

The Big Seven: Key risks facing France's nuclear fleet

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5 October 2023

Introducing the Big Seven

1.

Political risk



3.

Financial risk



5.

Reputational risk



6.

Nuclear waste risk



2.

Age-related operational risk



4.

Labor risk



7.

Climate risk



1. Political risk (1/3)

- France's aging nuclear fleet faces a multitude of **interconnected political risks** that hinge on policy decisions.
- **The main political risk is domestic:** Inconsistent government policies regarding the exiting fleet continue to create challenges for both short- and long-term planning, investment, and industry stability.



November 2018: France will shut down 14 of its 56 nuclear reactors by 2035, including up to six by 2030 (two reactors were subsequently decommissioned).



October 2021: France will be a leader in low carbon production through small modular reactors, as part of the broader France 2030 vision.



February 2022: France will have a nuclear renaissance with a massive programme of up to 14 new reactors to help make the country carbon neutral by 2050.



1. Political risk (2/3)

Domestic policy risk then leads to **EU policy risk**:

- The **ongoing discord between France and Germany over the EU energy market reform** will affect the nuclear sector in France and the broader energy sector across Europe
- France wants to allow **contract for differences (CfD)** for its existing nuclear fleet; Germany wants to limit such contracts for newly built clean energy solutions
- If France wins > **Germany might retaliate** with its own, direct subsidy for its industry > Backlash from EU countries will follow > No resolution before EU parliament dissolves > **Possible end of EU wholesale power market** (as most consumption would be locked into fixed prices) > **No timely reform** to bring in much needed investment and lower energy costs in Europe



1. Political risk (3/3)

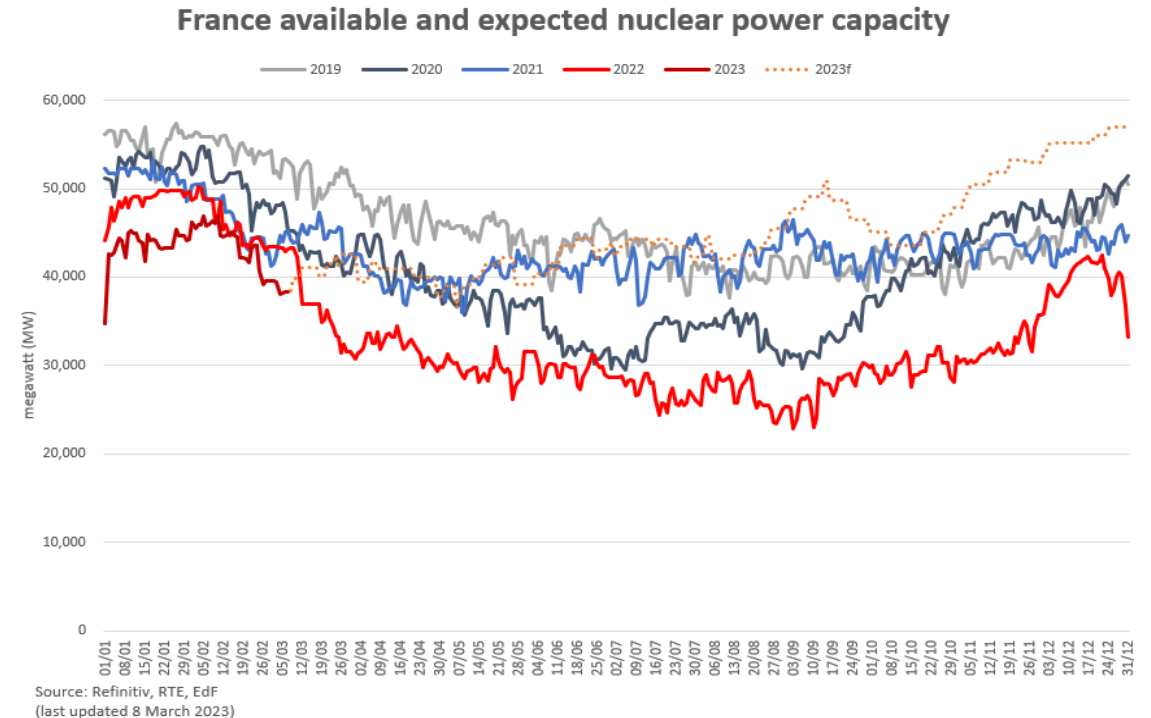
- **African political risk is limited in the short term, but worth monitoring:** The political instability in countries supplying uranium raises concerns about the reliability of this essential resource (e.g., recent coup in Niger)
- **Global geopolitics is a growing, indirect risk:** The unpredictability of the ever-changing geopolitical order introduces an element of uncertainty to the French nuclear industry by making worst-case scenarios more likely (e.g., last year's nuclear woes and broader energy crisis in France)



