INSTITUT DE L'ÉNERGIE TROTTIER

The Transition Accelerator

L'Accélérateur de transition

THE FUTURE IS ELECTRIC:

Trends and Implications for the World

Energy Transitions Commission

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CONTENTS

KEY POINTS

- Barely 38% of the primary energy used around the world ultimately becomes useful energy that provides mobility, heating, cooling and industrial production; the remainder is lost, largely as waste heat produced when fossil fuels are burned. Electric technologies provide the same services with far less energy input than fossil ones.

- In 2025, clean sources provided more than the entire increase in global electricity demand. This allowed fossil-fired generation to decline outside an economic crisis for the first time in over a decade.

- The rise of clean electrification and industry decarbonisation is creating profound uncertainty over future fossil fuel demand. Coal is already entering structural decline, oil is approaching a turning point, and gas future remains the most uncertain of the three.

- Clean electrification benefits from progress across five core technologies which reinforce one another: (1) Power electronics; (2) Solar PV; (3) Batteries; (4) Embedded computing; and (5) Electric motors.

- Clean electrification can potentially eliminate around 60% of annual GHG emissions, but additional action will be required to keep warming levels within Paris' threshold. Electrification must be accelerated, but it cannot be the only strategy.

- Electricity-based systems are becoming more competitive against fossil fuels each year. Even if low-carbon production can significantly increase the cost of basic materials, those materials account for only a small share of the final cost of consumer products. However, policy must lend support to the industry's efforts.

- Electricity is a major share of production costs, so the ability to generate cheap electricity has major implications for clean industry.

- Solar + battery is going to be the cheapest way to produce round-the-clock renewable electricity in the global sunbelt. Countries outside of it will have higher reliance on more expensive wind and nuclear energy, or hydro if available.

- Chinese manufacturing dominates global capacity across the technologies underpinning the clean energy transition, including critical-mineral processing. However, clean-tech dependence is not the same as fossil-fuel dependence, since critical materials can be recycled.

INTRODUCTION

Clean electricity technologies are becoming cheaper, more efficient and faster to deploy, fundamentally reshaping the economics of energy.

Electrification can eliminate a large share of emissions but cannot eliminate them all. Hard-to-electrify sectors, regional differences, market and financing constraints and geopolitics will continue to determine the pace and distribution of change.

This paper considers three questions:

1. **Why clean electrification is accelerating and will continue to do so**, driven by falling technology costs, growing availability and fundamental efficiency advantages.
2. **What are the implications for the global energy transition**, exploring how far electrification alone can get the world on warming targets and why deliberate action in hard-to-electrify sectors is still required, unfolding differently across regions.
3. **What this transformation means for fossil fuel demand**, as its historical comparative advantage shift in a changing global economy.

These questions will be answered in the following seven sections:

1) **Energy, prosperity and the climate challenge**
2) **Clean technologies have become cheap, abundant and deployable**
3) **Electricity technologies will keep getting more competitive**
4) **Electrification is necessary but not sufficient**
5) **Geography, economics and politics will shape an uneven transition**
6) **The role of China in the energy transition and global competition**
7) **The future of fossil fuels is increasingly uncertain**

1. Energy, prosperity and the climate challenge

Energy is fundamental to human welfare. Historically, increases in energy demand have also increased greenhouse gas (GHG) emissions in the atmosphere, especially carbon driven by the burning of fossil fuels. The level of warming the world is seeing today is already driving frequent and severe heatwaves, droughts, floods and wildfires, with growing impacts on people, ecosystems and economies. The central challenge is therefore to enable continued growth in the energy-based services that underpin prosperity, while rapidly reducing their impact on the planet.

Energy has powered extraordinary improvements in human welfare

Modern economic growth has depended on increasing access to energy. But energy consumption is not valuable in itself: what matters are the services it provides, including warm or cool buildings, cooking, lighting, mobility, digital connectivity, improved health and education and industrial production.

Billions of people in growth economies still consume far less energy than the average citizens of advanced economies. Rising incomes, urbanisation and population growth will therefore drive continued growth in demand for energy services.

This growth is both inevitable and desirable as households demand better housing, cooling, mobility and access to modern appliances. This means economies will require more infrastructure, industrial production and digital capacity, and that countries must expand access to reliable and affordable energy to support economic development.

But even if energy is fundamental to human welfare, energy consumption does not grow in tandem with economic output. In fact, over the years the world has performed increasingly better at harvesting more economic value from every unit of energy. Since the start of the Industrial Revolution, global primary energy consumption increased around 28-fold whilst global GDP increased around 100-fold.[1]

The current energy system wastes most of the energy it consumes and it's incompatible with a stable climate

The world currently uses around 170,000 TWh of primary energy each year. Yet only around 64,000 TWh ultimately becomes useful energy that provides mobility, heating, cooling and industrial production [Figure 1].[2]

Over 60% is lost, largely as waste heat produced when fossil fuels are burned. Internal combustion engines lose most of the energy contained in petrol or diesel as heat, thermal power stations discard large amounts of energy during electricity generation, gas boilers and cookers lose energy through combustion and exhaust heat, and in fossil fuel extraction, processing and transport consume additional energy before fuels reach the end user.

1 ETC (2025), Energy productivity: Increasing efficiency in an expanded, electrified energy system.

2 Ibid.

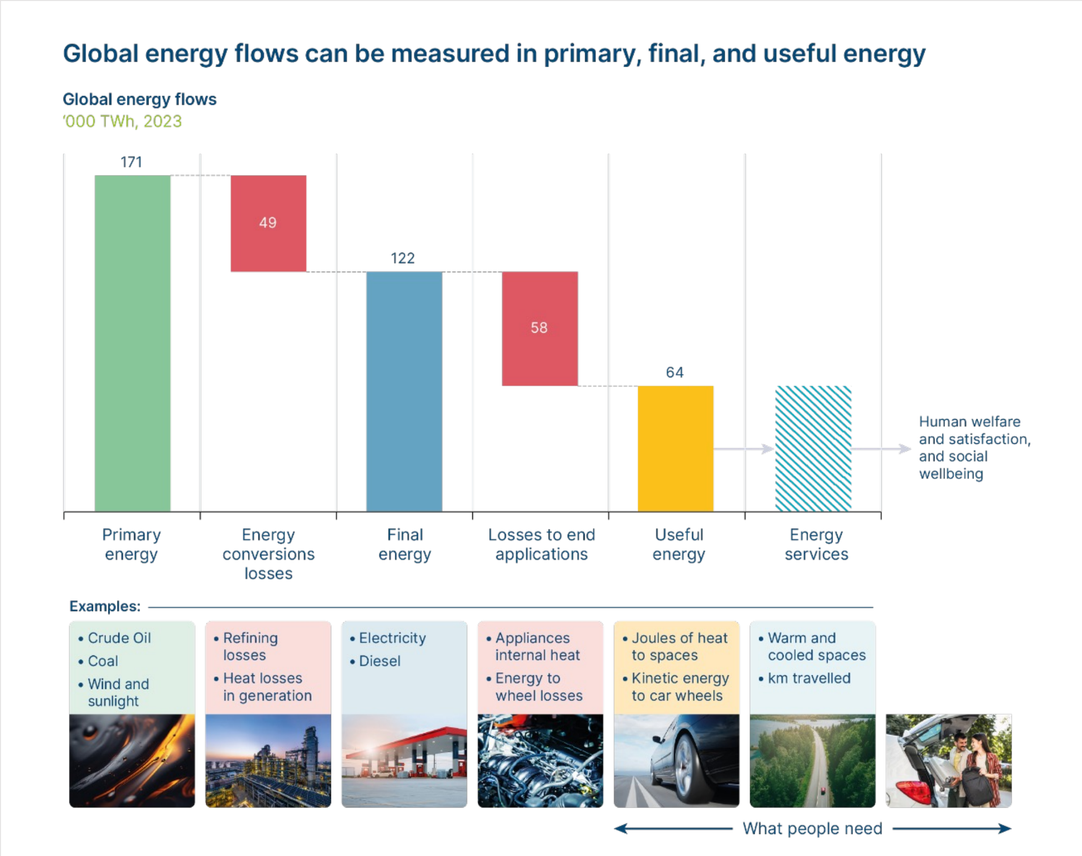


Figure 1, Source: ETC (2025), Energy productivity: increasing efficiency in an expanded, electrified energy system

These losses are so familiar that they are often treated as unavoidable, but they are only a consequence of an energy system built around combustion.

