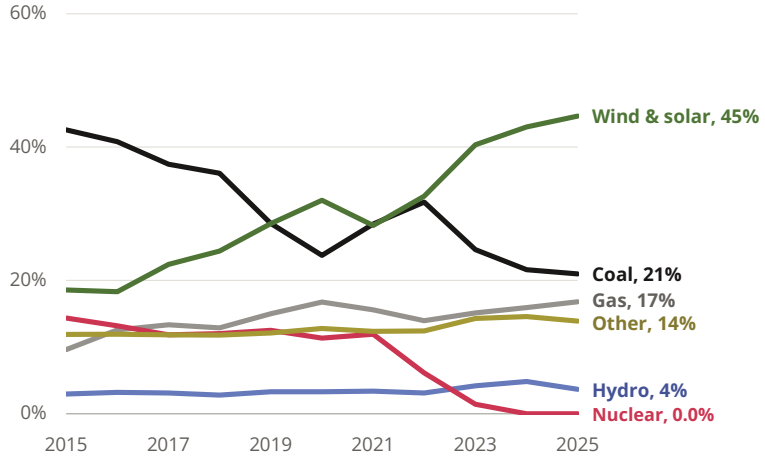
Germany at a glance

Germany has made strong progress towards a renewable power system, but climate neutrality by 2045 needs grid expansion, clean flexible power and faster electrification of transport, buildings and industry.

Key transition conditions: Strong renewable build-out, storage growth and a sizeable cleantech industry, but grids, system integration and end-use electrification must move much faster.

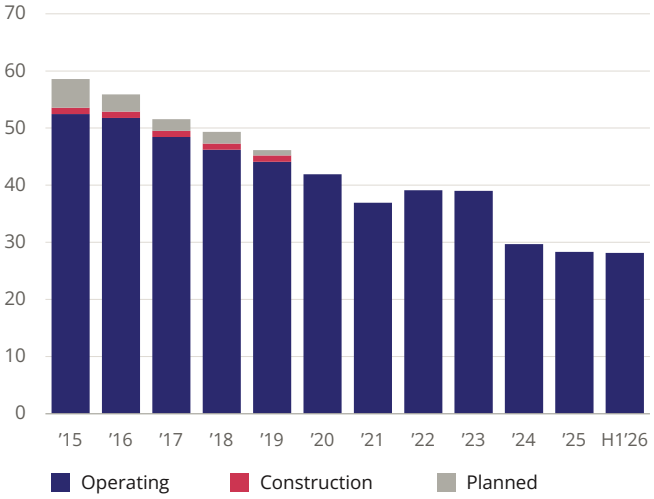
Electricity generation by source

2015–2025

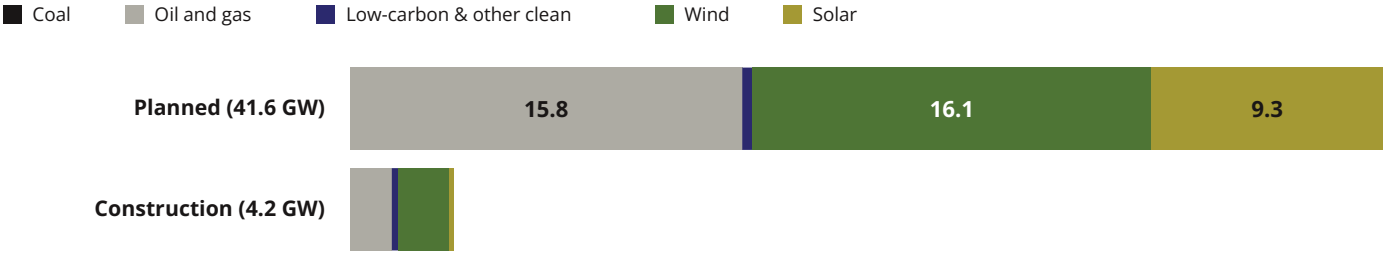


Coal capacity by status

GW, 2015–H1 2026



Capacity under development by source



Low-carbon & other clean 0.4 GW (planned) · Oil and gas 1.7, Low-carbon & other clean 0.3, Wind 2.1, Solar 0.2 GW (construction)

Power system landscape

Clean sources supplied around **59%** of electricity in 2025, and wind and solar out-generated fossil fuels for the first time. Yet oil, gas and coal are about 78% of total energy supply, all imported. Coal power ends by 2038.

