ENERGY SECTOR REPORT

2026

PRESIDENCY OF THE REPUBLIC OF TÜRKİYE
INVESTMENT & FINANCE OFFICE

INVEST IN TÜRKİYE

nexus OF THE WORLD

APLUS Energy Consulting

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20 YEARS OF EXCELLENCE

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Foreword

Energy security has become one of the central pillars of economic growth and national resilience, while rising geopolitical tensions, shifting trade routes, and the restructuring of global supply chains are accelerating the transition toward more diversified, secure, and sustainable energy systems. With its strong industrial base, strategic geographic location at the nexus of Europe, Asia, and Africa, and its critical role across regional energy and logistics networks, as well as investment ecosystems, Türkiye is determined to remain at the forefront of this transformation.

As a reflection of this strong position, the Turkish energy sector offers investors a well-developed and competitive market structure built on stability, predictability, and long-term growth potential. Support mechanisms such as YEKDEM (Renewable Energy Resources Support Mechanism) and YEKA (Renewable Energy Resource Areas), together with diverse investment models including unlicensed generation and hybrid projects, provide investors with a reliable and attractive investment environment.

We are witnessing a period in which Foreign Direct Investment (FDI) plays a pivotal role in accelerating Türkiye's green energy transition and strengthening its position as a regional powerhouse. This transformation spans every layer of the energy ecosystem, from grid modernisation and energy efficiency to the rapid expansion of renewable energy capacity and energy storage infrastructure.

As renewable energy capacity continues to expand rapidly, energy storage investments are becoming increasingly critical to ensuring grid flexibility and system reliability. At the same time, Türkiye's local manufacturing ecosystem, particularly in wind, solar, and battery technologies, is evolving into a highly integrated and competitive structure that serves both domestic and export markets. Through initiatives such as the HIT-30 Program and other robust incentive schemes, Türkiye continues to strengthen its industrial capacity, further enhancing its attractiveness as a secure and strategic destination for international investment.

At the same time, a transition of this scale requires a dynamic and adaptable development vision, supported by a clear roadmap capable of mobilising international capital, advanced technologies, and strong strategic partnerships. With this understanding, under the leadership of President Recep Tayyip Erdoğan, Türkiye is implementing a comprehensive and ambitious roadmap aligned with its National Energy Plan, while advancing toward its 2053 Net Zero target.

As part of this new growth agenda, one of our key priorities is to enhance access to accurate market data, sectoral expertise, and reliable analysis. To this end, Investment and Finance Office, acting as the primary solution partner for international investors, has prepared the "Energy Sector Report 2026" in collaboration with APLUS Enerji. Combining our Office's macroeconomic investment perspective with APLUS Enerji's deep technical and market expertise, this report provides a comprehensive analysis of Türkiye's energy landscape. It examines the full value chain, covering electricity market dynamics, pricing mechanisms, licensing frameworks, regulatory developments, and segment-specific assessments across the wind, solar, geothermal, and biomass energy markets.

I am confident that this report will serve as a valuable reference for international and domestic investors, fund managers, energy companies, and all stakeholders seeking to benefit from Türkiye's strong growth potential and attractive investment environment. I would like to extend my sincere gratitude to the APLUS Enerji team and all colleagues at the Investment and Finance Office who contributed to this comprehensive study.

A. Burak DAĞLIOĞLU
President of the
Investment and Finance Office

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Abbreviations

AA	Alternating Current
BAU	Business as Usual
BESS	Battery Energy Storage Systems
BMS	Battery Management System
BOT	Build-Operate-Transfer
BOTAŞ	Petroleum Pipeline Corporation
CAGR	Compound Annual Growth Rate
CBAM	Carbon Border Adjustment Mechanism
CCGT	Combined Cycle Gas Turbine
CDS	Credit Default Swap
CFD	Contracts for Difference
COP	United Nations Climate Change Conference
ÇED	Environmental Impact Assessment
DLR	Dynamic Line Rating
DGP	Balancing Power Market
DSİ	State Hydraulic Works
EBRD	European Bank for Reconstruction and Development
ESG	Environmental, Social, and Governance
EMRA	Energy Market Regulatory Authority
ENTSO-E	European Network of Transmission System Operators for Electricity
EPİAŞ	Energy Exchange Istanbul (EXIST)
ETS	Emission Trading System
EÜAŞ	The Electricity Generation Company
EV	Electrical Vehicles
FIT	Feed-In Tariff
HIT-30	High Technology Investments 2030
HVDC	High Voltage Direct Current
IBR	Inverter-Based Resources
IFI	International Financial Institutions
IFC	International Finance Corporation
INDC	Intended Nationally Determined Contribution
KOSGEB	Small and Medium Enterprises Development Organisation
LCP	Local Content Premium
LTS	Long-Term Climate Strategy
MENR	Ministry of Energy and Natural Resources
MRV	Monitoring, Reporting, Verification
NDC	Nationally Determined Contribution
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OTC	Over the Counter
PCS	Power Conversion System
PFC	Primary Frequency Control
PPA	Power Purchase Agreement
REPA	Wind Energy Potential Atlas
SFC	Secondary Frequency Control
SPP	Solar Power Plants
SME	Small and Medium Enterprises
TEK	Turkish Electricity Authority
TEAŞ	Turkish Electricity Generation and Transmission Corporation
TEİAŞ	Turkish Electricity Transmission Corporation
TETAŞ	Turkish Electricity Trading and Contracting Corporation
TEDAŞ	Turkish Electricity Distribution Corporation
TOGG	Türkiye's Automobile Joint Venture Group
TÜBİTAK	The Scientific and Technological Research Council of Türkiye
TÜİK	Turkish Statistical Institute/TurkStat
TÜREB	Turkish Wind Energy Association
TCA	Turkish Competition Authority
UNFCCC	The United Nations Framework Convention on Climate Change
VRE	Variable Renewable Energy
WPP	Wind Power Plants
YEKA	Renewable Energy Resource Areas
YEKDEM	Renewable Energy Support Mechanism
YEK-G	Renewable Energy Resource Guarantee System

OVERVIEW OF THE CURRENT ELECTRICITY MARKET

1.1 Brief History

Türkiye's electricity sector traces its origins to the late Ottoman period. The first hydroelectric facility was commissioned in Tarsus in 1902, though infrastructure remained limited and localised. By 1923, when the Republic was established, installed capacity stood at a modest 32.8 MW.[1] Early development focused on extending access to major urban centres as part of national modernisation efforts.

This early period was characterised by fragmented ownership and limited infrastructure development (See Figure 1). Türkiye's electricity sector began its modern institutional development in 1970 with the establishment of the Turkish Electricity Authority (TEK) under Law No. 1312. TEK operated as a vertically integrated state monopoly, controlling all generation, transmission, and distribution activities. This centralised structure enabled rapid infrastructure expansion during the 1970s and 1980s, supporting Türkiye's industrialisation and urbanisation. By 1982, all municipal electricity networks had been transferred to TEK, consolidating state control over the entire sector. This structure provided centralised planning capacity but created investment bottlenecks and operational inefficiencies that would later necessitate reform.[2]

This monopolistic structure persisted for decades, with TEK dominating the market while the State Hydraulic Works (DSI) operated hydroelectric facilities. Despite this consolidation, the rapid growth in electricity demand began to strain the state-owned system's capacity to finance necessary infrastructure expansion.

The 1980s marked the beginning of a conceptual shift toward market liberalisation. In 1984, Türkiye took its first tentative steps away from complete state monopoly by allowing private sector participation in power plant construction through Build-Operate-Transfer (BOT), Build-Operate (BO), and Transfer of Operating Rights (TOR) models.[3] These regulatory changes aimed to attract foreign investment and address the growing gap between electricity supply and demand. However, the fundamental structure remained state-dominated, with private participation limited to specific investment models rather than comprehensive market competition.

By the late 1990s, the limitations of the state monopoly model had become acute. Investment requirements consistently exceeded state budgetary capacity, operational efficiency lagged international standards, and electricity access in rural areas remained inadequate.[4] By the year 2000, Türkiye's installed capacity had grown to 26.1 GW.[5] Yet the sector faced mounting challenges such as insufficient generation capacity to meet rapidly growing demand, limited private sector involvement, a lack of transparent pricing mechanisms, and a state-dominated structure that struggled to attract the investments needed for modernisation.[6]

The true restructuring of Türkiye's electricity sector commenced with the establishment of the Energy Market Regulatory Authority (EMRA) following the enactment of Electricity Market Law No. 4628 on March 3, 2001.[7] This legislation marked a fundamental shift in Türkiye's approach to electricity governance, establishing the legal and institutional framework for transitioning from a state monopoly to a competitive, liberalised market structure.

The primary objectives of Law No. 4628 were ambitious and transformative. The law sought to create a financially sound, stable, and transparent electricity market operating under competitive principles and private law provisions.[8] Crucially, it envisioned a future where the state would function solely as a supervisory and reg-

[1] Ozturk, H. K. (2007). Development and restructuring of Türkiye's electricity sector: a review. Renewable and Sustainable Energy Reviews, 11(4). https://www.sciencedirect.com/science/article/pii/S1364032104000620

[2] Ozturk, H. K. (2007). Past, present and future status of electricity in Türkiye. Renewable and Sustainable Energy Reviews. https://www.sciencedirect.com/science/article/abs/pii/S1364032105000274

[3] Ozturk, H. K. (2007). Development and restructuring of Türkiye's electricity sector: a review. Renewable and Sustainable Energy Reviews, 11(4). https://www.sciencedirect.com/science/article/pii/S1364032104000620

[4] World Bank. (2005). The World Bank in Turkey, 1993-2004: Country assistance evaluation. Independent Evaluation Group. Washington, DC: World Bank. https://ieg.worldbankgroup.org/sites/default/files/Data/reports/turkey_cae.pdf

[5] Ibid.

[6] Kütükcü, G. (2024, November). Latest developments in Turkish electricity market [Conference presentation]. ERRA EMER Committee Meeting, İstanbul, Türkiye. ERRA. https://erranet.org/wp-content/uploads/2024/11/GKUTUKCU_ERRA_Nov2024-v4_final.pdf

[7] Energy Market Regulatory Authority. (2001). Electricity Market Law No. 4628. Official Gazette.

[8] Gün + Partners. (2001). Turkish Electricity Market: Steps Towards Liberalisation. https://gun.av.tr/insights/updates/Türkiye-turkish-electricity-market-steps-towards-liberalisation

ulatory authority rather than as a market participant and investor. The law mandated the unbundling of the vertically integrated state monopoly, requiring the separation of generation, transmission, distribution, and retail supply activities into distinct entities.[9]

Following the law's enactment, the Energy Market Regulatory Board was commissioned on November 19, 2001, giving EMRA the authority to regulate and supervise the electricity market independently.[10] In May 2002, EMRA issued draft regulations for market licensing and tariffs, which became effective in August 2002. The Electricity Market Implementation Manual followed in April 2003, providing detailed operational guidelines for the new market structure.[11]

The restructuring process involved the disaggregation of the state-owned Turkish Electricity Generation and Transmission Corporation (TEAŞ) into separate entities with specialised functions. The Turkish Electricity Transmission Corporation (TEİAŞ) was established to manage the transmission network as a state-owned natural monopoly. The Turkish Electricity Generation Corporation (EÜAŞ) was created to manage state generation assets. The Turkish Electricity Trading and Contracting Corporation (TETAŞ) was formed to handle wholesale electricity trading and contracting.[12]

Despite these structural reforms, progress during the 2000s was gradual. The market remained substantially dominated by state-owned companies, and the transition to a fully competitive environment proved more complex than initially anticipated. Private sector participation increased incrementally through new generation investments, particularly in natural gas-fired plants and renewable energy, but the comprehensive privatisation of state assets remained incomplete.

The period after 2010 witnessed a dramatic acceleration in Türkiye's electricity market transformation, characterised by aggressive privatisation programs, substantial private investment inflows, and the establishment of organised market mechanisms. This era marked the transition from theoretical market liberalisation to practical implementation and measurable outcomes.

One of the most significant achievements of the post-2010 period was the comprehensive privatisation of electricity distribution. In preparation for this process, The Turkish Electricity Distribution Corporation (TEDAŞ) was restructured into 21 regional distribution companies, each holding a monopoly in its designated service area.[13] The privatisation program proceeded rapidly, with the government setting ambitious targets to complete the process by early 2011. By 2010, Türkiye had completed power grid privatisation covering the entire country, generating bids totalling 16 billion USD. The Uludağ and Çamlıbel distribution companies were among the first to be privatised. As of August 31, 2013, all share transfer agreements between private consortia and TEDAŞ had been completed, finalising the distribution privatisation program. The total investment in Türkiye's electricity distribution and privatisation over the decade following 2008 reached approximately 23 billion USD, demonstrating unprecedented confidence in the country's economic and political stability.

A critical milestone in Türkiye's electricity market evolution was the enactment of Electricity Market Law No. 6446, which entered into force on March 30, 2013, replacing the 2001 legislation.[14] This comprehensive law provided a more refined framework for market operations and accelerated the liberalisation process. Law No. 6446 maintained the core objective of establishing a financially sound, stable, and transparent electricity market operating in a competitive environment, while introducing more detailed provisions for organised market operations.[15]

The new law addressed several shortcomings of the previous legislation and established clearer frameworks for market mechanisms, licensing procedures, and regulatory oversight. It maintained the requirement for unbundling between distribution companies and supply companies, even when under common ownership, to prevent anti-competitive behaviour and ensure fair market access.[16]

Perhaps the most transformative provision of Law No. 6446 was the establishment of Energy Exchange Istanbul (EPİAŞ) as Türkiye's sole authorised energy market operator.[17] EPİAŞ was officially established on March 18, 2015, and received its license from EMRA to operate organised electricity markets and began operating the organised wholesale markets on September 1, 2015, taking over market operations from TEİAŞ.[18] EPİAŞ established the Day-Ahead Market enabling competitive hourly price formation, the Intraday Market allowing participants to adjust positions closer to real-time delivery, and the Balancing and Settlement mechanism managing system stability and financial settlement of imbalances. The creation of EPİAŞ fundamentally transformed electricity trading in Türkiye by introducing transparent price discovery, centralised clearing, and a comprehensive data platform.[19]

The post-2010 period witnessed unprecedented growth in Türkiye's installed generation capacity, driven primarily by private sector investments. By the end of 2025, renewables accounted for approximately 62.3% of installed capacity, with thermal sources comprising the remaining 37.4%, demonstrating the success of liberalisation in ca-

[9] Dautaj, E., & Akkemik, K. A. (2016). Evaluation of the Reform in Turkish Electricity Sector: A CGE Analysis. 24th IIOA Conference. https://www.iioa.org/conferences/24th/papers/files/2694_20160520121_DautajSenerdem-Akkemik_IIOA2016.pdf

[10] Ozturk, H. K. (2007). Development and restructuring of Türkiye's electricity sector: a review. Renewable and Sustainable Energy Reviews, 11(4). https://www.sciencedirect.com/science/article/pii/S1364032104000620

[11] Ibid.

[12] Wild, J., Spielmann, C., Vaterlaus, S., & Worm, H. International Association for Energy Economics. https://www.iaee.org/en/publications/proceedingsabstractdoc.aspx?id=8063

[13] Erdem & Erdem. (2021). Electricity Distribution Sector Report. https://www.erdem-erdem.av.tr/en/insights/electricity-distribution-sector-report

[14] Government of Türkiye. (2013). Electricity Market Law No. 6446. Official Gazette, No. 28603. https://www.epias.com.tr/wp-content/uploads/2023/06/ELECTRICITY-MARKET-LAW.pdf

[15] Asia Pacific Energy Portal. (2013). Türkiye: Electricity Market Law No. 6446 of 2013. https://policy.asiapacificenergy.org/node/2308

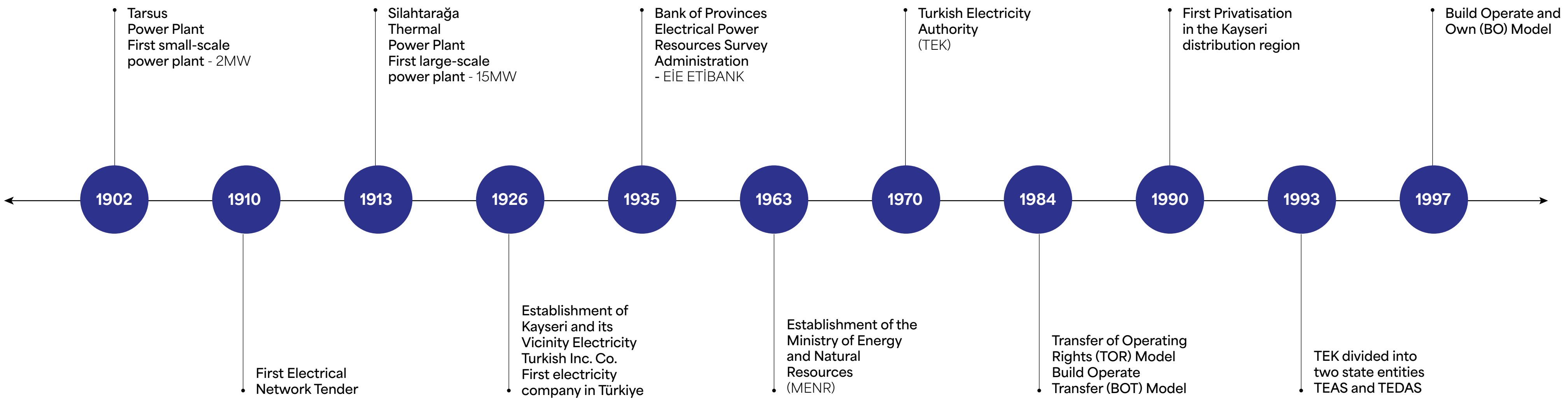
[16] CEE Legal Matters. (2024). Türkiye: Liberalisation of the Electricity Market and the Role of Antitrust Interventions. https://ceelegalmatters.com/Türkiye/20901-Türkiye-liberalisation-of-the-electricity-market-and-the-role-of-antitrust-interventions

[17] Mermeroglu Law Firm. Electricity Market Law. https://www.mermerogluhukuk.com/en/electricity-market-law

[18] EPİAŞ. (2025). About EPİAŞ - Energy Exchange Istanbul. Europex. https://www.europex.org/members/epias/

[19] NARUC. (2015). EPIAS Roles and Responsibilities. https://pubs.naruc.org/pub.cfm?id=2576CE39-A678-E6E0-2B5C-D64D1BBFC904

Figure 1. Historical Development of Electricity Market



talysing private-sector-led transformation and positioning Türkiye among regional leaders in renewable capacity deployment. With a young and growing population, low per capita electricity consumption relative to developed countries, and rapid urbanisation, Türkiye remained one of the fastest-growing power markets globally throughout this period.[20]

A historic milestone occurred in 2024 when wind and solar generation exceeded domestic coal generation for the first time, marking a fundamental shift toward cleaner, domestically sourced renewable energy.[21] This transition has also helped reduce reliance on imported fossil fuels while supporting the country's climate commitments.

Parallel to distribution privatisation, Türkiye pursued an ambitious program to privatise state-owned generation assets. The privatisation of generation facilities included 17 thermal power plants and 28 hydroelectric power plants owned by EÜAŞ. The Privatisation Administration's preferred method was privatisation through share sales for portfolios of generation assets, while coal reserves were privatised through TOR agreements.[22]

The generation privatisation program proceeded in waves throughout the 2010s, with portfolio groupings designed to create balanced and attractive investment opportunities. By 2013, the privatisation of nine small generation plants totalling 140 MW had been finalised, with larger portfolio privatisations following in subsequent years. The privatisation program benefited from strong investor interest, demonstrating confidence in Türkiye's electricity market structure and growth potential.[23]

The period after 2010 also witnessed continuous refinement of the regulatory framework. EMRA issued numerous regulations, communiqués, and guidelines addressing licensing procedures, market operations, tariff methodologies, connection and system usage, renewable energy support mechanisms, and consumer protection. These regulatory instruments provided greater clarity and predictability for market participants, facilitating investment decisions and market entry.[24]

The retail electricity market was progressively liberalised, with eligible consumer thresholds gradually reduced to expand market competition. The unbundling requirements between distribution companies (which operate as natural monopolies) and supply companies (which compete for customers) were strictly enforced to prevent cross-subsidization and anti-competitive practices.[25] The Turkish Competition Authority (TCA)

[20] Florence School of Regulation. (2017). Problems of Regulatory Reforms in Electricity: Examples from Türkiye. https://fsr.eui.eu/niq-19-2-reforms-electricity-Türkiye/

[21] Ember. (2025). Türkiye Electricity Review 2025. https://ember-energy.org/latest-insights/turkiye-electricity-review-2025/

[22] Türkiye-Japan Business Council. Electricity Market in Türkiye. https://www.Türkiye-japan.com/business/category5/category5_432.pdf

[23] Turkish Ministry of Energy. General Overview of Turkish Electricity Sector (Privatization). https://tacs.eu/Analyses/Energy/B2-Dilli-Budak-MinistryOfEnergy.pdf

[24] Paksoy Law Firm. (2024). Legal Briefing on Recent Developments in the Electricity Market. https://paksoy.av.tr/en/2024/12/legal-briefing-on-recent-developments-in-the-electricity-market/

[25] Erdem & Erdem. (2021). Electricity Distribution Sector Report. https://www.erdem-erdem.av.tr/en/insights/electricity-distribution-sector-report

worked closely with EMRA during this period, providing competition law perspectives on regulatory design and actively investigating potential anti-competitive behaviour in the market.[26]

As of 2026, Türkiye's electricity market has achieved substantial transformation from its origins as a state monopoly. Looking ahead, the adoption of Türkiye's first Climate Law in July 2025 and the Nationally Determined Contribution (NDC) 3.0 framework, which sets a 2035 emissions cap alongside the 2053 net-zero target, together with the planned TR-Emission Trading System (ETS) pilot phase in 2026-2027, create a strengthening regulatory environment that aligns carbon pricing with investment incentives, further enhancing the long-term value proposition for low-carbon generation assets. The market operates with a competitive generation segment featuring diverse private and public participants, privatised regional distribution monopolies subject to performance-based regulation, a liberalised retail supply market with eligible consumer switching mechanisms, organised wholesale markets operated by EPİAŞ providing transparent price discovery, and an independent regulatory authority in EMRA providing oversight and market supervision.[27]

The Turkish electricity market's journey from centralised state monopoly to a liberalised, competitive structure demonstrates both the complexity of power sector reform and the substantial achievements possible through sustained political commitment, regulatory sophistication, and private sector engagement. The post-2010 period in particular showcased Türkiye's capacity to implement comprehensive structural reforms, attract significant domestic and foreign investment, and establish modern market institutions while maintaining supply security and expanding access. The foundation established during this transformative era positions Türkiye to address future challenges including further renewable integration, grid modernisation, demand-side management, and alignment with international climate commitments.

[27] Invest in Türkiye. Investor's Guide for Electricity. https://enerji.gov.tr/info-bank-investors-guide-for-electricity

1.2 Market Structure

The Turkish electricity market today operates as a largely liberalised and unbundled system, characterised by competitive generation and retail segments, regulated transmission and distribution monopolies, and organised wholesale trading platforms. This structure reflects more than two decades of reform, creating a transparent market environment that has attracted significant private investment.

The modernisation process accelerated with the Electricity Market Law of 2001, which initiated the unbundling of state assets. This was followed by the privatisation of electricity distribution in 2013 and the separation of EPİAŞ from TEİAŞ in 2015.[28] A key consolidation occurred in July 2018, when TETAŞ and EÜAŞ merged under the EÜAŞ brand to streamline public market activities. Today, the market operates on a fully unbundled value chain comprising generation, transmission, distribution, wholesale, and retail supply (See Figure 2).

The governance of the Turkish power sector is characterised by a clear separation of policy, regulation, and operation, ensuring a transparent environment for investors.

MENR (Ministry of Energy and Natural Resources): The central policy-making body responsible for defining long-term strategies, such as the National Energy Plan and supply security policies.

EMRA: The independent regulator responsible for licensing, tariff setting (for regulated segments), market surveillance, and consumer protection. EMRA ensures a level playing field for private entrants.

TEİAŞ: The state-owned entity responsible for operating the high-voltage transmission network also oversees system balancing by managing the Balancing Power Market and procuring Ancillary Services to ensure grid stability.

EPIAŞ: The central counterparty and market operator for Day-Ahead and Intraday trading, ensuring financial settlement and transparency while operating the YEK-G Guarantees of Origin system for green energy trading.

EÜAŞ: The state-owned generation entity, following the 2018 merger, acts as both a dominant generator (holding nearly 17% of installed capacity as of 2025) and a wholesale trader, managing the portfolio of state assets and acting as a counterparty for certain security-of-supply contracts.

The Turkish electricity market is structured into five distinct segments: generation, transmission, distribution, supply and retail. Generation operates under a liberalised framework with competitive private participation. As of 31 December 2025, Türkiye's total installed capacity exceeded 120 GW. The state-owned entity EÜAŞ accounted for approximately 20.8 GW, representing around 17% of total installed capacity, while the remaining capacity was predominantly owned by private independent power producers.[29,30] Private sector dominance is particularly pronounced in renewable energy, which accounted for 62.3% of installed capacity by end-2025 with solar, wind, hydro, and geothermal projects predominantly owned and operated by private entities.

