

Modular reactors can help energy transition

India's economic growth has been among the fastest in the world over the past two decades, resulting in rapid growth in electricity demand. To date, coal has served as the bedrock of India's industrial growth and modernisation. India is currently undergoing an energy transition driven partly by an increasing focus on renewable energy. Today, India's renewable power capacity is the fourth largest in the world and is set to increase this year to become the third largest after China and the United States (US).

Alongside renewables, nuclear power is a carbon-free source of electricity that can help meet demand round the clock. It has been a vital part of the global energy landscape and is a critical pillar in the shift to a carbon-free future. In recent years, it has faced a variety of issues, including high infrastructure costs and more extended construction periods, making growth more challenging. Today, however, technological innovations such as small modular reactors offer hope for a brighter future.

International Energy Agency (IEA)'s analysis shows that an expansion of nuclear power capacity globally is a key part of international efforts to ensure energy security and reach climate goals. Renewables are expected to meet the lion's share of India's rising demand, but nuclear power capacity will also need to increase six-fold in the next three decades. This means new projects must be delivered quicker and more affordably in the future while maintaining a steadfast commitment to safety standards.

This is where the emerging technology of small modular reactors — often called SMRs — can play a role alongside more established reactor designs. These small nuclear power plants have the potential to introduce greater agility in an industry that has often faced criticism for time and cost overruns on large-scale projects.

Unlike traditional nuclear plants, SMRs can be factory produced, shipped and assembled on-site, making them an attractive option for countries seeking to simultaneously diversify, decentralise and decarbonise relatively swiftly.

In addition to the potential for lower technology costs, SMRs can be built on the sites of

existing and retired fossil fuel plants due to their smaller exclusion zone requirements. Thus, they can take advantage of the installed transmission lines, water cooling facilities and a skilled workforce. This is important to pursue a human-centred, just transition that ensures citizens are not left behind amid the changes brought about by the clean energy transition.

SMRs also offer advantages for industrial sectors. When co-located in industrial facilities and high-grade heat. The latter makes them ideally suited to pairing with energy-intensive industries, including steel, iron and chemical production. SMRs can also provide backup power with greater flexibility and response times than traditional nuclear plants.

While the development of SMRs is still in the early stages, several countries, including the US, Canada, and the United Kingdom, are researching and developing this technology. India's Niti Aayog has also stepped up its focus on SMRs as a key pathway towards India's clean energy transition.

However, there are several challenges which must be addressed before SMRs can be widely deployed, including regulatory frameworks and public acceptance. Enhanced international cooperation and joint research are necessary to accelerate the development and deployment of SMRs. India has assumed the G20 presidency this year under the theme of "One Earth, One Family, One Future". The Energy Transition Working Group under India's G20 presidency has identified "Addressing technology gaps for Energy Transition" as one of the key priority areas. It focuses on identifying collaborative measures necessary for the rapid development and commercialisation of critical technologies for the energy transition, including SMRs. India's G20 presidency will be a rallying point for the developing countries for accelerating clean energy transitions, with the potential to further open up avenues for SMRs to play a role.



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