Clean transition trends

Target of at least **80%** renewable electricity by 2030. By mid-2026 Germany had reached 58% of its solar, 61% of its onshore wind and 36% of its offshore wind targets. New capacity rules are likely to favour hydrogen-ready gas plants.

Enablers and bottlenecks

Battery storage has reached around 25 GWh and about 46 GW of permitted onshore wind awaits construction. But around **9.4 TWh** was curtailed in 2025, smart meters cover only 5.5%, and network charges are about 29% of household prices.

Opportunities for international cooperation with *Germany*

- **Clean industrial partnerships around key supply chains are an opportunity,** such as a cleantech corridor with India covering wind, solar, batteries, grids and green hydrogen.
- **North and Baltic Sea cooperation can deepen**, moving from shared targets to joint spatial and grid planning, cost sharing and harmonised tenders.
- **German diplomacy can strengthen the EU's capacity to act** through coordinated external policy, strategic partnerships and an integrated strategy for growth and decarbonisation.

Sources: *Ember annual electricity data; Global Energy Monitor annual capacity charge data and coal plant tracker data*

E3G

This country profile was produced as part of the report *Powering Across Divides – Clean energy cooperation in a fragmented world*, published November 2026. The full report is available from **https://www.e3g.org/publications/powering-across-divides-clean-energy-cooperation-fragmented-world/**

Germany's profile

Outline and domestic political economy context

Clean energy resources accounted for around 59% of Germany's electricity generation in 2025. Wind and solar alone provided around 47%, with onshore wind accounting for around 24% of generation, solar for 17% and offshore wind 6%.[1] Fossil fuel generation has meanwhile fallen substantially over the past 15 years.[2] In 2025, wind and solar together generated more electricity than fossil fuels for the first time.[3]

Germany targets at least 80% of gross electricity consumption to come from renewable sources by 2030; this is backed by capacity targets of 115 GW of onshore wind, 215 GW of solar PV and 30 GW of offshore wind, which require deployment to accelerate beyond recent rates.[4] In fact, by mid-2026, around 61% of the onshore wind, 58% of the solar and 36% of the offshore wind targets had already been reached. The onshore wind pipeline is particularly strong: around 51 GW of permitted capacity was not yet in operation by September 2026. If ultimately commissioned, together with the 71.3 GW already operating, this would exceed Germany's 115 GW target for 2030.[5] However, recently proposed reforms to renewable support schemes and grid management have raised concerns that growth will slow down rather than accelerate.[6]

Increasingly, Germany's critical challenge is grid integration rather than renewable generation itself. Much of its wind generation is concentrated in the north while major industrial demand centres lie in the south and west, creating persistent north–south transmission bottlenecks. The growing difficulty of integrating available clean power into the system is illustrated by around 9.4 TWh of renewable generation being curtailed in

[1] Bundesnetzagentur, January 2026, **Bundesnetzagentur publishes 2025 electricity market data**
[2] Federal Statistical Office (Destatis), 2025, **Environmental-Economic Accounts – Energy Accounts 2006-2023 (Umweltökonomische Gesamtrechnungen – Energiegesamtrechnung, 2006-2023)** (PDF)
[3] Carbon Brief, 28 July 2026, **Analysis: Wind and solar power overtake fossil fuels in Germany for first time ever**
[4] Federal Ministry of Justice, 2023, **Renewable Energy Source Act (Gesetz für den Ausbau erneuerbarer Energien (Erneuerbare-Energien-Gesetz – EEG 2023)**
[5] Bundesnetzagentur, October 2026, **Statistics on electricity generation capacity from selected renewable energy sources – September 2026 (Statistik zur Stromerzeugungsleistung ausgewählter erneuerbarer Energieträger - September 2026)** see Table 2 and 9 (PDF)
[6] Clean Energy Wire, 29 July 2026, **Q&A: Will Germany's electricity grid reform slow down the energy transition?**

2025 to manage grid congestion.[7] Germany also lags behind in areas such as grid digitalisation, standardised connection processes and smart-meter deployment, which reached only 5.5% of metering points in 2025.[8] Battery storage is expanding rapidly, reaching around 25 GWh by the end of 2025;[9] but storage, transmission and demand-side flexibility will need to expand further as variable renewable generation continues to grow.

Germany remains structurally dependent on imported fossil fuels, with oil, gas and coal accounting for around 78% of total energy supply in 2024.[10] As a net importer of all three, its energy system and economy remain exposed to global energy prices and geopolitical disruption. This is particularly significant given Germany's energy-intensive, export-oriented industrial model. Industry accounts for around 23% of gross value added[11] and 29% of total energy consumption, while energy-intensive manufacturing represents around 17% of manufacturing value added but roughly 75% of industrial energy use.[12] Energy costs and supply security are therefore central to industrial competitiveness, a vulnerability made particularly visible by the loss of Russian pipeline gas over recent years.

