

# SMRs: The answer to the world's energy trilemma?

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# SMRs: The answer to the world's energy trilemma?

SMRs—Small Modular Reactors—are an often overlooked source of energy that can play an integral part in the energy transition and offer a solution without many of the drawbacks that have hobbled its larger predecessors. Yet, there are challenges to overcome, as **Daniel Garton, Andrew McDougall KC** and **Kirsten Odynski** highlight.

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Events in Ukraine brought the issue of energy security to the forefront in 2022, galvanising the debate around alternative sources of energy, including nuclear. Often overlooked as an energy source that can play an integral role in the energy transition and a cleaner future is the Small Modular Reactor (SMR). SMRs typically produce less than 300 MWe compared to up to 1,600 MWe for traditional reactors. Their smaller size means they provide an option to fulfil the need for flexible and affordable power and heat generation for a much wider range of users and applications, in addition to the possibility of combining nuclear with alternative energy sources, including renewables.

## Heavyweight backing

US President Joe Biden has signalled that they have a key role to play, allocating US\$21 billion of the fiscal 2023 budget to nuclear and hydrogen programs. In the UK, new Prime Minister Rishi Sunak pledged “ambitious cooperation” on nuclear with France’s Emmanuel Macron at COP27. Canada has released its own SMR Action Plan, while emerging nations such as Estonia and Poland are looking closely at the technology.

Corporates are involved, too. Reactor designs are being developed by well-known companies such as Rolls-Royce to newer names including NuScale Power and TerraPower, which has drawn investment from Bill Gates and is developing several innovative SMR technologies for

potential use in providing electricity to the developing world. EDF—the world’s biggest operator of atomic plants—is also championing the future role of the SMR.

## Opportunities across industry sectors

The use of small reactors for reliable power is not actually a new concept. SMRs have been used in the military since the 1950s, especially in vessels, such as icebreakers and aircraft carriers that need to be at sea for long periods without refuelling, or for powerful submarine propulsion.

The potential use of SMRs across major industries presents a significant commercial opportunity, not least in the extractive industry. Driven by the rapid industrialisation of developing economies such as China and India, global energy consumption is on the rise, and the demand for resources remains great. Yet the discovery of high-grade mineral deposits is simultaneously declining, forcing companies to turn to more remote inland locations.



According to the International Atomic Energy Agency, there are currently almost 70 different SMR technologies under development, a significant jump from just a few years ago