Today, fossil fuels provide around 80% of global primary energy.[3] Their combustion is the principal driver of rising atmospheric greenhouse gas concentrations and global warming. Continued dependence on fossil fuels creates a fundamental conflict between two global imperatives:

- **Expanding prosperity**, particularly in countries where energy consumption and incomes remain low.
- **Limiting climate change**, in line with the Paris Agreement, adopted by 195 countries in 2015, to keep warming well below 2°C pursuing efforts to limit it to 1.5°C, recognizing that this would significantly reduce climate risks and impacts.[4]

Clean electrification is increasingly changing this equation. Falling prices of renewables, storage and slim lead time for deployment of new assets make clean electrification the most competitive, efficient and zero-carbon form of energy in most cases.

[3] Energy Institute (2026), *Statistical Review of World Energy* 2026.

[4] UNFCCC (2015), Historic Paris Agreement on Climate Change: 195 Nations Set Path to Keep Temperature Rise Well Below 2 Degrees Celsius.

2. Clean technologies have become cheap, abundant and deployable

When I became the first Chair of the UK Climate Change Committee in 2008, I believed that reducing emissions by 80%, let alone reaching net zero, would require significant economic sacrifice. That assumption proved dramatically wrong.

Clean electrification consists of zero-carbon electricity generation and substitution of incumbent fossil fuels in end-use to electricity. Three developments have fundamentally changed the picture over the past 15 years, transforming the economics of clean generation and allowing electrification to spread: falling costs of renewables and storage, unprecedented deployment and scale in manufacturing capacity.

A) Technology costs have collapsed

Clean technologies have fallen in cost far faster than almost anyone anticipated:

- The UK Climate Change Committee expected solar photovoltaic costs to decline by around 25% to 40% by the 2020s. In reality, solar module costs fell by more than 90% since 2008 and by over 99.9% since first commercialised in the 1970s.[5]
- Wind turbines have become 40% cheaper than 2008, and continue to decrease in cost, and are particularly cheaper in China.[6]
- Lithium-ion battery costs have fallen by around 99% since 1990.[7]

These cost reductions mean that clean electricity can now be produced at little or no additional cost relative to fossil fuel alternatives across much of the world. In many locations, new wind or solar generation is already the cheapest source of additional electricity.

B) Deployment at unprecedented speed

Clean electricity technologies can generally be installed far more quickly than conventional fossil fuel infrastructure:[8] rooftop solar can often be installed within days, utility-scale solar projects can be built within one or two years and onshore wind projects can be completed within just a few years.

By comparison, new fossil fuel infrastructure can take at least five years once turbines are procured, planning is in place, and construction and fuel supply requirements are sourced.

Solar power illustrates this transformation most clearly. Deployment has consistently exceeded the expectations of governments, investors and expert forecasters. Successive projections have underestimated both the pace of cost reductions and the resulting scale of global rollout.

Clean technologies are also spreading beyond advanced economies. Africa increased solar imports by around 60% in the 12 months to June 2025, reaching 15 GW,[9] showing that falling technology costs are creating opportunities even in markets where financing and infrastructure constraints remain significant.

[5] Our World in Data (2026), *Solar photovoltaic panel prices*.

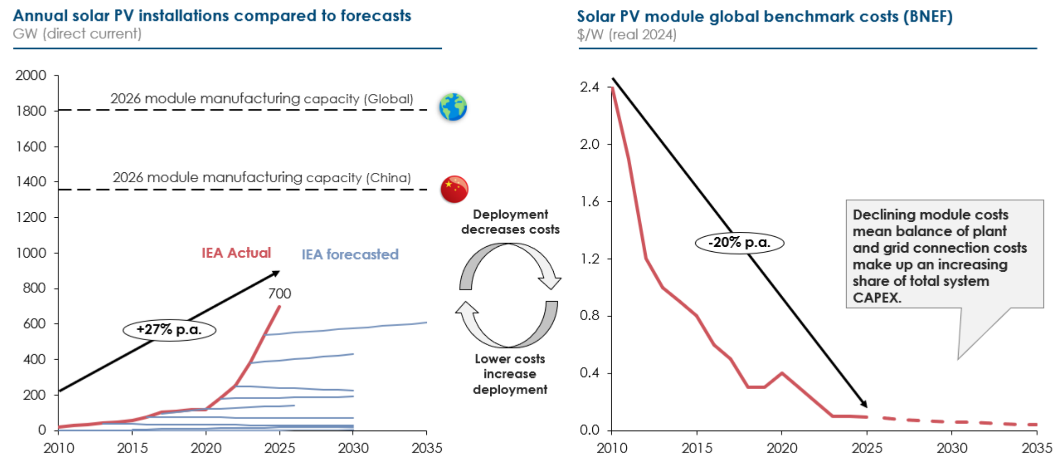
[6] BNEF (2025), *Wind Turbine Price Index* 1H 2025: Still on the Rise.

[7] Our World in Data (2026), *Battery costs have declined by 99% in the last three decades, making electrified transport a reality*.

[8] ETC (2026), *Lessons on Energy Security after the Hormuz Crisis: How Accelerating the Clean Energy Transition Builds Resilience Against Future Price Shocks*.

[9] Ember (2025), *Africa's solar imports surge 60%, giving the first evidence of a take-off in solar in Africa*.

Solar deployment continues to rise as costs fall – a self-reinforcing cycle



Note: Manufacturing capacity refers to solar crystalline silicon module manufacturing capacity, split between China and global (including China). Costs are module element of benchmark capex for a typical fixed-axis utility-scale PV project. CAPEX = capital expenditure. Source: IEA (Various), *IEA World Energy Outlook*; BNEF (2025), *Global Installed Capacity*; BNEF (March 2025), *Solar Modules Are Cheap and Will Become Even Cheaper*; BNEF (2026), *Solar Manufacturing Assets*

Figure 2, Source: ETC (2026), Energy Transition Monitor 2026

C) Manufacturing capacity is not a bottleneck

Global manufacturing capacity has expanded even faster than deployment: current annual installations are around 700 GW while China alone now has more than 1,000 GW of annual solar manufacturing capacity, with total global manufacturing capacity exceeding 1,400 GW.[10]

Decarbonisation is faster than once thought possible

Falling costs, speedy deployment and spare manufacturing capacity allow the world to decarbonise electricity supply much faster and at lower cost than was foreseen in 2008, paving the way to faster electrification of end uses. Electrification of demand is now also inevitable and more productive. Electric technologies provide the same services with far less energy input than fossil:[11]

- **Electric vehicle**s convert around 85% to 90% of the electricity they receive into motion, compared with around 25% to 30% for an internal combustion engine.
- **Heat pumps** can deliver three to four units of heat for each unit of electricity consumed, compared with efficiencies of around 90% for the best gas boilers.
- **Induction cookers** typically convert around 80% to 90% of their energy into useful heat, compared with around 30% to 40% for gas cookers.
- **Electric industrial equipment** can often provide heat and mechanical power more precisely and efficiently than fossil fuel alternatives.[12]

[10] BNEF (2026), *Global Installed Capacity*; BNEF (2026), *Solar Manufacturing Assets*.

[11] ETC (2025), Energy productivity: Increasing efficiency in an expanded, electrified energy system.

