Climate Resource

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The path to 1.5°C

The change in pace of the energy transition that keeps overshoot short and sharp

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ACKNOWLEDGEMENT OF COUNTRY

We acknowledge the Traditional Owners throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their elders past and present.

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IMAGE CREDIT

New South Wales coast, December 2020, Malte Meinshausen

TABLE OF CONTENTS

Summary 6

1 Introduction 10

2 Reality check – warming and emissions to 2025 compared to previous 1.5 °C pathways 11

The world will exceed the 1.5 °C threshold – at least temporarily 11

Total emissions have not declined as needed for pathways that could have limited warming to 1.5°C without overshoot 11

The biggest contributor has been power generation from fossil fuels 12

3 A new generation of scenarios, new insights on achieving lowest-overshoot pathways 16

Current lowest-overshoot pathways to 1.5 °C imply a different trajectory given what is now feasible 17

Achieving the lowest-overshoot pathways, and limiting warming to 1.5°C means rapid reductions from 2025 21

Acceleration is needed to align with current lowest-overshoot pathways across all major sectors, but at varying rates 22

4 Main takeaways 30

References 32

LIST OF FIGURES

Figure 1	Greenhouse gas emissions and global surface warming in the AR6 pathways and the C1 pathways	12
Figure 2	Observed greenhouse gas emissions against the AR6 C1 pathways, and sources of the 49.6 $GtCO_2eq$ gap over 2020–2025	13
Figure 3	Drivers of the 49.6 $GtCO_2eq$ gap by source: energy demand, power generation, industry fuel use and energy methane against the AR6 C1 pathways, 2015–2025	14
Figure 4	Greenhouse gas emissions in the AR6 C1 pathways and the ten current lowest-overshoot pathways	17
Figure 5	Greenhouse gas emissions and global surface warming in the 68 ScenarioMIP-CMIP7 pathways, by category	18
Figure 6	Greenhouse gas emissions and global surface warming in the ten lowest-overshoot pathways compared with the AR6 C1 pathways	20
Figure 7a	Final energy per GDP, electricity and fuels used directly, 2015–2035	24
Figure 7b	Renewable capacity and renewable, coal-fired and gas-fired generation, 2015–2035	25
Figure 7c	Coal, natural gas and oil used directly in all sectors, 2015–2035	27
Figure 7d	Energy-sector methane emissions and primary energy from coal, gas and oil, 2015–2035	28

LIST OF TABLES

Table ES-1	Average annual rates of change: observed 2015–2025, IEA outlooks to 2030 and lowest-overshoot pathways 2025–2035	7
Table 1	ScenarioMIP-CMIP7 categories, scenario counts and assessed warming	17
Table 2	Average annual rates of change: observed 2015–2025, IEA outlooks to 2030 and lowest-overshoot pathways 2025–2035	23

ACRONYMS AND ABBREVIATIONS

AC	alternating current
AR6	Sixth Assessment Report of the IPCC
AR7	Seventh Assessment Report of the IPCC
C1	AR6 scenario category that limits warming to 1.5 °C (>50% likelihood) with no or limited overshoot
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CMIP7	Coupled Model Intercomparison Project, Phase 7
CO_2	carbon dioxide
CO_2eq	carbon dioxide equivalent
COP	Conference of the Parties to the UNFCCC (e.g. COP28, COP31)
EDGAR	Emissions Database for Global Atmospheric Research
EJ	exajoule
EU	European Union
GDP	gross domestic product
Gt	gigatonne (billion tonnes)
GWP100	global warming potential over a 100-year time horizon
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
LNG	liquefied natural gas
MAGICC	Model for the Assessment of Greenhouse Gas Induced Climate Change
mb/d	million barrels per day
MEECC	Model for Energy Equity and Climate Compatibility
NGFS	Network for Greening the Financial System
PPP	purchasing power parity
PV	photovoltaic
PWh	petawatt-hour
ScenarioMIP	Scenario Model Intercomparison Project
SPM	Summary for Policymakers
SSP	Shared Socioeconomic Pathway
STEPS	Stated Policies Scenario (IEA)
TW	terawatt
TWh	terawatt-hour
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
VL	Very Low, the ScenarioMIP-CMIP7 scenario category with the lowest emissions
WEO	World Energy Outlook (IEA)
WMO	World Meteorological Organization

Summary

It has become clear this year that limiting warming to 1.5°C in line with the Paris Agreement goal can now only be achieved after a period of overshoot: warming will first exceed the threshold and then has to be brought back down to it by 2100. The question is no longer whether warming will exceed 1.5 °C, but how to keep overshoot as short and low as possible, while managing its risks and impacts. This brief explores what newly published climate-science scenarios show about the pace and shape of the energy transition that can deliver the lowest-overshoot pathways. It looks at:

- **Where we are now, compared to what we were aiming for five years ago:** It compares actual emissions over the last 10 years across each major part of the energy system to highest ambition scenarios from five years ago that could have limited warming to 1.5 °C without overshoot, drawing on the IPCC AR6.[1]
- **What outcomes are needed from this point on:** It unpicks the changes across the energy system from 2025 to 2035 that would deliver the current lowest-overshoot pathways and return warming to 1.5°C by 2100, based on scenarios published in 2026 that will inform the upcoming IPCC AR7 cycle.

Headline insights are:

- Over the past decade, the world built clean energy generation capacity at record rates, but did not deliver the clean energy or energy efficiency transition that 1.5°C pathways required. Energy demand grew, outrunning efficiency gains and growth in clean energy generation. Coal and gas filled the gap, pushing emissions higher.
- The next decade has to be different. A step change in the speed of the transition is needed across every part of the energy system. In the lowest-overshoot pathways the rate of increase in energy efficiency doubles relative to the last decade, renewable generation grows by nearly 12% a year, up from about 7%, coal power falls by about 14% a year and gas power by nearly 5% a year, reversing a decade of growth in both.
- The targets on the table are aligned with lowest-overshoot pathways to 1.5°C. Delivery is the gap. Tripling renewables, and doubling the rate of improvement in energy efficiency by 2030, and electrifying 35% of final energy by 2035 are aligned with the lowest-overshoot pathways. Low-cost clean energy generation and growing sales of electric vehicles and heating alone won't deliver them. It also needs additional policy drivers and investment.
- Delay has measurable costs. Every year of delay raises peak warming. The lowest-overshoot pathways peak around 1.7 °C mid-century and return to 1.5 °C by 2100, if strong action

[1] IPCC (2022).

starts now. Achieving this means reducing emissions by around 3.5% of the 2019 level per year to 2050 on average, and reducing even faster than this from 2025 to 2035.

Table ES-1: Average annual rates of change observed over 2015–2025, in IEA outlooks to 2030 and in the lowest-overshoot pathways over 2025–2035, with 2015–2035 trajectories.[2]

The pace of change across the energy system

The last decade, the current outlook, and lowest-overshoot pathways

— Observed ····· IEA outlook — Lowest-overshoot median

Element	Last 10 years 2015–2025	Projected 2025–2030, IEA	Required 2025–2035	Trajectory 2015–2035
Energy demand				
Final energy per GDP index 2020=100	−1.6%/yr	−2.2%/yr	**−3.5%/yr**	Accelerate decline
Electricity EJ/yr	+2.9%/yr	+3.4%/yr	**+3.2%/yr**	Accelerate electrification
Fuels used directly Non-electric final energy, EJ/yr	+1.0%/yr	+0.4%/yr	**−2.3%/yr**	Reverse
Power generation				
Renewable capacity TW	+10.8%/yr	+10.9%/yr	**+13.2%/yr**	Accelerate
Renewable generation PWh/yr	+6.9%/yr	+8.4%/yr	**+11.7%/yr**	Accelerate
Coal-fired generation PWh/yr	+1.3%/yr	−0.9%/yr	**−14.0%/yr**	Reverse
Gas-fired generation PWh/yr	+2.2%/yr	+2.6%/yr	**−4.7%/yr**	Reverse
Fossil fuel final energy				
Final energy from coal EJ/yr	−1.7%/yr	−0.6%/yr	**−5.0%/yr**	Accelerate decline
Final energy from gas EJ/yr	+2.0%/yr	+1.6%/yr	**−3.2%/yr**	Reverse
Final energy from oil EJ/yr	+0.9%/yr	+0.3%/yr	**−2.4%/yr**	Reverse
Energy methane				
Energy methane Gt CO_2eq/yr	+0.3%/yr	—	**−8.4%/yr**	Reverse
Primary energy from coal EJ/yr	+1.1%/yr	−0.6%/yr	**−10.7%/yr**	Reverse
Primary energy from gas EJ/yr	+1.9%/yr	+1.6%/yr	**−2.1%/yr**	Reverse
Primary energy from oil EJ/yr	+0.6%/yr	+0.3%/yr	**−2.6%/yr**	Reverse

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[2]Source: Calculations based on Byers et al. (2022); Riahi et al. (2026a); Ember (2026); IRENA (2026c); IEA (2025d, 2025f–i, 2026a–b, 2026e–f); World Bank (2026). Rates are compound annual changes; required rates run from 2025 level to lowest-overshoot 2035 median (9–10 pathways); IEA rates are calculated within each source's own 2025–2030 basis, with final-fuel proxies for coal, gas and oil (from 2025 medium-term reports before the 2026 energy crisis) and IEA Electricity 2026 forecast for electricity. Histories include estimated years; no IEA outlook shown for energy methane.

Delivering the existing and proposed goals and aligning with lowest-overshoot pathways necessitates effective action, starting now. The underlying changes in the physical economy are considered achievable, but will not happen solely based on current trends, despite new clean energy generation now being the least-cost source in so many markets, booming sales of electric vehicles and more energy-efficient and electrified heating taking off.

On the supply side, it means accelerating the deployment of renewables further still to meet electricity demand growth, addressing grid bottlenecks, and reversing the last decades' continued growth in coal, oil and gas, and associated high fossil fuel methane emissions.

On the demand side, it means delivering energy efficiency across the economy, including from electrification and reversing the growth in non-electrified energy demand, that still accounts for over 75% of final energy in 2025.

Addressing some of these barriers can be done fast, building on and replicating policies in place and effective in jurisdictions around the world. For other barriers, it requires changes with long lead times or the deployment of yet-to-be-commercialised technologies at scale.

There is a lot to do in the nine years to 2035.

