# Türkiye’s Energy Transition: Current Profile, Renewable Potential, and Future Outlook

## Introduction

Türkiye is undergoing a significant transformation in its energy landscape, driven by increasing energy demand and a strategic shift towards renewable sources. In 2024, total energy consumption in Türkiye rose by 6% to approximately 170 Mtoe (Enerdata). This escalating demand, coupled with a historical reliance on fossil fuels, underscores the urgent need for a robust renewable energy strategy. While coal, oil, and natural gas have traditionally dominated the energy mix, recent developments indicate a strong move towards diversification. Renewable energy has notably met most of the increase in electricity demand, leading to a historic low in the share of gas in electricity generation (Ember Energy, 2025). By 2025, Türkiye’s renewable energy share is projected to exceed 60% (Erdogan, 2025), with low-carbon generation peaking in 2024 (Low-Carbon Power, 2024). This paper examines Türkiye’s current energy profile, its substantial renewable energy potential across solar, wind, and geothermal sources, and the incentives and challenges shaping its energy future.

## Current Energy Profile and Fossil Fuel Dependency

Türkiye’s energy mix remains significantly influenced by fossil fuels. According to the International Energy Agency (IEA), coal and coal products constitute 25.2% of the energy mix, oil and oil products 28.9%, and natural gas 26.6%. Hydropower accounts for 3.9%, while solar, wind, and other renewables contribute 11.8% (IEA). In terms of electricity generation, coal accounts for 34%, gas for 22%, and hydropower for 18% (Low-Carbon Power, 2024/2025). The substantial increase in overall energy consumption, which grew by 6% in 2024, highlights the continuous pressure on the country’s energy supply (Enerdata, 2024). Despite this growth, the increased deployment of renewable energy has been instrumental in meeting a significant portion of the rising electricity demand and has successfully reduced the share of natural gas to its lowest historical level (Ember Energy, 2025).

## Renewable Energy Potential and Development

Türkiye possesses considerable potential across various renewable energy sources, and recent years have seen rapid development in these sectors. The country’s diverse geographical and climatic conditions are conducive to harnessing solar, wind, and geothermal power (ScienceDirect, 2025).

### Solar Energy

Türkiye has emerged as a significant player in solar energy, with its installed capacity rapidly expanding. As of May 2025, the installed solar capacity reached 22.5 GW (REGlobal, 2025; Ember Energy, 2025). The first half of 2025 alone saw an installation of 3.1 GW of new solar capacity, bringing the cumulative capacity to 27 GW (Juan Cole, 2025). This rapid growth meant Türkiye’s solar energy capacity doubled in two and a half years, reaching 19.6 GW by the end of 2024, thereby surpassing its 2025 target ahead of schedule (Ember Energy, 2024). The country also hosts the largest solar power plant of any European nation (Juan Cole, 2025). The total solar potential is estimated at 380 TWh/year, though only 25 TWh is currently produced (ScienceDirect, 2025). Additionally, there is a vast 120 GW solar energy potential available on rooftops, alongside an 8 GW hybrid solar potential that, if realized, could further boost total installed capacity (Ember Energy, 2025; REGlobal, 2025).

### Wind Energy

Türkiye’s wind energy potential is substantial. Estimates for technical wind energy potential range from approximately 88,000 MW (ResearchGate, 2001) to 118,683 MWe for wind speeds over 6.8 m/s at 50m height (Sogukpinar, 2025). The theoretical potential is even higher, around 131,756.40 MW, with an additional 17,393.20 MW for sea wind power (İlkiliç, 2012, TUREB). Over the last 15 years, the Turkish wind power sector has installed 12,000 MW, placing Türkiye 12th globally and 6th in Europe in terms of installed capacity (AA.com.tr). By December 2020, installed wind power capacity was 8,830 MW, representing only 7.75% of the total potential (Kursun, 2023). Currently, only 13 GW of a 48 GW exploitable wind potential is installed (ScienceDirect, 2025).

### Geothermal Energy

Türkiye is strategically located in a region with significant geothermal resources, possessing one-eighth of the world’s total geothermal potential (ScienceDirect, 2009). The overall geothermal potential is estimated to be over 31 GW (Jeotermal Enerji), with some estimates reaching 38,000 MW (ResearchGate, 2013) and a potential for 5 GW of geothermal power (Wikipedia). As of April 2023, the installed geothermal power capacity reached 1691.4 MW (ThinkGeoEnergy, 2023), with 1,600 MW installed capacity and 500 MW in pipeline projects reported elsewhere (Jeotermal Enerji). In 2020, geothermal plants generated 8,421 GWh of electricity (Jeotermal Enerji). All existing geothermal plants are concentrated in Western Anatolia, particularly across six provinces in the Aegean Region, due to favorable geological conditions (Wikipedia; ThinkGeoEnergy, 2023). Approximately 88% of the country’s geothermal potential is suitable for thermal use, indicating broad utility beyond electricity generation (ResearchGate, 2013).

## Challenges and Incentives for Renewable Energy Growth

The transition to a greater share of renewable energy in Türkiye is supported by various government incentives and is yielding substantial economic benefits. Türkiye’s investment incentives actively promote green investments (State Department, 2025). The Renewable Energy Law offers key incentives, including access to and use of state-owned land, along with an 85% reduction on permit fees (Norton Rose Fulbright). The facilitation of self-consumption-focused power plant installations has notably accelerated new solar installations (Ember Energy, 2024).

The economic advantages of this shift are evident; the combined electricity generation from solar and wind energy helped Türkiye avoid $15 billion in natural gas imports (Ember Energy, 2024). Raising renewable capacity targets not only strengthens Türkiye’s energy independence but also amplifies its economic benefits (Ember Energy, 2024). Foreign Direct Investment (FDI) capital inflows into Türkiye also reflect growing confidence, increasing from $5.9 billion in 2023 to $6.7 billion in 2024 (State Department, 2025). To maintain the momentum, future growth can be supported by commissioning battery storage plants, hybrid power plant projects, and leveraging the extensive rooftop solar potential (Ember Energy, 2024). Türkiye’s success in surpassing its 2025 solar target ahead of schedule demonstrates its capacity to set and achieve even more ambitious goals (Ember Energy, 2024).

## Conclusion

Türkiye is actively pursuing an ambitious energy transition, moving away from its traditional reliance on fossil fuels towards a more sustainable and diversified energy mix. Despite a 6% increase in overall energy consumption in 2024, renewable energy sources have significantly contributed to meeting electricity demand and reducing natural gas dependency. The country holds immense potential in solar, wind, and geothermal energy, with remarkable progress already made in installed capacities. Solar capacity, for instance, doubled in two and a half years, surpassing the 2025 target. Substantial wind and geothermal resources also offer significant opportunities for further development. Government incentives, coupled with the economic benefits of reduced fossil fuel imports, are driving this transition. By continuing to invest in renewable technologies, including battery storage and hybrid power plants, Türkiye is well-positioned to enhance its energy independence, achieve more ambitious climate goals, and secure a sustainable energy future.