State of Energy Policy 2024

INTERNATIONAL ENERGY AGENCY

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Key findings

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The last four years unleashed a wave of new energy policies that addressed pressing energy security concerns and accelerated the uptake of clean energy. The global economic crunch triggered by the Covid19 pandemic prompted governments to launch new recovery and relief packages, with many prioritising clean energy transitions. Close to 150 countries - covering close to 95% of global greenhouse gas (GHG) emissions set forth new, more ambitious climate commitments, leading about 50 governments to tighten energy efficiency, renewables and emissions standards alongside these new incentives for clean energy. Since 2020, clean energy investment grew 60% globally.

Energy security has prominently reemerged as a priority for policymakers. Russia's invasion of Ukraine in 2022 led to energy price spikes globally, highlighting the risks posed to interconnected energy systems. Countries were reminded anew of traditional energy security concerns, while the shift to clean energy brought forth new ones, particularly in terms of supply chain concentration of key technologies and the critical minerals essential to their production. Disruptions to trade routes amid growing geopolitical tensions and climate-induced extreme weather are complicating the situation, exposing energy systems to new vulnerabilities. More than ever, countries are having to consider and adopt new approaches to balance the interconnected goals of sustainability, affordability, competitiveness and security.

Against this backdrop, the IEA has produced its inaugural edition of *State of Energy Policy.* Intended as a 'first-of-its-kind' global inventory, this annual publication provides users with the most comprehensive up-to-date energy policies by countries and sectors, highlighting the most substantial changes in the preceding 12 months. It draws upon the expertise, insights, and review of numerous international experts, to compile more than 5 000 policy records across 50 key policy types from more than 60 countries, all available in a public database, the Energy Policy Inventory. Distinct trends emerge from this comprehensive review as to the types of policy governments use to bridge the gaps to their long-term pledges while ensuring energy security, and where these policies have gained traction.

Government incentives for clean energy grew to unprecedented levels, and are now a major driver for rising clean energy investment. Since 2020, governments have earmarked almost USD 2 trillion in direct investment support for clean energy – nearly triple the amount committed to clean energy in response to the 2007-08 financial crisis. Some 80% of this earmarked funding is concentrated in just three regions: China, the European Union and the United States. Many measures are framed as efforts to boost clean technology deployment and to secure positions in emerging industries that promise to be major future sources of growth and

employment. New spending measures continue to be approved. In the first half of 2024 alone, more than 40 countries earmarked clean energy support, totalling to USD 290 billion.

Government interventions to manage energy prices peaked in 2022, but affordability remains a key concern. Price spikes prompted by Russia's invasion of Ukraine pushed total end-use expenditure on energy to a record high in 2022 – USD 10 trillion. Short-term consumer support directly from governments totalled USD 940 billion, mainly concentrated in Europe, while other pricing regulations instituted by governments amounted to USD 2.4 trillion worth of fossil fuel subsidies accruing since 2022. Prices have since declined and government have rolled back most emergency provisions. Still, all G20 countries maintain programmes that provide affordability support to certain consumers. Such programmes benefit from targeting households most in need to manage fiscal burdens and ensure a fair distribution of costs and benefits – a task that only one-third of the emergency measures achieved.

Securing clean energy supply chains has become a key priority, prompting use of diverse policy measures – from direct incentives to trade policy. Geographical concentrations within clean energy supply chains remains higher than fossil fuel supply. Across key technologies – solar PV, wind, battery, and electrolyser – at least 80% of manufacturing capacity is concentrated within the top three producing countries. This renders global supply chains vulnerable to disruptions, whether due to policy changes in individual countries, natural disasters, technical failures or corporate decisions. Recent policies and strategies have designated key clean energy technologies and related commodities to be of strategic importance, proposing requirements or targets for minimum shares of domestic manufacturing. Recent notable examples the United States Defence Production Act and the European Union's Net Zero Industry Act, however other countries have introduced similar policies and targets. Additionally, government direct support available to domestic manufacturers of these technologies climbed to USD 170 billion globally in the last four years – nearly 10% of total government energy spending mobilised across that period. The largest portion of these incentives is going to electric vehicles (EVs), followed by hydrogen and batteries production, along with critical minerals refining and production. Since 2020, around 70% of this earmarked support was concentrated in advanced economies and China, although new spending is being mobilised in other emerging manufacturing hubs, such as Brazil, India and Malaysia.

Since 2020, sharp rise is evident in trade measures relating to clean technology supply chains. Over the past 25 years, the number of new trade measures targeting batteries, solar PV, EVs, wind turbines and electrolysers has increased steadily. Since 2020, countries implemented nearly 200 trade policies targeting clean energy technology, whereas only 40 such initiatives were implemented in the preceding 5 years. Often, the largest importers and exporters of these technologies are at the forefront of these changes in trade rules, which may well have implications for clean technology supply chains, innovation, competition and economic efficiency. Tariff adjustments, anti-dumping duties and countervailing

measures (including those recently announced by the European Union and the United States), account for close to 40% of policy changes since 2020. In that same period, around 50 new free trade agreements were signed, of which nearly 90% still extended preferential tariffs to clean energy technologies.

Energy performance regulations now cover three-quarters of global energy-related emissions. As of 2024, fifteen G20 countries have energy performance regulations in place covering each key energy sector — power, industry, buildings transportation, and fuel supply. This is a substantial change from just a few decades ago. In 2000, only 5% of industrial motors were covered by energy performance standards; now over 50% are. Since 2020, half of G20 countries have updated building energy codes, affecting 70% of their sector emissions.

Since 2023, 35 countries – representing one-fifth of energy-sector CO_2 emissions – passed new energy regulations. Among the most impactful updates to energy regulations include the latest fuel-economy and emissions standards for passenger cars and trucks, as well as new regulations for GHG emissions from fossil fuel-fired power plants in the United States. Several major firsts also warrant mention: Australia added its very first fuel efficiency standard for vehicles, the European Union introduced regulations on climate-forcing refrigerants used in appliances (so-called fluorinated greenhouse gases [F-gas] regulations); and Ukraine established its first-ever biofuel blending mandate, set to start in 2025.

Some policies were rolled back since 2020, but their impact was smaller than the increased stringency elsewhere. Notable rollbacks or delays were applied to proposed regulations banning the sale of new fossil fuel boilers in buildings and of internal combustion engines (ICE) vehicles, and on phase-out of unabated coal. Such adjustments were largely motivated by the energy crisis and public concerns. The replacement regulations either delayed the start date for compliance or relaxed the proposed policy stringency. Regulations that were rollbacked and delayed policies in 2023 covered around 1% of current global emissions.

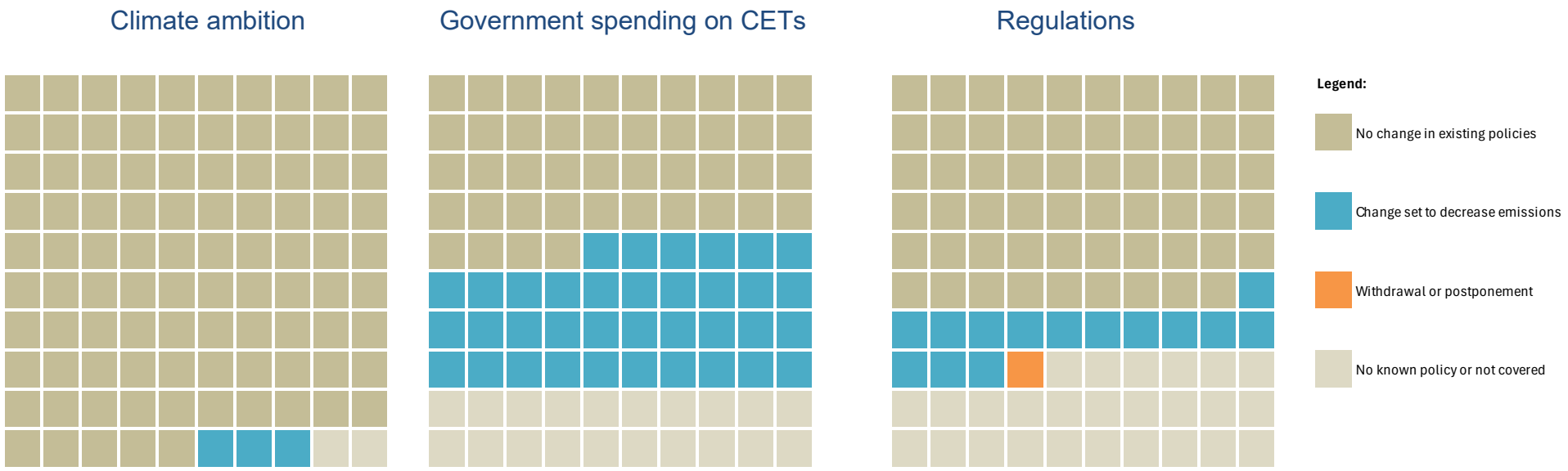
Still, substantial leeway exists to advance coverage, stringency and enforcement of these policies. Around one-quarter of global energy growth to 2030 is projected to occur in unregulated sectors, and in most countries, the least efficient appliances legally sold are at least 40% less efficient than the “best-in-class” equivalent in that region. Additionally, rising policy coverage does not necessarily imply near-term impact. Some policies naturally come with some time-lag — most fuel economy standards are updated every 4 – 5 years and aim to give industry a 10 – 15-year time horizon to comply — but a lack of enforcement of these standards can also diminish their impact. For instance, while 90% of fossil fuel production is now subject to one or more regulations targeting fugitive methane, energy-sector methane emissions still climbed by 3% last year.

Current Nationally Determined Contributions target reducing energy-sector CO_2 emissions to 32 Mt by 2030, with updated NDCs expected in 2025. The IEA’s Climate Pledges Explorer

assesses the energy component of all NDCs and long-term climate ambitions and finds that current NDCs fall short of what is needed to hit long-term climate objectives. With Paris Agreement signatories set to submit new NDCs targets in 2025 — *State of Energy Policy 2024* can help highlight which policies have proven effective, and where they can be expanded. Many recent energy policies show clear potential to advance climate mitigation in the energy sector. But they must also fit local contexts, and ensure security, competitiveness and affordability. The IEA remains committed to monitoring and providing the latest energy policy data to governments and the public, as we collectively chart a path to a secure and sustainable energy future.

Countries covering one-third of energy-related CO_2 emissions earmarked new clean energy spending last year; those representing one-fifth of emissions adopted new energy regulations

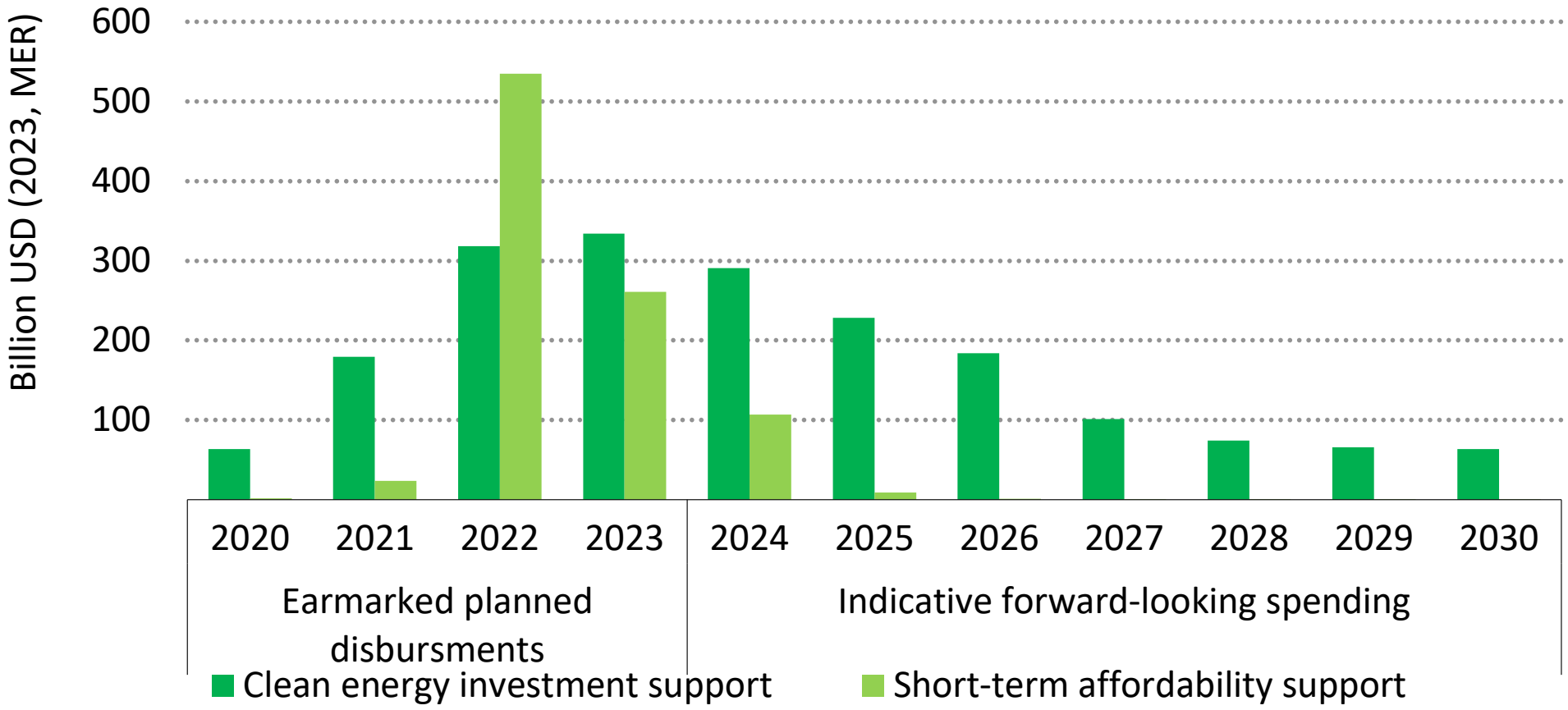
Global CO_2 emissions covered by changes in policy between June 2023 and September 2024 (%)



Note: CET = clean energy technology. One tile represents 1% of global energy-related CO_2 emissions. Change in climate ambition reflects changes in stringency of NDCs or of net-zero targets. Change in CET government spending highlights countries that increased (between 2023 and 2024) their earmarked spending linked to energy-related emissions. Change in regulation tracks a change in policy to address sectoral CO_2 emissions, with more details provided in the sectoral scorecards later in this report.

Governments continue to allocate more long-term investment support to clean energy, with over USD 2 trillion in fresh allocations since 2020

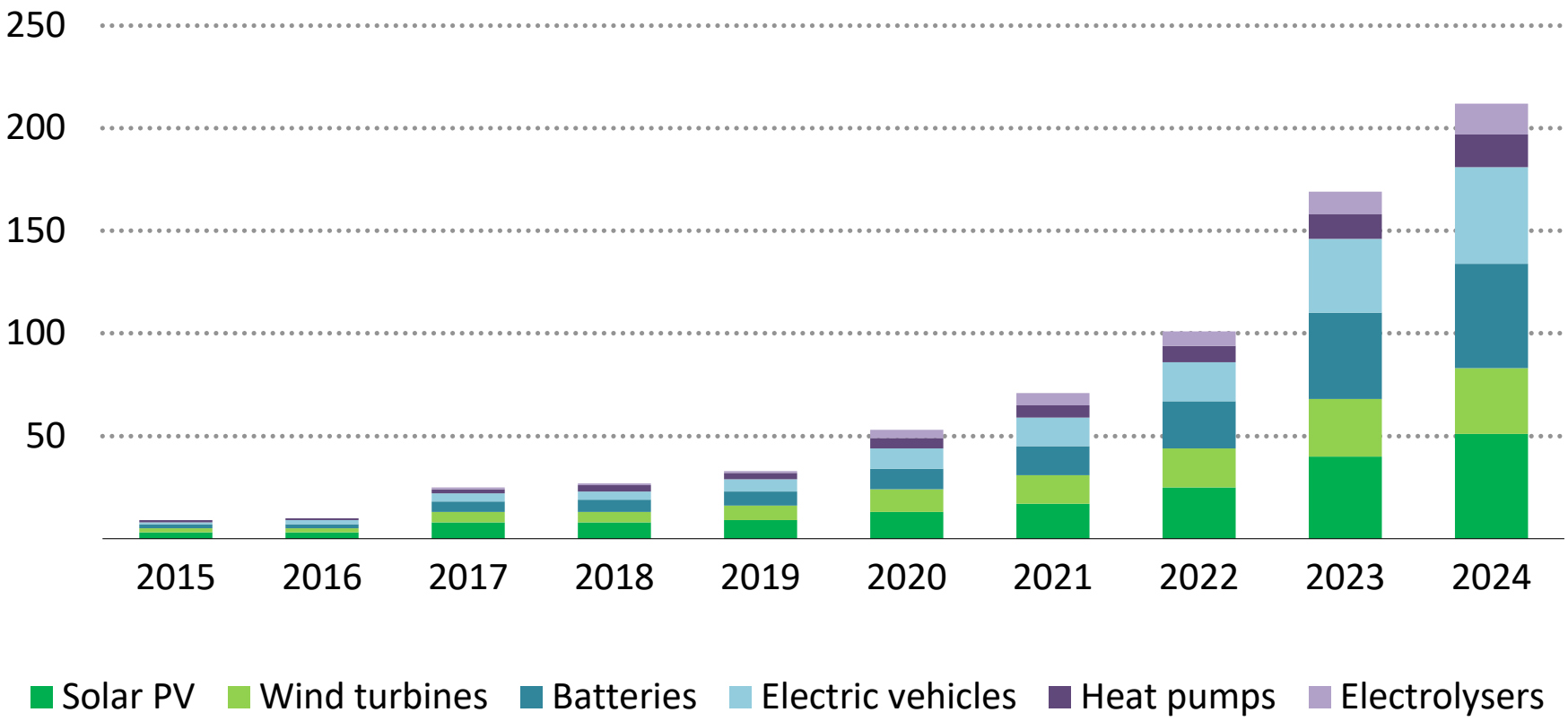
Earmarked government support for clean energy investment and consumer energy affordability measures by budget allocation year



Note: Earmarked government spending shows planned disbursements and indicative forward-looking spending across budget timelines as validated between 2020 and H1/2024. These estimates do not translate into disbursement projections up to 2030, as it is expected that governments will route more spending packages through annual approval processes.

Trade policies related to key clean energy technologies sharply increased in the early 2020s

Cumulative new trade policies covering clean technologies, 2015-H1/2024



Note: Each count indicates a single instance of a trade measure impacting solar PV, wind turbines, batteries, EVs, heat pumps or electrolysers, and their components. This includes EVs and battery cells, anode and cathode; solar PV modules, cells, wafers and polysilicon; wind nacelles and blades; heat pumps and electrolysers. Any measure that includes several of these technologies is counted once per provision. Trade policies considered include changes in import or export tariffs, anti-dumping duty and countervailing measures, import or export control and bans, and other non-tariff measures, such as import or export licensing and quotas. The scope of FTAs is investigated separately and is not included in the chart.

