Green Techs: Recent Developments

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STILL 85% FOSSIL — BUT RENEWABLE CAPACITY ADDITIONS DOUBLED IN 3 YEARS

15%

share of carbon-free energies in the global primary energy mix (doubled in 10 years)
Renewable capacity additions ×2 between 2022 and 2024

Clean energy surge

Clean energy technology adoption surged at an unprecedented pace over the last three years. Total renewable capacity additions increased by a factor of 2 between 2022 and 2024, driven by record solar PV deployment globally.

But the gap remains immense

Fossil fuels (coal, oil, gas) still represent 85% of global primary energy consumption. The energy transition is accelerating in electricity, but heating, transport, and industry remain largely fossil-dependent.

Source: Our World in Data, IEA

2× MORE INVESTED IN CLEAN ENERGY THAN IN FOSSIL FUELS

$2,2T

Clean energy investment in 2025 (New high)

Total energy investment in 2025 (IEA) : $3,3T | Fossil fuels: first decline since 2020

Clean energy at record highs

Clean energy investment hits $2.2 trillion, with record additions of renewables, strong EV sales, and rapid battery deployment. Investment now running at 2× the fossil fuel level.

Fossil investment retreating

Upstream oil investment is set to fall for the first time since 2020. Oil spending revised down amid new economic outlook and cost pressures. Global refinery investment hits a 10-year low. Gas/LNG remains robust.

Source: IEA World Energy Investment 2025

RENEWABLES +9% IN ELECTRICITY — COAL FLAT FOR THE FIRST TIME

Low-emission sources surging

Renewables grew +9% in electricity production in 2025, slightly below +9.6% in 2024 (weather dampened wind/hydro). Still well above the 6.4% decade average.

Coal generation flat

Coal-fired generation remained flat in 2025 after +1.4% in 2024. Declines in China and India were offset by gains in the US and Eurasia. A historic inflection point: for the first time, additional demand is being fully met by clean sources.

Energy storage booming

2025 saw record growth in grid-scale battery storage. The increasing share of intermittent renewables creates price volatility in power markets, fostering massive investment in storage solutions. Negative electricity prices are increasingly frequent in key markets.

Source: IEA Electricity 2026

EVS EXCEED 20 MILLION SALES — BUT ENERGY INTENSITY STALLS

20.7M

electric vehicles sold globally in 2025 (+20%)

BEV: 13.6M (+24%) | **PHEV:** 7.0M (+13%)
Europe: 4.3M (+33%), best in class
China: 12.9M (+17%), but Q4 slowdown as incentives cut
North America: stagnating in USA (policy uncertainty) and collapsing in Canada (end of subsidies)

Energy efficiency improvement slowing

Only 1%/yr improvement in 2024, down from 2%/yr (2010–2019)

Key reasons for slowdown:
- Investment-intensive post-COVID growth in emerging economies (China, India)
- Higher energy demand from extreme temperatures
- Poor growth in hydropower output leading to more fossil fuel consumption

Heat pumps: sales declining

Global sales fell −1% in 2024. Sharp decline in Europe, stagnation in China. Japan and US partially recovered in H2. Cost remains the major barrier. Market collapsing in Canada after end of subsidies.

Energy innovation funding is slowing

Public energy R&D spending in 2024 dropped from its recent high point in 2023, and IEA's estimate for 2025 is down a further 2% to USD 55 billion.
Energy VC fundings is declining since 2022, initially due to higher interest rates and macroeconomic environment. In 2025 energy start-ups faced stiff competition for capital from AI start-ups.

Source: Benchmark Minerals, IEA

Green Techs: Outlook

THE SHARE OF FOSSIL FUELS IN GLOBAL PRIMARY ENERGY CONSUMPTION IS EXPECTED TO FALL TO 71% BY 2035 (IEA)

71 %

Share of fossil fuels in primary energy demand in 2035 (According to STEPS scenario of IEA)
While Energy demand grows by 0,7%/y until 2035 assuming energy efficiency improves 2.2%/y.

Coal and oil demands peak by 2030

Coal demand remains broadly stable at its current level (6 090 million tons), but it peaks before 2030 and then declines to under 4 900 Mtce in 2035.

Oil demand rises slowly to around 102 mb/d by 2030 before beginning a slow decline, with reductions in oil demand for road transport broadly offset by increased oil use for petrochemicals.

Natural gas grows 1% / year

Natural gas demand rises by 1% per year to 2035, driven mainly by growth in industry and power and then remains stable.

