Institute for Energy Economics and Financial Analysis

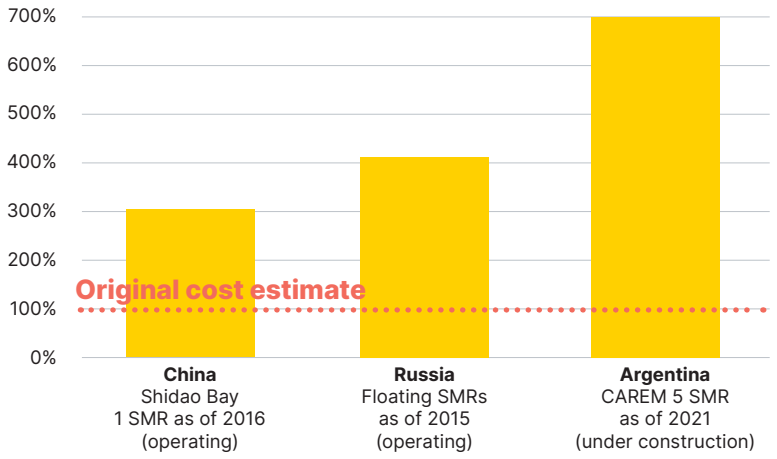
Fact Sheet:

Small modular reactors: Still too expensive, too slow and too risky

Too expensive: Small modular reactors (SMRs), like large nuclear reactors, have a history of cost overruns

- There currently are three operating SMRs worldwide – two in Russia and one in China – with a fourth under construction in Argentina. Costs for all four have been three to seven times higher than originally expected.
- Similar significant cost increases have occurred at proposed SMR projects in the US where cost estimates have already doubled or quadrupled since their inception. IEEFA has previously documented the problems at NuScale's cancelled SMR project in Idaho.

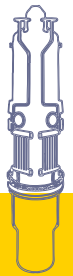
Cost escalation experienced by SMRs in operation or under construction

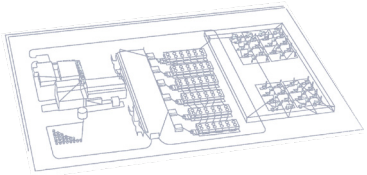


Costs of the three operational SMRs have ended up three to seven times higher than originally estimated

Source: IEEFA calculations from data in the 2023 World Nuclear Industry Status Report and Bellona Environmental Foundations

What are small modular reactors?





SMRs are generally defined as reactors with a power capacity of no more than 300 megawatts (MW), though several so-called SMRs are larger.

The International Atomic Energy Agency says there are more than 80 SMR concepts at some phase of development worldwide.

SMR proposals span the technology gamut, from scaled-down conventional boiling and pressurised water reactors (BWRs and PWRs), to first-of-a-kind technologies, as well as designs that have been tried previously and have failed.

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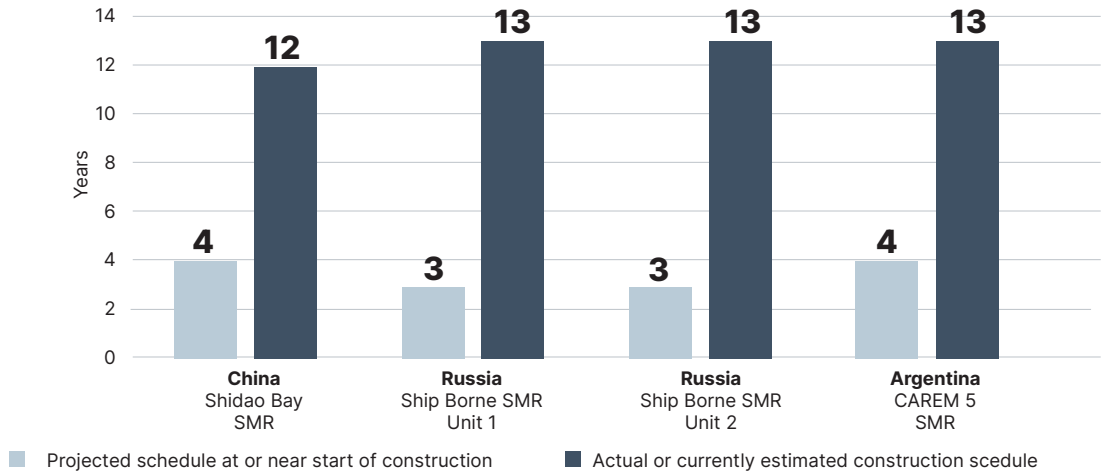
Small Modular Reactors: Still too expensive, too slow and too risky

Too slow: SMRs would not be operating before the 2040s in Australia, too late to replace coal

- Looking at the results in Russia, China and Argentina, long construction delays have been the norm, not the exception. Not one of these SMRs has come close to meeting its projected three- to four-year construction schedule, instead taking (or estimated to take) 12-13 years.
- The construction schedule is the time it takes from the first concrete pour, which in turn can only take place after years of planning, contracting and pre-construction works. In Australia, this would be in addition to the time required to develop the regulatory regime.

Projected vs. actual SMR Construction schedules

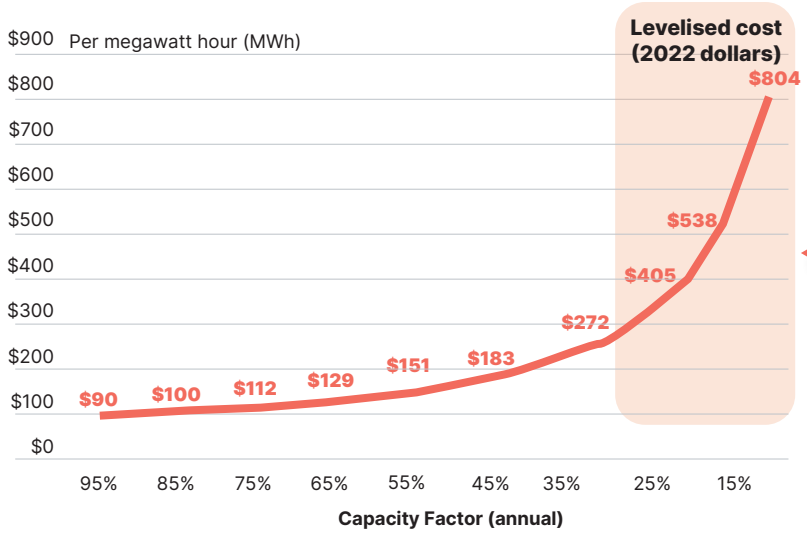


Source: IEEFA calculations from data in the 2023 World Nuclear Insustry Status Report and IAEA's Power Reactor Information System

A bad fit: SMRs are not financially viable as flexible generation to complement renewables

Nuclear plants can be flexible within a range; however, the economics rely upon being operated in 'baseload' mode. The less they run, the more their costs per megawatt-hour (MWh) rise and the harder it will be for them to compete in the market.

SMR power costs rise as capactity factor falls, USD



By the time nuclear could be made available in the 2040s, the Australian Energy Market Operator (AEMO) expects that more than 90% of generation will be supplied by variable renewables complemented by flexible storage and generation. Coal would have exited the system.

By this time, the gas generation utilisation rate is expected to fall below 15%. SMR costs would skyrocket at such low utilisation rates, if it was even possible to achieve them operationally.

Source: IEEFA analysis using data in the Novembner 2020 Development Cost Reimbursement Agreement between UAMPS and NuScale

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy.

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