BRIEFING

How to harness the Electrotech Revolution

PURPOSE

The global energy system is undergoing its fastest transformation in history. The rise of 'electrotech' technologies that generate, store and use renewable electricity, is disrupting fossil fuel dependence and reshaping economies.

Governments that embrace this revolution will secure **energy independence, lower costs for households and businesses and gain new engines of growth**. Those that delay, risk stranded assets, rising import bills and loss of competitiveness. All the critical technologies are available, yet in many countries, policy and regulation lag, preventing society from fully capturing this potential.

This briefing distils key findings from Ember's Electrotech Revolution into key recommendations for policymakers.

The Dawn of the Electrotech Revolution

There are two parts to the energy transition: making cheap local electricity, mainly from solar and wind, backed up by long and short duration storage; and powering end-demand with electricity. As these combine, for the first time in history, we can harness the exceptional power of the sun, leading to solar going from the smallest to largest source of capacity in only 15 years (Ember, 2025). Meanwhile, in 2024, wind power accounted for approximately 8% of global electricity generation, with onshore wind now producing electricity at less than half the cost of fossil fuels (IRENA, 2025). Electrification is also growing rapidly across the world; electricity now makes up 22% of final energy demand as well as almost all of the growth in the industry, buildings and road transport sectors (Ember, 2025). For those sectors which cannot be fully electrified directly with renewable energy, green hydrogen can ensure renewables decarbonises them too. These changes signal the rise of the electrotech era.

Six Policy Recommendations to Exploit the Electrotech Revolution

Policy action is needed to accelerate electrotech deployment and overcome key barriers. Progress can be supported by lessons from other countries' transformations and by innovative regulatory approaches. Policy should be tailored to the different stages of the energy transition in each sector (S-curve economics, 2025). We recommend the six following policy actions to accelerate progress:

Set clear national plans and pathways

- Embed ambitious, specific renewable and electrification targets into Nationally Determined Contributions, industrial strategies and long-term energy plans.
- Use sectoral roadmaps and these long-term signals to provide market certainty on ambition and pace. This enables investors and the private sector to align their strategies with national goals, helping to build a bankable pipeline of projects.
- Electrify everything that can be electrified in long-term plans. 75% of the global energy system can already be electrified with existing technologies (Ember, 2025).

Invest in and build grids, storage and infrastructure

- Deploy long and short duration storage, digitalisation and demand-side management to integrate variable renewables reliably and cost effectively.
- Expand transmission and distribution capacity, while optimising and digitalising existing grids. Over 3,000 GW of renewable projects globally are waiting for grid connection (IEA, 2023).

Align prices and subsidies with the transition

- Shift the tax burden from renewables to fossil fuels: reduce electricity taxes while increasing those on fossil fuels. In the EU, only Sweden, Finland and Bulgaria tax gas more heavily than electricity (Ember, 2025). Correcting this imbalance is essential to making electrification the most affordable choice for households and businesses.
- Phase out fossil fuel subsidies fairly: $1.3 trillion in fossil subsidies lock in dependence on imports and distort energy markets (IISD, 2023). Set a clear phase out timeline, while using targeted measures to protect vulnerable households and workers.
- Reduce electricity costs with innovative policies (RAP, 2025): Low tariffs accelerate electrification across transport, heating and industry, while also maintaining public support for the transition. Highly electrified economies show that cheap electricity is both achievable and essential.

Do not try to solve 2050 problems with 2025 technology

- Prioritise electrotech solutions that are already cost-effective, scalable and efficient, such as renewables, electrification, and long and short duration storage.
- Avoid overreliance on expensive technologies without clear learning curves such as Carbon Capture and Storage (CCS) or large-scale biomass. CCS adds to costs, reduces efficiency and does not enhance energy security (Ember, 2025).