2. Operational risk

Age-related operational risk is probable the most intuitive risk from the Big Seven:

- **Corrosion and maintenance issues:** The older reactors are prone to corrosion and require extensive maintenance, which can lead to operational disruptions, extended outages, and increased costs.
- **Poor planning:** An ageing fleet requires robust and consistent policy decision-making regarding next steps to avoid reliability and efficiency issues. That was not the case in France.
 - The initial **push to decommission** turned into a **push to extend the lifetime of old reactors** (most of France's 56 reactors are between 30 and 40 years old; goal is now to push for up to 60 years of operational time).
- The **ageing fleet will not be enough** to meet the country's current nuclear ambitions > hence the strong need for new reactors.



3. Financial risk

Financial risk casts a shadow over the nuclear sector, affecting both operational sustainability and expansion efforts.

- **Daunting needs:** The substantial financing requirements for extending the lifetime of reactors and constructing new ones present financial challenges for the industry.
 - Current estimates are around EUR 50 billion for lifetime extensions and an additional 50 billion envelope for the first six new reactors.
- **Cost overruns and delays:** Ambitious nuclear expansion plans often result in cost overruns and project delays, straining financial resources and timelines.
 - EDF is already having huge trouble starting up its current developments, including the **1.6 GW Flamanville plant**, which is many years behind schedule and billions of euros over budget.



4. Labor risk

The nuclear sector grapples with **significant labor-related challenges**, affecting workforce availability, expertise, and project timelines for both the ageing and new fleets.

Where are the experts?

Costly delays are a reminder of **France's loss in expertise and human capital** as nuclear specialists retire without replacement and as young engineers—who were told the golden years of the nuclear era were over—have developed expertise in other energy sectors.

Where is the workforce?

A significant shortage of skilled workers, including **welders, pipe-fitters, and boiler makers**, hinders maintenance and expansion efforts. This scarcity is so pronounced that EDF had to **bring in 100 of these professionals from the United States and Canada** last year.

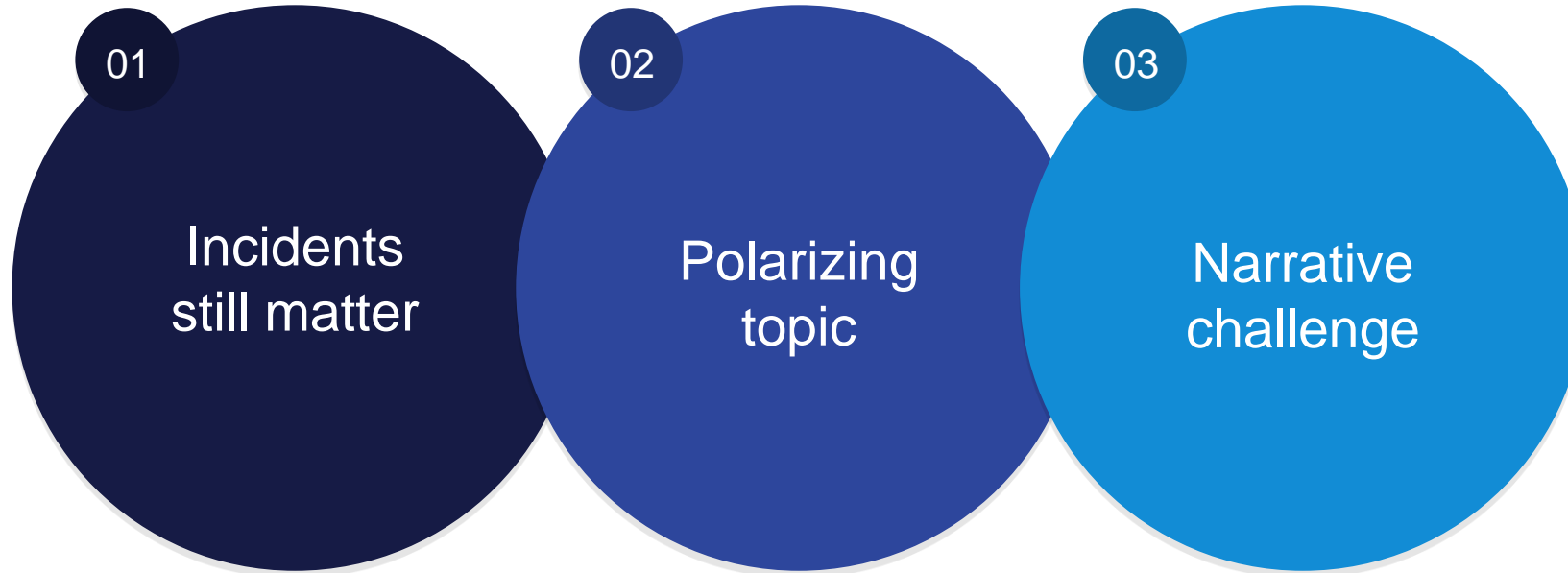
Who will bridge the gap?