[12] ETC & Mission Possible Partnership (2026), *Harnessing Energy Productivity for Industrial Competitiveness in a Low Carbon World*

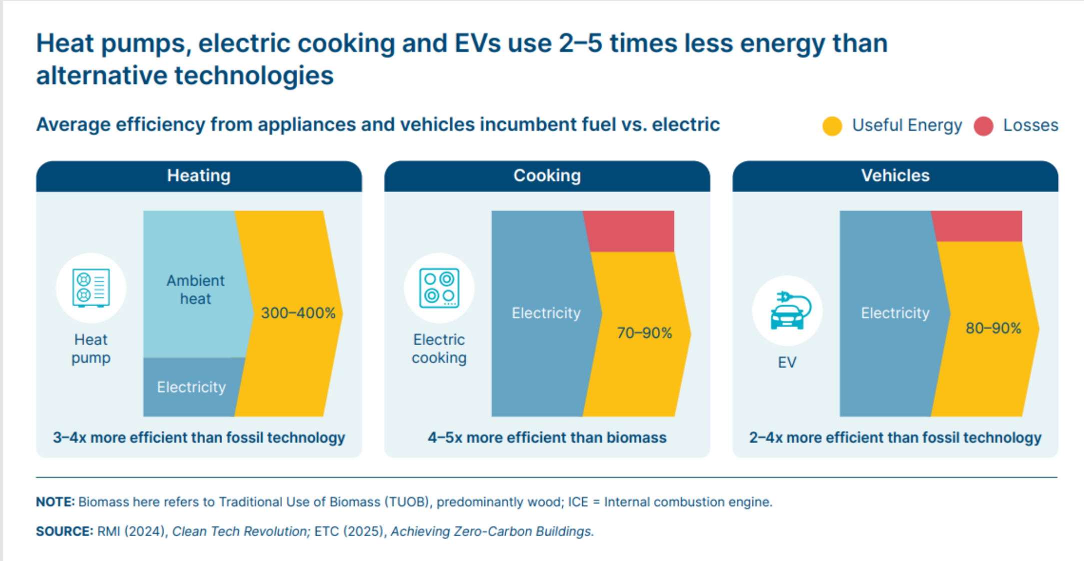


Figure 3, Source: ETC (2025), Energy Productivity: Unlocking Growth and Savings

I personally hope that major cities will invest in public transport, pedestrian and cycling facilities which reduce our reliance on cars, but even if they do that, global road transport kms travelled could increase 70% by 2050. Air travel will probably increase by at least 150% percent, so too will the demand for cooling, while heated floor area could increase by a smaller but still significant 25%.[13]

But given the inherent efficiency advantage of electricity, and the potential to subsequently improve still further the efficiency of electrical equipment, these increases in energy-based services by 2050 could be met while reducing final energy demand 25% below today's level, with electricity use growing to meet as much as 60% or 70% of final energy demand [Figure 4].[14]

[13] ETC (2025), Energy productivity: Increasing efficiency in an expanded, electrified energy system.
[14] Ibid.

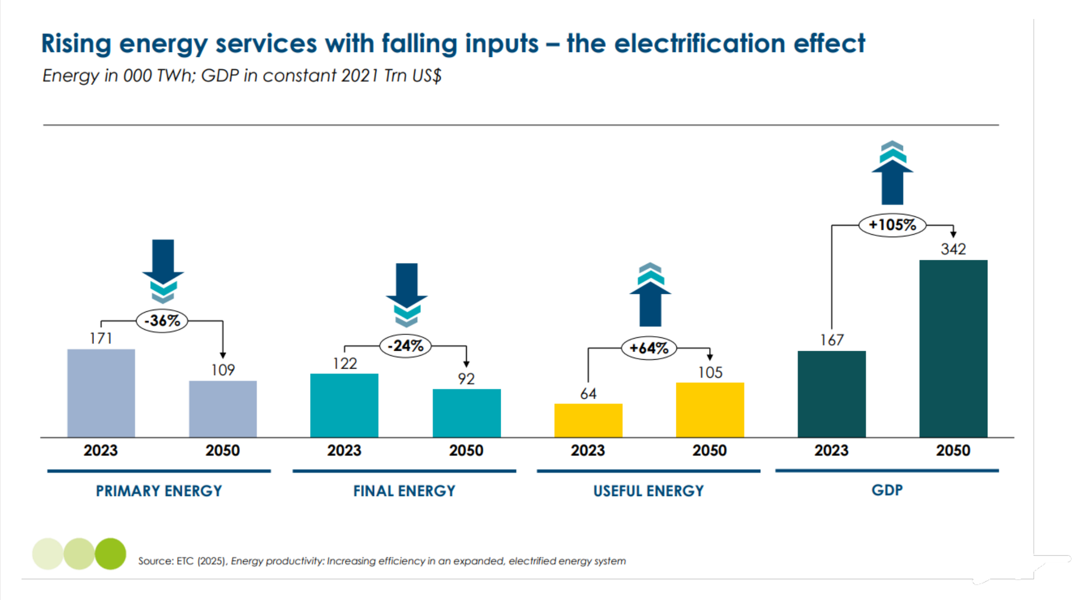


Figure 4, Source: ETC (2025), Energy Productivity: Unlocking Growth and Savings

> In 2025, clean sources provided more than the entire increase in global electricity demand.

It has become clear that clean power dominance is inevitable. In 2025, clean sources provided more than the entire increase in global electricity demand. This allowed fossil-fired generation to decline outside an economic crisis for the first time in over a decade.

A fundamental shift in the energy transition is happening right now: no longer is the challenge on whether clean technologies work but on how to build grids, storage, financing systems, and policy and market frameworks required to deploy them fast enough.

3. Electricity technologies will keep getting more competitive

The learning curves associated with electricity-based technologies make them continuously more competitive, while that of fossil-based technologies lag behind.

Clean electrification benefits from progress across five core technologies: (1) **Power electronics**, which convert and control the most efficient flow of electricity; (2) **Solar PV**; (3) **Batteries**; (4) **Embedded computing**, which automatically monitor, optimise and respond to changing conditions in power usage; and (5) **Electric motors** — used widely in electric vehicles, wind turbines and manufacturing processes as well as increasingly small devices like drones.

Together, these technologies reinforce one another, driving continuous improvements in performance while reducing costs. Deployment of all of these technologies is increasing, amplifying this effect. Together, these technologies have fallen in cost by around 99% since 1990, equivalent to an average annual reduction of 12.6%.[15] Innovation across these components also enables new electronic applications such as robotics.

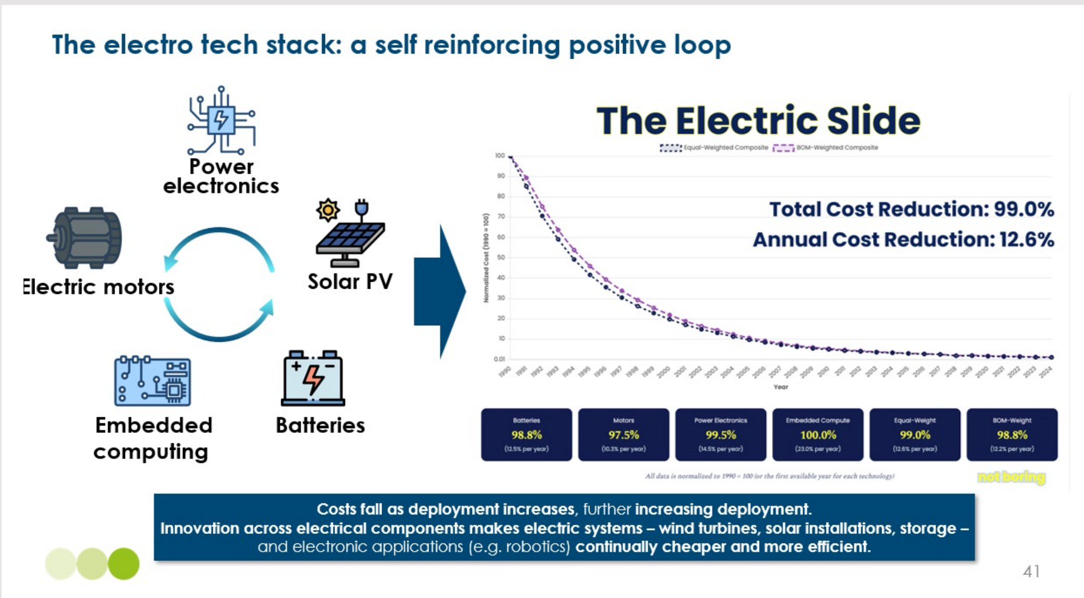


Figure 5, Source: ETC based on Packy McCormick (2025), *The Electric Slide*

Further progress is likely for two reasons:

- Advances in materials science will continue to improve performance and reduce costs, with AI likely to accelerate innovation.
- Progress in one technology supports progress in others, creating reinforcing cycles of innovation, deployment and cost reduction across the stack.

[15] Packy McCormick (2025), *The Electric Slide*.