BOX ES-1: KEY FINDINGS

What happened?

- **Emissions over the last 10 years were above the highest ambition AR6 pathways that limited warming to 1.5°C 'no or limited overshoot' (the C1 pathways).** Cumulative emissions over 2020–2025 were 49.6 $GtCO_2eq$ above the median of these C1 pathways, led by power generation (21.5 $GtCO_2eq$), industry fuel use including process emissions (5.7 $GtCO_2eq$) and energy-sector methane (6.5 $GtCO_2eq$).
- **Renewable capacity deployment tracked broadly in line with C1 pathways, but renewable generation and the broader electricity generation mix did not**. Coal-fired generation was more than twice the C1 median.
- **Energy demand grew faster than projected in 1.5°C AR6 C1 pathways, despite slower economic growth**. Energy use per unit of GDP fell only 15% from 2015 to 2025, compared with 27% in the C1 median.

What needs to happen next?

- **Clean energy deployment accelerates further still and fossil fuel generation declines rapidly to achieve the current lowest-overshoot pathways**. From 2025 to 2035 the lowest-overshoot pathways require renewable capacity to grow by around 13% a year (up from just under 11% over 2015–2025) and renewable generation by nearly 12% a year (up from around 7%). Coal-fired generation falls by around 14% a year and gas-fired generation by around 4.7% a year in the lowest-overshoot pathways, steep reversals of growth trends for both over the past decade.
- **Energy efficiency improvement rates double in the next decade relative to the last.** Energy intensity (final energy demand per GDP) improves by 3.5% a year in the lowest-overshoot pathways, around double the past decade's rate[3].
- **Electricity growth and electrification accelerate faster than in the last decade.** Together with clean energy deployment and energy efficiency, achieving this growth rate in electricity and electrification pushes fossil final energy to fall steeply. Achieving this requires continued rapid acceleration of road transport and heating, and commercialisation of solutions for hard-to-electrify sectors including industry and aviation, including driving demand, de-risking investment, and deployment at scale.
- **Energy-sector methane declines rapidly, reversing recent growth trends.** Fossil fuel methane emissions offer some of the lowest-cost emissions reductions available. These emissions have stayed high over the past decade, with no sustained fall. In the lowest-overshoot pathways, they fall by around 8% a year from 2025–2035, a sharp reversal of current trends.

[3] Energy efficiency means delivering the same service with less energy. Energy intensity of GDP, measured here as final energy per unit of GDP, is a broader economy-wide indicator that is often used as a proxy for efficiency. It is also shaped by structural change in the economy and by fuel switching, including electrification, which reduces the final energy needed for transport and heating. The IEA's tracking of the COP28 "doubling" goal is usually based on primary energy intensity (total energy supply per unit of GDP), rather than final energy intensity as used here.

1 Introduction

The enduring validity of the Paris Agreement 1.5 °C goal is the foundation of international climate policy. The International Court of Justice found in its 2025 Advisory Opinion that 1.5 °C has become the primary temperature goal under the Paris Agreement[4], and the UN General Assembly welcomed that opinion in a 2026 resolution.[5]

It has also become clear this year that the remaining feasible pathways to limit warming to 1.5 °C by the end of the century involve overshooting this threshold and then bringing warming back to that level before 2100. This is evident in multiple lines of evidence, including the warming we are already observing, the UNEP Limiting Overshoot report released in September 2026,[6] the UNEP Emissions Gap Report 2026, published in October 2026, and newly published scenarios from the international climate science community.

This is due to global greenhouse gas emissions continuing to rise to 2025, rather than falling from 2020 as was needed to keep warming below 1.5 °C with no or only limited overshoot. New scenarios sketch the feasible pathways for reducing emissions from 2025 emissions levels. The question now is, how do we keep overshoot as short and shallow as possible, while managing the risks and consequences?

In this brief we unpick:

1. **Where we are now, compared to where we wanted to be:** We explore how actual emissions to 2025 differ from earlier scenarios assessed in the IPCC AR6 published in 2022[7] that could have limited warming to 1.5 °C with no or limited overshoot, and what sectors have contributed to the difference.
2. **What that means for the action now required:** We outline what recently published lowest-overshoot scenarios, which will inform the upcoming IPCC Seventh Assessment Report (AR7) cycle, show about 1.5°C-aligned emissions trajectories from this point onwards.

This turns the spotlight on the pace of change in each major sector to return to 1.5°C from 2025 emissions levels, guiding the policies, action and investment required for a short and sharp overshoot.

[4] International Court of Justice (2025).

[5] UNFCCC (2026), Decision 1/CMA.7, paras 6–7; United Nations General Assembly (2026).

[6] UNEP (2026a).

[7] IPCC (2022).

2 Reality check – warming and emissions to 2025 compared to previous 1.5 °C pathways

Significant progress in the transition to a low-emissions future has been made in the last 10 years. The world is no longer heading towards well over 3°C of warming as was projected under business-as-usual scenarios at the time of the Paris Agreement in 2015. But we did not see the steep decline in global emissions from 2020 that was required to limit warming to below 1.5 °C.

The world will exceed the 1.5 °C threshold – at least temporarily

The 1.5 °C long-term temperature goal is generally interpreted as relating to the 20-year average increase in global mean surface temperature by the end of the century.[8] The world saw warming of more than 1.5°C in an individual year in 2024. It is likely that the five-year mean from 2026 to 2030 will exceed warming of 1.5 °C, and that we have or will soon enter the period for which the 20-year average will also exceed 1.5 °C.[9]

Climate impacts that were only projected a few years ago are already being observed. The world is seeing rising deaths due to excess heat, more people pushed into hunger by drought and heat, tens of millions displaced each year by storms and floods, more extreme wildfires, accelerating glacier loss and the widespread die-off of warm-water coral reefs.[10] Impacts are affecting communities and ecosystems the world over, and particularly in its most vulnerable regions.

Total emissions have not declined as needed for pathways that could have limited warming to 1.5°C without overshoot

The international climate science community produces modelled projections of how global emissions and the resulting warming might evolve under a range of social, economic, technology and policy drivers. Teams worldwide publish many such scenarios, providing a range of perspectives on future trajectories. They are not forecasts. Rather, they provide an internally consistent, coherent view of the emissions and warming implications of different future socioeconomic, policy, and technology pathways. This is one core line of evidence in assessing future warming scenarios and what the world can do to address climate change.

Since 1990, the Intergovernmental Panel on Climate Change (IPCC) has coordinated assessments of the latest science from the international scientific community, publishing a major report every five to seven years. The IPCC's sixth assessment report (AR6) cycle published its findings between 2021

[8] The IPCC assesses global warming levels as 20-year averages of global surface temperature relative to 1850–1900, so a single year above 1.5 °C does not by itself mean the long-term goal of limiting warming to 1.5°C has been exceeded (IPCC 2021).

[9] Annual global mean temperature exceeded 1.5 °C for the first time in 2024 (WMO 2025). WMO (2026) estimates a 75% chance that the 2026–2030 five-year mean will exceed 1.5 °C, and a 91% chance that at least one year in that period will.

[10] Romanello et al. (2025); FAO, WFP and GNAFC (2026); IDMC (2026); Kelley et al. (2025); World Weather Attribution (2025); The GlaMBIE Team (2025); Lenton et al. (2025); Forster et al. (2026).

and 2023. Its Working Group III (WGIII) drew on over 1,200 scenarios with a climate assessment, submitted before October 2021, some of which were produced several years prior to that cut-off date.[11] The most ambitious pathways assessed under AR6 were known as the C1 category. These limited warming to 1.5°C with greater than 50% probability and no or limited overshoot (Figure 1, panel b). These C1 scenarios incorporated global emissions falling steeply from 2020 (Figure 1, panel a). That did not happen. Emissions have continued to rise (Figure 1, bold black line in panel a).

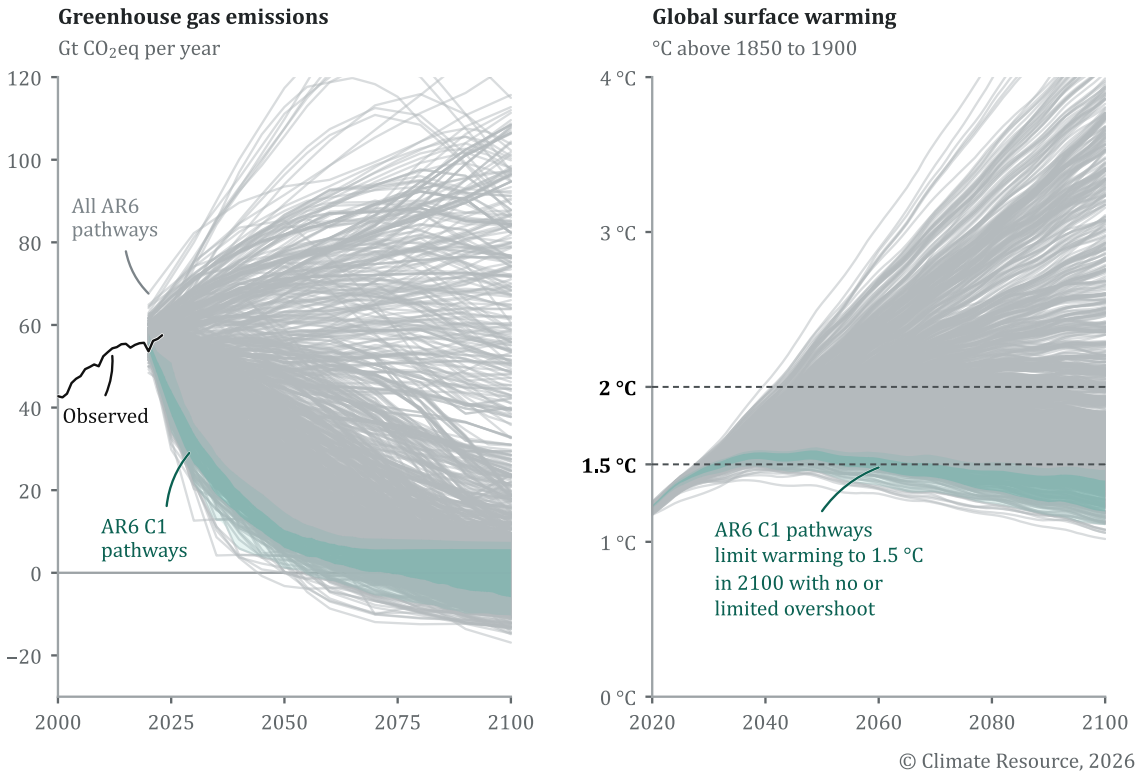


Figure 1: Greenhouse gas emissions (a) and global surface warming (b) in the 1,202 AR6 pathways (grey lines) and the 97 C1 pathways (interquartile and 5th–95th percentile ranges), with observed emissions to 2023 (black). Source: Byers et al. (2022); Nicholls et al. (2025); Climate Resource calculations.[12]

The biggest contributor has been power generation from fossil fuels

From 2020 to 2025, cumulative global greenhouse gas emissions were 49.6 $GtCO_2eq$ higher than the median of the C1 pathways (Figure 2). The largest share of those excess emissions above C1 pathways came from power generation, which accounted for 21.5 $GtCO_2eq$ (43% of the gap). The remainder came from industry fuel use, energy methane, fluorinated gases and other sources, together with inventory and pathway accounting differences. The power sector emissions were the result of continued growth in fossil fuel generation and coal in particular, electricity demand

[11] Riahi et al. (2022); Byers et al. (2022).

