

Electrification and the pathway to 1.5°C

What the latest global climate scenarios tell us
about the role of electricity in final energy



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What the latest global climate scenarios tell us about the role of electricity in final energy

This report assesses the consistency of the COP31 Presidency's proposed global electricity share of around 35% of final energy by 2035 with the current lowest-overshoot pathways. These pathways limit end-of-century warming to 1.5°C after a peak of up to around 1.7°C.

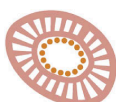
Key messages:

- Electrification is a central component of the energy-system transformation required to keep 1.5°C within reach.
- The latest scenario evidence places electricity at a larger share of final energy than today, and a global share of around 35% by 2035 sits at the median of the current lowest-overshoot pathways.
- The lowest-overshoot pathways point to the importance of both expanding renewable electricity supply and accelerating electrification across transport, buildings and industry.

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Executive summary

On 9 June 2026, at the Bonn Climate Change Conference, the COP31 Presidency launched a global electrification target as a flagship initiative of its Action Agenda, calling for electricity's share of final energy to rise from around 20% today to 35% by 2035.¹ This was formalised on 21 September 2026 as the COP31 '35-by-35 Global Electrification Pledge', launched at UN Headquarters in New York during Climate Week NYC.² This target is consistent with the IEA's 2026 Special Report on Electrification, which finds that 35% by 2035 remains compatible with its Net Zero Emissions by 2050 Scenario.³ Our analysis provides a broader assessment using Integrated Assessment Models and 1.5°C-aligned scenarios, finding that an electricity share of 35% of final energy by 2035 is consistent with the most ambitious climate pathways.

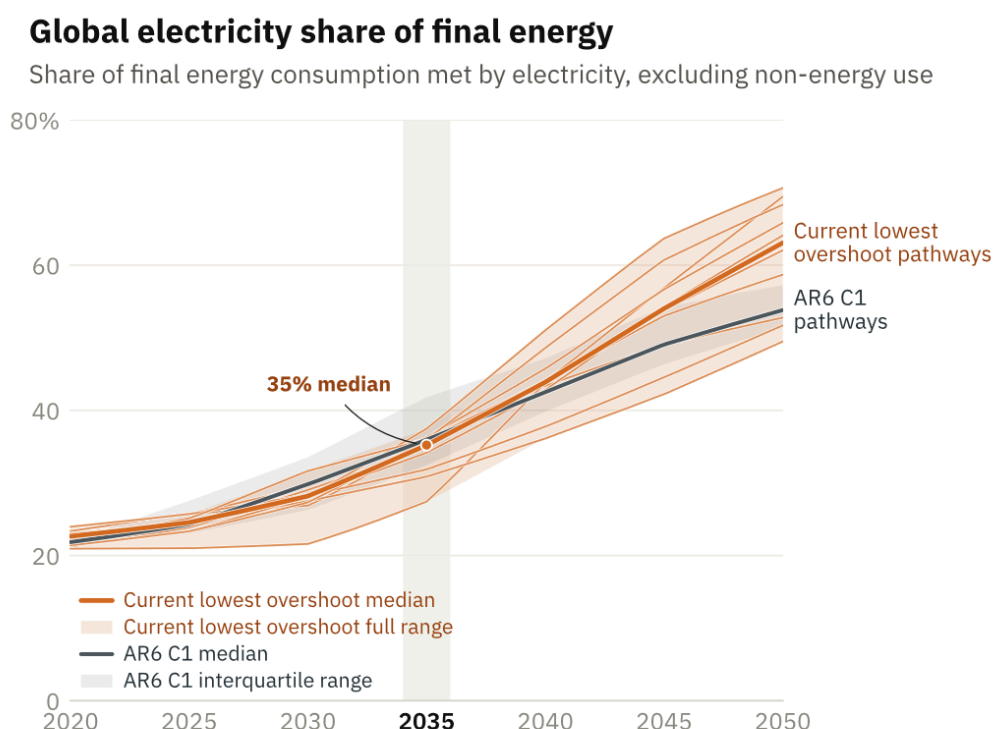


Figure 1 | Electricity's share of global final energy in the current lowest-overshoot pathways and the IPCC AR6 C1 pathways, 2020 to 2050. Electricity as a share of final energy consumption excluding non-energy use. The orange line is the median of the ten current lowest-overshoot pathways, the pale band their full range and the thin lines the pathways themselves; the grey line and band are the median and interquartile range of the 23 IPCC AR6 C1 pathways that report this variable. Sources: ScenarioMIP-CMIP7 (Riahi, van Vuuren et al., 2026); IPCC AR6 Scenarios Database v1.1 (Byers et al., 2022).

Key messages:

1. **Electrification is a core feature of decarbonisation:** IAM pathways that achieve the deepest emissions cuts show a rapid increase in electrification.
2. **The world needs to electrify faster:** In 2025, electricity met around 23% of global final energy demand, excluding non-energy use. The pathways consistent with the most ambitious climate outcomes show faster growth over the next decade and beyond. Electrification expands the share of energy demand that can be met by renewables.

¹ COP31 Presidency. 2026. COP31 Presidency announces '35% by 2035' electrification target. Bonn, 9 June 2026.

² COP31 Presidency. 2026. COP31 35-by-35 Global Electrification Pledge. New York, 21 September 2026.

³ IEA. 2026. *Electrification: Special Report*. Paris.

3. **35% by 2035 sits within the modelled pathway evidence (Figure 1):** across the current lowest-overshoot pathways, electricity's share of global final energy rises from around 23% in 2025 to a median of 28% by 2030 and 35% by 2035. The previous generation of highest-ambition scenarios assessed in AR6 gives a similar result, with a median of 36% in 2035, so the finding does not depend on the latest pathways alone.
4. **Electrification is one part of a broader transition:** in these pathways, higher electrification occurs alongside rapid clean electricity deployment and declining fossil fuel use. The 35% benchmark is therefore one indicator of a broader package of transition outcomes.