Electric technologies improve faster than molecule-based technologies

The fastest cost reductions occur in technologies that can be standardised, mass manufactured and deployed at scale, e.g. solar PV. By contrast, molecule-based technologies that require some level of bespoke engineering, e.g. fossil fuels, carbon capture, etc., tend to have slower and less certain learning rates, and their costs remain broadly flat as a result. For instance, since 1990 and after more than three decades of engineering innovation, the efficiency of the world's best combined-cycle gas plants has increased from around 50% to over 64%, and this major period of cost reduction saw real costs per kW fall by around 35% during the 1990s, with little room to substantially increase further.[16] Over the same period, record crystalline-silicon solar-cell efficiency has increased from around 23% to almost 28%, while real costs per W for solar PV module costs have fell by around 99%, with learning curves predicting further decreases.[17]

This is why future decarbonisation pathways will likely prioritise technologies with the greatest potential for sustained cost reduction, with renewable and electricity-based systems becoming more competitive against fossil fuels each year.

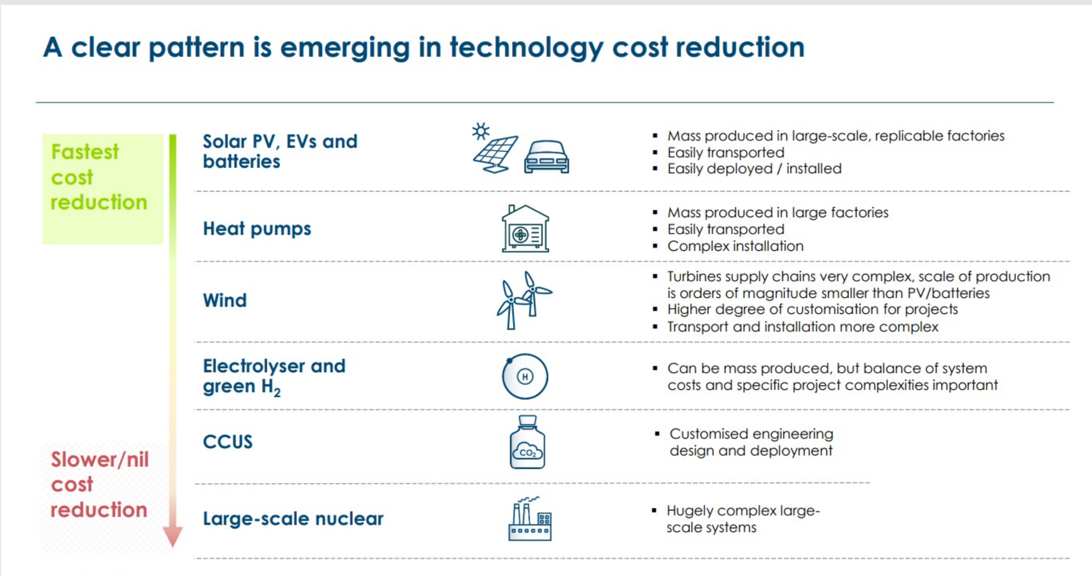


Figure 6, Source: Adair Turner LSE Lecture Series 2026, Lecture 1

> Future decarbonisation pathways will likely prioritise technologies with the greatest potential for sustained cost reduction, with renewable and electricity-based systems becoming more competitive against fossil fuels each year.

[16] UK Department of Energy (1991), Thermal Efficiency; Siemens Energy (2026), SGT5/6-9000HL Heavy Duty Gas Turbine; Colpier and Cornland (2002), *The economics of the combined cycle gas turbine—an experience curve analysis*

[17] NREL (2025), *Best Research-Cell Efficiency Chart*; Nemet (2009); Farmer and Lafond (2016), via Our World in Data.

4. Electrification is necessary but not sufficient

Despite technological progress, the world remains on course for dangerous levels of warming. The 2015 Paris Agreement recognised the need to hold warming well below 2°C and pursue efforts to limit it to 1.5°C to avoid catastrophic environmental effects that would deeply affect human living standards.

Under current and stated policy pathways, drawn by the International Energy Agency (IEA), the world is heading towards 2°C to 3°C of warming. Such level of warming would create severe and potentially irreversible environmental and economic impacts.

Clean electrification, at its full potential, can potentially eliminate more than half of annual GHG emissions, but additional action will be required to keep warming levels within Paris' threshold. Electrification must therefore be accelerated, but it cannot be the only strategy.

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Direct electrification can eliminate around 60% of emissions

Global emissions fall into three broad categories:

- **Around 30 GtCO_2eq, or 60%, comes from sectors that can be directly electrified**, including buildings, road transport and low-temperature industrial heat. The required technologies are generally well understood and can often reduce both emissions and costs.
- **Around 10 GtCO_2eq comes from hard-to-electrify sectors**, including aviation, shipping, steel, cement and chemicals. These sectors require hydrogen, sustainable biofuels, carbon capture or other low-carbon molecules and processes, often at a 'green' cost premium.
- **Around 10 GtCO_2eq comes from agriculture and land use**, where emissions are largely unrelated to energy consumption. Mitigation requires changes in farming practices, diets, land management and biological processes, with no single dominant technology solution.

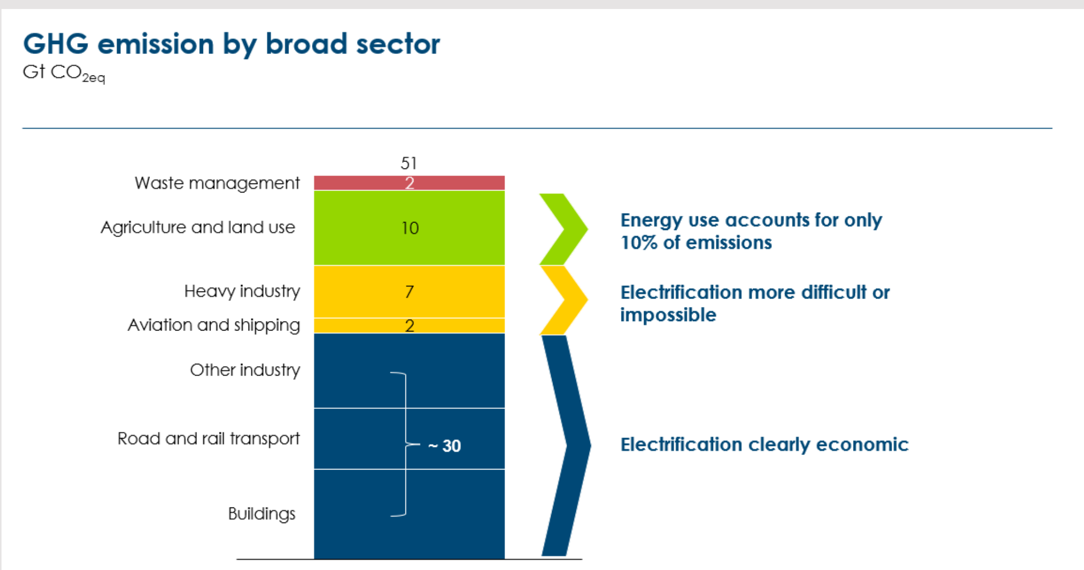


Figure 7, Source: Adair Turner LSE Lecture Series 2026, Lecture 1

Hard-to-electrify sectors can be decarbonized but will incur higher costs

For attaining the objectives of the Paris Agreement, the hard-to-electrify sector will need to be decarbonised. The technologies for doing so already exist:

- **Sustainable aviation fuels** can replace fossil jet fuel in aviation.
- **Hydrogen-based direct reduced iron furnaces** can produce near-zero-carbon steel.
- **Green ammonia and methanol** can reduce emissions from long-distance shipping and plastics production.
- **Carbon capture storage and utilisation** can address process emissions from cement and some chemical production.

However, because of the elevated costs of these technologies, it is a harder task to coordinate sufficient demand, investment and policy to deploy these solutions at commercial scale. Low-carbon production can significantly increase the cost of basic materials. But those materials often account for only a small share of the final cost of consumer products.

> Low-carbon production can significantly increase the cost of basic materials. But those materials often account for only a small share of the final cost of consumer products.