State of Energy Policy 2024

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Understanding the *State of Energy Policy* report

State of Energy Policy 2024 is a first-of-its-kind publication from the IEA, which explores how the global energy policy landscape has evolved over the past year — specifically, between June 2023 and September 2024. With input from country officials and a wide range of international experts, the report covers over 50 policy types across more than 60 countries, and, in total, catalogues over 5 000 energy policies, all available on a publicly accessible database — the IEA's Energy Policy Inventory. The report offers a synthesis of this comprehensive dataset, helping users to make sense of latest trends and compare energy policy positions across different countries.

Each year, *State of Energy Policy* will provide updates, building on the IEA's comprehensive annual review of policies to inform its Global Energy and Climate modelling. Future editions will continue to expand on the types of policies covered.

Scope

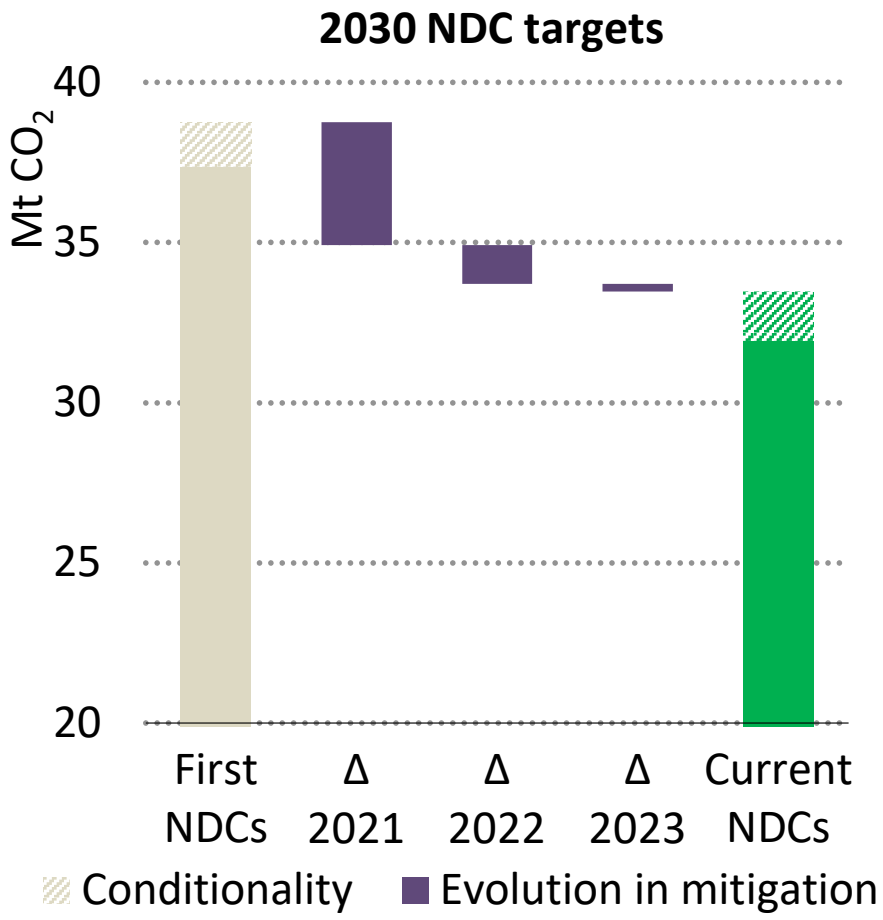
The *State of Energy Policy* report and its associated dataset examine key measures that have been adopted widely across several countries or regions and show potential to meaningfully accelerate and secure clean energy transitions. The inventory for 2024 includes:

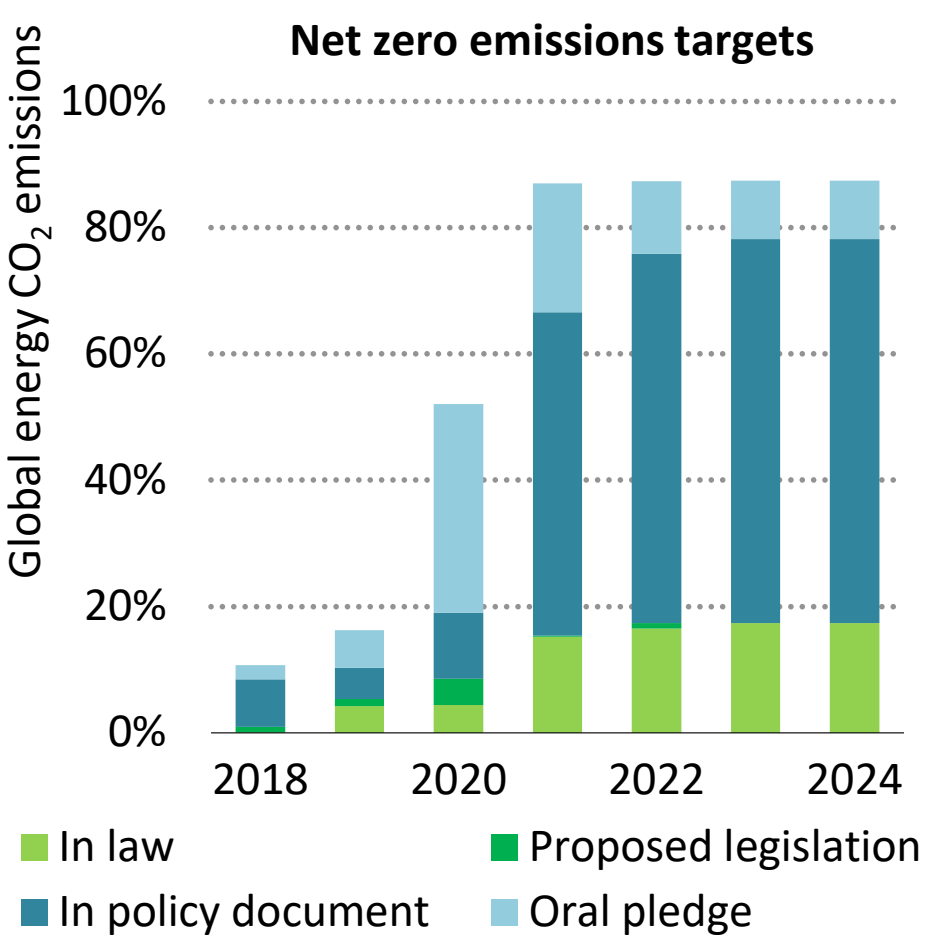
- **International commitments and climate pledges,** which encompass Nationally Determined Contributions (NDCs) and net zero emissions targets, as inventoried in the IEA's Climate Pledges Explorer.
- **Government energy spending**, which builds on the annual collection of the IEA's Government Energy Spending Tracker Database, covering clean energy investment support and consumer energy affordability measures. The present report supersedes the Government Energy Spending Tracker analysis, which is now covered in its own section of this report.
- **Trade policies** encompass analysis of tariffs and non-tariff measures, as well as free trade agreements (FTAs) that impact key clean energy technologies and commodities. It is a new area of analysis by the IEA, taken up as of 2024. The detailed global impacts of these trade policies are further analysed in the forthcoming publication Energy Technology Perspectives 2024.
- **Regulations** covers topics such as minimum energy performance standards (MEPS), standards, pricing instruments, supply chains resilience, and plans to expand energy networks, as well as the phase-out of fossil-fuel based or inefficient technologies.

International commitments and climate pledges

Few new updates or announcements of long-term climate goals occurred in the past 12 months

Evolution in mitigation targets in Nationally Determined Contributions (NDCs) and coverage of net zero emissions targets





Source: IEA, Climate Pledges Explorer

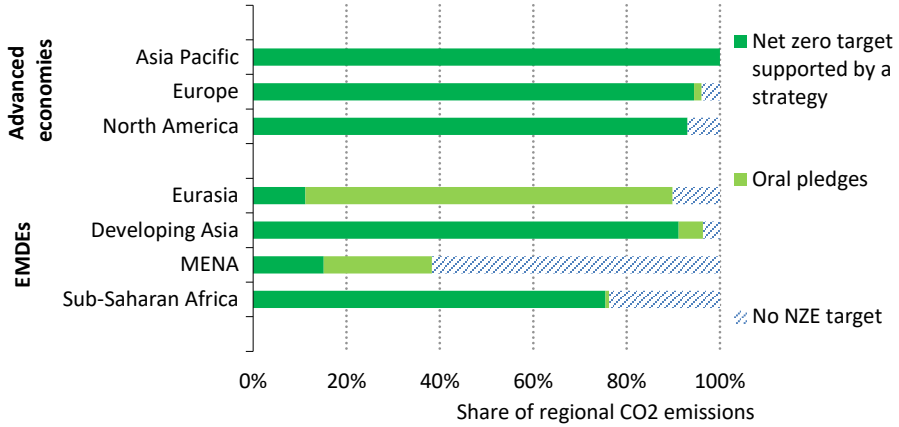
All sights are now set on 2025 to update Nationally Determined Contributions and long-term strategies in advance of COP30

Net zero pledges in 2024

As of September 2024, 98 countries and the European Union have committed to reach carbon or climate neutrality. Around 87% of global energy-related CO_2 emissions are eventually covered, although not all are supported by at least one policy document or a law.

Only a few additional countries pledged new targets over the past 12 months. Switzerland enshrined its 2050 climate neutrality goal in law (June 2023) through its Climate and Innovation Law. Ethiopia and Georgia both set goals to reach net zero by 2050, as outlined in their Long-Term Low Emission Development Strategies (LT-LEDS) (published in June and July 2023, respectively). Ghana recently increased its ambition to achieve carbon neutrality by 2060, through its updated Energy Transition and Investment Plan. Uganda unveiled its Energy Transition Plan (supported by the IEA), setting a target to reach energy-sector net zero CO_2 emissions by 2065. Regionally, the increase in coverage of net zero pledges is most noticeable in Europe, where Türkiye's 2053 climate neutrality goal raised the share of regional emissions covered by a net zero pledge to 95%.

Regional CO_2 emissions coverage of net zero pledges



Note: NZE = net zero emissions. EMDEs = emerging market and developing economies. MENA = Middle East and North Africa. Advanced economies in Asia Pacific include Australia, Japan, Korea and New Zealand.

The uptick in net zero coverage is also noticeable in Eurasia, with the approval of Kazakhstan's Net zero Strategy in February 2023. To date, however, most of the region's emissions are not yet covered by a climate neutrality pledge that is supported by a strategy or law. As of the first half of 2024, most of the global emissions not yet covered by a net zero target – roughly 10% – are concentrated in the Middle East and North Africa (MENA) and Eurasia.

Nationally Determined Contributions in 2024

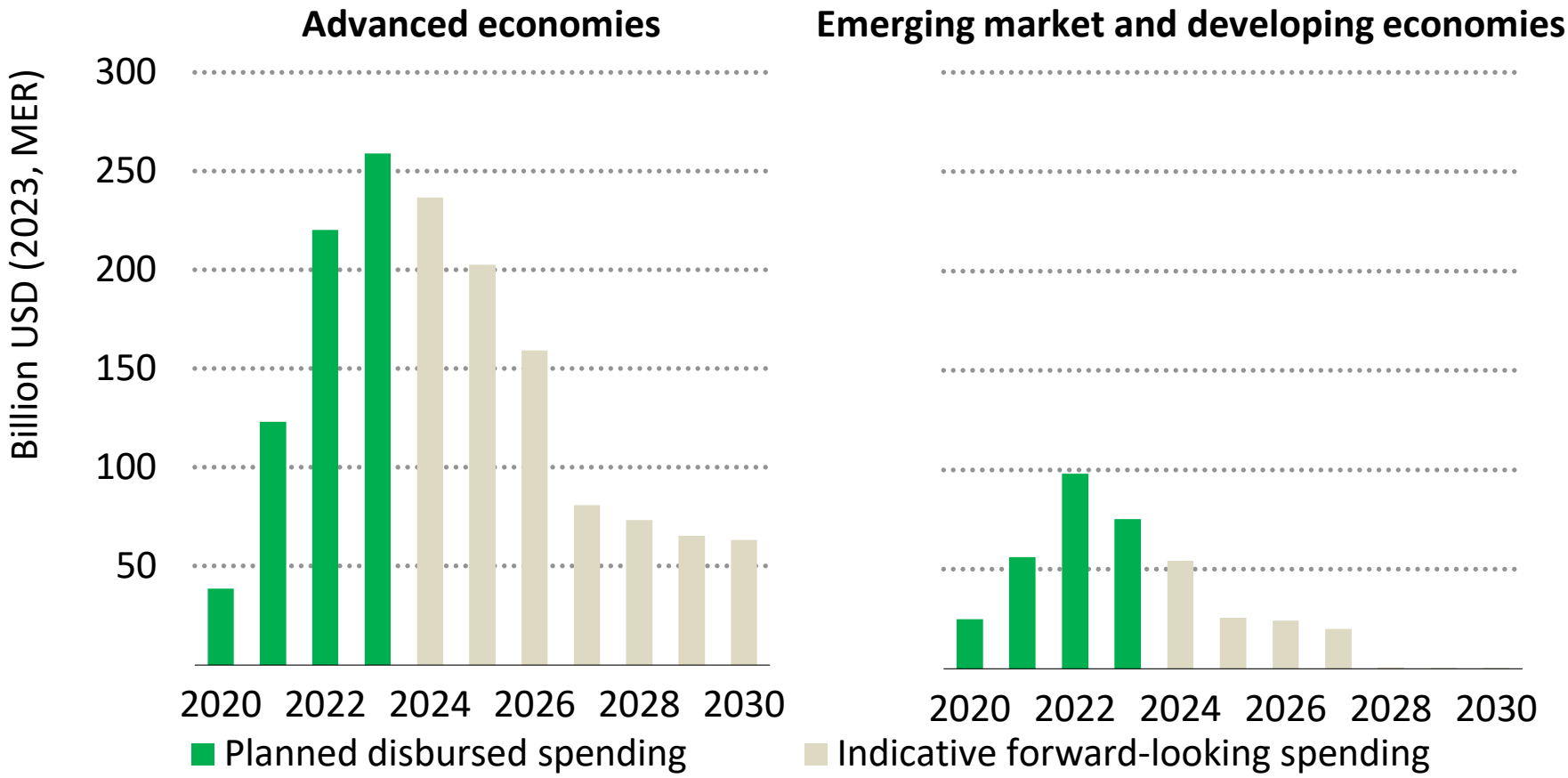
Only a handful of new NDCs (14) have been submitted since January 2023, collectively implying an additional cumulative reduction of 240 Mt of energy-related CO_2 emissions by 2030. Among those updated, the United Arab Emirates 2023 Second NDC is the most notable. It aims for an economy-wide, absolute emissions reduction of 19% by 2030 (compared to 2019 levels), moving away from the business-as-usual trajectory set in its 2020 Second NDC. Brazil also updated its NDC, moving from a target of 50% below 2005 levels by 2030 to an absolute annual emissions limit of 1.2 Gt CO_2-eq, consistent with a 53.1% reduction target. The European Union also submitted an updated NDC, but without any overall enhancement of its mitigation component.

If pledges are met on time and in full, current NDCs imply a trajectory in which emissions peak in this decade and stabilise at around 32 Mt CO_2 in 2030. This trajectory, however, is still misaligned with the long-term strategies of most countries and falls short of a 1.5 °C compatible pathway. Strengthened submissions (before COP30 in Brazil) will largely set 2035 targets. To comply with countries' own long-term goals according to the IEA's Announced Pledges Scenario (APS), in aggregate, NDCs would need to cut emissions by about 1 Gt CO_2 every year from 2023 to 2035 – approximately 400 Mt more than the amount currently pledged. Annual global mitigation would need to rise to roughly 2 Gt to 2035 to align with the IEA Net Zero Emissions by 2050 Scenario (NZE Scenario), which achieves the targets to triple renewables capacity and double energy efficiency improvements, in line with the COP28 UAE Consensus.

Government energy spending

Advanced economies earmarked three times more support for clean energy than in emerging market and developing economies, with greater focus on boosting long-term investor certainty

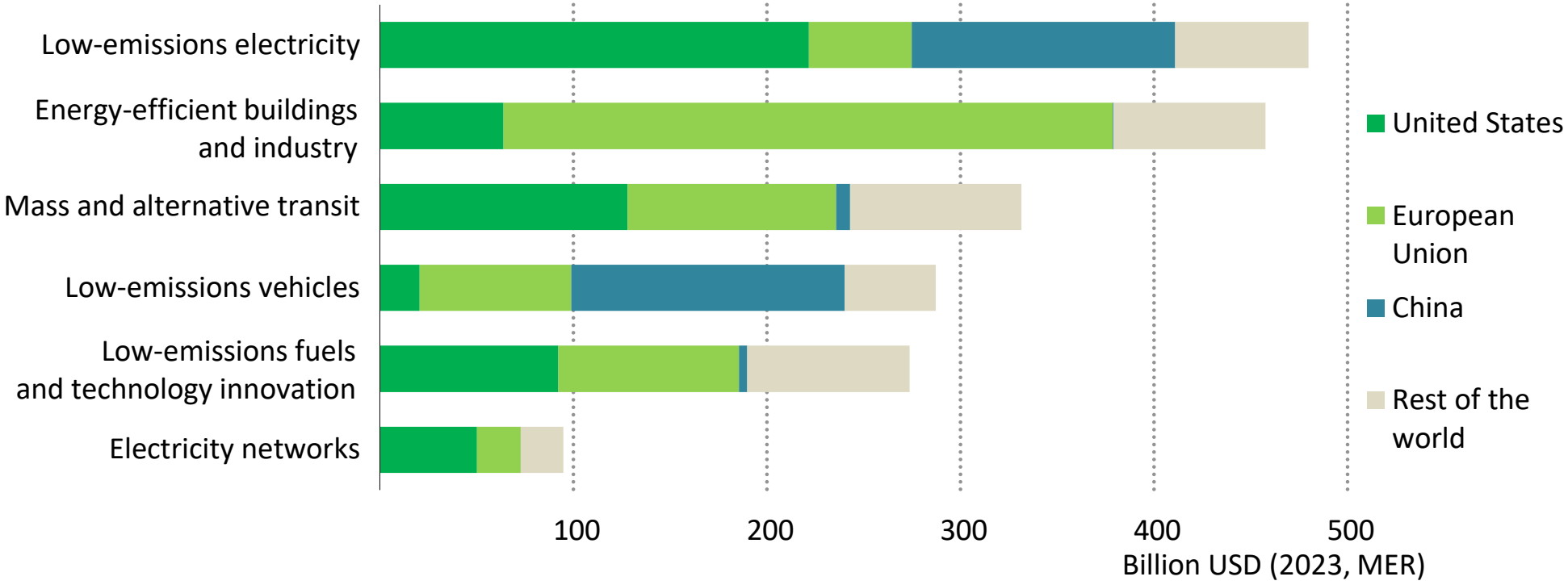
Earmarked annual government support for clean energy investment by budget allocation year



Note: Earmarked government spending shows planned disbursements and forward-looking direct spending through budget timelines validated between 2020 and H1/2024. These estimates do not translate into disbursement projections up to 2030, as it is expected that governments will route more spending packages through annual approval processes.

