

Cost Implications of Lifetime Extensions

Servicing old machines is costly. That is just as true for nuclear power plants as it is for cars that are getting on in years. Downtimes for repairs become longer and more difficult to predict. Operators of uneconomic facilities call for subsidies, some go a step further.

The television news channel NTV aired a report entitled “Geiz ist gefährlich – Alte Autos schlecht gewartet” (“Greed is dangerous – Poorly serviced old cars”). “The older a vehicle, the more deficiencies are discovered”, explains Martin Kugele, analyst at Dekra, an expert organisation in Stuttgart, and he provides the numbers of a unique study: 6,000 damage appraisals drawn up by Dekra after traffic accidents that occurred between 2001 and 2004 revealed that nearly half of the vehicles older than 11 years involved in accidents had exhibited serious defects. In cars up to three years of age, the share was only 11 percent. The deficiency rate, rising with age, markedly increased the risk of causing an accident. Car owners are clearly skimping on servicing their bangers.¹

This is a truism. Unfortunately, it holds true not only for ageing passenger cars but also for ageing nuclear power plants. On a global average, today’s nuclear power plants have been operating for 32 years, three times as long as the cars exhibiting excessive accident rates mentioned above.

¹ See NTV, “Alte Autos, schlecht gewartet”, 23 May 2006, see [n-tv.de/auto/Alte-Autos-schlecht-gewartet-article183070.html](https://www.n-tv.de/auto/Alte-Autos-schlecht-gewartet-article183070.html), accessed on 9 February 2021.

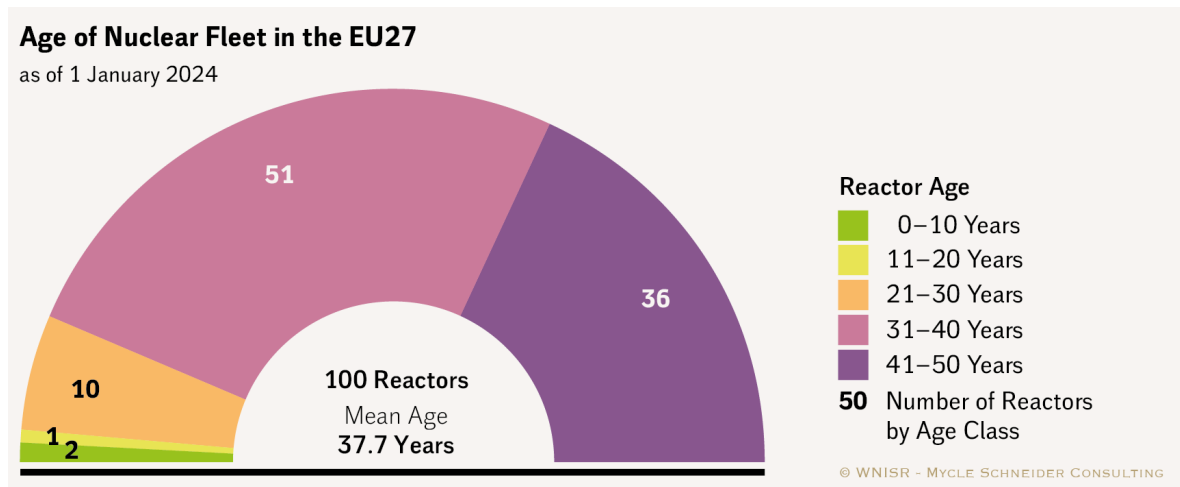
The Age of Nuclear Fleets Is Increasing Constantly and So Do Maintenance Costs

The risk of a serious accident increases just as the price that needs to be paid to prevent any such accident. The EU's 27 member states rank among those who joined the nuclear club quite early on. As a result, the facilities in the EU are about 38 years old on average. Seven in eight reactors have been running for 31 years or longer (Figure 1). In some countries, they are expected to supply electricity for up to 50 or even 60 years.

