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SMR

Small Modular Reactor

Small Reactor, Big Role in the Clean Energy Future

When it comes to clean electricity, most people immediately think of solar power, wind power, and batteries. However, these energy sources depend on weather conditions and are unable to meet electricity demand 24 hours a day.

This is where **Small Modular Reactors (SMRs)** come into the energy conversation. SMRs are advanced nuclear reactors typically designed to produce **up to 300 MWe of electricity per module.** Compared with conventional nuclear power plants, they are smaller and modular, and designed to make greater use of standardized and factory-manufactured components.

Low-carbon electricity — around the clock

Unlike solar and wind power, SMRs are not weather-dependent. They can provide **a steady supply of electricity,** making them a potential complement to variable renewable energy sources.

SMRs could be integrated into future electricity systems such as:
Solar - clean electricity during sunny periods
Wind - clean electricity when conditions allow
Battery storage - flexibility, energy storage, and grid balancing
SMR - firm low-carbon electricity 24/7

The real question may therefore not be **"Nuclear or renewables?"** but rather: **"How can nuclear and renewables work together?"**

Types of SMRs

SMR is not one single technology. Several reactor concepts are being developed globally, including:

Water-cooled SMRs

High-Temperature Gas-Cooled Reactors

Fast-Neutron SMRs

Molten Salt Reactors

Microreactors

Each type differs in its coolants, fuels, operating temperature, safety characteristics, and potential applications.

Why could SMRs matter for Thailand?

Thailand's electricity challenge is evolving. Economic growth increasingly depends on sectors such as d**ata centers, digital infrastructure, EV and battery manufacturing, Advanced manufacturing, and petrochemicals and industrial estates.**

These sectors do not simply need electricity. They require **reliable, affordable, and low-carbon electricity around the clock.**

Renewable energy will play a major role, but high shares of solar and wind will also increase the need for energy storage, grid flexibility, demand management, and firm low-carbon generation. This creates a potential role for SMRs in Thailand's future electricity system.

Thailand has already started exploring SMRs

Thailand's draft **Power Development Plan 2024** proposed approximately **600 MWe of potential SMR capacity** including **SMR Plant 1 — 300 MWe and SMR Plant 2 — 300 MWe,** with an original planning horizon around **2037.**

Thailand is therefore exploring a range of issues, including technology selection, potential locations, regulatory readiness, nuclear safety, human-resource development, waste management, emergency preparedness, and public engagement. This does not mean Thailand has already decided to build SMRs. Ratther, it indicates that SMRs are becoming an increasubgly important part of the country's **long-term energy strategy discussion.**

Why are SMRs considered potentially safer?

Many modern SMR designs incorporate **passive safety systems.** Rather than depending entirely on electrically powered pumps and active cooling systems, passive systems may use natural forces such as **Gravity, Natural circulation, Convection, and Decay heat removal.** The smaller reactor size and simplified designs may also allow certain safety systems to be integrated directly into the reactor configuration.

However, **smaller does not mean risk-free.** SMR deployment still requires rigorous management of nuclear safety, nuclear security, safeguards, emergency preparedness, radioactive waste, and decommissioning.

The biggest question may be economics

SMRs involves smaller individual project sizes than conventional nuclear plants, but **smaller reactor does not automatically mean cheaper electricity.** Large nuclear plants benefit from economies of scale, while SMRs expected to rely more heavily on an **"Economy of series".**

If the same standardized reactor design can be produced repeatedly in factories, costs could potentially decline through standardization, modular manufacturing, supply-chain learning, shorter construction periods, and replication across multiple projects.

The key test will therefore be whether the first generation of commercial SMRs can demonstrate **cost competitiveness, reliable construction schedules, and strong operational performance.**

SMRs may be smaller than traditional nuclear reactors, but the questions are much bigger.

Can they deliver competitive, reliable 24/7 clean power? could they become the missing link between renewable energy and firm low-carbon electricity?

The answer will depend not only on technology, but also on economics, regulation, public confidence, and real-world performance.

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