Nuclear (incl. SMRs)

Source Metadata

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IEA Technology Definition

The IEA classifies nuclear energy as a low-carbon dispatchable electricity source using controlled nuclear fission. The technology is split between conventional large-scale reactors (Generation III/III+) and Small Modular Reactors (SMRs) with capacities below 300 MW. The ETP Technology Guide positions conventional nuclear as a mature technology and SMRs as an emerging technology at demonstration to early commercial readiness.

Technology Readiness & Deployment

Conventional nuclear power operates approximately 440 reactors globally with around 390 GW of installed capacity. New large reactor construction continues in China, India, Egypt, Turkey, and the UK. SMRs have seen a surge of interest, with conditional offtake agreements between data centre operators and SMR developers growing from 25 GW at end-2024 to 45 GW by mid-2025. China and Russia have operational SMR-type designs, while NuScale, Rolls-Royce, and others are in advanced licensing stages.

Key Metrics & Benchmarks

Large nuclear plant LCOE ranges from USD 40-100/MWh with capacity factors typically above 80%. SMR cost projections range from USD 60-120/MWh but remain unproven at commercial scale. Nuclear provides approximately 10% of global electricity and about 25% of low-carbon electricity. Typical construction timelines are 7-12 years for large reactors; SMRs aim for 3-5 year build cycles through factory fabrication and modular assembly.

LATAM Relevance

Argentina, Brazil, and Mexico operate nuclear power plants, with Argentina pioneering the CAREM-25 small modular reactor, one of the most advanced SMR projects globally. Brazil is constructing Angra 3 to expand its nuclear fleet. Chile and Colombia have explored nuclear feasibility studies. Nuclear can complement variable renewables in LATAM grids, providing firm low-carbon baseload power.

Critical Minerals Link

Nuclear energy requires uranium fuel, zirconium alloys for fuel cladding, hafnium for control rods, and specialized steel for pressure vessels. SMRs may use high-assay low-enriched uranium (HALEU). Latin America has uranium deposits in Brazil and Argentina, though most supply comes from Kazakhstan, Canada, and Australia.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sectors: ES (Energy Systems) — nuclear power generation, SMR deployment, grid stability; IN (Industry) — nuclear-powered industrial heat (SMR applications); XS (Cross-Sectoral) — hydrogen production via nuclear heat.

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