French nuclear sector will require an annual recruitment of **10,000 to 15,000 workers until 2030**. EDF has an annual hiring target of 3,000 new employees over that period (i.e., 15% of its current nuclear workforce). It also aims to employ 1,000 welders by 2030, doubling current numbers.



5. Reputational risk

Reputational risk is a **constant concern for the nuclear industry**, particularly for ageing fleets.



Accident and incidents across the world will continue to negatively affect the industry's reputation and public trust (e.g., legacy of Fukushima).

Nuclear energy remains a polarizing and emotionally charged topic, making it challenging to find consensus and manage public expectations.

How to build trust in a time of ageing reactors and associated, new concerns? Has this been thought through?



6. Nuclear waste risk

The management of radioactive waste presents a **multifaceted and evolving risk** that demands careful consideration.

- **No more space at La Hague?** Cooling pools used for spent fuel face the risk of reaching capacity by 2030, likely triggering reactor shutdowns.
 - EDF is building a new one, expected by 2034 (so this might be too late).
- **The “Cigéo” storage project:** France's proposal for a long-term radioactive waste storage project encounters local and activist opposition in the eastern part of the country.
- **Still no permanent repository in France:** To date, not a single country has a permanent nuclear waste repository, and a global shift is very unlikely as it is difficult to secure community buy-in on permanent waste sites (with the exception of Finland).

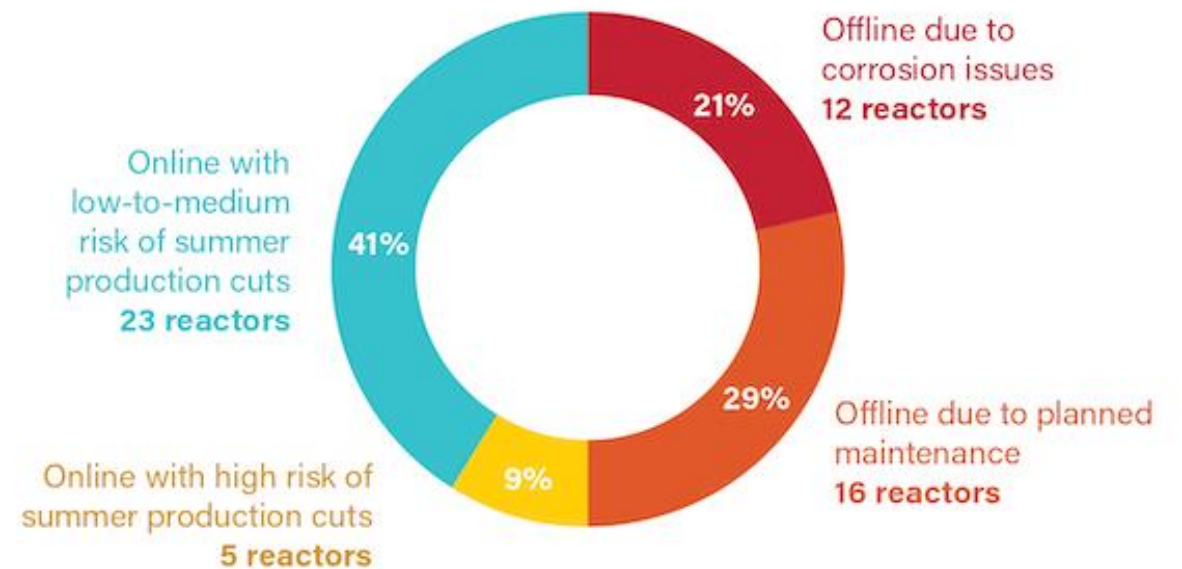


7. Climate risk

Climate-related risks introduce **additional complexities and vulnerabilities** to the aging fleet.