Low-carbon energy demand steeply growing

Demand for renewables increases by an average of 5.5%/y to 2035: most of the additional demand comes from the power sector, but the direct use of renewables also increases, particularly in industry and biofuels in transport.
Renewable power capacity expands 2.6 times from 2022 to 2030, and 3.7-times by 2035.
Nuclear capacity increases by 3% on average to 2035

Source: IEA Electricity 2026

ELECTRICITY DEMAND SET TO ACCELERATE: +3.6%/YR TO 2030

33,600 TWh

global electricity consumption in 2030 (up from 28,200 TWh in 2025)
+1,100 TWh/yr added on average through 2030 (vs 700 TWh/yr over 2015–2025)

Buildings: 49% of the new demand

Largest absolute growth. Space cooling, data centres, and heat pumps make up almost half of buildings sector growth. Electricity share in total final consumption rises from 21% to 24%.

Industry accelerating

Industrial electricity consumption expected to accelerate vs past decade, especially from light industries. Electrification replacing fossil heating in selected processes.

AI likely to add a stress on top of previous consumption pathways.

Transport: share doubles

Fueled by rapid EV uptake, transport's share of demand growth rises to >10%, double from the past five years.

Source: IEA Electricity 2026

50% LOW-EMISSION ELECTRICITY BY 2030 — NUCLEAR RESTARTS

Renewables outlook to 2030

+1,050 TWh/yr

renewable electricity generation growth per year

Solar PV alone: +600 TWh/yr. Solar PV overtakes wind and nuclear by 2026, hydropower by 2029.

Low-emission share rises to 50% of global electricity by 2030 (from 42% in 2025). Coal falls to 27% (from 34%).

Gap to COP28 tripling target

Despite strong growth, a gap remains vs the global tripling target announced at COP28. Storage must increase ×6 to support ×3 renewables.

Nuclear restart announced

+2.8%/yr

nuclear generation growth (vs 1.3% in 2021–2025)

China: ~30 GW new nuclear capacity by 2030. Largest build programme globally.

Japan: Continued restarts supporting generation growth.

India & Korea: New reactors being commissioned.

France: Robust output from advancement of maintenance works.

US & EU: Output expected to remain relatively stable.

Source: IEA Electricity 2026

RENEWABLE HEAT, BIOGAS & STORAGE: ACCELERATING BUT INSUFFICIENT

Renewable heat: 18% by 2030

Heat demand rises +8% by 2030. Modern renewables expand +42% but still only 18% of total (from 14%). Industry becomes dominant consumer. China's renewable heat to double, 60% of growth from China+India.

Biogas & biomethane: +22% by 2030

Global production expands 22% by 2030. Growth mainly from biomethane (versatile, uses gas grids). Drivers: energy security post-Ukraine, hard-to-abate decarbonization, circular economy, rural development. EU, India, China setting ambitious 2030 targets.

Storage: ×6 needed for NZE

COP28's ×3 renewables target requires ×6 grid-scale storage. 2025 saw record battery deployments but far below the NZE trajectory. Negative electricity prices increasingly frequent, highlighting the urgency of storage build-out.

Source: IEA Renewables 2025, Rystad Energy

EV FLEET ×4 BY 2030 — BUT CRITICAL MINERALS REMAIN A BOTTLENECK

EV outlook to 2030

250 million EVs

global fleet by 2030 (STEPS) — ×4 vs end 2024

>90% electric cars, stock growing ~25%/yr (vs ~50%/yr in 2018–2024 as the base expands).

Warning signals:
Recent changes in trade policies, tariffs, and demand-side policies (fuel economy standards, tax incentives) may affect EV sales in several markets. US policy changes could have larger impact via demand-side incentives than tariffs alone.

Critical minerals: lithium highest risk

IEA warns of future lithium & copper shortages despite current oversupply and price collapse.

Concentration worsening:
Top 3 countries: 86% of refining (vs 82% in 2020), 77% of mining (vs 73%). China dominates. 55% of strategic metals subject to export restrictions.

Supply shock risk: 40–50% price increase for consumers or loss of competitiveness for manufacturers (IEA).

Solutions: geographic diversification, recycling, and technological innovation. But progress toward diversified supply chains expected to be slow.

Source: IEA Global EV Outlook 2025, IEA Critical Minerals 2025

HYDROGEN & CCUS: ESSENTIAL BUT STILL IN INFANCY

Low-carbon hydrogen

Use of low-carbon hydrogen grew ~10% in 2024 but remains <1% of total demand due to cost challenges and insufficient policy support.

Many projects cancelled or delayed in 2024–2025, but approved pipeline requires ~$8B investment in 2025 (2× 2024 level).

Production expected to reach 4% of total hydrogen by 2030 (IEA).

Policy initiatives in EU, Japan, Korea can accelerate ramp-up, but impact depends on implementation speed.

Carbon capture (CCUS)

Seen as essential for hard-to-abate industries (steel, cement, refining) that cannot be easily electrified.

Currently capturing only 0.1% of global CO_2 emissions per year — still in its infancy.

Strong pipeline of new projects: if successfully developed, CCUS investment would rise more than ×10 over the next 3 years.

Key challenge: scaling from demonstration to commercial deployment while reducing costs and ensuring permanent storage.

Source: IEA World Energy Outlook 2025