Electricity Transmission & Distribution

Source Metadata

Field	Value
source	iea
source_version	ETCS 2025
source_id	IEA-SUP-008
iea_category	energy_supply
technology	Electricity Transmission & Distribution
technology_readiness	commercial
mitigation	Y
adaptation	N
last_checked	2026-05-26

IEA Technology Definition

The IEA classifies electricity transmission and distribution (T&D) infrastructure as foundational to clean energy transitions. This includes high-voltage AC and DC transmission lines, substations, transformers, power electronics (FACTS devices, HVDC converters), and distribution networks. The timely expansion and modernization of grids is identified as a critical bottleneck for achieving net zero targets.

Technology Readiness & Deployment

Conventional T&D infrastructure is fully mature and commercially deployed. HVDC technology for long-distance, high-capacity transmission is at commercial stage and expanding rapidly, particularly in China and Europe. The IEA flags that grid expansion is not keeping pace with renewable deployment in most regions. Permitting and planning processes for new transmission lines typically take 5-15 years, creating structural delays in the energy transition.

Key Metrics & Benchmarks

Global electricity grid length exceeds 80 million km. Annual grid investment reached approximately USD 400 billion in 2024 but the IEA estimates this needs to nearly double by 2030. HVDC lines can transmit power over 2,000+ km with losses below 3%. Transformer lead times have extended to 2-3 years globally due to supply chain constraints. Distribution system upgrades are critical for accommodating distributed generation, EVs, and heat pumps.

LATAM Relevance

Latin America faces significant transmission challenges connecting remote renewable resources to demand centres. Brazil's HVDC backbone transmits Amazonian hydropower and northeastern wind over thousands of kilometres. Chile's single-circuit transmission from the Atacama solar region to Santiago is a recognized bottleneck. Regional interconnections between Colombia, Ecuador, Peru, and Chile remain limited, constraining cross-border electricity trade and system resilience.

Critical Minerals Link

T&D infrastructure is the largest single demand sector for copper, which is essential for conductors, cables, transformers, and substations. Aluminium is used extensively in overhead transmission lines. Transformer cores require grain-oriented electrical steel. LATAM's copper production (Chile and Peru account for 37% of global supply) directly supports global grid expansion.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sectors: ES (Energy Systems) — transmission planning, grid expansion, interconnections; IN (Industry) — cable and transformer manufacturing; XS (Cross-Sectoral) — electrification infrastructure enabling all sectors.

Revisión #2
Creado 2026-05-27 03:38:33 UTC por Gideon Blaauw
Actualizado 2026-05-27 03:49:31 UTC por Gideon Blaauw