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Accelerating the Energy Transition For Türkiye's Climate Ambition, Energy Security, And Green Growth

November 2026



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Suggested Citation:

Borrero, M., Cui, R., Behrendt, J., Bertram, C., Zagoruichyk, A., Kreis, A., Young, C., Syed, M., Nelson-Rowntree, X., Churlyaev, D. (November 2026). "Accelerating the energy transition for Türkiye's climate ambition, energy security, and green growth". Center for Global Sustainability, University of Maryland. 26 pp.

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Table Contents

Summary 4

Introduction 5

Accelerating the Energy Transition for Greater Climate Ambition 8

Economy-Wide Pathways For High-Ambition NDC 8

Power Sector Decarbonization: Renewable Deployment and Coal Phase-Out 11

Industrial Decarbonization: Electrification and Carbon Pricing 14

Accelerating the Energy Transition for Improved Energy Security 17

Accelerating the Energy Transition for Green Economic Growth 19

Conclusion 21

References 22

Summary

Türkiye has made notable progress recently in solar deployment and vehicle electrification and has implemented a number of policies to support industrial decarbonization. Despite declining emissions since 2021, the country's latest Nationally Determined Contribution (NDC), submitted in November 2025, indicates a 33% increase in total greenhouse gas (GHG) emissions by 2035 from 2023 levels, reflecting low ambition. Meanwhile, Türkiye has been expanding and investing in fossil fuel infrastructure, raising concerns about energy security with continued dependence on imported fossil fuels, which accounts for 72% of today's total energy supply. As a major global exporter of cement, glass, and iron and steel, Türkiye faces increasing pressure to decarbonize major industrial sectors in response to recent European Union (EU) regulations, particularly the Carbon Border Adjustment Mechanism (CBAM).

As the host of COP31, Türkiye has an opportunity to demonstrate leadership on climate ambition and showcase how accelerating the energy transition can not only sustain emission reductions but also deliver broader benefits for energy security and economic growth. In this analysis, we present a pathway for Türkiye with accelerated energy transitions, particularly through advanced renewable energy development in electricity and end-use electrification in industries and transportation, that delivers greater climate ambition, improved energy security, and sustained green economic growth for the country.

Under the High Ambition pathway, total GHG emissions in Türkiye decline by 36-40% by 2035 relative to 2023 levels, primarily driven by reductions in the power and industry sectors. For electricity decarbonization, the High Ambition pathway includes faster renewable deployment with a total of 120 GW solar and wind buildout between 2026 and 2035, a near-complete coal phaseout by 2035, and declining gas generation with no additional new capacity. In the industry sector, electrification plays a key role, increasing to 38% by 2035 from 32% in 2024. The energy transition under the High Ambition pathway also creates opportunities to lower import dependence of fossil energy by reducing oil, gas, and coal consumption by 30%, 23%, and 80%, respectively, by 2035 relative to 2025 levels, and to promote green economic growth through investments and employment opportunities in energy efficiency and clean technologies manufacturing.

Introduction

Türkiye is the 16th-largest emitter of greenhouse gases (GHG) globally, accounting for 1.06% of total GHG emissions.[1] Emissions in Türkiye peaked in 2021 and declined between 2021 and 2023, driven by reductions in the power and industry sectors.[1,2] In 2023, the power sector accounted for 28% of total GHG emissions (including LULUCF), transportation contributed 19%, industry accounted for 13.5%, and methane emissions accounted for 13% (Figure 1).[1,2] However, preliminary data from Ember suggests that power sector emissions have recently returned to an upward trend, increasing by 2% between 2023 and 2024 and by approximately 5% between 2024 and 2025, driven by higher gas electricity generation due to poor hydropower conditions.[3] This trend is also supported by the Global Carbon Budget, which reports a 5 increase in fossil CO_2 emissions between 2023 and 2024.[4] Meanwhile, methane emissions decreased by 13% between 2021 and 2023, while transportation emissions have remained relatively stable.[2]

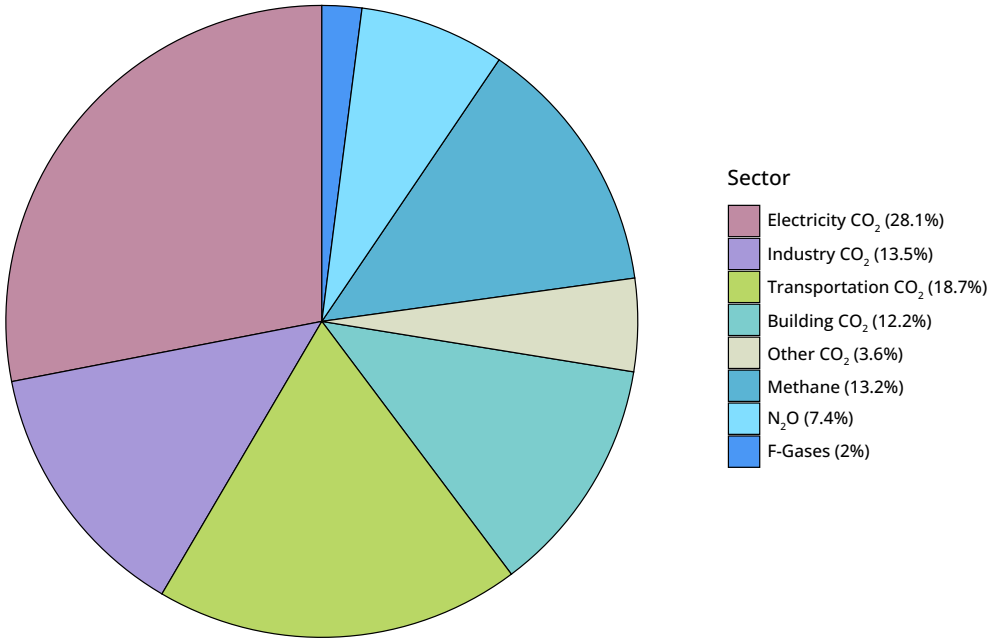


Figure 1. Türkiye's GHG emissions by sector, 2023. Historical CO_2 emissions data is from CEDS, and non-CO_2 emissions data is from PRIMAP-hist.[1,2]

Despite the dominance of fossil fuels in power generation, Türkiye has achieved rapid solar deployment in recent years. In 2025, fossil fuels accounted for 57% of total electricity generation (34% from coal and 22% from gas), while renewables contributed 43%, including 16% from hydro, 11% from solar, and 11% from wind.[3] Solar deployment reached 6.18 GW/year in 2023, a significant increase from previous years, when annual additions remained below 2 GW.[3] This trend has continued, with the country deploying around 5 GW of solar capacity per year in 2024 and 2025. Solar generation also increased by 45% in 2025. Wind deployment, meanwhile, has lagged behind solar, with 2 GW of new capacity installed in 2025 and an 8% increase in generation between 2024 and 2025.[3] Overall, solar and wind capacity reached 25 GW and 15 GW, respectively, in 2025.[3] Electricity demand is also increasing to meet cooling needs as the country experiences hotter summers, with peak demand rising by 6.9% between 2023 and 2024.[5]

Transportation electrification is also advancing. In 2025, battery electric vehicles (BEVs) accounted for 17% of new car sales in Türkiye, similar to the EU average.[6] BEV sales increased by 80% compared to 2024 levels.[6] Under the "New Energy Architecture for 2040" document, which the government aims to release by COP this year, Türkiye targets the deployment of 8-10 million electric vehicles (EVs) by 2035,[7] up from a target of 2.5 million EVs by 2030.[8] In the industry sector, the share of electricity in manufacturing energy use has also increased, reaching 28% in 2024.[8] However, the country's manufacturing energy-intensity remains higher than other countries in the region, and industry continues to drive fossil fuel consumption.[8] Moreover, new regulations on smart metering and building energy-efficiency standards have come into effect.[8]

