

Triple Pledge, Empty Promise?

During the U.N. climate change conference in Dubai in December 2023 more than 20 countries endorsed a declaration to triple global nuclear capacity by 2050. But to simply maintain the current capacity, the startup rate per year of new reactors would need to double to make up for anticipated reactor closures. The triple pledge is impossible to be achieved by any industrial standards.

During the World Climate Action Summit of the 28th Conference of the Parties to the United Nations' Framework Convention on Climate Change (COP28), 25 countries committed "to work together to advance a global aspirational goal of tripling nuclear energy capacity from 2020 by 2050".¹ The countries included major nuclear countries like France, South Korea, the United Kingdom, and the United States, but also rather unexpectedly Ghana, Jamaica, Moldova, Mongolia, or Morocco.²

The list does not reflect current industrial activity. None of these countries have started building a new nuclear power plant since January 2020. All the 35 reactor construction-starts in the past four and a half years took place either in China (22) or were implemented by the Russian nuclear industry in various countries. It is precisely these two countries that are missing on the pledge list.

¹ U.S. Department of Energy, "At COP28, Countries Launch Declaration to Triple Nuclear Energy Capacity by 2050, Recognizing the Key Role of Nuclear Energy in Reaching Net Zero", 1 December 2023, see energy.gov/articles/cop28-countries-launch-declaration-triple-nuclear-energy-capacity-2050-recognizing-key.

² Full list of endorsing countries: Armenia, Bulgaria, Canada, Croatia, Czech Republic, Finland, France, Ghana, Hungary, Jamaica, Japan, the Republic of Korea, Moldova, Mongolia, Morocco, the Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden, Ukraine, the United Arab Emirates, United Kingdom, and United States.

The signatory countries commit to a range of actions including:

- “to mobilize investments in nuclear power, including through innovative financing mechanisms”;
- “to supporting the development and construction of nuclear reactors, such as small modular and other advanced reactors for power generation as well as wider industrial applications for decarbonization, such as for hydrogen or synthetic fuels production”;
- “to supporting responsible nations looking to explore new civil nuclear deployment under the highest standards of safety, sustainability, security, and non-proliferation”.

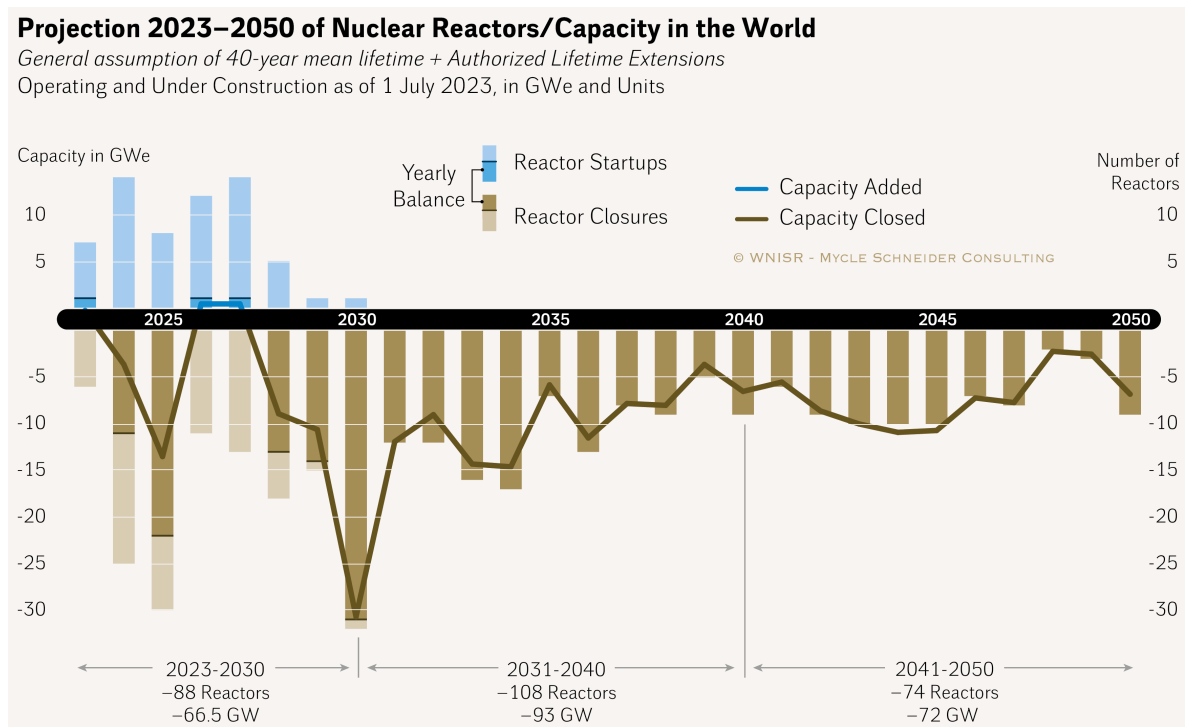
Judging from past achievements and the current state of the international nuclear industry, political and financial support will not be enough to reach the stated goal. It is lacking at all levels in competence, from skilled cement and steel workers to welders, from experienced operators and regulators to high-profile engineers and efficient top managers.

Outside China, Newbuilds are Far from Compensating Closures

In the two decades between 2004 and 2023, there were 102 startups in the world (of which 49 in China alone), thus five per year. But at the same time, 104 reactors were closed (none in China).