[12] Emissions are harmonised and infilled Kyoto gases (AR6 GWP100); warming is each pathway's median MAGICC v7.5.3 projection above 1850–1900. Observed emissions are the CMIP7 harmonisation history.

growing faster than projected in the modelled scenarios, and renewable capacity additions generating less.

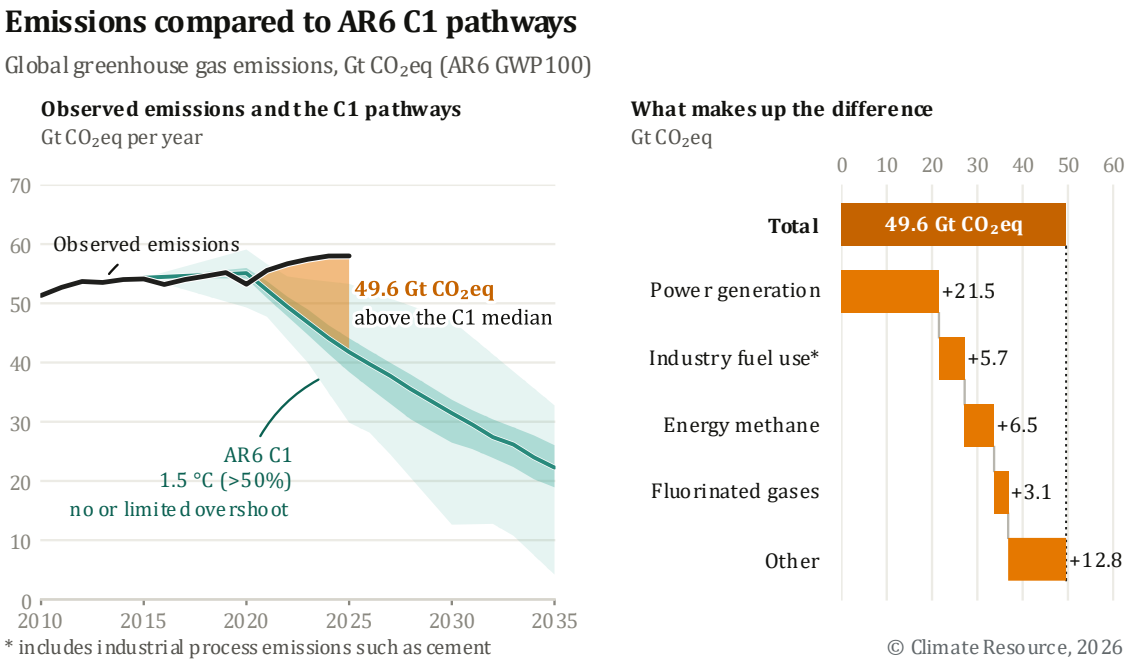


Figure 2: Observed greenhouse gas emissions and the AR6 C1 pathways (median, interquartile and 5th–95th percentile ranges), and the sources of the 49.6 Gt CO_2eq by which observations exceeded the C1 median over 2020–2025. Source: Byers et al. (2022); Gütschow and Pflüger (2026); Crippa et al. (2026); Friedlingstein et al. (2026); IEA (2026e); Climate Resource calculations.[13]

On the demand side, global electricity demand ran about 2,200 TWh above the C1 median in 2025 (Figure 3, top row). Country-level contributions to the higher-than-projected electricity and total final energy consumption differ. China's industrial electricity use was the largest single contributor:[14] an estimated 5,200 TWh against a pathway median of 3,800 TWh, even though China's GDP growth over 2019–2025 came in below the pathway median. The IEA attributes this to electricity-intensive manufacturing and the electrification of industrial processes. Part of this demand is a consequence of the clean-energy transition, which requires manufacturing solar modules, batteries, electric vehicles and associated materials, accounting for nearly 35% of the increase in China's industrial electricity demand between 2022 and 2024.[15]

[13] Observations: PRIMAP-hist v2.8 Kyoto gases excluding land use plus Global Carbon Budget 2025 net land-use CO_2 (AR6 GWP100); 2025 values are estimates. The difference is the sum of observed emissions minus the 97-pathway C1 median over 2020–2025.

[14] The comparison of recent developments with least-cost pathways does not stipulate who would have to bring about these reductions. Responsibility is a separate question. In the case of least developed countries or India for example with very low per-capita emissions, globally cost-optimal models indicate where climate finance and support should enable emission reductions to have a globally cost-effective pathway.

[15] IEA (2025a).

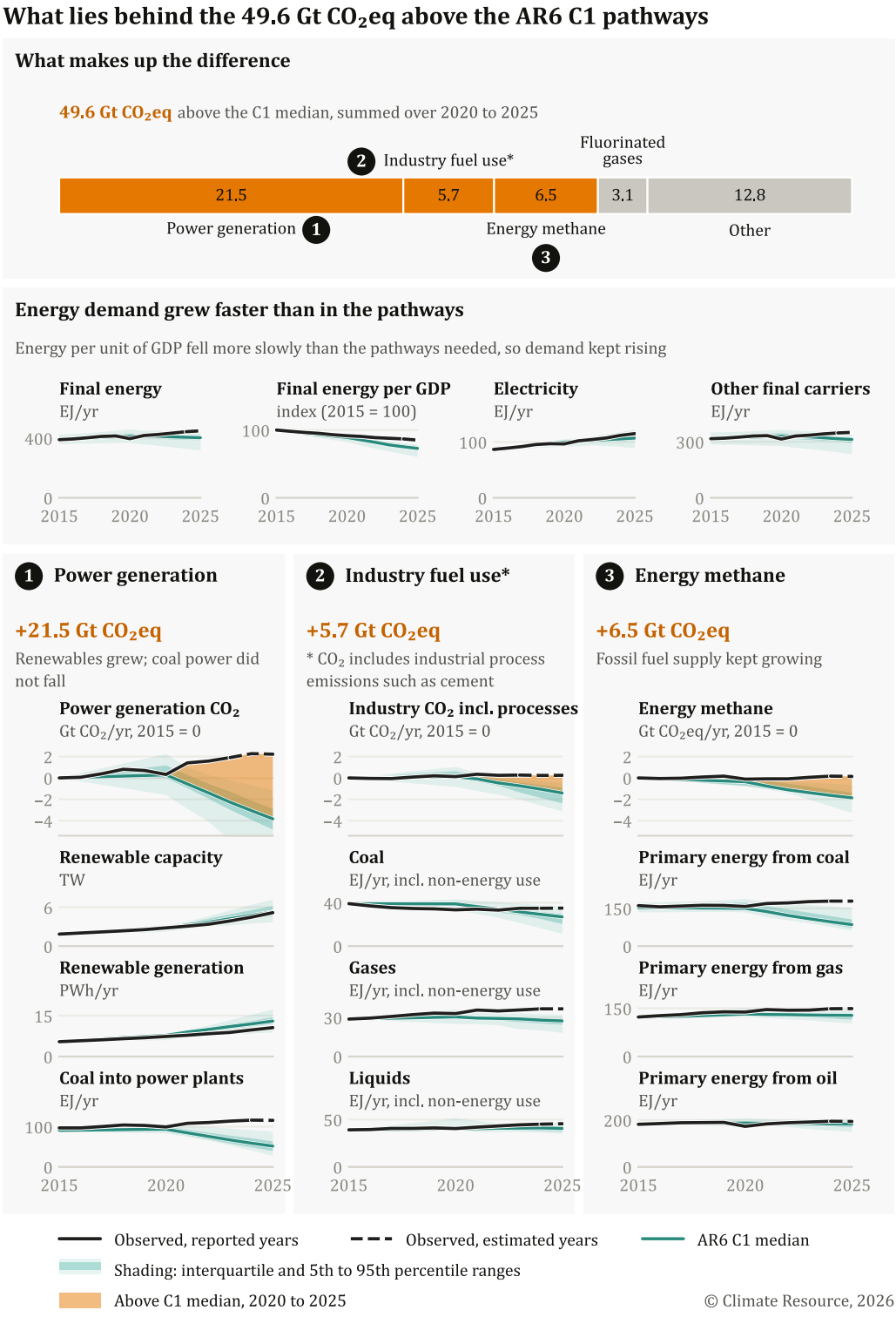


Figure 3: Drivers of the 49.6 Gt CO_2eq by source, and observed energy demand, power generation, industry fuel use and energy methane (black; dashed where estimated) against the AR6 C1 pathways (median, interquartile and 5th–95th percentile ranges), 2015–2025. Source: Byers et al. (2022); Gütschow and Pflüger (2026); Crippa et al. (2026); Friedlingstein et al. (2026); IEA (2026b, 2026e, 2026f); Ember (2026); IRENA (2026c); World Bank (2026); Climate Resource calculations.[16]

[16]Figure 2. Industry CO_2 is industry energy plus process CO_2 (76 pathways) against EDGAR industrial combustion plus processes. Industry fuel panels show IEA industry use of coal, gas and oil including non-energy use (reported to 2024; 2025 is an author estimate) against the models' industry carriers (69, 79 and 69 pathways), each pathway harmonised to the observed 2015 level to account for boundary differences in reporting; pathways below half the observed 2019 level are excluded. Fuel panels are activity indicators, not a CO_2 breakdown.