In July 2025, Türkiye released its first climate change law, which establishes an Emissions Trading System (ETS)[9] expected to begin its pilot phase in 2026.[10] The law also establishes the country's climate governance framework, institutional arrangements, and financial mechanisms, complementing a broader set of policies and targets aimed at supporting the energy transition. These include reaching 120 GW of wind and solar capacity and ensuring that renewables account for more than 55% of total power generation by 2035,[11–13] reducing primary energy consumption by 16% from 2024 to 2030,[14] and increasing installed electrolyzer capacity to 5 GW by 2035.[15]

As the host of COP31, Türkiye is leading an initiative to increase the share of electricity in total energy consumption, with a target of reaching 35% by 2035. This initiative promotes the use of clean energy, grid modernization, and battery storage adoption to reduce reliance on fossil fuels.[16] In addition, Türkiye aims to discuss the growing energy demand from the Artificial Intelligence (AI) industry during COP31, encouraging companies to improve transparency around their energy consumption while promoting the use of clean energy.[16]

Although Türkiye has made progress in clean energy deployment and electrification and has introduced policies and initiatives to support the energy transition, it continues to pursue fossil fuel development, despite the potential benefits of a faster transition for energy security and economic growth. At the same time, its recent 2035 NDC remains limited in ambition, setting an emissions target of 643 $MtCO_2eq$ in 2035[17] that allows emissions to increase by 33% relative to 2023 levels. Türkiye aims to peak emissions by 2038 and achieve net-zero GHG emissions by 2053.[17,18]

Türkiye is a net energy importer, and its energy policies continue to support a fossil fuel-dependent economy, leaving the country vulnerable to international fuel prices and supply disruptions. In 2025, 72% of the country's total energy supply came from imported resources,[19] including 84% of total oil supply,[20] 95% of total gas supply,[21] and 66% of total coal supply.[22] Türkiye's strategic location between major gas-producing regions and European markets, combined with its existing pipeline infrastructure, has made it a key regional hub for gas trade and transit, particularly for Azerbaijani and Russian gas, while the country also aims to expand its role to include other regional producers.[23] Türkiye has also continued to expand its gas import and storage infrastructure.[23] The country has increased its regasification capacity and expanded its gas storage capacity to support gas supply agreements with Balkan countries and increase Liquified Natural Gas (LNG) imports from the United States and Algeria.[23]

At the same time, coal accounts for 34% of total electricity generation, with two-thirds of the coal supply coming from imports,[24] and is responsible for roughly 70% of the country's power sector emissions.[25,26] Despite its reliance on imported coal and coal's substantial contribution to emissions, Türkiye's existing National Energy Plan projects adding 2.5 GW of new coal capacity by 2035.[27] Türkiye is also estimated to provide US$8.7 billion in support for coal-fired power by 2030 through purchase guarantees for domestic coal power plants, despite the declining costs of solar and wind power and the relatively low average efficiency of existing domestic coal-fired power plants (approximately 32%).[25] Consequently, Türkiye stands out as the only OECD member without a coal phase-out plan or a ban on new coal permits.

Türkiye is also a major producer and exporter of emissions-intensive products, including steel, aluminum, cement, and glass, with the European Union (EU) serving as one of its key export markets. Given the recent trade policy changes introduced by the EU, such as the CBAM, which imposes a fee on the imports of carbon-intensive goods, decarbonizing Türkiye's industry is vital for maintaining the competitiveness of its exports and sustaining the country's economic growth.

These trends reflect both the challenges and the opportunities that Türkiye faces in accelerating its energy transition. In this context, hosting COP31 offers a timely opening to drive concrete action across the energy sector. This report examines how accelerating the energy transition through renewable power deployment and end-use electrification can strengthen Türkiye's climate ambition and energy security while creating new opportunities for sustainable economic growth. In particular, this report develops a High Ambition pathway for emissions reduction and identifies key actions needed to support this transformation in the power and industry sectors. It also examines how these actions could contribute to energy security and, more broadly, generate benefits through improved energy affordability, employment, and investment opportunities.

Accelerating the Energy Transition for Greater Climate Ambition

Economy-Wide Pathways For High-Ambition NDC

In November 2025, Türkiye announced its 2035 NDC target, which aims to reduce GHG emissions by 466 $MtCO_2eq$ relative to a Business-as-Usual (BAU) scenario, limiting GHG emissions to 643 $MtCO_2eq$ in 2035. This target greatly exceeds current emissions and allows total GHG emissions (including LULUCF) to increase by 33% between 2023 and 2035, corresponding to an average annual growth rate of 2%. Compared with Türkiye's previous 2030 NDC target, which aimed to reduce total GHG emissions by 41% relative to BAU, limiting emissions to 695 $MtCO_2eq$ in 2030, this represents a modest improvement.[18] The 2030 target allows emissions to increase by 44% from 2023 levels by 2030, equivalent to an average annual growth rate of 5%.

Both NDC targets do not fully capture the country's potential for a more ambitious energy transition, given the continued growth in renewable deployment and recent emission trends, with total GHG emissions declining by 4% between 2022 and 2023.[1] To better align its climate targets with current emission trajectories and increase the level of ambition, Türkiye could establish a transparent NDC target based on reductions from a historical base year rather than relying on a hypothetical BAU scenario, which is subject to large uncertainties.

Using the Global Change Analysis Model (GCAM-CGS), an open-source global integrated assessment model, we developed two emission pathways that incorporate bottom-up sectoral analyses of technologies with demonstrated potential to enable rapid decarbonization. Because Türkiye is not represented as a standalone region in GCAM, its results are downscaled from the Europe_Non EU region using an approach developed by IIASA for the NGFS Consortium to provide the finer resolution required for country-level analysis.[1] The downscaling tool generates country-level data on final, secondary, and primary energy variables as well as energy-related CO_2 emissions using regional GCAM outputs, population and GDP projections from baseline scenarios, and historical energy data from IEA energy balances. It develops short-term and long-term projections, which are harmonized through linear interpolation and combined using weighted averages, with weights adjusted to place greater emphasis on longer term projections.[28]

The first pathway, the High Ambition pathway, represents an accelerated energy transition designed to achieve more ambitious emissions reductions. Under this pathway, emissions (including LULUCF) peak in 2021 and subsequently decline through 2035, reaching net-zero emissions by 2050. The second pathway, the Current Policies pathway, reflects an emission trajectory based on current emissions and energy trends.

Under the High Ambition pathway, total GHG emissions (including LULUCF) decrease by 16-20% by 2030 and 36-40% by 2035, compared to 2023 levels (Figure 2, Table 1). Emissions continue to decline thereafter, reaching approximately 135 $MtCO_2$ in 2050, as the country is moving toward net-zero emissions. By contrast, under a Current Policies pathway, GHG emissions (including LULUCF) are projected to remain relatively stable by 2030, with increases reaching a maximum of 3% relative to 2023 levels, and to increase by 6-14% by 2035. All percentage changes are reported with an uncertainty range of +/-2%.