State of play for 1.5°C pathways

The Paris Agreement commits countries to hold the increase in global average temperature to well below 2°C, and to pursue efforts to limit it to 1.5°C (Article 2.1a).⁴ At COP30, countries reiterated their resolve to pursue efforts to limit the temperature increase to 1.5°C and to limit both the magnitude and duration of any temperature overshoot.⁵ In July 2025, the International Court of Justice's advisory opinion on climate change confirmed that the 1.5°C warming level is the primary temperature goal of the Paris Agreement.⁶

Progress against 1.5°C is assessed in terms of long-term warming levels, so a single year above 1.5°C does not mean the global goal has been breached. Many pathways assessed as consistent with the Paris Agreement temporarily exceed 1.5°C before temperatures decline again. This is what is meant by overshoot: a temporary exceedance of a given warming level, followed by a return to or below it. Parties have clarified their intent to still achieve 1.5°C after a temporary overshoot in the Global Mutirão Decision.⁷

Since the IPCC's Working Group III contribution to the Sixth Assessment Report (AR6) was published in 2022, global temperatures have continued to rise. Annual warming reached about 1.55°C above the 1850–1900 baseline in 2024. The World Meteorological Organization gives a 75% chance that the 2026 to 2030 five-year average will exceed 1.5°C, and the 20-year average will most likely be crossed (but confirmed only retrospectively).⁸ The remaining carbon budget for a 50% chance of holding warming to 1.5°C has fallen to around 130 GtCO₂ from the start of 2026. This is roughly three years of emissions at current rates.⁹ Once the budget is exceeded, returning below 1.5°C requires net-negative CO₂ emissions later this century. Given uncertainty in the feasibility and scale of negative-emissions technologies, readily-available technologies that support electrification and renewably-sourced electricity are critical to minimise the scale and duration of overshoot.

Emissions have also remained higher than assumed in many modelled 1.5°C pathways in AR6, particularly relative to the most stringent mitigation category (C1), which assumed that global emissions would begin falling from around 2020.¹⁰ That decline in emissions did not happen, so these pathways can no longer be followed as modelled, and limiting warming to 1.5°C with no or limited overshoot (in the IPCC's technical definition of that category) is now widely considered out of reach.¹¹

⁴ UNFCCC. 2015. Paris Agreement, Article 2.1(a). Bonn.

⁵ UNFCCC. 2025. Global Mutirão: uniting humanity in a global mobilization against climate change. Decision of the CMA at its seventh session, Belém, 22 November 2025, paragraph 7.

⁶ ICJ (International Court of Justice). 2025. Obligations of States in Respect of Climate Change, Advisory Opinion of 23 July 2025. The Hague. Paragraph 224.

⁷ UNFCCC. 2025. Global Mutirão: uniting humanity in a global mobilization against climate change. Decision of the CMA at its seventh session, Belém, 22 November 2025, paragraph 7.

⁸ WMO. 2025. *State of the Global Climate 2024*. WMO-No. 1368. Geneva; WMO. 2026. *WMO Global Annual to Decadal Climate Update 2026–2030*. Geneva; Bevacqua E et al. 2025. A year above 1.5°C signals that Earth is most probably within the 20-year period that will reach the Paris Agreement limit. *Nature Climate Change*.

⁹ Forster PM, et al. 2026. Indicators of Global Climate Change 2025: annual update of key indicators of the state of the climate system and human influence. *Earth System Science Data* 18: 3889–3933; IPCC. 2021. *Climate Change 2021: The Physical Science Basis. Summary for Policymakers, Table SPM.2*. Cambridge University Press.

¹⁰ IPCC. 2022. *Climate Change 2022: Mitigation of Climate Change. Working Group III contribution to the Sixth Assessment Report, Summary for Policymakers, Table SPM.2 (category C1)*. Cambridge University Press.

¹¹ Riahi K, Clarke L, Hasegawa T, Huppmann D, Kriegler E, Luderer G, Rogelj J et al. 2026. Mitigation benchmarks from the 2025 community update of global emissions pathways. *Research Square* (preprint).

Updated modelling is therefore focused on more recent pathways developed through ScenarioMIP for the seventh phase of the Coupled Model Intercomparison Project (CMIP7), which reflect emissions trends to 2025. The very low pathways from CMIP7 scenarios peak at around 1.7°C in the 2040s before returning to 1.5°C by 2100 (Figure 2).¹² We refer to these as the 'lowest-overshoot pathways' (see Appendix A1 for a detailed discussion of CMIP, ScenarioMIP, and AR6). A consistent finding across both AR6 and the more recent pathways is the role of electrification in reducing emissions across the economy, which is the focus of this report.

