation has not yet been put to the test in practice. In order to avoid a repeat of the phenomena that adversely affected the conduct of the Flamanville construction site, it is particularly important to ensure that the governance manual detailing the division of functions between the project owner and the project manager is updated and consistent with the new organisation of the nuclear sector within EDF.

The structuring of the nuclear sector within the EDF group itself, as illustrated in particular by its two subsidiaries Framatome and Arabelle Solutions, is designed to meet the challenges of the New Nuclear Programme for France (PNNF). According to the projections made, extrapolated to all 200,000 jobs in the sector, the workload of the nuclear programme will require the recruitment of 100,000 additional jobs by 2033. However, the efforts made to strengthen the nuclear industrial sector remain insufficient, particularly with regard to ensuring the necessary development of skills and capacities.

Although revised, the industrial and contractual strategy implemented by EDF, which was already criticised by the Court in 2020, does not yet guarantee the accountability of the players and the incentives for performance that are essential to the success of the EPR2

[7] According to EDF's definition, the supply chain is the set of functions (from strategy and contracting to manufacturing and production control) aimed at securing the activities of EDF's industrial partners.

programme. In this area, the tasks of supervising new nuclear projects, mobilising and coordinating the public authorities, and monitoring the various audits that accompany the revival of the sector, entrusted by the State to the interministerial delegation for new nuclear power (DINN), are crucial to ensuring the success of the programme for the construction of new electronuclear reactors.

Recommendations

1. Postpone the final investment decision for the EPR2 programme until its financing has been secured and detailed design studies have progressed in line with the planned timeline for the first nuclear concrete milestone (*EDF, ministry of the economy, finance and industry, ministry for the ecological transition, energy, climate and risk prevention, 2024*).
2. Ensure that any new international project in the nuclear field generates quantified gains and does not delay the schedule of the EPR2 programme in France (*EDF, ministry of the economy, finance and industry, 2024*).