The obsolescence of these very complex machines leads to numerous defects and a growing frequency and duration of unplanned outages. The numbers speak for themselves. In France, for example, a country that operates more than half of all the nuclear reactors in the EU, the French Court of Audit determined in 2018 that the state-controlled corporation EDF (Électricité de France) – the world's largest nuclear operator – will need to spend €100 billion by 2030 to upgrade its vintage reactors. Since then, the situation has deteriorated drastically, and the conditions drawn up by the Nuclear Safety Authority for a possible lifetime extension of 32 reactors, which needs to be approved on a case-by-case basis, could gobble up many additional billions of euros (See Factsheet "Safety Implications of Lifetime Extensions"). Already, EDF admitted that operation and maintenance costs have doubled over the past decade.²

² Bernard Salha, Oral Evidence before the Parliamentary Office for the Evaluation of Scientific and Technological Choices (OPECST), 16 February 2023; see OPECST, "Comptes Rendus de l'Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques—Nouvelle organisation du contrôle et de la recherche en sûreté nucléaire et en radioprotection", Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques/Parliamentary Office for the Evaluation of Scientific and Technological Choices, French Parliament, 16 February 2023.

Figure 1: Age Distribution of the EU27 Reactor Fleet. Sources: WNISR with IAEA-PRIS, 2024



Outage Times Increase and Become Less Predictable

In 2019, maintenance work at the then 58 ageing French reactors³ required 1,700 repair days more than initially scheduled. Overall, the number of downtime days reached 5,580. In 2022, the outages reached 8,515 days with zero production and on average the reactors of the French fleet did not supply a single kilowatt-hour of electricity over a cumulative period of five months.⁴ The reasons for the disastrous performance were a cumulation of unexpected defaults in essential piping systems⁵, extended outages for a series of fourth decennial inspections and upgrading in view of lifetime extensions, climate effects, and... strikes.

While these outages are very expensive, they are certainly better than an undiscovered defect in safety and operation relevant systems. And yet, in those cases costly servicing does not automatically translate into absolute safety. In 2023, EDF declared 710 “significant safety events” in France, compared with 683 in 2022.⁶

³ After the closure of the two Fessenheim reactors, as of mid-2024, there are 56 operating reactors in France with one additional one, Flamanville-3, in the course of starting up, 12 years later than planned.

⁴ Mycle Schneider et al., “World Nuclear Industry Status Report 2023”, December 2023, see worldnuclearreport.org/-World-Nuclear-Industry-Status-Report-2023-.html.

⁵ So-called stress-corrosion cracking, which is *not* an ageing phenomenon.

⁶ EDF, “Universal Registration Document 2023”, April 2024, see edf.fr/sites/groupe/files/2024-04/edf-urd-annual-financial-report-2023-en-updated-2024-04-11.pdf.

By the end of 2023, the French nuclear operator EDF had run up a net debt of over € 54 billion. Other nuclear companies, like AREVA or the historical American giant Westinghouse, went bankrupt during the past decade. How long will safety continue to come before profitability under these circumstances?

Increasing Age, Shrinking Investments in the United States: For How Long?

In the United States, as early as 2012, nuclear operators started spending less and less on servicing their ageing power plants.⁷ Even so, they are unable to compete in the market and several states as well as the federal government have come up with massive subsidy programs to save uncompetitive reactors. A dozen units have been closed for good since 2009, usually many years prior to expiration of their operating license. The latest seven reactors closed at an average age of 47 years. In Ohio, operators found a (short-lived) solution to the dilemma. They forked out bribes totalling 60 million dollars to members of State Congress and other stakeholders to push a subsidy bill through Congress that turned loss-making into profitable power plants. The bill had already been adopted when the FBI conducted a sting operation and arrested those responsible, including the Speaker of the House who in June 2023 was given a 20-year prison sentence.⁸

Do exceptional situations require exceptional means? As the global reactor fleet ages, one question is becoming increasingly urgent by the day: who will request and who will provide sufficient funding for timely refurbishments to mitigate nuclear risks?

Last update: 2024

⁷ Nuclear Energy Institute, “Nuclear Costs in Context”, October 2020, see [nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/Nuclear-Costs-inContext.pdf](https://www.nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/Nuclear-Costs-inContext.pdf), accessed on 9 February 2021.

⁸ Laura A. Bischoff and Jessie Balmert, “Ex-Ohio House Speaker Larry Householder sentenced to maximum 20 years”, The Columbus Dispatch, 29 June 2023, accessed on 20 May 2024