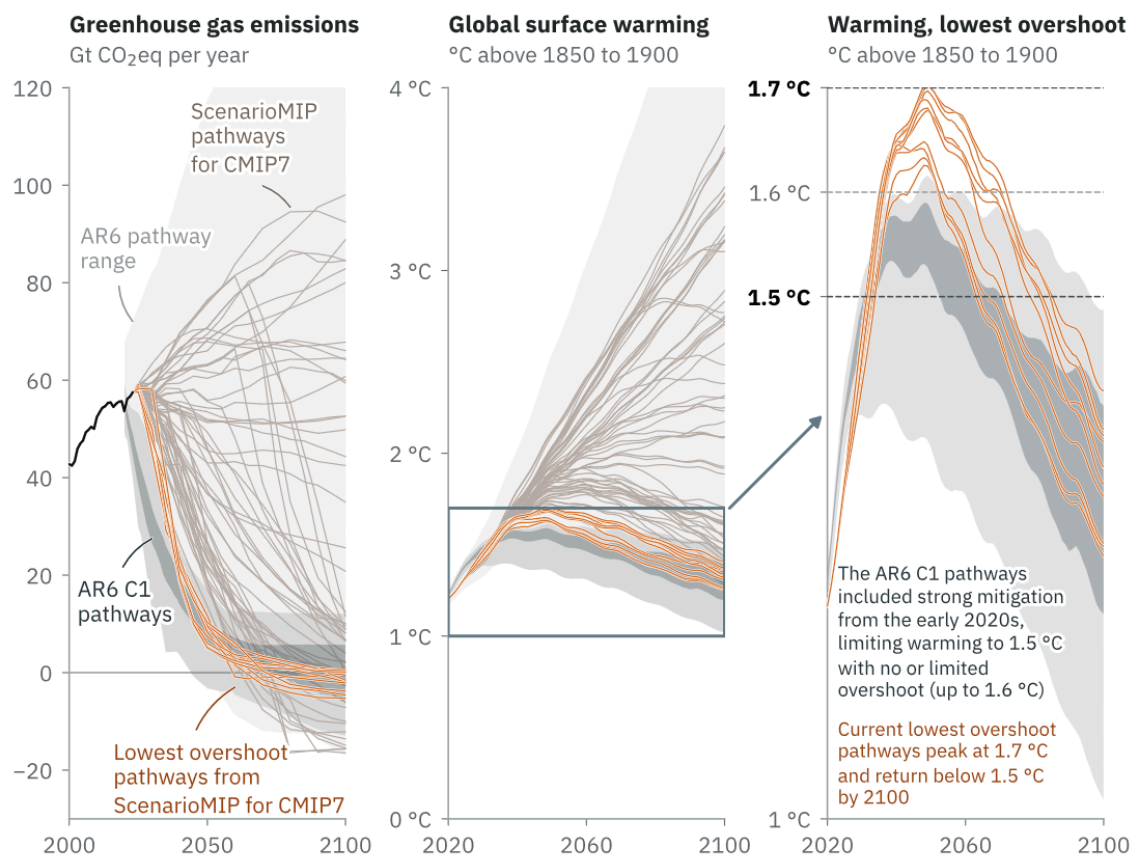


Figure 2 | The ten current lowest-overshoot pathways within the full ScenarioMIP-CMIP7 ensemble and against the IPCC AR6 pathways: greenhouse gas emissions (left) and global surface warming (centre), with the warming panel enlarged for the 1 to 1.7°C band (right). The ten orange lowest-overshoot pathways are shown within the full 68-pathway ScenarioMIP-CMIP7 ensemble, selected for median peak warming of 1.7°C or below and 1.5°C or below in 2100. The faint grey band is the full range of the 1,202 AR6 scenarios with a climate category (C1 to C8); the darker grey bands are the interquartile range (dark grey) and full range (medium grey) of the 97 AR6 C1 pathways. Emissions are the harmonised Kyoto-gas totals (AR6 GWP100) each climate assessment was run on; ScenarioMIP series begin at the 2023 harmonisation year, and the black line is the historical total they were harmonised to (2000 to 2023). Warming is the median MAGICC global surface air temperature above 1850 to 1900; dashed lines mark 1.5, 1.6 and 1.7°C. Sources: ScenarioMIP-CMIP7 (Riahi, van Vuuren et al., 2026); IPCC AR6 Scenarios Database v1.1 (Byers et al., 2022); Nicholls et al. (2025), CMIP7 ScenarioMIP historical timeseries for harmonisation; Climate Resource (2026); author calculations.

¹² van Vuuren D, et al. 2026. The Scenario Model Intercomparison Project for CMIP7 (ScenarioMIP-CMIP7). Geoscientific Model Development 19: 2627–2656; pathway data: Riahi K, van Vuuren D, et al. 2026. ScenarioMIP pathways for CMIP7. IIASA.

Why electrification matters for 1.5°C

The energy system must transform rapidly

Under current policies, warming is projected to reach a central estimate of 2.8°C by 2100 (2.3 to 2.5°C if the latest NDCs are fully implemented).¹³ As energy supply and use account for the majority of global greenhouse gas emissions, closing the gap to 1.5°C requires transformation of the global energy system.

The latest generation of ‘lowest-overshoot’ pathways are characterised by:

- rapid expansion of renewable electricity capacity to lower the emissions intensity of electricity supply;
- faster electrification of end uses across transport, buildings and industry, to expand the share of energy demand that can be met by clean supply; and
- a rapid decline in fossil fuel use across the economy, enabled by renewable electricity supply, electrification and other technological and structural changes.

Electrification drives efficiency and extends the benefits of renewable electricity across the economy

Replacing the direct combustion of fossil fuels with electricity (in vehicles, heating and cooling, and industrial processes) is a consistent feature of the pathways that keep 1.5°C within reach. It matters for three reasons:

1. It typically increases efficiency at the point of use compared to the fossil-fuelled technologies it replaces, contributing to the global goal of doubling the rate of energy efficiency improvement by 2030.¹⁴
2. It creates more opportunities for renewable electricity to be used across the economy, supporting investment in clean power systems and progress toward the global goal of tripling renewable energy.¹⁵
3. It enables emissions reductions in transport, buildings and industry by replacing the direct combustion of fossil fuels with low-emissions electricity.

Electrification in the 1.5°C scenario space

Figure 3 tracks electricity's share of global final energy across the lowest-overshoot pathways from 2020 to 2050. The indicator is defined as electricity as a share of total global final energy consumption (TFEC), excluding non-energy use. This is the basis international assessments are increasingly converging on, including IRENA's 2026 electrification roadmap and the IEA's recent electrification analysis.¹⁶ This definitional choice and how it compares with the total final consumption (TFC) measure behind many headline electricity-share statistics is set out in Appendix A2.

¹³ UNEP (UN Environment Programme). 2025. Emissions Gap Report 2025. Nairobi.

¹⁴ UNFCCC. 2023. Decision 1/CMA.5, Outcome of the first global stocktake, paragraph 28(a).

¹⁵ Ibid.

¹⁶ IRENA. 2026. *Transitioning away from fossil fuels: A roadmap powered by renewables, electrification and grid enhancement*. Abu Dhabi; IEA. 2026. *Electrification: Special Report*. Paris.