80% of earmarked government spending is concentrated in three regions: the United States, the European Union and China

Earmarked government spending on clean energy by sector and region, 2020-H1/2024



Newly earmarked government support for clean energy in 2024 brings total since the Covid-19 pandemic to USD 2 trillion

Cumulative government support for clean energy reached almost USD 2 trillion since 2020, of which USD 290 billion was earmarked for 2024. As more spending packages are currently routing through government approval processes, earmarked spending in 2024 could be on par with or even surpass that of 2023. *State of Energy Policy 2024* builds on the IEA's Government Energy Spending Tracker, which monitors clean energy investment support since 2020 across five areas: clean energy infrastructure; renewables; electrification; energy efficiency; and clean energy technologies supply chains.

Government spending has been central to rapid growth of clean energy investment since 2020, with recovery plans contributing to growth of nearly 50%. Planned disbursements peaked in 2022/23 with the launch of the United States Inflation Reduction Act (US IRA), the largest package ever released (nearly USD 370 billion). Subsequently, a steady slowdown of government spending towards clean energy technologies is evident. Disbursement of packages established between 2020 and 2023 is still underway, with a sharper decline expected in 2027, at when most of the EU Recovery and Resilience Facility will be fully disbursed.

Advanced economies remain the largest source of committed funding, with 65% of government spending enacted in the United States and the European Union. EMDEs, led by People's Republic of China (hereafter, "China"), are stabilising their earmarked allocations, with an average of USD 55 billion. New funding announcements in EMDEs place particular weight on incentives for domestic manufacturing. China's new energy vehicle subsidies and tax exemptions drive these estimates higher, as do new schemes in Brazil, through its Green Mobility and Innovation Programme (MOVER), and through South Africa's domestic electric and hydrogen vehicle producer support.

Low-emissions transport, power sector renewables, buildings energy efficiency and low-emissions hydrogen are the main recipients of earmarked government spending for 2024. With allocations of around USD 90 billion, low-emissions transport incentives ranked highest. Most of this spending was in China's new energy vehicle subsidies and tax exemptions and in continued disbursements in the US IRA. Earmarked incentives for renewable energy support stands at USD 75 billion, with major initiatives being a new Offshore Wind Energy Fund in Poland and an Investment Tax Credit for Clean Electricity in Canada. In buildings, Germany's programme for promoting energy efficiency and renewable energy measures, along with Poland's Clean Air Programme extension, account for most of the USD 60 billion earmarked. The remaining new spending (USD 15 billion) went largely to low-emissions hydrogen, through packages such as Canada's Clean Hydrogen Investment Tax Credit.

Critical minerals showed the largest percent increase during this timeframe, with incentives cumulating to about USD 20 billion since 2020, largely

from the Future Made in Australia Plan, the US IRA, Canada's Critical Minerals Infrastructure Fund and Clean Technology Manufacturing Investment Tax Credit.

While more diverse than in previous periods, these new outlays still largely reinforce the same spending segments. Since 2020, at USD 480 billion, low-emissions power generation has received the most support, followed by energy-efficient buildings (USD 340 billion), mass and alternative transit (USD 330 billion), and low-emissions vehicles (USD 290 billion). Together, these sectors account for more than two-thirds of total global clean energy support since the Covid-19 crisis. Many of the announcements since 2020 have spending horizons that extend well into the 2030s. This includes the US IRA incentives, which prioritise long-term certainty to appeal to investors. At nearly USD 370 billion, the US IRA remains the largest single package committed since 2020; its launch easily made 2022 the year with the largest increase in newly announced spending over the past four years.

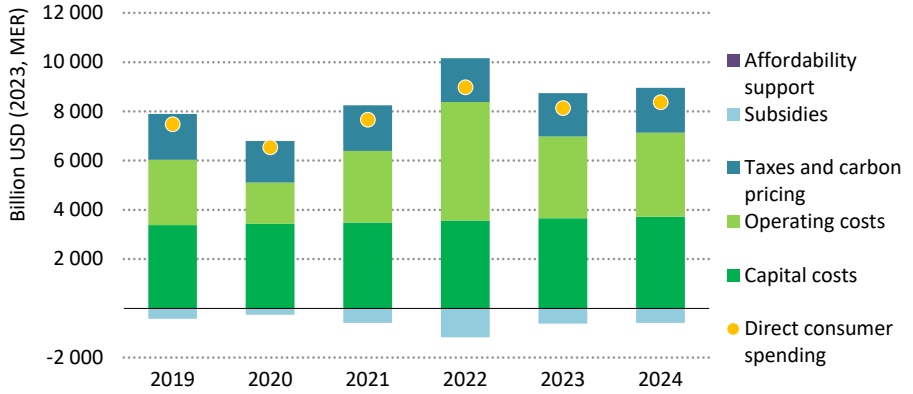
Energy technology budgets for Research, Development and Demonstration (RD&D) are on the rise since 2016, with more than USD 26 billion for 2023 alone. Their allocation remains concentrated towards energy efficiency; nuclear fission and fusion; renewables; hydrogen and fuel cells, which aggregated account for more than two-third of the total expenditures. The IEA released in September 2024 its Tracking Clean Energy Innovation Policies policy guide, to support policy makers to identify effective innovation policy measures and tuning their design to the specificities and maturities of the technologies.

The energy crisis prompted governments worldwide to spend close to USD 940 billion in affordability support, with most schemes phased down as of 2024

Total end-use expenditure on energy was at its highest ever – USD 10 trillion – in 2022, owing to price spikes prompted by Russia's invasion of Ukraine. The IEA's Strategies for Affordable and Fair Clean Energy Transitions finds that energy delivery costs paid by households and industrial consumers in 2023 declined to USD 8 trillion.

To support their populations against these rising costs, governments globally earmarked almost USD 940 billion since the start of the energy crisis to implement temporary affordability measures. Spending reached a peak of USD 535 billion in 2022. This short-term support has since declined, with most support directly from government balance sheets being phased out in the first semester of 2024. Remaining support notably includes extension of the French tariff shield and exceptional measures (which include electricity price caps) and Japan's comprehensive emergency measures to address soaring crude oil and commodity prices in 2024.

Total energy system costs and spending by component, 2019-24



Note: IEA fossil fuel consumption subsidies account for the difference between consumer prices and market rates. Affordability support includes direct fiscal measures. Aggregated affordability support combined with energy taxes can result in end-user prices being higher than wholesale prices.

In addition to affordability measures directly administered by governments, fossil fuel subsidies – defined by prices set below prevailing wholesale prices and delivery costs for energy commodities – also peaked in 2022, reaching an unprecedented USD 1.2 trillion. Often, these subsidies are not borne directly by governments, but rather by state-owned energy companies, in the form of either operating losses or forgone revenues. These subsidies are applied almost exclusively in EMDEs and are not revenue neutral, as tax revenues are typically insufficient to cover the full burden of these measures.

A vast majority of these subsidies and affordability support measures did not target those most in greatest need. Of all affordability measures tracked by the IEA, only 20% explicitly targeted affected households. With around 25% of short-term support explicitly targeting households in need, the rate was marginally better in advanced economies. In EMDEs, around 95% of affordability measures provided the same unit price reduction to the entire population. Channelling support through price regulations stands as the main factor undermining fairer allocation towards low-income households.

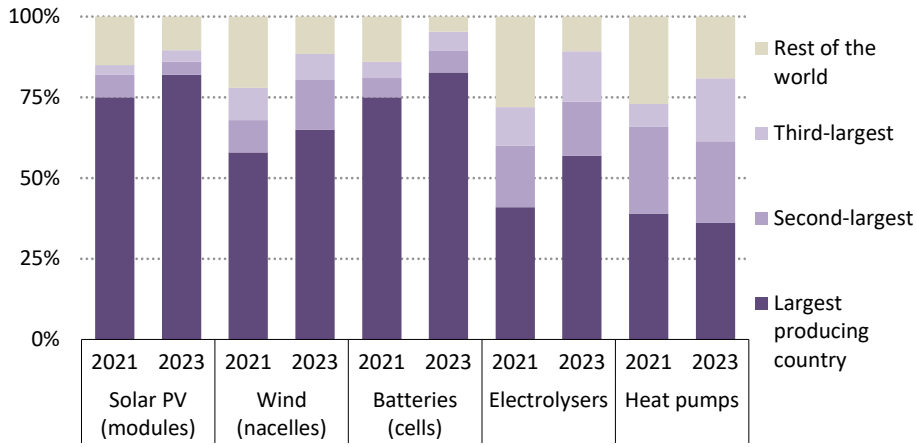
Securing clean energy transitions

Concentration in clean energy supply chains is becoming a key focus for policy makers

The pipeline of new clean energy manufacturing coming online expanded substantially over the past four years, with new investment in manufacturing facilities growing by more than 70% in 2023 alone, to reach USD 200 billion annually. As noted by the IEA Clean Technology Manufacturing Roadmap, three-quarters of the growth in clean energy technology supply chains — which include solar PV, wind, electric vehicles (EVs), batteries, heat pumps and hydrogen electrolysers — was in China in 2023, despite many other countries providing new manufacturing incentives.

Regional concentration of manufacturing stands as a major risk for securing energy transitions. All critical technologies (i.e. solar PV, wind, batteries, electrolysers and heat pumps) currently present a high level of geographical concentration. In all cases, the three largest producing countries or regions account for around 80% or more of existing capacity. Equally concentrated is the upstream supply chains for raw materials essential to manufacturing these products. This level of concentration renders the entire supply chain vulnerable to disruptions, whether due to policy changes in individual countries, natural disasters, technical failures or corporate decisions. In addition to measures incentivising new manufacturing, other new policies have come into force that aim to highlight clean energy technologies as key strategic industries that must be maintained domestically for security of supply. This includes in the United States, where these clean energy technologies were added to the Defense Production Act, making their domestic production "critical and strategic" and in the EU where the Net zero Industry Act aims to simplify the regulatory framework for "net zero strategic projects", through faster permitting and new mandatory rules in public procurement, auctions and other schemes.

Geographical concentration of clean energy manufacturing capacity, 2021 and 2023



Source: IEA (2024), Advancing Clean Technology Manufacturing Abstract: An Energy Technology Perspectives Special Report ; IEA (2023), Energy Technology Perspectives 2023.

Direct government support for domestic manufacturing is on the rise everywhere

Governments worldwide are increasingly implementing new spending that specifically supports domestic manufacturers of clean energy technologies. Of the USD 2 trillion allocated to clean energy since 2020, around 10% (roughly USD 170 billion) rewards projects that use domestically manufactured inputs or provides direct incentives to domestic producers. With advanced manufacturing production credits of about USD 50 billion, the US IRA accounts for almost one-third of the total. Other regions have implemented new policies that mirror these incentives for what they consider priority technologies, adding USD 30 billion in 2024. These include new policies such as the Future Made in Australia, which commits USD 4.5 billion towards the Hydrogen Production Tax Incentive, and Germany's USD 6 billion for implementing its National Hydrogen Strategy.

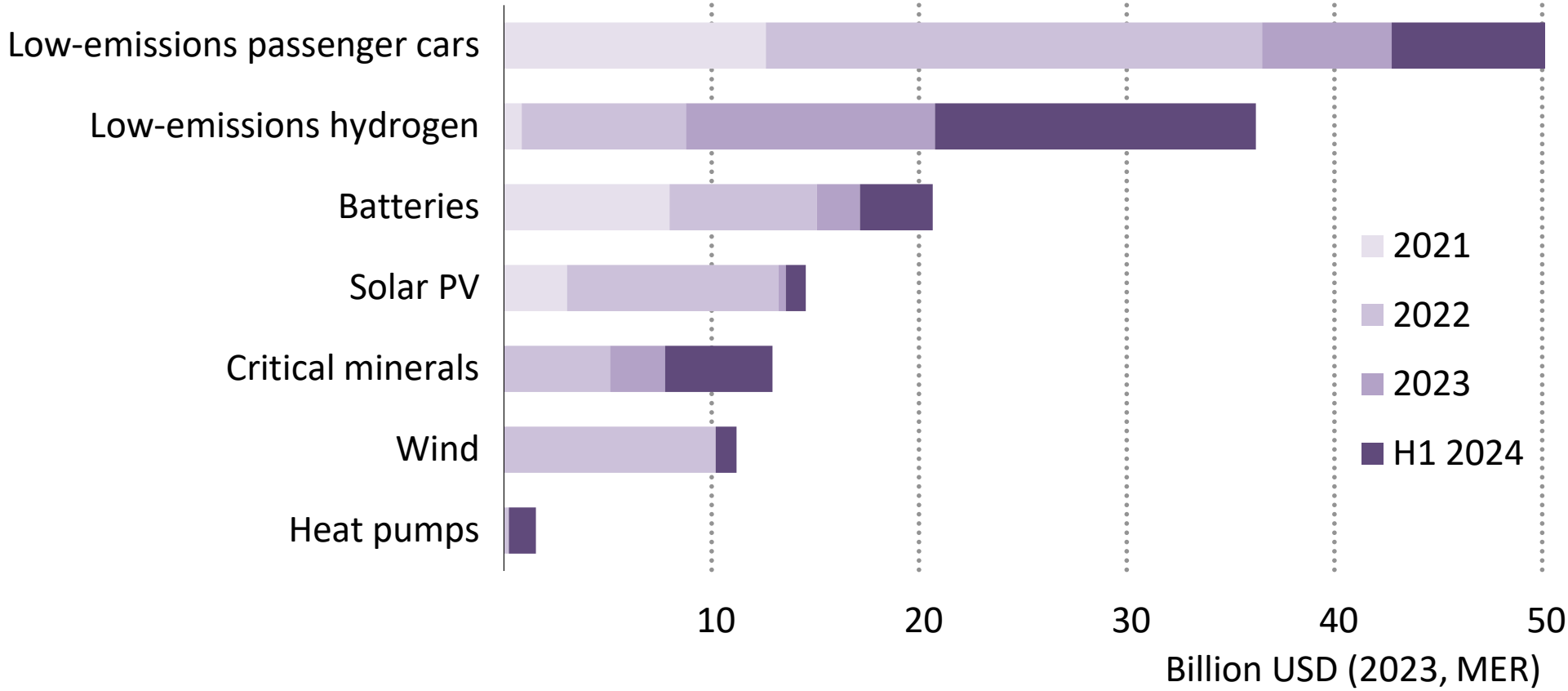
EMDEs also recently prolonged existing or enacted new domestic manufacturing incentives. China continues to foster domestic manufacturing with its 2024 New Energy Vehicle Promotion and Application Subsidy Funds. India has extended its Production-Linked Incentive (PLI) schemes. With its Green Mobility and Innovation Programme (MOVER), Brazil grants tax incentives (from 2024 to 2028) to companies producing automotives and components for low-emissions vehicles.

Domestic manufacturers of low-emissions vehicles received the most attention, followed by hydrogen and batteries. Low-emissions vehicle manufacturing was the targeted recipient for about USD 50 billion of spending allocated since 2020, driven by subsidies enacted by the Chinese government. Low-emissions hydrogen production support from governments grew to about USD 35 billion since 2020, the largest growth in the past year. This was anchored by new programmes in Australia and Canada. Batteries also received substantial attention (USD 21 billion earmarked over four years), largely through additional incentives predicated on domestic sourcing, a feature in the US IRA's production credits, India's PLI scheme and Japan's GX Green Transformation Policy. Additional spending packages with domestic manufacturing incentives are being advanced in different jurisdictions, notably including Nova Indústria in Brazil.

Governments have also employed other policy tools to support domestic clean energy manufacturing, such as: capital injections to state-owned entities; below-market rate lending and energy prices; preferential terms to access infrastructure and services; and other bequeathments (e.g. land). These supports have played a role for much longer than the recent uptick in direct incentives captured in the *State of Energy Policy 2024* and are more common in jurisdictions in which state-owned entities play a major role in the economy.

Several clean energy technologies have seen a large share of government incentives directed towards promoting domestic manufacturing activities

Government incentives for domestic manufacturing of clean energy technologies by announcement year, 2020-H1/2024



Securing critical mineral supply chains is drawing policymakers' attention but remains vital, especially for refined materials

Production of refined minerals critical to manufacturing clean energy technologies remains highly concentrated in just a few countries. The IEA *Global Critical Minerals Outlook 2024* shows the top three producers of refined lithium, cobalt, natural graphite and rare earth metals represent over 80% of global production. With the exception of lithium, these shares have increased across all critical minerals since 2020. A similar trend is evident for mined or raw material production.

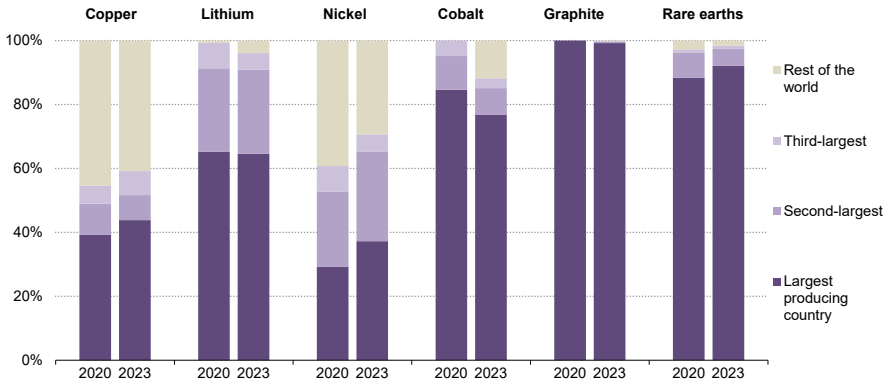
High supply concentration is a threat to the security of energy transitions, as it makes supply chains and routes more vulnerable to disruption from extreme weather, trade disputes, geopolitics, etc. Overall, copper and lithium are the most exposed to supply and volume risks; nickel, cobalt, graphite and rare earths face more substantial geopolitical risks.

This has prompted governments to implement various policy measures to promote supply chain diversification. The Critical Minerals Policy Tracker inventories key policies across three areas:

- **Ensuring supply reliability and resiliency**, which includes measures such as having strategic sourcing plans, putting said minerals on strategic material lists and stockpiling requirements.
- **Promoting exploration, production and innovation,** including policies such as financial incentives, recycling requirements and funding geologic surveys.
- **Encouraging sustainable and responsible practices**, which include environmental and labour policies, transparency, and robust permitting and due diligence schemes.

Such policies contribute to a more secure global supply chain for these materials. Based on the current pipeline of announced projects, however, the IEA's *Global Critical Minerals Outlook 2024*, finds limited signs of a significant diversification of suppliers on the horizon.

