

The French nuclear energy policy

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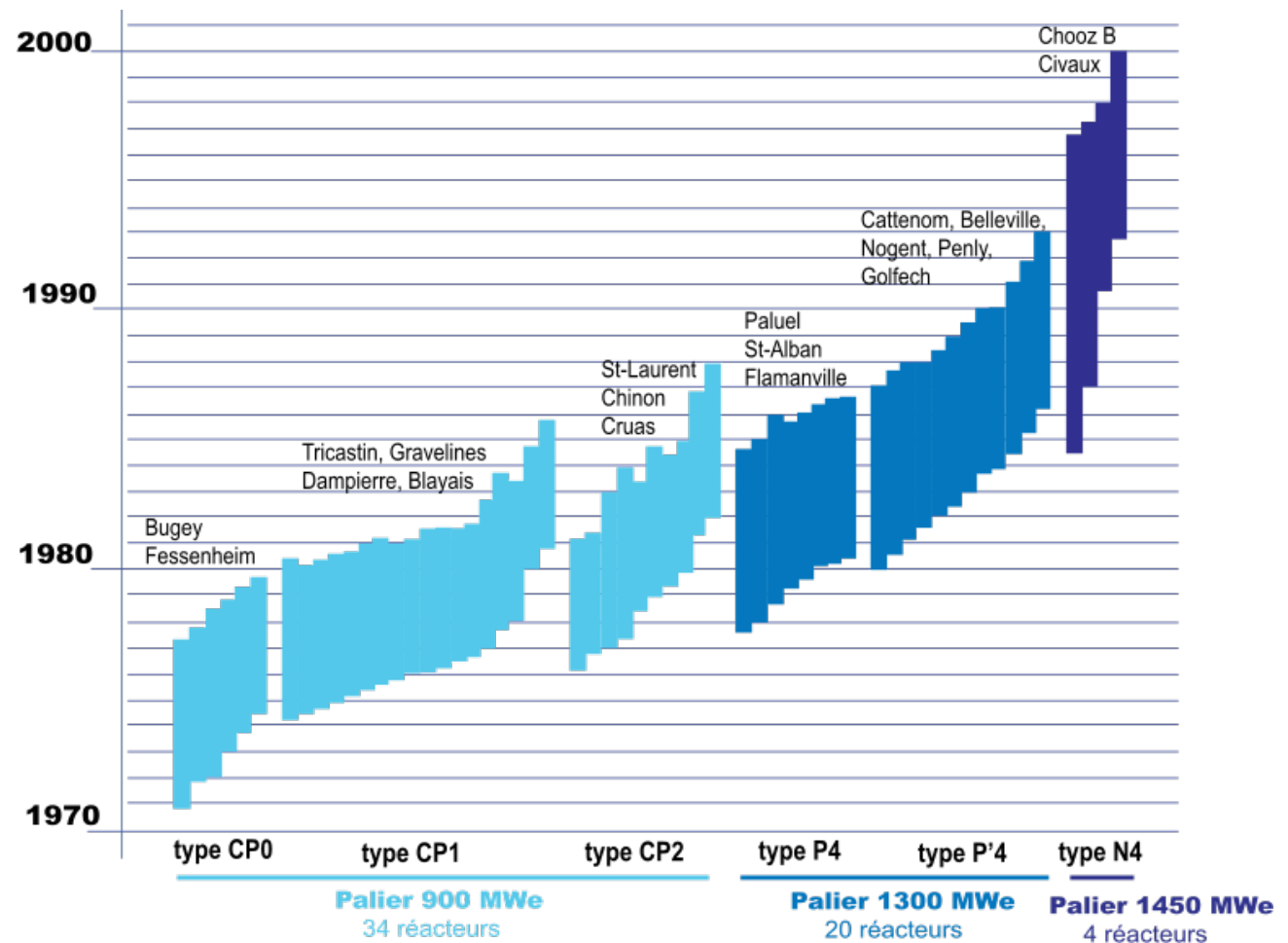
Outline

- Basic facts on nuclear energy in France
- The controversy on nuclear costs
- The new energy law
- The energy mix and NPPs life extension debate
- Economic appraisal
- Concluding remarks

The French nuclear fleet

58 reactors + a new build at Flamanville, 19 NPPs
 63130 MWe, 385 TWh (2012), 75% of energy mix