Global electricity share of final energy

Share of final energy consumption met by electricity, excluding non-energy use

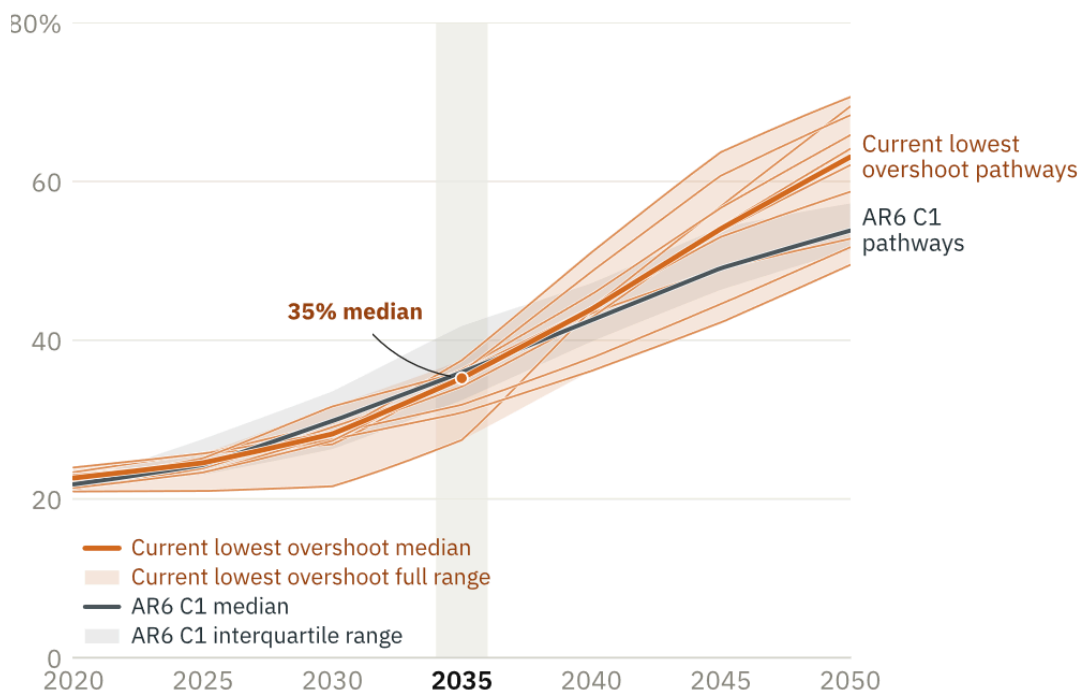


Figure 3 | Electricity's share of global final energy in the current lowest-overshoot pathways and the IPCC AR6 C1 pathways, 2020 to 2050. Electricity as a share of final energy consumption excluding non-energy use. The orange line is the median of the ten current lowest-overshoot pathways, the pale band their full range and the thin lines the pathways themselves; the grey line and band are the median and interquartile range of the 23 IPCC AR6 C1 pathways that report this variable, summarised separately. In 2035 the lowest-overshoot median is 35% (full range 27 to 37%) and the AR6 C1 median 36% (interquartile range, 32 to 42%). Sources: ScenarioMIP-CMIP7 (Riahi, van Vuuren et al., 2026); IPCC AR6 Scenarios Database v1.1 (Byers et al., 2022); author calculations.

The AR6 C1 range, representing the pathways the IPCC classified as limiting warming to 1.5°C with no or limited overshoot, is shown for reference only. Those pathways can no longer be followed as modelled, mainly because fossil fuel use has continued to grow rather than beginning to decline from around 2020 as they assumed.

However, the AR6 C1 pathways remain useful benchmarks for indicators such as electrification and renewable electricity deployment. That their temperature outcomes are no longer considered achievable without overshoot does not invalidate their mitigation pathways for electrification, which also reach around 35% by 2035 (median 36%, interquartile range 32 to 42%). Recent trends in electrification and renewable deployment have also tracked much closer to the C1 median than fossil fuel use has. That two generations of scenarios point to a similar level of electrification suggests an enduring body of evidence for around 35%, rather than a result specific to the latest pathways.

Across the current lowest-overshoot pathways, electricity's share of global final energy rises from around 23% in 2025 to 28% by 2030 (22 to 32%) and 35% by 2035 (27 to 37%). The proposed COP31 '35% by 2035' goal sits on this pathway median.

This finding tests consistency between the 35% benchmark and the scenario evidence. Every scenario consistent with 1.5°C shows high electrification, so it is a key element of the pathways, but it is not sufficient on its own. Electrification is one component of an integrated

transition. Reaching this benchmark without expansion of clean generation and efficiency improvements described earlier would not, on its own, deliver a 1.5°C-consistent outcome.

From today's trajectory to 2035

Where are we now?

Global electrification has been rising steadily from 17% of final energy in 2000 to 23% in 2025.¹⁷ On stated policies, the IEA projects this reaching slightly less than 30% by 2035, which is short of the 35% pathway median consistent with 1.5°C (Appendix A2).