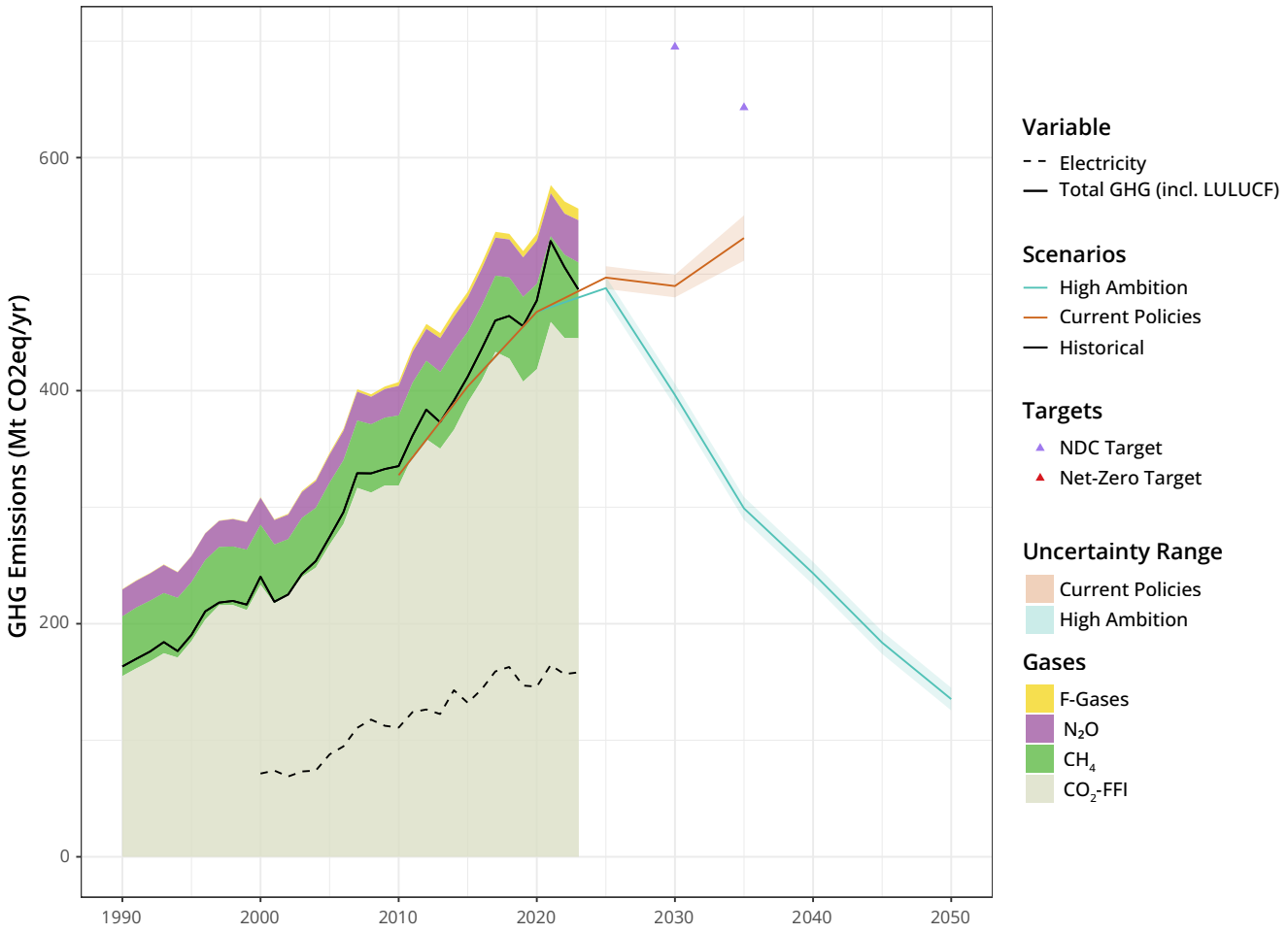


Figure 2. Türkiye's GHG emission pathways (including LULUCF). Historical emissions data is from PRIMAP-hist,[1] and Ember[3] (dashed black line for electricity GHG). CO_2 FFI refers to CO_2 from fossil fuel combustion and industrial processes. Colored triangles mark the official NDC and net-zero targets. Pathways data includes LULUCF emissions and is based on the scenarios developed using the GCAM model from the NGFS Phase V with adjustments, downscaled from the Europe_Non_EU region.[29] The shaded area represents +/- 2% of NDC base year emissions.

Table 1. Summary of changes in GHG emissions under the High Ambition and Current Policies pathways in 2030 and 2035, relative to 2023 (including LULUCF).

Year/Scenario	High Ambition % change from 2023	Current Policies % change from 2023
2030	-16% to -20%	-1% to +3%
2035	-36% to -40%	+6% to +14%

Our results suggest that Türkiye's NDC targets are lacking ambition (Figure 2), as both the 2030 and 2035 targets imply emissions levels above those observed historically. By comparison, the Current Policies pathway projects modest increases in emissions by 2030 and 2035, whereas the High Ambition pathway shows a downward emissions trajectory, with lower emissions in both years. These findings suggest that Türkiye's NDC could better reflect the emission-reduction potential of an accelerated energy transition, including faster renewable deployment and greater electrification, as demonstrated by the High Ambition pathway.

Achieving the High Ambition pathway, would require Türkiye to focus primarily on accelerating the energy transition in the power and industry sectors. Under the High Ambition pathway, emissions decrease by 39% between 2025 and 2035, and 45% of emissions reductions are from the power sector, while 24% come from the industry sector. Actions to mitigate non-CO_2 emissions and reduce emissions from transportation and buildings are also important, accounting for 13%, 8%, and 8% of total emission reductions, respectively. Under the Current Policies scenario, emissions in Türkiye increase by 9% between 2025 and 2035, driven mainly by increases in emissions from the power sector, buildings and non-CO_2 sources. These increases are partly offset by emissions reductions in sectors such as industry, transportation, and land use change.

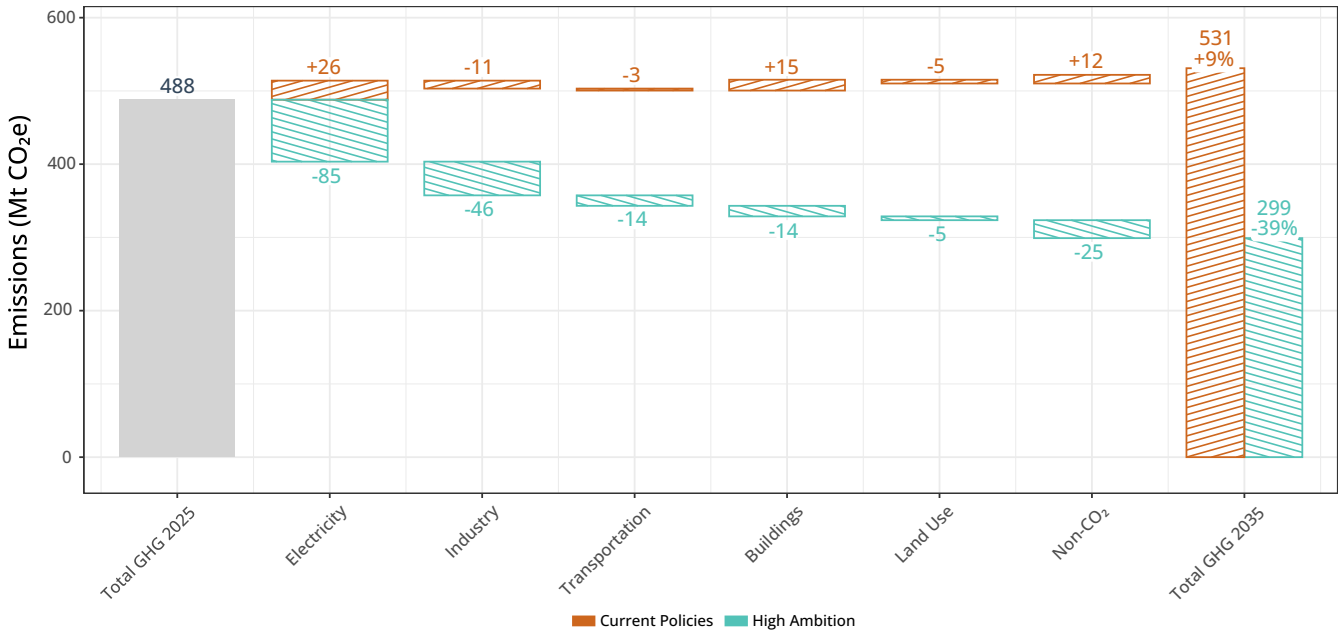


Figure 3. Türkiye's GHG emissions reductions by sector under the High Ambition and Current Policies scenarios. Pathways data is based on the scenarios developed using the GCAM model from the NGFS Phase V with adjustments, downscaled from the Europe_Non_EU region.[29] 2025 Total GHG emissions are based on the High Ambition scenario.