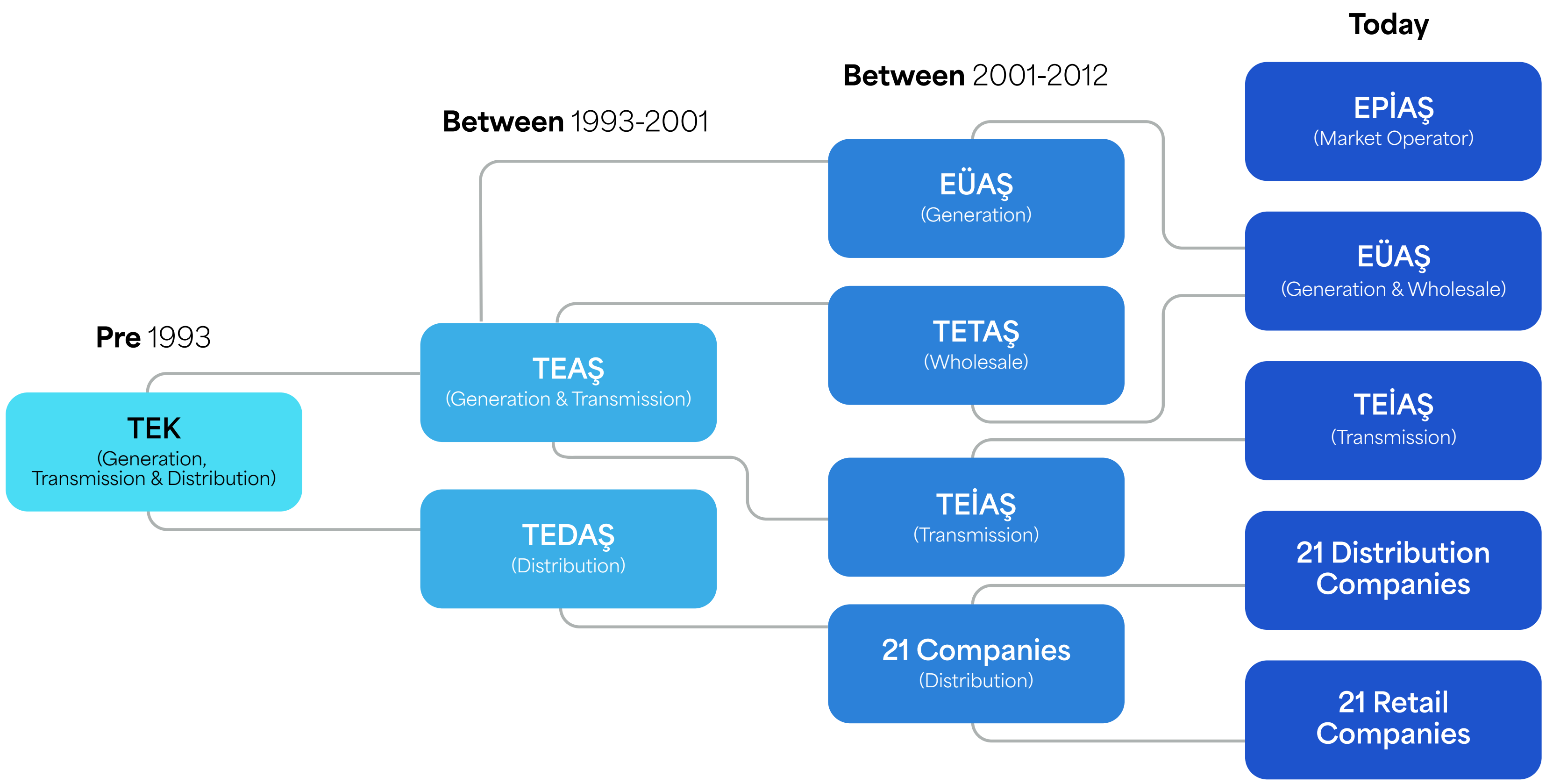
Investors can enter the generation market through multiple routes. Large-scale licensed utility projects, including wind, solar, hydro, and geothermal facilities, represent the most common

[28] Sarıibrahimoğlu Law Office. July 2018. Outlook of the energy market in Turkey. https://export.flandersinvestmentandtrade.com/sites/fit_domains/files/media/news/EnergyMarket_0.pdf

[29] EMRA License Database, February 9, 2026. Retrieved from https://lisans.EMRA.gov.tr/epvys-web/faces/pages/lisans/elektrikUretim/elektrikUretimOzetSorgula.xhtml

[30] Türkiye Elektrik İletim A.Ş. [TEİAŞ]. (n.d.). Yük tevzi bilgi sistemi – İstatistikler [Load dispatch information system – Statistics]. https://ytbsbilgi.teias.gov.tr/ytbsbilgi/frm_istatistikler.jsfhttps://ytbsbilgi.teias.gov.tr/ytbsbilgi/frm_istatistikler.jsf

Figure 2. Market Structure



entry point for institutional capital seeking long-term contracted revenues or merchant exposure. Distributed self-consumption installations, commonly referred to as unlicensed projects, have grown rapidly in recent years, particularly in the solar segment, driven by declining equipment costs and favourable regulatory frameworks that enable industrial consumers to generate electricity for their own use without obtaining a full generation license. Hybrid configurations, which co-locate renewable capacity with existing licensed thermal or hydro assets, have also emerged as an attractive option, allowing developers to leverage existing grid connections and land-use permits while diversifying technology risk.

Transmission remains a regulated state-owned monopoly under TEİAŞ, which owns and operates the high-voltage transmission network facilitating third-party access for all generators and consumers under regulated tariffs approved by EMRA. TEİAŞ's role extends beyond physical grid management to include operation of the Balancing Power Market (DGP) and procurement of ancillary services such as frequency regulation, voltage support, and black-start capability. For project developers, understanding TEİAŞ's connection procedures, capacity allocation rules, and balancing settlement methodology is critical for accurate financial modelling, as connection delays and imbalance penalties can materially impact project economics.

A significant regulatory development is underway in the balancing market. Pursuant to amendments to the Balancing and Settlement Regulation published in the Official Gazette dated 21 January 2025 (No. 32789),[31] the imbalance settlement period will transition from hourly to 15-minute intervals following completion of the required technical infrastructure, with implementation targeted for 1 January 2027. This reform is expected to increase imbalance cost sensitivity and enhance the value of storage, flexibility, and accurate forecasting, creating new revenue opportunities for battery energy storage systems and demand response providers while placing greater emphasis on short-term forecasting accuracy for variable renewable generators.

The distribution network, meanwhile, is operated by 21 privatised regional distribution companies, each holding a monopoly within its designated service area. These companies were fully privatised between 2010 and 2013 through Transfer of Operating Rights agreements, with private consortia managing operations, investments, and grid maintenance under performance-based regulation. In addition to these regional operators, Türkiye's distribution landscape includes 217 Organised Industrial Zone (OSB) distribution license holders managing dedicated grids for industrial clusters, as well as three enterprise-based distribution licenses serving specific large-scale facilities.[32] This privatised distribution infrastructure, combined with strict unbundling requirements between distribution and supply activities, ensures competitive neutrality and prevents cross-subsidization.

Table 1 - Number of Participants by License Type [37]

License Type	State-Owned	Private Sector	Total
Generation	6	1203	1209
OSB Generation	0	1	1
Supply	0	286	286
Retail	0	63	63
Distribution	0	21	21
Transmission	1	0	1
Aggregation License	0	36	36
Total Licence	6	1610	1617

[31] EMRA. (2025, January 21). Regulation Amending the Electricity Market Balancing and Settlement Regulation (Transitional Article 40) [Elektrik Piyasası Dengeleme ve Uzlaştırma Yönetmeliğinde Değişiklik Yapılmasına Dair Yönetmelik]. Official Gazette of the Republic of Türkiye (No. 32789).

[32] EMRA License Database. (February 9, 2026). Retrieved from https://lisans.EMRA.gov.tr/epvys-web/faces/pages/lisans/elektrikUretim/elektrikUretimOzetSorgula.xhtml

[37] EPİAŞ Transparency Platform. (April, 2026). Retrieved from https://seffaflik.epias.com.tr/electricity/electricity-markets/general-data/participant-count-based-upon-license-type

The supply segment, encompassing both wholesale and retail activities, has been largely liberalised, while the state-owned EÜAŞ remains an active market participant. According to the EPİAŞ Transparency Platform data for April 2026, 286 entities hold supply licenses, while 63 entities hold retail supply licenses. These companies operate in a competitive market environment and participate in wholesale trading activities as well as end-user supply. The relatively high number of licensed market participants reflects the depth and maturity of Türkiye's electricity market and supports liquidity in bilateral contracting structures, including Power Purchase Agreements (PPAs) with industrial consumers, retail suppliers, and trading companies.

The retail segment has been progressively liberalised through reductions in the eligible consumer threshold. As of 2026, the threshold stands at 500 kWh per year, effectively liberalising the entire residential and commercial market.[33] Consumers are therefore able to switch suppliers freely, contributing to competitive dynamics in pricing and service offerings. The unbundling requirements between distribution and supply activities continue to form an important component of the market structure in order to support fair competition and prevent cross-subsidization practices. The liberalised retail market also supports the development of direct Corporate PPA structures, particularly for export-oriented industrial consumers seeking to manage electricity procurement and carbon-related compliance considerations.

A key structural development is the emergence of licensed aggregators. Following the Regulation on Aggregation Activity published in December 2024,[34] 36 aggregation licenses have been granted as of April 2026. These entities aggregate distributed generation, storage, and demand response assets into virtual portfolios capable of participating in organised wholesale markets and ancillary service mechanisms.[35] This regulatory innovation addresses a critical gap by enabling smaller projects and behind-the-meter assets to access market revenues that were previously limited to utility-scale facilities.[36] Aggregation licenses create new business models for energy service companies, storage developers, and distributed solar portfolios, while also improving the bankability of smaller projects by providing access to organised market revenues.

According to the EPİAŞ Transparency Platform, Türkiye's electricity market comprised 1,617 licensed entities as of April 2026, indicating substantial market depth and private sector participation. The generation segment accounts for the majority of licenses, with 1,209 generation license holders, of which 1,203 belong to the private sector. In addition, the market includes 286 supply license holders, 63 retail supply license holders, 21 distribution companies, and 1 transmission entity. This license structure illustrates the diversification and liberalisation of Türkiye's electricity market over time (See Table 1).

Electricity trading in Türkiye occurs through two main channels such as bilateral agreements and organised wholesale markets operated by EPİAŞ. Bilateral agreements represent the backbone of medium-to-long-term electricity trading in Türkiye. In 2024, bilateral contracts accounted for approximately 56% of total trade volume, demonstrating their importance as a hedging mechanism and revenue certainty tool. These agreements are negotiated directly between buyers including traders, suppliers, and large consumers and sellers primarily generators. Contracts can be physical, specifying delivery of electricity at agreed prices and volumes, or financial, structured as Contracts for Difference (CfD) where only the price differential is settled financially with physical delivery through spot markets.[38] Prices and terms are unregulated and determined freely between parties. Contracts typically range from monthly to multi-year including long-term PPAs up to 20 years. The dominance of bilateral trading means Türkiye has deep over-the-counter liquidity, enabling flexible deal structures, bespoke hedging arrangements, and direct Corporate PPA negotiations.

EPİAŞ operates transparent spot markets that provide reference price signals used to index many bilateral contracts and settlement obligations. The Day-Ahead Market is the primary arena for short-term liquidity. Participants submit hourly bids and offer for each hour of the following day, and EPİAŞ matches supply and demand to determine the Day-Ahead Market Price (DAMP) for each hour, which serves as the benchmark price for the Turkish power sector. Following EMRA's decision of 2 April 2026, effective from 4 April 2026, the maximum settlement price in both the Day-Ahead Market and the Balancing Power Market was increased to 4,500 TL/MWh from the previous level of 3,400 TL/MWh established in April 2025.[39] This cap is adjusted periodically to reflect input cost dynamics including fuel prices and foreign exchange rates. DAMP serves as the reference price for merchant revenue modelling, and understanding historical DAMP volatility, seasonal patterns, and the impact of renewable penetration on price formation is essential for financial due diligence.

The Intraday Market allows participants to adjust their positions closer to real-time up to 60 minutes before delivery, which is particularly valuable for managing renewable energy imbalances caused by weather forecast errors. Projects with accurate short-term forecasting systems can capture value in the Intraday Market by selling surplus genera-

[33] EMRA. (2025, December 18). Decision on the 2026 Eligible Consumer Threshold [2026 Yılı Serbest Tüketici Limiti Hakkında Kurul Kararı] (Decision No. 14039). Official Gazette of the Republic of Türkiye (No. 33116, 23 December 2025).

[34] https://www.resmigazete.gov.tr eskiler/2024/12/20241217-27.html

[35] Energy Exporter. (2025, July 7). New business models in the electricity market with aggregation activity. https://energyexporter.com/public/en/blog/new-business-models-in-the-electricity-market-with-aggregation-activity

[36] Asy Legal. (2024, December 17). Aggregator licenses: Key changes to Turkey's electricity market. https://www.asylegal.com/turkey-electricity-market-new-aggregator-licenses/

[37] EPİAŞ Transparency Platform. (April, 2026). Retrieved from https://seffaflik.epias.com.tr/electricity/electricity-markets/general-data/participant-count-based-upon-license-type

[38] SHURA Enerji Dönüşümü Merkezi. (2025, July). Türkiye'de yenilenebilir enerji tedarik anlaşmalarının etkinleştirilmesi [Enabling renewable energy power purchase agreements in Türkiye] (A. Bağ Güllü, H. Aksoy, S. Serhadlıoğlu, & R. Y. Çalışkan). Sabancı Üniversitesi. https://shura.org.tr/wp-content/uploads/2025/06/SHURA-EDM-%E2%80%93-Turkiyede-Yenilenebilir-Enerji-Tedarik-Anlasmalarinin-Etkinlestirilmesi-Raporu-%E2%80%93-08.07.2025.pdf

[39] EMRA. (2026, April 2). Gün Öncesi Piyasası ve Dengeleme Güç Piyasasında Asgari ve Azami Fiyat Limitlerinin Belirlenmesine İlişkin Usul ve Esaslar Hakkında Kurul Kararı (Karar No. 14459). https://www.epias.com.tr/tum-duyurular/piyasa-duyurulari/elektrik/dgp/gun-oncesi-piyasasinda-ve-dengeleme-guc-piyasasinda-azami-fiyat-limitinin-4-500-tl-mwh-belirlenmesine-iliskin-kurul-karari/

[40] Ozmen, Z. EPİAŞ. (2020, February) Gün İçi Piyasası. (Intraday market presentation). https://www.dunyaenerji.org.tr/wp-content/uploads/2020/02/GunIciPiyasasi24Subat2020.pdf

tion or buying shortfall volumes at more favourable prices than the balancing market.[40]

The DGP, operated by TEİAŞ rather than EPİAŞ, ensures real-time supply-demand equilibrium by accepting bids from generators with flexible capacity, including hydro, gas turbines, and storage, to increase or decrease generation in response to system imbalances. Market participants are financially responsible for deviations from their scheduled generation or consumption.[41] Those experiencing with positive imbalance (generation surplus or consumption shortfall) receive a discounted settlement price typically below DAMP, while those with negative imbalance (generation shortfall or consumption surplus) pay a premium price above DAMP. The penalty structure is periodically adjusted by EMRA to incentivize accurate forecasting and maintain system balance. As noted, the planned 15-minute settlement transition will increase imbalance cost sensitivity, enhancing the value of flexible resources such as battery storage and demand response.[42]

EPİAŞ operates the Guarantees of Origin certificate system (YEK-G), which serves as Türkiye's platform for the issuance and trading of renewable energy certificates.[43] YEK-G certificates separate the green attribute of renewable electricity from the physical commodity, enabling corporate green procurement and Scope 2 emissions reporting. Companies can purchase YEK-G certificates to claim renewable electricity consumption for sustainability reporting and corporate Environmental, Social and Governance (ESG) commitments, providing renewable energy generators with an additional revenue stream beyond electricity sales. EPİAŞ regularly publishes settlement notices for the organised YEK-G market, ensuring transparency and market operation reliability.

The PPA landscape in Türkiye offers a spectrum of revenue models ranging from state-guaranteed mechanisms to fully merchant corporate contracts, allowing investors to optimise risk-return profiles based on project characteristics, technology, and capital structure. State-supported mechanisms have historically been the primary driver of renewable energy capacity expansion, providing the bankability required for project financing. The Renewable Energy Resource Areas (YEKA) model functions as the flagship mechanism for large-scale capacity deployment, operating as a competitive auction-based regime where investors bid for allocated grid capacity in exchange for long-term purchase guarantees.

In the current market structure, YEKA projects serve as the "anchor" assets for the renewable sector, securing large volumes of wind and solar capacity through competitive auctions with long-term purchase guarantees and structured market exposure periods.[44] As of 2026, Türkiye has completed ten YEKA tenders (five wind and five solar) and announced plans for at least 2 GW of new YEKA auctions annually as part of the 2035 Renewable Energy Roadmap.[45] Detailed analysis of the YEKA model, including tender structures, recent awards, and local content requirements, is provided in Section 2.2.2.

Serving as a complement to YEKA, the Renewable Energy Support Mechanism (YEKDEM) operates as a feed-in tariff mechanism for projects developed outside the auction system, providing a predictable floor price indexed to foreign exchange and inflation. YEKDEM plays a critical role in the market by supporting mid-scale projects and technologies like geothermal and biomass that require specific incentive structures, with the current framework (updated in May 2023) remaining applicable for projects commissioned through December 31, 2030.[46] While YEKA targets utility-scale cost reduction through competitive bidding, YEKDEM ensures broader market participation and diversity of supply by offering an accessible route to market for smaller developers and less mature technologies. Detailed analysis of YEKDEM tariffs, local content premiums, and application procedures is provided in Section 2.2.1.

As the market matures and state guarantees evolve toward more competitive structures, the private corporate PPA market is emerging as a key pillar of revenue generation, driven by industrial decarbonization needs. The EU Carbon Border Adjustment Mechanism (CBAM), effective from January 2026, has intensified pressure on Turkish exporters to demonstrate low-carbon electricity consumption, driving corporate PPA demand.[47] Corporate PPAs enable direct electricity sales from independent power producers to industrial consumers, providing generators with long-term revenue certainty while allowing consumers to hedge price risk and meet Scope 2 emission targets. These agreements are typically structured as physical PPAs, where electricity is delivered through the grid, or as financial PPAs, where price hedges are transferred without physical delivery constraints.

With the relatively low retail eligibility threshold in Türkiye, most industrial consumers are eligible to switch suppliers and can engage in bilateral PPA negotiations, creating a broad potential pool of offtakers for market-based contracting.[48] The corporate PPA market, while still nascent as of 2026, is growing rapidly, with major industrial consumers including steel producers and automotive manufacturers beginning to sign long-term agreements and specialised PPA advisory and structuring services emerging to support deal flow. Expected developments in the bilater-

[41] EMRA. (2025, December 29). Regulation amending the Electricity Market Balancing and Settlement Regulation [Elektrik Piyasası Dengeleme ve Uzlaştırma Yönetmeliğinde Değişiklik Yapılmasına Dair Yönetmelik]. Official Gazette of the Republic of Türkiye (No. 33122). https://resmigazete.gov.tr/eskiler/2025/12/20251229.pdf

[42] PwC. (2023, September). Overview of the Turkish electricity market. https://www.pwc.com.tr/tr/sektorler/enerji/2024/overview-of-the-turkish-electricity-market-2023.pdf

[43] EPİAŞ. (n.d.). Renewable Energy Guarantee of Origin System (YEK-G). https://yekgnedir.epias.com.tr/

[44] Gözen, M. (2021, May 19). Power Purchase Agreements (The Turkish Experience) [Conference presentation]. Energy Regulators Regional Association, Chairman's Meeting. https://erranet.org/wp-content/uploads/2021/03/Gozen_Turkish_PPAs_ChairmenMtg_May2021_updated.pdf

[45] MENR. (2024, October 20). Yenilenebilir enerjide 2035 yol haritası. https://enerji.gov.tr/haber-detay?id=21380

[46] Presidential Decree (2023). Decision on Prices and Periods Applicable to Power Plants Based on Renewable Energy Resources from 1/7/2021 to 31/12/2030 [1/7/2021 tarihinden 31/12/2030 tarihine kadar elektrik üretim tesisleri için uygulanacak fiyatlar ve süreler ile fiyatların güncellenmesine ilişkin Karar] (Decision No. 7189). Official Gazette of the Republic of Türkiye (No. 32177).

[47] Republic of Türkiye Ministry of Trade. (2024, February 23). AB Sınırda Karbon Düzenleme Mekanizması (SKDM) [EU Carbon Border Adjustment Mechanism - CBAM] [Presentation slides]. https://ticaret.gov.tr/data/65dc9d3113b8762768385d66/Ticaret%20Bakanl%C4%B1%C4%9F%C4%B1%20SKDM%20Sunum-23022024.pdf

[48] EMRA. (2025, December 18). Decision on the 2026 Eligible Consumer Threshold [2026 Yılı Serbest Tüketici Limiti Hakkında Kurul Kararı] (Decision No. 14039). Official Gazette of the Republic of Türkiye (No. 33116, 23 December 2025).

al electricity trade market, including corporate PPA structures, pricing dynamics, and market growth trajectories, are discussed in detail in Section 3.7.

The merchant revenue model refers to a market-exposed generation strategy in which producers sell electricity primarily through organised spot markets operated by EPİAŞ, and/or via short-term bilateral arrangements, without long-term price guarantees. Revenues are therefore fully exposed to market price volatility driven by demand fluctuations, renewable output variability, fuel prices, and system conditions. While pure merchant models are less common for greenfield project financing due to bankability constraints, most project financiers require some level of contracted revenue certainty, merchant tails (post-PPA/feed-in-tariffs periods) and hybrid structures (where a portion of capacity is sold merchant) are integral to the Turkish investment landscape.[49] The merchant market provides the essential price signals that underpin the discount and premium structures of Corporate PPAs and inform the free-market periods embedded in recent YEKA tenders, creating a transparent reference point for bilateral negotiations. Price formation dynamics, merit order evolution, and future merchant revenue outlook are analysed in Sections 1.5.

Türkiye's electricity market structure offers a liberalised environment for energy investment, characterised by deep liquidity, transparent regulation, and diverse revenue models that allow investors to tailor risk-return profiles to specific project characteristics and capital structures. The coexistence of state-guaranteed mechanisms including YEKA and YEKDEM with a liquid spot market and a burgeoning corporate PPA sector provides multiple pathways to bankability, while forward-looking regulatory initiatives including aggregation licenses, 15-minute settlement targeted for 2027, and evolving carbon pricing mechanisms that signal a market that continues to innovate and adapt to the energy transition. With over 1,800 licensed actors ensuring competition and transparency, independent regulation by EMRA, and organised markets operated by EPİAŞ providing real-time data transparency, the Turkish power market presents compelling opportunities for investors seeking exposure to one of Europe's fastest-growing electricity markets, underpinned by ambitious 2035 targets including 120 GW of wind and solar capacity.[50]

[49] Gözen, M. (2021, May 19). Power Purchase Agreements (The Turkish Experience) [Conference presentation]. Energy Regulators Regional Association, Chairman's Meeting. https://erranet.org/wp-content/uploads/2021/03/Gozen_Turkish_PPAs_ChairmenMtg_May2021_updated.pdf

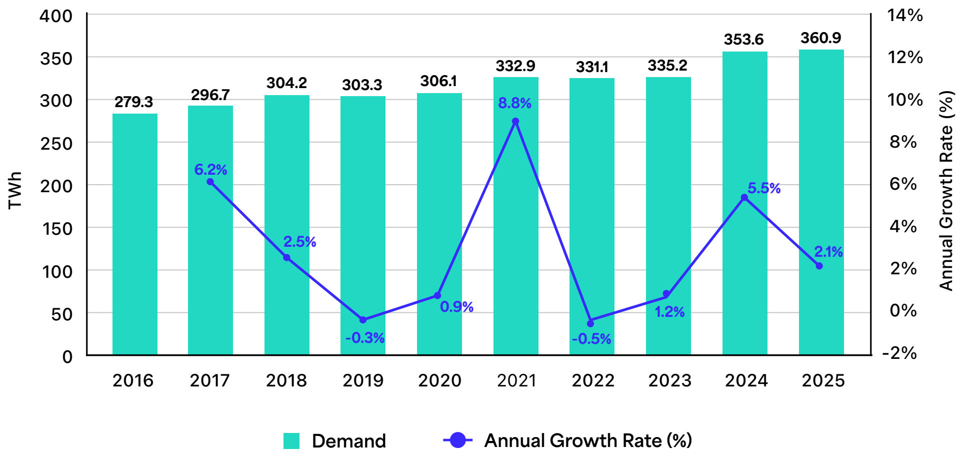
[50] MENR. (2024, October 27). New tender period in renewable energy. https://enerji.gov.tr/news-detail?id=21385

1.3 Demand & Supply

Türkiye's electricity market is characterised by sustained demand growth, rapid renewable capacity expansion, and an evolving generation mix. This section analyses historical demand trends, sectoral consumption patterns, installed capacity evolution, and generation profiles to provide investors with a comprehensive view of the market's supply-demand dynamics.

Türkiye's gross electricity consumption has demonstrated consistent growth over the past decade, reflecting the country's economic expansion, industrialisation, and urbanisation. Annual electricity consumption increased from approximately 279.3 TWh in 2016 to 360.9 TWh in 2025, representing an average annual growth rate of approximately 2.9%. The growth trajectory experienced temporary disruptions during economic downturns, most notably in 2019 (0.3% decrease) and 2022 (0.5% decrease), with the latter reflecting demand-side adjustments following the global energy crisis but recovered strongly in subsequent years.[51]

Figure 3. Historical Electricity Demand by Year [52]



Türkiye's instantaneous peak electricity demand followed a clear upward trajectory between 2016 and 2025, reflecting structural demand growth and increasing cooling requirements. Peak demand rose from 44.3 GW in August 2016, it increased to 49.4 GW in August 2018, before stabilising around 49.1 GW in 2019 and 49.3 GW in 2020. A structural step-change occurred in 2021, when peak demand increased sharply to 55.6 GW on August 4, driven primarily by extreme summer temperatures and rising cooling demand. In 2022, peak demand declined temporarily to 51.4 GW due to milder weather conditions and demand-side adjustments following the global energy crisis. Demand growth resumed thereafter, reaching 54.0 GW in July 2023, rising further to 58.7 GW in July 2024, and setting a new all-time record of 59.5 GW in July 2025, as shown in Figure 4.[53]

Between 2016 and 2025, annual electricity consumption growth rates ranged from -0.5% to 8.8%, reflecting the sensitivity of demand to economic cycles, weather conditions, and external shocks. The strongest growth was recorded in 2021 (8.8%), driven by post-pandemic economic recovery and extreme summer tempera-

[51] MENR. (n.d.). Bilgi bankası – Elektrik. https://enerji.gov.tr/electricity-infobank

[52] EPİAŞ. (n.d.). Şeffaflık platformu [Transparency platform]. https://seffaflik.epias.com.tr/home

[53] Ibid.

tures. The year 2024 saw robust growth of 5.5%, reaching 353.6 TWh, followed by more moderate growth of 2.1% in 2025. Daily electricity demand also reached a new record on July 29, 2025, hitting 1,244 GWh, driven by increased cooling demand during hot summer months.[54]

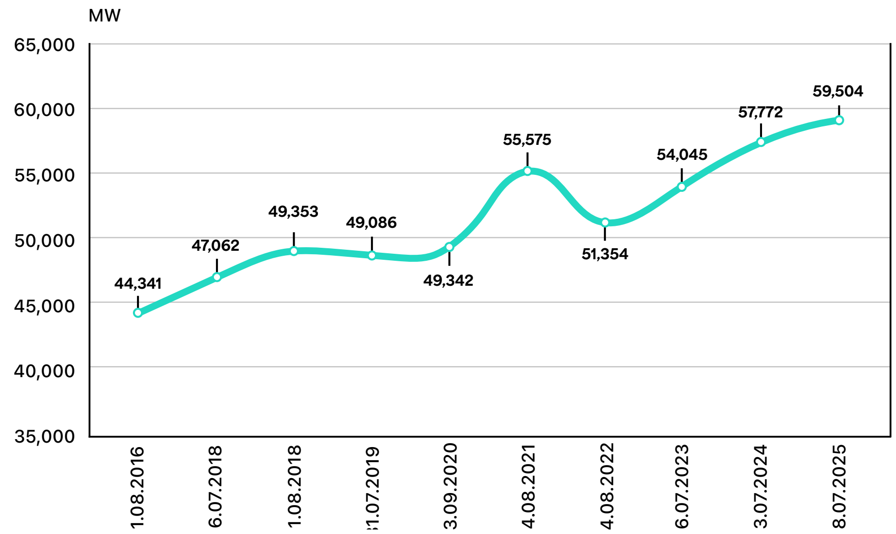
Despite this growth, per capita electricity consumption in Türkiye remains below Organisation for Economic Co-operation and Development (OECD) averages, standing at approximately 4.1 MWh compared to approximately 8.0 MWh for OECD member countries as of 2025.This gap indicates significant headroom for continued demand growth as the country's economy develops and living standards converge toward developed-market levels.