A decarbonised 'green' bar of iron could cost around 75% more than traditional iron; resulting in decarbonised 'green' steel costing around 45% more. Yet these materials represent only a small share of the total cost of a car. A car made entirely of decarbonised steel would have a cost increase of only 1.2%.[18]

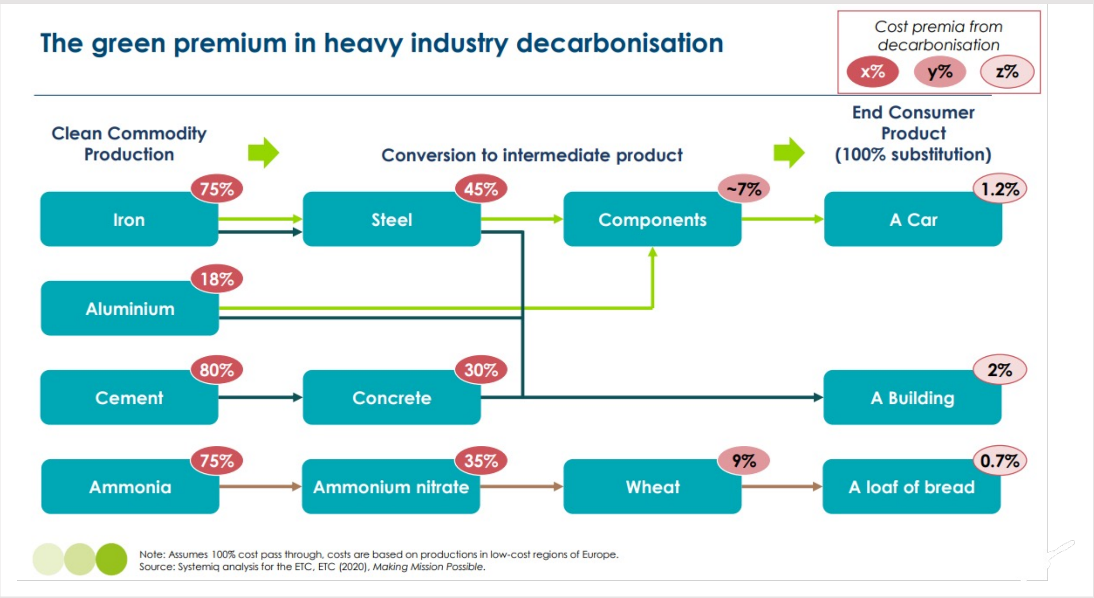


Figure 8, Source: Adair Turner LSE Lecture Series 2026, Lecture 1

[18] ETC (2020), Making Mission Possible.

Policy requirements to close the green premium and most recent developments

Producers will not adopt higher-cost clean processes at scale if there is no levelling of the playing field against incumbent technologies.

Effective policy must therefore show the direction of travelling by:

- Creating strong and stable carbon pricing, aligning measures across domestic and imported carbon.
- Protecting low-carbon producers against carbon leakage.
- Establishing product standards or mandates that create demand for clean commodities.

Within the global pipeline of over 1,000 announced clean industry projects, to date, only 84 are in operation, whilst 77 have reached FID.[19] Governments must provide incentives and create markets in which technically feasible low-carbon products can compete.

Europe has operated a strong emissions trading system for two decades, applicable to all emissions-intensive sectors. The introduction of the EU Carbon Border Adjustment Mechanism (CBAM) in 2026 extends a comparable carbon cost to imports of products such as steel, aluminium and cement, reducing the risk that European production is displaced by higher-emissions imports not subject to carbon pricing. But its impact may also extend beyond the European market.[20] China and India have both created and expanded national emissions trading systems, with the EU CBAM a contributing factor for domestic decarbonisation of industry.[21]

In aviation and shipping, international fuel mandates provide the most important demand signal that could unlock final investment decision of low-carbon fuel production. The International Civil Aviation Organisation (ICAO) has established a collective ambition to reduce international aviation emissions by 5% by 2030 through cleaner aviation energy, but this remains an aspirational global target rather than a binding fuel mandate.[22] The International Maritime Organisation (IMO) is considering a strong decarbonisation framework for shipping, combining mandatory reductions in the greenhouse-gas intensity of marine fuels with a pricing mechanism. Formal adoption was delayed in 2025, and negotiations are continuing through 2026.[23]

EU ETS CBAM, ICAO and IMO showcase the importance of initial demand signals driven by greater international cooperation, but it is ultimately the longevity of such actions that will accelerate action for decarbonising the hard-to-electrify sectors.

[19] MPP (2026), *Global Project Tracker*

[20] European Commission (2026), *CBAM definitive regime*.

[21] Government of China (2025), *Guideline to advance low-carbon transition and strengthen the national carbon trading market*; Government of India (2025), *Carbon Pricing in India: Market Mechanisms for Climate Leadership*.

[22] ICAO (2023), *ICAO Global Framework for SAF, LCAF and other Aviation Cleaner Energies*.

[23] IMO (2026), *IMO Net-Zero Framework*.

5. Geography, economics and politics will shape an uneven transition

Geography, access to finance and political choices will shape where clean energy and industry develop the fastest, producing a transition that is inherently uneven.

Geography will reshape industrial advantage

Section 2 established the vast cost decreases in renewable energy that have taken place in recent years, the largest of these being reductions to solar and battery costs. This has created a world where the solar + battery combination is going to be the cheapest way to produce round-the-clock renewable electricity in most of what we label the global sunbelt, where the main renewable resource will be solar and the main balancing challenge from day to night [Figure 9]. (Though it is worth noting that the most favourably placed regions are those blessed with both abundant solar and wind resources such as North Africa, Chile and Australia).

> The solar + battery combination is going to be the cheapest way to produce round-the-clock renewable electricity in most of what we label the global sunbelt.

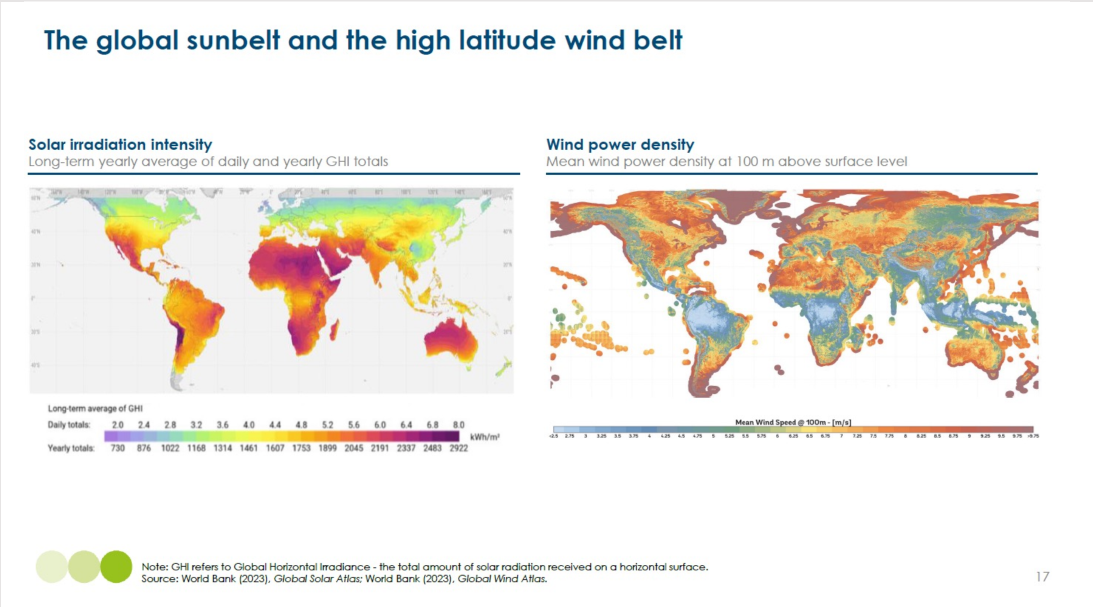


Figure 9, Source: Adair Turner LSE Lecture Series 2026, Lecture 1

In the high latitude windbelt, where our main renewable resource will be wind and the system balance need is seasonal, the challenges are more difficult, and a wider array of storage and flexibility technologies will have to be deployed. But recent ETC analysis still shows that in almost all climatic regions, the future total system cost of power systems which derive the vast majority of their power from intermittent renewables will be lower than the price of electricity today, and particularly so in both China and in global sunbelt countries such as India [Figure 10].[24]

[24] ETC (2025), *Power Systems Transformation: Delivering Competitive, Resilient Electricity in High-Renewable Systems.*