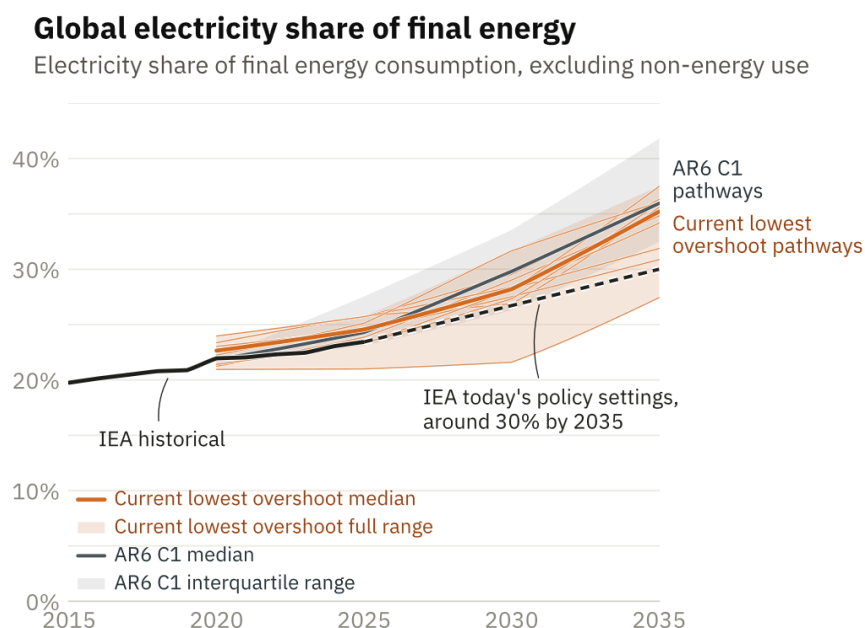


Figure 4 | Electricity's share of global final energy: IEA observations and outlook against current lowest-overshoot and IPCC AR6 C1 pathways, 2015 to 2035. Electricity as a share of final energy consumption excluding non-energy use. The black line is the IEA's observed world series, which reaches 23.4% in 2025. The dashed line is the IEA's outlook on today's policy settings, drawn from the 2025 observation to around 30% in 2035. The orange line is the median of the ten current lowest-overshoot pathways, the pale band their full range and the thin lines the pathways themselves; the grey line and band are the median and interquartile range of the 23 IPCC AR6 C1 pathways that report this variable. Sources: IEA (2026), *Electrification: Special Report*; Riahi, van Vuuren et al., 2026; Byers et al., 2022.

Figure 4 shows that the current trajectory tracks below the lowest-overshoot median. The IEA finds that fully capturing the electrification opportunities that are already cost-competitive today would raise the global electrification rate to 33% by 2035.¹⁸ Closing the remaining gap to 35% depends on enabling infrastructure, consumer awareness, access to finance, and progress on end-uses that are not yet cost-competitive. This pace is demanding, but achievable. Some sectors, such as transport, are showing promising growth rates (Breakout box).

¹⁷ IEA. 2026. *Electrification: Special Report*. Paris.

¹⁸ IEA. 2026. *Electrification: Special Report*. Paris.

Breakout box: transport electrification is accelerating

Road transport accounts for around 20% of global final energy demand but is currently only around 2% electrified. Historically, this has been one of the biggest constraints on overall electrification rates, given the sector's scale.¹⁹

That is now beginning to change, fastest at the point of sale. One in four new cars sold globally in 2025 was electric, up from less than one in 100 in 2015.²⁰ Electric vehicles are also gaining share in segments once considered hard to electrify. The size of the existing vehicle fleet means these sales trends take time to show up in stock and energy metrics, but the shift is starting to appear there too. Around 10% of the global two- and three-wheeler fleet is already electric, and electric vehicles now make up around 5% of the global car stock, up from under 1% five years ago, and still growing rapidly.²¹

As electrification begins to penetrate one of the world's largest end-use sectors, it shows that faster growth in global electrification rates is achievable over the coming decade. This picture varies by country, and a global average obscures which markets are leading the trend.

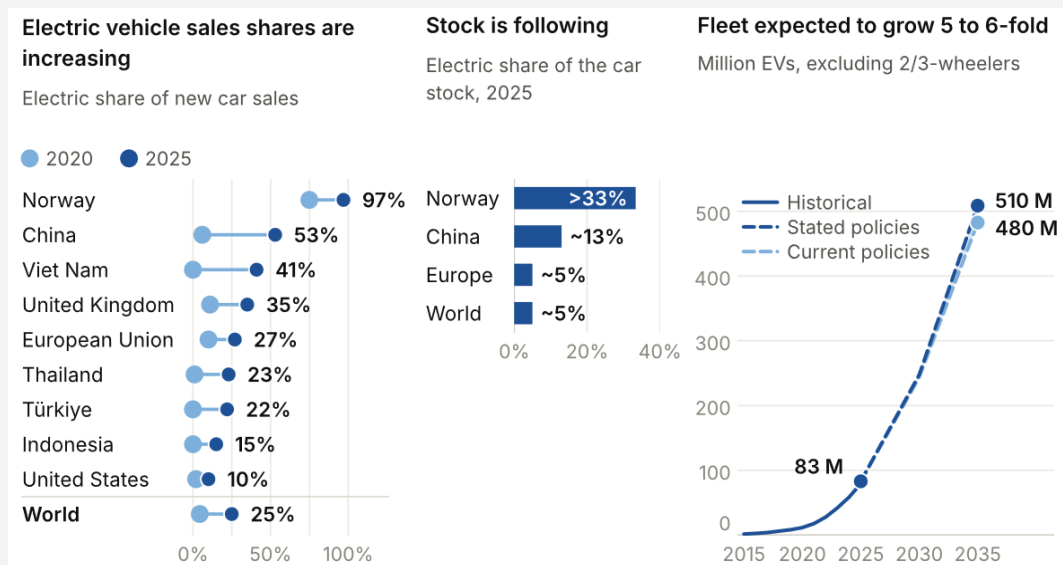


Figure 5 | **Electric car sales shares have surged across markets, the car stock is starting to follow, and the EV fleet is set to grow five- to six-fold by 2035.** Electric cars are battery electric and plug-in hybrid cars; fuel cell vehicles are excluded. Left: the electric share of new car sales in 2020 (light blue) and 2025 (dark blue) for nine markets and the world; market values are labels from IEA Figure 1.2 and world values are from the IEA Global EV Data Explorer. Centre: the electric share of the car stock at the end of 2025, shown at the rounded values stated by the IEA. Right: the global stock of electric cars, vans, buses and trucks, excluding two- and three-wheelers, using the IEA's historical series for 2015–2025 and approximate values read from IEA Figure 9.1 for 2030 and 2035 under its Current Policies and Stated Policies scenarios. Sources: IEA (2026), *Global EV Outlook 2026*, Figures 1.2 and 9.1, Chapters 1 and 9 and the Executive Summary; IEA Global EV Data Explorer.