This consumption is not evenly distributed across economic sectors. Türkiye's electricity consumption is dominated by the industrial sector, which accounted for approximately 40% of total billed consumption in 2025.[56] Industrial demand encompasses energy-intensive sectors including mining, food and beverage processing, textiles, chemicals, metals manufacturing, and construction. The substantial share of industrial consumption has important implications for the corporate PPA market, as large industrial consumers represent a significant customer base for long-term renewable energy contracts. The household sector constitutes the second-largest consumer segment at approximately 27.1% of total billed demand, followed by commercial and services consumption at 25.9%. Agriculture and livestock farming account for a share of 4.8%, while lighting represents the smallest segment at approximately 2%.[57]

Beyond sectoral segmentation, demand exhibits strong geographic concentration in western regions, particularly in major metropolitan and industrial centres. Istanbul alone accounted for approximately 44.6 TWh of billed electricity consumption in 2025, representing roughly 15.5% of national billed demand. The broader Marmara region, which includes Istanbul, Kocaeli (Izmit industrial corridor), Bursa, and Tekirdağ, collectively represents approximately 34.7% of national billed electricity consumption.[58] From an investment perspective, this west-heavy demand concentration creates distinct opportunities. Western regions benefit from shorter transmission distances, lower grid losses, and proximity to end-users, making renewable projects in the Marmara and Aegean regions more attractive for corporate PPA offtake and merchant revenue models. However, eastern regions offer superior renewable resource quality (particularly for hydropower and wind) and may access capacity mechanism revenues or regional incentives, requiring investors to balance resource quality against grid access and offtake proximity. This geographic concentration also creates transmission challenges, as significant amounts of electricity must be transmitted from generation centres, particularly hydroelectric plants in the east and south, to demand centres in the west. Grid congestion in certain corridors can limit the ability of renewable projects to deliver power to high-value demand centres, affecting merchant revenue potential and project economics.

Looking forward, Türkiye's electricity demand growth trajectory is increasingly driven by structural factors that extend beyond traditional GDP-linked consumption. While economic expansion remains important, electricity demand is gradu-

Figure 4. Annual Peak Demand [55]



[54] Ibid.

[55] Ibid.

[56] EMRA. (2025, December). Electricity market sector report (December 2025). Energy Market Regulatory Authority. https://www.EMRA.gov.tr/Detay/Icerik/3-0-23/aylik-sektor-raporu

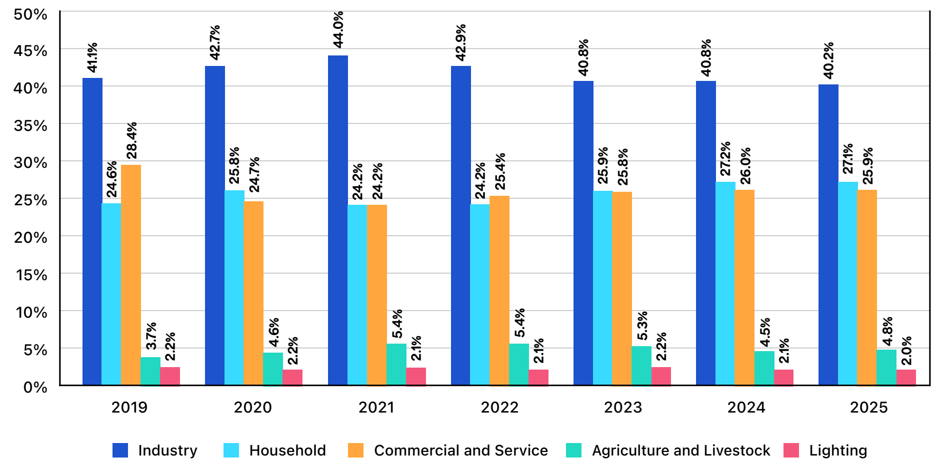
[57] Ibid.

[58] Ibid.

ally growing faster than overall energy consumption, reflecting a global trend observed by the International Energy Agency, and climate-related factors are reshaping demand patterns.[60] Industrial electricity consumption continues to expand, particularly in export-oriented sectors such as automotive, iron and steel, and manufacturing, supported by ongoing electrification, automation, and increased integration of renewable energy.

Electrification in transport and buildings represents an emerging source of demand growth, driven by rising electric vehicle adoption, expanding charging infrastructure, and gradual uptake of efficient electric heating and cooling technologies. Data centre development is also becoming an increasingly important demand segment, with data centres consuming approximately 645 GWh in 2024, predominantly in the Marmara region, reflecting Türkiye's position as a regional digital and financial hub.[61]

Figure 5. Electricity Consumption Share by Sector [59]



Climate-related cooling demand has become a major structural driver, with summer peak loads reaching record levels in recent years, highlighting the growing impact of temperature-sensitive electricity consumption.[62] In parallel, Türkiye's high urbanisation rate, exceeding 90% according to the Turkish Statistical Institute, continues to support steady growth in residential and commercial electricity consumption. Collectively, these structural drivers are strengthening the long-term growth outlook for electricity demand and reducing its sensitivity to short-term economic fluctuations improving long-term demand visibility and strengthening the investment case for new generation capacity, particularly renewable energy and flexibility assets.[63]

To meet this growing demand, Türkiye's installed electricity generation capacity has expanded rapidly over the past decade, driven predominantly by renewable energy investments. Total installed capacity reached 122.5 GW by the end of December 2025, up from approximately 78 GW in 2015. This represents a compound annual growth rate (CAGR) of approximately 4.6%, outpacing demand growth and strengthening overall system adequacy and supply security while supporting continued demand growth.[64] In 2025 alone, Türkiye added 6.2 GW of net new capacity, with renewable energy accounting for 99% of these additions. Solar power led capacity expansion with 4.9 GW of new installations, followed by wind power at 1.9 GW. In contrast, natural gas-based capacity declined by 758 MW, reflecting the retirement of older gas plants and limited new thermal capacity development.[65] Renewable energy sources collectively account for 76.3 GW, representing 62.3% of total installed capacity. This marks a significant transformation from a decade ago when fossil fuels dominated the capacity mix. The combined installed capacity of solar and wind reached 39.9 GW (32.6% of total), positioning Türkiye as having achieved approximately one-third of its 2035 target of 120 GW of combined solar and wind capacity.[66]

This capacity expansion has translated into substantial electricity generation growth, though the generation mix differs significantly from the capacity mix due to varying capacity factors across technologies. Electricity generation in Türkiye has grown in line with capacity expansion and demand increases. Gross electricity generation reached approximately 363 TWh in 2025, up 3.9% from 349.5 TWh in 2024. However, 2025

[59] MENR. (2025, November 17). 2024 yılı Ulusal Enerji Denge Tabloları [2024 National Energy Balance Tables]. https://enerji.gov.tr/duyuru-detay?id=30578

[60] IEA (2026), Electricity 2026, IEA, Paris https://www.iea.org/reports/electricity-2026

[61] TÜİK. (2025, November 7). Hizmet - Ticaret Sektörü Nihai Enerji Tüketim Araştırması. https://veriportali.tuik.gov.tr/tr/press/54136

[62] TÜİK. (2026, February 9). Adrese dayalı nüfus kayıt sistemi sonuçları, 2025 [Address-based population registration system results, 2025] Haber Bülteni No. 53899). https://veriportali.tuik.gov.tr/tr/press/53899

[63] Mendiluce, M. (2026, February 9). New IEA data on electricity demand: What CEOs and investors need to know. Forbes. https://www.forbes.com/sites/mariamendiluce/2026/02/09/new-iea-data-on-electricity-demandwhat-ceos-and-investors-need-to-know/

[64] MENR. (n.d.-a). Bilgi bankası – Elektrik. https://enerji.gov.tr/electricity-infobank

[65] TEİAŞ (Turkish Electricity Transmission Corporation). (2025, December 31). Kuruluş ve Kaynaklara Göre Kurulu Güç Raporu [Installed capacity by institution and source]. Genel Günlük İşletme Neticesi. Yük Tevzi Bilgi Sistemi (YTBS)

[66] Daily Sabah. (2026, January 22). Türkiye achieves one-third of 2035 solar, wind capacity target. Daily Sabah. https://www.dailysabah.com/business/energy/turkiye-achieves-one-third-of-2035-solar-wind-capacity-target

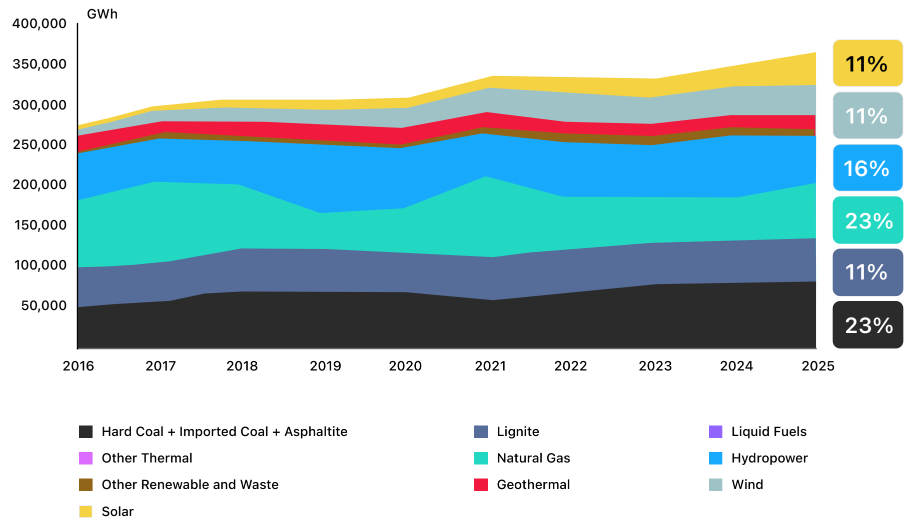
was marked by severe drought conditions that significantly impacted hydropower generation, which declined 23.3% year-over-year to 57.4 TWh. This deficit was compensated primarily by increased natural gas generation, which rose 26.2% to 83.3 TWh. Türkiye maintains a small surplus between generation and consumption, with modest net exports. In 2025, the country exported 4.1 TWh while importing 2.0 TWh, resulting in net exports of 2.1 TWh, reflecting Türkiye's geographic position as an energy bridge between Europe, Asia, and the Middle East.[67]

Despite representing 62.3% of installed capacity, renewables contributed approximately 43.3% of total electricity generation in 2025, declining from 45.8% in 2024, primarily due to lower hydropower output caused by drought conditions.[67,68] Within the renewable portfolio, variable renewable energy (VRE) sources such as wind and solar, increased their share from 18.2% to 21.4% of total generation, driven by a 45% surge in solar output to 38.1 TWh, nearly matching wind generation (39.4 TWh) for the first time. This rapid VRE expansion highlights both the success of Türkiye's renewable energy policies and the growing need for grid flexibility solutions to manage intermittency. Looking ahead, the government expects the first unit of the Akkuyu nuclear power plant to come online in 2026, adding 1.2 GW of baseload capacity and contributing to long-term supply diversification and energy security.[69]

The share of domestic energy sources in electricity generation declined slightly in 2025 as drought-related hydropower shortfalls required increased natural gas imports. Hydropower generation exhibits significant year-to-year variability depending on precipitation patterns. While hydropower accounts for 26.4% of installed capacity, its generation share in 2025 was approximately 15.9%, down from 21.5% in 2024.[70] Domestic sources (including hydropower, wind, solar, geothermal, and domestic coal) accounted for approximately 55.7% of total generation in 2025, down from 59.4% in 2024, while imported fuels (natural gas, imported coal, and fuel oil) represented 44.3%.[71] However, this trend is expected to partially reverse as domestic gas production from the Sakarya Field in the Black Sea ramps up toward its full capacity in 2026-2027, reducing import dependency.[72] Also, the decline in hydropower output in 2025 was partially offset by increased wind, solar, and geothermal generation. As Türkiye continues to add variable renewable capacity, managing the intermittency of both hydropower (due to seasonal and multi-year precipitation cycles) and wind/solar (due to daily and seasonal patterns) will require investment in grid flexibility solutions including energy storage, demand response, and regional interconnections.[73]

Türkiye's electricity system has experienced tightening reserve margins in recent years, particularly during peak summer demand periods. While headline reserve margins based on total installed capacity remain high, effective reserve margins, accounting for the availability of dispatchable capacity during peak demand hours, are structurally lower due to the variability of hydropower, wind, and solar generation. System-wide peak instantaneous demand reached a new record of 59,504 MW in 2025, up from 58,712 MW in 2024 , reflecting sustained underlying demand growth.[74] While total installed capacity reached 122.5 GW by year-end 2025,

Figure 6. Electricity Generation Breakdown by Source



[67] Ibid.

[68] Enerdata. (2026, January 22). Türkiye reached 1/3 of its 2035 solar and wind capacity target in 2025. Enerdata Daily Energy News. https://www.enerdata.net/publications/daily-energy-news/turkiye-reached-one-third-its-2035-solar-and-wind-capacity-target-2025.html

[69] Ibid.

[70] EMRA. (2025, December). Electricity market sector report (December 2025). Energy Market Regulatory Authority. https://www.EMRA.gov.tr/Detay/Icerik/3-0-23/aylik-sektor-raporu

[71] EMRA. (2025, December). Electricity market sector report (December 2025). Energy Market Regulatory Authority. https://www.EMRA.gov.tr/Detay/Icerik/3-0-23/aylik-sektor-raporu

[72] AA. (2026, January 15). Bakan Bayraktar: 2026'da Karadeniz'deki Sakarya Gaz Sahası'ndaki üretimimiz 2 katına çıkacak. https://www.aa.com.tr/tr/ekonomi/bakan-bayraktar-2026da-karadenizdeki-sakarya-gaz-sahasindaki-uretimimiz-2-katina-cikacak/3800410

[73] SolarQuarter. (2026, January 22). Türkiye's power capacity hits 122 GW in 2025 as renewables reach 62% – SHURA reports. SolarQuarter. https://solarquarter.com/2026/01/22/Türkiyes-power-capacity-hits-122-gw-in-2025-as-renewables-reach-62-shura-reports/

[74] Ibid.

effective available capacity during peak demand periods is significantly lower due to maintenance schedules, hydrological variability, and the intermittent nature of wind and solar generation. Reserve margin estimates based on actual hourly available capacity data indicate materially tighter system conditions during peak stress periods than suggested by headline installed capacity figures alone.

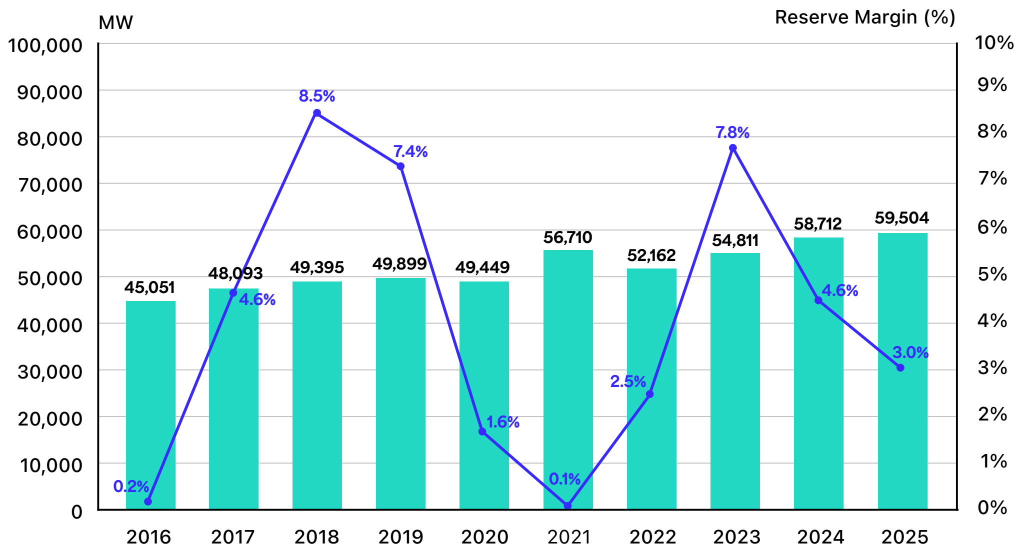
Reserve margins tightened significantly during peak demand periods in recent years, highlighting the increasing importance of system flexibility. While capacity additions, particularly in wind and solar, have improved overall supply adequacy, record daily demand of 1,244 GWh on July 29, 2025, demonstrated the system's continued exposure to extreme weather-driven demand spikes.

From an investment perspective, tightening effective reserve margins and increasing peak demand variability are strengthening the need for flexible and dispatchable capacity. This creates favourable market conditions for investment in grid flexibility solutions, including battery energy storage systems, demand response, and hybrid renewable-plus-storage projects. These assets are expected to play a critical role in maintaining system reliability while enabling continued renewable energy expansion.

The capacity mechanism, implemented within the Turkish electricity market framework and administered through the TEİAŞ settlement system, provides an additional revenue stream for dispatchable generation assets, particularly thermal and flexible resources. This mechanism improves revenue visibility, reduces market risk exposure, and supports long-term investment viability.

As renewable penetration continues to increase and demand growth remains structurally strong, system flexibility is expected to become an increasingly valuable asset class. This is likely to enhance investment opportunities in battery storage, hybrid renewable projects, and flexible generation, supported by improving market fundamentals, capacity remuneration mechanisms, and increasing price volatility during peak demand periods.

Figure 7. Historical Reserve Margins



1.4 Energy Targets

Türkiye's strategic approach to its energy and climate future is defined by a comprehensive transformation aimed at balancing economic growth with a radical reduction in carbon intensity, a vision centred on the 2053 Net Zero Emissions Target. This long-term commitment is supported by a series of foundational policy documents. These documents collectively outline a trajectory where the nation's electricity system becomes the primary engine for decarbonization, shifting from a fossil fuel-based architecture to one dominated by variable renewable energy, storage, and nuclear power. Türkiye's renewable energy installed capacity targets have been updated several times over the years. Türkiye's evolving renewable energy ambitions are reflected in a sequence of progressively higher official targets, as shown below.

- The 'National Renewable Energy Action Plan' published in December 2014 detailed the country's targets for renewable energy use between 2013 and 2023. The plan envisaged a significant increase in the installed capacity and generation of renewable resources such as wind, solar, and hydropower. The 2023 installed capacity targets for solar (5,000 MW), geothermal (1,000 MW), and biomass (1,000 MW) were exceeded in 2021, while the targets for hydropower (34,000 MW) and wind (20,000 MW) are yet to be reached.[75]

- Türkiye announced an updated renewable energy target in its Intended National Determined Contribution (INDC) submitted to the The United Nations Framework Convention on Climate Change (UNFCCC) on September 30, 2015. The document details the country's GHG mitigation commitment between 2020 and 2030. Türkiye's INDC includes targets to increase the installed capacity of solar energy to 10 GW and wind energy to 16 GW by 2030 and to utilise the country's full hydropower potential to reduce GHG emissions. The target set for solar energy was surpassed before the target year.[76]

- The installed capacity targets for various renewable energy sources were updated once again in 2020 as part of the "2019-2023 Strategic Plan" announced by the MENR.[77] The installed capacity targets set for 2023 for hydropower and wind energy have been almost reached by the end of the year, while the target for solar energy has been significantly exceeded.

- In 2021, the Green Deal Action Plan announced plans to commission 1,000 MW for wind and 1,000 MW for solar annually until the end of 2027.[78] Although the commissioned wind capacity gives the impression that the goal will not be fully achieved, the rapid increases in solar energy capacity in recent years point to a significant increase over the targeted capacity.

- All of these targets and plans were published before the ratification of the Paris Climate Change Agreement by the Turkish Parliament and the announcement of the 2053 net zero carbon target. The Türkiye National Energy Plan, a comprehensive modelling study to achieve the 2053 net zero carbon target, was published by the MENR at the end of 2022 and the Hydrogen Technologies Strategy and Roadmap was published at the beginning of 2023.[79]

These targets have evolved since 2014, consistently exceeding initial projections as shown in Table 2.

In the published National Energy Plan in 2022, the reference scenario values in the projection studies prepared by the Turkish Statistical Insti-

[75] T.C. Enerji ve Tabii Kaynaklar Bakanlığı. (2014). Türkiye Ulusal Yenilenebilir Enerji Eylem Planı.

[76] T.C. Çevre ve Şehircilik Bakanlığı. (2015). Türkiye'nin Birleşmiş Milletler İklim Değişikliği Çerçeve Sözleşmesi kapsamındaki Ulusal Katkı Niyet Beyanı (INDC).

[77] T.C. Enerji ve Tabii Kaynaklar Bakanlığı. (2019). Stratejik Plan 2019–2023.

[78] T.C. Ticaret Bakanlığı. (2021). Türkiye Yeşil Mutabakat Eylem Planı.

[79] T.C. Enerji ve Tabii Kaynaklar Bakanlığı. (2023). Türkiye Ulusal Enerji Planı (2020–2035).

Table 2 - Summary of Official Energy Targets in Türkiye

Target	2025 Actual	2028 Target Strategic Plan[80] (announced in November 2024)	2035 Target National Energy Plan[81] (announced in January 2023)	2035 Target Renewable Energy Roadmap[82] (announced in October 2024)	2053 Target National Energy Plan (announced in 2021)
Solar Installed Capacity (MW)	25,118	33,100	52,900	76,900	-
Wind Installed Capacity (MW)	14,774	19,300	29,600	43,100	-
Combined Wind+Solar Installed Capacity (MW)	39,892	52,400	82,500	120,000	-
Hydropower Installed Capacity (MW)	32,294	*Other renewable installed capacity totalling 38,963	35,100	-	-
Geothermal and Biomass Installed Capacity (MW)	3,879		5,100	-	-
Thermal Installed[83] Capacity (MW)	48,502	49,077	59,800	-	-
Renewable Installed Capacity (MW)[84]	76,065	91,363	122,700	-	-
Battery Installed Capacity (MW)	46	10,000	7,500	-	-
Electrolyser Installed Capacity (MW)	-	1,500	5,000	-	-
Nuclear Installed Capacity (MW)	-	4,800	7,200	-	-
Electricity Consumption (TWh)	360.90	-	510.50	-	1,271.40
Share of Renewable Energy in Total Generation (%)	43.30	50.00	54.80	-	69.10

[80] Ministry of Energy and Natural Resources. (2024). MENR 2024–2028 strategic plan. Available at: https://enerji.gov.tr/Media/Dizin/SGB/tr/Kurumsal_Politikalar/MENR_2024-2028_Stratejik_Plani.pdf

[81] Ministry of Energy and Natural Resources. (2023). Türkiye national energy plan. Available at: https://enerji.gov.tr/Media/Dizin/EIGM/tr/Raporlar/TUEP/T%C3%BCrkiye_National_Energy_Plan.pdf

[82] Ministry of Energy and Natural Resources. (2024). Renewable Energy 2035 roadmap launch presentation. Available at: https://enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular/Yenilenebilir%20Enerjide%202035%20Yol%20Haritas%C4%B1%20Lansman%20Sunumu_202410221014.pdf

[83] Thermal installed capacity covers fossil-fuel based power plants for electricity generation (coal/lignite, natural gas, other fossil fuels). Heat-only boilers and district heating capacities are excluded.

[84] Total Renewable = Wind + Solar + Hydro + Geothermal + Biomass installed capacity for electricity generation.

tute (TÜİK) between 2018 and 2080 were used for assumptions regarding population growth. Forecasts from the Presidency of Strategy and Budget were used for economic growth values, while the OECD estimates were used for sub-sector growth forecasts.

Türkiye's renewable energy targets have been updated with the Renewable Energy Roadmap 2035 (updated in October 2024), establishing a combined wind and solar target of 120 GW by 2035. This takes the place of the National Energy Plan 2022's[85] 82.5 GW combined target. Annual additions of 8-9 GW are needed to bridge this gap from today's 39.9 GW base.

The 2035 targets are as follows:

- Among intermittent renewable energy sources, solar energy is planned to reach 76.9 GW installed capacity in 2035, while wind energy is planned to reach 43.1 GW installed capacity, consisting of onshore and offshore wind.

- Other capacity targets remain aligned with the National Energy Plan 2022. Hydropower plants are planned to reach an installed capacity of 35.1 GW by 2035. Geothermal and biomass power plants are planned to reach a total of 5.1 GW.

- The increasing share of intermittent renewable energy sources in electricity generation is projected to lead to an increased need for flexibility in the system. Accordingly, the need to utilise tools to increase flexibility in the system such as electrolysers, battery storage technologies, and demand response measures are stressed under the document.

- By 2035, the battery storage capacity in the system is expected to reach 7.5 GW according to the National Energy Plan. However, this target appears to have been revised upward in subsequent policy documents. The Ministry's 2024-2028 Strategic Plan sets a more ambitious near-term objective, targeting cumulative battery storage capacity to increase to 10 GW by 2028 exceeding the 2035 projection.

- On the demand side, the capacity contributing to the system in terms of load reduction and load increase is projected to reach 1.7 GW by 2035.[86]

The plan provides limited details beyond 2035, but outlines 2053 energy mix projections from the National Energy Plan to achieve Türkiye's net zero emissions target:

- The share of electricity in final energy consumption is projected to increase by 33.8% to reach 55.6% in 2053.

- Electricity demand is projected to increase at an average annual rate of 3.5% in the 2020-2035 period, while it is estimated to increase at an average annual rate of 5.2% in the 2035-2053 period. In the post-2035 projections, it is considered that the share of electricity in final energy consumption will increase for Türkiye to achieve its zero-emission target for 2053.

- By 2053, the share of renewable energy sources in primary energy consumption is projected to reach 50%, while the share of nuclear energy is projected to reach 29.3%. Over the same period, the share of fossil resources is targeted to decline to 20.8%, with the share of coal falling to 3.6%, oil to 5.6% and natural gas to 11.7%.

- By 2053, the share of renewable energy sources in electricity generation is projected to increase from 42.4% to 69.1%, while the share of intermittent renewable energy sources will gradually increase from 11.7% to 61.4%. However, achieving these targets is dependent on overcoming a range of structural and operational challenges across the sector.

The transportation sector is undergoing a parallel revolution, driven by the increasing penetration of electric vehicles (EVs) as a core component of the energy transition. In April 2026, EMRA published a revised EV and Charging Infrastructure Projection, approved by Board Decision No. 14510 of 22 April 2026, which supersedes its 2024 projection. Actual EV deployment has already outpaced the prior projection: Türkiye's EV stock reached 411,796 by end-March 2026 and 440,327 by end-May 2026, both above the 2024 high-scenario forecast of 361,893 for 2025. Under the revised medium scenario, the EV stock is now projected to reach approximately 2.3 million by 2030 and 5.6 million by 2035, roughly double the 2024 medium-scenario figures of 1.3 million and 3.3 million. Charging point requirements have been revised down for the same horizon, with the medium scenario now anticipating approximately 127,000 points by 2030 and 199,000 by 2035, reflecting a continued shift toward higher-capacity DC fast-charging infrastructure rather than a proportional expansion in charging point count. EMRA estimates that even under the high scenario, EV-related electricity consumption will represent only around 2% of total electricity consumption by 2030 and 4% by 2035, limiting near-term system-wide security-of-supply risk, though localised distribution network reinforcement may be needed in areas of concentrated fast-charging demand. Table 3 and Table 4 present the EV projections published by EMRA.[87]

[85] MENR. Türkiye National Energy Plan 2022. MENR, 2022. Available at: https://enerji.gov.tr/Media/Dizin/EIGM/tr/Raporlar/TUEP/Türkiye_National_Energy_Plan.pdf

[86] Ibid.