Comparison of share of refined material production, 2020 and 2023

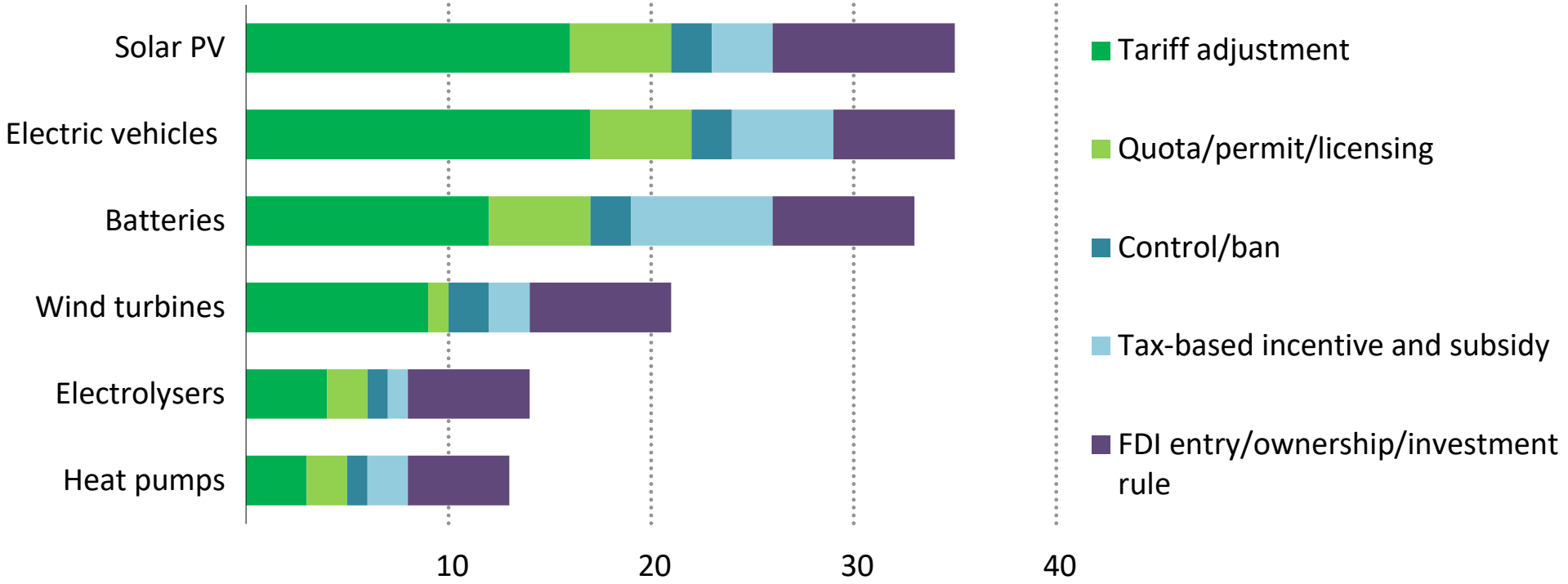


Source: IEA (2024), Critical Minerals Outlook 2024.

Trade policies

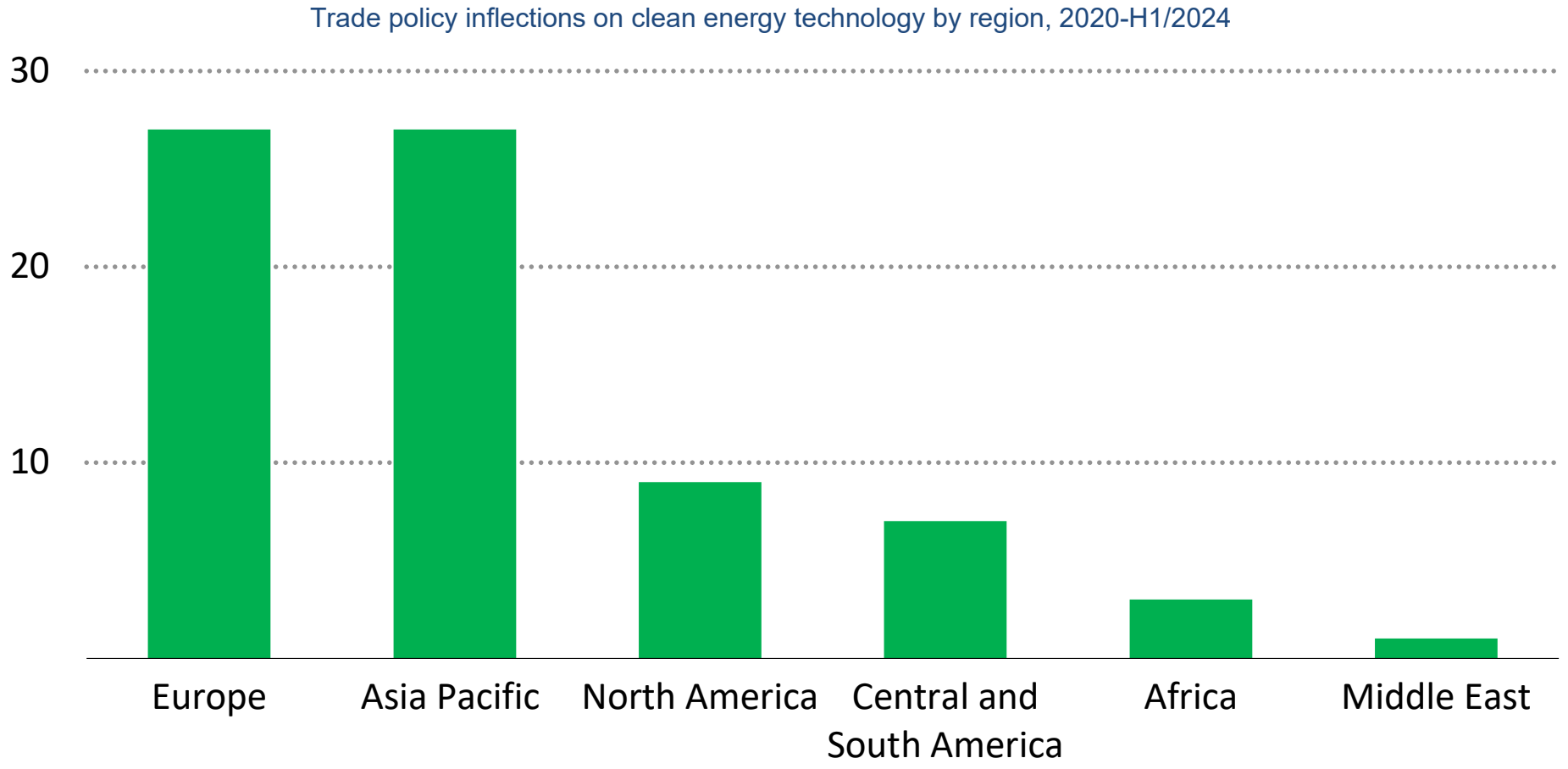
The rise in trade policies, particularly since 2020, affects solar PV, electric vehicle and battery industries

Trade policy inflections enacted for clean energy technologies, 2020-H1/2024



Note: FDI = foreign direct investment. Each count indicates a single instance of a trade measure impacting final products and components of solar PV, EVs, batteries, wind turbines, electrolysers and heat pumps, as well as their components. This includes EVs and battery cells, anode and cathode; solar PV modules, cells, wafers and polysilicon; wind nacelles and blades; electrolysers and heat pumps. A measure that includes several of these technologies is counted once per provision. The scope on FTAs is investigated separately and is not included in the chart.

Countries in Asia Pacific and Europe account for the majority of recent changes in trade-related measures linked to clean energy technologies



Note: Each count indicates a single instance of a trade measure impacting final products and components of solar PV, EVs, batteries, wind turbines, electrolysers and heat pumps, as well as their components. This includes EVs and battery cells, anode and cathode; solar PV modules, cells, wafers and polysilicon; wind nacelles and blades; electrolysers and heat pumps. A measure that includes several of these technologies is counted once per provision. The scope on FTAs is investigated separately and is not included in the chart.

Trade policies related to clean energy transitions have become more prominent since 2020

New trade measures targeting clean energy technologies have come into force recently, underpinning efforts to strengthen domestic manufacturing and diversify global supply chains. Since 2020, nearly 200 new trade measures have been implemented across regions and trade blocs, many of which represent substantial shares of current imports of clean energy technology demand. Most recent trade measures, excluding free trade agreements (FTAs), originate from Australia, China, the European Union, India and Türkiye. Nearly 70% of clean energy trade measures are related to solar PV, batteries and EVs, citing their strategic importance, supply chain concentration and fair trade practices as key motivations. Most countries have favoured tariff adjustments, antidumping duties and countervailing measures as the major measure — representing close to 40% of new trade policies. Changes on import and export controls, taxation, FDI regulation and licensing are also important.

Most recent changes in trade policy are tariff adjustments

Many measures specifically target Chinese-made goods, largely focused on three technologies: solar PV panels, EVs and batteries. This reflects that, at present, China makes up over 80% of global production or sales of solar panels, 60% for EVs and over 80% for batteries. These trade policies include anti-dumping and countervailing duties, which aim to support domestic manufacturing industries while also creating a level playing field for all countries. Since 2020, several regions, including the European Union, Türkiye and the United States, have announced additional duties or countervailing measures on Chinese solar PV, EVs and batteries. Most notable are new measures from the United States, which have plans to raise tariffs on Chinese EVs from 25% to 100% and on Chinese batteries from 7.5% to 25%. In parallel, new tax credits provide incentives for domestic production. The European Union announced an additional provisional tariff of up to 38% on Chinese EVs as of July 2024, following countervailing investigations. Canada announced an additional surtax of 100% as of October 2024.

The recently enacted measures do not target only China. Many extend to clean energy technology exports from Brazil, Chinese Taipei, Croatia, Jordan, Korea, Malaysia, Türkiye and Viet Nam, (among others). Some measures aim to address trade circumvention, whereby a country seeks to side-step tariffs by first exporting to a third country, then “re-importing” to the final market. One example is glass fibre fabrics used in wind turbines, in which case exports from China and Egypt were consigned through Morocco. Similarly, stainless steel tube fittings exported from China and Chinese Taipei were consigned from Malaysia. In response, the European Commission has also expanded duties on raw materials and manufactured goods to these re-importing countries.

Most recent tariff reductions are concentrated in emerging markets and developing economies, many of which may be seeking to boost clean energy manufacturing and trade as well as to meet rising demand and deployment needs. Tariff reductions have been applied primarily in Asia-Pacific countries, such as China, India, Malaysia and the Philippines, but also in Argentina, and Egypt. Switzerland is the only advanced economy to eliminate import tariffs on industrial

products and commodities related to clean energy technologies to facilitate trade and reduce consumer prices, thereby strengthening its position as a business and industrial location.

Non-tariff measures are also playing a significant role

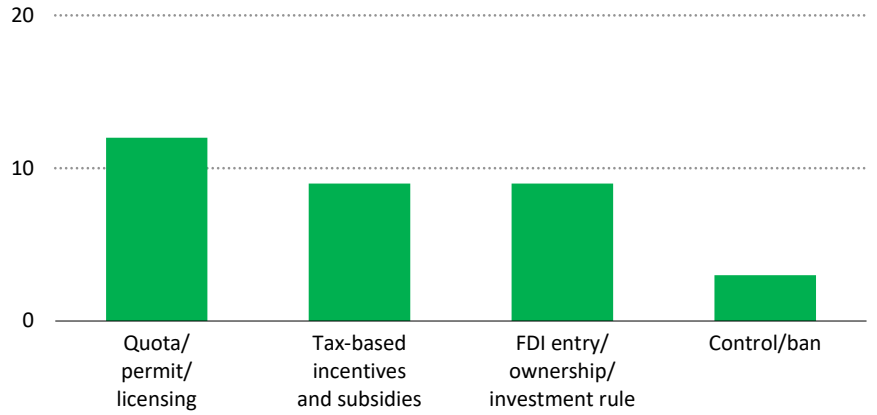
Governments implemented several non-tariff measures to influence the trade of clean energy technologies, including measures such as import and export quotas; permits and licensing; tax-based incentives and subsidies; FDI entry, ownership and investment rules. These measures are of similar importance to tariff measures in reshaping global clean energy supply chains.

Many countries with strong domestic manufacturing bases for clean energy technologies are advancing strategic trade partnerships. The aim is to enhance commercial exchange and create opportunity for their companies to build manufacturing facilities in partner countries. Between 2022 and 2024, China strengthened its bilateral trade partnerships with Brazil, Hungary and Mexico to pursue local production of EVs in these jurisdictions. The number of factories producing Chinese-branded EVs is also increasing in Europe, North America and Southeast Asia, as they further diversify production across the clean energy supply chain.

Some countries have also implemented specific financing support for new export-oriented industries. Korea and Norway, for example, are offering funding and public loan guarantees for factories producing clean energy technologies for export. Argentina and India have provided tax exemptions more broadly to export-oriented industries.

FDI rules have also been modified since 2020, placing more emphasis on securing domestic energy sectors and manufacturing. Algeria, China, Europe, Singapore and Switzerland imposed more stringent investment screening requirements, potentially increasing scrutiny on strategic sectors (e.g. power). The European Union adopted (in 2019) the FDI Screening Regulation to create levers to identify, assess and mitigate potential risks that certain FDIs pose to the Union and its member states. Other countries are restructuring FDI rules to attract more foreign investors. China now offers (to certain investment areas) custom duty exemptions on self-use equipment imports, priority land supply and tax reductions. The emerging market economies of Angola, Kenya and South Africa established special economic zones or free zones that offer import duty rebates and tax exemptions to attract FDI.

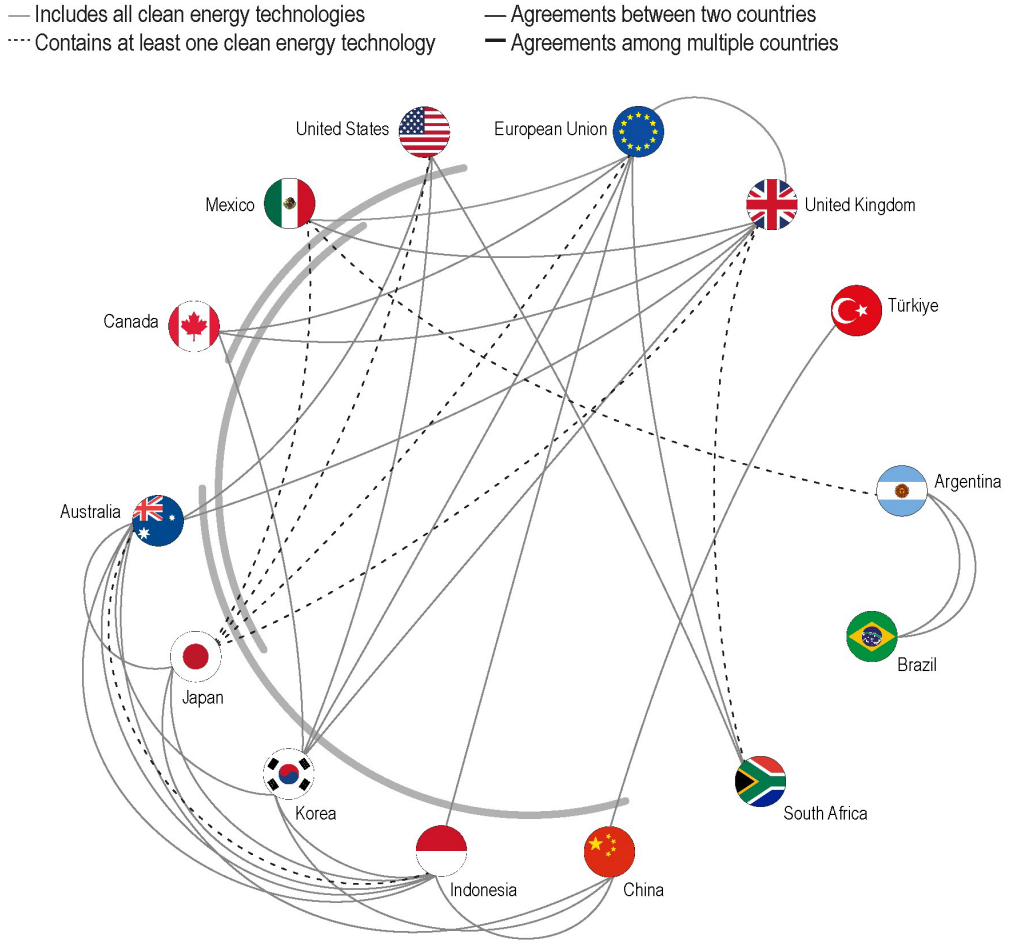
Count of non-tariff trade inflections on clean energy technologies, 2000-H1/2024



Note: Scope of clean energy technologies includes solar PV, EVs, batteries, wind turbines, electrolysers and heat pumps, as well as their components. The scope on FTAs is investigated separately and is not included in the chart.

Free trade agreements established since 2020 largely still enable free exchange of clean energy technologies among G20 partners

Free trade agreements established among G20 that include clean energy technologies



Note: Scope of clean energy technologies includes solar PV, EVs, batteries, wind turbines, electrolysers and heat pumps, and their components.

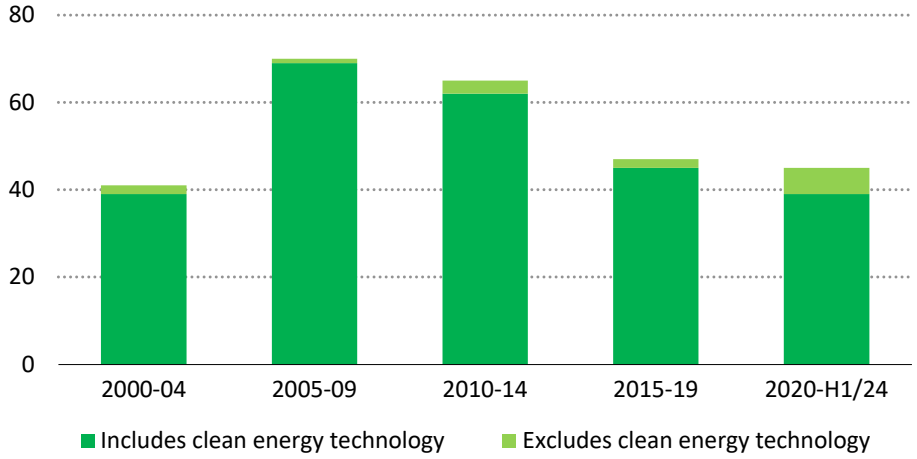
95% of free trade agreements still extend preferential trade status to many decarbonising technologies

The broader policy push to facilitate international trade continues with many countries and, by proxy, is providing preferential tariffs on clean energy technology in many regions. Across nearly 40 new FTAs since 2020 (largely in EMDEs), a clear trend is to continue to lower tariffs on all goods, including clean energy technologies. Despite the limitations imposed by some of these trade measures, clean energy technologies continue to benefit tacitly from new FTAs that include tariff exemptions and ease trade restrictions.