¹⁹ IEA. 2026. *Electrification: Special Report*. Paris.

²⁰ Ibid.

²¹ IEA. 2026. *Global EV Outlook 2026 and Global EV Data Explorer*. Paris.

Electrification and renewable energy deployment are complementary

Across the lowest-overshoot 1.5°C pathways, electrification expands the share of energy demand that can be met by renewable sources, while increasing renewable electricity generation lowers the emissions intensity of electrified activities. Together, these transitions reinforce one another and accelerate economy-wide decarbonisation.

Global renewable electricity capacity and generation

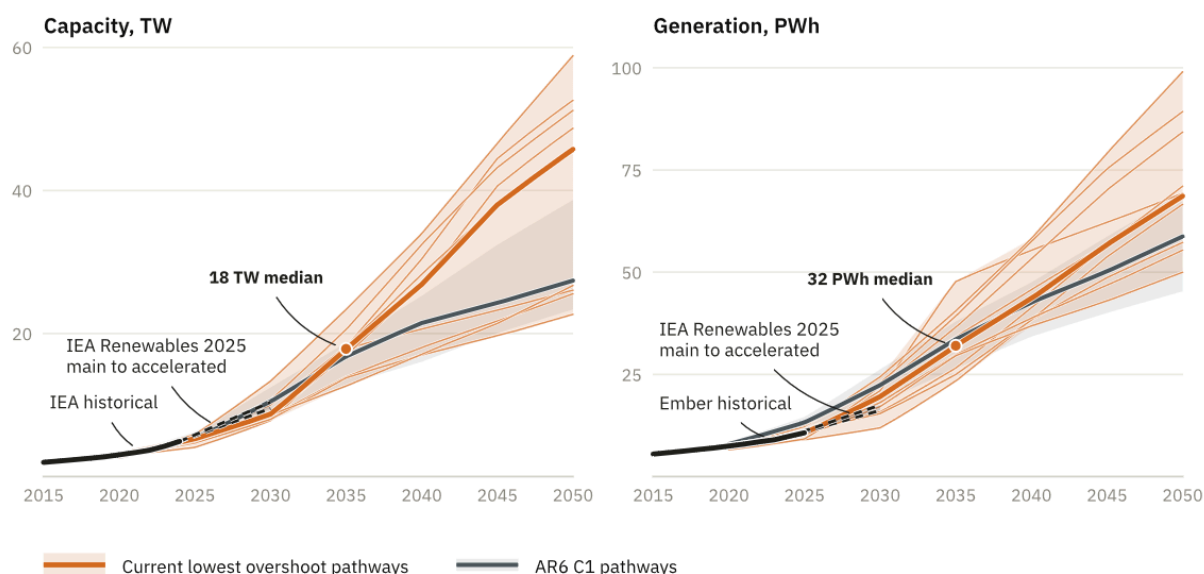


Figure 6 | Global renewable electricity capacity (left, TW) and generation (right, PWh), 2015 to 2050, in the current lowest-overshoot and AR6 C1 pathways. In each panel the orange line is the median of the lowest-overshoot pathways (nine report capacity, all ten report generation), the pale band their full range and the thin lines the pathways themselves; the grey line and band are the median and interquartile range of the AR6 C1 pathways that report the same technologies (74 for capacity, 94 for generation). The black line on the left is the IEA Renewable Energy Progress Tracker series, 2015 to 2024, which counts solar PV in DC terms and includes pumped storage; on the right it is Ember's world renewable generation series, 2015 to 2025. The dashed wedge from 2024 to 2030 on each panel spans the IEA Renewables 2025 main and accelerated cases (9.5 to 10.4 TW; 16.2 to 17.5 PWh). The dots mark the lowest-overshoot medians in 2035 (18 TW; 32 PWh). Sources: ScenarioMIP-CMIP7 (Riahi, van Vuuren et al., 2026); IPCC AR6 Scenarios Database v1.1 (Byers et al., 2022); IEA Renewable Energy Progress Tracker; IEA (2025), Renewables 2025; Ember (2026), Yearly Electricity Data; author calculations.

Figure 6 explores how renewable energy deployment tracks across the same lowest-overshoot pathways, measured both as installed generating capacity (TW) and as renewable electricity generation (PWh) (see Appendix A3 for more detail on how renewable energy deployment is defined).

Global renewable electricity capacity reaches a median of 8.7 TW by 2030 (7.8–13.3 TW) and 17.9 TW by 2035 (12.7–23.4 TW), and renewable generation rises from 10.7 PWh in 2025 to a median of 19.6 PWh by 2030 (11.9–24.4 PWh) and 32.0 PWh by 2035 (23.4–47.7 PWh). The COP28 goal of tripling renewable capacity by 2030 (roughly 11 TW) sits within the lowest-overshoot pathway range.²² IRENA finds that more than 90% of utility-scale renewable projects commissioned in 2025 delivered power below the cost of the cheapest new fossil-fuel plant built in their market. The IEA's Renewables 2025 outlook reaches 9.5 TW by 2030 in its main case and 10.4 TW if policy uncertainty, permitting, grid-integration

²² UNFCCC. 2023. Decision 1/CMA.5, Outcome of the first global stocktake, paragraph 28(a).

and financing barriers are addressed (16.2 to 17.5 PWh of generation), identifying these as key constraints on faster deployment.²³

Fossil fuel decline is an outcome of electrification and renewable energy increases

The COP28 goals on renewables and the proposed ‘35 by 35’ electrification goal are complementary benchmarks for the same underlying transformation.²⁴ Each addresses a different part of the same problem: renewable expansion lowers the emissions intensity of the electricity supplied and electrification determines how much of total energy demand can increasingly be met by clean electricity. Fossil fuel decline is in large part a consequence of renewable energy and electrification scaling together.