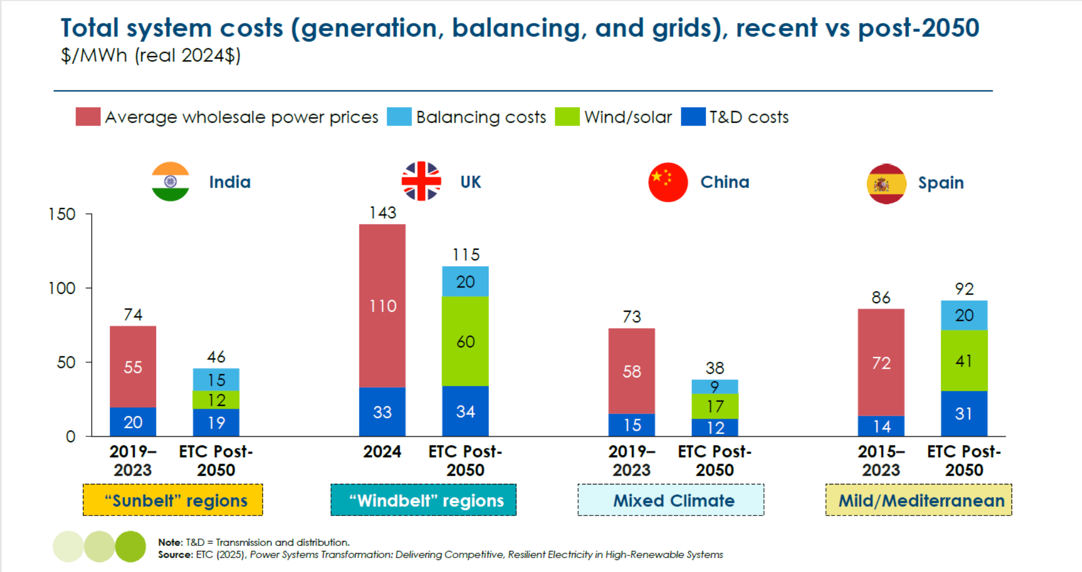


Figure 10, Source: Adair Turner LSE Lecture Series 2026, Lecture 1

Recent auctions point in the same direction. India in 2025 awarded round-the-clock clean power contracts covering around 75% to 85% of hours, at approximately US$49/MWh (CA$68/MWh).[25] While the United Kingdom's 2026 seventh auction round awarded offshore wind contracts at around US$125/MWh (CA$173/MWh), indexed to inflation and covering only the hours when projects generate.[26]

The ability to generate cheap electricity has major implications for clean industry, where electricity is a major share of production costs, which leaves countries in the global sunbelt facing a major opportunity: by building power systems around abundant, low-cost solar generation, they can attract clean industrial production.

> The ability to generate cheap electricity has major implications for clean industry, where electricity is a major share of production costs

Early evidence is already emerging, as Mission Possible Partnership's Global Project Tracker shows a growing share of the next generation of clean industrial projects developing in a new industrial sunbelt.[27] Countries outside of the sunbelt will have higher reliance on more expensive wind and nuclear energy for clean industry, though areas with ample amounts of hydro such as Sweden, Quebec and Manitoba could still remain very competitive.

While geography is very important, the key benefits depend on finance to unlock deployment at pace.

Finance will determine how quickly countries seize the opportunity

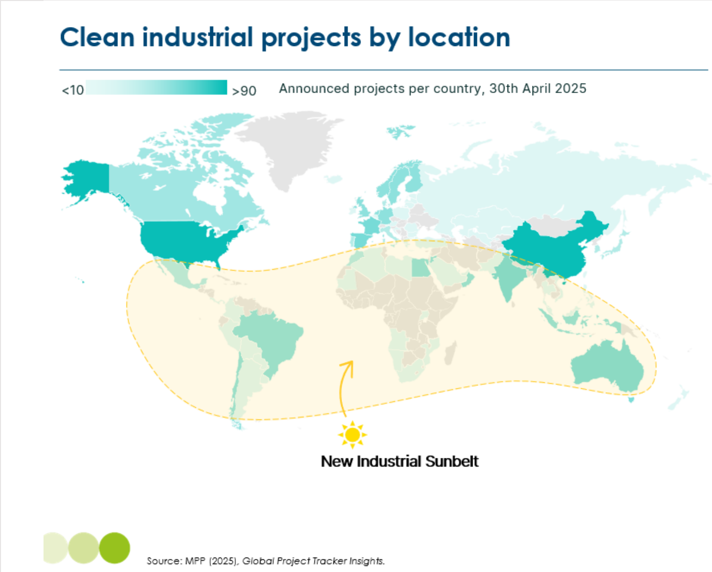
Renewable technologies require most of their investment upfront and have very low operating costs, making their competitiveness particularly sensitive to the cost of capital. For example, increasing the cost of capital from ~4% to ~17% can more than double the cost of solar electricity — from around $0.06/kWh to over $0.13/kWh — even using identical technology.[28]

[25] MERCOM (2025), *Renewable Power Auction*.

[26] UK Department for Energy Security and Net Zero (2025), *Contracts for Difference (CfD) Allocation Round 7: results*.

[27] Mission Possible Partnership (2026), *Global Project Tracker*.

[28] Ovewo *et al.* (2022), *The impact of financing costs on the levelised cost of electricity from solar PV*. Modelling using identical technology and cost assumptions shows that increasing WACC from around 4% to 17% can more than double solar PV LCOE, from approximately $0.06/kWh to over $0.13/kWh.



Total and announced projects
Top 20 countries, by total project count

EMDE country in the new industrial sunbelt
Non-EMDE country in the new industrial sunbelt

Country	Announced	Total*
China	96	142
United States	92	108
Australia	46	48
India	36	41
Canada	25	39
France	34	36
Spain	28	32
Norway	19	27
Egypt	25	25
Brazil	19	23
Sweden	19	22
Germany	18	21
Chile	21	21
Oman	15	17
Jordan	14	14
Netherlands	11	13
Finland	11	13
United Kingdom	13	13
Indonesia	11	12
Mexico	9	9

Includes projects that are at the announced, reached final investment decision (FID) and operational

Figure 11, Source: Adair Turner LSE Lecture Series 2026, Lecture 2

This particularly disadvantages growth markets exposed to higher financing costs. Political, currency and financial risks can therefore prevent countries with some of the world's best renewable resources from accessing the cheapest electricity. Reducing financing costs can accelerate the transition without requiring further technological breakthroughs.

Politics can accelerate the transition or hold it back

The most recent oil and gas crisis, the closure of the Strait of Hormuz, exposed yet again the vulnerability of a fossil fuel-based energy system. Importing countries, which hold two-thirds of the global population (including Japan, India and Türkiye),[29] face two broad choices against supply shortages and price spikes:

- Diversify fossil fuel imports and remain exposed to future supply and price shocks.
- Invest in domestic clean electrification once and reduce the need to import equivalent fuel for decades.

> The most recent oil and gas crisis, the closure of the Strait of Hormuz exposed yet again the vulnerability of a fossil fuel-based energy system.

This crisis has strengthened interest in clean technology imports and new domestic energy strategies in several markets. Since the start of the crisis, 50 countries hit record highs for solar imports, with India, Kenya and Ethiopia solar imports up 140%, 200% and 390% in March compared to the previous year.[30] But it has also encouraged greater domestic coal use in parts of Asia, at least temporarily. Energy shocks can therefore accelerate or delay the transition, depending on how governments respond.

Recent ETC analysis showed that the entirety of oil and gas supply through the Strait of Hormuz could be replaced by 2035 by accelerating progress in: Deploying renewable energy, scaling up electric vehicle adoption, electrification of heating and cooking, creating sustainable fuels and fertilisers, and increasing energy productivity.[31]

29 Ember (2026), *The energy security fallout: from fossil fuel fragility to electric independence*.
30 Ibid.
31 ETC (2026), *Lessons on Energy Security after the Hormuz Crisis*.

6. The role of China in the energy transition and global competition

China has emerged as the clean technology leader. Its immense manufacturing capacity is both accelerating the global energy transition and creating new challenges around industrial competitiveness.