Currently, of more than 300 FTAs worldwide, approximately 95% include provisions for some clean energy technologies. With clean energy technologies included in close to 90% of agreements established after 2020, their exclusion in some new agreements has had minimal effect. For instance, Japan, Korea, Mexico, the United Kingdom and the United States excluded certain clean energy technologies from new FTAs signed with other EMDEs. The most notable examples (which excluded certain technologies such as EVs, hybrid vehicles, batteries, electrolysers, solar PV and wind turbines components) include: Argentina-Mexico Economic Complementation Agreement; EU-Japan Economic Partnership Agreement; Japan-Mexico Economic Partnership Agreement; UK-Japan Comprehensive Economic Partnership Agreement; and US-Japan Trade Agreement.

Depending on their design, this rise in use of trade policies in country portfolios could help to diversify clean energy technology supply chains globally. The IEA had previously assessed the near-term impact of trade fragmentation and diminishing global collaboration on clean technology, finding that it delayed global efforts to reach net zero by a decade or more. The impacts and opportunities are further detailed in the IEA Energy Technology Perspectives 2024 (forthcoming), which analyses different outlooks for manufacturing and trade in clean energy transitions.

Count of new free trade agreements, 2000-H1/2024



Note: Scope of clean energy technologies includes solar PV, EVs, batteries, wind turbines, electrolysers and heat pumps, as well as their components.

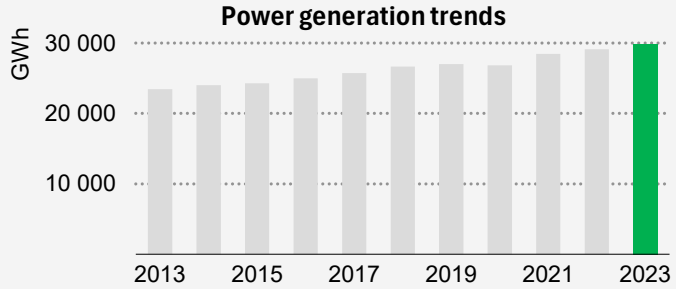
Power

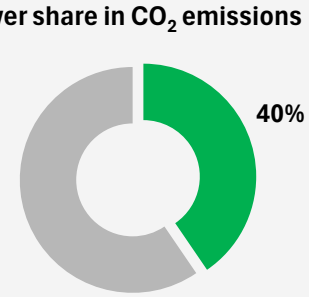
Power Sector Snapshot

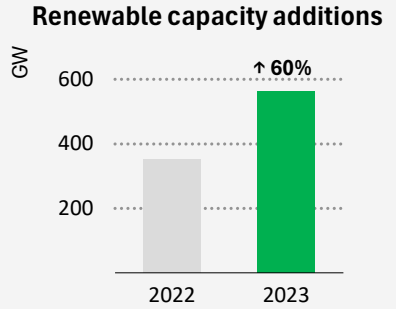
Power sector: State and trends of key energy policies

State of play

Global

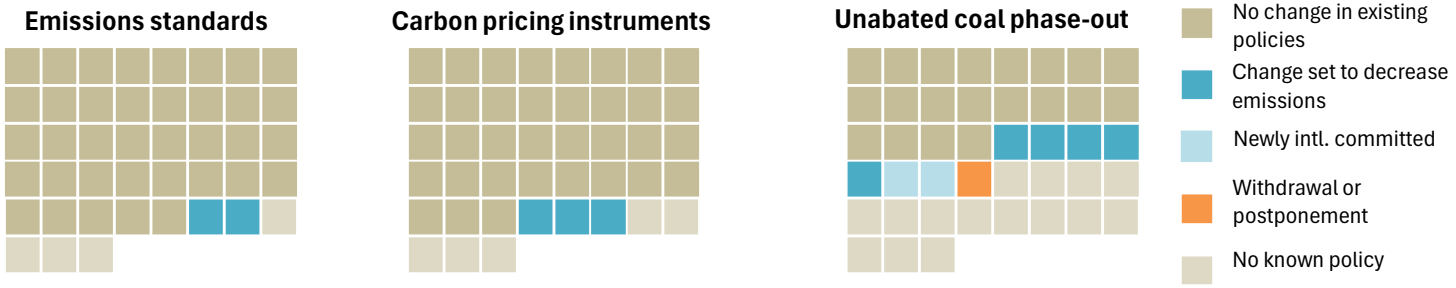






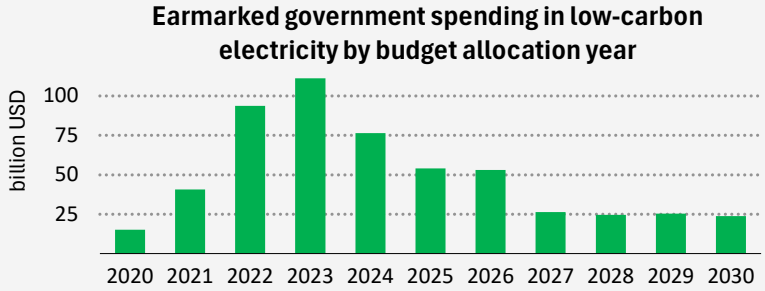
Evolution of key regulations

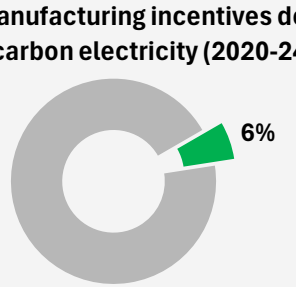
between June-23 and September-24, G20 and EU member countries



Evolution of government spending on clean energy technologies

Global





Note: Intl.= internationally. Each square in “Evolution of key regulations” represents one G20 or EU member country and shows the state of play for the selected regulation. Earmarked government spending indicates disbursed and forward-looking direct spending through budget timelines validated between 2020 and H1/2024. These estimates do not translate into disbursement projections up to 2030, as it is expected that governments will route more spending packages through annual approval processes.

Financial incentives remain the most-favoured policy driver for new power sector investments

Among diverse policy measures currently shaping the power sector, direct incentives and price guarantees have emerged as the most prominent forces driving the rapid global uptick of renewables. *State of Energy Policy 2024* covers four relevant aspects: instruments enabling faster renewables deployment; direct government spending support towards low-emissions power technologies and infrastructure; emissions standards; and carbon-pricing instruments. These measures largely aim to decarbonise power generation, but also support other key objectives such as lowering prices and improving energy security.

The regulatory structure of the power sector remains an important factor for designing effective policy, including elements such as regulated rates, cost recovery and private sector participation. These fields may be covered in future editions of the *State of Energy Policy*.

Incentives remain the determining policy measure for attracting renewable investments

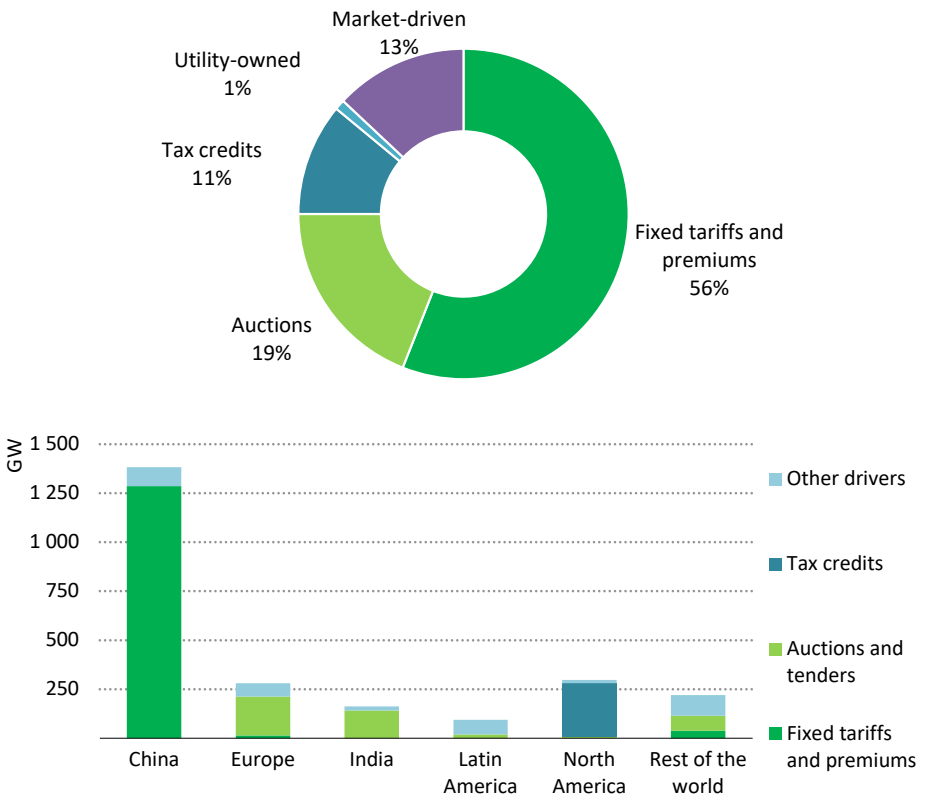
Renewable power generation capacity additions globally grew by 60% in 2023, reaching almost 560 gigawatts (GW) installed annually, with solar PV accounting for three-quarters of additions. Solar and wind now undercut most other power generation costs, even without subsidies. Even with this price advantage, elevated interest rates and climate objectives have prompted governments to continue or expand incentives for renewable power technologies to attract higher levels of investment. Incentives remain the defining instrument behind decisions about where and how much renewable capacity is being brought online.

In assessing the major drivers of new renewable capacity coming online by region, the IEA *Renewable Market Report 2023* found that nearly 90% of renewables growth projected between 2023 and 2028 reflects policy-driven deployment. Remarkably, 95% of China's capacity growth in the next five years is foreseen to be policy-driven, aided by fixed tariffs and premiums, which have helped to support long-term revenue stability. Competitive auctions remain the dominant instrument in Europe, while tax credits are driving deployment in North America.

Earmarked government spending for low-emissions electricity and electricity networks amounts to about USD 75 billion for 2024. This uptick was largely from EU countries launching national schemes to secure funds committed through REPowerEU. Examples include Poland's Offshore Wind Energy Fund and Spain's new support scheme for domestic manufacturing across renewable energy and storage value chains. The United States' renewable tax credits remain the single largest measure announced, and are set to remain available to 2031, responding to demands from the private sector for long-term certainty. Many countries are implementing similar measures, such as Canada's new tax credits. Some new measures explicitly cite measures in other countries as part of the motivation to offer competitive incentives.

Comparing direct government spending across countries, however, rarely reveals the true value of support in each country. This is particularly true as measures such as regulated benchmark prices and feed-in tariffs for renewables do not appear on government balance sheets, but instead are borne by ratepayers.

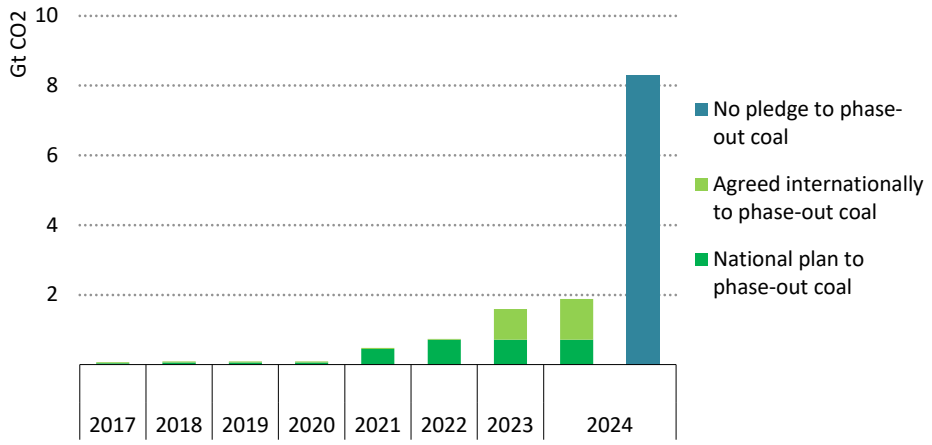
Utility-scale renewable electricity capacity by primary driver and region, 2023-28



Note: Other drivers include power purchase agreements (PPAs), green certificates and bilateral contracts.

Source: IEA (2023), Renewable Market Report 2023.

CO_2 emissions from power generation covered by a plan to phase-out unabated coal in G20 countries



Ambitions to phase-down coal power gain ground

Phasing out unabated coal use in the power sector is gaining traction in international climate negotiations and is one of the key milestones in the IEA's NZE Scenario. As of September 2024, about 17% of global power-related emissions from coal are covered by a pledge to phase-out its unbated use, up from 15% in 2023 and 7% in 2022. The increase is largely attributed to the United States having joined the Powering Past Coal Alliance (PPCA), following its previous commitment to target net zero emissions in the power sector by 2035. To date, most coal phase-out commitments come from advanced economies – nearly 90% of total emissions governed under such commitments. They are anchored by the G7 commitment to phase-out existing unabated coal power generation during the first half of the 2030s or before.

Commitments from EMDEs are growing, but remain longer-term targets. Beyond phase-down initiatives in a number of Just Energy Transition Partnerships (JET-Ps), and pledges by joining the PPCA, 2023 also saw the launch of a new, French-led Coal Transition Accelerator. This initiative aims to unlock new sources of public and private financing to facilitate coal phase-out in EMDEs. These international efforts also build on JET-Ps, such as those in Indonesia, Viet Nam and South Africa. In late 2023, Indonesia established a target for the gradual decommission of fossil-fuel power plants by 2056, based on its roadmap for net zero emission in the energy sector.

Direct CO_2 regulation and pricing continues to expand, with new emissions guidelines in the United States

Carbon pricing, which includes carbon markets, carbon taxes and other direct pricing mechanisms, continues to gain ground, expanding in coverage and modestly increasing in stringency. As of 2023, carbon pricing covers around half of global GHG emissions for electricity and heat production, about five percentage points higher than in 2022. Indonesia's carbon pricing scheme came into force in 2024, covering only coal power plants for its first stage. Within its Green Transformation Policy (GX), Japan introduced in 2023 the voluntary phase of a new emissions trading scheme (ETS), covering 570 companies, including power utilities.

Without question, the most consequential policy change directly regulating power sector CO_2 emissions comes from new guidelines for coal-fired power plants in the United States. For all new and existing coal-fired power plants operating at more than a 40% capacity factor and scheduled to operate past 2039, the policy requires implementation, by 2032, of 90%-effective carbon capture and storage. The issuance of similar guidelines for natural gas plants was delayed to later in 2024.

Power sector: State of energy policy in G20 countries, 2024

Country	Earmarked government spending			Trade		Pricing policies and regulation							Ambition	
	Total spending since 2020 (USD)	*Main spending instrument*	*Main spending recipient*	Recent import tariff inflexion	Local content requirements	Carbon pricing scheme	Feed-in tariffs/ premium*	Auctions and tenders*	Tax credits *	Green certificate*	Power purchase agreement*	Emissions standards	Phase-out of unabated coal	Sector share of national emissions
China	136 bn	Producer subsidy	Onshore wind	●	-	●	●	-	-	●	-	●	-	56%
South Africa	< 1 bn	-	-	-	-	●	●	●	-	-	●	●	-	55%
Korea	8 bn	Direct government investment	Low-emissions power	-	-	●	-	●	-	●	●	●	2050	53%
India	19 bn	Government grant	Distribution	●	●	-	-	●	-	-	-	●	-	51%
Saudi Arabia	< 1 bn	-	-	-	-	-	-	●	-	-	●	●	-	50%
Russia	< 1 bn	-	-	-	-	-	-	●	-	-	-	-	-	50%
Japan	3 bn	Government grant	Offshore wind		-	●	●	●	-	-	●	●	2035**	48%
Australia	32 bn	Direct government investment	Low-emissions power	●	-	●	-	●	-	●	●	-	-	48%
Indonesia	< 1 bn	-	-	-	●	●	-	●	-	-	-	●	2056	43%
Mexico	< 1 bn	-	-	●	-	●	-	-	-	-	●	-	n.a**	41%

Country	Earmarked government spending			Trade		Pricing policies and regulation							Ambition	
	Total spending since 2020 (USD)	*Main spending instrument*	*Main spending recipient*	Recent import tariff inflexion	Local content requirements	Carbon pricing scheme	Feed-in tariffs/ premium*	Auctions and tenders*	Tax credits *	Green certificate*	Power purchase agreement*	Emissions standards	Phase-out of unabated coal	Sector share of national emissions
Germany	3 bn	Government grant	Low-emissions power	-	-	●	●	●	-	-	●	●	2038	37%
Türkiye	2 bn	Infrastructure investment	Transmission	●	-	-	●	●	-	-	●	●	-	36%
United States	272 bn	Tax credit	Low-emissions power	●	●	◒	-	-	●	-	-	●	2035**	36%
Italy	13 bn	Infrastructure investment	Low-emissions power	-	-	●	-	●	-	-	●	●	2025	30%
Argentina	< 1 bn	-	-	●	-	●	-	●	-	-	●	●	-	28%
United Kingdom	3 bn	Direct government investment	Low-emissions power	-	-	●	-	●	-	-	●	●	2024	21%
Brazil	3 bn	Infrastructure investment	Utility-scale PV	●	-	-	-	●	-	-	●	-	-	20%
Canada	12 bn	Government grant	Low-emissions power	-	-	●	-	●	-	-	●	●	2030	15%
France	9 bn	Producer subsidy	Offshore wind	-	-	●	●	●	-	-	●	●	2027	12%

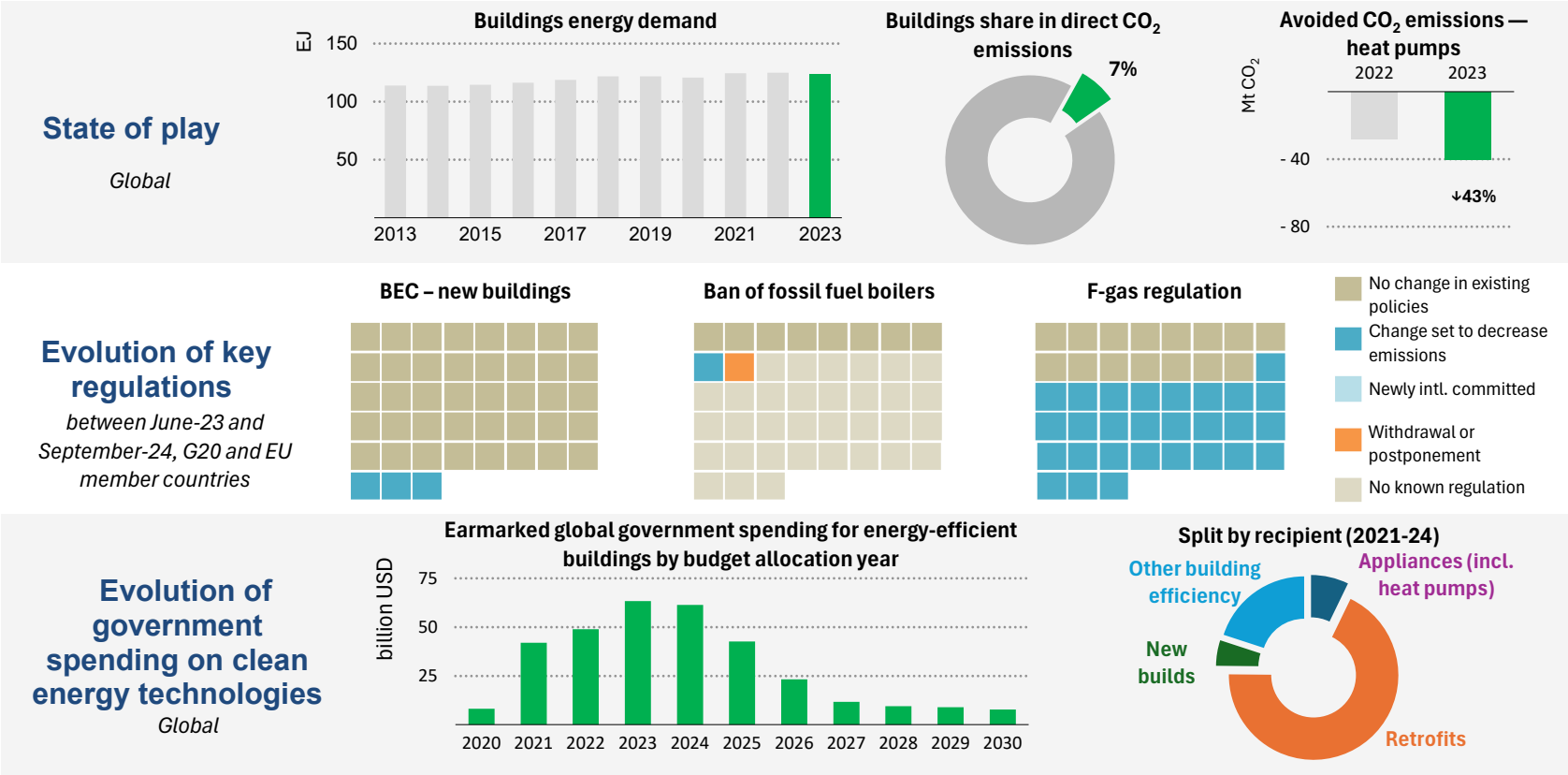
● = National implementation // ◒ = Subnational implementation // ◌ = International commitment // - = no known policy.

