

No Signs of a Nuclear Renaissance

The nuclear industry is building too little to survive in the long term. Construction starts and grid connections peaked decades ago. Renewables have long displaced nuclear power. Only the construction of new reactors in China is hiding the industry's gradual, global decline – so far.

Ursula von der Leyen, President of the European Commission, told the March-2024 Brussels Nuclear Summit that “nuclear technologies can play an important role in clean energy transitions. (...) However, this future for nuclear technologies is hardly assured. The reality today, in most markets, is a reality of a slow but steady decline in market share.”

Nuclear's Share in Global Power Generation Shrinking for Almost Three Decades

Indeed, the nuclear share in global commercial power generation peaked in 1996 at 17.5 percent. In 2023, at 9 percent, nuclear provided hardly more than half its record from the 1990s. The golden age of nuclear power has long passed. 1976 saw the highest number of reactor construction starts in history with a global total of 44. In 2023, six foundations were laid for reactor buildings, five of which in China. Logically, this also means that fewer power plants were put into operation. While 33 reactors started to generate electricity one year before the Chernobyl disaster in 1986, the industry took an entire decade to complete a mere 32 units. 2023 saw five grid connections, while five reactors were retired that year (see Figure 1).

Mainly China's construction of a large, state-funded nuclear fleet is helping to scantily mask the global comedown of nuclear power. With 49 units almost half of the 102 reactors added to the grid over the past two decades are located in China. Outside of China, the past two decades saw only 53 units put into operation, whereas 104 were

retired – a cumulated negative balance of 51 – and only in four years the annual balance was positive, the last time in 2016 (see Figure 2).

Figure 1: Nuclear Power Reactor Startups and Closures in the World – and in China, Sources: World Nuclear Industry Status Report (WNISR), with IAEA-PRIS, 2024

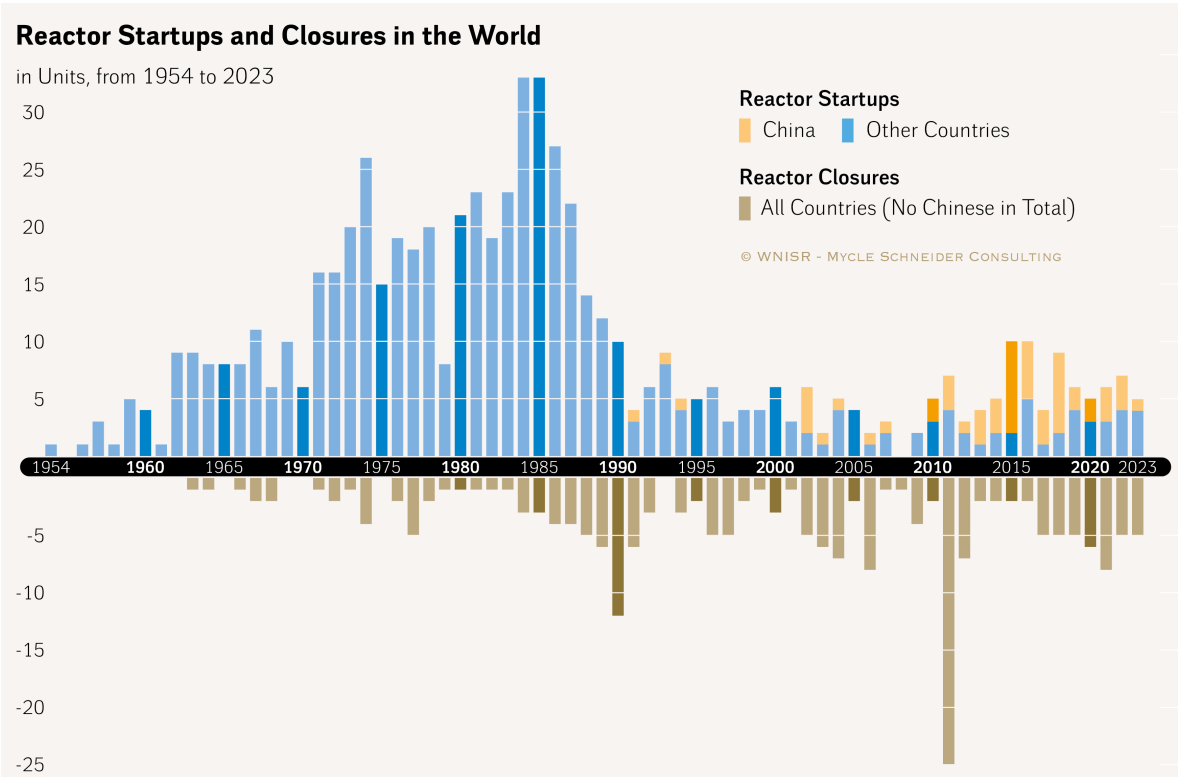
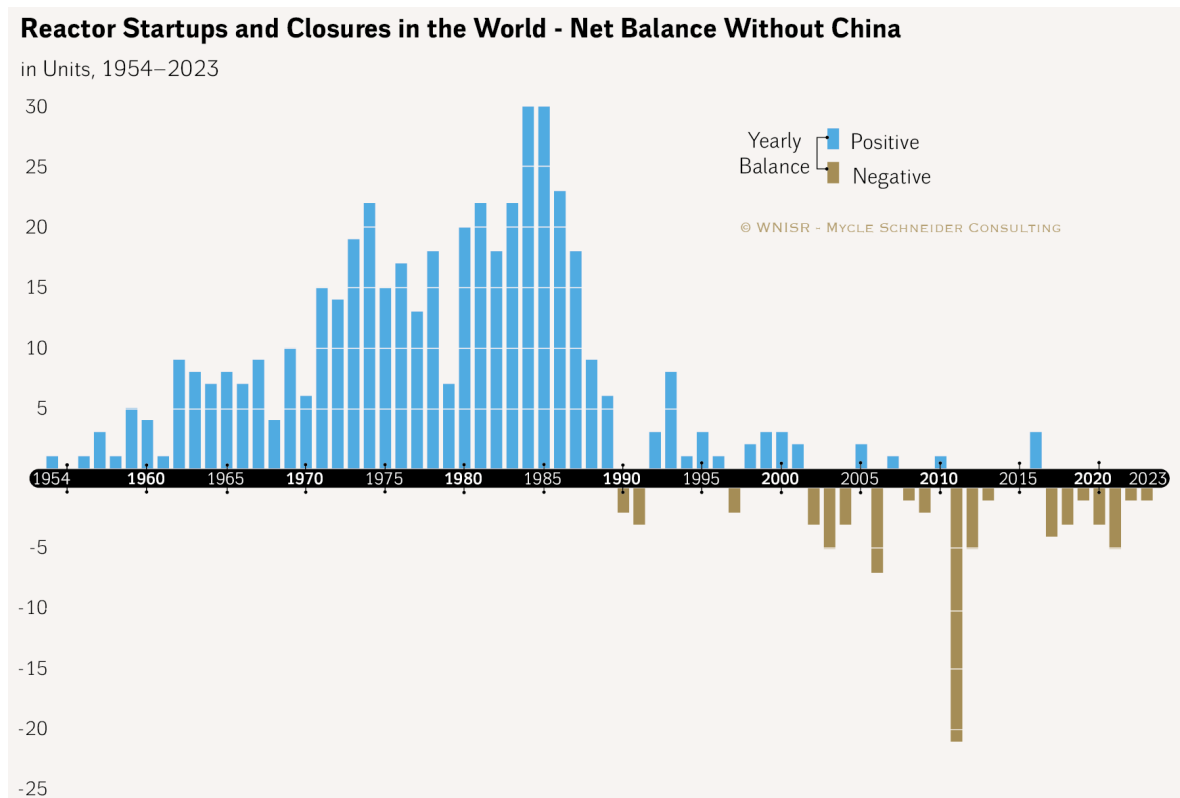