On the supply side, installed renewable capacity was close to the AR6 C1 median in 2025, but renewable generation was about 2,400 TWh lower than assumed (Figure 3, column 1). This is primarily due to the technology mix. Solar capacity exceeded the median, while wind and particularly hydro remained below it. Solar PV, with a lower capacity factor, produces less electricity annually per unit of installed capacity than wind or hydropower.[17]

Coal-fired power generation grew to meet the higher energy demand accounting for most of the power generation's contribution to the excess cumulative emissions over C1 pathways to 2025. In 2025, industrial use of coal, gases and liquids, including non-energy use, all exceeded the C1 medians (Figure 3, column 2). Methane from fossil fuel extraction, production, and distribution also exceeded C1 pathways, with methane associated with coal mining causing most of the difference (Figure 3, column 3).

BOX 1: DIFFERENCES BETWEEN AR6 C1 PATHWAYS AND OBSERVATIONS, 2015–2025

- **Cumulative emissions exceeded the C1 median by 49.6 Gt CO_2eq over 2020–2025.** Power generation contributed 21.5 Gt, industry fuel use including process emissions 5.7 Gt and energy methane 6.5 Gt, together accounting for about 68% of the gap.
- **Final energy demand was higher despite slower economic growth.** Demand reached 449 EJ in 2025, compared with 403 EJ in the C1 median, while GDP grew 18% over 2019–2025 compared with 23%.
- **Energy intensity improved much more slowly.** Final energy use per unit of GDP fell 15% over 2015–2025, compared with 27% in the C1 median.
- **Higher electricity demand and lower renewable generation sustained coal-fired power.** Renewable capacity was close to the C1 median, at 5.2 versus 5.3 TW, but renewable generation was 19% lower. Coal-fired generation reached 10.6 PWh, more than twice the C1 median of 5.0 PWh.
- **Fossil fuel consumption also remained higher outside power generation.** Industry use of coal, gases and liquids, including non-energy use, exceeded the C1 medians by about 8.1, 9.3 and 4.9 EJ respectively in 2025. Industry CO_2 including process emissions was 0.2 Gt above its 2015 level, while the C1 median fell by 1.4 Gt CO_2.
- **Continued fossil fuel production and use kept energy methane emissions high.** Annual emissions were 4.2 Gt CO_2eq in 2025, 0.1 Gt above 2015, while the C1 median fell by 1.9 Gt from 2015.

[17] IRENA (2026a).

3 A new generation of scenarios, new insights on achieving lowest-overshoot pathways

The IPCC is now working on its seventh assessment report (AR7)[18]. A set of scenarios that will play a core role in AR7 made its results publicly available in September 2026 – referred to as the CMIP7 ScenarioMIP outputs.[19] These new CMIP7 ScenarioMIP outputs will be a subset of the full set of scenarios that will ultimately inform AR7. A comprehensive scenario set that considers equity[20] and the latest science will be key for decision making. Nonetheless, this ScenarioMIP subset and similar collections[21] provide an important update that accounts for observed emissions in recent years and the evolution of technology costs, deployment, and policy. They also offer insights into the lowest-overshoot pathways now feasible and the implications for the underlying changes in the physical economy that deliver the emissions and warming outcomes.

The headline insight from the CMIP7 ScenarioMIP results is that it remains feasible to limit warming to 1.5 °C after temporarily overshooting to a peak of up to 1.7 °C, with strong action starting from 2025. These scenarios found no feasible pathways that, starting from current emissions, keep warming below 1.5°C without overshoot, consistent with findings from other major recent modelling processes.

Overall, we now need to reduce emissions at 3.5% of the 2019 level per year (on average) over the period to 2050, to deliver the current lowest-overshoot pathways. This is faster than the 2.8% per year reductions that would have been required to follow the AR6 C1 pathways from 2020 onwards. Even when delivering the faster pace of emissions reductions now required to achieve the current lowest-overshoot pathways, the world still faces the higher risks and more severe climate impacts. The pace of change in global emissions needed to achieve the current lowest-overshoot pathways, compared to what would have been required to deliver the AR6 C1 pathways, is shown in Figure 4. Reducing emissions at the pace aligned with the current lowest-overshoot pathways does not achieve the 60% (range 49–77%) reduction on 2019 emissions levels by 2035 implied by the C1 pathways, as is clear in the figure and set out in IPCC (2023, Table SPM.1).

[18] More than previously, the IPCC's work is currently constrained by the withdrawal of US support and some countries' stance on timelines and budgets, which hinders the work of the scientists to deliver the report in time. This affects a key source of information for all countries' decision-making on adaptation, loss and damage, and mitigation. https://www.theguardian.com/environment/2026/oct/13/ipcc-pressure-delay-publication-climate-report-ar7-cop33

[19] In each IPCC assessment cycle, including AR6 and now AR7, a core set of scenarios is developed to support a structured model intercomparison coordinated by the World Climate Research Programme's Coupled Model Intercomparison Project (CMIP). The seven marker scenarios selected in CMIP Phase 7 (CMIP7) ScenarioMIP are the starting point for earth system model experiments that explore climate impacts under different warming outcomes, and form an important part of the evidence base for AR7. Data and documentation are available from the ScenarioMIP database hosted by IIASA, https://scenariomip.apps.ece.iiasa.ac.at/ . Hausfather (2026) outlines differences in terminology and characteristics of AR6 scenarios and the new CMIP7 ScenarioMIP. We note the Hausfather analysis reports higher warming estimates than the CMIP7 data explorer because its authors used a different climate model and methodology than used in the CMIP7 ScenarioMIP process.

[20] See for example JustMIP scenario intercomparison protocol at: https://zenodo.org/records/20591284 or the New Pathways Initiative at https://newpathways.eu/

[21] See e.g. https://scenariocompass.org/

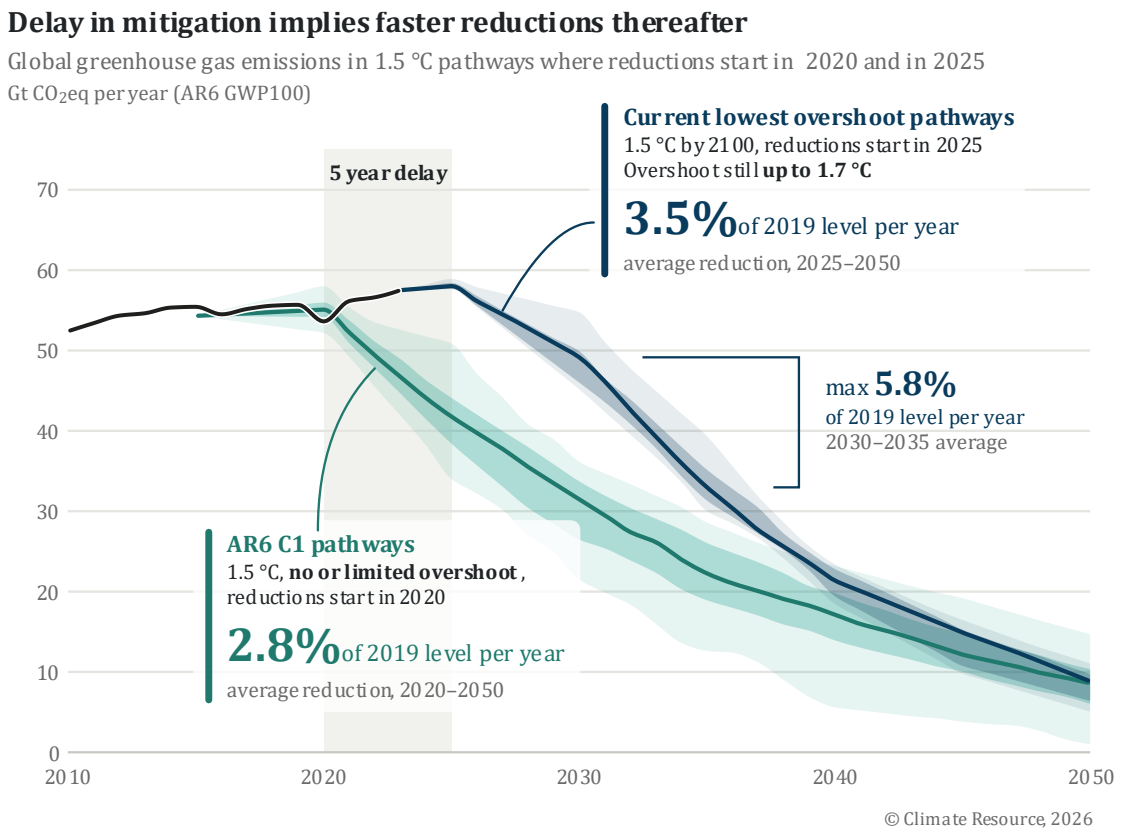


Figure 4: Greenhouse gas emissions in the AR6 C1 pathways and the ten current lowest-overshoot pathways (medians, interquartile and 5th–95th percentile ranges), and observed emission to 2023. Annual average emissions reductions are shown as a percentage of 2019 emissions. The steepest five-year reduction in the lowest-overshoot median (2030–2035) is also shown. Source: Byers et al. (2022); Riahi et al. (2026a); Nicholls et al. (2025); Climate Resource calculations.[22]

Current lowest-overshoot pathways to 1.5 °C imply a different trajectory given what is now feasible

In total, the CMIP7 ScenarioMIP ensemble reports 82 scenarios. From this, seven marker scenarios are selected, one for each of the seven socio-economic and emissions pathways explored.[23] Of these, 68 are model scenarios with a climate assessment using the MAGICC climate emulator we maintain (the other 14 are ensemble envelopes), and 11 are in the 'Very Low (VL)' grouping. The ten VL scenarios that keep peak warming to 1.7 °C and return to 1.5 °C by 2100 are referred to as the 'current lowest-overshoot' scenarios. Table 1 lists the seven new CMIP7 marker scenario categories, with a brief description and their warming implications. Figure 5 shows how these scenarios track in terms of emissions and warming relative to the AR6 scenarios.

[22] Rates are mean annual absolute changes divided by observed 2019 emissions, not compound rates; the headline averages cover 2020–2050 (C1) and 2025–2050 (lowest overshoot). The 2030–2035 figure is the lowest-overshoot median's mean annual reduction over those years on the same basis.