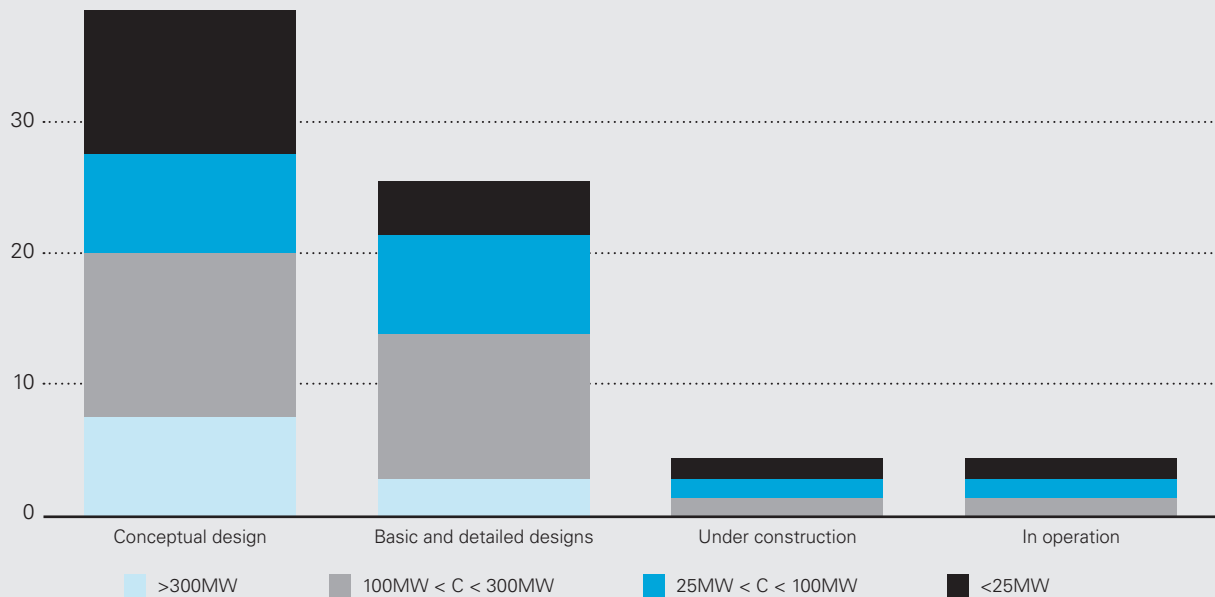
These off-grid sites are often powered by diesel generators, fulfilling the need for consistent power supply but proving problematic in terms of logistics and environmental impact. Given the intermittency of solar and wind, potential replacements being touted include batteries and hydrogen, yet these have significant cost constraints. SMRs offer the opportunity to limit emissions and maintain climate change commitments, not only acting as replacements for diesel generators but also as a source of heat for industrial processes and residential use. SMRs can be deployed alongside renewables as they could offer reliable baseload power to these otherwise intermittent forms of energy. In Canada, such progress is already underway. Westinghouse and Bruce Power have collaborated to develop the eVinci microreactor, which can be used in mines and remote areas.

Another opportunity is sustainable supply of potable water. About 20 per cent of the world’s population still has no access to safe drinking water,



**The potential of SMRs across major industries presents a significant commercial opportunities for a wide range of users and applications**

## Global number of small modular reactor projects by development status, 2022



Source: IEA

and this number will increase as the population continues to grow and global freshwater sources continue to decline. The worst-affected areas are the arid and semiarid regions of Asia, the Middle East and North Africa. Interest in SMR technology is high in such regions, particularly the Middle East, where fossil fuels are used as a source of heat and electricity for desalination to meet the needs of its population, in addition to irrigation water for crops and landscapes. Utilities can correctly size power plants for current clean energy and water needs, then add capacity as necessary in response to demand.

### Traditional nuclear plants vs SMRs

Traditional nuclear plants have often been viewed with scepticism due to the length of time new builds can take, and the massive amount of cost along with some notable examples of significant cost overruns. By contrast, the intention is that with SMRs, many aspects of the build process will be standardised and each unit will be smaller, meaning units could be operational in two to three years and at a reduced cost.

Regulation—which has always been a challenge in traditional nuclear plant development—also has the potential of being simplified given the lower



Nuclear energy currently provides about 30% of the world's low carbon electricity

Source: World Nuclear Association

safety risk associated with SMRs and the current effort between regulators to harmonise codes and standards and domestic safety regulations.

According to the International Atomic Energy Agency, there are currently almost 70 different SMR technologies under development, a significant jump from just a few years ago. Given that such innovation is at work, the pipeline of potential capacity is substantial.

### Unlocking the SMRs' full potential

The SMR has widespread political support. The technology's offering is compelling: Carbon-free power is reliable, safe, more affordable, and can be built and deployed without the significant costs and complexity of traditional nuclear power. In a world where almost every investment decision will now be measured against its climate impact and whether it is compatible with the Paris climate goals, the SMR could offer a solution without many of the drawbacks that have hobbled its larger predecessors.

Yet, there are challenges to overcome. The champions of the SMR will have to work with all stakeholders, from governments and investors to the wider public, to ensure its potential can be fully unlocked.



**The SMR technology's offering is compelling: Carbon-free power that is reliable, safe, more affordable, and can be built and deployed without the significant costs and complexity of traditional nuclear power**

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