[87] EMRA. (2026). Electric Vehicle and Charging Infrastructure Projection Report (April 2026 edition). Retrieved from: https://solarbaba.com/wp-content/uploads/pdf-epdk-sarj-2026-nisan.pdf

Table 3 - EV Projections- Number of EVs

Year	Low Scenario	Medium Scenario	High Scenario
2030	1,318,043	2,295,927	2,768,970
2035	2,773,899	5,629,051	7,024,525
2040	4,976,259	10,595,970	13,068,521

Table 4 - EV Projections- Charging Point (Socket) Projection

Year	Number of Charging Points (AC)			Number of Charging Points (DC)			Number of Charging Points (Total)		
	Low Scenario	Medium Scenario	High Scenario	Low Scenario	Medium Scenario	High Scenario	Low Scenario	Medium Scenario	High Scenario
2030	42,724	74,422	89,756	30,213	52,629	63,473	72,937	127,051	153,229
2035	54,226	110,041	137,321	43,923	89,133	111,229	98,149	199,174	248,550
2040	78,277	166,676	205,570	75,789	161,378	199,035	154,066	328,054	404,605

Financially, these overall targets represent a call for unprecedented investment in the Turkish energy sector. The 2035 Roadmap for Renewable Energy alone requires billions of USD in capital expenditure, which the government intends to attract through competitive auction mechanisms and the newly established TR ETS. The TR ETS, formalised under the Climate Law, is expected to provide the necessary price signals to shift investment away from high carbon assets. TR ETS will focus on the most energy intensive sectors, including power generation, to ensure that the cost of carbon is internalized in the electricity price, thereby making renewable projects even more competitive relative to fossil fuels.

In conclusion, Türkiye's energy and climate targets for 2035 and 2053 represent a fundamental reimagining of the nation's economic structure. The shift from the 2024 baseline to the 2035 targets for wind and solar, the rapid build out of 10 GW of battery storage by 2028, and the projected surge in EV adoption are all interconnected components of a single strategy. While the targets are ambitious, the alignment between the 2035 Roadmap for Renewable Energy, the 2024-2028 Strategic Plan, and the Long-Term Climate Strategy provides a clear and determined path forward. As Türkiye prepares to host Conference of Parties 31 (COP31) and implements its NDC 3.0, the focus remains on execution, grid modernisation, and the mobilisation of finance to ensure that the 120 GW renewable target becomes the cornerstone of a sustainable and prosperous 2053.

1.5 Electricity Prices & Price Formation

Türkiye's wholesale electricity prices are primarily determined through the day-ahead market operated by EPİAŞ, where generators and suppliers submit hourly bids reflecting their marginal production costs. The resulting market clearing price, known as the DAMP, serves as the primary reference price for the Turkish electricity market and underpins merchant revenues, bilateral contracts, and investment decisions. Under this framework, power plants with lower marginal costs (i.e. renewable energy, run-of-river hydro, and coal-fired plants) are dispatched first, while higher-cost plants, particularly combined cycle gas turbines (CCGTs), are dispatched last and therefore frequently set the market clearing price.

The Turkish electricity market operates under a marginal pricing framework, where the price in each hour is set by the most expensive generation unit required to meet demand. As a result, electricity prices are strongly influenced by the variable cost of marginal thermal generation, particularly natural gas-fired power plants. This structure creates a direct link between electricity prices and fuel costs, hydrological conditions, renewable generation output, and demand variability. Over the past decade, Türkiye's electricity price dynamics have evolved significantly, reflecting rising renewable penetration, fuel price volatility, currency movements, and structural demand growth. While renewable energy has exerted downward pressure on average wholesale prices, it has also increased intra-day and seasonal price volatility by introducing intermittency into the generation mix. This has strengthened the investment case for flexible generation and energy storage assets, which benefit from increasing price spreads and balancing requirements. Understanding historical price evolution and the structural drivers of price formation is critical for assessing merchant revenue potential, project bankability, and long-term investment attractiveness in Türkiye's electricity market.

In Türkiye's day-ahead electricity market, CCGT plants and peak reservoir hydropower units currently act as the main price-setting technologies. CCGTs typically have the highest short-run marginal costs among frequently dispatched units, while reservoir hydropower plants use their storage capability to concentrate generation in hours with the highest expected prices, despite having very low marginal costs. This reflects intertemporal optimisation behaviour, where hydro operators maximise water value rather than short-run marginal cost.

During off-peak hours with lower demand, the market-clearing price may occasionally be set by plants with lower marginal costs, such as imported coal or lignite-fired power plants. However, this has been relatively infrequent in recent years, as gas-fired units remain on the margin for a significant share of hours. Consequently, international natural gas prices and the exchange rate have a strong influence on wholesale electricity prices, via their impact on the offer curves of CCGT units.

The dominance of CCGTs as marginal plants is reinforced by the current capacity mix and investment pipeline. Most economically viable large reservoir hydropower projects have already been developed, and there are significant financing and permitting challenges for new coal or gas-fired capacity, limiting the addition of new mid-merit or peak thermal units (See Figure 8). This dynamic was further reinforced by the expiration of major BO and BOT contracts by 2020, following which several older and less efficient natural gas plants reduced utilisation

Figure 8. A Representative Current Market Merit Order (April 4, 2024, at 14:00)

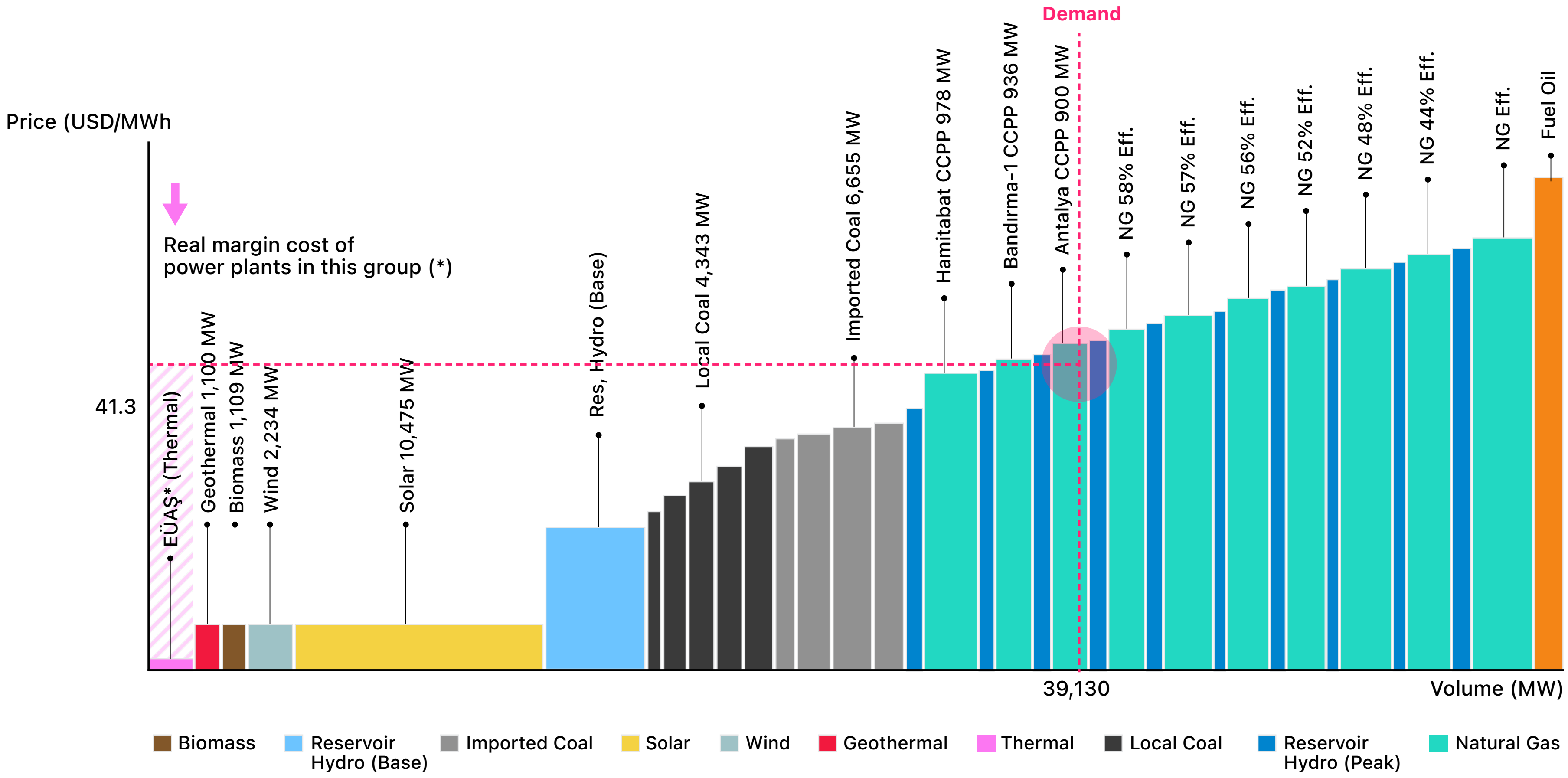
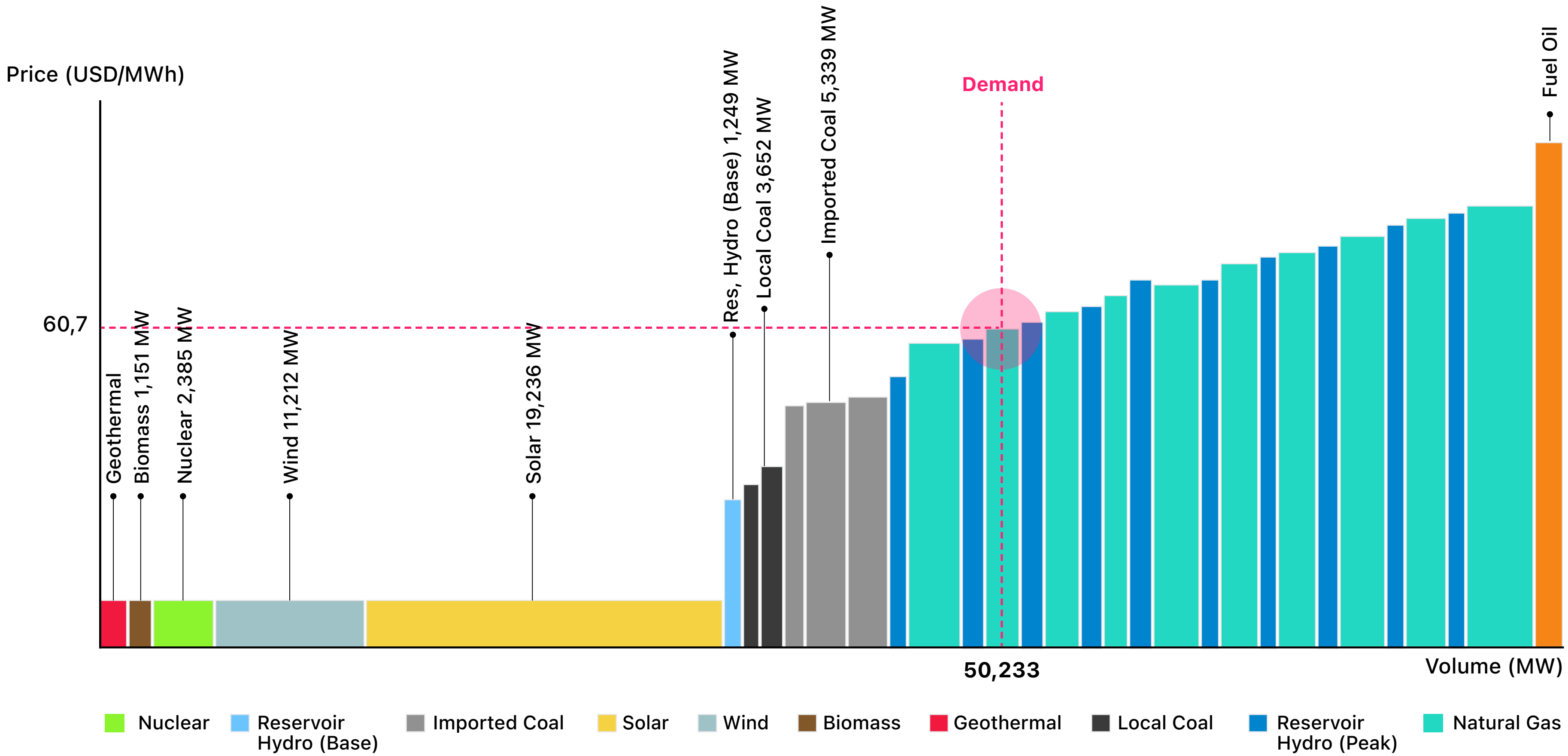


Figure 9. A Representative Future Market Merit Order (April 8, 2030, at 16:00)



rates or temporarily exited the market, tightening available flexible capacity and increasing the likelihood of gas-fired units setting the marginal price. In this context, structurally strong electricity demand implies that existing CCGT capacity will continue to play a critical balancing role, particularly during summer peaks and dry hydro years.

Looking ahead, the commissioning of the Akkuyu Nuclear Power Plant, with the first 1.2 GW unit expected in the second half of the 2020s, is likely to introduce a new low-marginal-cost baseload resource into the merit order. Nuclear generation will primarily displace mid-merit fossil units in off-peak and shoulder hours, reducing the number of hours in which CCGTs set the price. However, unless there is a substantial build-out of additional flexible generation or storage, gas-fired plants are still expected to remain the main price setters during peak hours and periods of low renewable output, meaning that natural gas will continue to be a key driver of wholesale price dynamics in Türkiye. The structural positioning of Akkuyu within the merit order is further shaped by its contractual framework Akkuyu Nuclear Power Plant benefits from a 15-year guaranteed purchase agreement covering 70% of output from the first two units and 30% from the remaining units at a fixed price of 123.5 USD/MWh, as established under the intergovernmental agreement ratified in 2010.[88] As a result, Akkuyu's generation is expected to consistently occupy the low-cost end of the supply curve, displacing mid-merit thermal units in off-peak and shoulder hours rather than providing flexible or price-responsive output.

Reservoir-based hydropower plants in Türkiye can be broadly grouped into base reservoir and peak reservoir units, depending on their operational and bidding strategies. Base reservoir plants are often dispatched largely independently of market price signals, due to irrigation requirements, cross-border flow obligations, flood-control needs and, in some cases, directives from the DSİ or EÜAŞ aimed at moderating market prices. State-owned power plants operated by EÜAŞ have in some cases been dispatched independently of strict marginal cost considerations, contributing to increased supply during certain periods, which may have exerted downward pressure on market prices. In this way, EÜAŞ-operated reservoir hydro assets have at times functioned as an implicit price moderation mechanism, effectively acting as a soft ceiling on peak wholesale prices. In contrast, privately owned reservoir hydro plants typically seek to maximise profits by shifting generation towards high-price hours, reinforcing their role as peak and shoulder resources in the merit order.

Figure 9 illustrates a representative future merit order incorporating the expected changes to Türkiye's generation mix over the medium term. The most significant structural shift relative to the 2024 snapshot is the entry of Akkuyu Nuclear Power Plant, whose first 1.2 GW unit is expected to be commissioned in the second half of the 2020s. As a low-variable-cost baseload asset operating under a 15-year offtake agreement at 123.5 USD/MWh, Akkuyu will consistently occupy the left-hand end of the supply curve alongside other must-run and low-cost resources, irrespective of prevailing market prices. This expands the low-cost baseload segment of the merit order and pushes coal and natural gas units further to the right, reducing the number of hours in which gas-fired plants set the marginal price. The continued expansion of solar and wind capacity will further reshape the intraday merit order, suppress midday prices while preserve or widening peak-hour spreads during evening demand ramps when solar output declines. Taking together, these structural shifts point toward a market with lower average wholesale prices in off-peak periods, higher intraday price volatility, and a sustained role for flexible generation and storage as the primary providers of residual peak and balancing capacity.

Figure 10 shows the evolution of the DAMP in USD/MWh alongside the USD/TRY exchange rate over the period from July 2009 to December 2025. Expressing electricity prices in USD terms allows for a clearer assessment of real price dynamics by removing the direct effect of domestic currency depreciation. Between 2009 and 2016, DAMP prices in USD terms exhibited a gradual downward trend, declining from levels around 90-100 USD/MWh to approximately 40-50 USD/MWh. This decline was primarily driven by falling global fuel prices, particularly natural gas, and the increasing penetration of renewable energy sources such as hydro and wind, which reduced marginal generation costs. During this period, although the Turkish lira depreciated gradually, the decline in underlying generation costs offset exchange rate effects when expressed in USD terms.

From 2017 to 2020, USD-denominated electricity prices remained relatively stable, fluctuating within a narrow range of 40-60 USD/MWh. This stability reflects a relatively balanced underlying cost structure despite ongoing currency depreciation, with the merit order remaining dominated by natural gas, coal, and increasing renewable generation. An important structural change during this period was the 2018 adjustment of Petroleum Pipeline Corporation (BOTAŞ) natural gas tariffs for electricity generators, which moved from a partially subsidised structure toward cost-reflective pricing. This reform strengthened the linkage between global natural gas prices and domestic wholesale elec-

[88] Republic of Türkiye. (2010, October 6). Agreement between the Government of the Republic of Türkiye and the Government of the Russian Federation on cooperation in relation to the construction and operation of a nuclear power plant at the Akkuyu site in the Republic of Türkiye (Official Gazette No. 27721, Decision No. 2010/918). https://www.resmigazete.gov.tr/eskiler/2010/10/20101006-6.html

tricity prices, increasing the market's sensitivity to international fuel price fluctuations from this point onward.

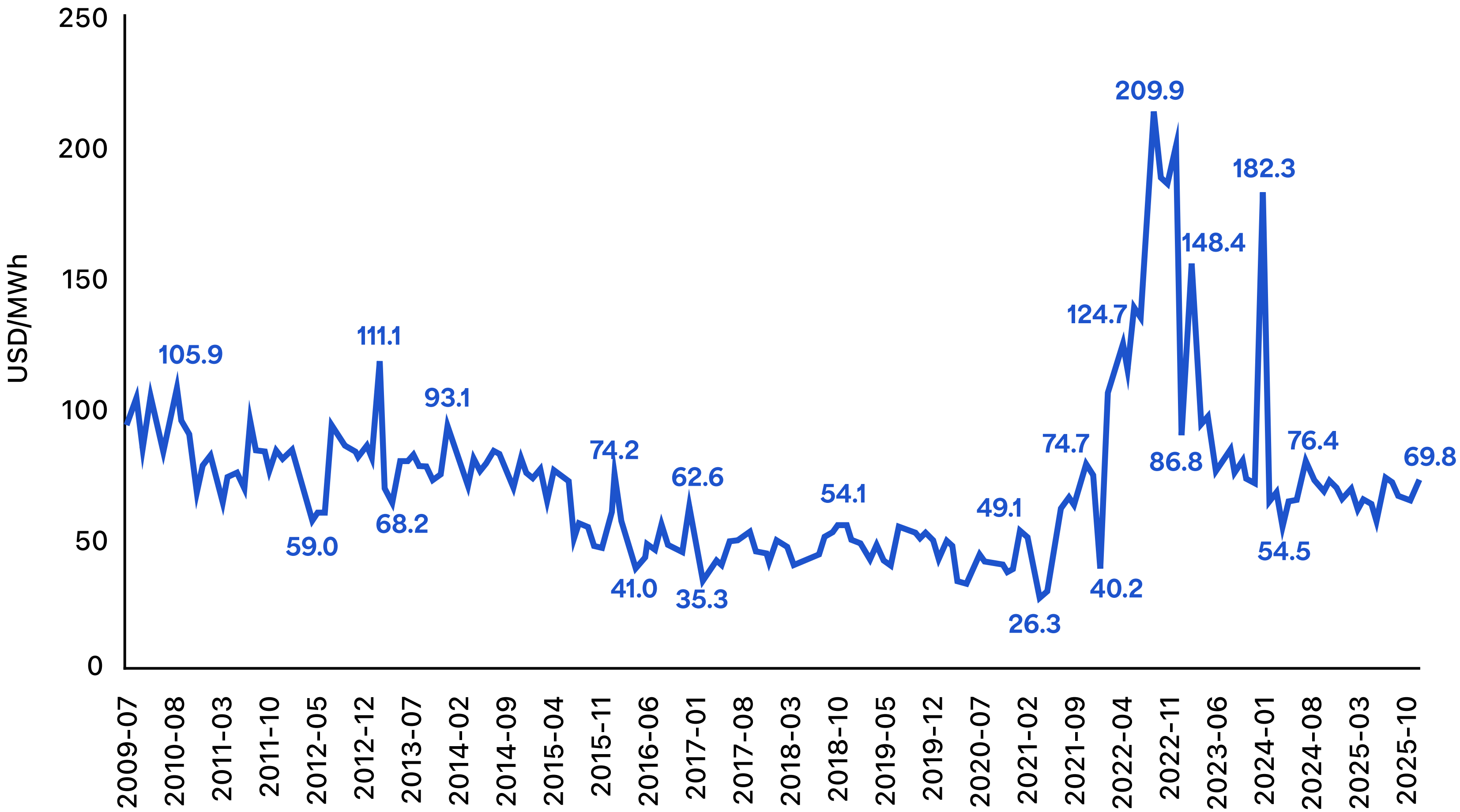
A notable deviation from these fundamentals occurred in the first half of 2019, when USD-denominated DAMP prices fell well below the levels implied by underlying fuel costs. This period was characterised by unusually high hydropower capacity factors and a surge in generation from state-owned power plants, coinciding with increased generation from state-owned hydropower plants and unusually favourable hydrological conditions. As a result, additional low-marginal-cost supply was pushed into the market, temporarily depressing wholesale prices and highlighting the role that state-owned assets and policy decisions can play in short-term price formation beyond pure cost fundamentals.

A significant structural break occurred beginning in late 2021 and continuing through 2022. During this period, DAMP prices in USD terms increased sharply, peaking above 200 USD/MWh in 2022. This increase was primarily driven by the global energy crisis, characterised by unprecedented increases in natural gas and coal prices following the COVID-19 recovery and the Russia–Ukraine war. Since natural gas-fired power plants frequently set the marginal price in the Turkish electricity market, increases in gas prices had a direct and amplified impact on electricity prices. Importantly, the simultaneous sharp depreciation of the Turkish lira further exacerbated price increases in local currency terms, although even in USD terms, prices rose substantially, reflecting a genuine increase in real generation costs rather than purely currency effects.

Following this peak, USD-denominated prices declined significantly throughout 2023 and stabilised in the range of 60-80 USD/MWh during 2024 and 2025. This normalisation was driven by easing global fuel prices, improved supply security, increased renewable generation capacity, and adjustments in market expectations. Despite the continued depreciation of the Turkish lira, USD-based electricity prices returned closer to historical averages, indicating that the extreme price levels observed in 2022 were largely driven by temporary global energy market disruptions. The sharp price spike during the 2021-2022 global energy crisis, followed by a rapid normalisation in 2023-2025, also underlines the strong pass-through from international fuel prices and exchange rate movements to Turkish wholesale electricity prices. However, the fact that prices did not return to pre-2019 lows despite the easing of commodity prices reflects structural changes in the market, including higher dependence on imported fuels, increased peak demand, and the growing share of variable renewables, all of which contribute to a higher and more volatile long-term price floor.

Overall, the comparison between USD-denominated electricity prices and the exchange rate highlights two key dynamics. First, exchange rate depreciation amplifies electricity prices in local currency terms but does not fully explain price spikes observed during crisis periods. Second, real electricity price dynamics in Türkiye are primarily driven by global fuel prices, particularly natural gas, as well as structural changes in the generation mix and renewable energy penetration. Institutional factors including state ownership of hydropower assets, regulatory interventions, contractual transitions, and natural gas pricing policies. These play a critical role in shaping the final market outcome alongside these cost fundamentals. This confirms the strong linkage between Türkiye's electricity market and global energy commodity markets and underscores the importance of fuel price risk management and revenue diversification for investors operating in the Turkish power sector.

Figure 10. Evolution of DAMP in USD Terms



RENEWABLE ENERGY AND BATTERY MARKET

2.1 Current State of the Market & Technical Potential for Different Technologies

Türkiye's energy system has transformed significantly over the past two decades, driven by rapid demand growth, import dependency, and decarbonisation pressures. Strong increases in industrial activity, urbanisation, and electrification have positioned energy policy at the core of national development priorities, balancing security of supply, affordability, and sustainability. Limited domestic fossil fuel resources, combined with high reliance on imported hydrocarbons, have heightened macroeconomic vulnerabilities and price exposure. In response, policy has increasingly prioritised the development of indigenous and renewable energy sources, aligning energy security objectives with the transition toward a more sustainable energy mix.

Within this framework, renewable energy technologies occupy a structurally expanding role in Türkiye's power sector. Hydropower has traditionally constituted the backbone of domestic renewable generation, benefiting from favourable hydrological conditions and early infrastructure development. Wind and solar technologies, however, have emerged as the primary drivers of recent capacity additions, largely due to declining global technology costs, modular deployment characteristics, and supportive regulatory mechanisms. The diversification of the renewable portfolio has therefore become both a technical and economic phenomenon rather than solely a policy-driven outcome.