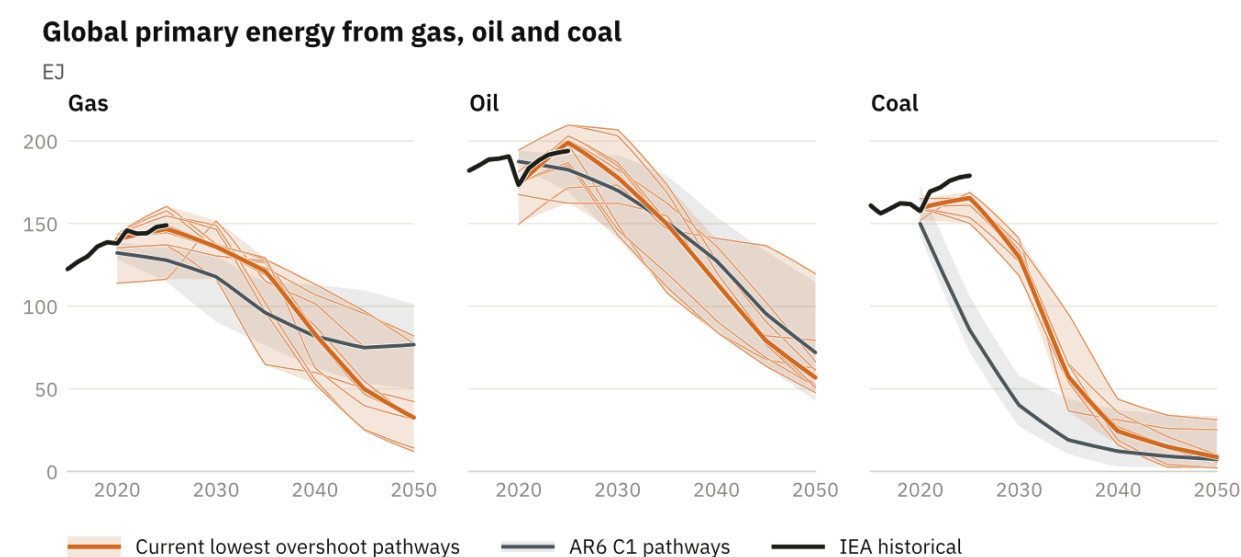


Figure 7 | Global primary energy supply from gas, oil and coal, 2015 to 2050, in the current lowest-overshoot and AR6 C1 pathways. In each panel the orange line is the median of the lowest-overshoot pathways (ten for gas and oil, nine for coal) and the pale band their full range, with the pathways themselves as thin lines; the grey line and band are the median and interquartile range of the 94 AR6 C1 pathways that report the fuel. The black line is IEA history: World Energy Balances to 2023 and Global Energy Review 2026 estimates for 2024 and 2025. One pathway (COFFEE 1.6, Very Low, SSP2) is excluded from the coal panel only, because its 2023 coal use is more than 20% above the IEA observation. Sources: ScenarioMIP-CMIP7 (Riahi, van Vuuren et al., 2026); IPCC AR6 Scenarios Database v1.1 (Byers et al., 2022); IEA World Energy Balances and Global Energy Review 2026; author calculations.

Figure 7 shows global primary energy supply from gas, oil and coal across the same lowest-overshoot pathways used to track electrification and renewable energy deployment above.

Across the lowest-overshoot pathways, by 2035 (pathway medians relative to IEA 2025 levels):

- Global gas demand declines 19% on 2025 levels (13–57%);
- Global oil demand declines 23% on 2025 levels (11–44%); and
- Global coal demand (thermal and metallurgical coal taken together) declines by 68% on 2025 levels (47–79%).

²³ IEA. 2025. *Renewables 2025: Analysis and forecasts to 2030*. Paris; IRENA. 2026. Renewable Power Generation Costs in 2025. Abu Dhabi.

²⁴ COP31 Presidency. 2026. COP31 Presidency announces “35% by 2035” electrification target. Bonn, 9 June 2026.

These trajectories show the pattern that as renewable energy and electrification scale together, fossil fuel demand falls. Coal declines fastest and oil and gas decline more gradually.

Conclusions

Electrification is a core feature of ambitious climate pathways. Across the current lowest-overshoot pathways, the median share of electricity in global final energy rises from around 23% in 2025 to around 35% by 2035, in line with the target proposed by the COP31 Presidency. Even as pathways have evolved in response to changing real-world conditions, electricity must account for a larger share of global energy use if 1.5°C is to remain within reach.

These pathways show renewable energy deployment and electrification scaling together, with much of the decline in fossil fuel use enabled by these mutually reinforcing trends. Renewable energy deployment has had a clear global benchmark since COP28's tripling goal. Electrification is its complement, because clean electricity only delivers its climate benefits when it is used across transport, buildings and industry. Yet electrification has lacked an equivalent benchmark.

Getting on track will require acceleration beyond recent progress and current projections, but much of the potential is already within reach. The IEA finds that fully capturing the electrification options that are already cost-competitive today would raise the global electrification rate to 33% by 2035, within two percentage points of the 35% benchmark.²⁵

The growing body of evidence demonstrates that a global 35% electricity share of final energy by 2035 is a credible and feasible benchmark for the level of electrification required to align energy systems with pathways consistent with limiting warming to 1.5°C.

²⁵ IEA. 2026. *Electrification: Special Report*. Paris.

Appendix - methodological details

A1 - CMIP, ScenarioMIP, and differences with AR6

Assessments of what emissions pathways are achievable draw on integrated assessment models (IAMs), which represent how energy, land use, the economy, technology and emissions interact over time. The pathways these models produce are internally consistent 'what if' scenarios rather than forecasts.