Note: *Based on the IEA *Renewable 2023* report. **Target date set within an international framework (e.g. COP). Country-level policy details available on the IEA Energy Policy Inventory page.

Buildings

Buildings Sector Snapshot

Buildings: State and trends of key energy policies



Note: BEC = building energy code. F-gas = fluorinated greenhouse gas. Intl.= internationally. “Avoided emissions” refers to emissions displaced or avoided due to the installation of heat pumps rather than another fossil fuel-based technology. Each square in “Evolution of key regulations” represents one G20 or EU member country and shows the state of play for the selected key regulation. BEC encompasses all mandatory building codes with energy efficiency standards and norms for at least one technology. Earmarked government spending indicates disbursed and forward-looking direct spending through budget timelines validated between 2020 and H1/2024. These estimates do not translate into disbursement projections up to 2030, as it is expected that governments will route more spending packages through annual approval processes.

Efficiency standards for new buildings and appliances gained ground in 2023, although some policies targeting existing buildings face legal challenges and public push-back

Energy performance standards for buildings and appliances – a long-standing staple of buildings energy efficiency policy – continue to be the major driver for gradually reducing both energy demand and related CO2 emissions. *State of Energy Policy 2024* tracks energy efficiency standards enshrined in building codes and standards for appliances, as well as direct incentives for consumers to retrofit their houses and replace their equipment.

Since the 1970s, energy efficiency standards have focused on regulating new products placed on the market and the construction of new buildings. A typical pace for updating efficiency standards for appliances is every five years; building codes are updated less frequently, at ten years. More than half of G20 countries took steps to advance related standards within the last five years. Together, these now cover around 70% of G20 buildings emissions.

As countries now focus on accelerating clean energy transitions, they have been trialling new legislative interventions related to fuel switching and retrofits of existing buildings. In some markets, these new interventions have faced resistance, causing implementation to be delayed or revised to address concerns. Overall, the impact of these delays on future energy consumption trends remains minimal.

Standards for appliances are gradually being made more stringent

Most G20 countries have introduced minimum energy performance standards (MEPS) for major appliances and equipment used for heating, cooling, cooking and lighting, as well as for plug-in loads (e.g. refrigerators, washing machines, dishwashers, dryers and televisions). Cooling, the fastest-growing end-use, is covered by MEPS for air-conditioners (ACs) in 18 of the G20 countries. Major cooling markets, such as Australia, China and the United States, have upgraded their standards in the past two years. As of 2024, following recent adoption of legislation in South Africa, all G20 countries have energy efficiency standards for light bulbs. Standards for dishwashers and dryers are less common in EMDEs, reflecting limited ownership rates for such appliances in those markets.

Typically, MEPS trail the best-in-class efficiency on the market. In the case of air-conditioning, in most geographies, units that meet MEPS are around 40% less efficient than best-in-class. To encourage consumers to voluntarily purchase technologies that are more efficient than the MEPS, most G20 countries have established parallel labelling schemes, which provide information on the product's efficiency and performance. Such labels have been proven to prompt the desired behaviour by consumers, although the success rate of such measures varies across geographies. For instance, the least efficient ACs available make up the majority of sales in Saudi Arabia, whereas the least efficient products make up less than 20% of sales in China.

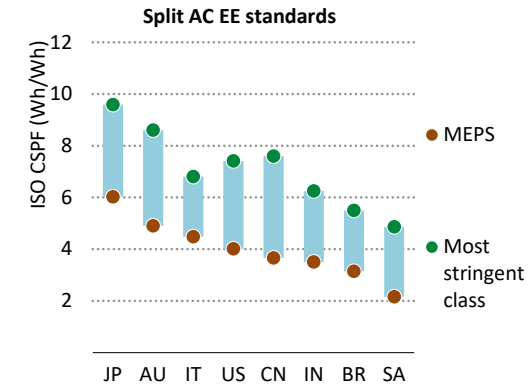
State of MEPS for appliances in selected economies, 2023

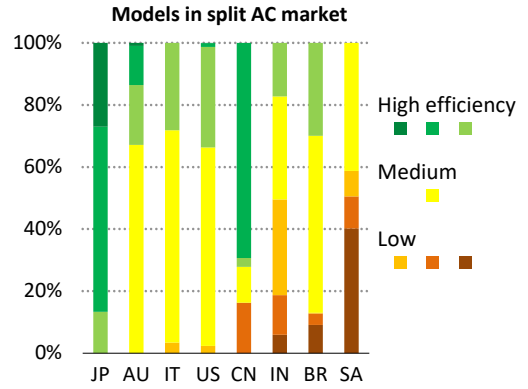
	S/H	W/H	AC	CO	LI	RE	W/M	D/W	DR	TV
US	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CN	✓	✓	✓	✓	✓	✓	✓	✓	-	✓
JP	✓	✓	✓	✓	✓	✓	✓	✓	-	✓
RU	-	✓	✓	✓	✓	✓	✓	✓	✓	-
IN	✓	✓	-	-	✓	✓	-	-	-	✓
ID	✓	-	✓	-	✓	✓	✓	-	-	-
BR	-	✓	✓	✓	✓	✓	-	-	-	-

Note: MEPS = minimum energy performance standards. **S/H** = space heating. **W/H** = water heating. **AC** = air-conditioning. **CO** = cooking. **LI** = lighting. **RE** = refrigerators. **W/M** = washing machines. **D/W** = dishwashers. **DR** = dryers. **TV** = televisions.

Source: IEA (2023), Energy Efficiency Market Report 2023.

Split air-conditioning energy efficiency standards and labelling schemes





Note: Within each scheme, the most stringent class reflects the lower bound value of the highest labelling grade. MEPS and other energy efficiency class values are based on the following sources: LBNL "Lost in translation"; CLASP "World best MEPS"; and ChinaIOL "Energy efficiency study of China's exported room air conditioner". This method is used to harmonise to ISO Cooling Seasonal Performance Factor (CSPF) (high efficiency > 6.2 Wh/Wh; medium efficiency = 4.9-6.2 Wh/Wh; low efficiency < 4.9 Wh/Wh).

As governments implement MEPS and labelling schemes, companies are prompted to produce more efficient technologies for major markets. Over time, the impacts of such policies often extend beyond national borders. When a critical mass of markets implement a specific efficiency level, manufacturers may opt to discontinue the manufacture of their least efficient, non-compliant appliances. In turn, as these devices are imported, the average efficiency of products on the global market improves, even in countries without MEPS. Recent measures aim to improve the environmental performance of appliances, most notably by revising the F-gas regulation in the European Union. Other countries may follow suit by regulating refrigerants used in air conditioners and heat pumps.

Clean heating is an area of buildings energy policy that has gotten increased attention recently, particularly through restrictions on the types of new heating devices that can be installed in homes and businesses. Some EU countries and US states introduced measures to restrict the installation of new fossil-fuel boilers in new buildings. In some cases, they also set timelines for when these systems could no longer be installed in existing buildings.

Some of the initial legislative proposals banning fossil-fuel boilers were deemed to be overly prescriptive and faced public backlash. In response, some governments made adjustments to be more technology-neutral and allow local and municipal governments to layout timelines that align with their needs and decarbonisation pathways. Notable measures in this space that have moved ahead are the revised Buildings Energy Act in Germany, which introduces

clean heating requirements for existing buildings, and the Austrian Renewable Heat Act, which applies to new buildings and extends the existing ban on oil and coal boilers to all fossil-fuel systems, including gas boilers.

At present, such policies cover less than 20% of global residential heating demand, with most governments continuing to prioritise fiscal incentives to influence the purchase preferences of property owners.

Regulation is increasing quality and quantity of retrofits

Building codes for new construction include energy efficiency standards in virtually all G20 countries. Over the past 12 months, the European Union, Korea and the United States have revised standards and definitions upwards. Only eight countries, however, require building owners to meet such standards when undertaking retrofits on existing buildings. Building codes that apply to retrofits typically focus on larger projects and only mandate cost-effective measures to avoid placing an undue burden on building owners.

Some countries have introduced regulations aimed at increasing the quantity of retrofits. Starting from 2023, owners of Dutch office buildings are required to meet energy performance class C (EPC-C). When purchasing a home that falls below a certain EPC rating, Flemish home buyers must commit to retrofitting the property within five years. France and the United Kingdom introduced similar laws targeting private landlords in recent years. The revised EU Energy Performance of Buildings Directive (adopted in 2024) requires that countries retrofit the worst-performing 26% of their commercial buildings by 2033. Reflecting the long-lasting nature of the buildings stock and the relative lack of new construction, such policies are being introduced in countries where the importance of retrofits compared to new construction is highest — and often offer ample retrofit subsidy support to help meet these targets. Financial support from governments has been key to making these requirements socially acceptable.

Covid-19 recovery packages continue to sustain higher levels of energy efficiency spending

Between 2020 and 2024, earmarked government support for buildings energy efficiency continued to grow, reaching USD 60 billion in the past 12 months. Many of these programmes found their origin as a part of recovery plans initiated directly in the wake of the Covid-19 pandemic and the energy crisis. The level of participation in these programmes varies across regions. In some countries, the fiscal burden eventually prompted governments to downscale support; in others, programmes were undersubscribed, pushing governments to scale back support envelopes (such as in the United Kingdom). The latest batch of buildings-focused efficiency incentives still provides multi-year support, aiming to elevate retrofit rates in the coming years. The EU Recovery and Resilience Facility (RRF), the largest single source of government spending currently available, continues to support energy efficiency programmes in member states through to 2027. Some member state initiatives, such as Poland's Clean Air Programme, have even been enlarged in the past 12 months.

In terms of appliances, China implemented new buy-back schemes in major cities and provinces, effectively paying consumers to upgrade to more efficient models. In the United States, some tax credits and deductions introduced as part of the US IRA – such as the Energy Efficient Home Improvement Credit – extend through to the beginning of the 2030s. These long-term commitments bring much-needed stability to the retrofit and heat pump markets, which have traditionally been exposed to and affected by sudden changes in government funding, often arising from annual budget negotiations.

Many government energy efficiency programmes emphasise, as a core principle, means-based support for vulnerable groups. By the IEA's assessment, however, in 2020, only five advanced economies had established energy efficiency subsidy schemes specifically targeting low-income households and other vulnerable groups. In 2024, this number has reached 14 countries.

Buildings sector: State of energy policy in G20 counties, 2024

Country	Earmarked government spending				Regulations						Sector share of direct national emissions
	Total spending since 2020	*Main spending instrument*	*Main spending recipient*	*DMI: Heat pumps*	**Regulations on F-gases**	**BEC:** new buildings	**BEC:** existing buildings	**MEPS:** *appliances**	**FF boilers ban:** *new buildings*	**FF boilers ban:** *existing buildings*	
United Kingdom	USD 15 bn	Government grant	Energy-efficient retrofits	-	●	●	●	10/10	2035 (*oil, coal*)	2050 (*gas*)	27%
France	USD 22 bn	Government grant	Energy-efficient retrofits	●	●	●	●	10/10	2022 (*all FF*)	-	21%
Germany	USD 90 bn	Government grant	Energy-efficient retrofits	-	●	●	●	10/10	2045 (*all FF*)	2045 (*all FF*)	20%
Italy	USD 44 bn	Tax reduction	Energy-efficient retrofits	●	●	●	●	10/10	-	-	19%
Argentina	< USD 1 bn	-	-	-	●	●	-	6/10	-	-	16%
Türkiye	< USD 1 bn	-	-	-	●	●	●	9/10	-	-	15%
Canada	USD 7 bn	Consumer subsidy	Energy-efficient retrofits	-	●	●	◒	10/10	2028** (*oil*)	-	14%
Russia	< USD 1 bn	-	-	-	●	●	●	8/10	-	-	13%
United States	USD 60 bn	Tax credit	Energy-efficient retrofits	●	●	◒	◒	10/10	-	-	12%
Japan	< USD 1 bn	-	-	-	●	●	●	9/10	-	-	10%

Country	Earmarked government spending				Regulations						Sector share of direct national emissions
	Total spending since 2020	*Main spending instrument*	*Main spending recipient*	*DMI: Heat pumps*	Regulations on F-gases	BEC: new buildings	BEC: existing buildings	MEPS: *appliances**	FF boilers ban: *new buildings*	FF boilers ban: *existing buildings*	
Korea	USD 5 bn	Infrastructure investment	Energy-efficient retrofits	-	◌	●	-	9/10	-	-	8%
Mexico	< USD 1 bn	-	-	-	●	-	-	7/10	-	-	6%
India	< USD 1 bn	-	-	-	●	◒	-	5/10	-	-	6%
Indonesia	< USD 1 bn	-	-	-	◌	●	-	5/10	-	-	5%
Brazil	< USD 1 bn	-	-	-	●	●	-	5/10	-	-	5%
South Africa	< USD 1 bn	-	-	-	◌	●	●	10/10	-	-	4%
China	< USD 1 bn	-	-	-	●	●	-	9/10	-	-	4%
Australia	USD 2 bn	State-backed loan	Energy-efficient retrofits	-	●	●	-	7/10	-	-	4%
Saudi Arabia	< USD 1 bn	-	-	-	●	●	-	6/10	-	-	1%

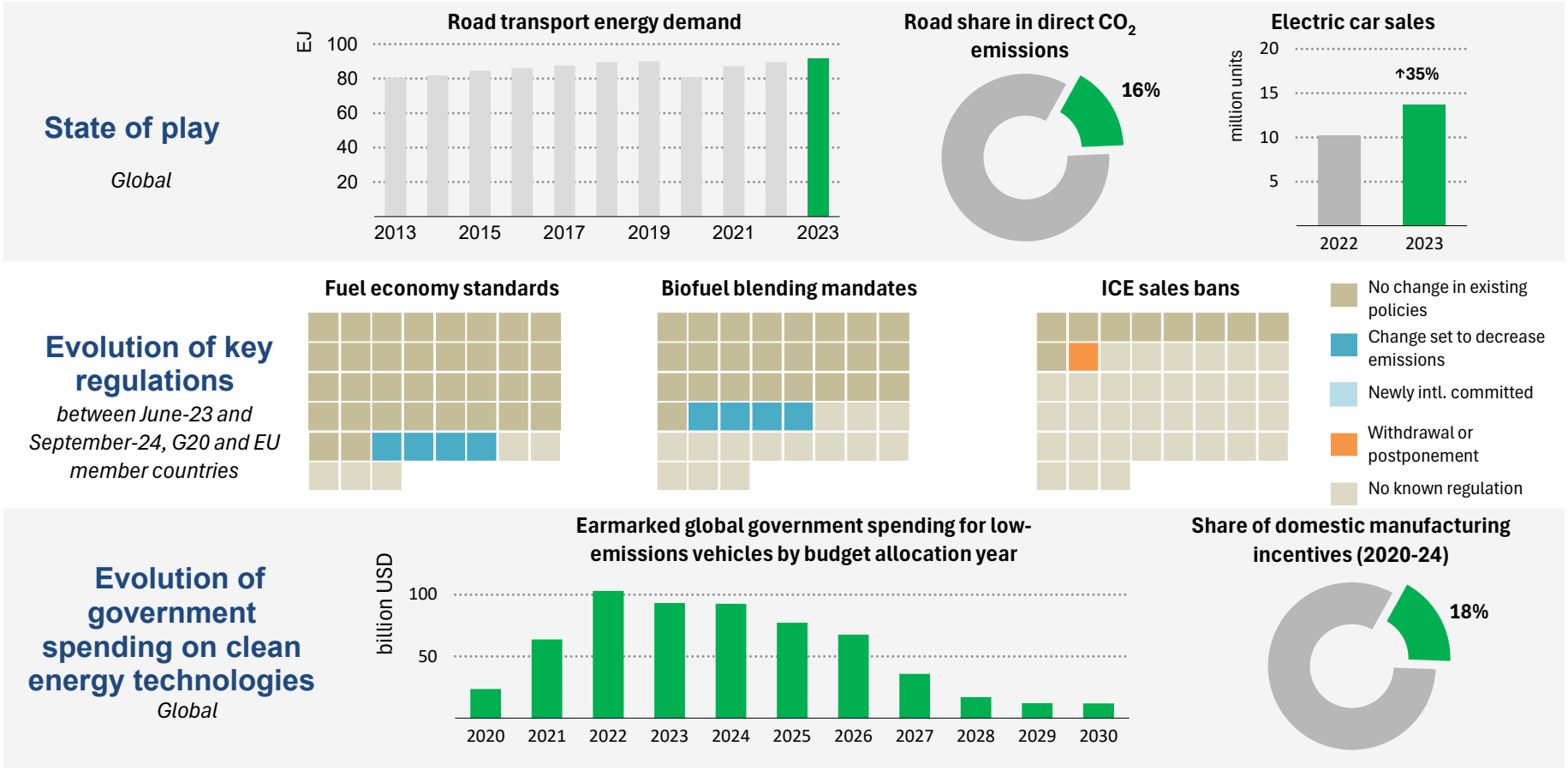
● = National implementation // ◒ = Subnational implementation // ◌ = International commitment // - = no known policy.