Wind energy represents one of the most extensively studied components of Türkiye's renewable resource base. The formalisation of national wind assessments through the Wind Energy Potential Atlas (REPA) established a systematic analytical foundation for understanding spatial resource distribution. Therefore, according to REPA, Türkiye has a substantial offshore wind potential and has attracted increasing attention, especially in the Aegean and Marmara regions, where stronger and more stable wind profiles offer long-term development prospects.[89]

Figure 11 illustrates the spatial distribution of wind energy capacity factors across Türkiye, highlighting pronounced regional differences. Higher capacity factors are concentrated primarily along the Aegean and Marmara coastlines, as well as in selected parts of southeastern Türkiye, indicating areas with stronger and more consistent wind regimes. In contrast, much of the inland and eastern regions display lower capacity factors, reflecting weaker or more variable wind conditions. Therefore, this distribution suggests that coastal regions offer more favourable conditions for wind power development, with improved generation efficiency and stronger project economics. Türkiye's coastal waters exhibit meaningful offshore wind resources that have yet to be fully developed. Strategic assessments and international roadmaps estimate a technical offshore wind potential in the tens of gigawatts range (with figures around 27 GW by 2050 under high-growth scenarios), supporting policy targets to install several gigawatts of offshore wind capacity by 2035. Floating wind technology is expected to play a prominent role given the deeper waters along much of Türkiye's continental shelf.[91]

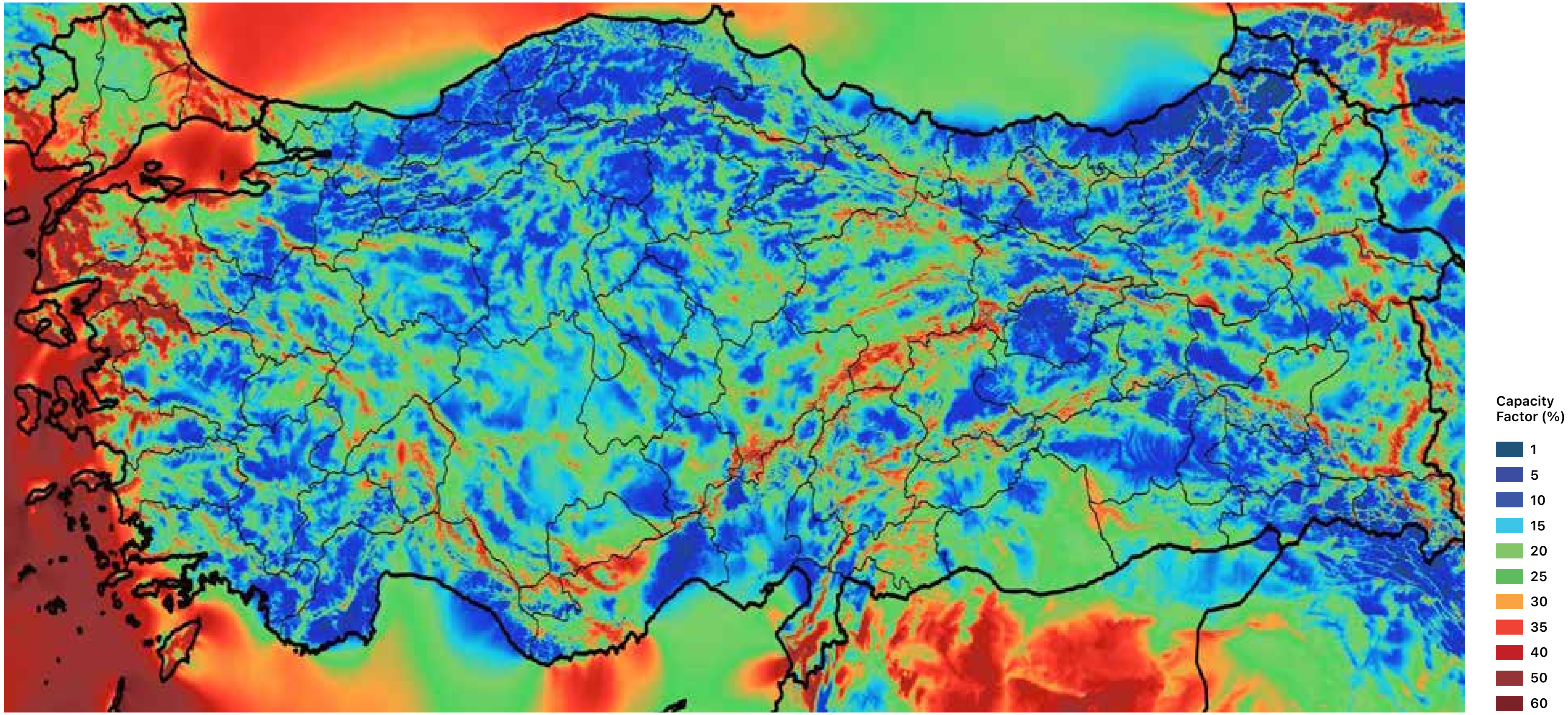
Lower capacity factor zones, while not unsuitable, may require more careful site selection, higher-performance turbine technologies, or supportive policy mechanisms to achieve comparable viability.[92]

[89] REPA (n.d.). https://repa.enerji.gov.tr/REPA/bolgeler/TURKIYE-GENELI.pdf

[91] AA. (2025b). Türkiye has potential for 27 GW of offshore wind by 2050, World Bank says. Aa.com.tr. https://www.aa.com.tr/en/energy/wind/turkiye-has-potential-for-27-gw-of-offshore-wind-by-2050-world-bank-says

[92] Ministry of Energy and Natural Resources. (2024). Republic of Türkiye Ministry of Energy and Natural Resources - Wind. Enerji.gov.tr. https://enerji.gov.tr/bilgi-merkezi-enerji-ruzgaren

Figure 11. Wind Energy Capacity Factor Distribution [90]



[90] REPA (n.d.). https://repa.enerji.gov.tr/REPA/bolgeler/TURKIYE-GENELI.pdf

Solar energy constitutes another strategically significant pillar of Türkiye's renewable transition. The country's geographic location affords relatively high solar irradiation levels compared to many European markets, generating favourable conditions for photovoltaic deployment. The rapid expansion of both licensed and unlicensed solar installations reflects the technology's scalability, declining capital costs, and compatibility with distributed generation models. Importantly, solar generation characteristics align closely with Türkiye's daytime demand patterns, particularly during summer months when cooling loads dominate consumption profiles. This temporal complementarity enhances the system value of solar capacity beyond simple energy output metrics. Technological advancements, including higher-efficiency modules and improved inverter systems, continue to reinforce the economic competitiveness of solar investments.

Figure 12 depicts the geographical distribution of solar irradiation across Türkiye, revealing a clear north-south gradient. The highest irradiation levels are concentrated in the southern and southeastern regions, where solar resources are strongest and most stable. Central Anatolia exhibits moderate values, while the Black Sea region shows comparatively lower irradiation due to higher cloud cover and less favourable climatic conditions. These spatial patterns align with Türkiye's geographical latitude and underpin the strong solar resource base available for photovoltaic deployment.

Beyond utility-scale ground-mounted solar, Türkiye's solar potential extends significantly into distributed and innovative deployment models:

Rooftop Solar: Recent assessments indicate that Türkiye possesses substantial technical potential for rooftop photovoltaic (PV) deployment across residential, commercial, and industrial buildings. The available roof surface area suggests that rooftop PV could accommodate a significant level of additional installed capacity, representing a meaningful share of the country's overall solar expansion potential. While precise estimates vary across studies depending on methodology and assumptions, the overall conclusion is consistent: rooftop systems constitute an important untapped resource. Expanding distributed PV on rooftops would not only increase renewable generation but also reduce transmission and distribution losses, alleviate grid congestion in urban areas, and enhance local energy resilience by bringing generation closer to consumption points.[93]

Floating Solar Power Plants: Floating PV installations on existing water bodies particularly reservoirs associated with hydroelectric infrastructure which offer a promising avenue to utilise unused water surfaces while reducing land requirements. Studies suggest floating solar potential is large, with estimates indicating tens of gigawatts could be deployed on state-owned reservoirs, potentially exceeding 50 GW in theoretical capability, thereby supporting both hydropower efficiency and incremental renewable generation.[94]

Geothermal energy holds a distinctive position within Türkiye's renewable energy portfolio due to its favourable geological conditions and dispatchable generation characteristics. The country hosts approximately 1,000 geothermal resources, predominantly concentrated in Western Anatolia (around 78%), followed by Central Anatolia (9%), the Marmara Region (7%), and Eastern Anatolia (5%), a distribution that has shaped investment patterns and project development. Around 90% of these resources are low- to medium-temperature systems suitable for direct-use applications such as district heating, thermal tourism, and industrial processes, while only about 10% are appropriate for electricity generation. Following regulatory reforms in the mid-2000s, particularly the 2007 Law on Geothermal Resources and Natural Mineral Waters, private sector participation accelerated and installed geothermal power capacity reached approximately 1.7 GW. Türkiye's total geothermal heat potential is estimated at roughly 40,000 MWt, including district heating, greenhouse applications, thermal tourism, and other direct uses; however, the economically viable potential for electricity generation alone is estimated at around 4–4.5 GW. Despite this sizeable power-generation potential, overall utilisation remains limited, and industry projections suggest that only an additional 0.4–0.5 GW of new capacity is likely to be added by 2031, indicating relatively modest expansion compared to the country's resource base.[95,96]

Biomass generation's controllable output profile distinguishes it from wind and solar resources, enabling participation in ancillary service provision and system balancing functions. Biomass energy, although comparatively smaller in installed capacity, provides additional diversification benefits within the renewable mix. In Türkiye's context, biomass utilisation also intersects with waste management policies, agricultural residue valuation, and rural development considerations. Despite slower growth rates relative to other renewable technologies, biomass retains structural importance due to its flexibility and potential contribution to circular economy objectives.[97]

The expansion of renewable energy technologies in Türkiye must be interpreted within the broader evolution of market design and policy mech-

[93] EMBER. (2025, March 13). Türkiye's roof solar potential is ten times its current capacity | Ember. Ember. https://ember-energy.org/latest-updates/turkiyes-roof-solar-potential-is-ten-times-its-current-capacity

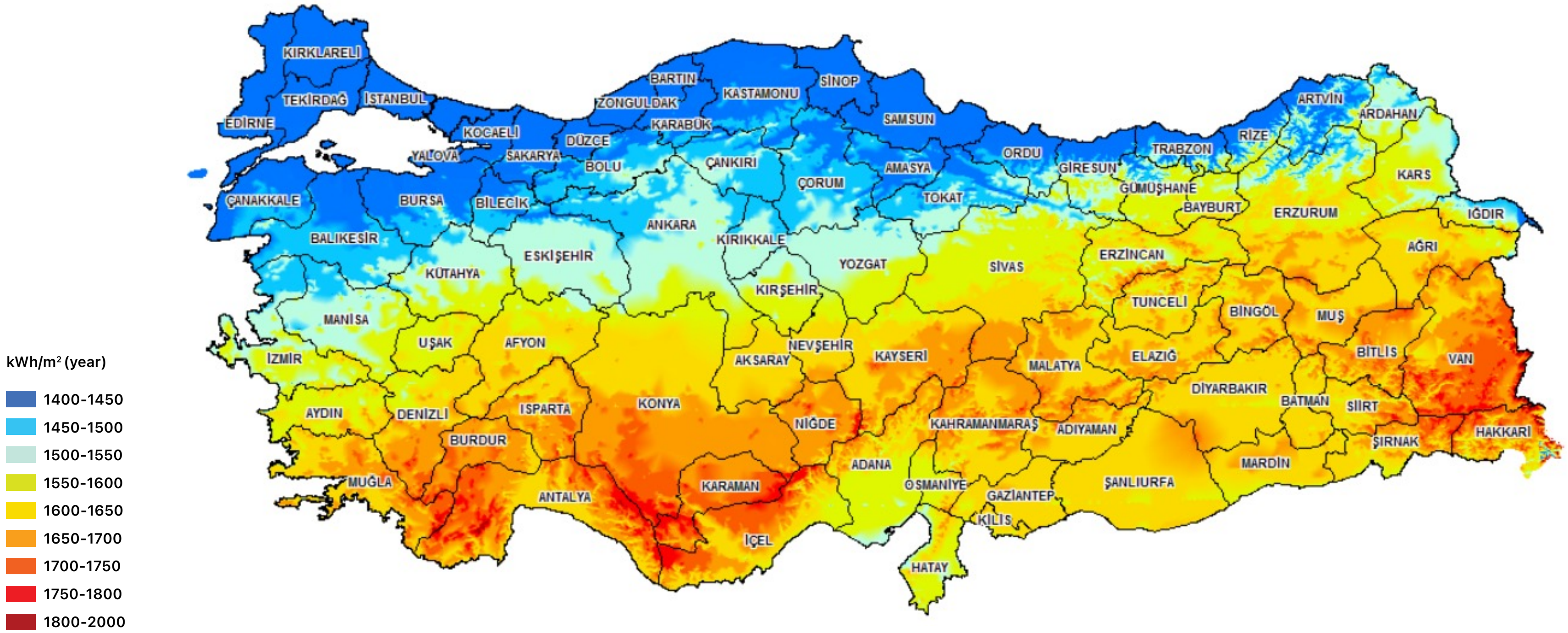
[94] AA. (2023). Türkiye's solar power integrated with hybrid plants outperforms wind in 2023. Aa.com.tr. https://www.aa.com.tr/en/energy/hydro/turkiye-s-solar-power-integrated-with-hybrid-plants-outperforms-wind-in-2023/40775

[95] Jeotermal Enerji Derneği (JED). (2025, January). E-bülten, sayı 5 [E-bulletin, issue 5]. Available at: https://jeotermalenerjidernegi.org.tr/public/pdf/84893221.pdf

[96] Enerji Haberleri I Enerji Günlüğü. (2023, February 2). Jeotermal santrallerinden elektrik iletim bedelinde adalet talebi. Enerji Günlüğü. https://www.enerjigunlugu.net/jeotermal-santrallerindenelektrik-iletim-bedelinde-adalet-talebi-52716h.htm

[97] Ministry of Energy and Natural Resources. (2024b). Republic of Türkiye Ministry of Energy and Natural Resources - Biomass. Enerji.gov.tr. https://enerji.gov.tr/bilgi-merkezi-enerji-biyokutle-en

Figure 12. Total Solar Irradiation Map of Türkiye



anisms. Support schemes, auction models, and localisation incentives have collectively shaped investment dynamics, while liberalisation reforms have progressively increased private sector participation. As renewable penetration rises, however, integration challenges related to variability, network constraints, and price formation mechanisms become increasingly relevant. The interaction between variable renewable energy sources and dispatchable generation assets will therefore remain a defining feature of Türkiye's electricity market trajectory.

Türkiye's renewable energy potential reflects a convergence of resource availability, technological progress, and strategic policy orientation. While theoretical potential estimates provide useful planning benchmarks, realised deployment depends fundamentally on economic conditions, grid integration capabilities, financing environments, and regulatory stability. The ongoing evolution of technology costs and performance characteristics suggests that renewable energy will continue to strengthen its structural position within Türkiye's energy system, reinforcing both decarbonisation pathways and energy security objectives.

2.2 Renewable Energy Investment Models

2.2.1 YEKDEM

In order to reach the renewable energy installed capacity targets specified under the latest strategy documents, the feasibilities under different investment models available to investors will be crucial. Under the current circumstances, existing and potential renewable energy investments in the country can be categorised into two main groups: licensed and unlicensed applications. Licensed applications include larger-scale projects that have been implemented under the YEKDEM and the YEKA frameworks up to the present. Unlicensed applications, on the other hand, are primarily aimed at self-consumption and generally include relatively smaller scale projects (maximum capacity associated with the consumption point), with a comparatively straightforward commissioning process.

Since its implementation in 2011, YEKDEM has undergone three revisions. The first version of the YEKDEM (YEKDEM v1.0) was introduced as a USD-based incentive mechanism. It functions as a resource-based fixed price scheme to increase the installed capacity of renewable energy power plants. The mechanism aimed to incentivize the renewable energy sector to reduce dependence on imported energy sources and minimise the current account deficit.

The implementation period of the YEKDEM purchase guarantees has been determined as 10 years for all types of generation facilities. The power plants under the YEKDEM scope can also enjoy an additional bonus on top of the purchase guarantee level for a period of 5 years which is determined based on the share of LC in the facility.[98] The base purchase guarantee levels for different types of renewable sources can be seen under Table 5.

On January 30, 2021, the Official Gazette announced the tariffs and periods to be applied under the new YEKDEM. The new YEKDEM (YEKDEM v2.0) included renewable power plants to be commissioned between July 1, 2021, and December 31, 2025. It provided a purchase guar-

Table 5. Applicable Prices by Facility Type under YEKDEM v1.0

Type of Generation Facility Based on Renewable Energy Sources	Applicable Prices (USD/MWh)
Hydropower[99]	73
Wind	73
Geothermal	105
Biomass (including landfill gas)	133
Solar	133

[98] EPİAŞ. (2023). YEKDEM.

[99] Includes river type and reservoir HPP's with a reservoir capacity of less than 15 km^2.

antee in TRY terms for renewable generators. The levels of the purchase guarantee prices for different renewable sources can be seen under Table 6. It was also announced that the tariffs would be updated every quarter with a set escalation method. However, since no capacity auctions were announced under the new YEKDEM and the incentive mechanism was designed in TRY terms, the capacities commissioned under the new YEKDEM remained almost non-existent. In order to address the stagnation in renewable capacity increases caused by the end of the USD based YEKDEM and in line with the expectations from private actors in the energy sector, the YEKDEM scheme was once again updated in mid-2023. With the decree dated May 1, 2023, the YEKDEM base prices and methodology were changed, and the guaranteed prices started to be updated on a monthly basis (thus accounting for potential losses from monthly changes in inflation and foreign exchange rates).

The revised YEKDEM prices' implementation period is determined as 15 years for geothermal power plants and pumped storage hydropower facilities, and 10 years for other types of facilities. The implementation period of the LC premium has been set as 5 years for hydropower, wind, geothermal, biomass, and solar power plants and 10 years for wind or solar power plants with storage, hydropower plants with pumped storage and generation plants based on wave. Also, differing from the previous YEKDEM regulation, YEKDEM floor prices are also stated in USD cent/kWh based on facility types. There is no escalation applied on floor and cap prices which are determined in nominal USD/MWh terms. Domestic Component Support Pricing covers 5 years for most renewable plants and 10 years for storage-integrated and tidal plants.

With the revised mechanism, new renewable energy technologies, including offshore wind power plants, electricity storage facilities integrated with wind or solar energy, pumped hydropower facilities, and electricity generation plants based on wave or current energy sources, were priced separately for the first time under YEKDEM and Local Content Premium. The base YEKDEM and Local Content Premium will not be applicable for storage-integrated wind or solar power plants

Table 6. Applicable Prices by Facility Type under YEKDEM v2.0

Type of Generation Facility Based on Renewable Energy Sources	Announced Price (TRY/MWh)	Announced Price (USD/MWh)[100]
Hydropower	400	54.8
Wind	320	43.8
Geothermal	540	74.0
Solar	320	43.8
Landfill a/waste energy-based production plant	320	43.8
Biomethanization	540	74.0
Thermal Disposal	500	68.5

[100] January 29, 2021 dated Central Bank of the Republic of Türkiye exchange rate is taken into consideration.

for the stored electricity drawn from the grid. The applicable purchase guarantee will only be valid for the renewable energy generation component.

With this update, it was also decided to leave out thermal disposal-based biomass facilities out of the FiT scope. The base YEKDEM and Local Content Premium (LCP) determined for thermal disposal-based biomass facilities applied to facilities that have obtained their pre-licenses until the regulatory update (May 1, 2023). Facilities that have obtained their pre-licenses after this date will not be able to benefit from the YEKDEM and LCP. The updated base YEKDEM prices under YEKDEM 3.0 are given under Table 7.

The LC premium applicable for different types of power plants was updated with the general YEKDEM v3.0 update in 2023. Table 8 outlines the LC premium and implementation timelines for various renewable energy sources under YEKDEM v3.0. The table specifies the price per MWh (in TRY) for each technology, alongside the duration of LC premium implementation. It should be noted that these prices are subject to monthly escalations based on the escalation formula explained further in this section.

The bonus for hydropower plants, both reservoir and run-off-river, are set at 288.0 TRY/MWh for 5 years. Wind energy power plants (WPPs), onshore, also has a LC premium of 288.0 TRY/MWh for 5 years, while offshore wind energy commands a higher price of 384.5 TRY/MWh for the same period. Geothermal power plants receive 288.0 TRY/MWh for 5 years, and the bonus for biomass facilities, depending on the source, range from 215.8 TRY/MWh for basic disposal to 288.0 TRY/MWh for by-products like landfill gas and waste tyres. The LC premium for solar energy power plants (SPPs) is priced at 288.0 TRY/MWh for 5 years. Pumped storage hydropower plants and wave or tidal energy plants also receive a price of 384.5 TRY/MWh for 10 years.

Furthermore, it is important to note that currently, some power plants active in the market continue to enjoy the USD-based YEKDEM (v1.0) while others are benefiting from the TRY-based YEKDEM (v3.0). The reason for this is that there is existing power plants commissioned before June 2021 under the previous USD based YEKDEM whose purchase guarantees will expire after a period of 10 years. On the other hand, hybrid power plants whose installed capacity are increasing in recent years, are only eligible to receive the YEKDEM prices that applies for the main facility.

Since its introduction in 2011, YEKDEM has contributed to a notable increase in the country's installed renewable energy capacity, which expanded from approximately 15 GW in 2010 to over 68 GW as of December 2024. The mechanism's Feed-in-Tariff (FiT) structure has provided stable revenue assurances, fostering investment from both domestic and international stakeholders, with wind and solar energy emerging as key areas of focus. Initially, YEKDEM primarily supported hydropower and wind power projects; however, subsequent modifications broadened its scope to include solar, geothermal, and hybrid energy systems, thereby enhancing the diversity of Türkiye's energy portfolio.

YEKDEM has been the main instrument in the introduction of increased renewable capacity in the Turkish electricity market over the last decade. Even though the investments stalled after the expiration of the USD-based YEKDEM in 2021, an important step has been taken to increase the viability of renewable energy investments and energy investment models in the market with the updated YEKDEM in May 2023. Following the latest changes which re-introduced incentives for local equipment use and competitive pricing mechanisms, the emphasis has started to shift towards renewable energy integration. These advancements are aimed at strengthening grid stability, encouraging local industrial growth, and raising the share of renewables in total electricity generation. The utilisation of renewable energy fostered by the YEKDEM scheme in Türkiye is of great importance in the context of combating climate change, reducing imported fuel dependency on energy, and increased utilisation of domestic resources.

Table 7. Applicable Prices by Facility Type under YEKDEM v3.0

Type of Generation Facility Based on Renewable Energy Sources	Announced Price (TRY/MWh)	Announced Price (USD/MWh)[101]
Reservoir Hydropower	1,440	73.8
Run-of-River Hydropower	1,350	69.2
Onshore Wind	1,060	54.3
Off-shore Wind	1,440	73.8
Geothermal	2,020	103.6
Landfill gas/ waste energy-based production plant	1,060	54.3
Biomethanization	1,730	88.7
Thermal Disposal	1,349	69.2
Solar	1,060	54.3
Storage-Integrated Wind or Solar	1,250	64.1
Hydro with Pumped Storage	2,020	103.6
Wave or Stream	1,350	69.2

Table 8. Local Content Premium Under YEKDEM v3.0 Based on Renewable Energy Sources

Sub-Production Facility Based on Renewable Energy Sources		LC Premium (TRY /MWh)	LC Premium (USD /MWh)[102]	LC Premium Implementation (Year)
a. Hydropower plant	Reservoir	288.0	14.8	5
	Run-of-River	288.0	14.8	5
b. Wind energy-based power plant	Onshore	288.0	14.8	5
	Offshore	384.5	19.7	5
c. Geothermal power plant		288.0	14.8	5
d. Biomass power plant	Sources obtained from the by-products generated by the processing of landfill gas/waste tyres	288.0	14.8	5
	Biomethanisation	288.0	14.8	5
	Basic Disposal[103]	215.8	11.1	5
e. Solar energy-based power plant		288.0	14.8	5
f. Integrated electricity storage facility with a wind or solar energy-based power plant		384.5	19.7	10
g. Pumped storage hydropower plant		384.5	19.7	10
h. Wave or tidal energy-based power plant		384.5	19.7	10

[101] May 2, 2023 dated Central Bank of the Republic of Türkiye exchange rate is taken into consideration.

[102] Ibid.

[103] Municipal waste, vegetable oil waste, agricultural waste that has no food or feed value, forest products excluding industrial wood, industrial waste sludge, and treatment plant sludge

2.2.2 YEKA

For some time prior to 2016, the MENR in Türkiye had been working on the development of a new investment model concerning large-scale renewable projects. The regulation on the new investment model called "Renewable Energy Resource Areas" (YEKA's) came into force after being published in the Official Gazette on October 9, 2016.

The scheme targets large-scale renewable energy projects through a competitive tendering process, thereby attracting both domestic and international investments. The YEKA model was envisioned to play a crucial role in promoting technological advancement and domestic production in Türkiye. By encouraging the development of local engineering and manufacturing processes, YEKA schemes aim to foster domestic technology growth and support research, and development initiatives focused on renewable energy.

Under the model, regions with specified installed capacities are allocated to the potential investors through tenders with an obligation to build power plants with predetermined technical characteristics. Depending on specific YEKA tenders, the technical characteristics also include obligations regarding the domestic manufacturing of the equipment to be used in the power generation facilities at varying levels. The requirement of "domestically manufactured equipment" in these areas is aimed at contributing to the technology know-how transfer and further investments in the research and development areas.

The above-mentioned regulation sets out the principles and procedures regarding:

- the determination of YEKA's
- connection and capacity allocation for these areas
- determination of usage of allocated capacity conditional on domestic manufacturing or utilisation of domestic goods
- the conditions to be met by legal entities participating in the tender, holding of the competition
- the process of license applications by tender winners for setting up the generation facilities in YEKA's
- sale of electricity generated

Türkiye's allocated wind energy capacity has expanded significantly through successive YEKA tenders. YEKA WPP-1 marked the beginning of this initiative, followed by YEKA WPP-2 in 2019, which allocated 1,000 MWe across four provinces. In 2022, YEKA WPP-3 added another 850 MWe through 20 projects with 240 MWe of operational capacity. Most recently, YEKA WPP-2024 was announced with a total capacity of 1,200 MWe. Table 9 illustrates the wind YEKAs that have operational capacity as of January 2026.

In 2023, Karapınar SPP, Europe's largest solar power plant established under the YEKA SPP-1 competition, Bor-2 SPP and Bor-3 SPP established under the YEKA SPP-4 competition, were commissioned. Bor-3 SPP, established as part of the YEKA SPP-4 competition, was commissioned at the end of October 2023 and is currently operating at its full capacity of 100 MW. Bor-2 SPP, another power plant established as part of the YEKA SPP-4 competition, with an installed capacity of 100 MW, was commissioned in August 2023 and operates at its full capacity of 100 MW. Table 10 shows the solar YEKAs that have operational capacity with their allocated total capacities.

The recent announcements by MENR and the update in the Energy Plan also included a plan to introduce new YEKA's on an annual basis worth 2,000 MWs of combined wind and solar installed capacity. The first of these YEKA's were auctioned at the start of 2025 in the form of two separate auctions including 1,200 MWs of wind power projects and 800 MWs of solar power projects. That is, for YEKA SPP-5 the solar energy sites include Karapınar (385 MWe), Karaman (200 MWe), Malatya (75 MWe), Van (60 MWe), Antalya (40 MWe), and Kütahya (40 MWe). Moreover, for YEKA WPP-4, on the other hand, the main wind project locations include Edirne (410 MWe), Balkaya (340 MWe), Sergen (200 MWe), Yellice (160 MWe), and Gürün (90 MWe).[104]

[104] Ministry of Energy and Natural Resources. (2023). YEKA Modeli ve Uygulamaları.

Table 9. Wind YEKAs with Operational Capacity as of January 2026 in Türkiye (MWe)

Wind Power Plant	Tender	Company	Allocated Capacity (MWe)	Operational Capacity (MWe)
UYGAR RES	WPP2	Enerjisa	250	250
AKKÖY RES	WPP2	Enerjisa	250	25.2
HACIHIDIRLAR RES	WPP2	Enerjisa		63
ÇANAKKALE RES	WPP2	Enerjisa	250	29.9
OVACIK RES	WPP2	Enerjisa		54.6
HARMANCIK RES	WPP2	Enerjisa		42
R3-ORDU-4 RES	WPP3	Kalen	40	40
R3-MUŞ-4 RES	WPP3	MBD Rüzgar	30	25
R3-YOZGAT-1 RES	WPP3	Eksim	50	50
R3-SİVAS-1-2 RES	WPP3	Aşiyan	40	40
R3-ÇORUM-1 RES	WPP3	Aşiyan	50	50
R3-MALATYA-1 RES	WPP3	Aşiyan	80	80
R3-ELAZIĞ-1 RES	WPP3	Kalyon	40	40
R3-ANKARA-2-1 RES	WPP3	Kalyon	50	50
R3-BİLECİK-6 RE	WPP3	Kalyon	70	70
R3-KARAMAN-1 RES	WPP3	Kalyon	70	14
R3-TRABZON-1 RES	WPP3	Kalyon	20	20
R3-BAYBURT-5 RES	WPP3	Kalyon	40	40
TOTAL			1,330	984

Table 10. Solar YEKAs with Operational Capacity as of January 2026 in Türkiye (MWe)

Solar Power Plant	Tender	Company	Allocated Capacity (MWe)	Operational Capacity (MWe)
Karapınar YEKA-1 SPP	YEKA-1 SPP	Kalyon	1,000	1,000
G4-Bor 1	YEKA-4 SPP	Smart	100	93
G4-Bor 2	YEKA-4 SPP	Ecogreen	100	100
G4-Bor 3	YEKA-4 SPP	Kalyon	100	100
G4-Erzin 1	YEKA-4 SPP	Limak	100	100
G4-Erzin 2	YEKA-4 SPP	IC İÇTAŞ	100	100
G4-Viranşehir 1	YEKA-4 SPP	Egesa	50	50
G4-Viranşehir 2	YEKA-4 SPP	Eksim	50	50
G4-Viranşehir 3	YEKA-4 SPP	Reşitoğlu	50	50
G4-Viranşehir 4	YEKA-4 SPP	Ral Enerji	50	50
G4-Viranşehir 5	YEKA-4 SPP	Kalyon	50	50
G4-Viranşehir 6	YEKA-4 SPP	Eksim	50	50
G4-Viranşehir 7	YEKA-4 SPP	Yeni Çağdaş İhtiyaç ve Gıda	50	50
G4-Viranşehir 8	YEKA-4 SPP	Kalyon	50	50
G4-Viranşehir 9	YEKA-4 SPP	Ral Enerji	50	50
G4-Viranşehir 10	YEKA-4 SPP	Eksim	50	50
G3-Gaziantep 1	YEKA-3 SPP	Kalyon	20	20
G3-Gaziantep 2	YEKA-3 SPP	Kalyon	20	20
G3-Gaziantep 3	YEKA-3 SPP	Kalyon	10	10
TOTAL			2,050	2,043

The newly established YEKA's offer several distinct advantages. These YEKA projects will be allowed to sell electricity in the spot market at a guaranteed minimum price of 49.5 USD/MWh for a duration of 5 to 6 years. Additionally, they benefit from an exemption from the TEİAŞ cost which refers to fees applied by TEİAŞ to both producers and consumers and have varied over the years. There are also other advantages such as foreign currency-based floor prices and access to international arbitration. A minimum local content requirement has also been defined under the new YEKA's.[105]

From the inception of YEKA projects, YEKA auctions have been structured to support the government's strategic objectives of increasing energy independence and promoting local industry. These auctions require the winning companies to establish local production facilities and research centres, or at least to use a certain proportion of locally sourced components.