Power Sector Decarbonization: Renewable Deployment and Coal Phase-Out

Türkiye has established a range of policies and targets to accelerate renewable energy expansion and support the integration of additional solar and wind capacity. Under the Roadmap for Renewable Energy to 2035, Türkiye targets 120 GW of solar and wind capacity and a 55% share of renewables in total electricity generation by 2035.[11–13] The country has also announced a US$30 billion grid upgrade plan to expand and strengthen transmission capacity to accommodate the additional solar and wind development expected by 2035,[30] alongside targets for 7.5 GW of battery storage capacity and 7.2 GW of nuclear capacity by the same year.[31] Policies to streamline solar and wind permitting have reduced permitting timelines by an average of 18 months,[8] helping to scale up the deployment of solar and wind capacity, with total additions reaching 7.15 GW in 2025.[3] In addition, policies requiring solar and wind projects that are exempt from tenders or auctions to install battery storage capacity at least equal to the project's capacity have supported the development of battery storage, with 33 GW currently in the pipeline, more than any European country.[24]

However, fossil fuel use in generation is increasing. Despite a significant increase in solar generation (45%) and an 8% increase in wind generation in 2025, a 23% decline in hydro generation from 2024, combined with rising electricity demand, led to a 24% increase in gas generation.[3] Overall, renewable generation declined by 2% between 2024 and 2025, while electricity demand increased by 3.7%.[3] Coal and gas generation increased by 14% and 15%, respectively, between 2020 and 2025. Coal generation began rising in 2022 and reached its highest level in 2025, while gas generation dropped significantly in 2022 but recovered to 2020 levels by 2024.[3] Despite these changes in generation, installed coal and gas power capacity have remained largely stable in recent years. As of August 2026, Türkiye had no gas-fired capacity under construction or in the pre-construction stage, while 1,738 MW of coal capacity is in pre-construction stage.[32,33]

Several factors may support the continued role of coal and gas in Türkiye's electricity mix. The existing coal fleet is relatively young, with 54% of the country's coal plants having been in operation for less than 20 years,[32] while gas-fired power plants currently operate at relatively low capacity factors, averaging around 30%,[3] suggesting potential for continued coal generation and increased utilization of existing gas capacity. In addition, policy support may further sustain domestic coal generation. Türkiye has established a purchase guarantee for domestic coal plants covering the period from 2026 to 2029, at a guaranteed price of 75 USD/MWh, 13% above the county's average market price in 2025,[24] providing continued economic support for domestic coal generation in the coming years. Overall, these trends highlight Türkiye's continued reliance on fossil fuels for electricity generation despite the expansion of renewable capacity. Accelerating solar and wind deployment will be important to meet rising electricity demand while helping offset fluctuations in hydropower generation.

Taken together, these trends highlight the need for a faster power sector transition. Under the High Ambition pathway, policy efforts should focus on building on the existing momentum in solar and wind deployment, accelerating capacity additions, phasing out coal, and limiting further expansion of gas-fired power generation. In particular:

- Solar and wind capacity reach 110 GW by 2030 and 160 GW by 2035, with annual buildouts of 14 GW between 2026 and 2030 and 10 GW between 2030 and 2035. This increases the share of solar and wind generation from 22% in 2025 to 39% by 2030 and 55% by 2035.

- Coal phase-out is nearly achieved by 2035, with the share of generation declining from 34% in 2025 to 2% in 2035, and total coal generation falling by 93% relative to 2025 levels.
- Gas generation remains largely unchanged between 2025 and 2035 and stays 24% below its 2021 peak, mainly through higher utilization of existing capacity, with no additional new capacity. As a result, the share of gas generation declines from 22% in 2025 to 17% in 2035. Gas with CCS accounts for less than 2% of total generation by 2035.

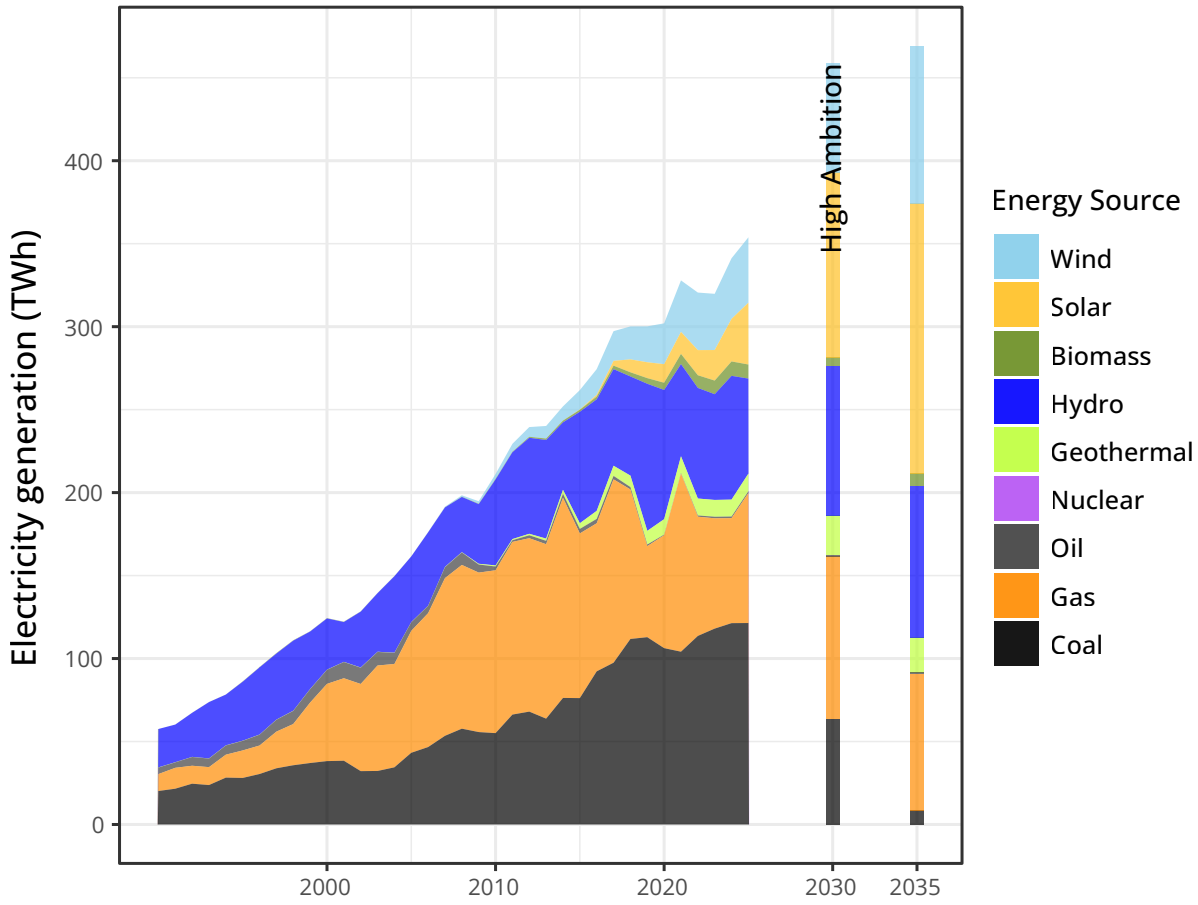


Figure 4. Türkiye's electricity generation by technology. Historical data is from Ember[3] and projections for 2030 and 2035 are based on the scenarios developed using the GCAM-CGS model for the NGFS Phase V with adjustments.[29]

Table 2. Key power sector metrics under the High Ambition scenario.

Year/ Scenario	Solar + Wind % of total elec generation (Installed capacity, GW)	Coal % of total elec generation (Installed capacity, GW*)	Gas % of total elec generation (Installed capacity, GW**)
2025[3]	22% (40 GW)	34% (21 GW)	22% (27 GW)
2030	39% (110 GW)	14% (11 GW)	21% (28 GW)
2035	55% (160 GW)	2% (1 GW)	17% (28 GW)

Note: *Capacity values of coal plants denote the total capacity with constant operating hours at today's level in the respective categories. The same emissions reductions can also be achieved through reduced utilization of coal plants to support the integration of increasing penetration of solar and wind, which results in higher capacity. **The capacity factor for gas plants increases to 40% by 2030 and 34% by 2035 from 27% in 2024, assuming no additional gas expansion.

