Hydropower, Tidal & Wave

Source Metadata

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IEA Technology Definition

The IEA groups hydropower, tidal, and wave energy under renewable electricity technologies that harness the energy of water. Hydropower (conventional and pumped storage) is the largest source of renewable electricity globally. Tidal and wave (ocean energy) technologies convert marine kinetic and potential energy into electricity through various mechanisms including tidal barrages, tidal stream turbines, and wave energy converters.

Technology Readiness & Deployment

Conventional hydropower is a mainstream technology with over 1,400 GW installed globally. Pumped storage hydropower provides about 160 GW of grid-scale storage capacity. Hydropower installations more than doubled to over 25 GW in 2024, driven by large projects in China, Africa, and Southeast Asia. Ocean energy (tidal and wave) remains at demonstration or early commercial stage with less than 1 GW deployed globally and is not on track per IEA assessments, requiring rapid scale-up in policy support.

Key Metrics & Benchmarks

Hydropower LCOE ranges from USD 20-80/MWh depending on site and scale. Pumped storage provides 4-12 hours of discharge at costs of USD 50-150/MWh. Capacity factors for conventional hydro average 40-60%. Hydropower accounts for approximately 3% of projected new renewable power additions to 2030, while pumped storage is seeing faster growth between 2025-2030 than the previous five years.

LATAM Relevance

Latin America depends heavily on hydropower, which supplies over 45% of the region's electricity. Brazil has the world's third-largest hydropower fleet (over 110 GW), and Colombia, Peru, and Chile rely significantly on hydroelectric generation. Climate variability and drought increasingly threaten hydro-dependent grids, making diversification urgent. Pumped storage potential exists across the Andes and Brazilian highlands.

Critical Minerals Link

Hydropower requires large quantities of steel and concrete for dams and infrastructure, copper for generators and transmission, and aluminium for structural components. Ocean energy devices require steel, copper, and specialized marine-grade materials. The mineral intensity per MWh is relatively low compared to other renewables.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sectors: ES (Energy Systems) — hydroelectric generation, pumped storage, ocean energy; XS (Cross-Sectoral) — water-energy nexus, climate adaptation of hydro assets.

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