On the history of the nuclear energy deployment in France see Hecht (2004), Topçu (2013) Dänzer-Kantof and Torres (2014)

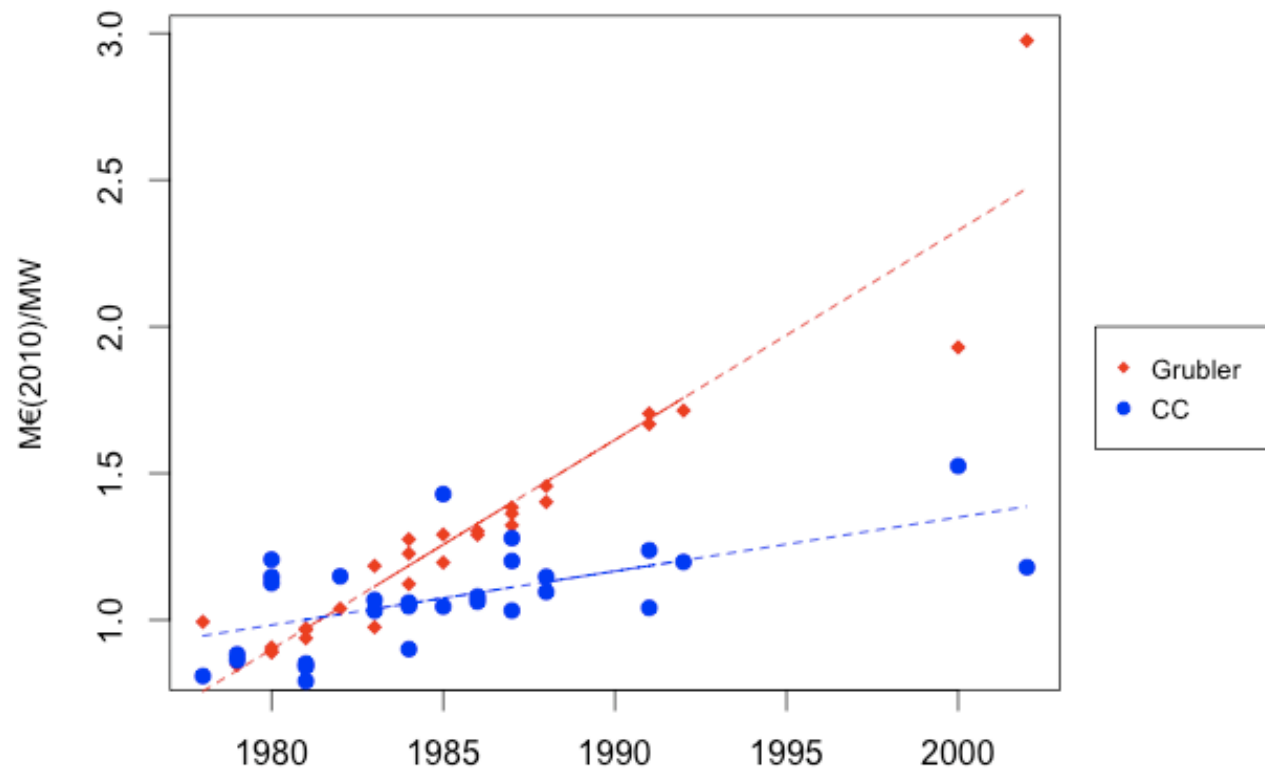


The French nuclear organisation

- A single owner and operator, EDF
 - State-owned (82,5%), vertically integrated in design and engineering of NPPs
- A single supplier of reactor pressure vessels, AREVA (formerly Framatome)
 - State-owned (87%), vertically integrated from mining to reprocessing
- A single nuclear research institute, CEA
 - Civil and military applications
- A nuclear safety regulation authority, ASN
 - Independent, transparent, competent
- An energy regulatory commission, CRE
 - It sets retail electricity tariffs for residential and a wholesale tariff for nuclear MWhs produced by EDF and sold to competitors in supply (42€/MWh)

The cost controversy: is nuclear power competitive? 1/2

- Has the cost to build the French fleet escalated (like in the US) ? No, according to the costs published by the French Court of Auditors (*Cour des Comptes*) in 2012