Secure the supply chain for electrotech and train the workforce

- Establish robust, secure and resilient renewable energy supply chains for solar, wind, batteries and grids. Supply chains serve as a critical foundation to achieve scale and speed. This does not mean every part of the electrotech stack must be domestically produced. As with any technology, it is necessary to identify key niches and areas of focus, and to build up a network of diverse suppliers to avoid over-reliance on a single country.
- Invest in (re)training programmes to ensure a skilled electrotech workforce.

Ensure a fair and secure transition

- Communicate the benefits of electrotech and combat disinformation: electrotech enables lower bills, cleaner air and energy independence.
- Involve communities in decision-making. Share benefits locally to maintain support.
- Strengthen cybersecurity for increasingly digitalised energy systems. AI's future hinges on energy: the nations that enable stable, baseload solar with storage will hold the strongest cards.

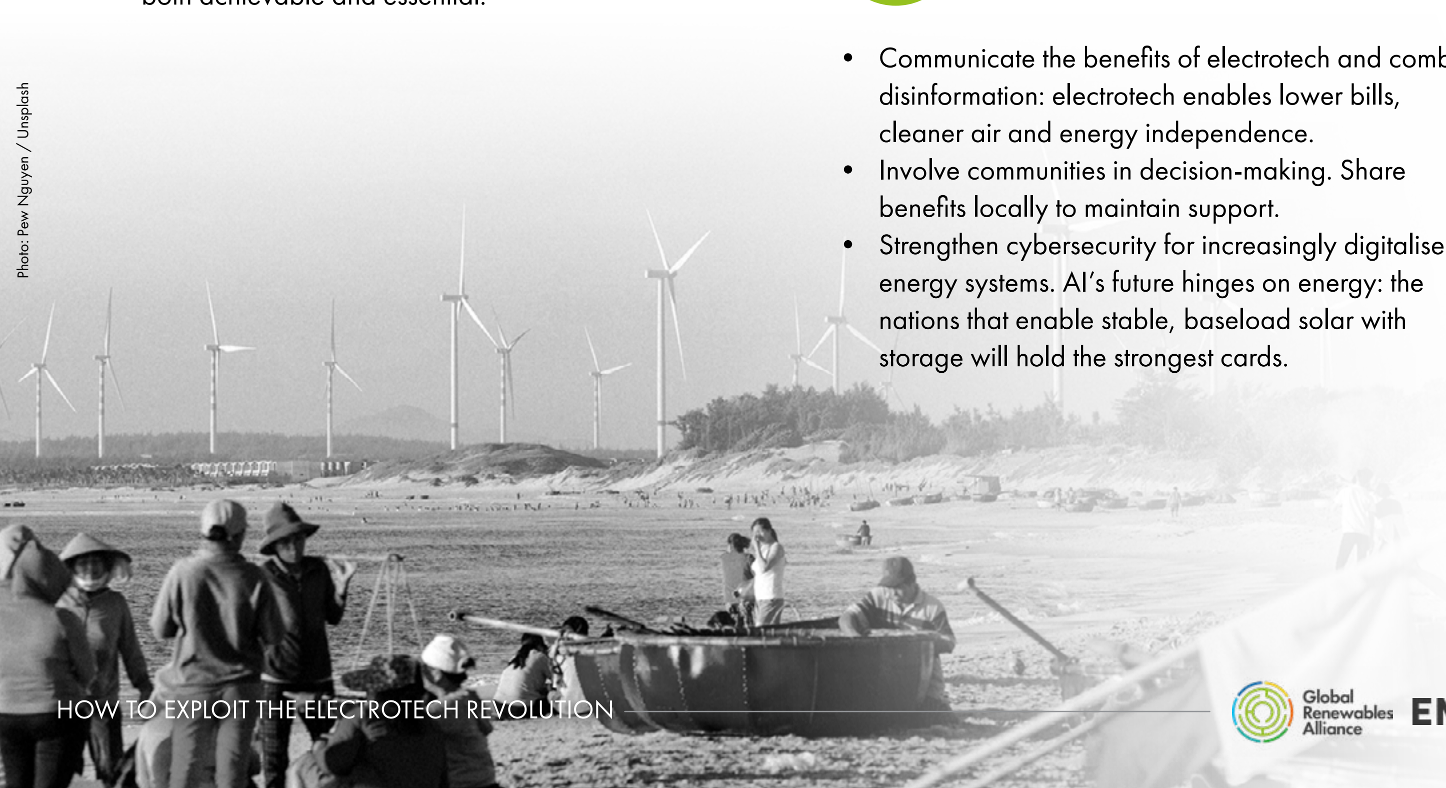


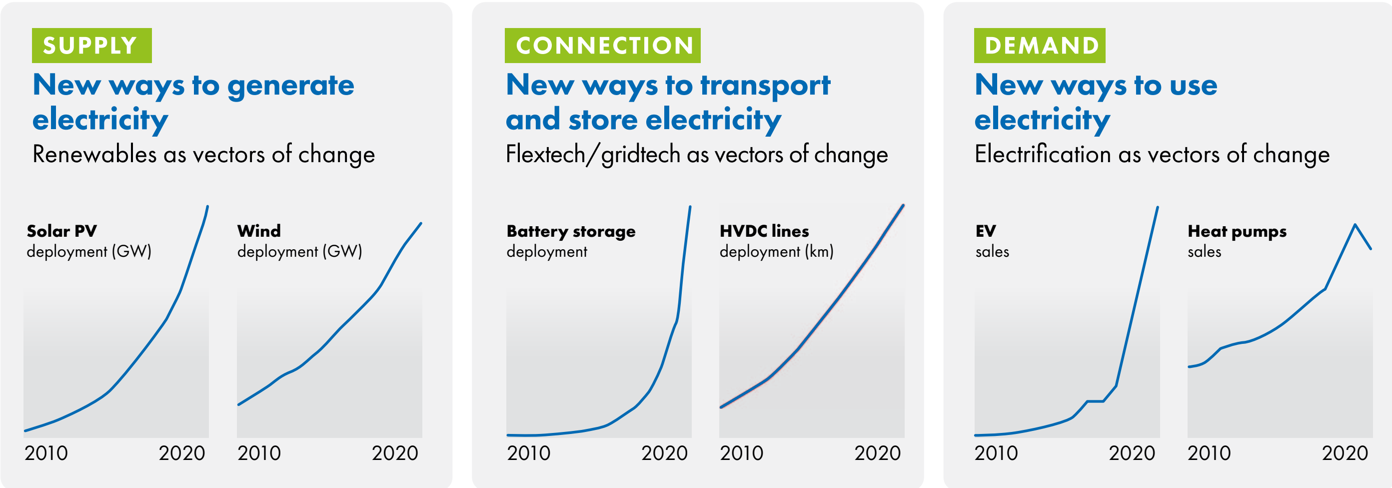
Photo: Pew Nguyen / Unsplash

CONTEXT

What is electrotech?

Electrotech refers to a set of exponential energy technologies that are revolutionising the way we generate, connect and use electrons (see graph 1). These include rapidly scaling technologies with steep learning curves, such as solar, wind and water, chemical and thermal batteries, alongside digital solutions like demand-side management and Artificial Intelligence (AI) for energy (Ember, 2025).

Graph 1: What is Electrotech – Ember, 2025



Who benefits from electrotech and how?

Every nation can take part - global solar and wind potential is over 100 times energy demand. 92% of countries enjoy renewable potential more than 10 times their current demand and every country has enough to be energy self-sufficient (Ember, 2025). The sun supplies more energy every five days than all fossil fuel reserves (Ember, 2025). The old energy system is inefficient, fossil fuels lose two-thirds of their energy to thermodynamics, while electrotech is three times as efficient (Ember, 2025). This unlocks the door to a wealthier, fairer, cleaner world, where:

GDP is growing: In 2023, clean energy drove 10% of global GDP growth. In China alone, clean energy sectors drove a quarter of GDP growth in 2024 (IEA 2024, CREA 2025).