Under Türkiye's YEKA regulation, introduced in 2016, investors are required to use locally manufactured equipment in renewable energy projects. This regulation was consistently applied across YEKA tenders, mandating that bidders commit to specific rates of domestic equipment use. However, the exact domestic production requirements are outlined in detail in the published conditions for each tender.

The previously mentioned YEKA SPP-1 required a local content ratio of 60-70%, while the requirement for wind projects was kept lower, with 65% for YEKA WPP-1. YEKA SPP-1 also involved a commitment to build a solar panel factory with an annual production capacity of 500 MW.

YEKA WPP-2, launched in 2019, aims to expand Türkiye's wind energy capacity across four provinces -Aydın, Muğla, Balıkesir, and Çanakkale- with a combined capacity of 1000 MWe. Each project under WPP-2 maintained strict local content standards, reinforcing domestic production requirements to stimulate regional economic development and create jobs. The conditions stipulated the use of local content at specified minimum rates: 65% for towers, 60% for blades, and 51% for other equipment.[106]

The YEKA SPP-3 initiative, also known as "Mini YEKA," allocated 1000 MWe capacity in smaller increments across 36 provinces. Conducted in 2021, the tender required participating firms to use locally manufactured components. This project provided 74 different investors with opportunities to contribute to Türkiye's solar energy sector, particularly in underserved areas, fostering renewable energy growth across diverse regions. The minimum local content requirement in this YEKA was set as 70%.

Following this, YEKA SPP-4 continued Türkiye's solar energy expansion by focusing on 15 solar projects located in Niğde-Bor, Hatay Erzin, and Şanlıurfa-Viranşehir, with capacities between 50-100 MWe. Held in 2022, the tender emphasised domestic equipment use and aimed to integrate additional solar capacity into Türkiye's national grid, further supporting industrial development in targeted regions. The minimum local content was mildly raised under this YEKA to 75%.

YEKA WPP-3, awarded in 2022, added 850 MWe to Türkiye's wind energy capacity across 20 sites, with projects ranging from 20-80 MWe. Each project within WPP-3 maintained the domestic equipment requirements, reinforcing Türkiye's dedication to expanding wind power while advancing domestic manufacturing capabilities and technology transfer. The requirement for the local content ratio for wind was again set as 55% under this YEKA.

The latest YEKA projects, YEKA WPP-4 and YEKA SPP-5, which were announced in early November in 2025, also maintained stringent local content requirements. The YEKA SPP-5 aimed for a combined capacity of 800 MWe with a minimum of 75% local content for solar modules. For YEKA WPP-4, a wind power capacity of 1,200 MWe will be established, with wind turbines required to meet a minimum local content rate of 55%.

A total of 7,850 MW has been allocated through solar and wind YEKA tenders, 3,800 MW for solar and 4,050 MW for wind, including the most recent tenders in early 2025. As of January 2026, 3,034 MW of this capacity has been commissioned, comprising 2,050 MW from solar power plants and 984 MW from wind power plants as shown in Table 11.

In conclusion, the YEKA framework has played a pivotal role in scaling up large-capacity renewable energy investments in Türkiye by combining competitive tenders with domestic manufacturing and technology transfer requirements. Beyond accelerating installed capacity growth, YEKA auctions have contributed to cost reductions, supply chain localisation, and long-term price visibility in the power market. As such, YEKA projects remain strategically important not only for achieving renewable energy targets but also for strengthening energy security and supporting industrial development.

[105] Ministry of Energy and Natural Resources, General Directorate of Energy Affairs (EİGM). (2024). EİGM Reports [EİGM Raporları].

[106] Ministry of Energy and Natural Resources (MENR). (2021, May 28). Regulation on Domestic Components [Yerli Aksam Yönetmeliği]. Official Gazette of the Republic of Türkiye (No. 31493).

Table 11. Summary of YEKA Auctions as of January 2026

YEKA	Auction Date	Allocated Capacity (MWe)	Operational Capacity (MWe)	Minimum Local Content Requirement (%)
YEKA SPP-1	2017	1,000	1,000	60-70
YEKA SPP-3 (Mini YEKA)	2021	1,000	50	70
YEKA SPP-4	2022	1,000	1,000	75
YEKA SPP-5	2025	800	-	75
YEKA WPP-1	2017	1,000	-	65
YEKA WPP-2	2019	1,000	465	65% for towers, 60% for blades, 51% for other equipment
YEKA WPP-3	2022	850	519	55
YEKA WPP-4	2025	1,200	-	55
TOTAL			7,850	3,034

Offshore Wind Extension of the YEKA Model: DÜRES 2026

Building on a decade of onshore experience, Türkiye's YEKA model is now being extended to offshore wind. In June 2026, the Ministry of Energy and Natural Resources published a draft specification for YEKA DÜRES-2026, setting out the technical, administrative, and legal principles governing the development, construction, and operation of an offshore wind facility within a designated YEKA, and envisaging Türkiye's first offshore wind tender for a single 1 GW site with a 49-year usage right. Four candidate zones in the Aegean and Marmara regions, Saros, Gökçeada, Bozcaada, and Edremit, have been designated by the Ministry as potential sites for the tender.[107] The Ministry has separately indicated a longer-term ambition of reaching 5 GW of offshore wind capacity by 2035, of which the DÜRES-2026 tender would represent the first stage.[108] This compares to a technical offshore wind potential in Turkish territorial waters estimated at approximately 75 GW under a joint assessment by the Ministry and the World Bank.[109] For investors, this positions DÜRES-2026 as an entry point into a market at an early stage of its development, with substantial headroom for follow-on capacity ahead of the 2035 target.

The draft auction format combines a sealed financial bid within a 7.00-11.00 US cent/kWh band with an open descending auction among the five lowest bidders. If the floor price is reached and more than one bidder remains, the process converts to an ascending auction based on a contribution premium starting at USD 10 million. The winning bid is treated as the Contract Price on a 43% capacity factor basis. Where first acceptance is achieved within seven years of contract signing, a fixed price of 12.00 US cents/kWh applies for that seven-year window; absent early commissioning, the price applicable for the first four operating years defaults to the Contract Price adjusted to a 40% capacity factor basis. At the end of the fourth operating year, the average capacity factor actually measured over that period is used to set a Final Purchase Price, apply-

[107] Ministry of Energy and Natural Resources (MENR). (2026, 22 June). Draft Specification for the Allocation of Renewable Energy Resource Areas and Connection Capacity for Offshore Wind Power Plants (YEKA DÜRES-2026)

[108] Minister of Energy and Natural Resources Alparslan Bayraktar, opening remarks, 15th Turkish Wind Energy Congress (TÜREK 2026), 12 May 2026.

[109] World Bank Group & T.C. Enerji ve Tabii Kaynaklar Bakanlığı. (2024). Offshore Wind Roadmap for Türkiye. Washington, DC: World Bank; Enerji ve Tabii Kaynaklar Bakanı Alparslan Bayraktar, TÜREK 2026 açılış konuşması, 12 Mayıs 2026.

ing the same scale, the Contract Price at 43% or above, rising by 2.5% for each percentage point below that, down to a cap at 40%, and this price then remains fixed for the remainder of the 27-year purchase period. The draft further provides that TEİAŞ transmission tariff charges are reimbursed to the winning bidder under YEKDEM for the full 27-year period, and that revenue shortfalls caused by grid-operator-instructed curtailment, where not attributable to the licence holder, are similarly compensated under the same mechanism.[110]

A minimum local content requirement of 25% of total investment applies, with a penalty of USD 5 million for each percentage point of shortfall; an earlier draft provision for contract termination in cases of non-compliance has since been removed, leaving a monetary-only sanction. A separate incentive schedule adds a per-kWh premium to the Final Purchase Price for its first five years for certified domestically-manufactured components: USD cents 0.30/kWh for blades, 0.10 for towers, 0.60 for generators and gearboxes (or direct-drive generators), 0.20 for foundation structures, and 0.20 for subsea cables, up to a combined maximum of 1.40 US cents/kWh, pro-rated where only part of a given component's quantity is domestically sourced. The specification also permits the winning bidder to integrate a co-located electricity storage unit, up to the licensed electrical capacity, alongside the offshore generation facility, offering scope for revenue diversification through the storage asset over the life of the project. The draft also provides for staged exit rights during early development: following the mandatory 12-month meteorological and oceanographic measurement campaign, a measured capacity factor below 40% allows the winning bidder to request termination; following seabed geophysical and geotechnical surveys, capacity may be reduced by up to 50% or the contract terminated. Both rights are available only within the first four years from contract signing and are distinct from the capacity-factor-based price adjustment that applies once the plant is operational.[111]

The specification remains in draft form. The Ministry opened it for public consultation in June 2026, with industry bodies including the Turkish Wind Energy Association (TÜREB) engaging actively in the process and submitting feedback on measurement standards, geotechnical survey scope, and price indexation, among other provisions.[112] As with earlier YEKA tenders, the terms are likely to be refined before the competition is finalised.

[110] YEKA DÜRES-2026 Draft Specification, Art. 3.3.3, 8.1.1, 8.1.3, 8.2.1–8.2.4, 8.2.14.

[111] YEKA DÜRES-2026 Draft Specification, Art. 4.2–4.5, 6.1, 8.2.11, Annex-1.

[112] Turkish Wind Energy Association (TÜREB). (2026, 1 July). TÜREB Offshore Wind Working Group, 3rd Meeting: Türkiye's First Offshore Wind Tender - YEKA DÜRES-2026.

2.2.3 Unlicensed Projects

Türkiye's electricity sector has undergone a transformation over the past decade, and at the centre of that transformation is a legal category that is frequently misunderstood: unlicensed electricity generation. Unlike licensed generation, which requires formal authorisation from the EMRA, unlicensed generation allows individuals, businesses, and legal entities to produce electricity from renewable sources up to a defined capacity threshold without obtaining a generation license, provided the primary purpose of generation is meeting their own consumption needs rather than commercial electricity trading. While the unlicensed framework theoretically encompasses all renewable sources, solar photovoltaic technology has come to dominate this segment so thoroughly that the two have become practically synonymous in public discourse. By 2022, solar energy accounted for approximately 92 percent of all unlicensed electricity generation in Türkiye, a share that has only increased since.[113]

The legal foundation of unlicensed electricity generation was laid by the Regulation on Unlicensed Electricity Generation in the Electricity Market, which entered into force on 21 July 2011 and was later revised by a landmark regulation dated 2 October 2013. Under the 2013 framework, the permissible installed capacity for a single unlicensed facility was raised from 500 kilowatts to 1 megawatt, and importantly, the overproduced power from renewable resources was guaranteed to be purchased at a specified feed-in tariff for a period of ten years. These provisions provided an early but meaningful incentive structure that attracted the attention of small and medium-sized enterprises across the country. Although solar power had been widely used for water heating since the 1970s, its deployment in electricity generation was effectively a new phenomenon, and it was in 2014 that Türkiye truly began tapping its solar potential through unlicensed generation installations.

The unlicensed segment initially attracted a form of regulatory arbitrage. Because the applicable legislation at the time neither explicitly prohibited nor permitted the establishment of multiple facilities by a single entity, investors began setting up separate portfolios of unlicensed solar projects, each below the 1-megawatt threshold, within the same substation region, effectively aggregating capacities that would otherwise require a full generation license. This creative interpretation of the law was widespread enough that it became a defining feature of the early Turkish solar market, with investors establishing multiple special purpose vehicles, each holding a separate unlicensed project in the same substation area, for the purpose of trading excess power rather than meeting self-consumption needs. The practice generated considerable controversy, as it was widely viewed as contrary to the spirit of the Energy Market Law, which intended unlicensed generation to serve prosumers rather than commercial generators.

The regulatory response came in March 2016, when EMRA amended the Unlicensed Electricity Generation Regulation to explicitly restrict the total installed capacity that any single real or legal person, including entities under their direct or indirect control, could hold at any given transformer substation to 1 megawatt. The amendment further introduced distance requirements, limiting projects of up to 499 kilowatts to a maximum of 5 kilometres from the grid connection point, and those with larger capacities to no more than 6 or 12 kilometres depending on configuration. Additionally, the reform capped the amount of excess energy that unlicensed wind and solar facilities could feed into the grid at 30 times the connection capacity of the associated consumption facility, a measure designed to prevent the effective monetisation of generation capacity well beyond what self-consump-

[113] Lexology / Güleryüz Partners. (2023, November 7). Electricity generation in Turkey series II: Unlicensed electricity generation. https://www.lexology.com/library/detail.aspx?g=a37953fe-ab51-4533-a63c-c2e4edc0b87e

tion logic would justify. These reforms also introduced share transfer restrictions, preventing shareholders of applicant entities from transferring their stakes until the facility had obtained its provisional acceptance and commenced commercial operations, which sought to curb the speculative flipping of project rights.[114]

Despite their restrictive intent, the 2016 reforms did not dampen the underlying enthusiasm for unlicensed solar investment. Instead, they redirected that energy toward more genuinely consumption-oriented deployments, particularly in the commercial and industrial segment. The threshold for unlicensed generation was raised again in 2019, this time to 5 megawatts, which significantly expanded the range of businesses that could develop solar facilities without entering the licensing regime. This single adjustment had a profound practical effect: a food processing plant, a textile factory, or a logistics centre could now install a multi-megawatt rooftop or field-mounted system, reduce its electricity bill substantially, and sell limited surplus to the grid, all without dealing with the bureaucratic and capital requirements of the licensed market.

The most consequential regulatory shift, however, came in two stages during 2021 and 2022. In May 2021, the requirement that a generation facility be located at the same physical point as the consumption facility was abolished, allowing prosumers to build their solar plants on suitable land within the same distribution zone rather than exclusively on their own premises or rooftops.[115] This single change opened enormous new land possibilities for industrial consumers, who could now identify agricultural or otherwise underutilised land within the same regional distribution network and develop ground-mounted systems at a fraction of the cost of urban or industrial-zone land. Since then, various amendments and regulatory updates have been introduced, all of which are presented in the timeline below in Figure 13.

[114] pv magazine. (2016, April 1). Turkey amends its unlicensed market regulation. https://www.pv-magazine.com/2016/04/01/turkey-amends-its-unlicensed-market-regulation_100023979

[115] Ember. (2023). The south can unlock Türkiye's solar ambitions. https://ember-energy.org/latest-insights/the-south-can-unlock-turkiyes-solar-ambitions/

Figure 13. Historical Timeline of Unlicensed Electricity Generation

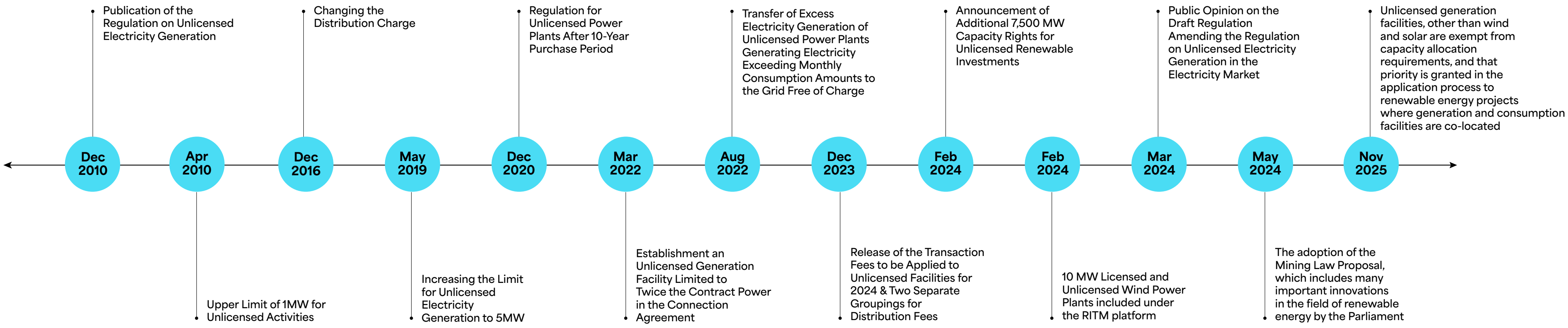
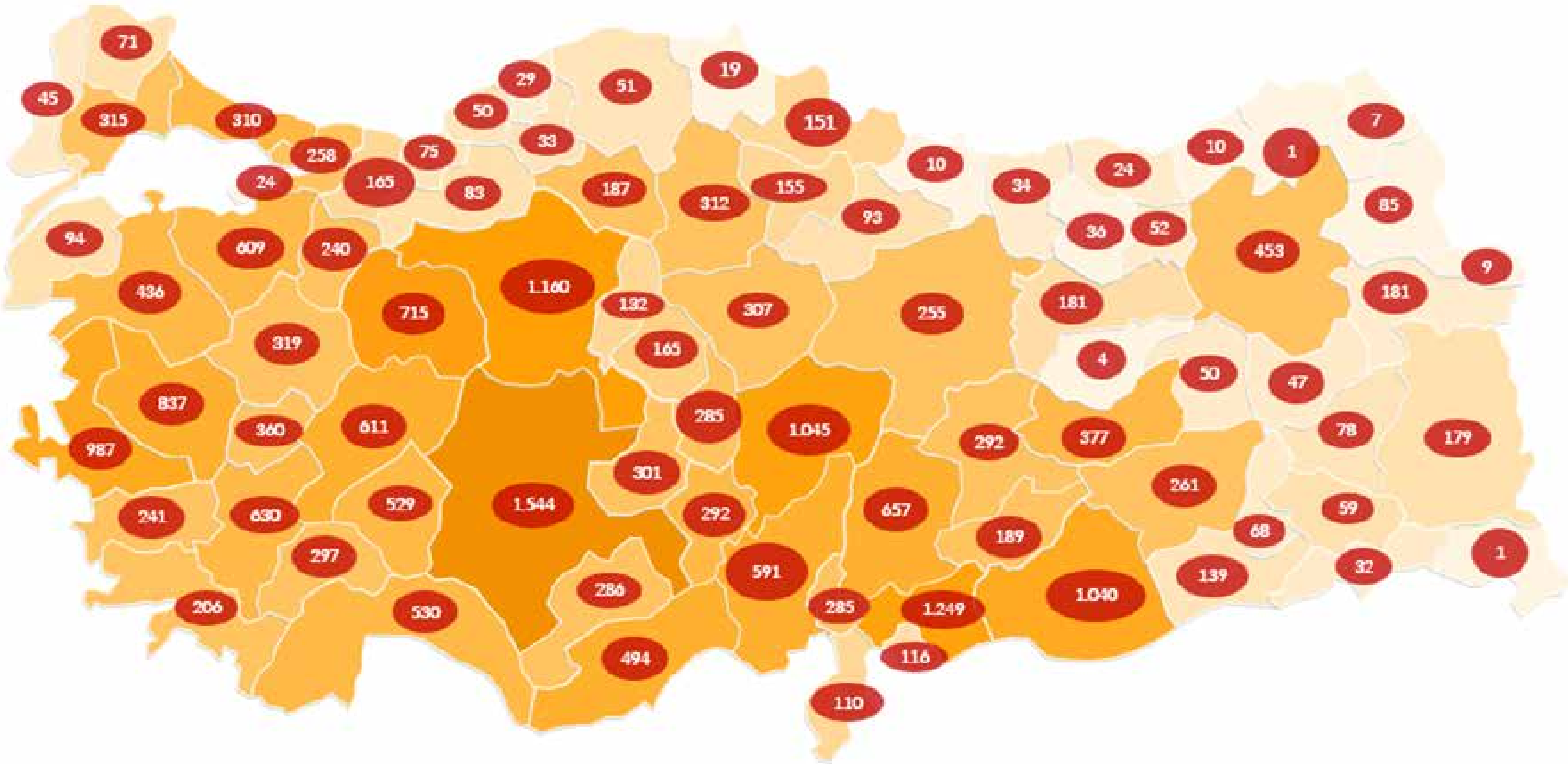


Figure 14. Installed Capacity of Unlicensed Electricity Generation in Türkiye in 2025 [116]



[116] EMRA. (2025). Aylık Sektör Raporları. Aralık Ayı Sektör Raporu.

The sheer momentum of unlicensed energy capacity has been the primary driver of Türkiye's headline renewable energy statistics. As of the end of 2025, total installed capacity of unlicensed renewable energy reached 22,87 MW, underscoring the structural weight of distributed generation within the country's overall power mix.

This scale is particularly significant as it reflects the rapid diffusion of small-scale and behind-the-meter investments, especially in solar PV, which have materially contributed to capacity expansion without relying on large-scale licensed projects. The continued growth of the unlicensed segment not only strengthens Türkiye's renewable penetration ratio but also enhances supply diversification, decentralisation of generation, and resilience at the distribution level. Figure 14 represents the Installed Capacity of Unlicensed Energy in Türkiye in 2025.

Furthermore, to understand the economic rationale of unlicensed electricity generation, it is essential to grasp the settlement mechanism on which the framework rests. Until the entry into force of the amendments on 1 May 2026, Türkiye's regulatory framework for unlicensed electricity generation was based on monthly netting ("aylık mahsuplaşma") rather than on daily or hourly netting. Under the Unlicensed Electricity Generation Regulation then in force, electricity produced by an unlicensed facility was netted against the associated consumption over the span of an entire billing month, and the resulting net production or consumption figures were reconciled using the relevant retail active energy price. This approach, formalised with the 2019 amendments to the secondary legislation, had supported the investment case for small-scale distributed generation by allowing producers to offset consumption across a longer settlement horizon rather than over shorter intervals.

The most significant practical advantage of the monthly netting structure was the temporal flexibility it provided. A producer with a variable generation profile, such as a rooftop solar installation, could offset surplus midday output against consumption occurring at other times within the same billing month. This reduced the need for precise hourly load-generation alignment and limited exposure to imbalance-related financial risks.

This framework changed materially in 2026.* Amendments to the Unlicensed Electricity Generation Regulation, published in the Official Gazette on 2 April 2026, introduced hourly netting from 1 May 2026. Detailed implementing procedures were published on 5 May 2026. Under the hourly netting regime now in force, production and consumption are reconciled within each hourly interval rather than across a full billing month. Surplus energy generated in one hour can no longer be carried forward to offset consumption in a later hour, thereby reducing the revenue capture potential of facilities with variable generation profiles, particularly rooftop solar installations. Residential consumers remain exempt from the hourly netting requirement. The reform also introduced a "remunerated generation limit" (bedelli üretim limiti), which caps the volume of surplus energy eligible for sale at twice the associated consumption point's annual electricity consumption in the previous calendar year.

That transformation brought clear benefits in terms of energy security, foreign exchange savings, and industrial competitiveness. It also created new challenges: grid congestion, evolving rules that require ongoing adaptation, and a segment that now includes facilities far larger than those originally intended under the unlicensed generation framework. The 2026 transition to hourly netting marks a structural shift in how this framework balances producer flexibility against system-wide settlement precision.

* EMRA. (2026, April 2). Regulation Amending the Unlicensed Electricity Generation Regulation [Elektrik Piyasasında Lisanssız Elektrik Üretim Yönetmeliğinde Değişiklik Yapılmasına Dair Yönetmelik]. Official Gazette of the Republic of Türkiye (No. 33212);

EMRA. (2026, April 30). Procedures and Principles on Netting Transactions for Unlicensed Electricity Generation Facilities and Associated Consumption Facilities [Lisanssız Elektrik Üretim Tesisleri ve İlişkili Olduğu Tüketim Tesislerinin Mahsuplaşma İşlemlerine İlişkin Usul ve Esaslar] (Decision No. 14531).

2.2.4 Hybrid Projects

The emergence of hybrid power plants in Türkiye represents a transformative shift in the nation's energy strategy, moving toward a more resilient and flexible grid architecture. This evolution is driven by the regulatory framework established through the Regulation on Amendment of the Electricity Market Licensing Regulation, which officially paved the way for multiple source generation facilities. By allowing investors to combine different renewable energy sources, such as wind and solar, at a single grid connection point, Türkiye aims to maximise the utilisation of existing transmission infrastructure. The legal basis for hybrid projects is fundamentally rooted in the principle of increasing the capacity factor of power plants without necessitating the construction of new, costly high voltage transmission lines. This approach is particularly strategic for Türkiye, given its rich solar irradiation and wind potential, often occurring in overlapping geographical regions. From a licensing perspective, a hybrid project is viewed as a primary source facility supplemented by a secondary source, where the total energy injected into the grid does not exceed the capacity defined in the original connection agreement. This regulatory nuance allows developers to optimise their land use and reduce the unit cost of electricity by sharing balance of plant infrastructure, such as substations and access roads.

The primary motivation for the rapid adoption of hybrid projects in Türkiye is the mitigation of intermittency and the enhancement of energy density. Solar energy, which peaks during daylight hours, serves as an ideal complement to wind energy, which often exhibits higher generation profiles during the night or in different seasonal patterns. By integrating these sources, a hybrid plant provides a more stable and predictable power output, which is essential for maintaining grid frequency and voltage stability. For an investor, the ability to add a secondary solar capacity to an existing wind farm provides an immediate secondary revenue stream with minimal additional environmental permitting, provided that the new installation remains within the boundaries of the already licensed area. This has led to a surge in applications for "Solar PV on Wind Farm" projects, as many wind facilities in the Aegean and Marmara regions possess unused land beneath the turbines that is highly suitable for solar arrays.

Financial and technical viability of these projects is closely tied to the YEKDEM. Under current regulations, the electricity generated from the secondary source is typically sold at the same price as the primary source, provided it is within the scope of the original support scheme. This has created a significant incentive for older wind and hydroelectric plants to modernise through hybridization. However, the technical integration requires sophisticated energy management systems to ensure that the combined output does not violate the technical limits of the grid connection. The TEİAŞ mandates the installation of advanced monitoring and control equipment at hybrid sites to manage the dispatch of power from different sources. This complexity is further heightened by the recent inclusion of BESS into the hybrid definition. By adding storage, developers can "time shift" their energy production, storing excess solar power during midday peaks and releasing it during evening hours when demand and prices are higher. This capability is critical for Türkiye's goal of creating a "smart" grid that can accommodate a higher percentage of variable renewable energy.