[23] The scenarios in the CMIP7 ScenarioMIP database follow the experimental design described in van Vuuren et al. (2026), which sets out seven emissions pathways that span the range of plausible 21st-century futures, each chosen to answer distinct climate-science and policy questions.

Table 1: ScenarioMIP-CMIP7 categories, scenario counts and assessed warming.

Scenario	Description	# scenarios	Warming
Very Low (VL)	Deep, rapid CO_2 and methane cuts, minimal overshoot	11	Peak 1.7°C (1.6–1.7); 2100: 1.3°C (1.3–1.5)
Low-to-Negative (LN)	Larger overshoot of 1.5°C, offset by large-scale removals	10	Peak 1.9°C (1.7–1.9); 2100: 1.4°C (1.3–1.5)
Low (L)	Rapid strengthening, holds below 2°C	10	Peak 1.8°C (1.7–1.9); 2100: 1.6°C (1.5–1.7)
Medium-Low (ML)	Medium to 2040, then decline to net-zero CO_2	10	Peak 2.1°C (1.9–2.4); 2100: 2.1°C (1.9–2.4)
Medium (M)	Current policy held at 2025 levels	11	Peak 2.7°C (2.2–3.2); 2100: 2.7°C (2.2–3.2)
High-to-Low (HL)	High to mid-century, then net-zero CO_2 by 2100	5	Peak 2.8°C (2.5–3.2); 2100: 2.8°C (2.5–3.2)
High (H)	Policy rollback; emissions as high as still plausible	11	Peak 3.4°C (3.2–3.8); 2100: 3.4°C (3.2–3.8)

Note: Warming is each scenario's median MAGICC v7.6.0a3 projection above 1850–1900; the table gives median and range across the scenarios in each category. Counts cover 68 model runs and exclude 14 envelope entries. Very Low category contains eleven runs, of which ten meet this report's lowest-overshoot selection. Source: Climate Resource calculations from Riahi et al. (2026a), 8 Sept 2026 ScenarioMIP-CMIP7 pre release snapshot.

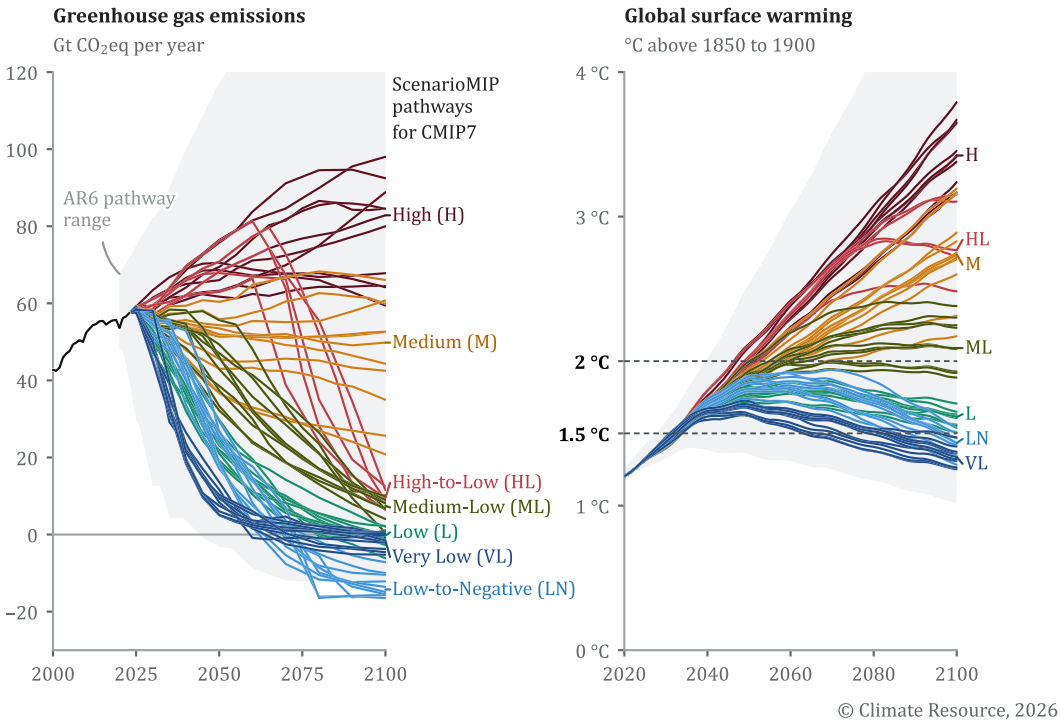


Figure 5: Greenhouse gas emissions (left) and global surface warming (right) in the 68 ScenarioMIP-CMIP7 pathways, coloured by category, against the range of the 1,202 AR6 pathways (grey) and observed emissions to 2023. Source: Riahi et al. (2026a); Byers et al. (2022); Nicholls et al. (2025); Climate Resource calculations.[24]

[24]Emissions are Kyoto gases (AR6 GWP100). Warming is each pathway's median MAGICC projection above 1850–1900 (v7.6.0a3 for ScenarioMIP-CMIP7, v7.5.3 for AR6). The 68 pathways exclude 14 ensemble-envelope entries.

This new generation of scenarios from CMIP7 ScenarioMIP provides more insights into the overshoot-and-return phase than previous scenario generations. Building on this, AR7 will be able to explore, in more detail than before, the overshoot, the pace of the subsequent decline, the scale of carbon removal it requires, and the risks that accumulate in the meantime.

Compared with the previous generation of scenarios that informed AR6, the plausible range of both emissions and temperature outcomes has compressed

At the top end, cheap renewable energy and slower coal growth have ruled out the highest emissions category in AR6 (referred to as SSP5-8.5). SSP5-8.5 projected 4.6°C (3.5–6.2°C) in 2100 (Hausfather, 2026); the new 'High' scenario in CMIP7 ScenarioMIP projects 3.4°C (3.2–3.8°C), a drop of 1.2 °C in the median projection.

At the bottom end, where C1 pathways projected around 1.5°C in 2100 with no or limited overshoot, the current lowest-overshoot scenarios now imply 1.5°C by 2100, reached only after overshooting to around 1.7°C mid-century. Timing matters: the 'Low-to-Negative' scenarios, which start reductions later and then rely on larger negative emissions in the second half of the century, still imply peak warming of up to 1.9°C.

Figure 6 shows the AR6 C1 emissions pathways are contrasted with the new generation of 'Very Low' scenarios assessed as feasible from where we are now in 2025. It illustrates the continued rise in emissions to date, and the new shape and warming implications of the current lowest-overshoot pathways.

The new scenarios that take into account recent trends will be an anchor for climate science and policy over the coming years. The CMIP7 ScenarioMIP set is not the only credible scenario ensemble with recent updates and reading across multiple scenarios can be helpful. Where independent modelling groups agree, that is a stronger signal than any one ensemble agreeing with itself, and where they diverge, it is worth knowing too. This is a key reason why AR7 will ultimately draw on many hundreds of scenarios (many as yet unpublished), as has been the case with previous IPCC assessment report cycles.

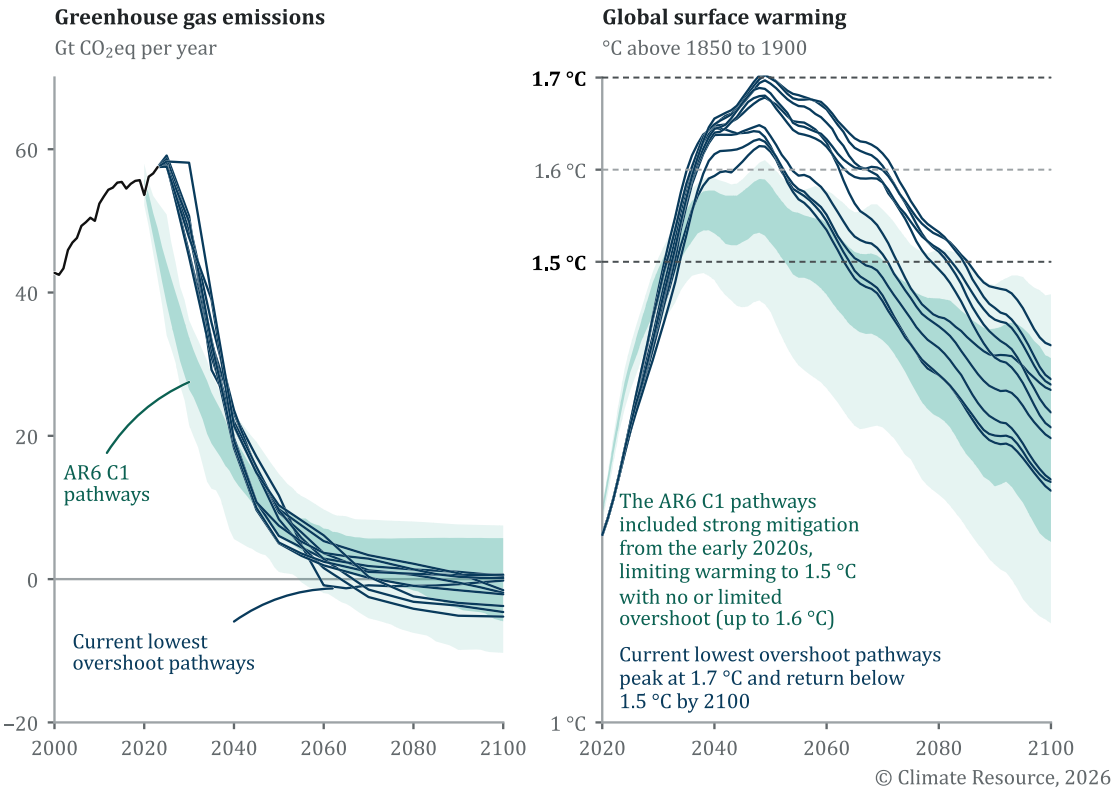


Figure 6: Greenhouse gas emissions (left) and global surface warming (right) in the ten current lowest-overshoot ScenarioMIP-CMIP7 pathways (lines) and the AR6 C1 pathways (interquartile and 5th–95th percentile ranges), with observed emissions to 2023. Source: Riahi et al. (2026a); Byers et al. (2022); Nicholls et al. (2025); Climate Resource calculations.[25]

BOX 2: OTHER SCENARIO ENSEMBLES AND VETTING PROCESSES

Other scenario ensembles likely to be published in the coming months include:

T**he Network for Greening the Financial System (NGFS) scenarios,** which are now a standard reference for central banks and financial regulators assessing climate-related financial risk, and are built on different modelling choices to AR6.[26] An update may be published in the coming months (NGFS Phase 6).