Energy security can be ensured by deploying renewables and electrifying: renewables, electrification of transport, and low temperature heat can reduce fossil imports by 70% (Ember, 2025). This saves money and reduces the impact of fossil fuel price volatility. Since around 75% of the global energy system can already be electrified with current technologies, accelerating electrification is essential to strengthen resilience.

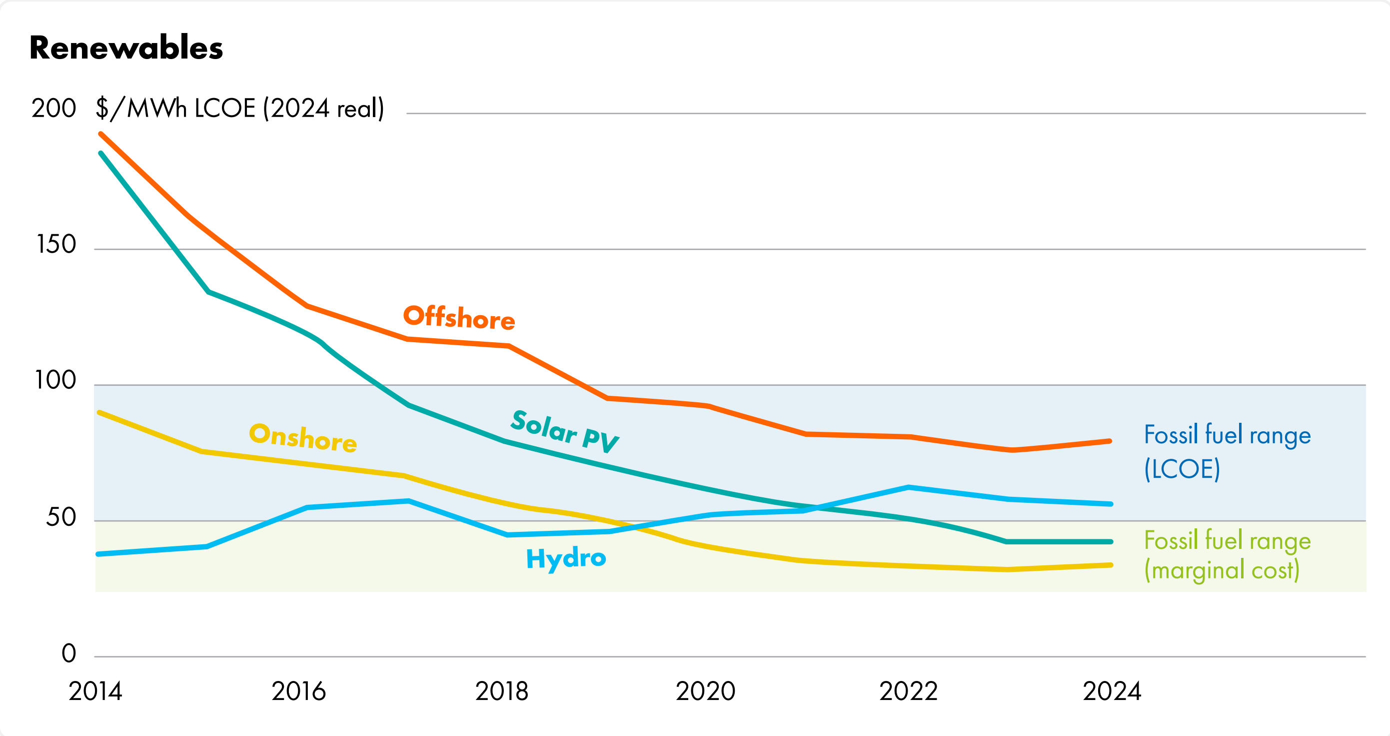
Jobs are created: About 35 million people are employed in clean energy worldwide (IEA, 2024), and renewables create three times more jobs per dollar invested compared to fossil fuels (Sustainability Science, 2024).