Note: DMI = domestic manufacturing incentives. BEC = building energy code. MEPS = minimum energy performance standards. FF = fossil fuel. * The indicator for MEPS covers space heating, water heating, air-conditioning, cooking, lighting, refrigerators, washing machines, dishwashers, dryers and televisions. **Announced FF boilers ban. Country-level policy details available on the IEA Energy Policy Inventory page.

Road transport

Road Transport Sector Snapshot

Road transport: State and trends of key energy policies



Note: Intl. = internationally. Each square in “Evolution of key regulations” represents one G20 or EU member country and shows the state of play for the selected key regulation. Earmarked government spending indicates disbursed and forward-looking direct spending through budget timelines validated between 2020 and H1/2024. These estimates do not translate into disbursement projections up to 2030, as it is expected that governments will route more spending packages through annual approval processes.

Electric vehicle incentives and more stringent fuel economy standards drive the greatest advances in road transport efficiency

Energy demand in the transport sector reached a new high record in 2023 – three-quarters of which was exclusively driven by road transport. In the past 12 months, 5 countries implemented new policies to reduce road transport oil consumption. In tracking key regulatory instruments for this sector, *State of Energy Policy 2024* focuses on fuel economy standards, sales bans, biofuel blending mandates, and carbon pricing schemes, as well as direct incentives for consumers and producers to foster uptake of low-emissions vehicles.

Governments continue to lean heavily on consumer incentives to encourage the shift to electric vehicles (EVs) and low-emissions vehicles, the most significant policy instrument used to foster uptake over last 12 months. Over the same period, new vehicle efficiency standards were also passed. In some countries, notably in the United States, these represented a significant increase in stringency. The positive trends are tempered, however, by one notable rollback of a previous policy stance: the repeal, of a ban on sales of internal combustion engine (ICE) vehicles in the United Kingdom. The impact of this rollback is quite minimal in terms of overall transition pace. According to the IEA's Global Electric Vehicle Outlook 2024, EV sales have continued to grow in 2024, and are set to expand to 60 million passenger cars by 2035 – 10 million more than in the 2023 Outlook.

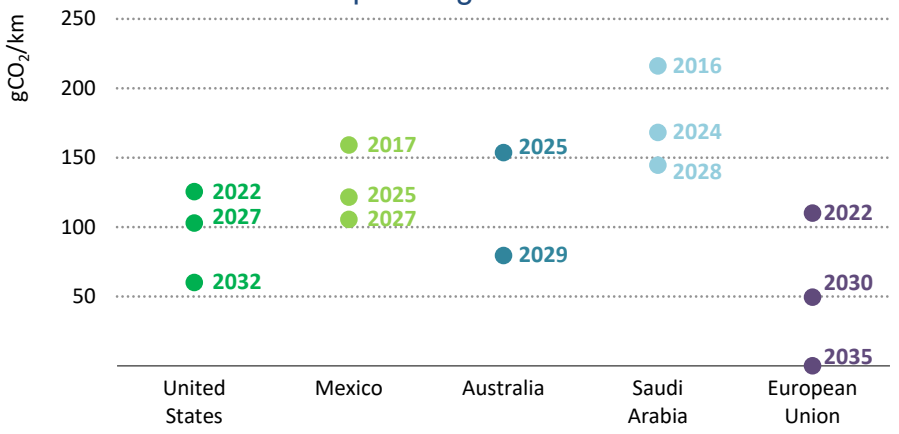
New fuel efficiency standards drive producers towards more electric vehicles in their line-ups

As of September 2024, fuel efficiency standards apply to about 70% of oil demand in road transport for light-duty vehicles (LDVs) and 60% for trucks. Fuel efficiency standards have been widely used to drive performance improvements since they were initially put in place widely during the first oil crisis in the 1970s. Typically, these standards are updated every 4-5 years, and aim to give industry a 10-15-year time horizon to achieve them. Despite their widespread use, five G20 countries still lack federal standards (although some have subnational standards). Australia is the most recent to introduce in 2024 a federal standard in 2024, with the New Vehicle Efficiency Standard expected to come into effect in January 2025.

In 2023 and 2024, several countries adopted new efficiency and tailpipe emissions regulations, which substantially increase upcoming targets for manufacturers. In 2024, the US Environmental Protection Agency (US EPA) published new fuel economy standards for model years 2027 onwards, with projected CO_2 emissions reductions of 50% for LDVs and 40% for mid-sized vehicles (MDVs) in 2032 (compared to 2027 levels). Saudi Arabia announced enhancements, with its updated corporate average fuel economy (CAFE) standards, to 2028 for LDVs. Also notable is implementation of Mexico's 2025-2027 CO_2 standards.

Some governments defined an end-date for the sale of ICE vehicles within their jurisdictions, thereby pushing car manufacturers to transform their production lines towards 100% EVs or other low-emissions vehicles. To date, only a few of these sales bans have been enacted into law. In general, ICE sales bans have faced legal challenges and public calls for their withdrawal or postponement. In 2024, for example, the United Kingdom adjusted its 2030 ICE sales ban to a zero-emissions vehicles mandate by 2035. Similarly, the European Union adjusted its first proposal to a more flexible regulation, with more leeway to permit sales and registration of ICE passenger cars after 2035, provided they run on CO_2-neutral fuels. These new regulations still face some challenges from EU member states: Italy and Germany have raised the possibility that they would not comply.

Recent enhancements in CO_2 emissions standards for passenger cars



IEA. CC BY 4.0

Source: IEA Policy and Measures Database, and International Council on Clean Transportation (ICCT) passenger car emissions and consumption, normalised to Worldwide Harmonized Light Vehicles Test Procedure (WLTP).

Many countries continue to provide consumer incentives for electric vehicles, much of it for manufacturing

Around 40 countries globally have implemented consumer incentives for EVs and other low-emissions vehicles and/or direct producer subsidies to manufacturers of these vehicles. Total government spending committed since 2020 has reached nearly USD 290 billion – with new allocations in 2024 adding around USD 45 billion. Around 20% of all government support for EVs is channelled through incentives linked to domestic manufacturing. China remains the largest provider of direct producer and consumer incentives, with more than USD 70 billion confirmed budget for its New Energy Vehicle Sales tax exemptions from 2024 to 2027. To drive EV uptake, China has also employed other non-financial measures such as priority vehicle registration and exemption from car congestion controls.

Governments have also advanced spending for transport-related infrastructure, including measures to expand EV charging and encourage a shift towards active transport (e.g. biking and walking) and greater use of public transit. Immediately after the Covid-19 pandemic, the largest share of energy-related spending in recovery packages focused on rail and charging infrastructures. The US IRA furthered this by allocating a large portion of government spending to expansion and redevelopment of urban and public transit infrastructure. In the last 12 months, a number of EU countries increased funding for low-emissions mobility and enhancing air quality via active transport support. Notably, Norway earmarked USD 110 million to upgrade its domestic railway system.

Road transport sector: State of energy policy in G20 countries, 2024

	Earmarked government spending				Regulations					Trade	Ambition	
Country	**Total spending since 2020 (USD)**	*Main spending instrument*	*Main spending recipient*	DMI: low-emissions vehicles	**Fuel efficiency standards**: cars	**Fuel efficiency standards**: trucks	**ICE sales ban**: cars	**ICE sales ban**: trucks	**Biofuel blending mandate**	**Recent tariff inflexions** - low-emissions vehicles	**Zero-emission car sales**	**Sector share of national emissions**
Brazil	3 bn	Government grant	Low-emissions vehicles	●	-	-	-	-	●	●	100% by 2035	42%
France	20 bn	Infrastructure investment	Low-emissions vehicles	-	●	●	2040	-	●	-	100% by 2035	39%
United Kingdom	13 bn	Infrastructure investment	Mass transit	-	●	●	-	2040	●	-	100% by 2035	31%
United States	149 bn	Infrastructure investment	High-speed rail	●	●	●	-	-	●	●	50% by 2030*	31%
Italy	48 bn	Infrastructure investment	High-speed rail	-	●	●	2035	-	●	-	100% by 2035	30%
Mexico	<1 bn	-	-	-	●	-	2040	2050	●	●	100% by 2040**	27%
Canada	24 bn	Infrastructure investment	Urban transit	●	●	●	-	-	●	●	100% by 2035	26%
Argentina	< 1 bn	-	-	-	-	-	2041	2041	●	●	-	26%
Saudi Arabia	< 1 bn	-	-	-	●	-	-	-	-	-	-	25%
Germany	57 bn	Consumer subsidy	Low-emissions vehicles	●	●	●	-	-	-	-	100% by 2035	23%
Indonesia	< 1 bn	-	-	-	-	-	-	-	●	-	-	22%

	Earmarked government spending				Regulations					Trade	Ambition	
Country	**Total spending since 2020 (USD)**	*Main spending instrument*	*Main spending recipient*	DMI: low-emissions vehicles	**Fuel efficiency standards**: cars	**Fuel efficiency standards**: trucks	**ICE sales ban**: cars	**ICE sales ban**: trucks	**Biofuel blending mandate**	**Recent tariff inflexions** - low-emissions vehicles	**Zero-emission car sales**	**Sector share of national emissions**
Türkiye	< 1 bn	-	-	-	-	-	-	-	●	●	-	21%
Australia	1 bn	Direct government investment	Electric passenger cars	-	●	-	-	-	-	●	-	21%
Korea	12 bn	Direct government investment	Low-emissions vehicles	-	●	-	-	-	●	-	83% by 2030***	17%
Japan	2 bn	Tax reduction	Electric passenger cars	-	●	●	-	-	●	-	100% by 2040****	17%
India	18 bn	Infrastructure investment	Mass transit	●	●	●	-	-	●	●	-	12%
South Africa	< 1 bn	-	-	-	-	-	-	-	●	-	-	11%
Russia	< 1 bn	-	-	-	-	-	-	-	-	-	-	9%
China	149 bn	Producer subsidy	Low-emissions vehicles	●	●	●	-	-	-	-	60% by 2030	7%

● = National implementation // ◒ = Subnational implementation // ◌ = International commitment // - = no known policy.

Note: DMI = domestic manufacturing incentives. BEV = battery electric vehicles. PHEV = plug-in hybrid electric vehicles. HEV = hybrid electric vehicles. FCEV = fuel cell electric vehicles. LCV = light commercial vehicles. *Recent US EPA rules suggest that EV sales could account for up to 56% by 2030, but this ambition is yet to be enshrined as an objective. **Mexico's EV sales ambition specifies 100% sales to be PHEVs and BEVs by 2040, and 100% BEVs by 2050. ***Korea's 83% target includes BEV, HEV, PHEV and FCEVs. ****Japan's Green Growth Strategy states: 100% of car sales to be BEV, PHEV, HEV, or FCEV by 2035; 20-30% of LCV sales by 2030; and electrified vehicles and decarbonised fuel vehicles to account for 100% of sales by 2040. Country-level policy details are available on the IEA Energy Policy Inventory page.

Industry

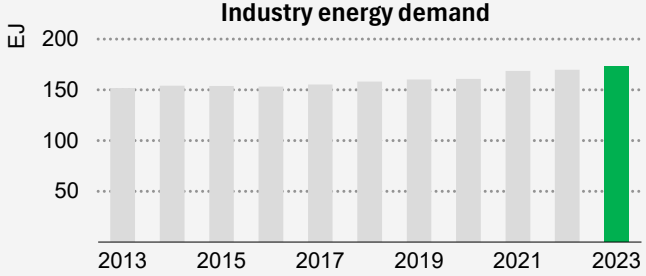
Industry Sector Snapshot

Industry: State and trends of key energy policies

State of play

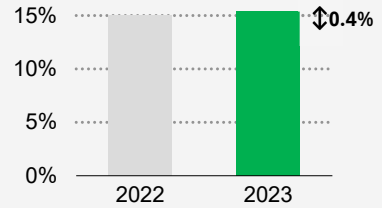
Global

Industry energy demand



Industry share in direct CO_2 emissions

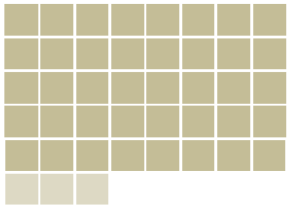
Low-emission share in fuel demand



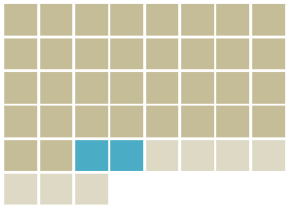
Evolution of key regulations

between June-23 and September-24, G20 and EU member countries

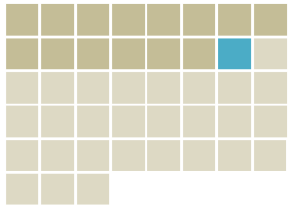
MEPS for industrial motors



Carbon pricing instruments



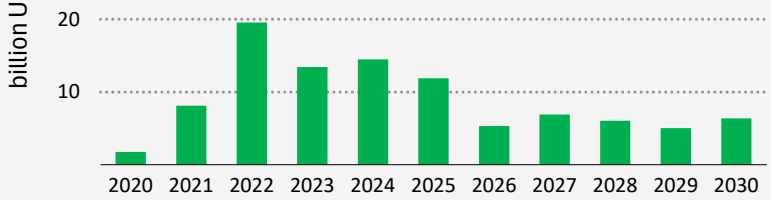
Energy efficiency obligation schemes



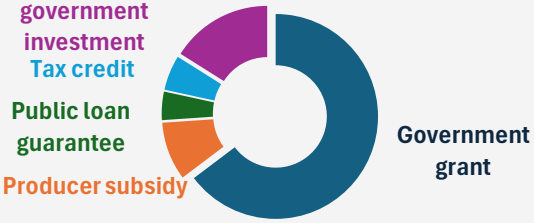
Evolution of government spending on clean energy technologies

Global

Earmarked global government spending for energy efficiency in industry by budget allocation year



Main spending instruments (%, 2020-24)



Note: Intl. = internationally. Each square in "Evolution of key regulations" represents one G20 or EU member country and shows the state of play for the selected key regulation. Earmarked government spending indicates disbursed and forward-looking direct spending through budget timelines validated between 2020 and H1/2024. These estimates do not translate into disbursement projections up to 2030, as it is expected that governments will route more spending packages through annual approval processes.

New industrial energy efficiency and decarbonising policies show few advances, amidst broader concerns on supply chain security and competitiveness

Industrialised countries have a long history of standards and incentives to improve industrial efficiency, often pursuing it as a means to improve competitiveness. Policy making for industrial decarbonisation, however, has advanced more cautiously, as governments seek to avoid having domestic decarbonisation efforts hurt industries' ability to compete in global markets – and unduly raise end-user prices. These considerations add to the complexity of designing industrial energy policies that can accommodate diverse new industries, across which few "one-size-fits-all" approaches would be effective.

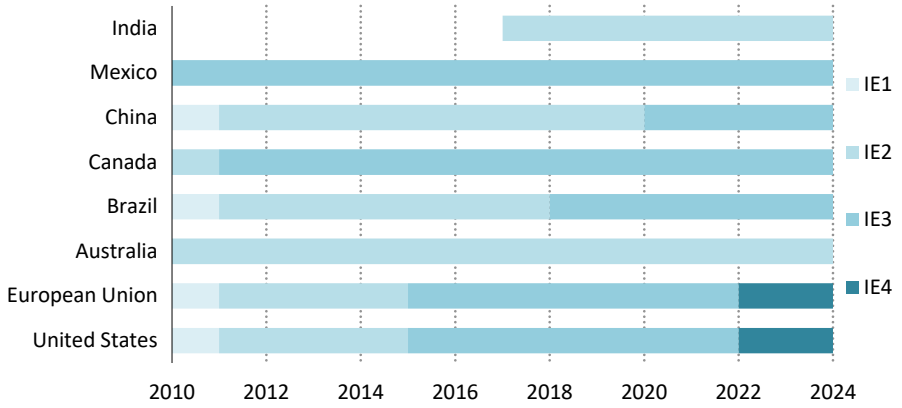
State of Energy Policy 2024 focuses on cross-cutting national energy policies for industry, such as: MEPs for industrial motors, pumps and compressors; energy efficiency obligation (EEO) schemes; carbon pricing instruments; and direct government support towards energy efficiency and recycling measures. Within this scope, amidst heightened concerns regarding industrial competitiveness and in the wake of the global energy crisis, little policy progress was evident in 2023. Similarly, few new international initiatives aiming to drive industry decarbonisation were announced in 2023. The last major set of new targets were announced in 2021, at COP26 in Glasgow. Examples included the First Movers Coalition (which pledged to reach 10% low-emissions steel by 2030) and Concrete Action for Climate (net zero carbon emissions from cement industry operations by 2050).

Energy efficiency remains the preferred lever for policy makers, and enjoys broad coverage already

MEPs for industrial motors are the norm in all G20 countries, now covering more than half of industrial motors worldwide (up from only 5% in 2000). Standards stringency varies by region, with the European Union's ecodesign requirements for electric motors being the most advanced globally (IE4 or above). Implemented in July 2023, this standard does not yet match the most efficient and commercially available electric motors (IE5). In contrast, of remaining G20 countries with standards in place, most set their minimum at IE3 or equivalent.

Industry-wide efficiency standards – which leave enterprises to identify and apply the measures best-suited to their activities – showed no advances in 2023 or 2024 among G20 countries. EEO schemes, which set compulsory energy savings targets for energy suppliers or utilities, are now established for industry in 15 countries. The number of schemes has grown steadily over the last 20 years. No new increases have passed since 2021, however, with few new policies under consideration as of September 2024. In China, energy performance standards, for either single plants or company-wide performance averages, have not been updated in any significant way since the last five-year plan (2020). Meeting these standards has typically been linked to government decisions on which plants to retire to address parallel overcapacity.

Evolution of minimum energy performance standards for industrial motors in key markets, 2010-24



Note: International Efficiency (IE) ratings: IE1 = standard efficiency; IE2 = high efficiency; IE3 = premium efficiency; and IE4 = super-premium efficiency.

Incentives to carry out energy efficiency upgrades remain a widespread tool, currently applied in 30 countries. Since 2020, governments globally have earmarked a cumulative USD 120 billion of industrial decarbonisation support. The number of fresh spending announcements for direct energy efficiency measures has, however, declined steadily since 2022. In contrast, support towards innovation technologies and low-emissions fuels has shown an upturn. A small number of countries are responsible for most of this spending. Most noticeable is Germany's earmarking of more than USD 40 billion in its draft 2025 budget and its carbon contracts for difference schemes, launched in 2024 with about USD 4 billion enacted for the first tender. Together, Canda, France, Germany and Japan account for more than three-quarters of earmarked spending for energy efficiency measures in industry.