JustMIP[27] **and the New Pathways Initiative,**[28] and other new scenarios outside these initiatives,[29] all of which bring a focus to equity and justice dimensions. In contrast, in previous scenario analysis justice and equity issues have often been addressed by tools and processes other than the integrated assessment models on which many of the scenarios are based.

[25]The ten lowest-overshoot pathways (seven model families) have median peak warming of up to 1.7 °C and 2100 warming at or below 1.5 °C. Warming is the median MAGICC projection (v7.6.0a3; AR6 v7.5.3). Ranges describe scenario spread, not probabilities.

[26] NGFS (2024).

[27]JustMIP (2026).

[28] New Pathways Initiative https://newpathways.eu/

[29] Recent additions include national-scenario work for China (Zhong et al., 2025); the Model for Energy Equity and Climate Compatibility (MEECC v.1), which explores futures constrained by convergence of per-capita final energy across the global North and South (Kanitkar et al., 2026); and net-zero-compatible national pathways for seven major emerging economies, Argentina, Brazil, China, India, Indonesia, Mexico and South Africa (Briand et al., 2026).

To manage a growing pool of scenarios, the **Scenario Compass Initiative** launched a curated database in 2026 covering nearly 1,600 global emissions scenarios. This includes the 1,200 that fed into AR6 plus about 350 published since. The scenarios are vetted against what has actually happened since 2020. They are vetted for:

- Historical consistency: a pathway whose assumed coal, oil, gas or overall CO_2 use falls more than 25% below what has actually been observed is treated as already diverged from reality, regardless of its eventual warming outcome.
- Technological feasibility: checking cumulative reliance on geological CO_2 storage against an estimated planetary limit of around 1,460 $GtCO_2$, and near-term renewable build-out against IRENA's ambitious 1.5°C pathway, with a 25% allowance.[30]

The vetting process used in the Scenario Compass Initiative is continuing to evolve. Of the nearly 1,600 scenarios in the Scenario Compass pool to date, only around 350 pass the historical vetting and around 160 of those raise no major feasibility or sustainability concern, across all warming levels.[31]

None of the scenarios in the current CMIP7 or vetted Scenario Compass Initiative pool holds warming at or below 1.5°C for the century as a whole with more than 50% likelihood. To deliver the Paris Agreement 1.5°C goal, the task now is to minimise the magnitude and duration of overshoot.

Achieving the lowest-overshoot pathways, and limiting warming to 1.5°C means rapid reductions from 2025

The overshoot pathways that peak around 1.7°C and return to 1.5°C have steep reductions from 2025. Delaying the onset of steep reductions to 2030 rather than starting those reductions from 2025 pushes peak warming toward 1.8°C or higher, rather than 1.7 °C, and places 1.5 °C by 2100 potentially out of reach given plausible limits to geological storage for carbon dioxide removal.[32]

The task now is to limit the magnitude and duration of overshoot, and return to 1.5°C as fast as possible, and manage the risks and impacts that overshooting will imply. It will come with higher risks, costs, and impacts on people and ecosystems. Evidence published since AR6 is highlighting the risk of both earlier tipping points, and the likelihood that the impacts of temporarily exceeding

[30] https://scenariocompass.org/; Riahi et al. (2026b); Gidden et al. (2025).
[31] Riahi et al. (2026b).
[32] UNEP (2026a).

1.5°C are not all expected to return to previous conditions as warming comes back to that level by 2100.

Acceleration is needed to align with current lowest-overshoot pathways across all major sectors, but at varying rates

Understanding the pace of change at a sectoral level that aligns with the current lowest-overshoot pathways can guide policy, investment, and action. It shines a light on the level of ambition needed for global goals to 2030 or 2035, and beyond to 2050. There are nine short years to 2035, and 2050 seems close. If we are off track, it is time to accelerate action to address barriers and implement measures to capture the mitigation opportunities identified in the models, and also to revisit the modelled outcomes based on what is happening in each sector and find other measures to deliver the required mitigation volumes.

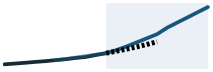
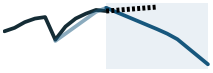
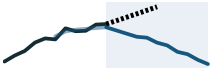
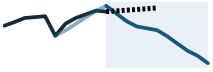
The pace of acceleration or reversal of past trends to align with lowest-overshoot pathways is summarised in Table 2. It compares trends over the past decade, IEA outlooks to 2030, and what is required to align with lowest-overshoot pathways over the next decade to 2035.

Table 2: Average annual rates of change observed over 2015–2025, in IEA outlooks to 2030 and in the lowest-overshoot pathways over 2025–2035, with 2015–2035 trajectories (as Table ES-1). Source: as Table ES-1.

The pace of change across the energy system

The last decade, the current outlook, and lowest-overshoot pathways

Observed IEA outlook Lowest-overshoot median

Element	Last 10 years 2015–2025	Projected 2025–2030, IEA	Required 2025–2035	Trajectory 2015–2035	
Energy demand					
Final energy per GDP index 2020=100	−1.6%/yr	−2.2%/yr	**−3.5%/yr**		Accelerate decline
Electricity EJ/yr	+2.9%/yr	+3.4%/yr	**+3.2%/yr**		Accelerate electrification
Fuels used directly Non-electric final energy, EJ/yr	+1.0%/yr	+0.4%/yr	**−2.3%/yr**		Reverse
Power generation					
Renewable capacity TW	+10.8%/yr	+10.9%/yr	**+13.2%/yr**		Accelerate
Renewable generation PWh/yr	+6.9%/yr	+8.4%/yr	**+11.7%/yr**		Accelerate
Coal-fired generation PWh/yr	+1.3%/yr	−0.9%/yr	**−14.0%/yr**		Reverse
Gas-fired generation PWh/yr	+2.2%/yr	+2.6%/yr	**−4.7%/yr**		Reverse
Fossil fuel final energy					
Final energy from coal EJ/yr	−1.7%/yr	−0.6%/yr	**−5.0%/yr**		Accelerate decline
Final energy from gas EJ/yr	+2.0%/yr	+1.6%/yr	**−3.2%/yr**		Reverse
Final energy from oil EJ/yr	+0.9%/yr	+0.3%/yr	**−2.4%/yr**		Reverse
Energy methane					
Energy methane Gt CO_2eq/yr	+0.3%/yr	—	**−8.4%/yr**		Reverse
Primary energy from coal EJ/yr	+1.1%/yr	−0.6%/yr	**−10.7%/yr**		Reverse
Primary energy from gas EJ/yr	+1.9%/yr	+1.6%/yr	**−2.1%/yr**		Reverse
Primary energy from oil EJ/yr	+0.6%/yr	+0.3%/yr	**−2.6%/yr**		Reverse

© Climate Resource, 2026

Energy demand

Energy demand grew faster from 2015 to 2025 than in the C1 pathways (Figure 7a). The three panels in Figure 7a explore the underlying drivers.

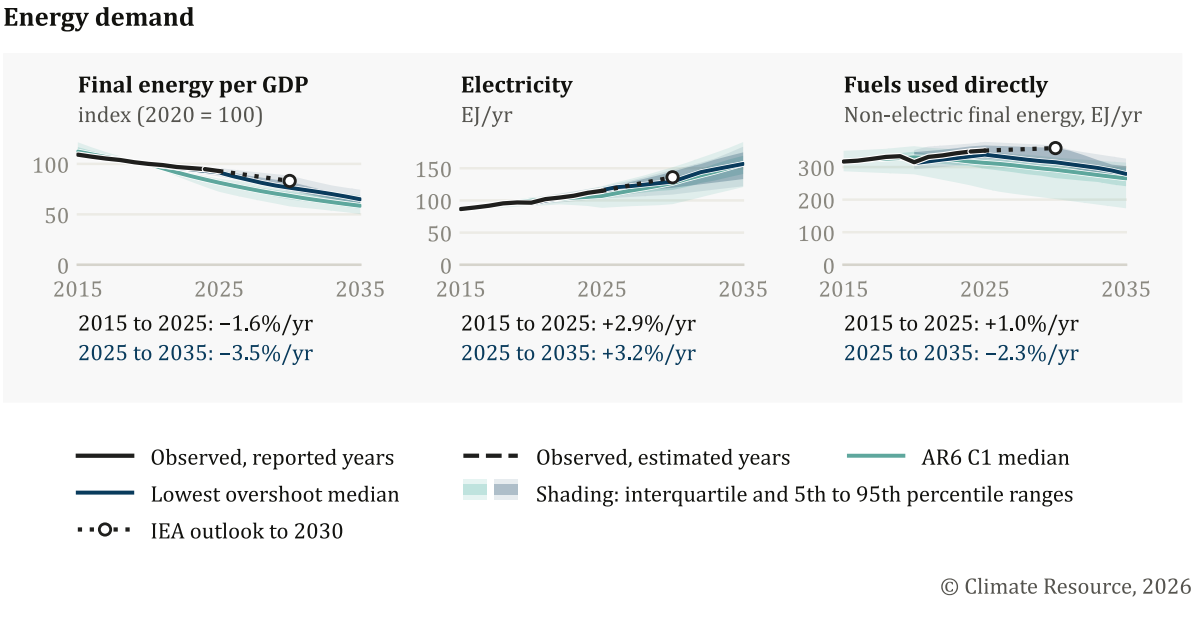


Figure 7a: Final energy per GDP (index, 2020 = 100), electricity and fuels used directly (non-electric final energy): observations (black; dashed where estimated), IEA outlooks to 2030 (circles) and the AR6 C1 and lowest-overshoot pathways (medians, interquartile and 5th–95th percentile ranges), 2015–2035. Source: Byers et al. (2022); Riahi et al. (2026a); IEA (2025d, 2025f–h, 2026a–b, 2026f); World Bank (2026); Climate Resource calculations.[33]

Energy efficiency improved significantly more slowly from 2015–2025 than in the 1.5°C-aligned pathways. The average annual rate of change in final energy demand per unit GDP in the decade to 2035 needs to double the rate in the 10 years to 2025 to align with the lowest-overshoot pathways, which require an average reduction of 3.5% a year from 2025 to 2035.