Furthermore, environmental and social governance in hybrid project development requires a careful balance between land use efficiency and ecological preservation. While hybridizing an existing site is generally more environmentally friendly than developing a brand new "greenfield" site, it still requires an amendment to the Environmental Impact Assessment (EIA) and the zoning plans. In Türkiye, this process involves securing an "EIA Not Required" or an "EIA Positive" decision for the secondary source, taking into account potential cumulative impacts such as the shadow flicker of turbines on solar panels or the increased footprint on local flora. Public participation remains a cornerstone of the licensing process, especially in regions with high agricultural value. The Turkish regulatory body has introduced "Agricultural Friendly" solar guidelines to encourage the use of trackers or elevated structures that allow for simultaneous farming and energy generation, a concept known as agrivoltaics. This social licensing aspect is crucial for the long-term sustainability of hybrid investments, ensuring that energy production does not come at the expense of local food security or community wellbeing.[117]

The institutional framework for hybrid licensing is also evolving to address the needs of "Super Permits" and centralised applications. Minister Alparslan Bayraktar has recently emphasised that the goal is to reduce the bureaucratic burden by allowing investors to handle most of their technical and administrative amendments through an integrated digital portal. This digitalisation is essential for managing the sheer volume of hybrid applications, which has grown exponentially since the regulation was first introduced. Moreover, planned investments in transmission, distribution and wider grid infrastructure will be essential to provide the necessary hosting capacity for hybrid projects. Strengthening and modernising the grid is critical to the effective integration of additional renewable capacity and to reducing curtailment risks. Therefore, the synchronisation of TEİAŞ's infrastructure investments with the private sector's hybrid ambitions is the most critical factor for the success of Türkiye's energy transition.[118]

In conclusion, hybrid projects are not merely a technical trend but a strategic necessity for the Turkish electricity market. They offer a unique solution to the challenges of land scarcity, grid constraints, and resource intermittency. By leveraging the existing legal framework of Law No. 6446 and the incentives of the YEKDEM mechanism, Türkiye is positioning itself as a leader in integrated renewable energy generation. For investors, the ability to combine wind, solar, and storage at a single site provides a robust hedge against market volatility and a clear path toward sustainable profitability. As the regulatory environment continues to mature and the national grid becomes more digitized, the hybrid model will undoubtedly become the standard for all new large scale energy investments in the country. The future of Turkish energy is not in isolated turbines or panels, but in the intelligent and synergistic integration of all available natural resources.

2.3 Battery Storage

Battery storage has rapidly moved to the centre of Türkiye's electricity market reform agenda, reflecting the growing penetration of variable renewable energy and the need for enhanced system flexibility. Successive policy documents have set progressively more ambitious targets, signalling strong political commitment.

A decisive regulatory milestone was the 2022 amendment to Electricity Market Law No. 6446, published in the Official Gazette on 19 November 2022, which established the legal basis for storage-integrated renewable generation facilities and enabled investors to secure grid connection rights through a storage commitment. Secondary legislation issued by the EMRA clarified licensing and technical requirements. Following this reform, pre-licenses were granted for approximately 33 GW of storage-integrated renewable projects, demonstrating strong market uptake and fundamentally reshaping investment incentives.

Battery-integrated projects are increasingly necessary in Türkiye due to the rapid expansion of solar and wind capacity, which has intensified intra-day price volatility and system balancing needs. High solar output during midday hours can suppress wholesale prices and increase the risk of curtailment, while evening peak demand periods require flexible resources. Battery energy storage systems address this structural mismatch by shifting energy from low-price to high-price hours, thereby reducing renewable

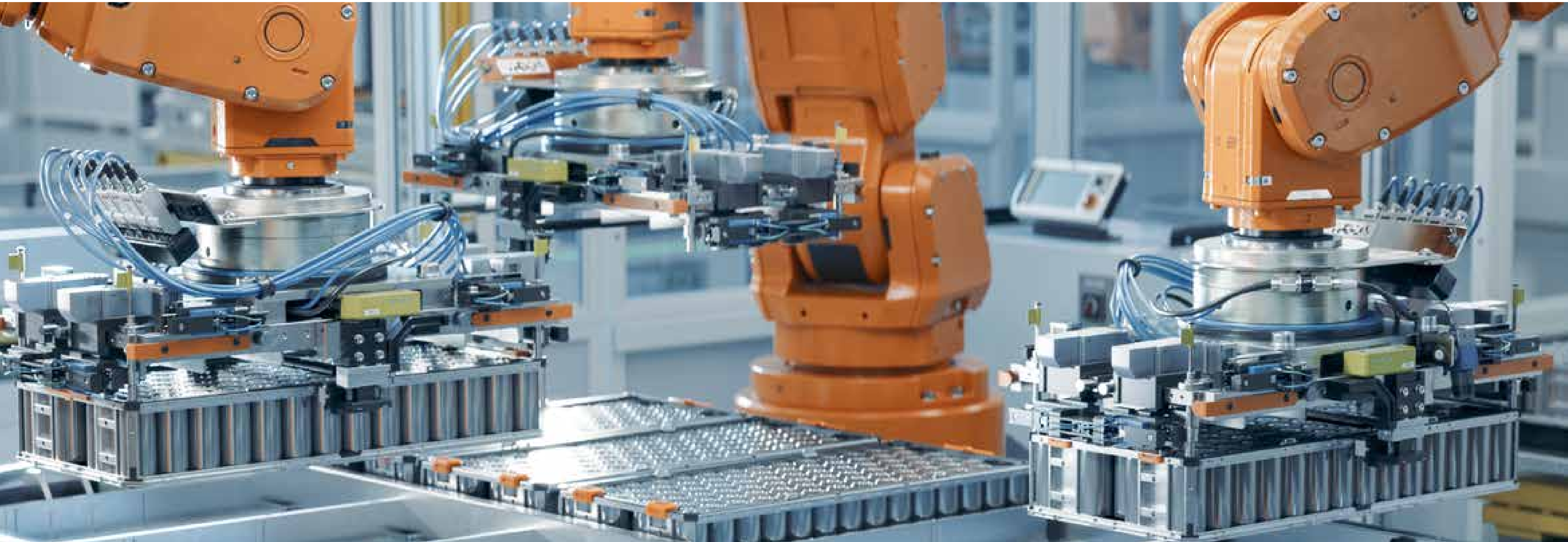
[117] World Bank. (2023). Regulatory Indicators for Sustainable Energy (RISE) 2023. Washington, DC: World Bank.

[118] Bloomberght. (2025, October 6). Dünya Bankası'ndan Türkiye'ye 750 milyon dolarlık enerji finansmanı | Enerji haberleri. Bloomberght.

curtailment and supporting system reliability. In addition to energy shifting, batteries are technically well suited to provide ancillary services such as primary and secondary frequency control (PFC and SFC) due to their rapid response times and high ramp rates. As the share of variable renewables increases, fast frequency response becomes more valuable in maintaining system stability, reducing reliance on conventional thermal units for frequency support.

Battery storage also creates arbitrage opportunities within the day-ahead and balancing markets by enabling operators to charge during low-price periods and discharge when prices rise, thus improving revenue streams for renewable projects. Participation in the balancing power market operated by the Turkish transmission system operator allows storage assets to offer upward or downward regulation capacity, contributing to real-time supply–demand equilibrium and potentially reducing imbalance costs. As balancing requirements grow alongside renewable penetration, the cost structure of system balancing is evolving, increasing the economic relevance of flexible technologies. Furthermore, integrating batteries with solar plants improves captured prices by allowing generators to avoid selling large volumes during midday price troughs and instead deliver electricity during higher-priced evening hours. This enhances revenue stability and strengthens the investment case for hybrid renewable-plus-storage projects.

Taken together, regulatory reform, rising renewable penetration, growing balancing needs, and evolving market price dynamics indicate that battery storage is becoming a structural component of Türkiye’s electricity market architecture rather than a supplementary technology.



2.4 Renewable Energy Local Original Equipment Manufacturer (OEM) Market

2.4.1 Wind

Türkiye's wind energy OEM market has developed into a diversified and increasingly localised manufacturing ecosystem, supported by both domestic deployment and strong export linkages. According to TÜREB 2024 Turkish Wind Energy Industry Inventory Research report, sector turnover expanded substantially to approximately 1.05 billion USD in 2024, reflecting rapid industrial scaling and integration into international supply chains.[119] According to the TÜREB, Türkiye ranks fifth in Europe in wind equipment manufacturing and exports turbine components to 45 countries across six continents, with Germany, Spain, and Denmark remaining core markets despite some moderation in export intensity due to rising domestic installations.

The domestic OEM structure spans the full spectrum of major turbine components, including towers, rotor blades, generators, yaw systems, pitch systems, and other mechanical sub-components. Recent 2024 industry data indicate that the domestic contribution rate now exceeds 50% across all manufactured product categories, demonstrating a structurally strengthened local supply chain. In terms of production capability, Türkiye manufactures approximately 1,500 blades annually equivalent to roughly 500 turbines alongside around 500 towers per year and approximately 120 generators. Since domestic annual installations do not fully absorb this output, a share of production is exported. In parallel with these developments, the High Technology Investment Program (HIT-30) announced in 2024 introduced targeted incentives for strategic renewable energy equipment manufacturing. Within the scope of the program, support mechanisms are provided for investments in advanced wind energy technologies, including turbine components, blades, generators, power electronics, and other critical sub-components. The program aims to deepen localisation, strengthen Türkiye's integration into global supply chains, and enhance the international competitiveness of the domestic wind manufacturing industry.

As can be seen from the Table 12, particularly in structural components such as towers and blades, localisation rates remain above 60%, positioning Türkiye as a competitive supplier within the European manufacturing network. Generators and other mechanical components also maintain domestic contribution levels above the 50% threshold, indicating relatively balanced industrial depth across key hardware segments. From a cost-structure perspective, this localisation profile has strategic implications. Towers account for approximately 20–25% of total turbine costs, rotor blades represent 15–20%, and the nacelle constitutes the largest cost block at 30–35%, while foundations, installation, and electrical infrastructure (transformers, cabling) comprise the remaining share. Given the strong domestic presence in towers, blades, and mechanical components, Türkiye captures a significant portion of turbine value added domestically. However, certain high-value and technologically sophisticated nacelle elements such as main shafts and specific electronic control components remain partially import-dependent, limiting full value-chain integration.

That is to say, the Turkish wind OEM market demonstrates broad-based manufacturing capability with sustainable domestic contribution levels exceeding 50% across all product categories. While structural and mechanical components are well localised and export-competitive, further technological upgrading in high-value nacelle systems will be critical for increasing domestic value retention and strengthening Türkiye's long-term position within global wind supply chains.

[119] TÜREB. (2024). Türkiye Rüzgar Enerjisi Sanayisi Envanter Araştırması. Turebtr. https://tureb.tr/icerikler/diger-raporlar

Table 12. Wind Energy Localisation Levels, and Share of Costs (%)

Components	Localisation Levels	Share of Cost of the Total System
Blade	63%	15-20%
Tower	64%	20-25%
Generator	68%	5-10%
Other Mechanical Components	64%	30-35%

2.4.2 Solar

Türkiye's solar energy OEM market has expanded rapidly in parallel with rising installed capacity. This growth has been accompanied by a significant strengthening of domestic manufacturing capabilities, particularly at the module assembly level and in downstream components. The most advanced example of vertical integration is an integrated photovoltaic manufacturing facility in Türkiye that produces ingots, wafers, cells, and modules within a single complex and has publicly reported localisation levels of around 90% for the panels it manufactures. This facility is among the few fully integrated solar manufacturing plants in Europe and represents a substantial step toward domestic value capture in photovoltaic production.[120]

Beyond existing integrated facilities, recent policy developments and new investments indicate a broader strategic effort to deepen localisation specifically in solar cell manufacturing, which constitutes the most value-intensive segment of photovoltaic production. Within the scope of the HIT-30 announced in 2024, Türkiye aims to establish approximately 20 GW of annual domestic solar cell production capacity in the first phase through large-scale investments supported by targeted industrial incentives. In this context, both domestic and international companies have announced GW-scale photovoltaic cell manufacturing investments in Türkiye, focusing particularly on advanced high-efficiency technologies such as TOPCon-based cell production. These developments reflect a strategic policy objective to strengthen upstream manufacturing capabilities, reduce import dependency in photovoltaic technologies, and position Türkiye as a regional manufacturing hub serving both domestic demand and export markets. Given that solar cells typically account for approximately 50–55% of total module cost, the expansion of domestic cell manufacturing capacity is expected to play a critical role in increasing overall localisation ratios and domestic value creation in the solar industry.[121]

At the broader industry level, Türkiye has developed strong manufacturing capacity in module assembly as well as in balance-of-system and

[120] Holding, K. (2025). Kalyon Enerji'den 520 MWp'lık Yeni Yatırım. Kalyonholding.com. https://kalyonholding.com/media/kalyon-enerjiden-520-mwplik-yeni-yatirim

[121] Demir, Döndü Nur. "Türkiye Güneş Enerjisinde Vites Yükseltti: 20 GW Hedefi Açıklandı." Kayseri Haber | Deniz Postası, www.kayserihaber.com/turkiye-gunes-enerjisinde-vites-yukseltti-20-gw-hedefi-aciklandi.

structural components such as solar glass, aluminium frames, mounting structures, and junction boxes, supported by the country's established industrial base in glass and metals. Market reporting indicates that domestically manufactured panels account for most modules supplied to the Turkish market, reflecting a high degree of localisation in finished module production. However, upstream segments of the value chain remain structurally more import dependent. Polysilicon production is not established at industrial scale domestically, and wafer supply continues to rely significantly on imports. While cell manufacturing capacity exists and is expanding, it has not yet fully matched total module assembly capacity across the country, meaning imported cells continue to complement domestic production in many facilities.[122]

From a cost structure perspective, these localisation patterns have important implications for value capture. Solar cells typically account for approximately 50–55% of total module cost, making upstream material and cell production the most value-intensive segment of the chain.

Table 13. Solar Energy Localisation Levels, and Share of Cost (%) *

Components	Localisation Levels	Share of Cost of the Total System
PV Module	70-80%	45-55%
Inverter	70-80%	5-10%
Mounting Structure	80-90%	10-15%

In contrast, glass generally represents around 10–15% of module cost, encapsulation materials about 6–8%, aluminium frames roughly 5–10%, backsheet around 5–7%, and junction boxes 1–2%. Since Türkiye has developed comparatively strong domestic capabilities in glass processing, frame production, and final module assembly, a meaningful share of downstream value is retained locally. Nevertheless, because the highest cost component, the cell and its upstream silicon inputs, remains partially import-dependent at the sectoral level, full value-chain localisation has not yet been achieved. Türkiye's solar OEM market reflects a dual structure: high localisation and industrial maturity in module assembly and structural components, combined with continued reliance on imported upstream materials and certain advanced cell technologies. The presence of fully integrated photovoltaic manufacturing facilities demonstrates that deep localisation is technically feasible within the country; however, scaling such integration across the wider industry remains the key determinant of how much additional value can be captured domestically in the coming years.

2.4.3 Battery Storage

Published in the Official Gazette on November 19, 2022, introduced a regulatory framework that enables legal entities establishing energy storage facilities to develop wind or solar power plants without participating in a pre-license competition, provided that the installed capacity of the RE source is equal to the storage facility's capacity. The regulatory change aims to accelerate project development and increase system flexibility. Since its introduction, the model has received considerable interest from industry stakeholders, and it is anticipated that a significant share of upcoming wind and solar investments will adopt this configuration.

In parallel with regulatory developments, battery production in Türkiye is expanding to meet growing demand from both the EV sector and the electricity generation market. Initially driven by EV-related investments such as the Türkiye's Automobile Joint Venture Group (TOGG) initiative, battery manufacturing activities have increasingly diversified to include stationary energy storage applications.

Prioritising domestic production in battery technologies has become an important component of Türkiye's industrial and energy policy framework. This strategy aims to strengthen local value chains, reduce external dependen-

[122] PwC Türkiye. (2024, March). Solar energy industry in the world and in Türkiye. PricewaterhouseCoopers Türkiye.

*This cost breakdown is based on standard monocrystalline silicon modules without embedded power electronics and reflects values commonly reported by manufacturers, laboratory tests, and industry teardown studies.

cy, and support the development of a domestic energy storage ecosystem. In this context, Türkiye hosts several ongoing and announced investments in battery cell, battery pack, and energy storage system manufacturing:

- Aspilsan Energy is one of the leading domestic battery manufacturers in Türkiye. The company's battery production facility in Kayseri became the country's first lithium-ion battery factory after commencing mass production in June 2022. The facility has an annual production capacity of 220 MWh and can produce approximately 21 million cylindrical cells annually. Production is primarily aimed at defence industry applications, hybrid and electric vehicles, and medical technologies.

- Siro Silk Road Clean Energy Storage Technologies, established as a joint venture between Farasis Energy and TOGG, currently focuses on battery module and pack assembly activities in Türkiye. In the medium term, the company also plans to establish battery cell manufacturing capabilities domestically to support the growing EV ecosystem.

- Pomega Energy Storage Technologies, a subsidiary of Kontrolmatik Technologies, commissioned its lithium-ion battery cell factory in Ankara Polatlı Organised Industrial Zone in August 2023. The facility represents Türkiye's first private-sector investment in battery cell production and manufactures lithium iron phosphate (LiFePO4)-based prismatic battery cells as well as energy storage systems. The project targets both EV and grid-scale energy storage applications, with planned phased capacity expansions reaching several GWh annually.

- Reap Battery, a subsidiary of YEO Technology, has completed its battery pack and energy storage systems assembly facility in Tuzla, Istanbul. The company has also announced longer-term plans to establish domestic battery cell production capabilities in Türkiye.

- Alarko Gotion Green Energy was established as a joint venture between Alarko Holding subsidiary Altek Alarko and Gotion High-Tech, one of the world's leading battery manufacturers. The joint venture aims to develop a domestic ecosystem for battery energy storage systems (BESS) and lithium-ion battery cell production in Türkiye. The investment will be implemented in two phases, beginning with a battery energy storage systems assembly facility with an annual production capacity of 3 GWh, followed by a lithium iron phosphate (LFP) battery cell "gigafactory" targeting 5 GWh annual production capacity.

- Yiğit Akü, one of Türkiye's leading battery manufacturers, announced a strategic partnership with Ganfeng Lithium to establish lithium-ion battery production capabilities in Türkiye. The joint venture is planned as a 500 million USD investment targeting an annual production capacity of 5 GWh. The facility is expected to produce lithium battery cells, battery modules, battery packs, energy storage systems, and battery management systems for both domestic and international markets. In addition to manufacturing activities, the project also envisages the establishment of an R&D centre focusing on advanced battery technologies, including next-generation solid-state batteries and high-performance applications for sectors such as marine and aviation.

- OAV Teknoloji is developing a pilot lithium-ion battery cell production facility in Boğazlıyan Organised Industrial Zone in Yozgat. The project focuses on the production of lithium iron phosphate (LFP) battery cells with a planned annual production capacity of approximately 501,000 battery cells. In addition to standalone battery cells, the facility is expected to produce battery packs and containerized energy storage systems targeting electric vehicles and stationary energy storage applications. The investment, valued at nearly 1 billion TRY, represents one of the emerging domestic initiatives aimed at strengthening Türkiye's local battery manufacturing ecosystem and reducing import dependency in advanced energy storage technologies.

- Maxxen Energy, a subsidiary of Kontek Energy, commissioned a high-technology Battery Energy Storage Systems (BESS) manufacturing facility in Aydın Organised Industrial Zone in late 2025. The facility focuses on battery pack and integrated energy storage system production for renewable energy plants, grid-scale storage applications, industrial facilities, and microgrid systems. The company aims to develop an export-oriented manufacturing model, targeting international markets alongside domestic demand. The facility is expected to reach up to 10 GWh production capacity within five years and contribute to Türkiye's broader objective of strengthening domestic energy storage manufacturing capabilities.

Türkiye's position in the global battery value chain is still in a formative stage, with emerging domestic initiatives aimed at building local capacity in both cell production and battery system integration. While the country currently relies heavily on imported lithium-ion cells particularly from East Asian suppliers' significant investments have been initiated to localise production of battery packs, Battery Management System (BMS), and energy storage integration. In the context of utility-scale battery energy storage systems (BESS), lithium-ion batteries typically account for approximately 60–70% of total system costs, followed by power conversion systems (PCS) and inverters (10–15%), thermal management and housing (5–10%), and energy management systems along with installation and commissioning (10–15%). These proportions may shift depending on the system configuration (e.g., front-of-the-meter vs. behind-the-meter), the chemistry used (e.g., LFP vs. NMC), and the level of local manufacturing.

In addition to that, battery production in Türkiye is also being developed with an eye toward international markets, particularly in the EU and neighbouring regions. The country's strategic geographic position and established logistics infrastructure can provide efficient access to export markets. Current industrial activities primarily focus on battery cell assembly, BMS, and system integration for stationary and mobile applications. However, localisation of upstream materials and key active components including anodes, cathodes, and electrolytes remains limited. Most raw materials and specialised chemistries are currently imported, with supply chains extending to East Asia and Europe.

Additionally, to address these structural dependencies and enforce deeper localisation within the sector, the regulatory landscape has recently been tightened. Effective December 13, 2025, the scope of the Domestic Component Regulation was expanded to formally incorporate solar and wind energy-based storage facilities, as well as pumped-storage hydroelectric power plants, into the legislative framework. Accordingly, key definitions such as "storage-integrated generation facility" and "primary source" have been clarified specifically for these asset classes. To qualify for incentives, a mandatory minimum local content ratio of 51% has been established for integrative components. Concurrently, a "Temporary Conformity Certificate" mechanism, valid for a maximum of 18 months, has been introduced to the certification process, with the strict stipulation that the final certification must be completed within this period. Furthermore, audit and sanction mechanisms for the operational phase have been significantly reinforced. Any modernisation, repair, or component replacement is now subject to mandatory notification and the submission of detailed documentation to the Ministry. It has been emphasised that in the event of non-compliance or a determination that local content ratios were not effectively met during the production process, all previously disbursed incentive payments shall be reclaimed with interest, underscoring that the incentive is no longer an irrevocable right, but a conditional support mechanism.[124]

[124] Official Gazette of the Republic of Türkiye. (2025, December 13). Yerli Aksam Yönetmeliğinde Değişiklik Yapılmasına Dair Yönetmelik [Regulation amending the regulation on domestic components]. https://www.resmigazete.gov.tr/13.12.2025

2.4.4 Others

In terms of OEM capabilities, Türkiye possesses a number of domestic engineering and manufacturing firms active in biomass-based power plant development. These firms typically operate as turnkey EPC contractors for waste-to-energy and biomass-fired power plants, covering design, manufacturing, installation, and commissioning. Product portfolios commonly include solid, liquid, and gas-fuelled boiler systems; steam, superheated steam, hot oil, hot water, and superheated water boilers; complete boiler houses; combustion chambers; fuel feeding systems; flue gas treatment units; heat recovery systems; and auxiliary mechanical installations. Some domestic manufacturers also undertake high-pressure and high-temperature boiler design under international technology licensing arrangements, producing equipment in line with globally recognised engineering standards and subject to independent certification procedures for pressure vessels and industrial boilers.

The geothermal OEM market in Türkiye reflects stronger industrialisation, given the country's resource base Türkiye ranks among the world's leading geothermal electricity producers by installed capacity. The geothermal sector has attracted both local and foreign manufacturers of drilling equipment, heat exchangers, turbines, and power plant control systems. While global OEMs supply advanced geothermal turbines and specialised downhole tools, domestic firms increasingly participate in fabrication of surface plant components and maintenance services. This dynamic has helped build a level of local supply capacity for heat-exchange equipment, piping, and civil works for plant construction, although highly specialised turbine manufacturing remains imported, mirroring patterns seen in broader industrial gas turbines and steam turbine supply chains.

Hydrogen and electrolyzer technology represent a nascent but rapidly emerging segment within Türkiye's clean energy OEM ecosystem. Driven by national strategy and pilot projects, the hydrogen economy is being actively developed with a focus on green hydrogen production using domestic renewable power. Domestic initiatives also include development of hydrogen production and demonstration facilities that incorporate locally designed and manufactured electrolyzers. Within this context, the Scientific and Technological Research Council of Türkiye (TÜBİTAK) Marmara Research Centre has developed a PEM-type electrolyzer capable of producing high-purity hydrogen and representing an important step toward indigenous electrolyzer technology. This electrolyzer is being integrated into early green hydrogen demonstration projects, such as the South Marmara Hydrogen Valley platform in Bandırma, where the system will be deployed to produce and utilise green hydrogen.[125]

In summary, Türkiye's biomass and geothermal OEM markets reflect established renewable deployment with incremental domestic supply participation, while the hydrogen and electrolyzer segment is rapidly emerging as a high-tech manufacturing opportunity. Collectively, these renewable OEM markets highlight both existing industrial capacity and areas for future technology development and localisation as Türkiye transitions toward broader clean energy adoption.

[125] AA. (2024). Türkiye'nin enerjisini yükseltecek hidrojen için yerli elektrolizör üretildi. Aa.com.tr. https://www.aa.com.tr/tr/bilim-teknoloji/turkiyenin-enerjisini-yukseltecek-hidrojen-icin-yerli-elektrolizor-uretildi/3429751

2.5 Licensing Procedures for Renewable Energy Investments

The legal and regulatory architecture governing renewable energy investments in Türkiye is a sophisticated system designed to balance rapid industrial growth with the country's 2053 Net Zero emissions target. Since the enactment of the Law on the Utilisation of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Law No. 5346) in 2005 and the subsequent Electricity Market Law (Law No. 6446) in 2013, the Turkish energy sector has undergone a profound transformation.

At the heart of this regulatory framework lies the distinction between a preliminary license (önlisans) and a generation license (lisans). A preliminary license is a mandatory temporary permit granted to legal entities for a specific period to complete the necessary administrative procedures before starting construction. For wind and solar projects, this phase is particularly critical as it encompasses site acquisition, technical interaction permits, and the completion of environmental impact assessments. To obtain a preliminary license, an investor must apply to EMRA with a designated project site and proof of technical capability, often backed by a bank letter of guarantee.

The transition from a preliminary license to a generation license requires the fulfilment of all obligations set out in the preliminary period. This includes obtaining YEKA documentation, securing zoning plan approvals, and finalising land usage rights. Once these milestones are met and the project's technical compliance is verified, EMRA grants the generation license, which officially authorises the holder to start construction and, subsequently, electricity generation for a period of up to 49 years.

The fundamental difference between the two is one of legal authorisation: the preliminary license provides a "reservation" of grid capacity and legal protection to finalise permits but strictly prohibits any physical construction or electricity sales. In contrast, the generation license is the final administrative act that transforms a project from a developmental concept into an operational industrial asset. Understanding this two-tier progression is essential for navigating the timeline and capital expenditure requirements of the Turkish energy market.

The licensing procedure is now characterised by a structured two stage process consisting of a preliminary license and a final generation license, both managed by the EMRA. This framework is designed to ensure that only financially viable and technically feasible projects progress to the construction phase. For an investor, the journey begins with the selection of a project site and the acquisition of a preliminary license, which typically lasts between 24 and 36 months. During this period, the legal entity is granted a window of time to obtain all necessary permits, including zoning plan approvals, land use rights, and the crucial Environmental Impact Assessment (EIA) clearance. The preliminary license does not authorise construction but serves as a protective legal shield that secures the grid connection capacity while the developer navigates the administrative labyrinth.[126]

The technical core of the Turkish licensing system is the grid connection capacity allocation, which is managed by the TEİAŞ. Because the availability of grid nodes is finite, the allocation process is often competitive. For wind and solar projects, if multiple applications are made for the same connection point or the same geographical area, a "Connection Capacity Competition" is triggered. In these auctions, the license is awarded to the developer who offers the highest "contribution fee" per megawatt to the state, or in the case of newer models, the lowest electricity sales price.