China leads the global transition and clean energy manufacturing

China accounts for over half of global solar PV installations and has driven the rapid expansion of global solar deployment.[32] The country is also responsible for over 60% of global EV sales and is electrifying its economy significantly faster than Europe and the United States.[33]

Between November 2025 and April 2026, China accounted for more than 60% of new clean industry final investment decisions; the country has now 43 clean industrial projects at FID stage and 30 already in operation.[34] As from 2026, CBAM under EU ETS is expected to further push clean industry developments in China — since China's current carbon price, at US$11 (CA$15) per tonne positions fall far below the US$80 (C$111) per tonne in the EU that China is now exposed to, creating an incentive to decarbonise industry for export.

China's scale has delivered major global benefits. Larger markets, integrated supply chains and intense competition have pushed costs down, making clean technologies more affordable across the world but has also created a situation where some cleantech industries are dominated by Chinese production:

- Chinese manufacturing dominates global capacity across the technologies underpinning the clean energy transition, leading cost reductions in wind turbines, batteries and electric vehicles, where costs of Chinese technology is cheaper than anywhere else in the world. Across industries, Chinese suppliers provide around 45% of the plant equipment used by clean industrial projects outside China that have reached FID.[35]
- Critical-mineral processing is also heavily dominated by China. In the IEA's World Energy Outlook 2025, China is the dominant refiner for 19 of 20 energy-related strategic minerals, with an average market share of around 70%. These materials are essential not only for batteries, grids and electric vehicles, but also for semiconductors, aerospace and defence.[36]

China sustained industrial strategy toward clean technologies has contributed to a substantial trade surplus, currently at around US$1.2 trillion (CA$1.7 trillion).[37] Beyond extensive spare capacity to manufacture many of the clean technologies the world needs, the large current account surplus creates pressure to export capital as well as manufactured goods. This is an opportunity to provide better financing conditions to growth markets where deployment is constrained by limited domestic finance.

[32] IEA PVPS (2026), *Snapshot of Global PV Markets 2026*.
[33] IEA (2026), *Global EV Outlook 2026*.
[34] Mission Possible Partnership (2026), *Clean Industry Rising: The Foundation of Resilient Value Chains – Global Project Tracker*.
[35] Ibid.
[36] IEA (2025), *World Energy Outlook 2025*.
[37] FEDS Notes (2026), *China's Trade Dominance and the Role of Industrial Policies*.

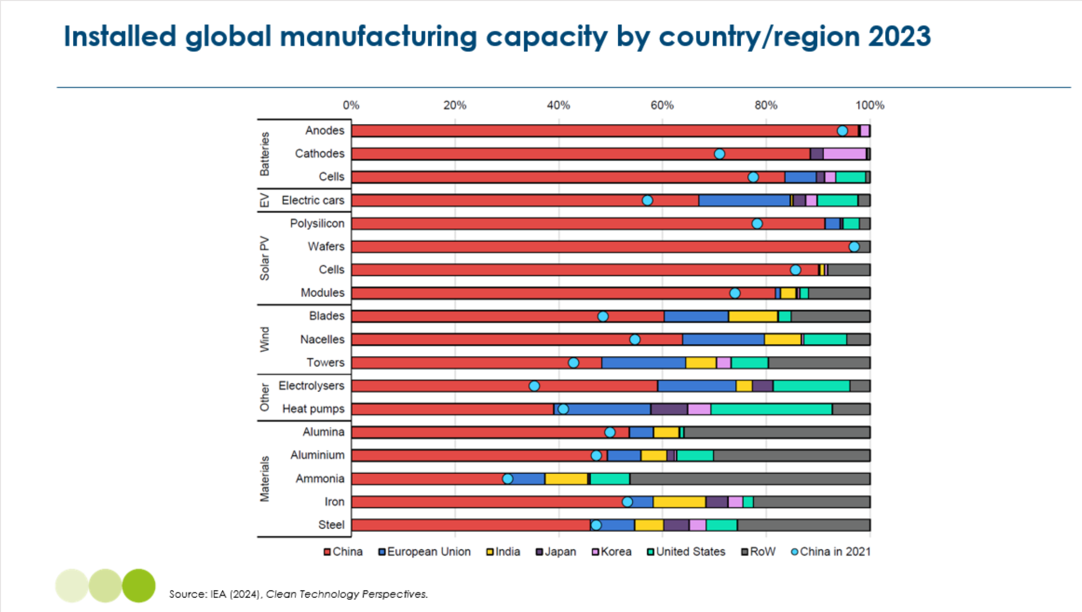


Figure 12, Source: IEA (2024) Clean Technology Perspectives.

Balancing tensions with Chinese power

Large tariffs and other trade restrictions on clean technology imports can significantly increase transition costs. Protecting strategic domestic capabilities may sometimes be justified, but poorly designed measures can raise costs sharply while generating limited additional domestic manufacturing, such as the barriers imposed on Chinese solar products in the United States.

Clean-tech dependence is not the same as fossil-fuel dependence. Fossil fuels must be continuously imported and consumed, whereas critical materials are embedded in long-lived, recyclable assets. Supply disruptions can slow future cleantech deployment but generally do not interrupt energy already being produced.

> Clean-tech dependence is not the same as fossil-fuel dependence.

Governments must balance several competing priorities to avoid over dependency on a single country. In 2025 ETC set out six principles which offer nuanced guidance for policymakers:[38]

1) Aim for diversified supply chains but **not complete autarky**;
2) Think straight about **different dimensions of "security"**;
3) **Vary policy by sector** to reflect different starting points and inherent characteristics;
4) Use **tariffs in a fact-based and WTO compliant** fashion;
5) Focus primarily on the **location of employment and value added**, rather than ownership;
6) Work with China to **increase climate finance flows to lower income countries** to support the accelerated deployment of clean technologies.

A balanced model in which Chinese scale continues to support global decarbonisation, that also allows other countries to build competitive capabilities in selected parts of the clean technology and industrial value chain is therefore essential.

[38] ETC (2025), Global trade in the energy transition: Principles for clean energy supply chains and carbon pricing.

7. The future of fossil fuels is increasingly uncertain

The rise of clean electrification and industry decarbonisation is creating profound uncertainty over future fossil fuel demand. Coal is already entering structural decline, oil is approaching a turning point, and gas future remains the most uncertain of the three.

> The rise of clean electrification and industry decarbonisation is creating profound uncertainty over future fossil fuel demand.

Coal is entering structural decline

Coal demand is expected to fall under today's policies as cheap renewables increasingly undercut the cost of new coal generation — the economic case for building additional coal capacity is therefore weakening rapidly [Figure 13].[39] The central challenge is now accelerating the retirement of existing coal plants, particularly in Asia and substituting its use for industrial heat, and as a reducing agent in iron and steel. Net zero scenarios require a steep and consistent decline, whilst current policies see shallower declines. The pace of decline will depend on policy, financing mechanisms to phase out coal, management of regional employment issues and energy security concerns.

Coal demand trajectories show a decline in both Net Zero and current trends pathways

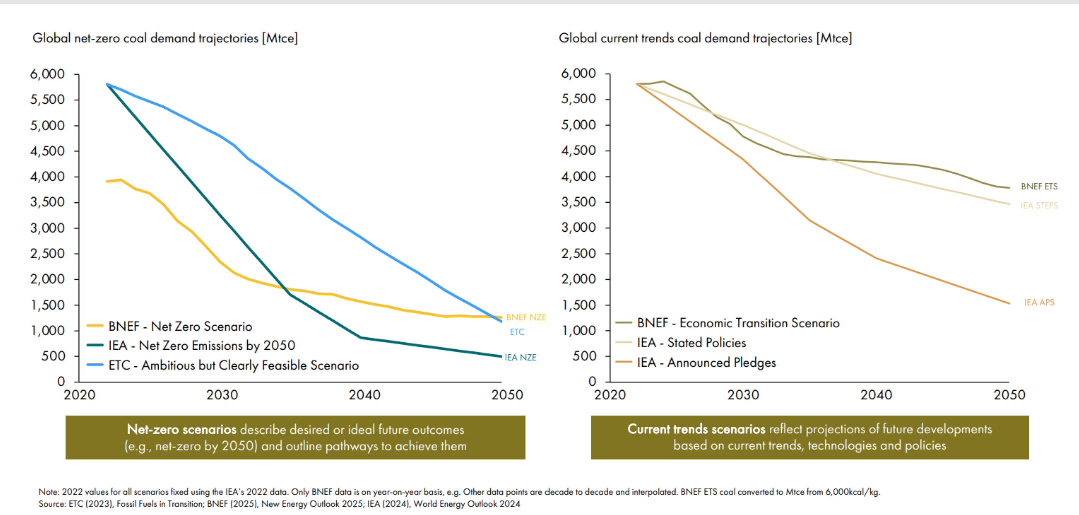


Figure 13, Source: WMBC (2026), *Power Up: How Clean Energy Is Putting Fossil Fuel Demand in Doubt*

[39] ETC (2026), Clean Electrification and Fossil Fuel Phase-Down: Building a Resilient Energy Future.