The cost controversy: is nuclear power competitive? 2/2

- Are nuclear power costs correctly assessed?
 - No hidden costs according to *Cour des Comptes* (2012) but liability and downstream costs are underestimated
- Is the cost of nuclear production too high?
 - A 21% cost increase between 2010 and 2013 (Cour des Comptes, 2014)
 - The cost/MWh produced by the existing fleet still remains much lower than any other alternative

EDF nuclear power generation costs (2013)

	€/MWh
Operating Cost	24,8
Of which fuel costs	5,7
Provision for waste and spent fuel	3,2
Provision for dismantlement	1,3
Maintenance investments	9,4
Economic rent	21
Total cost	59,8

Source: French Court of Auditors (2014)

The new energy law

- *Projet de loi relatif à la transition énergétique pour la croissance verte*
- A bill to be discussed next October at the Parliament and likely to be enacted in December 2014
- Nuclear energy is a sub-heading: the law mainly focuses on energy efficiency and renewables (long term quantitative objectives and means to implement them)
- However, the articles of the bill dealing with nuclear power are the most controversial and they will be much debated between MPs

The French nuclear policy as reflected in the bill

- *“We are not exiting nuclear but its part must fall”*
Ségolène Royal, Minister of the Environment (30 July 2014)
- A cap on the nuclear energy in the mix: 50% in 2025 (Art. 1)
- A cap on the installed nuclear capacity 63,2 GW (Art. 48)
- A governance mechanism to implement the new energy mix (nuclear caps as well as the renewables and energy efficiency long term objectives) (Art. 55)

