

New ETC report demonstrates that wind and solar-dominant power systems are competitive, reliable, and technically and economically feasible

London, 00:01 (BST) 29 July 2025 – The Energy Transitions Commission (ETC) has today published a landmark report, *Power Systems Transformation: Delivering Competitive, Resilient Electricity in High-Renewable Systems*. The report sets out that global power systems dominated by wind and solar generation can reliably deliver electricity at costs comparable to or lower than today’s fossil fuel-based power systems in most parts of the world.

Electricity is projected to provide up to 70% of global final energy consumption in a decarbonised energy system, growing from around 20% today. Total global electricity demand could potentially triple, reaching 90,000 TWh by 2050 compared to 30,000 TWh today, and be met with new generation predominantly from wind and solar.

A Global Opportunity

The report shows that many countries can operate power systems with 70% or more electricity from wind and solar, using proven technologies available today, like batteries, other energy storage, long-distance transmission, and flexible energy use. It highlights significant regional opportunities:

- “Sunbelt” countries – including India, Mexico, and much of Africa – are best-positioned to cut power system costs by transitioning to low-cost, solar-led systems, which mainly require day-night balancing.
- In contrast, “wind-belt” countries – such as the UK, Germany, and Canada – that rely on higher shares of wind face higher balancing costs, but can still achieve affordable, stable systems through smart policy and innovation.
- In many regions, long-distance transmission lines can be one of the most cost-effective solutions to balancing supply and demand, and should be maximised where feasible.

Rapid electrification of buildings, transport and industries and decarbonisation of power systems must advance together to keep costs per kilowatt-hour affordable for consumers and businesses.

“Multiple technologies, including nuclear and geothermal, may play a role in zero-carbon power systems. But wind and solar will be the dominant source of power in most countries, providing 70% or more of electricity at costs at or below today’s fossil-based systems. In particular, in the global sunbelt, the collapsing cost of solar PV and batteries makes possible far cheaper and more rapid growth in green electricity supply than seemed feasible 10 years ago. But wind belt countries can also achieve cost-effective decarbonisation by leading in offshore wind, long-duration storage, and grid innovation.” said **Adair Turner, Chair of the Energy Transitions Commission**.

Key Findings:

- **It is technically possible for wind and solar-dominant systems to be stable and resilient with the right mix of balancing and grid technologies.** These systems are no more likely to experience blackouts than thermal generation-dominated systems.
- **High wind and solar systems can be competitive with today’s wholesale prices and grid costs.** Sunbelt countries could see costs more than halve to \$30-\$40/MWh by 2050. Wind-dependent country (e.g., UK) costs are higher, but in the future could be comparable to current levels.

- **The “last mile” of decarbonisation will be the most expensive, particularly in countries which need ultra-long duration balancing to meet seasonal variations in supply and demand.** Once countries have reached very low levels of carbon intensity (e.g. less than 50g per kWh), electrification is more important than rapid last-mile decarbonisation.
- **Up to 30% of all global power demand could be time-shifted through demand-side flexibility.** This requires the development of dynamic pricing and the use of smart management technologies.
- **Grid costs per kWh can be kept stable.** Total global grid length will need to more than double by 2050, reaching around 150–200 million km. Annual grid investment could rise from \$370 billion in 2024, peaking at \$870 billion in the 2030s. However, ~35% of grid expansion costs (equivalent to \$1.3 trillion in Europe¹) could be avoided between now and 2050 through the usage of innovative grid technologies.
- **Delivering low-cost, high variable renewable energy power systems will require strategic vision and planning,** including market reform to put all technologies on a level playing field, grid modernisation enabled by innovative technologies, supply chain development strategies and customer engagement.

Policymakers, the power industry, and financial institutions should collaborate to ensure:

- Appropriate planning of high wind/solar systems to expedite planning approvals and minimise deployment bottlenecks.
- Electrification of demand that keeps pace with generation and grid build-out to avoid the cost per kWh increasing for consumers.
- Accelerate power market reforms to unlock investment in critical technologies.
- Address workforce and supply chain bottlenecks to enable delivery at scale.

The ETC also published a supplementary briefing, [*Connecting the World: Long-Distance Transmission as a Key Enabler of a Zero-Carbon Economy*](#), focused on the role of cross-border interconnectors and long-distance transmission in accelerating the energy transition.

About the ETC:

Power Systems Transformation: Delivering Competitive, Resilient Electricity in High-Renewable Systems was developed in collaboration with ETC members from across industry, financial institutions, and civil society. The Energy Transitions Commission is a global coalition of leaders from across the energy landscape committed to achieving net-zero emissions by mid-century. This report constitutes a collective view of the ETC; however, it should not be taken as members agreeing with every finding or recommendation.

Download the report: <https://www.energy-transitions.org/publications/power-systems-transformation/> [Link will be live from 00:01 (BST) on 29 July 2025].

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For further information on the ETC, please visit: <https://www.energy-transitions.org>

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¹ BNEF (2024), *New Energy Outlook*.