Industrial energy efficiency has barely progressed at the global level, improving by just 0.2% a year between 2019–23, in contrast with the previous decade when it improved by almost 2% a year between 2010–19. Heavy industry – which includes sub-sectors such as metals, chemicals and cement – drove 83% of industrial energy demand growth between 2019–23.[34]

Fuels used directly (non-electric final energy: coal, liquid fuels, gas and other carriers) trended in the wrong direction, increasing at an annual average rate of 1% from 2015 to 2025, rather than falling as required to align with the C1 pathways. Average annual falls of 2.3% from 2025–2035 deliver the lowest-overshoot pathways. Electrification of road transport has risen rapidly and was

[33]Figures 7a–d: pathways are at native levels, except coal final energy in Figure 7c (see its note); coverage is 71–94 C1 and 9–10 lowest-overshoot pathways. Rates are compound annual changes of the observations (2015–2025) and, for 2025–2035, from the observed 2025 level to the lowest-overshoot 2035 median. IEA outlooks apply each source's 2025–2030 growth to observed 2025 levels. Final energy per GDP uses PPP GDP at constant prices; its outlook uses WEO 2025 STEPS primary-energy intensity as a proxy. The fuels-used-directly outlook is a proxy based on IEA coal, gas and oil demand ratios.

[34] IEA (2025c), p. 14; IEA (n.d.).

regarded as on track for 1.5°C.[35] This was offset by high and rising final energy demand for both heavy and light industry, and increases in other transport sectors such as aviation.[36]

Electricity consumption grew rapidly to 2025, increasing at an average rate of 2.9% a year from 2015 to 2025. The rate of growth in electricity consumption rises to an average of 3.2% a year from 2025 to 2035 to reach the median of the lowest-overshoot pathways, and electricity reaches 35% of final energy demand by 2035.

Electricity supply

On the electricity supply side, the power-generation mix is not on track, despite the increase in renewables (Figure 7b).

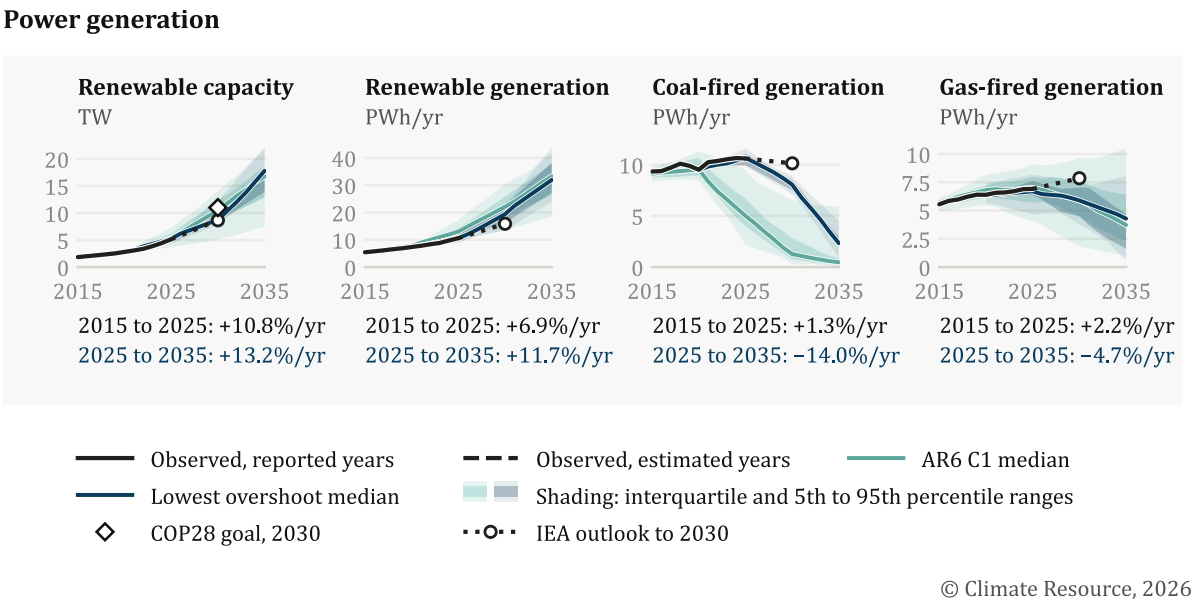


Figure 7b: Renewable capacity and renewable, coal-fired and gas-fired generation: observations, IEA outlooks to 2030, the COP28 tripling goal and the AR6 C1 and lowest-overshoot pathways, 2015–2035, drawn as in Figure 7a. Source: Byers et al. (2022); Riahi et al. (2026a); Ember (2026); IRENA (2026c); IEA (2025i, 2026a); UNFCCC (2024); Climate Resource calculations.[37]

Renewable energy capacity deployment has increased rapidly, at an average annual rate of just under 11% from 2015–2025, driven by falling generation technology costs and policy support. Deployment is 20% faster from 2025 to 2035 in the lowest-overshoot pathways, at an average of around 13% a year. IRENA (2026b) reports that over 90% of new utility-scale renewable capacity commissioned in 2025 generated electricity more cheaply than the lowest-cost new fossil fuel alternative. The needed acceleration in deployment over the next 10 years will not come from generation technologies' cost competitiveness alone. It requires action to modernise grids, including addressing planning and permitting constraints, social licence, finance, and barriers

[35] IEA (2025d).

[36] IEA (n.d.).

[37] Renewable capacity is IRENA's installed capacity (AC) and renewable generation Ember's (solar, wind, hydro and bioenergy). The IEA outlooks enter as their own 2025–2030 growth applied to the observed levels..

created by market rules or fossil fuel subsidies in some locations. Some of these have long lead times, particularly grid expansion and modernisation.

Renewable electricity generation also needs to accelerate from an actual average growth rate of around 7% a year from 2015 to 2025, to nearly 12% a year from 2025 to 2035 to align with the lowest-overshoot pathways. This will likely require a combination of deploying more renewable energy capacity, shifting the generation mix to increase the share of wind, and increasing the deployment of batteries and storage to firm capacity and reduce curtailment.

Coal-fired generation grew at an average rate of just over 1% a year from 2015–2025, markedly off track for C1 pathways. As described above, power generation accounted for around 43% of the excess cumulative emissions above C1 pathways since 2020. From 2025 to 2035, coal-fired generation declines by 14% a year in the current lowest-overshoot pathways, a material change from recent and forecast trends.

Gas-fired generation grew at an average of around 2.2% a year from 2015–2025, a rate broadly consistent with projections in C1 pathways. IEA (2026a) forecasts gas-fired generation to grow at an accelerated 2.6% a year to 2030, up from about 0.5% in 2025, driven by rising electricity demand in the United States, where data centres account for around half of demand growth. Gas is expected to be the largest source of additional supply for US data centres. In many other locations, low-emission sources are projected to meet most additional data-centre demand (IEA 2025e). Growth may also be driven by oil-to-gas switching in some parts of the Middle East, and by growth in China and India (IEA 2026a). In contrast, in lowest-overshoot scenarios, gas-fired generation declines at an average of 4.7% a year from 2025 to 2035.

Other final energy carriers

Non-electric carriers account for about 78% of total final consumption in 2025, including non-energy use. Figure 7c shows the coal, natural gas and petroleum oil components. Of these, oil is the largest source, given its role in transport, meeting more than twice as much final energy demand as gas and more than four times that of coal.

Oil consumption grew at an average of around 0.9% a year over 2015–2025, slightly below the 1.05% a year of the previous decade, with significant variation.[38] It saw a sharp fall in 2020, a rebound, then a slowdown to 0.7% in 2025.[39] Road-fuel demand has flattened as electric vehicles, and to a lesser extent biofuels, displace oil.[40] Oil use in advanced economies remains around 4% below 2019 levels. In China, growth now comes almost entirely from petrochemical feedstocks. Globally, the remaining growth is concentrated in petrochemical feedstocks and aviation. In 2025, the IEA forecast global oil demand to plateau at around 105.5 mb/d by 2030, with petrochemicals

[38] Energy Institute, Statistical Review of World Energy (via YCharts): 84.1 mb/d in 2005, 93.4 mb/d in 2015. https://ycharts.com/indicators/world_oil_consumption

[39] IEA (2025f).

[40] IEA (2026b).

and jet fuel offsetting the displacement of around 5.4 mb/d by electric vehicles.[41] The IEA has not yet published its 2026 medium-term update; its October 2026 Oil Market Report expects demand to fall by 2.6 mb/d in 2026, to 102.4 mb/d, as the energy security crisis bites, with 2027 demand still 0.6% below 2025 (IEA 2026g). The lowest-overshoot pathways instead require petroleum oil use for final energy to fall by around 2.4% a year from 2025 to 2035. Achieving this likely requires a step change in the rate of industrial decarbonisation, and sustainable transport fuels for aviation and shipping.