- **Biodiversity conservation:** The water used for cooling—which is then dumped back into rivers—is set to exceed France’s regulatory limits (designed to protect biodiversity) more frequently in coming years as **summer heatwaves and droughts** intensify.
 - This increases the likelihood of reactor shutdowns.
- **Climate planning:** Comprehensive climate resilience planning for existing plants is needed in the face of global warming. Such considerations might delay lifetime extension projects or new construction.
 - The future of the aging fleet as a climate mitigation tool in France will be contingent on its ability to grapple with climate disruption.

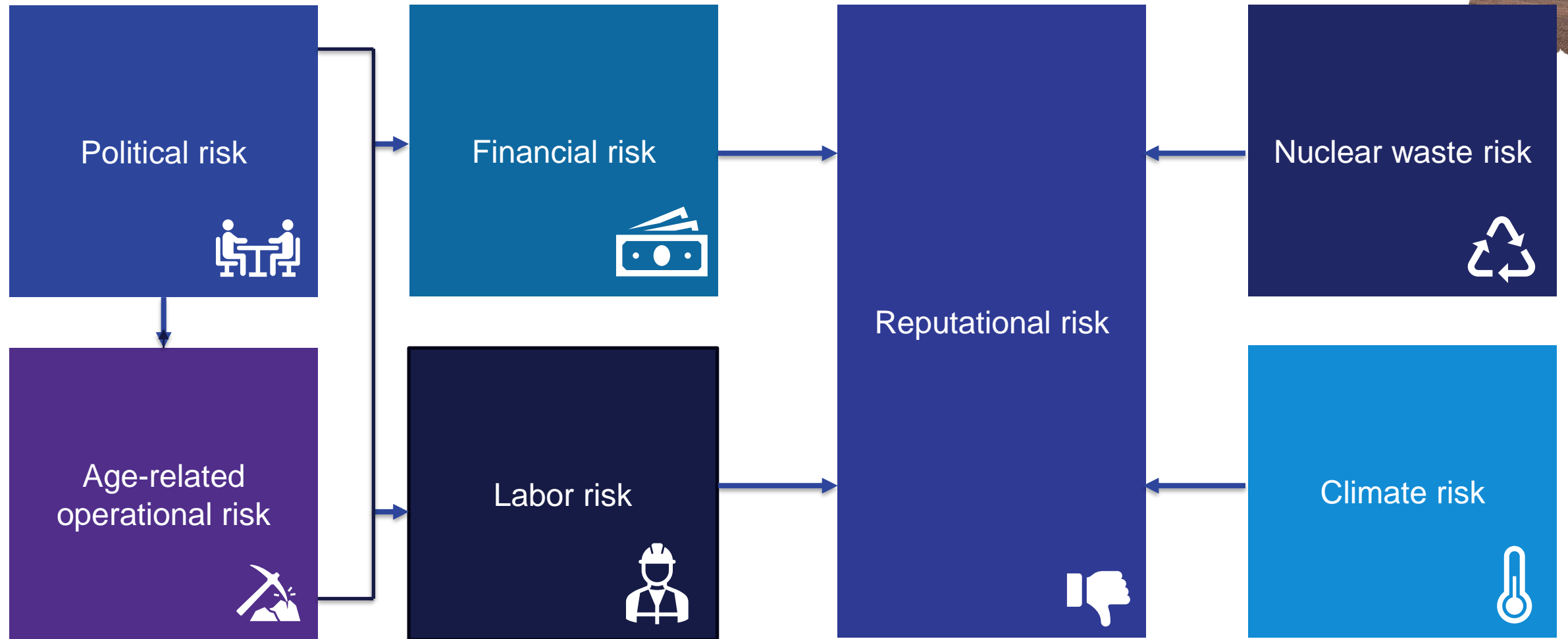
Nuclear reactor status in France (June 2022)



Source: EG Research



The Big Seven explained





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