The High Ambition pathway is more ambitious than Türkiye's current power sector targets, enabling greater renewable deployment and accelerating the transition away from fossil fuels. Under Türkiye's current policy targets, solar and wind capacity is expected to reach 51 GW by 2030 and 120 GW by 2035, with annual buildouts of 3 GW between 2025 and 2030, and 14 GW between 2030 and 2035.[24,31,34] The High Ambition scenario more than doubles the solar and wind capacity target for 2030 and reaches 40 GW above the policy target by 2035. The High Ambition scenario also achieves coal phase-out by 2035 and avoids further gas expansion, while Türkiye has not established a timeline for phasing out coal or gas.[35] Achieving these outcomes will require accelerating the annual renewable capacity additions from 7.15 GW in 2025 to at least 9 GW/year to meet current power sector targets, with even higher annual deployment needed to achieve the High Ambition pathway.

The balance between renewable deployment and electricity demand growth will be critical to achieving near-term emissions reductions in the power sector. Table 3 shows changes in power sector emissions under different rates of solar and wind deployment and electricity demand growth. Under a low renewable deployment scenario, in which solar and wind capacity continue to grow at the 2020-2025 average rates of 3 GW per year for solar and 1 GW per year for wind, power sector emissions in 2030 could increase by 9% under a 3% annual demand growth and by 22% under a 4% annual demand growth, compared with 2025 levels, assuming gas and hydro generation stay at historical averages. Under a medium renewable deployment scenario, in which annual renewable additions double to 6 GW of solar and 2 GW of wind, power sector emissions in 2030 would decline by 11% under a 3% annual demand growth but increase 1% under a 4% annual demand growth, relative to 2025. In comparison, under the High Ambition pathway, solar and wind deployment reaches 3.2 times the level of the low renewable deployment scenario by 2030, while electricity demand grows by 5% annually, resulting in a 31% decline in power sector emissions from 2025 levels. These results demonstrate that renewable energy deployment must increase substantially in the near future to

ensure that growing electricity demand is met by clean resources rather than fossil fuels, avoiding further increases in emissions and enabling significant emission reductions.

Table 3. Change in power sector emissions in 2030 relative to 2025 levels under different renewable deployment and electricity demand growth scenarios

	3% annual demand growth	4% annual demand growth
Low RE deployment*	9%	22%
Medium RE deployment* (Low x 2)	-11%	1%

Note: Both scenarios assume that gas, hydro and nuclear generation remain at the 2020–2024 average levels of 75 TWh, 68 TWh and 0 TWh, respectively. Demand growth assumptions are consistent with the National Energy Plan estimate for 2035 (3.5% per year) and the High Ambition scenario (5% per year by 2030). *Low RE deployment is assumed to be equivalent to the annual average renewable deployment between 2020 and 2025 (3 GW/year for solar and 1 GW/year for wind).

Achieving the High Ambition pathway will require addressing several policy and implementation challenges. These include limited grid connection capacity and the need for grid expansion and modernization to support renewable expansion; and insufficient financial mechanisms.[8,36,37] In addition, the country lacks a policy framework to support an organized coal transition that considers its impact on affected communities, market regulations that incentivize grid investments and demand-side response, and price signals that reflect the actual costs of electricity generation.[8] Further efforts to streamline bureaucratic processes, strengthen incentives for investors, establish green financing mechanisms, and develop regulatory frameworks that improve price signals for consumers, provide location signals for project development, and incentivize renewable energy investment could help accelerate the power sector transition.[38]

Industrial Decarbonization: Electrification and Carbon Pricing

Türkiye is a major global producer of cement, iron and steel and glass, making decarbonization of these industries and associated impacts on economic development critical. The industrial sector, including manufacturing, mining, and refining, accounts for 25% of the country's GDP and 35% of its total final energy consumption.[8] Türkiye is the largest producer of flat glass in Europe, and the fifth-largest producer globally.[39] Türkiye is also the world's largest cement and clinker exporter by value and the fourth-largest cement producer by volume.[8] In addition, it ranks as the seventh-largest steel producer globally, with the European Union (EU) representing a significant market for its steel exports.[8] Given the industrial sector's importance to Türkiye's economy and its position in global markets, decarbonizing these industries could support green growth and domestic emissions reductions while creating new business opportunities.

In 2023, industry accounted for just over one sixth of the country's total GHG emissions,[2] with the majority coming from the "other" sector, which includes various economic activities, followed by the non-metallic minerals sector, which includes the production of glass, cement, and ceramics.[2,40] Iron and steel and

chemicals together accounted for nearly one-quarter of total industrial emissions in 2023, while mining and non-ferrous metals were the smallest contributors to Türkiye's industrial CO_2 emissions.[2]

Emissions in many industrial subsectors, including non-metallic minerals, iron and steel, and chemicals, reached a historic high in 2021 and declined through 2023, potentially reflecting improvements in energy efficiency, among other factors. However, preliminary national inventory data indicate that industrial emissions increased in 2024.[40] According to the IEA (2026), Türkiye's economy continues to expand despite the impacts of the international energy crisis, during which the country's energy demand has declined, contributing to improvements in energy intensity and progress toward Türkiye's energy efficiency targets.

Alongside these broader trends, Türkiye has introduced policies to further reduce the carbon intensity of its manufacturing sector through electrification and energy efficiency measures. Policies such as the Energy Efficiency Obligation Scheme (Law No. 5627) require enterprises, Organized Industrial Zones (OIZs), and power plants that meet certain requirements to conduct energy audits and develop energy efficiency action plans.[8] To further reduce carbon intensity, the Turkish government also published the 2024 Low Carbon Pathway for the cement sector and incorporated "green cement" into public procurement requirements for construction projects. Through these policies, the share of electrification in the industrial sector reached 32% in 2024, with electrification in manufacturing processes reaching 28%. Meanwhile, energy intensity decreased by 20% between 2011 and 2023.[8]

Recent EU regulations, particularly the CBAM, have become increasingly stringent, potentially affecting the competitiveness of Türkiye's exports to the EU in sectors such as cement, iron and steel, and aluminium.[8,41] making decarbonization essential. In 2025, the EU accounted for approximately 42.7% of Türkiye's exported goods underscoring the importance of maintaining access to this market.[42] Although it is still too early to assess the full impact of the CBAM on Türkiye's exports and wider economy, available estimates suggest that the cement sector could face a larger exports contraction (exceeding 20%) than the iron and steel sector (9%), reflecting the latter's high level of electrification (70%).[43,44]

In response to the EU climate requirements and the need to maintain export competitiveness, Türkiye has been strengthening its domestic policy framework and aligning its industrial policies with the EU. In recent years, Türkiye has been actively developing climate legislation aimed at reducing emission from the industrial sector, including the adoption of the Long-Term Climate Strategy in 2024, which sets out plans for the manufacturing sector to contribute to Türkiye's goal of achieving net-zero emissions by 2053. To achieve this goal, the government developed decarbonization roadmaps for the cement, steel and aluminium sectors, which aim to achieve emissions reductions of 93% for cement, 99% for steel and 75% for aluminium by 2053. In addition, the country enacted its first Climate Law in 2025, which establishes the Emission Trading System (ETS) covering power plants, petroleum refineries, iron and steel producers, cement and lime manufacturers, selected waste management operators, and other enterprises emitting more than 50,000 t CO_2eq annually.[3,8] Türkiye also adopted industrial emissions regulations that integrate pollution prevention and control approaches to ensure comprehensive protection of the environment and public health.