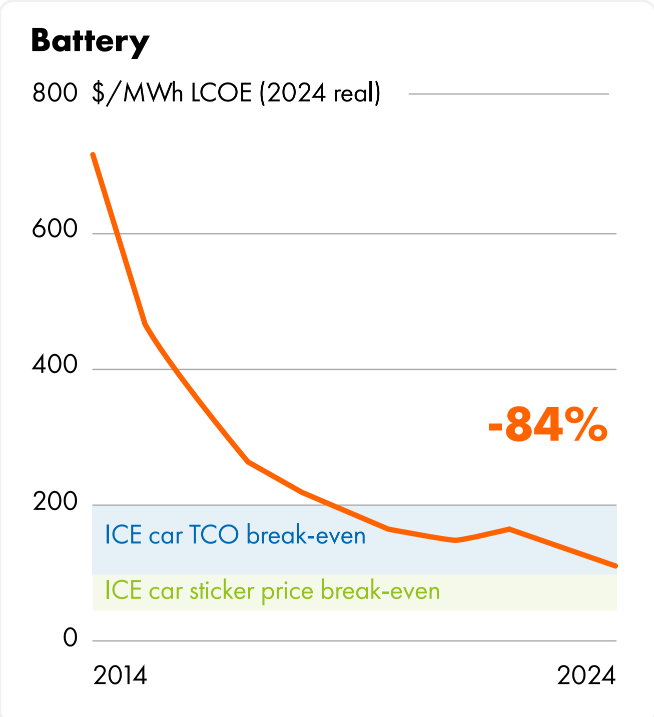
Electricity bills become affordable: If deployed effectively, renewable energy can lower electricity bills for consumers and help combat energy poverty. In 2021-2023 solar PV saved €100bn for EU electricity consumers (IEA, 2025). Wind, hydropower, and batteries, also fall well below fossil coals on levelized costs of electricity. The EU estimates that an energy system supported by market integration, renewable generation and flexible capacity could lower wholesale electricity prices by 40% on average across the EU (EU COM, 2025).

Energy access is enhanced: Solar home systems, mini-grids, and stand-alone storage are providing affordable, reliable electricity to remote and underserved communities, forging a path to clean development.

Growth of the new means decline for the old: Exponential growth of new electrotech drives peak, plateau and decline of the old fossil system, in one country and sector after another. Already, 75% of the world has passed peak fossil use in final energy, and half in power generation (Ember, 2025). Global fossil fuel demand reached a peak in 2019 and is now on a bumpy plateau before its inevitable decline after 2030 (RMI, 2022; DNV, 2025). Data from the first half of 2025 suggests fossil demand in China has now peaked both for electricity generation and in total (CREA, 2025). China is the pivot nation in global energy demand, accounting for 95% of the net growth in fossil fuel demand since 2018. A peak in China thus means a peak for the world (Ember, 2025)

Graph 2: Cheap Enough to Challenge Incumbents – Ember, 2025





The market follows a strict economic logic: Electrotech costs have dropped for decades - about 20% every time deployment doubles (see graph 2, the battery graph refers to batteries for EVs). They now challenge all fossil fuels on cost. In 2024, over 90% of new renewables beat the cheapest fossil fuels on electricity price (IRENA, 2025). Solar-plus-storage in India costs just $40/ MWh. Grid-scale long duration storage has seen costs come down considerably as well, with pumped storage remaining the most competitive technology in terms of global average cost for LDES above 6 hours. In this context, capital is shifting fast, and two thirds of energy expenditure is going into electrotech (Ember, 2025).

Politics should follow the same logic: Many countries are adding renewable capacity motivated by the drive for energy security and prosperity, as well as emission reductions. Yet, few are building fully integrated 'electrostates'. The solutions exist; now the next two decades are about full, systematic implementation.