The recent EU Net zero Industry Act (voted in June 2024) – which provides the regulatory framework to boost the competitiveness of EU industry and clean energy technologies – could signal a new wave of attention on industrial energy efficiency. The Act's current focus, however, is largely on developing local supply chains for eight strategic net zero technologies, aiming to meet 40% of the European Union's own demand for these technologies by 2030. These include: solar PV; wind; grid technologies; batteries; carbon capture and storage (CCUS); heat pumps; bioenergy; electrolysers and fuel cells. Simplifying the permitting of net zero technologies is a key pillar of the Act, usually by introducing time limits on the permit-granting process for manufacturing projects.

Carbon pricing schemes currently cover around 55% of industrial emissions. No new schemes were introduced in 2023; however, some governments expanded coverage of existing schemes. The EU Emissions Trading Scheme (EU ETS) announced (November 2023) gradual introduction of a Carbon Boarder Adjustment Mechanism. According to the latest plans, starting from 2026, the European Union will assess a price on carbon for parts of its imports at EU borders. This will be linked to the prices borne by EU industries, as represented by the progressive phase-out of free allowances for some industrial sectors. The United Kingdom is considering developing a similar policy and is running consultations.

Industry sector: State of energy policy in G20 countries, 2024

Country	Earmarked government spending			Regulations				Trade policies	
	Total spending since 2020	*Main spending instrument*	*Main spending recipient*	**MEPS for industrial motors**	**Carbon pricing**	*Price evolution (2023-H1/2024)**	**Energy efficiency obligation schemes****	**Recent import tariff /duty inflexion:** semiconductors, steel	**Sectoral share of national emissions**
Canada	USD 15 bn	Government grant	Energy efficiency	●	●	↗	-	-	36%
China	< USD 1 bn	-	-	●	◒	↗	●	●	30%
India	< USD 1 bn	-	-	-	-	-	-	●	27%
Indonesia	< USD 1 bn	-	-	●	-	-	-	-	27%
South Africa	< USD 1 bn	-	-	-	●	↗	-	-	27%
Brazil	< USD 1 bn	-	-	●	-	-	-	●	25%
Türkiye	< USD 1 bn	-	-	●	-	-	-	●	24%
Saudi Arabia	< USD 1 bn	-	-	●	-	-	-	-	23%
Mexico	< USD 1 bn	-	-	●	●	↗	-	●	23%
Japan	USD 13 bn	Government grant	Energy efficiency	●	●	↘	-	-	22%
Australia	USD 3 bn	Government grant	Energy efficiency	●	●	↗	-	-	22%

Country	Earmarked government spending			Regulations				Trade policies	
	Total spending since 2020	*Main spending instrument*	*Main spending recipient*	**MEPS for industrial motors**	**Carbon pricing**	*Price evolution (2023-H1/2024)**	**Energy efficiency obligation schemes****	**Recent import tariff /duty inflexion:** semiconductors, steel	**Sectoral share of national emissions**
France	USD 8 bn	Government grant	Energy efficiency	●	●	↘	●	-	21%
Argentina	< USD 1 bn	-	-	-	●	↘	-	-	21%
Russia	< USD 1 bn	-	-	●	-	-	-	-	20%
Korea	USD 3 bn	Direct government investment	Energy efficiency	●	●	↘	-	-	19%
Germany	USD 56 bn	Government grant	Energy efficiency	●	●	↘	-	-	18%
United Kingdom	< USD 1 bn	-	-	●	●	↘	-	-	17%
Italy	USD 1 bn	Tax credit	Energy efficiency	●	●	↘	●	-	17%
United States	USD 4 bn	Government grant	Energy efficiency	●	◒	↗	-	●	15%

● = National implementation // ◒ = Subnational implementation // ◌ = International commitment // - = no known policy.

Note: MEPS = minimum energy performance standard. *Source: World Bank State and Trends of Carbon Pricing Dashboard. **Source: IEA (2023), Energy Efficiency Market Report 2023. Country-level policy details are available on the IEA Energy Policy Inventory page.

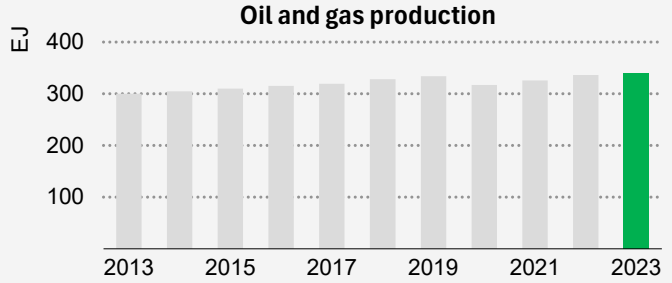
Fuel industry

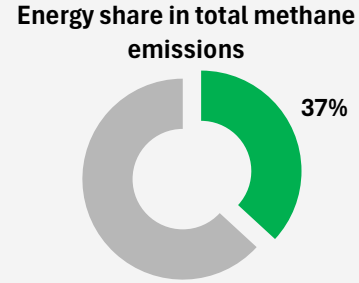
Fuel Industry Snapshot

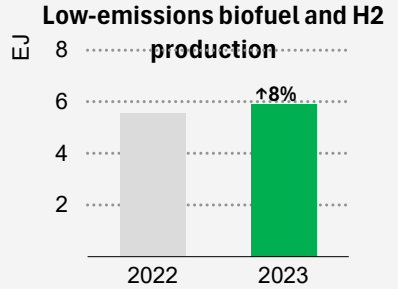
Fuel industry: State and trends of key energy policies

State of play

Global

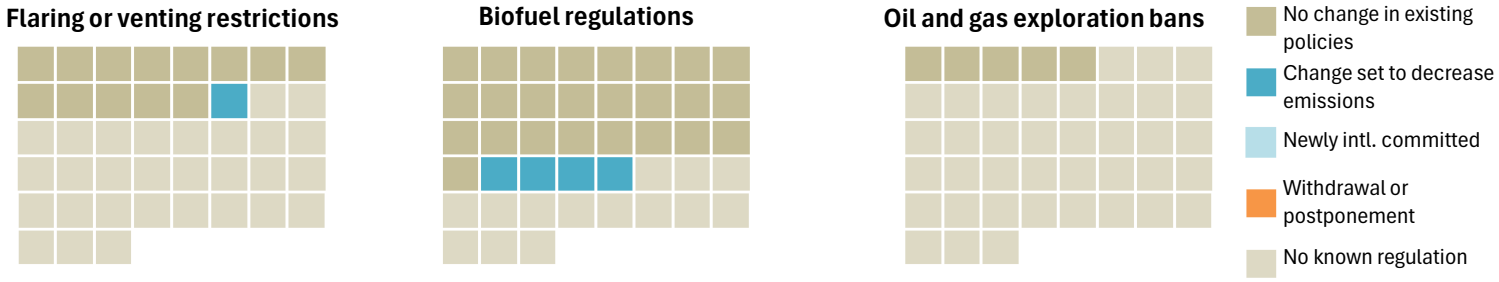






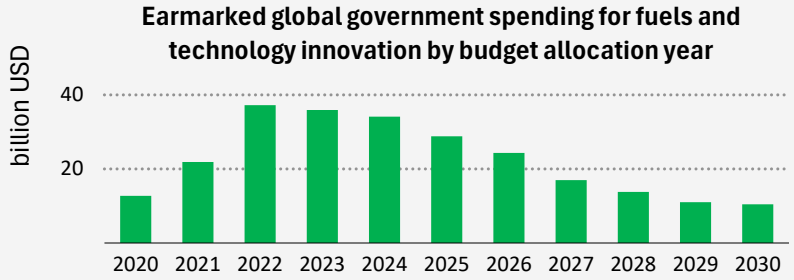
Evolution of key regulations

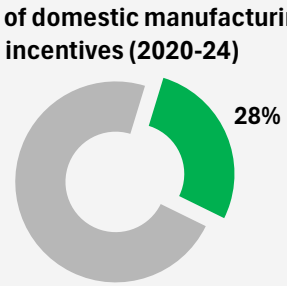
between June-23 and September-24, G20 and EU member countries



Evolution of government spending on clean energy technologies

Global





Note: H2 = hydrogen. Intl. = internationally. Each square in “Evolution of key regulations” represents one G20 or EU member country and shows the state of play for the selected key regulation. Earmarked government spending indicates disbursed and forward-looking direct spending through budget timelines validated between 2020 and H1/2024. These estimates do not translate into disbursement projections up to 2030, as it is expected that governments will route more spending packages through annual approval processes.

Incentives for fossil fuel production remain in place in many G20 countries, but the share of support for low-emissions fuels is increasing

Incentives that derisk fossil fuel production remain intact in many G20 countries, according to the OECD Inventory of Support Measures for Fossil Fuels. In parallel, new incentives have increased to develop and use low-emissions alternative fuels. *State of Energy Policy 2024* tracks current policies fostering this switch, notably: oil and gas exploration bans; biofuel blending mandates; methane abatement regulations; government spending incentives targeting fuels and technology innovation. Although few new regulations came into force in 2023, a new major global agreement on methane abatement was reached at COP28. Many countries have also signalled future plans to increase stringency on methane and biofuel blending.

Plans to phase-down support of oil, gas or coal production are yet to be fully implemented

Globally, support for fossil fuel producers reached USD 70 billion[1] in 2022, with oil taking by far the largest share (73%), followed by gas (16%). This is double the level estimated in 2018. No new national plans to phase-out producer subsidies were announced in 2023. The COP26 Glasgow Statement (2021) was the last major international advance on ambitions in this space. Under it, 40 countries and institutions signed a pledge to, by the end of 2022, halt public financing for energy projects relying on unabated fossil fuel in jurisdictions other than their own.

Some countries have since gone further, banning new oil and gas exploration in their own jurisdictions. Countries with formal bans, however, represent less than 1% of current global oil and gas production – and typically have few proven resources. The last notable decision includes Costa Rica's bill in 2023.

In contrast, the IEA Methane Tracker shows clear progress in 2023 in policies designed to reduce methane emissions from fossil fuel production. Several new methane-related announcements were made at COP28, including the launch of the Oil and Gas Decarbonisation Charter (ODGC) and new countries joining the Global Methane Pledge. Under current policies, less than half of the 50% emissions reduction pledged would be achieved in 2030. Existing policies focus largely on flaring and venting restrictions and standards, leak detection and repair mandates, and technology standards. As of 2023, countries representing 90% of fossil fuel

[1] This section only accounts for direct producer subsidies. For the full picture of fossil fuel subsidies, these estimates should be complemented with consumer subsidies that the IEA tracked to be at its highest in 2022 with over USD 1 trillion for this year alone.

production have one or more such policies in place. China's Ministry of Ecology and Environment notably released the final Methane Emissions Control Action Plan in November 2023 – a notable advancement for the 580 Mt CO_2-eq of coal-related methane the country emits annually.

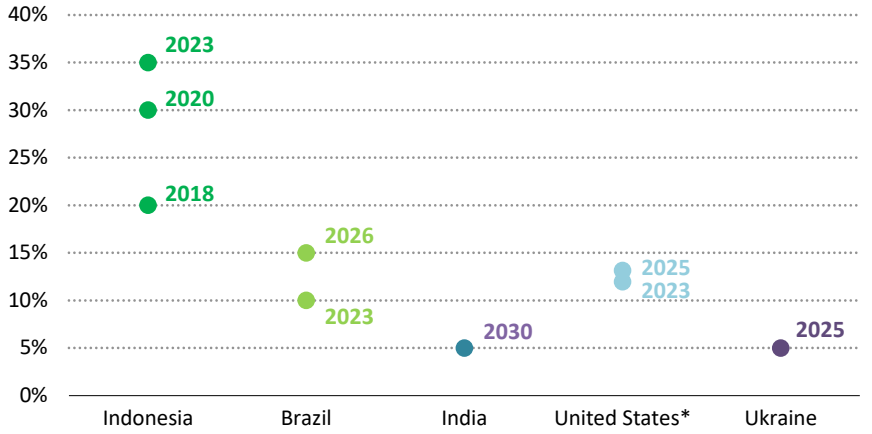
Governments are increasing direct support to low-emissions fuel production

Cumulative government support for fuel and technology innovation has reached over USD 270 billion since 2020. A large share stems from the US IRA and its tax credits for producing clean hydrogen and developing carbon capture. Recent initiatives include the Future Made in Australia plan, allocating USD 4.5 billion through its Hydrogen Production Tax Incentive to support growth of the renewable hydrogen industry. In 2024, Canada set an Investment Tax Credit for Clean Hydrogen and announced support for Clean Technology Manufacturing (such as batteries). Part of the funding for REPowerEU initiatives was redirected towards domestic hydrogen equipment manufacturers, as was the case in Spain.

Biofuel blending regulations increased in several regions in 2023, driving up demand and supporting an expanded pipeline for new production capacity. To date, support is largely for bioethanol blending in petrol and biodiesel blending. In 2024, Ukraine set in law its first biofuel blending mandate for road transport, with a mandatory content requirement of at least 5% of liquid biofuel from June 2025. Indonesia recently increased the blending target of biodiesel from 30% to 35% as of August 2023. Brazil followed suit with its own mandatory blending of biodiesel into diesel products, with blending set to rise from 10% in 2023 to 15% by 2026.

International co-operation to develop low-emissions fuels is increasing beyond finance, notably for hydrogen. The Global Hydrogen Review 2023 establishes an important focus on developing international supply chains. To date, it has secured government signatures worldwide on 31 hydrogen-specific bilateral agreements for co-operation, 15 of which focus on trade.

Mandated biodiesel blending rate by country and implementation year



Note: US federal biodiesel targets are set on a volumetric basis, and displayed biodiesel blending rates are contingent on projected diesel demand.

Fuel production: State of energy policy in G20 countries, 2024

Country	Earmarked government spending			Subsidies	Regulations			
	Total spending since 2020	*Main spending instrument*	*Main spending recipient*	Fossil fuels producer subsidies(2022)[1]	Biofuel blending mandate	Oil and gas exploration ban	Progress to net zero methane by 2030[2]	% of world oil and LNG production
United States	USD 92 bn	Tax credit	Carbon capture	USD 4.5 billion	●	-	Advanced	18.0%
Saudi Arabia	< USD 1 bn	-	-	n.a.	-	-	Limited	13.0%
Russia	< USD 1 bn	-	-	n.a.	-	-	Limited	12.0%
Canada	USD 30 bn	Tax credit	Hydrogen	USD 1.2 billion	●	-	Advanced	6.0%
China	USD 4 bn	Producer subsidy	Biofuels	USD 4.7 billion	-	-	Early stage	5.0%
Brazil	< USD 1 bn	-	-	USD 1.9 billion	●	-	Early stage	4.0%
Mexico	< USD 1 bn	-	-	USD 8.4 billion	●	-	Moderate	2.0%
Indonesia	USD 5 bn	Producer subsidy	Biofuels	USD 5.2 billion	●	-	-	0.9%
United Kingdom	USD 4 bn	Government grant	Carbon capture	USD 3.9 billion	●	-	Early stage	0.9%
Argentina	< USD 1 bn	-	-	USD 3.6 billion	●	-	Early stage	0.8%
India	USD 10 bn	Government grant	Hydrogen	USD 7.0 million	●	-	-	0.8%
Australia	USD 14 bn	Producer subsidy	Hydrogen	USD 2.7 billion	◒	-	Early stage	0.4%
Germany	USD 20 bn	Government grant	Hydrogen	USD 4.5 billion	-	-	Advanced	0.1%

Country	Earmarked government spending			Subsidies	Regulations			
	Total spending since 2020	*Main spending instrument*	*Main spending recipient*	Fossil fuels producer subsidies(2022)[1]	Biofuel blending mandate	Oil and gas exploration ban	Progress to net zero methane by 2030[2]	% of world oil and LNG production
Italy	USD 9 bn	Government grant	Hydrogen	USD 11.0 million	●	-	Advanced	0.1%
France	USD 14 bn	Government grant	Hydrogen	USD 36.0 million	●	2040	-	0.1%
South Africa	< USD 1 bn	-	-	n.a.	●	-	-	0.1%
Türkiye	< USD 1 bn	-	-	USD 281.0 million	●	-	-	0.1%
Korea	USD 4 bn	Direct government investment	Innovation funds	USD 30.0 million	●	-	-	<0.1%
Japan	USD 9 bn	Government grant	Hydrogen	USD 28.1 billion	●	-	-	<0.1%

● = National implementation // ◒ = Subnational implementation // ◌ = International commitment // - = no known policy.

Note: LNG = liquefied natural gas. Country-level policy details are available on the IEA Energy Policy Inventory page.

Source: (1) = OECD (2023), Inventory of support measures for fossil fuels 2023. (2) = IEA, IEA Methane Tracker.

Annex

Acknowledgements

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Abbreviations and acronyms

AC	Air Conditioner
APS	Announced Pledges Scenario (IEA)
BEC	Building Energy Code
BEV	Battery Electric Vehicle
CAFE	Corporate Average Fuel Economy
CCUS	Carbon Capture, Utilisation and Storage
COP	Conference of the Parties (UNFCCC)
CSPF	Cooling Seasonal Performance Factor
DMI	Domestic Manufacturing Incentive
EEO	Energy Efficiency Obligation
EJ	Exajoule
EMDE	Emerging Market and Developing Economies
EPC	Energy Performance Certificate
ETS	Emissions Trading System
EU	European Union
EU RRF	European Union Recovery and Resilience Facility
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
FDI	Foreign Direct Investment
F-gas	Fluorinated greenhouse gases
FTA	Free Trade Agreement
G7	The Group of Seven
G20	The Group of Twenty
GHG	Greenhouse Gases
GW	Gigawatt
GX	Green Transformation
HEV	Hybrid Electric Vehicle
ICCT	International Council on Clean Transportation
ICE	Internal Combustion Engine
IEA	International Energy Agency
JET-P	Just Energy Transition Partnership
LCV	Light Commercial Vehicle
LDV	Light Duty Vehicle
LNG	Liquified Natural Gas
LT-LEDS	Long-Term Low-Emission Development Strategy
MENA	Middle East and North Africa
MEPS	Minimum Energy Performance Standard
MER	Market Exchange Rate
MOVER	National Green Mobility and Innovation Programme (Brazil)
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contribution
OGDC	Oil & Gas Decarbonization Charter
OECD	Organisation for Economic Co-operation and Development

PHEV	Plug-in Hybrid Electric Vehicle
PLI	Production Linked Incentive Scheme (India)
PPA	Power Purchase Agreement
PPCA	Powering Past Coal Alliance
PV	Photovoltaic (solar)
STEPS	Stated Policies Scenario
UNFCCC	UN Framework Convention on Climate Change
US EPA	United States Environment Protection Agency
US IRA	United States Inflation Reduction Act
USD	United States Dollar
WLTP	Worldwide Harmonized Light Vehicle Test Procedure

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