Under the High Ambition scenario, emissions from the industry sector decline by 15% between 2023 and 2035, while the share of electricity in industrial energy consumption increases from 32% in 2024 to 38% in 2035.[45] To strengthen the country's climate ambition and move toward the High

Ambition pathway, Türkiye should build on the emissions reductions achieved through recent policies and accelerate industrial electrification to reduce reliance on fossil fuels. These efforts should be supported by a cleaner power sector, as described in the previous section, to achieve deeper emission reductions. In addition, the country should pursue further efforts to decarbonize heavy industries such as cement, steel and aluminum through efficient carbon pricing mechanisms and the adoption of clean technologies. Reducing emissions in the cement sector, which is highly exposed to European carbon policies, requires lowering cement's clinker content through the use of clinker substitutes such as limestone calcined clay cement (LC3), blended cements, and other supplementary cementitious materials (SCMs).[30,46] Meanwhile, given that Türkiye's steel sector is 70% electrified, the key focus should be placed on decarbonizing the electricity grid.[47] Additional mitigation actions can include integrating green hydrogen and Carbon Capture, Utilization, and Storage (CCUS) technologies. To achieve emissions reduction in the aluminum sector, technological upgrades of existing furnaces are required, in addition to increased scrap recycling.[31] To achieve decarbonization goals in the fertilizer sector, it is important to streamline investments in renewables, heat pumps, and green ammonia. Notably, Türkiye is already exploring hydrogen technologies to decarbonize its production processes, as well as the use of CCUS in the manufacturing sector.[31]

Moreover, the country has already taken steps to strengthen its climate ambition by encouraging industry to reduce the carbon intensity of production through the establishment of an ETS. The next priority is to ensure that the ETS operates effectively and achieves its intended results. Meanwhile, lighter industries such as food and textiles, which are included in the "other" sector, and have increasing energy use, should also gain access to the benefits provided by the existing Energy Efficiency Obligation Scheme, to implement energy efficiency measures and further electrify their operations. Progress toward a decarbonized and more energy efficient industry can create opportunities for green economic growth. In the following sections we examine how existing policies are supporting investment and employment in energy efficiency and clean energy manufacturing.

Accelerating the Energy Transition for Improved Energy Security

Accelerating the energy transition would not only reduce emissions and contribute to greater climate ambition, but also provide additional benefits, including enhanced energy security. Expanding renewable power generation and electrifying economic activities would allow Türkiye to reduce its reliance on fossil fuels and exposure to imported energy, while advancing toward the High Ambition pathway.

Türkiye is a net energy importer and is therefore susceptible to changes in global energy prices, making energy security a key concern. Despite its dependence on imported energy, Türkiye has positioned itself as a major transit hub for international gas and continues to invest in new fossil fuel infrastructure. Leveraging its strategic geographical location, the country connects major suppliers, including Russia, Iran, and Azerbaijan, with domestic and European markets through pipeline infrastructure.[48] Türkiye has also expanded its LNG infrastructure to diversify supply sources, improve flexibility in meeting domestic demand, and strengthen its capacity to supply regional markets.[48] Between 2016 and 2025, Türkiye's regasification (converting LNG to gas) capacity increased fivefold.[13]

In 2025, 72% of Türkiye's total energy supply was imported, including oil, gas and coal.[22] This dependency leaves the domestic economy highly exposed to systemic disruptions in global energy supply chains. For instance, while the closure of the Strait of Hormuz did not directly affect Türkiye's domestic energy supply due to its reliance on pipeline transit, the resulting increase in global oil prices affected the country's economy.[23] According to the Minister of Energy and Natural Resources, "every $1 increase in oil prices adds about $400 million to Türkiye's energy bill."[49]

Türkiye has already taken steps to reduce its reliance on imported fossil fuels, including targeting a 16% reduction in primary energy consumption between 2024 and 2030,[14] expanding renewable and nuclear power generation,[50] implementing an ETS,[9,10] developing energy efficiency roadmaps through 2030,[13,51] and promoting electric vehicle adoption to reduce oil consumption through fiscal incentives for domestic production and deployment of charging infrastructure.[52] However, the country continues to rely on fossil fuels, while simultaneously pursuing strategies to diversify its oil and gas suppliers, increase production both domestically and abroad through preliminary agreements with Exxon and Chevron,[49] and expand its LNG infrastructure.

Under the High Ambition pathway, an accelerated energy transition reduces reliance on fossil fuel imports as domestic demand declines, leading to reductions in oil, gas and coal consumption of 30%, 23% and 80%, respectively, by 2035 relative to 2025 levels (see Figure 4). Further measures to enhance energy security include increasing economy-wide electrification, defining a coal phase-out plan, limiting the expansion of LNG infrastructure and oil and gas supply, and reconsidering the development of an international gas hub.

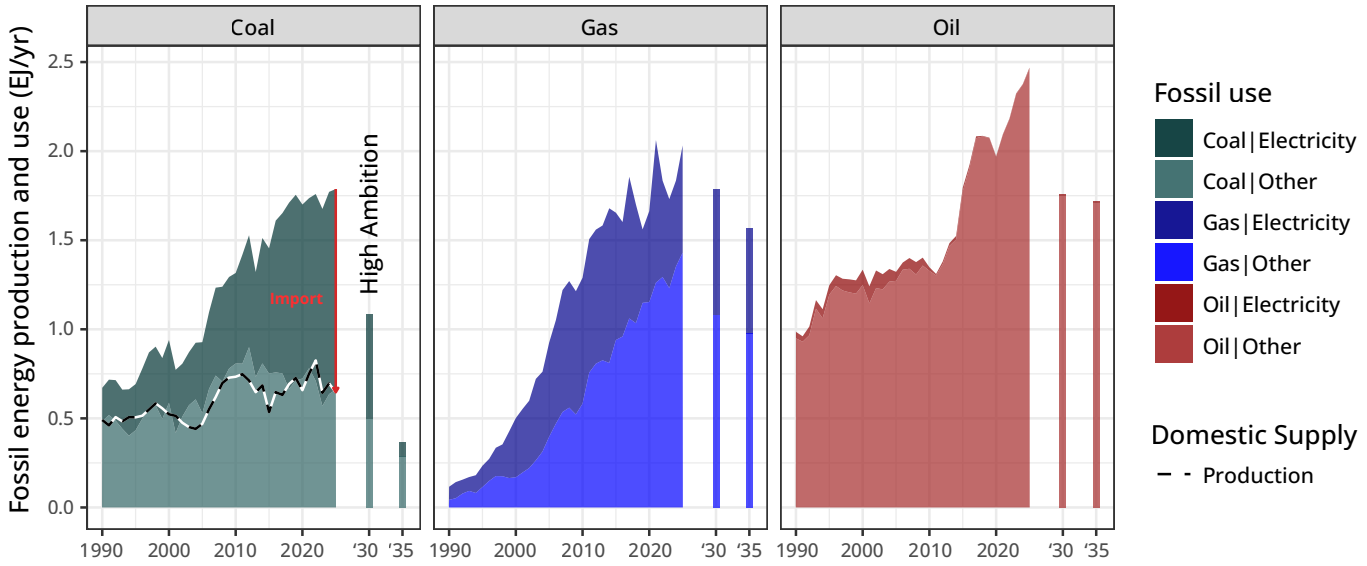


Figure 5: Türkiye fossil energy production and consumption. The chart highlights the country's significant reliance on fossil fuel imports. Due to data availability, domestic oil and gas production is not shown, which is at moderate levels. Historical data are from Statistical Review of World Energy Data,[53] Ember[3], IEA[22] and adjusted downscaled scenario data from the NGFS 2024 release.

Accelerating the Energy Transition for Green Economic Growth

Accelerating the energy transition through the deployment of renewable power plants and end-use electrification provides Türkiye with an opportunity to pursue sustainable economic growth. Beyond reducing emissions, the energy transition can also improve energy affordability and reduce energy poverty for households, and increase investment and employment in green industries. Recent progress in the energy transition already demonstrates Türkiye's gains in these areas. Further accelerating the transition could create additional opportunities for economic growth while enhancing the country's climate ambition.