Figure 2: Nuclear Power Reactor Startups and Closures in the World – Net Balance Without China, Sources: World Nuclear Industry Status Report (WNISR), with IAEA-PRIS, 2024



Number of Operating Power Reactors Shrinking for More Than Two Decades

As of mid-2024, 414 nuclear reactors supplied electricity to the grid in 32 countries, i.e. fewer than already 34 years ago and far fewer than during the all-time high in 2002 when 438 units were online.

In the European Union (EU), only three reactors have been commissioned in the past 20 years – Cernavoda-2 in Romania, Olkiluoto-3 in Finland and Mochovce-3 in Slovakia. Two additional units remain in the final phase of construction, Mochovce-4 in Slovakia and Flamanville-3, respectively 39 and 17 years after construction start.

The maximum number of power plants simultaneously operating in the 27 EU member states was 136, and that was back in 1989. Today, the region counts only 100 electricity generating reactors. Worldwide, the contribution of the nuclear industry to electricity

production-capacity additions has dropped to nearly zero. In 2023, the capacity balance between startups and closures was even negative by 1 gigawatt (1,000 megawatt). At the same time, solar alone added an estimated 440 gigawatts of installed capacity. In 2019, for the first time in history, non-hydro renewables generated more kilowatt-hours than all nuclear power plants combined. In 2023, the gap widened and renewables including hydro generated 30 percent of world power for the first time, while the nuclear share dropped to 9 percent.¹ Nuclear energy has become irrelevant in the new electricity capacity market and its significance in the existing power-plant fleet is fading.

Russia Now Number One Nuclear Reactor Technology Vendor

Russia has passed China as nuclear technology vendor. While China is currently building 23 units at home, Russia is building only six reactors domestically, but an additional 20 units of Russian design are under construction in various other countries including China (4 units), Egypt (4), India (4), Türkiye (4), Bangladesh (2), Iran (1), and Slovakia (1). However, China and Russia alone will not manage to stop the global extinction of nuclear energy. Just to keep things as they are, the growth rate in the 2020s and 2030s would have to rise to double that of the 2010s. In the real world, the number of startups has not increased at all.

Last update: 2024

¹ EMBER, “Global Electricity Review 2024 – World passes 30% renewable electricity milestone”, May 2024.