

# Small Modular Reactors are Sized for Emerging Markets

## But Deployment Success Depends on Managing Fuel Dependencies, Costs, and Nuclear Readiness

**BLUF:** Small Modular Reactors (SMRs) could become a cheaper, faster, more flexible alternative to conventional nuclear power, especially for industries in emerging economies. They are approaching commercial deployment, just as financing may also be available from development banks. However, some SMRs face specific risks, including first-of-a-kind cost premiums, specialized fuel dependencies, and novel waste forms. Countries aiming to integrate SMRs into their energy grid must consider those risks in their nuclear readiness planning.

### SMRs are sized for emerging market grids and energy needs.

If SMRs deliver on their design promises, they would offer emerging markets what they need:

- Reactors with a capacity ranging from [30 to 300 MWe per unit](#) (ideal for countries with small, 2-3 GW grids).
- Entry costs up to [\\$2 billion](#), compared to \$10+ billion for conventional nuclear.
- Deployment timelines of [24-36 months](#), rather than decade-long builds for conventional nuclear.

### However, realizing these benefits requires navigating four deployment challenges.

1. **First-mover risks.** Aside from two units in [China](#) and [Russia](#), no commercial SMR exists; the first US deployment is [expected in 2028](#). Cost and schedule overruns are a persistent challenge for SMRs, including for proven [light-water designs](#), with amplified risk for reactors using less mature technologies such as [molten salt or liquid metal coolants](#).
2. **Specialized Russian fuel creates vulnerabilities.** Many [advanced SMRs](#)<sup>1</sup> require [HALEU fuel](#) (5-20% enriched uranium) produced nearly exclusively [in Russia](#), creating fuel supply dependency until [alternative suppliers emerge](#).

<sup>1</sup> A standard SMR is a compact nuclear reactor (50–300 MW) designed for scalable, flexible power generation with conventional fuel and simplified safety systems. An advanced SMR builds on this by incorporating next-generation technologies, such as HALEU fuel, passive safety features, and higher efficiency.

3. **Novel waste forms lack disposal pathways.** Some advanced SMR reactors generate [waste forms that differ from conventional nuclear fuel](#), creating compatibility issues with existing disposal infrastructure and regulations. Light-water SMRs avoid this risk by producing familiar waste streams.
4. **Pre-deployment preparation is still lengthy.** SMR vendors advertise [2-3 year deployment](#), but the [International Atomic Energy Agency Milestones framework](#) requires 10-15 years to build nuclear infrastructure, regulatory institutions, and a specialized workforce. Rushing this preparation risks regulatory failure and [lost credibility](#).

## Countries should consider SMR adoption according to nuclear readiness.

**Ready countries with strong institutions and/or existing nuclear programs**, like Poland, Romania, the Czech Republic, and South Africa, should:

- **Mitigate first-of-a-kind cost overrun risk through coordinated regional procurement of multiple units.** Regional consortia such as [Europe's SPRING initiative](#) allow multiple countries to coordinate to pool demand and bulk purchase. This incentivizes vendors to establish serial production facilities that reduce costs and spread the cost across early adopters.
- **Minimize fuel dependencies by prioritizing light-water reactors.** Light-water SMRs use standard low-enriched uranium ([LEU](#)) fuel, which is widely available and familiar to operators. This avoids both Russian HALEU dependencies and untested waste streams.

**Less-ready countries still developing independent regulators, workforce, and waste frameworks**, like Ghana, Kenya, and the Philippines, **should concentrate on preparatory readiness first**, such as:

- **Monitoring which designs succeed commercially** before committing to specific technology, using the preparation period to evaluate early adopters' experiences.
- **Building local expertise** through research reactors or training centers to develop workforce and regulatory capacity before committing to commercial SMRs.

All countries should:

- **Ensure transparency in vendor selection, whether through regional consortia or competitive bidding.** Closed-door deals create risks of overpaying, limited choices, and potential misalignment with national industrial objectives.

## Conclusion

SMRs offer emerging markets a pathway to affordable, flexible nuclear power, but only when deployment matches readiness. Success requires strategic patience: ready countries should pool procurement and choose proven designs, while less-ready countries should use preparation time to learn from early adopters. The winners will be those who match ambition to capability.