Türkiye still faces significant energy poverty. As of 2023, 19.5% of Türkish households experienced energy poverty,[54] meaning they lacked sufficient, reliable, affordable, high-quality, and environmentally friendly energy services.[55] This rate is well above the EU average of 10.6%,[54] making energy poverty an important concern for Türkiye. However, renewable energy deployment is already helping to reduce electricity costs for households and improve energy affordability, with further reductions expected as renewable capacity expands. In 2025, electricity generation from renewable energy sources reduced wholesale electricity prices by up to 45%. This reduction translated into average annual savings of 9% on household electricity bills, equivalent to approximately one month's bill, with savings reaching up to 17% in some months.[56] Further savings could be achieved through hourly demand-side management programs, with the potential to double current savings. Lower electricity costs are also benefiting industrial and commercial users, with the average industrial facility saving over 9.5% on electricity costs, equivalent to an average of US$250,000 in annual savings.[56]

The energy transition in Türkiye has already attracted significant investment in energy efficiency, renewable deployment and green infrastructure. During the implementation period of the first National Energy Efficiency Action Plan (NEEAP), from 2017 to 2023, US$8.47 billion was invested in energy efficiency efforts across the country.[43] Under the second NEEAP, covering 2024-2030, Türkiye plans to invest US$20.2 billion in energy efficiency.[13] The Renewable Energy Resource Zone (YEKA) auctions, a key mechanism for expanding renewable capacity and attracting investment in Türkiye,[57] target at least 2 GW of onshore wind capacity annually and 5 GW of offshore wind by 2035.[12,58] In 2025 alone, solar and wind tenders generated approximately €530 million (nearly US$617 million) in revenue for the state.[59] However, of the 7.8 GW of solar and wind auctioned to date, less than one-quarter is operational, and no offshore wind capacity is currently online.[38] Despite this, the country's renewable projects mobilized US$13.1 billion investment in 2025, placing Türkiye 9th globally in renewable energy investments.[30]

The transition is also creating opportunities to expand clean energy manufacturing. Since 2023, solar manufacturing capacity has exceeded domestic demand, with the resulting surplus expected to support exports.[30] Five solar manufacturing facilities are expected to receive government subsidies, further increasing the country's export capacity by 2030.[30] Grid investment is also increasing, reaching a record of more than US$1 billion in 2025, with total investment in grid infrastructure expected to reach approximately US$30 billion between 2026 and 2035.[30]

The energy transition is further expected to attract foreign direct investments and create opportunities in emerging industries. Policies such as the Foreign Direct Investment (FDI) Strategy for 2024-2028, which has centered sustainability as a primary focus, anticipates at least 120 climate-related investment projects by 2028.[60,61] The automotive sector is also benefiting from the transition. In 2025, Türkiye ranked 4th in Europe in battery electric car sales,[6] while the country's only automaker is pursuing a joint venture with Chinese battery manufacturers to establish domestic battery-cell production in 2026.[30]

At the same time, renewable energy deployment and manufacturing have a strong potential to create thousands of local employment opportunities. In 2023, IRENA estimated that Türkiye had approximately 41,000 jobs in solar PV and 5,100 jobs in wind energy.[62] By 2024, these figures were estimated to reach 122,000 and 10,900, respectively.[62] Globally, Türkiye is estimated to account for 2% of employment in the hydropower sector.[62] In addition, the US$8.47 billion invested under Türkiye's first NEEAP supported the creation of approximately 45,000 new green jobs between 2017 and 2023.[43]

Beyond sector-wide investments, individual renewable energy projects and manufacturing facilities can also generate local employment opportunities. For example, Türkiye's first integrated solar panel manufacturing plant, located in the Başkent Organized Industrial Zone in Ankara, created approximately 1,400 jobs in the region.[63,64] To support workers from carbon-intensive industries that are shifting to lower emission activities, the National Employment Strategy includes measures to retrain affected workers, convert existing industrial roles into green jobs, and establish official certification programs to align workforce skills with sustainable production standards.[65]

Conclusion

Accelerating the energy transition brings multiple benefits to Türkiye, including strengthening the country's climate ambition, enhancing energy security, and creating opportunities for green economic growth. Faster renewable energy deployment, fossil fuel phase-out, and electrification can enable deeper emissions reductions while reducing the country's reliance on imported fossil fuels, improving energy affordability, reducing energy poverty, and increasing investment and employment. Despite Türkiye's progress in advancing the energy transition, the country's 2035 NDC remains limited in ambition, while fossil fuels continue to account for a significant share of its energy supply, policies continue to support coal-fired power generation, and oil and gas infrastructure continues to expand. As the host of COP31, Türkiye has an opportunity to accelerate its own energy transition while demonstrating how this can deliver climate, energy security, and economic benefits.

References

1. Gütschow, J., Pflüger, M. & Busch, D. The PRIMAP-hist national historical emissions time series (1750-2023) v2.6.1. Zenodo https://doi.org/https://doi.org/10.5281/zenodo.15016289 (2025).
2. O'Rourke, P. R. et al. CEDS v_2021_02_05 Release Emission Data. Zenodo https://doi.org/10.5281/zenodo.4509372 (2021).
3. Ember. Electricity Data Explorer - Open Source Global Electricity Data. Ember (2025).
4. The Latest GCB Data (2025). https://globalcarbonbudget.org/datahub/the-latest-gcb-data-2025/ (2025).
5. Gümüş, B. S. Solar surge Meeting two-thirds of the rise in Türkiye's peak electricity demand in 2024. Ember https://ember-energy.org/latest-insights/solar-surge-meeting-two-thirds-of-the-rise-in-turkiyes-peak-electricity-demand-in-2024 (2024).
6. Alparslan, U. Türkiye Ranks Fourth in Europe in Electric Car Sales. https://ember-energy.org/latest-insights/turkiye-ranks-fourth-in-europe-in-electric-car-sales (2026).
7. Vladimir Spasić. Turkey prepares 2040 energy architecture centered on rapid electrification. (2026).
8. Türkiye 2026. https://www.iea.org/reports/turkiye-2026 (2026).
9. ICAP. Turkish Emission Trading System. https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-66.pdf (2025).
10. Devranoglu, N., Sezer, C. & Butler, D. Turkey's ruling party submits climate change bill to parliament. Reuters https://www.reuters.com/world/middle-east/turkeys-ruling-party-submits-climate-change-bill-parliament-2025-02-20/ (2025).
11. Energy. Presidency of the Republic of Türkiye Investment & Finance Office https://www.invest.gov.tr/en/sectors/pages/energy.aspx (2025).
12. O'Byrne, D. Turkey outlines renewable power plans to 2035. S&P Global Energy https://www.spglobal.com/energy/en/news-research/latest-news/electric-power/102124-turkey-outlines-renewable-power-plans-to-2035 (2024).
13. Republic of Türkiye Ministry of Energy and Natural Resources. Energy Efficiency 2030 Strategy and 2nd National Energy Efficiency Action Plan (2024-2030). (2023).
14. Republic of Türkiye Ministry of Energy and Natural Resources. Energy Transition. Renewable Energy 2035. (2023).
15. Republic of Türkiye Ministry of Energy and Natural Resources. Türkiye Hydrogen Technologies Strategy and Roadmap. (2023).
16. Valerie Volcovici. Turkey launches AI initiative ahead of COP31 climate summit. Reuters

(2026).