Within the power sector, Germany's fossil fuel dependence is shifting rather than disappearing. While coal declines, gas is assuming a more strategic role in energy security and system flexibility. Germany has a legal target to phase out coal generation by 2038 at the latest;[13] to date, this transition has remained broadly on track as renewable deployment, EU carbon pricing and political commitment have progressively reduced coal's role. However, the final phase remains politically sensitive, particularly in eastern regions where coal production remains closely tied to employment, regional economic structures – and perceptions of an unequal transition.

Gas, by contrast, has not undergone a comparable structural decline and is increasingly expected to provide flexible, dispatchable capacity as coal retires and variable renewable generation expands. This has become more economically and geopolitically challenging since Germany ended its heavy reliance on relatively cheap Russian pipeline gas after 2022.[14] Regardless of these difficulties, the Merz government has introduced a capacity mechanism to ensure sufficient controllable capacity is available by 2031, reflecting the need for security of supply. Formally this mechanism is technology-neutral; however, its long-duration requirements – designed to cover extended periods with little wind or solar –

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[7] SMARD, March 2026, **Grid congestion management volumes remained stable over the year (Maßnahmenvolumen im Gesamtjahr stabil)**

[8] Bundesnetzagentur, March 2026, **Roll-out of intelligent metering systems (Roll-out intelligenter Messsysteme)**

[9] Federal Ministry for Economic Affairs and Energy, June 2025, **New energy storage for Germany**

[10] IEA, 2024, **Germany** (webpage, accessed 8 September 2026)

[11] Federal Statistical Office (Destatis), 2026, **EU comparison: Germnay and the other Member States**

[12] Federal Statistical Office (Destatis), 2024, **Importance of energy-intensive industries in Germany (Bedeutung der energieintensiven Industriezweige in Deutschland)** (webpage, accessed 8 September 2026).

[13] Federal Ministry of Justice, 2020, **Coal Phase-out Act (Gesetz zur Reduzierung und zur Beendigung der Kohleverstromung)**

[14] Agora Energiewende, 11 May 2022, **Breaking dependency on Russian gas: perspectives from France and Germany**

favour technologies capable of sustained generation, with hydrogen-ready gas plants likely to play a significant role alongside storage and other flexible resources.[15]

Managing the competitiveness and distributional consequences of decarbonising sectors where fossil fuels remain deeply embedded remains a challenge as Germany's power transition advances. In transport, Germany's large automotive industry and combustion-engine-based supplier networks mean electrification is a contested industrial transition. The scale of employment and value embedded in existing automotive supply chains makes protecting jobs and domestic value creation central to managing the shift;[16] on the other hand, intensifying competition in EVs, particularly from China, makes successful electrification increasingly important to Germany's future industrial competitiveness.[17]

In buildings, affordability and political acceptability similarly shape the transition. Fossil gas and oil remain deeply embedded in Germany's existing housing stock,[18] meaning decarbonisation requires millions of households and property owners to replace heating systems and absorb high upfront costs. The controversy surrounding the 2023 heating law, replaced in 2026 by a new one, illustrates how tangible household costs can constrain the pace of transition: the Merz government's new heating law continues to permit gas and oil heating, adding an expensive obligation to gradually blend in climate-neutral fuels – officially still retaining Germany's 2045 climate-neutrality objective.[19]

Affordability has become central to the politics of Germany's transition. Although energy prices have fallen from the peaks of the 2022 fossil gas supply crisis, household and non-household energy costs remain above pre-crisis levels:[20] network charges, for example, account for around 29% of household electricity prices in 2025,[21] meaning lower renewable generation costs do not automatically translate into lower bills. This sharpens political debate over who bears the costs of the transition and has reinforced government efforts to reduce energy prices for households and industry.[22]

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[15] Federal Ministry for Economic Affairs and Energy, September 2026, **Green light for secure electricity supply: European Commission approves ad-hoc capacity mechanism under thee Strom VKG (Grünes Licht für sichere Stromversorgung: Europäische Kommission genehmigt Ad-hoc-Kapazitätsmechanismus des StromVKG)**

[16] Federal Ministry for Economic Affairs and Energy, 2023, **Automotive Industry (Automobilindustrie)** (webpage, accessed 8 September 2026)

