

The world wants to triple nuclear energy: What will it take?

Nuclear can look to the aviation industry's model, which certifies aircraft, subject to strict and uniform standards, across countries.

By Ernest Moniz and Armond Cohen

Nuclear energy was an unexpected winner at COP28, the United Nations global climate conference that recently concluded in the United Arab Emirates. More than 24 countries, including the United States, and 120 companies [committed to tripling nuclear energy by 2050](#) as an essential part of mitigating climate change. The principal goal is carbon-free energy available 24/7 as an essential complement to variable wind and solar electricity. After years of skepticism, there is growing political momentum for nuclear energy, but if countries follow the current model of plant construction, they will not get where they have pledged to go. The world needs a new strategy for nuclear energy deployment that furthers climate goals, enhances grid reliability, and ensures that achieving energy security doesn't erode global security.

To make good on the COP pledge, accounting for a ramp-up time, the world will soon need to build the equivalent of about 50 large nuclear power reactors per year until 2050. This is two-thirds more than were built at nuclear power's peak in the early 1980s, and the current pace of construction is well short of that. Seventeen countries are building just one or two reactors at a time, each sometimes taking over a decade to build. In the West, nuclear construction projects are often long, complex, and characterized by delays and cost over-runs. Regulatory uncertainty and long timelines discourage investment. China, Russia, South Korea, and now the UAE have demonstrated the ability to build new nuclear reactors effectively, but this alone is clearly insufficient. Newcomer nuclear countries like Poland, Ghana, Saudi

Arabia, and the Philippines are looking to deploy domestically, but it will take time and considerable resources to meet simultaneously their project management, regulatory, security, finance and workforce ambitions.

To succeed, nations must rethink how to build, regulate, and finance nuclear technology. The United States offers a case in point. The second of two new-build gigawatt-scale nuclear reactors in Georgia is showing the immense value of learning from experience, but there aren't any other projects in the pipeline to take advantage of those lessons learned. The next US nuclear build will likely need to go back to basics without the benefits of an experienced workforce as technology evolves and schedules from commitment to operation extend well over a decade.

A new system will need to deliver standardized products rather than costly and risky one-off multi-decade projects. This could mean relying on proven designs of gigawatt-scale reactors or embracing a selection of new smaller designs amenable to assembly-line methods (analogous to those in the airline and shipbuilding industries), or some combination of both. Many countries, including the United States, have expressed strong interest in small modular reactors, but the reality is that little progress is being made.

It will require groups of customers of zero-carbon always-available electricity — utilities, large industrial users, large IT companies — to agree to purchase electricity or heat from dozens of nuclear plants of the same design. This so-called “orderbook”

approach, common in the aviation industry, would address many flaws of the current model by sending a durable demand signal to the nuclear supply chain, pooling resources, and unlocking workforce development, thereby reducing risks and costs. With each new reactor built, countries, companies, investors, and policy makers also learn more, saving time and money.

Public-private partnerships will probably be needed to implement this vision. Governments can help motivate the parties by offering financial risk backstops that could provide further confidence to private-sector developers, lowering first-of-a-kind risks. But more may be needed to launch a true nuclear renaissance, since nuclear construction is capital intensive. Especially for countries launching new nuclear programs, multilateral banks such as the World Bank and European Investment Bank must rebuild their nuclear finance capabilities and provide necessary capital to support the formation of orderbook transactions; new multilateral facilities might be considered as well.

In addition, the current process for certifying nuclear reactor designs is based on an inefficient country-by-country approach. Developing an international body charged with issuing a single globally accepted generic certification for reactor designs would further lower the barriers to nuclear deployment. Nuclear can look to the aviation industry's model, which certifies aircraft, subject to strict and uniform standards, across countries.

Current geopolitical tensions in Europe and in the Middle East reinforce the importance of scaling up in a way that maintains strong nuclear nonproliferation and security standards. If greater energy security leads to more nuclear weapons, the nuclear energy enterprise will be compromised. Countries

can meet these standards by tried and true practices of allowing international monitoring, relying on the international market for fuel rather than enriching their own, and avoiding weapons-usable materials as fuel. New approaches to transparency and verification can simultaneously alleviate concerns and free up unfettered international assistance.

Countries don't need to wait to get started. The organization charged with ensuring the safe, secure, and peaceful uses of nuclear energy, the [International Atomic Energy Agency, is convening heads of state in Brussels in March](#) to focus on expanding nuclear energy. This presents an important opportunity to begin putting the pieces of the plan outlined here in place. Countries should come ready to support the formation of an orderbook for specific nuclear reactor designs. Leaders should also lay the groundwork for enhanced regional and international institutions focusing on regulatory standardization, financial support, and workforce development.

While each country will need to pursue its own individual pathway to nuclear energy, it's essential the international community collectively reforms the system to enable success. Having recognized the need to expand nuclear energy, countries must now focus on cooperative implementation and work together to create the conditions for sustained scale-up of this important climate and energy security solution.

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