17. Republic of Türkiye. The Second Nationally Determined Contribution (NDC 3.0). (2025).
18. Republic of Türkiye. Republic of Türkiye Updated First Nationally Determined Contribution. (2023).
19. IEA. Türkiye - Energy Mix. International Energy Agency (IEA) (2024).
20. IEA. Türkiye - Oil. International Energy Agency (IEA) (2024).
21. IEA. Türkiye - Natural gas. International Energy Agency (IEA) (2024).
22. IEA. Türkiye - Countries & Regions. International Energy Agency (IEA) (2024).
23. Maria Borrero et al. Accelerating the Transition Away from Fossil Fuels in Response to the Global Energy Crisis with the Strait of Hormuz Closure. https://cgs.umd.edu/research-impact/publications/accelerating-transition-away-fossil-fuels-response-global-energy (2026).
24. Ufuk Alparslan. Türkiye Electricity Review 2026. https://ember-energy.org/app/uploads/2026/04/Turkiye-Electricity-Review-2026.pdf (2026).
25. Caglar Celikoz. $8.7 Billion Coal Subsidy Contradicts Türkiye's Renewable Goals. https://ember-energy.org/latest-insights/8-7-billion-coal-subsidy-contradicts-turkiyes-renewable-goals/ (2025).
26. COP31 President Türkiye at a Crossroads on Power Sector Transformation. https://climateactiontracker.org/press/release-cop31-president-t%C3%BCrkiye-at-a-crossroads-on-power-sector-transformation/ (2026).
27. Bahadır Sercan Gümüş. Domestic Coal Is Far from Providing a Baseload in Türkiye. https://ember-energy.org/app/uploads/2024/10/Domestic-coal-is-far-from-providing-a-baseload-in-Turkiye.pdf (2024).
28. Ryna Cui et al. Enhancing Global Ambition for 2035: Assessment of High-Ambition Country Pathways. https://cgs.umd.edu/sites/default/files/2024-12/file_CGS_Technical%20Appendix%20Global%202035%20Ambition_12.11.pdf.
29. NGFS. NGFS Scenarios Portal. Network for Greening the Financial System (NGFS) https://www.ngfs.net/ngfs-scenarios-portal/ (2024).
30. Turkey Transition Factbook 2026. https://assets.bbhub.io/professional/sites/44/Turkey-Transition-Factbook-2026.pdf (2026).
31. Republic of Türkiye. 2053 Long Term Climate Strategy. (2024).
32. GEM. Global Coal Plant Tracker (GCPT). Global Energy Monitor (GEM) (2025).
33. Global Oil and Gas Plant Tracker. https://globalenergymonitor.org/projects/global-oil-gas-plant-tracker.

34. Cezer, C., Altayli, B., Butler, D. & Fenton, S. Turkey aims to quadruple wind and solar energy capacity by 2035. Reuters https://www.reuters.com/sustainability/climate-energy/turkey-aims-quadruple-wind-solar-energy-capacity-by-2035-2024-10-21/ (2024).

35. Türkiye Policies & action. Climate Action Tracker https://climateactiontracker.org/countries/turkey/policies-action/ (2025).

36. Turkey solar capacity: Impressive 23 GW shatters 2025 goal. PVknowhow Turkey Solar News https://www.pvknowhow.com/news/turkey-solar-capacity-impressive-23-gw-shatters-2025-goal/ (2025).

37. Turkey renewable energy: Impressive 120 GW Goal by 2035. PVknowhow Turkey Solar News https://www.pvknowhow.com/news/turkey-renewable-energy-impressive-120-gw-goal-by-2035/ (2025).

38. Gümüş, B. S. New targets, old challenges in Turkish wind and solar tenders. Ember https://ember-energy.org/latest-insights/new-targets-old-challenges-in-turkish-wind-and-solar-tenders (2025).

39. Farshid Sadeghi-Khaneghah et al. Effects of Using Hydrogen as an Alternative Fuel on Türkiye's Glass Industry Economy. https://www.sciencedirect.com/science/article/abs/pii/S0360319925056940 (2026).

40. Turkish Statistical Institute. Greenhouse Gas Inventory of Turkey. https://unfccc.int/sites/default/files/resource/TUR_NID_2026.pdf (2026).

41. Türkiye. Türkiye. Biennial Transparency Report (BTR). https://unfccc.int/documents/642617 (2024).

42. EU Trade Relations with Türkiye. Facts, Figures and Latest Developments. https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/turkiye_en.

43. Republic of Türkiye. First Biennial Transparency Report Of Türkiye. (2024).

44. Rubin, R. Turkey's steelmakers face EU quota cuts as CBAM verification becomes critical. S&P Global Energy https://www.spglobal.com/energy/en/news-research/latest-news/metals/100926-turkeys-steelmakers-face-eu-quota-cuts-as-cbam-verification-becomes-critical (2026).

45. IEA. Türkiye Energy Consumption and Efficiency. https://www.iea.org/countries/turkiye/efficiency-demand#how-is-energy-used-in-industry-and-services-in-turkiye.

46. Assessment of Decarbonization Pathways for California's Cement Sector. https://www.catf.us/resource/assessment-decarbonization-pathways-californias-cement-sector/ (2026).

47. World Steel in Figures 2025. (2025).

48. Komar Mohamadpor & Geraint Moody. Turkish gas and LNG imports grow, targets to become a regional gas hub. S&P Global (2026).

49. Turkey's Middle East oil dependence at 10%, no supply disruption, says minister. Reuters https://www.reuters.com/business/energy/turkeys-middle-east-oil-dependence-manageable-10-supply-amid-iran-war-2026-03-25/ (2026).

50. Siccardi, F. Understanding the Energy Drivers of Turkey's Foreign Policy. Carnegie Endowment for International Peace. Europe https://carnegieendowment.org/research/2024/02/understanding-the-energy-drivers-of-turkeys-foreign-policy?lang=en (2024).

51. Republic of Türkiye Ministry of Energy and Natural Resources. National Energy Efficiency Action Plan (NEEAP) 2017-2023. (2018).

52. Sami Saka, M. Status of Electric Vehicles in Turkey. VoltGo https://voltgo.com.tr/en/portfolio/status-of-electric-vehicles-in-turkey/ (2023).

53. Energy Institute. Statistical Review of the World Energy Data. Statistical review of world energy https://www.energyinst.org/statistical-review/resources-and-data-downloads (2026).

54. Eurostat. Inability to keep home adequately warm. Eurostat (2026).

55. İpek, E. & İpek, Ö. Energy poverty and health in Turkey: Evidence from Longitudinal data. Renew. Sustain. Energy Rev. 203, 114777 (2024).

56. Gümüş, B. S. Renewables Cut Annual Electricity Bills by One Month in Türkiye. https://ember-energy.org/latest-insights/renewables-cut-annual-electricity-bills-by-one-month-in-turkiye (2026).

57. Gümüş, B. S. Türkiye Surpasses 2025 Solar Target as Capacity Doubles in 2.5 Years. https://ember-energy.org/latest-insights/turkiye-surpasses-2025-solar-target-as-capacity-doubles-in-2-5-years (2025).

58. Enerdata. Türkiye unveils roadmap to reach 120 GW of wind and solar capacity by 2035. Enerdata https://www.enerdata.net/publications/daily-energy-news/turkiye-unveils-roadmap-reach-120-gw-wind-and-solar-capacity-2035.html (2024).

59. Türkiye's 2025 renewable tenders generate over $610M in state revenue. Daily Sabah https://www.dailysabah.com/business/energy/turkiyes-2025-renewable-tenders-generate-over-610m-in-state-revenue (2025).

60. Dağlıoğlu, A. B. Türkiye: Nexus of green growth and innovation. Reuters | Invest In Turkiye https://www.reuters.com/plus/turkiye-nexus-of-green-growth-and-innovation (2025).

61. Presidency of the Republic of Türkiye Investment & Finance Office. Türkiye Foreign Direct Investment Strategy 2024-2028. (2024).

62. IRENA. Renewable Energy and Jobs Annual Review 2025. https://www.ilo.org/sites/default/files/2026-01/IRENA_SOC_RE_and_jobs_2026.pdf (2025).

63. Republic of Türkiye. Eighth National Communication And Fifth Biennial Report Of Türkiye Under The UNFCCC. (2023).

64. First Integrated Solar Panel Manufacturing Plant Commissioned. Presidency of the Republic of Türkiye Investment & Finance Office https://www.invest.gov.tr/en/news/news-from-turkey/pages/turkey-commissions-first-integrated-solar-panel-manufacturing-plant.aspx (2023).

65. NATIONAL EMPLOYMENT STRATEGY 2025-2028. https://csgb.gov.tr/Media/zgcfrstm/uis-ingilizce.pdf (2025).