

Technology Geriatrics 2 – Lifetime Extensions Are Expensive

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 over 30 years.

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

Figure 1: Lucky again. A Hydrogen explosion that occurred inside the containment of the German nuclear power plant Brunsbüttel in 2002 could have caused a disaster. Such accidents become more likely in ageing facilities.



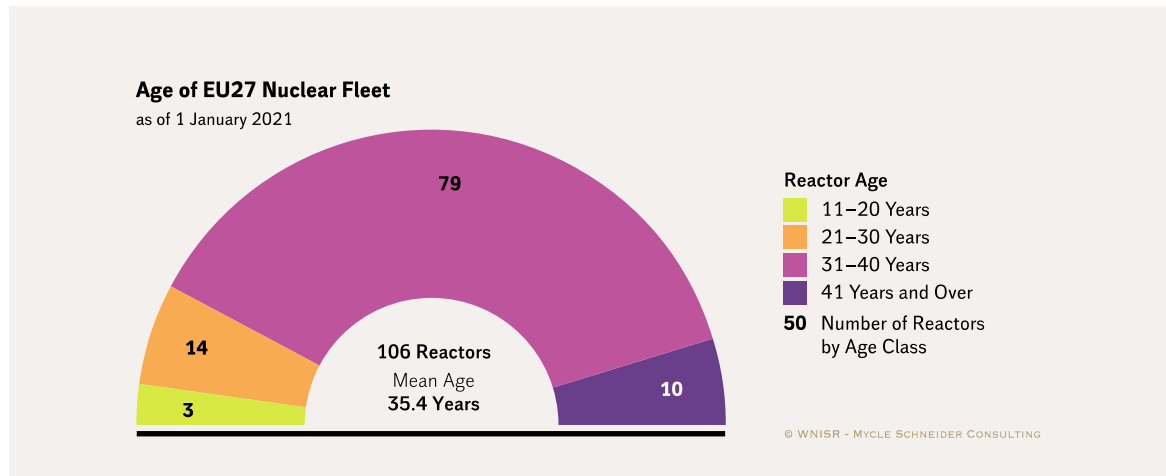
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The risk of a serious accident increases, just as the price that needs to be paid to prevent any such accident also increases. The EU's 27 member states rank among those who joined the nuclear club quite early on. As a result, the facilities in the EU are older than 35 years on average. More than four out of five reactors have been running for 31 years or longer (Figure 2). In some countries, they are expected to supply electricity for up to 50 or 60 years.

The obsolescence of these very complex machines leads to numerous defects and a growing frequency 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 need to be approved on a case-by-case basis, could gobble up many additional billions of euros.²

Figure 2: Age Distribution of the EU27 Reactor Fleet



Source: WNISR, with IAEA-PRIS, 2021

In 2019, maintenance work at the 58 ageing French reactors³ required 1,700 repair days more than initially scheduled. Overall, the number of downtime days increased by 10 percent on the previous year, reaching an all-time high of 5,580. On average, 2019 saw the reactors of the French fleet supply not a single kilowatt-hour of electricity over a cumulative period of more than three months (96 days).⁴

That is costly. However, it is certainly better than an undiscovered defect in the emergency-shutdown system. And yet, in this case costly servicing does not automatically translate into absolute safety. Over the past decade, the French Nuclear Safety Authority recorded 98 serious incidents. Among them, a total of 67 events affected the diesel generators of reactors' emergency electricity-supply systems. The collapse of the internal electricity supply was one of the factors that sealed the three core meltdowns at Fukushima in 2011.

² ASN, "Décision n° 2021-DC-0706 de l'Autorité de sûreté nucléaire du 23 février 2021", 23 February 2021.

³ At the end of 2020, only 56 reactors remained in operation after the two Fessenheim units were closed in the first half of 2020.

⁴ Mycle Schneider et al., "World Nuclear Industry Status Report 2020", September 2020.

By the end of 2020, the French nuclear operator EDF had run up a net debt of over €42 billion. Other nuclear companies, like AREVA or the historical US giant Westinghouse, went bankrupt. It did not take a pandemic for that to happen. On account of the COVID-19 crisis, EDF sold around 12 percent less nuclear power in 2020 than in 2019. For several years, the group has been losing 100,000 to 200,000 customers to competitors *every month*. How long will safety continue to come before profitability under these circumstances?

In the United States, as early as 2012, nuclear operators started spending less and less on servicing their ageing power plants.⁵ Even so, they are unable to compete in the market. A dozen units have been closed for good since 2009, usually many years prior to expiration of their operating license. 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.⁶

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

⁵ Nuclear Energy Institute, 'Nuclear Costs in Context', October 2020, see <https://www.nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/Nuclear-Costs-in-Context.pdf>, accessed on 9 February 2021.

⁶ Giulia McDonnell Nieto del Rio, "'Powerful Ohio Republican Is Arrested in \$60 Million Corruption Scheme', New York Times, 21 July 2020, see www.nytimes.com/2020/07/21/us/larry-householder-ohio-speaker-arrested.html, accessed on 9 February 2021.