Oil is approaching a turning point

Oil demand is expected to peak around 2030 under current policies, from there scenarios of demand diverge between plateau or the start a steep decline [Figure 14][40]

Road transport accounts for ~40% of all oil demand.[41] A passenger EV fleet of over 300 million, roughly one-fifth of the global car fleet and in line with IEA scenarios, could displace more than 5 mb/d of oil by 2030, compared to the 1 mb/d displaced by EVs today.[42] Global electric vehicle sales have increased from around 0.5 million in 2015 to more than 17 million annually, and the trend is accelerating faster in growing markets than in advanced economies.[43] Continued improvements in battery cost, range and charging infrastructure will strengthen this trend, and expand it beyond passengers cars.

Oil demand trajectories show decline or plateau, depending on assumptions

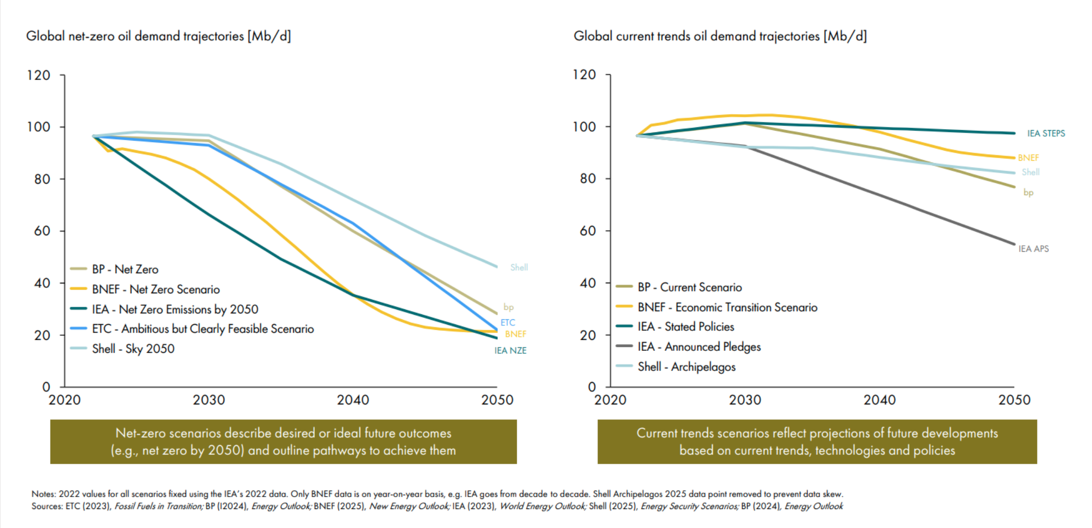


Figure 14, Source: WMBC (2026), *Power Up: How Clean Energy Is Putting Fossil Fuel Demand in Doubt*

Gas remains the key uncertainty

The future of gas is less clear because it is used across power generation, buildings and industry. Under current policies, global gas demand is expected to reach a plateau by the mid-2030s [Figure 15].[44] Its longer-term trajectory will depend on four developments:

- The speed at which renewable power, grids and storage reduce the role of baseload gas-fired generation;
- The extent to which power systems require gas for flexibility and back-up generation;
- The deployment of heat pumps and other electric heating technologies in buildings and industry.

[40] Ibid.
[41] WMBC (2026), *Power Up: How Clean Energy Is Putting Fossil Fuel Demand in Doubt*. The remaining 60% is made up of Shipping, Aviation, Chemicals, Other industry, Cooking, Heating and Power; other use cases will likely decrease demand at a slower pace than road transport.
[42] IEA (2025), *Global EV Outlook*
[43] ETC (2026), Clean Electrification and Fossil Fuel Phase-Down: Building a Resilient Energy Future.
[44] ETC (2026), Clean Electrification and Fossil Fuel Phase-Down: Building a Resilient Energy Future.

Under the IEA's Stated Policies Scenario, the coming wave of LNG capacity exceeds projected demand by around 65 bcm (2.4 PJ) in 2030, putting downward pressure on LNG prices and creating a risk of production shut-ins if additional demand does not materialise.[45]

Gas could retain an important role for longer than coal or oil, particularly in regions with rapidly growing energy demand. But its future is far from assured and electrification of heating and industrial processes will determine whether use of gas declines or remains resilient.

Gas demand trajectories increase in current trends, but decline under Net Zero assumptions

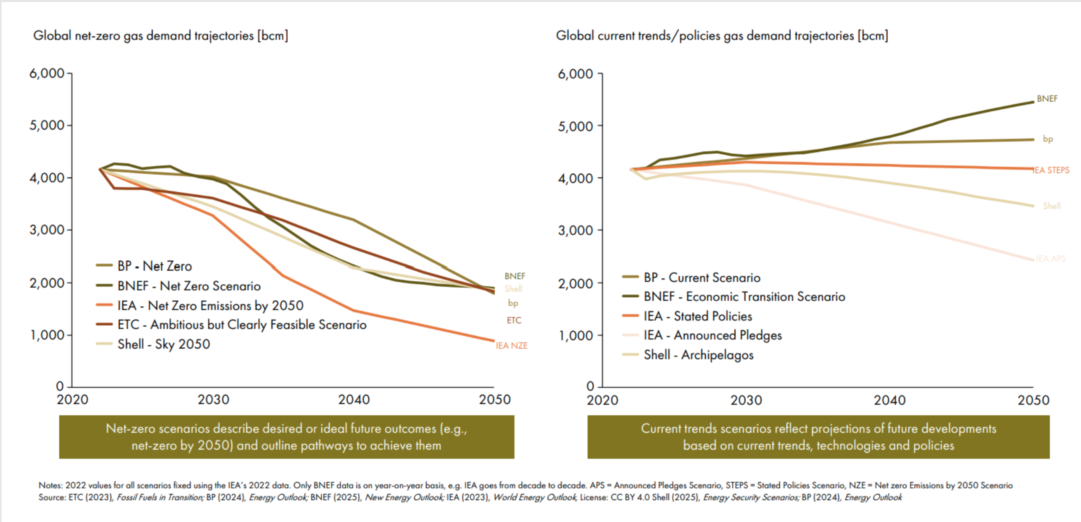


Figure 15, Source: WMBC (2026), *Power Up: How Clean Energy Is Putting Fossil Fuel Demand in Doubt*

Fossil fuel markets face growing transition risk

The timeline of coal, oil and gas differ, but their trajectory is the same: as clean electrification spreads, demand for fossil fuels across major parts of the global economy decreases. Small differences in the speed of electric vehicle adoption, renewable deployment or heat pump uptake could produce large differences in cumulative fossil fuel demand. For fossil producers and investors, the growing risks are overinvestment, stranded assets and declining long-term revenues, raising a fundamental question on how to stay a step ahead and shift towards new sources of prosperity as global energy demand progresses.

[45] IEA (2025), *World Energy Outlook 2025*; IEA (2025), *Gas 2025*. Around 300 bcm/year (11.1 PJ/y) of new LNG export capacity is scheduled to come online by 2030; under STEPS, available LNG supply exceeds demand by around 65 bcm (2.4 PJ) in 2030, putting downward pressure on prices and creating a risk of production shut-ins.

LIST OF ABBREVIATIONS

ABBREVIATION	DEFINITION
bcm	billion cubic meters
CBAM	Carbon Border Adjustment Mechanism
ETS	emissions trading system
EV	electric vehicle
FID	final investment decision
GDP	Gross Domestic Product
GtCO2eq	billion tonnes of CO2 equivalent
GW	gigawatts
ICAO	International Civil Aviation Organisation
IMO	International Maritime Organisation
kW	kilowatt
LCOE	levelized cost of electricity
LSE	London School of Economics
MWh	megawatt-hour
PJ	petajoules
PV	photovoltaic
TWh	terawatt-hour
W	watt
WTO	World Trade Organization