[17] Federal Government of Germany, 9 September 2025, **Chancellor's speech at the opening of IAA Mobility 2025: Shaping the transformation of the automotive industry (Rede des Kanzlers anlässlich der Eröffnung der IAA Mobility 2025: Den Wandel der Autoindustrie gestalten)**

[18] Federal Statistical Office (Destatis), June 2024, **2022 Census: three-quarters of all dwellings heated by oil or gas**

[19] Reuters, 13 May 2026, **German cabinet agrees to replace green-friendly heating law**

[20] Destatis, September 2026, **Electricity and gas prices for households fell in the first half of 2026 (Strom- und Gaspreise für Haushalte im 1. Halbjahr 2026 gesunken)**

[21] Bundesnetzagentur, 2026, **Monitoring repot 2025 (Monitoringbericht 2025)** (PDF)

[22] Federal Ministry of Finance and Federal Ministry for Economic Affairs and Energy, 3 September 2025, **Strengthening Germany as a business location, securing jobs and relieving the burden on consumers: The**

Summary of key domestic transition factors

- **Germany benefits from strong renewable build-out and rapidly growing storage deployment as well as a sizeable clean energy industry.** In 2023, green technologies generated around 9% of total gross value added,[23] accounted for more than 8% of exports and had grown by roughly 5% annually on average since 2010. Russia's invasion of Ukraine in 2022 marked a critical juncture: by exposing the economic and security risks of dependence on imported fossil fuels, it strengthened the case for domestic clean energy as a source of resilience and competitiveness. Germany's September 2026 TAFF roadmap consolidates existing measures to reduce fossil fuel dependence through renewables and electrification.

- **Converting these advantages into a secure and affordable transition will require much faster progress on grids, system integration and end-use electrification.** Germany needs to expand both its transmission and distribution grid much faster to address connection queues and enable north–south transmission of wind energy. The transition also requires significant smart-meter rollout and demand-side flexibility, alongside quicker electrification of its vehicle fleet and existing building stock. To secure political support, Germany will need to ensure the transition's system costs are manageable and distributed fairly.

Opportunities for international collaboration

1. **Build strong and strategic clean industrial partnerships around key supply chains**. Germany is particularly exposed to geopolitical competition over critical resources and cleantech supply chains. It needs to build on its existing diplomatic base to turn selected relationships with major economies into deeper partnerships fostering cleantech manufacturing supply chains, trade and investment. India, for instance, is a promising partner, with scope for a cleantech corridor combining European demand, finance, market access and technology leadership with its growing manufacturing capabilities in wind, solar, batteries and green hydrogen. A closer relationship would help both sides diversify concentrated supply chain dependencies.

2. **Deepen energy cooperation across both the North and Baltic Seas**. Germany can use regional cooperation on offshore wind, interconnectors (that allow the trading of electricity between territories) and hydrogen infrastructure to meet three objectives at the same time: to access more renewable power, lower system costs and strengthen energy security. North Sea cooperation could move beyond shared capacity targets: what is needed now is joint spatial and grid planning, clearer cross-border cost-sharing and trading arrangements, harmonised support schemes and tender requirements,

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German Federal Government adopts measures for lower energy prices (Standort Deutschland stärken, Arbeitsplätze sichern und Verbraucher entlasten: Bundesregierung beschließt Maßnahmen für niedrigere Energiepreise)

[23] Umweltbundesamt, 25 June 2025, GreenTech Atlas 2025

and better coordinated supply chain and security planning.[24] The same model can also be expanded in the Baltic Sea region, given Germany is already part of emerging cooperation on critical infrastructure protection and the Baltic Offshore Grid Initiative.

3. **Encourage Germany's diplomacy to strengthen European geopolitical and economic capacity.** German foreign policy can strengthen the EU's ability to act geopolitically, including through coordinated EU external policy and strategic partnerships, investment in the transition and an integrated European strategy for growth and decarbonisation. As Germany works on its coal phase-out, just transition and TAFF roadmap, its learning could provide a basis for deeper European and international cooperation on reducing fossil-fuel dependence while supporting competitiveness and social cohesion.

[24] E3G, 2026, **Empowering Europe: Delivering the security and economic benefits of North Seas wind** (webpage, accessed 9 September 2026)

ABOUT E3G

E3G is an independent think tank working to deliver a safe climate for all.

We drive systemic action on climate by identifying barriers and constructing coalitions to advance the solutions needed. We create spaces for honest dialogue, and help guide governments, businesses and the public on how to deliver change at the pace the planet demands.

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