The World Climate Research Programme's Coupled Model Intercomparison Project (CMIP) coordinates global climate-model experiments that underpin each IPCC assessment cycle. AR6 used CMIP6 for its physical-climate projections, while its mitigation assessment used a separate database of integrated-assessment pathways. The current, next-generation round, known as CMIP7, is now underway, and this report draws on its scenario component, ScenarioMIP, which defines common emissions and socioeconomic pathways for climate-model experiments.

This report's 'lowest-overshoot' set consists of 10 pathways drawn from the 'Very Low' emissions scenarios developed for CMIP7 ScenarioMIP. They come from seven modelling frameworks, with no more than two from any one framework so that no single model dominates the results. Each pathway has a median peak warming of 1.7°C or below and a median warming that returns to 1.5°C or below by 2100.

This differs from AR6. The pathways in AR6's most stringent category (C1), which limit warming to 1.5°C with no or limited overshoot, assumed that global emissions would begin falling from around 2020. That decline did not happen, so the current pathways start from higher emissions and accumulate more CO₂ before emissions fall. As a result, the best-estimate peak warming of the least-overshoot pathways has risen from around 1.6°C in AR6 (the C1 median) to around 1.7°C in the latest scenarios (Figure 2). The timing of net-zero CO₂ emissions (around mid-century) and the return to 1.5°C or below by 2100 are broadly unchanged, but the overshoot is now larger and longer, increasing the associated risks.

All 10 'lowest-overshoot' pathways are given equal weight in the medians and ranges reported here. These describe the spread across this small set of pathways, not the likelihood of any outcome. These are global modelled pathways designed to meet the ScenarioMIP Very Low narrative; they do not explicitly represent equity or fairness between countries. They should therefore be interpreted as global mitigation scenarios, not prescriptions for individual countries or a fair distribution of effort.

A note on terminology: the IPCC's AR6 pathway categories classify overshoot as 'no or limited overshoot' (C1) or 'high overshoot' (C2). Under that classification, the pathways this report calls 'lowest-overshoot' are AR6's high-overshoot pathways. 'Lowest-overshoot' is this report's own term for the least-overshoot pathways within the currently feasible set, not an IPCC category name.

A2 - Defining electrification

Electricity's share of final energy depends on two boundaries: what counts as final energy (the denominator), and what counts as electricity (the numerator). Both affect how '35% electrification' should be read and compared.

What counts as final energy (the denominator)

TFC is the basis for many headline electricity-share statistics, including non-energy uses such as fuels used as chemical feedstocks. This report instead uses TFEC, excluding non-energy use, as its denominator throughout. This is the basis the IEA has moved to for defining the electrification rate, reflecting growing policy focus on the share of final consumption that can realistically be electrified, and the approach IRENA's 2026 electrification roadmap also uses.²⁶

One definitional complexity is the treatment of blast furnaces and coke ovens (BFCO). The IEA's TFEC excludes non-energy use but includes BFCO within iron and steel rather than the transformation sector.²⁷ Where this report's figures diverge from other published estimates by a percentage point or so, BFCO treatment is a plausible source. Any comparison against other sources should be treated with caution until denominators are confirmed to be applied consistently.

What counts as electricity (the numerator)

The numerator is the final energy electricity end users consume directly. Electricity converted into another carrier before reaching them, such as hydrogen, hydrogen-derived fuels, or district heat from large heat pumps or electric boilers, is not counted as electricity. The delivered hydrogen or heat is counted at its own energy content, while the electricity used to produce it, and the conversion losses, sit in the energy sector. The IEA calls this 'indirect electrification' and reports hydrogen and district heat among 'other fuels' in final consumption.²⁸ The IAM pathways used in this report do not all draw this boundary in the same place.

For 2035, the effect is small. Low-emissions hydrogen is around 1% of hydrogen production today, and district heat is also a small share.²⁹ As these routes electrify, though, the boundary will matter more. An electrification rate that shows little change while hydrogen production and heat networks switch to electricity would understate the true pace of electrification. The metric should therefore be read alongside measures of indirect electrification and total electricity demand, and any target expressed as an electricity share should be explicit about which side of this boundary it counts.

²⁶ IEA. 2026. *Electrification: Special Report*. Paris; IRENA (International Renewable Energy Agency). 2026. Transitioning away from fossil fuels: A roadmap powered by renewables, electrification and grid enhancement. Abu Dhabi.

²⁷ IEA. 2026. *Electrification: Special Report*. Paris.

²⁸ IEA. 2026. *Electrification: Special Report*. Paris.

²⁹ IEA. 2026. Global Hydrogen Review 2026. Paris; IEA. 2026. Heat Pump Monitor 2026. Paris, "Deployment in district heating".

A3 - Defining renewable energy deployment

This report tracks renewable energy deployment in two ways. Installed capacity is the maximum amount of power that renewable plants can produce at any one time, measured in gigawatts (GW). Generation is the amount of electricity they actually produce over a year, measured in terawatt-hours (TWh) or, at global scale, petawatt-hours (PWh; 1 PWh = 1,000 TWh).

The two measures show different things. Capacity shows how much has been built and is the basis of targets such as the COP28 goal to triple renewable capacity by 2030. Generation shows how much electricity renewables actually supply. Capacity is not directly comparable across technologies: a gigawatt of solar generates less electricity over a year than a gigawatt of nuclear or hydropower, because it produces power only when the sun is shining and so has a lower 'capacity factor'. As solar makes up a growing share of renewables, capacity therefore tends to grow faster than generation.

Solar capacity can be reported on a direct current (DC) basis, reflecting the rated output of the panels, or an alternating current (AC) basis, reflecting the output delivered to the grid. DC values are typically higher, and published statistics do not always state which basis they use. The historical capacity series in Figure 6 is from the IEA, which reports solar PV on a DC basis and includes pumped storage hydropower in total renewable capacity. The IAM pathways do not always state a basis for solar, but their 2022 values closely match the IEA series, suggesting the two are broadly comparable. Comparisons with other analyses should take these conventions into account, particularly where sources report solar in AC or exclude pumped storage.

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