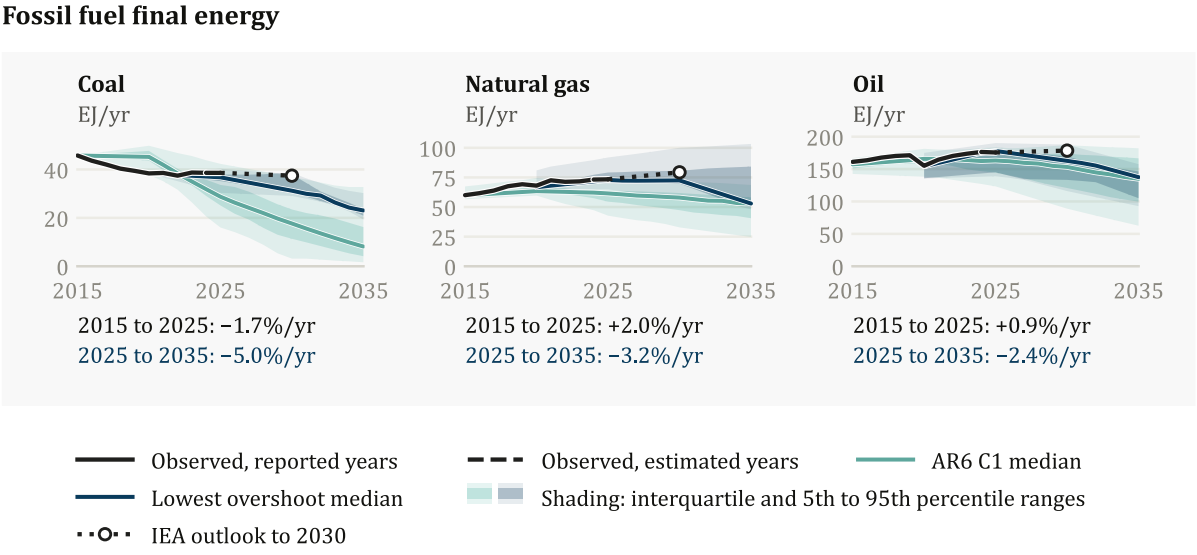


Figure 7c: Coal, natural gas and oil used directly in all sectors, including non-energy use: observations, IEA outlooks to 2030 and the AR6 C1 and lowest-overshoot pathways, 2015–2035, drawn as in Figure 7a. Source: Byers et al. (2022); Riahi et al. (2026a); IEA (2025f–h, 2026b, 2026f); Climate Resource calculations.[42]

Gas consumption for other final energy grew by about 2% a year from 2015 to 2025. In 2025, the IEA forecast continued growth to 2030, with industry and energy driving about 45% of that growth, power over a third, and buildings, transport and marine LNG smaller shares. The forthcoming 2026 update will show how much these forecasts change in response to the crisis in the Middle East. The IEA's *Gas Market Report Q3-2026* (IEA 2026c) signals a fall of about 0.5% in 2026 for all gas demand, including for power generation. In contrast to the last 10 years' trend and the IEA's current forecasts to 2030, natural gas consumption for final energy declines by around 3.2% a year from 2025 to 2035 in the lowest-overshoot pathways. Again, this signals the need for a step change in policy and outcomes for industry in particular.

Coal for other final energy fell at an average rate of 1.7% a year from 2015 to 2025. In 2025, the IEA forecasts global coal demand to plateau and fall to 2030 from 2025. Drivers include declines in

[41] IEA (2025f).

[42] Coverage: 89, 71 and 77 C1 pathways and nine lowest-overshoot pathways per fuel. Coal pathways are scaled so that each pathway's first-year value (2015 for C1, 2020 for lowest overshoot) equals the IEA observation, preserving its own rates of change, because models differ on whether coal and coke used in coke ovens and blast furnaces count as final energy. Gas and oil pathways are at native levels, which match the IEA in 2020.

several economies, including the EU and Japan, and China's transition from coal to gas and electricity for small industry and residential heating, and a slowdown in the output of its steel sector combined with transitioning steel production to electric arc furnaces. Coal for final energy is also forecast to increase in some countries to 2030, including India.[43] The crisis in the Middle East may again change the near-term outlook, even if it does not affect the longer-term drivers. The IEA's *Coal Mid-Year Update 2026* (IEA 2026d, September) now projects a 1.2% rise in 2026 for example. In the lowest-overshoot scenarios, coal for other final energy falls by an average of 5.0% a year, almost three times the rate of decline in the previous decade.

Methane from energy

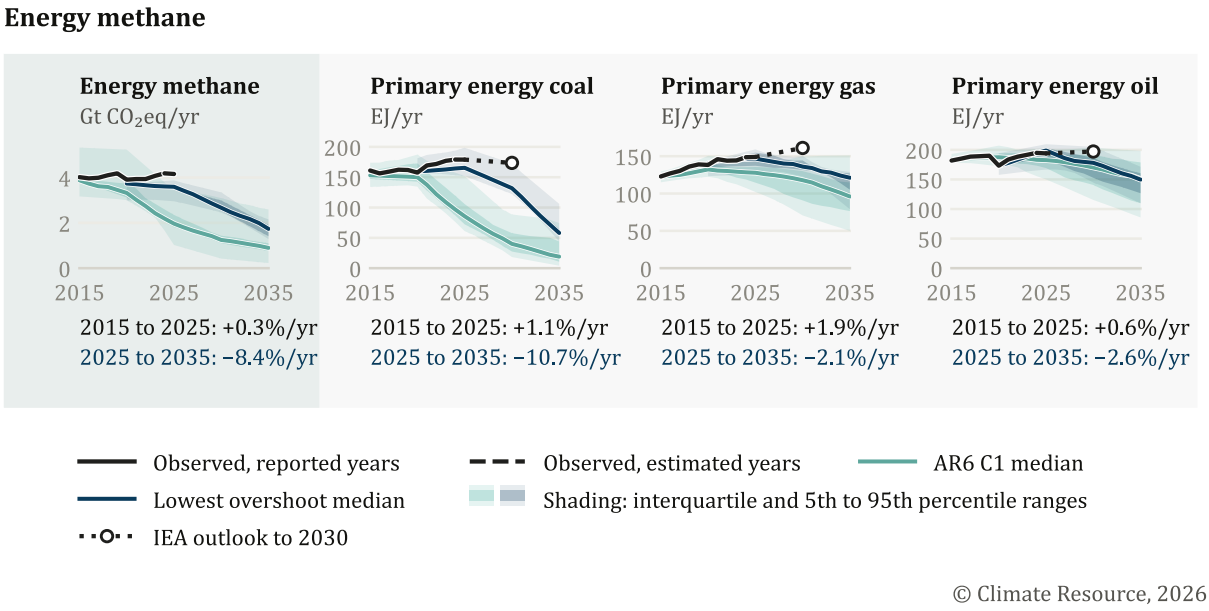


Figure 7d: Energy-sector methane emissions and primary energy from coal, gas and oil: observations, IEA outlooks to 2030 and the AR6 C1 and lowest-overshoot pathways, 2015–2035, drawn as in Figure 7a. Source: Byers et al. (2022); Riahi et al. (2026a); IEA (2025f–h, 2026b, 2026e, 2026f); Climate Resource calculations.[44]

Methane emissions from the energy sector have stayed high over the past decade, rising at an annual average rate of around 0.3% a year. This rise is spread across oil and gas operations, steam coal mines and abandoned facilities. In contrast, from 2025 to 2035, primary energy from coal and gas falls at around 11% and 2% a year, respectively, in lowest-overshoot pathways, contributing to energy methane emissions falling at 8% a year (Figure 7d). The IEA estimates that around 70% of fossil fuel methane can be avoided with existing technologies, and around 30% at no net cost under current energy prices.[45]

[43] IEA (2025h).

[44] Energy methane observations are the IEA Global Methane Tracker 2026 energy-related total. Primary fossil energy is a methane driver, not methane attributed by fuel. No IEA methane outlook is shown.

[45] IEA (2026e).

Goals already in place and proposed for renewable energy deployment, energy efficiency and electrification will drive the energy system towards these lowest-overshoot pathways over the next 10 years, if achieved, and extended beyond 2030 to align with the lowest overshoot pathways. [46] In June 2026, the COP31 Presidency announced an electrification initiative under its Global Climate Action Agenda to raise electricity's share of global final energy consumption to 35% by 2035, before launching the "35-by-35 Global Electrification Pledge" at New York Climate Week in September and reaffirming the goal at Pre-COP in Fiji in October. This, together with the existing COP28 targets to triple renewable energy capacity and double the rate of increase in energy efficiency by 2030, is aligned with the current lowest-overshoot pathways. Achieving these goals will shrink the space available for coal and gas and bend their trajectory downward. Establishing goals beyond 2030 for renewable energy and energy efficiency is also key.

[46] Climate Resource (2026).

4 Main takeaways

New scenarios have been published that will be part of the information set that underpins AR7. These scenarios add to the evidence that remaining feasible pathways to limit warming to 1.5°C by the end of the century involve overshooting this threshold and then returning. The question now is, how do we keep overshoot as short and sharp as possible, while managing the risks and impacts of overshoot on people and ecosystems the world over?

The COP31 pledge announced in September 2026, and reaffirmed at Pre-COP in October by Türkiye and Australia, is to electrify 35% of final energy by 2035. Together with the COP28 targets to triple renewable energy capacity and double the rate of increase in energy efficiency by 2030, these pledges are aligned with the current lowest-overshoot pathways.[47] Achieving these goals will shrink the space available for coal and gas and bend their trajectory downward.

Some of the changes set in motion by these goals will be mutually reinforcing. Electrification is around three times more efficient than burning fossil fuels for heating or transport. As a result, rapidly increasing electrification delivers increased energy efficiency, alleviating a driver of final energy demand growth.

However, comparing trajectories over the last 10 years across major sectors shows the rapid acceleration in decarbonisation required over the 10 years to 2035 if we are to deliver the current lowest-overshoot pathways. The economics of clean energy technologies will not deliver this without stronger policies, action, and investment. This applies to all parts of the energy landscape.

Key takeaways are that:

- Over the past five years, the world built clean energy generation capacity at record rates, but did not deliver the clean energy or energy efficiency transition that 1.5°C pathways required. Energy demand grew, outrunning efficiency gains and growth in clean energy generation. Coal and gas filled the gap, pushing emissions higher.
- The next decade has to be different. A step change in the speed of the transition is needed across every part of the energy system.
- The targets on the table are aligned with the lowest overshoot pathways. Delivery is the gap. Tripling renewables, and doubling the rate of improvement in energy efficiency by 2030, and electrifying 35% of final energy by 2035 together will help drive fossil fuel consumption lower, if delivered.
- Low-cost clean energy generation and growing sales of electric vehicles and heating alone won't deliver these targets. It also needs additional, effective policy and finance. Delivering

[47] Climate Resource (2026); COP31 Presidency (2026); UNFCCC (2024), Decision 1/CMA.5, para. 28.

the step change in pace requires a step change in action, including addressing barriers to expanding and modernising grids to integrate and support renewable deployment; policy support and investment to accelerate electrification, and transition industry and transport away from coal, gas and fossil-fuel based liquid fuels, and increase the viability of lower-emissions alternatives and deliver deployment at scale.

- Delay has measurable costs. Every year of delay raises peak warming. The lowest-overshoot pathways peak around 1.7 °C mid-century and return to 1.5 °C by 2100, if strong action starts now. Achieving this means reducing emissions by around 3.5% of the 2019 level per year to 2050 on average, and reducing even faster than this from 2025 to 2035.

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