While there is a trend towards lifetime extensions and no certainty as to how many reactors will close until 2050, there is no question that many of the 414 reactors operating in the world (status mid-2024) will not generate power until mid-century. If all reactors under construction are connected to the grid (historically, one in nine reactor constructions were abandoned before completion), all authorized lifetime extensions go to their term (in the past many reactors have closed long before their license ran out), and all other units operate until 40 years, a total of 270 reactors or around 230 gigawatts capacity would need to be planned, licensed, built, and commissioned until 2050 to make up for closures. In other words, the average grid-connection rate would have to double from five per year over the past two decades to ten per year until mid-century only to compensate for closures (see the scenario represented in the graph hereunder).

Figure 1: Projection 2023-2050 of Nuclear Reactors/Capacity in the World. Sources: WNISR and IAEA-PRIS, 2023



The tripling of the 2020 nuclear capacity of 370 gigawatts (414 reactors) to over 1,100 gigawatts would mean the planning, licensing, building, and commissioning of 1,200 additional reactors beyond the 270 to be replaced. The startup rate would have to jump—now—from five to 45 reactor units per year on average for the coming 27 years.

What Companies are Building Reactors?

There are only a handful of nuclear builders in the world: EDF in France, KEPCO in South Korea, Westinghouse in the United States/Canada, CNNC and CGN in China, and Rosatom in Russia. They are all facing significant challenges:

- EDF has three reactors under construction, Flamanville-3 in France that is supposed to start up in 2024 and two units at Hinkley Point C in the U.K. that is currently scheduled to be connected to the grid between 2029 and 2031. Both construction projects are at least twelve years behind the initial schedule. They are also three to six times over budget. This was not without impact on EDF's debt load that stood at €54.5 billion at

the end of 2023. Threatened by bankruptcy, EDF was fully renationalized before the end of the year.

- KEPCO has two reactors under construction at home and none abroad. The only construction project KEPCO ever realized abroad was the four-unit Barakah plant in the United Arab Emirates that was at least three years behind schedule, implemented under regulatory and financial conditions incomparable to western standards. The actual cost figures are classified. The company's total debt load might give a hint that not everything has been going well: by November 2023, the number had reached an unparalleled, staggering US\$154 billion (200 trillion won)³.
- Westinghouse went bankrupt in 2017 over the abandoned V.C. Summer reactor construction project in South Carolina, U.S. The company was bought up by Canadian asset management company Brookfield and today is shared with Canadian uranium company CAMECO. None of the two owners have ever built a nuclear reactor. Westinghouse completed two reactors at the Vogtle site in Georgia at exorbitant costs and schedule delays that the state's Public Service Commission found "have completely eliminated any benefit on a lifecycle cost basis."⁴ In early June 2024, the Wall Street Journal reported that "Westinghouse said it learned from its U.S. experience during the 2010s and no longer takes on reactor construction."⁵
- CNNC and CGN are the two major, state-owned Chinese nuclear builders. With the exception of Pakistan, where Chinese companies dominate the civil and military nuclear sector, China has never built any reactor outside the country. After years of negotiations, the U.K. government terminated all Chinese hopes to build their first plant in a western country and the U.S. blacklisted both companies which makes it virtually impossible for any major western company to enter into business deals with these entities.
- Rosatom is the Russian government's nuclear builder. It is successfully implementing nuclear projects in various countries including Bangladesh, China, Egypt, India, Iran, and Turkey. Rosatom is also actively contributing to the military occupation of the

³ *Reuters*, "KEPCO to hike industrial electricity price, sell assets as debt hits \$154 billion", 8 November 2023, see [reuters.com/business/energy/kepc-hike-industrial-electricity-price-sell-assets-debt-hits-154-bln-2023-11-08/](https://www.reuters.com/business/energy/kepc-hike-industrial-electricity-price-sell-assets-debt-hits-154-bln-2023-11-08/).

⁴ *AP/US News*, "The First US Nuclear Reactor Built From Scratch in Decades Enters Commercial Operation in Georgia", 31 July 2023, see [usnews.com/news/technology/articles/2023-07-31/first-american-nuclear-reactor-built-from-scratch-in-decades-enters-commercial-operation-in-georgia](https://www.usnews.com/news/technology/articles/2023-07-31/first-american-nuclear-reactor-built-from-scratch-in-decades-enters-commercial-operation-in-georgia).

⁵ *Wall Street Journal*, "The American Company Trying to Keep Ukraine's Nuclear Reactors Online", 7 June 2024, see [wsj.com/world/the-american-company-trying-to-keep-ukraines-nuclear-reactors-online-e636917a](https://www.wsj.com/world/the-american-company-trying-to-keep-ukraines-nuclear-reactors-online-e636917a).

Zaporizhzhia nuclear power plant in Ukraine and is subject to sanctions by the U.S. government on various segments of its activities.

For obvious reasons, it will be difficult and, with some exceptions, virtually impossible for Chinese and Russian companies to expand their technology exports. Westinghouse has retrieved from the nuclear builder role. As startups are even farther away from delivering, it is materially impossible for the two remaining companies EDF and KEPCO to stem the burden of building 45 units per year. Technicians, engineers, and competent managers cannot be produced on demand. The process of skills buildup and industrial development would take decades. In the meantime, ferocious competitors from other players in the energy sector whether in sufficiency, efficiency, demand-side management, storage, or renewables will not be turning thumbs. It is not even the question whether the triple pledge is “good or bad”, it is impossible to implement.

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