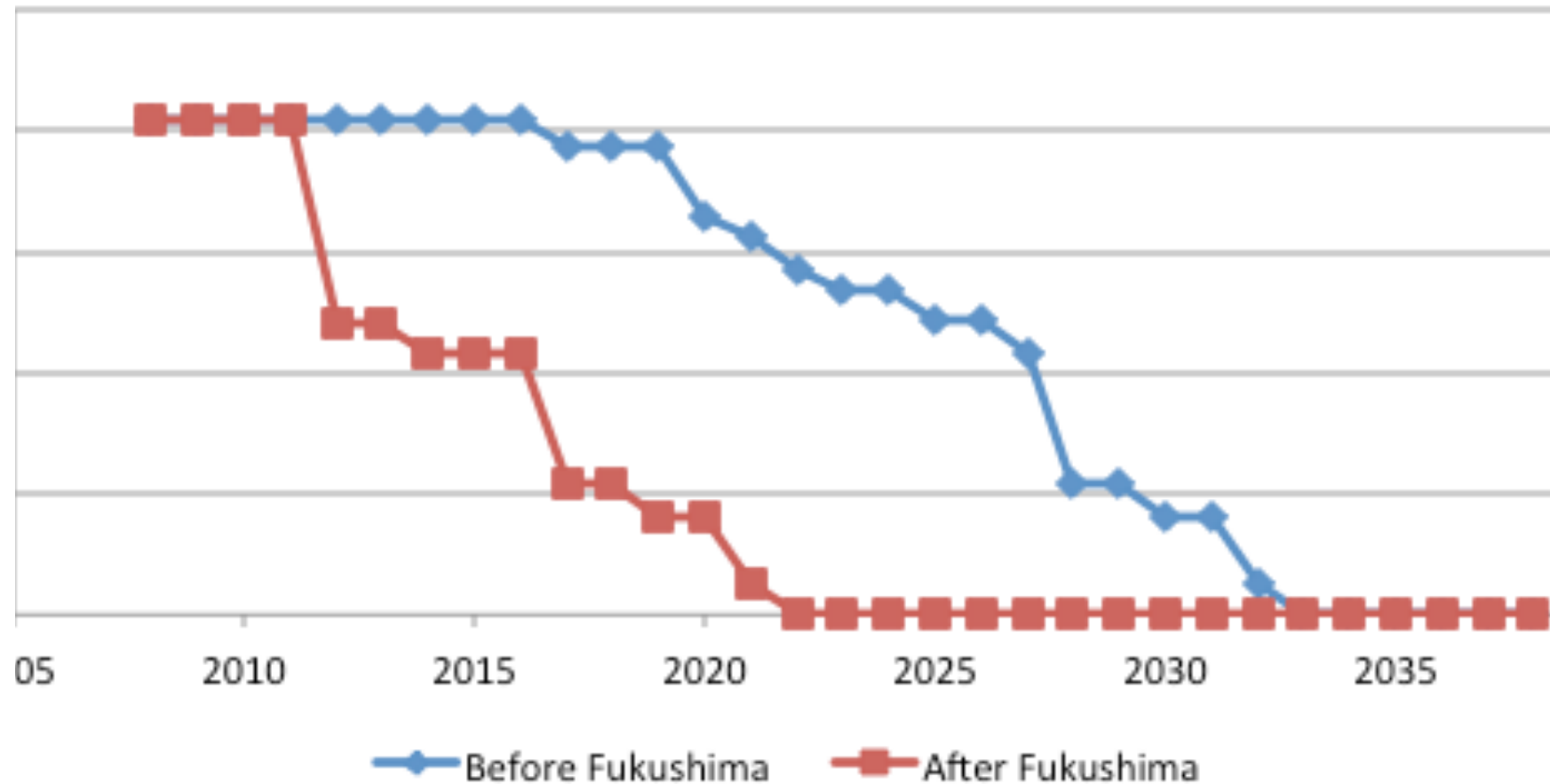
Origins of the caps

- The reducing of the nuclear power share to 50% by 2025 and the shut-down of Fessenheim NPP in 2016 (two 900 MW reactors in Alsace near Germany) have been written in an agreement between the socialist party and the green party before the 2012 presidential election. As candidate and as then acting president François Hollande has endorsed these two commitments
- The 50% by 2025 has not been based on any economic or technological studies (75% - 50%=25%, hence 2025!)
- Fessenheim has been picked up because it is the oldest NPP of the existing fleet (i.e., not because it is less safe - the French Safety Authority has given its green light for a 10 years life extension)
- In absence of legal means for the government to close Fessenheim (or any other NPPs) the 62,3 MW cap will force EDF to retire at least two reactors when the Flamanville EPR will start to operate

Consensus and controversies

- There is a wide political consensus in France not to exit from nuclear power but to reduce the share of nuclear power in the energy mix (with the noticeable exception of the green party)
- New build is not an issue, yet
- The opposition between policy-makers deals with the time-schedule and the implementation process regarding the retirement of existing NPPs
 - Going fast or slow: 50% in 2025, 2035, latter? No life-extension (40 years limit), +10 years, + 20 years?
 - Light-regulation or planning: the US or the German model?

The German model: Command and Control



The operational life of NPPs has been set by law

The US model: light regulation

- No government intervention in deciding the operation duration of existing NPPs
- The US Nuclear Regulatory Commission has provided operators with a 40 years license
- The operators may apply for a new license (20 years)
- They continue (or stop) to produce depending on whether they can earn money or not (maintenance investments + operation costs versus expected revenues from MWh sales)

What will the future French model be?

- The current model: after an in-depth safety inspection of the NPP, the nuclear safety authority may authorize a 10 year life extension with or without conditions, or refuse it. Then EDF is able to decide to go or stop depending on the costs to implement the ASN requirements
- The bill introduces a 5 year energy plan to ensure the new long term policy mix will be achieved. EDF will now have to take the energy plan and caps into account in addition to its costs-benefit analysis of life extension
- Many MPs would like to introduce a more intrusive process to drive EDF and other operators to achieve the new energy mix (e.g., public planning of the new investments and plant closures)

Economic appraisal

- The 50% by 2025 objective is costly
 - In so far as the existing reactors produce cheaper MWhs than any other alternative and are considered as safe enough by the nuclear authority, premature shutdowns is a loss for the economy
- Minimizing the cost to achieve it
 - Operators and safety authorities are better informed than law-makers to pick-up the reactors to shutdown
 - So leaving to EDF under the safety supervision by ASN the way to find how to comply with the 50% by 2025 objective seems the less costly implementation mechanism

Concluding remarks

- It is difficult to forecast how MPs will amend the nuclear part of the bill. It depends on the unstable alliance between the socialist party and the green party and on the divisions within the green party
- From an economic perspective, even if a country opts for nuclear power exit (i.e., no new builds) it is economically a non sense to accelerate the pace of closing existing safe reactors
- Whether France will go on with nuclear power with new builds is an open economic and political question
- We will see in ten years...