This mechanism ensures that the limited transmission infrastructure is utilised by the most economically efficient projects. Furthermore, Turkish law requires a minimum of one year of onsite wind or solar measurement data for any licensed application, a requirement that mandates early-stage capital commitment from the investor. This technical prerequisite is verified by the General Directorate of Meteorology or accredited institutions, ensuring that the generation forecasts provided to the regulator are rooted in empirical reality rather than mere estimates.[127]

A unique and highly strategic component of the Turkish licensing landscape is the YEKA model. Unlike the standard licensing process where an investor finds a site and applies for a permit, the YEKA model involves the MENR designating spe-

[126] Energy Market Regulatory Authority (EMRA). (2023). Electricity Market Licensing Regulation. Ankara: Republic of Türkiye Official Gazette

[127] Ministry of Energy and Natural Resources (MENR). (2022). Türkiye National Energy Plan.

cific large-scale areas with high resource potential. These zones are then put to a descending clock auction. The winner of a YEKA tender is granted a "Right of Use" under the relevant YEKA Agreement and tender specification. The "Right of Use" is valid for up to 49 years and does not replace the preliminary licence and generation licence process required under the applicable legislation. Although specific terms vary by tender specification (şartname), the YEKA auctions conducted in 2024 and 2025 shared a common structure. Winners receive an initial free-market sales period of 60 months for solar and 72 months for wind. This is followed by a 20-year purchase guarantee priced at the level established through the competitive auction. The 2024 tenders (YEKA RES-2024 and GES-2024) were denominated in US dollar cents per kWh. The 2025 tenders (YEKA RES-2025 and GES-2025) shifted to euro cents per kWh. In both cases, the offtake price is fixed in hard currency for two decades. The contracts also include a floor-price protection mechanism.

If the wholesale Market Clearing Price falls below a specified threshold during the free-market period, the guaranteed floor price is paid instead. Transmission tariff charges payable to TEİAŞ are reimbursed to the winning bidder under YEKDEM for the full 20-year guarantee period. This structure enhances project bankability. It offers lenders and sponsors a predictable revenue stream that mitigates both market-price volatility and Turkish lira depreciation risk over the debt tenor. The YEKA model often includes strict "local content" requirements, mandating the use of Turkish manufactured components or the establishment of local R&D centres. This policy aims to foster a domestic industrial base for renewable technologies while providing investors with a "super-permit" environment where many of the preliminary land and environmental hurdles are precleared or expedited by the state.[128]

For smaller scale investors or industrial facilities seeking self-consumption, Türkiye offers the "Unlicensed Generation" regime. Initially capped at 1 MW but later expanded to 5 MW and beyond for certain categories, this pathway allows legal entities and individuals to generate electricity without establishing a traditional energy company or obtaining a formal license from EMRA. The licensing procedure for unlicensed projects is significantly more streamlined, focusing primarily on a "Call Letter" for a connection agreement from the local distribution company.

However, the legal framework for unlicensed generation has become increasingly stringent to prevent it from being used as a commercial shortcut for large scale production. Current regulations require the generation facility to be associated with a consumption point. The treatment of surplus energy is subject to the applicable hourly netting and settlement rules, including the remunerated generation limit. Importantly, this association no longer requires geographic proximity. Amendments to the Unlicensed Electricity Generation Regulation removed the earlier requirement that the generation facility be located in the same distribution region as its associated consumption point. Under Article 5(1)(h) of the Regulation, a generation facility may be established outside the distribution licence area where the associated consumption facility is located, subject to the conditions set out in the applicable legislation and secondary regulations.

Environmental and social compliance in Türkiye is governed by the Environmental Impact Assessment Regulation, which categorises projects based on their potential ecological footprint. Large scale wind and hydro projects usually fall under "Annex I," requiring a comprehensive EIA report and public participation meetings, while

[128] Official Gazette of the Republic of Türkiye. (2016). Regulation on Renewable Energy Resource Zones (YEKA).

smaller projects may only require a "Project Description File" under "Annex II." The legal risk during this phase is significant; administrative courts in Türkiye are highly active in reviewing EIA positive decisions, often at the request of local environmental groups or affected communities. An investor must therefore ensure that the public consultation process is not merely a formality but a substantive engagement.

Furthermore, land acquisition involves navigating various types of land tenure, including treasury lands, forest lands, and private agricultural plots. The "Right of Easement" or "Expropriation" processes are governed by the Expropriation Law (Law No. 2942), and the cost of land acquisition must be factored into the project's initial financial model as a critical licensing expense.

The operational phase of a renewable investment in Türkiye is managed through the YEKDEM mechanism, which provides a 10-year purchase guarantee for plants commissioned within specific timeframes. The transition from a USD based tariff to a Turkish Lira based "escalating" tariff has changed the hedging strategies of international investors. To maintain the validity of the generation license, which is typically granted for 49 years, the project company must adhere to continuous reporting requirements and technical standards set by EMRA. Any changes in the shareholding structure of the project company during the preliminary license period are strictly regulated and often prohibited, a measure designed to prevent "license trading" where entities secure permits solely to sell them to third parties without any intent to build. This regulatory stance emphasises the government's focus on "realised capacity" rather than mere paper applications.

The recent introduction of the "Super-Permit" concept in 2025 aims to further accelerate the licensing timeline by centralising various administrative approvals under a more coordinated framework. This is particularly relevant for "Hybrid Power Plants," which combine different renewable sources at a single connection point. The Turkish regulatory body has recognised that the future of the grid depends on flexibility, leading to new regulations that allow for the integration of BESS into existing generation licenses. Investors who commit to building storage capacity are often granted priority in grid connection allocations; a policy move that reflects Türkiye's awareness of the technical challenges posed by high renewable penetration. This evolving legal landscape requires investors to be agile, as the "rules of the game" are frequently updated to reflect technological advancements and global market trends.

In conclusion, the licensing procedures for renewable energy in Türkiye offer a robust but demanding pathway for international and domestic capital. The clear distinction between the preliminary and final license phases provides a structured risk management framework, while the YEKA and unlicensed regimes offer specialised entries for different investment profiles. However, the successful navigation of this system requires a deep understanding of local administrative law, a proactive approach to environmental and social governance, and a technical strategy that aligns with the evolving requirements of the national grid. As Türkiye continues to expand its renewable capacity, the digitalisation of the licensing process and the further streamlining of permit timelines will be essential to maintaining its position as a leading destination for clean energy investment in the Mediterranean and Middle East regions.

2.6 Incentives for Renewable Energy Sources

In addition to overarching policy instruments such as YEKDEM and YEKA, Türkiye has progressively expanded a range of supplementary incentives aimed at strengthening the localisation of renewable energy technologies. These measures are designed not only to expand domestic manufacturing capacity but also to facilitate technology transfer, foster qualified employment, and reinforce industrial development across strategic energy-related sectors. The policy mix integrates fiscal exemptions, financial supports, investment incentives, and dedicated research and development mechanisms, reflecting a broader industrial policy orientation that links energy transition objectives with technological upgrading and supply chain security.

A major institutional shift occurred with the adoption of Presidential Decree No. 9903, published in the Official Gazette on 30 May 2025, which comprehensively restructured Türkiye's investment incentive framework. Replacing the earlier Decrees No. 2012/3305 and 2018/11201, the new system introduces a more targeted, layered, and transformation-oriented architecture aligned with macroeconomic priorities, industrial competitiveness, and green and digital transformation goals.[129] The decree seeks to promote investments that enhance production and employment, reduce import dependency in critical sectors, strengthen supply security, attract foreign direct investment, and mitigate regional disparities. Incentives under this framework are applicable to investment certificate applications submitted until the end of 2030.

The reconfigured system is organised around three complementary pillars: the Century of Türkiye Development Initiative, the Sectoral Incentive System, and the Regional Incentive System. The Century of Türkiye Development Initiative operates through project-based evaluation and supports investments demonstrating high value-added potential, technological sophistication, and alignment with green and digital transformation objectives. Eligible projects may benefit from customs duty exemptions, VAT exemptions, corporate tax reductions, interest or profit share support, machinery support, and land allocation.

By contrast, the Sectoral Incentive System provides rule-based incentives for investments in predefined priority and targeted sectors without requiring committee-based project evaluation. Investments qualifying under sectoral criteria may access similar support instruments, thereby ensure procedural predictability while maintain policy selectivity.

The Regional Incentive System supplements both strategic and sectoral incentives by introducing geographically differentiated benefits structured across six socio-economic regions. Incentive intensity increases with lower regional development levels, with Region VI receiving the most extensive supports. Instruments include employer social security premium support nationwide and additional employee premium support for Region VI. Minimum investment thresholds vary by region, reflecting differentiated development objectives. The framework also introduces special provisions for relocated manufacturing investments, enabling firms shifting

Table 14. Summary of the New Investment Incentives System

Century of Türkiye Development Initiative	Sectoral Incentive System	Regional Incentive System
Technology Initiative Program	Priority Investments Incentive Scheme	Türkiye Century Move
Local Development Initiative Program	Targeted Investments Incentive Scheme	Sectoral Incentives
Strategic Initiative Program		

[129] Presidential Decree No. 9903 [Cumhurbaşkanı Kararı]. (2025, May 30). Official Gazette of the Republic of Türkiye.

operations from more developed regions to less developed ones to benefit from regional supports under specified employment conditions. VAT exemption applies to domestically procured and imported machinery and equipment included within the investment certificate, effectively lowering upfront capital expenditure and improving project feasibility. Customs duty exemption similarly reduces investment costs by eliminating import duties on qualifying machinery and equipment, a mechanism particularly relevant for capital-intensive renewable energy and advanced manufacturing investments.

Corporate tax incentives constitute the primary long-term financial support mechanism within the system. Rather than offering differentiated tax rates by region alone, the framework links tax relief intensity to program classification and investment contribution ratios. This design reflects a policy preference for performance-based and transformation-oriented incentives, rewarding investments that generate higher value added, technological upgrading, and localisation effects. The uniform corporate tax reduction structure, combined with varying investment contribution rates, ensures predictability for investors while maintaining policy flexibility.

Employment-related incentives have been recalibrated to align with the updated Socio-Economic Development Index. Employer social security contributions for additional employment are partially or fully subsidized depending on the region, with extended support durations for earthquake-affected provinces and designated districts. Corporate tax relief mechanisms have also been revised, with investment contribution rates varying by program category while maintaining a uniform corporate tax reduction structure. The designated regions are illustrated in the Table 15.

Table 15. Regions in the Investment Incentive System

I.Region	II.Region	III.Region	IV.Region	V.Region	VI.Region
Ankara	Aydın	Adana	Afyon	Bartın	Adıyaman
Antalya	Balıkesir	Bilecik	Aksaray	Bayburt	Ağrı
Bursa	Bolu	Burdur	Amasya	Çankırı	Ardahan
Eskişehir	Çanakkale	Düzce	Artvin	Erzurum	Batman
İstanbul	Denizli	Gaziantep	Çorum	Giresun	Bingöl
İzmir	Edirne	Isparta	Elâzığ	Hatay	Bitlis
Kocaeli	Kayseri	Karabük	Erzincan	K.maraş	Diyarbakır
Muğla	Konya	Karaman	Kastamonu	Kilis	Gümüşhane
	Manisa	Kırıkkale	Kırşehir	Niğde	Hakkâri
	Mersin	Kırklareli	Malatya	Ordu	Iğdır
	Sakarya	Kütahya	Sivas	Osmaniye	Kars
	Tekirdağ	Nevşehir		Sinop	Mardin
	Yalova	Rize		Tokat	Muş
		Samsun		Tunceli	Siirt
		Trabzon		Yozgat	Şanlıurfa
		Uşak			Şırnak
		Zonguldak			Van

Regional differentiation is primarily implemented through social security premium supports and minimum investment thresholds, rather than through VAT or customs instruments. The Regional Incentive System operates across six socio-economic regions, where incentive intensity increases as regional development levels decline. Region VI benefits from the most extensive support measures, including full employer social security premium coverage and additional employee premium support. In other regions, employer contributions are partially subsidised, reinforcing cost advantages for investments located in less developed provinces.

Minimum fixed investment requirements also vary across regions, lowering entry barriers for Regions III through VI relative to the more developed Regions I and II. This mechanism functions as an implicit regional equalisation tool, encouraging spatial redistribution of investments without distorting core fiscal instruments. Additional adjustments, such as one-region-up support for underdeveloped districts and special provisions for relocated manufacturing investments, further strengthen the territorial cohesion objective embedded within the framework.

From a renewable energy and localisation perspective, the incentive structure plays a dual role. First, VAT and customs exemptions reduce capital costs and facilitate technology deployment. Second, regional and program-based supports steer investments toward domestic value creation, industrial clustering, and employment generation. This integrated design underscores Türkiye's evolving policy approach, where renewable energy expansion, industrial upgrading, and regional development are treated as mutually reinforcing policy domains rather than isolated objectives.

Within this framework, licensed solar and wind power investments are supported under the Targeted Investments Incentive Scheme (Hedef Yatırımlar Teşvik Sistemi). Eligible projects benefit from VAT exemption and customs duty exemption. Interest or profit-share support is available only for investments located in Regions IV, V, and VI, and the scheme does not extend corporate tax reduction to licensed or commercial generation investments.[130]

By contrast, solar and wind investments built by manufacturing industry establishments for their own electricity consumption, limited to the contracted capacity in the connection agreement, are classified as Priority Investments (Öncelikli Yatırımlar Teşvik Sistemi) and may access VAT exemption, customs duty exemption, and employer social security premium support, though interest or profit-share support does not apply. Self-consumption solar and wind investments by non-manufacturing entities fall outside the Priority Investments category and are evaluated instead under the Targeted Investments Incentive Scheme.

Access to these incentives is conditional on domestic content requirements introduced by the Communiqué on the Implementation of the Presidential Decree on State Aids for Investments (Communiqué No. 2025/1), published in the Official Gazette dated 21 June 2025 (No. 32933). For solar investments, photovoltaic panels must be produced from cells manufactured domestically from the ingot-slicing stage or an earlier stage, and panel carrier construction systems must be domestically produced. For wind investments, blades and towers must be domestically produced, and, for incentive certificate applications filed from 1 January 2026 onwards, the generator, or the generator inside the nacelle, must also be domestically produced. These conditions do not apply to wind investments that secured contract signing rights through YEKA tenders, or that obtained a pre-licence or licence, before 21 June 2025.

Consistent with this localisation policy, photovoltaic panels and panel carrier construction systems, together with blades, generators, and turbines used in unlicensed wind investments within the connection capacity limit, are excluded from customs duty exemption when sourced from abroad, even where the investment otherwise holds an incentive certificate.

Investments in the manufacturing of renewable energy equipment are supported separately, with the applicable incentive scheme varying according to investment scale and the technological classification of the equipment produced. Larger and more technologically advanced projects may additionally apply to the HiT-30 Program, a call-based mechanism offering an elevated support package. Depending on the applicable scheme, available instruments include VAT exemption, customs duty exemption, corporate tax reduction, employer social security premium support, interest or profit-share support, machinery support, and land allocation.[131]

Building on the broader investment incentive framework, Türkiye's industrial and renewable energy transformation is further supported through targeted innovation, R&D, and internationalization mechanisms that complement fiscal and regional incentives. TÜBİTAK, Small and Medium Enterprises Development Organisation (KOSGEB), and the Responsible® Program[132] provide dedicated funding, technical assistance, and consultancy services to enhance domestic technological capabilities, energy efficiency, and firm-level green transformation, addressing structural constraints that investment certificates alone cannot resolve. Programs such as the Green Transformation Support Program and the Türkiye Green Industry Project,[133] coordinated with the World Bank, combine financing, sector-specific technology roadmaps, and R&D support to promote low-carbon, sustainable production practices. The 2030 Industry and Technology Strategy set the overarching direction, guiding Türkiye toward a high-value-added, technology-intensive, and resilient industrial structure, while emphasising localisation, digitalisation, and strategic autonomy. Flagship initiatives like the HIT-30 Program[134] accelerate strategic investments in renewable energy technologies, energy storage, electric mobility, semiconductors, and advanced manufacturing, combining grants, tax advantages, R&D support, and localisation requirements to strengthen domestic value chains, reduce import dependency, and enhance global competitiveness. Together, these complementary instruments reflect an integrated policy approach where energy transition, industrial upgrading, and technological sovereignty are mutually reinforcing objectives.

[130] Communiqué on the Implementation of the Decision on State Aids in Investments [Yatırımlarda Devlet Yardımları Hakkında Kararın Uygulanmasına İlişkin Tebliğ] (Communiqué No. 2025/1). Official Gazette of the Republic of Türkiye (No. 32933, 21 June 2025).

[131] Ministry of Industry and Technology, General Directorate of Strategic Research and Productivity. (2025). Ministry of Industry and Technology – HiT-30 Project [Sanayi ve Teknoloji Bakanlığı - Hit30 Projesi]. https://hit30.sanayi.gov.tr/

[132] Ministry of Trade. (2024). Responsible® Programme (Green Deal Compliance Project Support) [Yeşil Mutabakata Uyum Projesi Desteği - Responsible® Programı]. https://ticaret.gov.tr/dis-iliskiler/yesil-mutabakat/yesil-mutabakata-uyum-projesi-destegi-responsible-programi

[133] TÜBİTAK (The Scientific and Technological Research Council of Türkiye). (2024). Call 1831 – Green Innovation Technology Mentorship Programme [1831 - Yeşil İnovasyon Teknoloji Mentörlük Çağrısı]. https://tubitak.gov.tr/tr/destekler/sanayi/ulusal-destek-programlari/1831-yesil-inovasyon-teknoloji-mentorluk-cagrisi

[134] Ministry of Industry and Technology, General Directorate of Strategic Research and Productivity. (2025). Ministry of Industry and Technology – HiT-30 Project [Sanayi ve Teknoloji Bakanlığı - Hit30 Projesi]. https://hit30.sanayi.gov.tr/

FUTURE OUTLOOK, POTENTIAL RISKS & DRIVERS FOR GROWTH

3.1 Expected Demand Growth

Türkiye's power system has experienced substantial changes in its generation mix over the past decade, characterised by accelerated renewable capacity additions, evolving market structures, and growing electrification trends across multiple sectors. These transformations coincide with persistent growth in electricity consumption, reflecting macroeconomic expansion, demographic factors, industrial activity, and the gradual electrification of end uses. Understanding the trajectory and characteristics of this demand growth is therefore fundamental to interpreting future investment requirements and system constraints.

The demand outlook presented in the Ten-Year Demand Forecast (2025–2034) provides a comprehensive framework for this evaluation. By offering low, base, and high consumption scenarios, the forecast captures both expected growth patterns and inherent uncertainties surrounding economic activity, consumption behaviour, and structural shifts in electricity use. Beyond aggregate consumption levels, the projections also highlight developments in peak demand, which carry distinct implications for capacity adequacy, system reliability, and network planning. These considerations underscore that demand growth is not solely an issue of energy volumes, but also of temporal load patterns and system stress conditions.

Against this background, the following section examines Türkiye's projected electricity demand evolution and discusses its broader implications for generation technologies, system flexibility, and infrastructure requirements. Establishing this demand perspective enables a more coherent interpretation of the roles that renewables, thermal resources, and other non-renewable sources are expected to play within the emerging power system configuration.

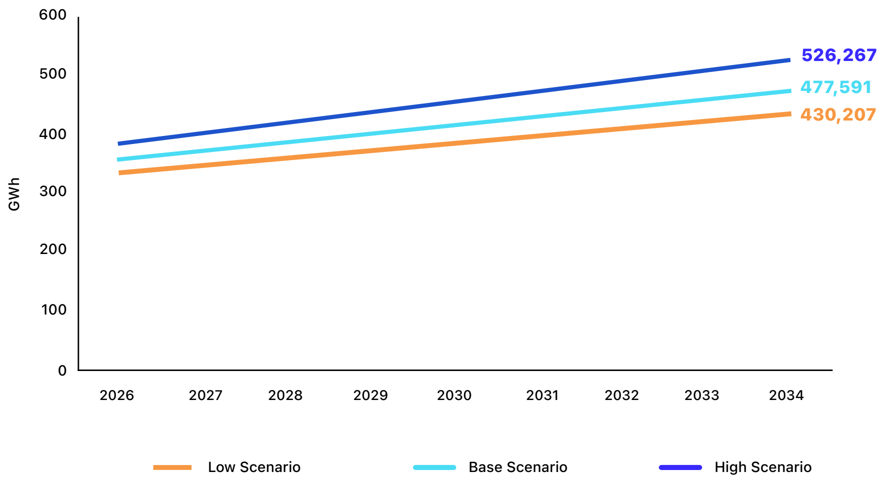
According to Türkiye's latest medium-term demand outlook implying a structurally different power system by the early 2030s, as can be seen from Figure 15. The projections in the Ten-Year Demand Forecast (2025–2034) indicate steady and non-cyclical growth across all scenarios, with national consumption rising from roughly 330-380 TWh in 2026 to 430–526 TWh by 2034. Even the low-demand trajectory reflects annual growth above 3%, which is significant for a power system that has already undergone major expansion over the past decade. From a system planning perspective, the critical implication is not only higher energy volumes, but a simultaneous and persistent increase in peak demand, with the national system peak expected to approach 73–90 GW by 2034.[135]

From a generation mix standpoint, the demand trajectory projected for Türkiye must be interpreted within a broader global context of sustained electricity consumption growth. Global electricity demand is expected to expand at robust rates, averaging approximately 3.3% in 2025 and 3.7% in 2026. Although these figures represent a moderation from the exceptionally strong growth observed in 2024, they remain among the highest annual increases recorded in the past decade.[136] Despite macroeconomic uncertainties, including downward revisions to global GDP expectations and persistent trade-related risks, structural drivers such as industrial activity, rising cooling needs, data centre expansion, and accelerating electrification continue to underpin electricity demand worldwide.

[135] TEİAŞ. (2024). 2025-2034 Talep Tahmin Raporu. İlgili Raporlar. Teias.gov.tr. https://www.teias.gov.tr/ilgili-raporlar

[136] IEA. (2025). Demand: Global electricity use to grow strongly in 2025 and 2026 – Electricity Mid-Year Update 2025 – Analysis - IEA. IEA. https://www.iea.org/reports/electricity-mid-year-update-2025/demand-global-electricity-use-to-grow-strongly-in-2025-and-2026

Figure 15. According to Different Scenarios Expected Demand Growth between 2026-2034



Electricity consumption is thus growing significantly faster than total final energy demand, reinforcing the centrality of power systems in the global energy transition.

Within this international landscape, Türkiye exhibits demand dynamics that are broadly consistent with global electrification trends yet characterised by country-specific structural features. The national demand forecasts indicate a steady and economically meaningful expansion of electricity consumption throughout the 2026–2034 period, accompanied by a pronounced increase in peak load requirements.

Several structural factors beyond baseline residential and industrial consumption are expected to exert additional upward pressure on future electricity demand in Türkiye. First, the adoption of EVs is projected to make a measurable contribution to electricity consumption. Although EVs accounted for a negligible share of total electricity demand in 2023, studies project that by 2030 the electricity consumed by EV charging could increase to represent more than half a percent of total demand, reflecting rapid uptake of electrified transport and the expansion of charging infrastructure.[137] In this context, the EV stock is projected to reach 1,321,932 vehicles by 2030 and 3,307,577 vehicles by 2035 under the medium scenario of the April 2024 projection study published by the EMRA. Based on these projections and prevailing assumptions regarding vehicle usage patterns and electricity consumption intensity, EV-related electricity demand is expected to rise steadily throughout the next decade. Accordingly, total EV electricity consumption is estimated to correspond to roughly 1% of installed capacity by 2030 and approximately 2.3% by 2035, indicating that transport electrification will become an increasingly visible, though still manageable, component of overall system demand.[138]

Second, digital transformation and the expansion of data centres associated with cloud computing, artificial intelligence and advanced computing services present another emerging driver of electricity demand. While Türkiye's data centre fleet is currently smaller relative to larger economies, available projections suggest that electricity consumption from data centre operations in Türkiye could grow substantially over the next decade as capacity expands. Some industry estimates anticipate that data centre electricity demand could reach between ten and twenty terawatt hours per year by 2030, representing a non-negligible share of national electricity consumption and adding to overall load growth pressures on the system.[139]

Third, hydrogen production capacity growth is expected to introduce new electricity demand streams later in the projection period. Türkiye's National Hydrogen Strategy targets the development of two gigawatts of electrolyzer capacity by 2030, five gigawatts by 2035 and up to seventy gigawatts by 2053, reflecting ambitions to scale green hydrogen production for industrial use and potentially for export. Electrolyzers convert electricity into hydrogen, and at scale this conversion process will contribute additional demand for grid-sourced power as the hydrogen economy matures and integrates with manufacturing sectors, including steel, cement, chemicals and transportation.[140]

Fourth, broader electrification trends including heat pumps, electrified industrial processes and the electrification of building heating and cooling loads also influence forecast demand. For example, sectoral analyses in Türkiye's energy transi-

[137] Şahin, H. (2025). Electricity Consumption of Electric Vehicles in Türkiye and its Share in Total Electricity Consumption: 2030 Projection. Fırat Üniversitesi Mühendislik Bilimleri Dergisi, 37(1), 423-432. https://doi.org/10.35234/fumbd.1603738

[138] EMRA. (2024). EMRA | Enerji Piyasası Düzenleme Kurumu. EMRA.gov.tr. https://www.EMRA.gov.tr/Detay/Icerik/4-14379/elektrikli-arac-ve-sarj-altyapisi-projeksiyonu-

[139] Çelik, R., Şahman, M. A., & Dündar, A. O. (2025). Assessment of the Energy Efficiency of Data Centres in Türkiye. Electrical Engineering and Energy (ELENE). https://doi.org/10.64470/elene.2025.14

[140] Ministry of Energy and Natural Resources. (2023). Türkiye Hydrogen Technologies Strategy and Roadmap. Retrieved from https://enerji.gov.tr/Media/Dizin/SGB/en/HSP_en/ETKB_Hydrogen_T_Strategies.pdf

tion literature estimate that electrification of end uses beyond conventional loads could add billions of kilowatt hours to total annual electricity consumption by 2030, driven by expanded use of electric heat pumps, industrial electrification and electrified transport forms such as rail.[141]

Infrastructure implications are arguably more profound than generation mix effects. Demand growth of the magnitude reflected in national projections necessitates continuous reinforcement of transmission and distribution networks, irrespective of technology pathways. Rising peak loads directly affect network utilisation rates, transformer capacities and regional transfer constraints. Simultaneously, the geographical concentration of renewable resources such as wind-intensive corridors, solar-rich regions and hydro-dominated basins increases the requirement for long-distance power transfers. Grid expansion thus becomes jointly driven by demand growth and spatial resource asymmetry. Absent sufficient network capacity, congestion and renewable curtailment risks inevitably intensify, undermining system efficiency.

In strategic terms, Türkiye's projected demand evolution reinforces three structural conclusions that align with, yet are not identical to, global developments. First, renewables are expected to dominate incremental energy supply due to economic competitiveness and policy alignment. Second, thermal and other dispatchable resources remain indispensable for reliability, with their system value increasingly defined by flexibility rather than energy production. Third, network expansion and system flexibility emerge as the principal constraints of the transition, potentially outweighing concerns related solely to aggregate generation adequacy. The core challenge of the coming decade therefore lies not merely in expanding capacity, but in ensuring that a larger, more renewable-intensive system can operate securely under higher peaks, greater variability, and increasingly complex power flow patterns.

3.2 Climate Mitigation Policies

As of early 2026, Türkiye has fundamentally restructured its environmental and economic policy landscape to align with its 2053 Net Zero Emissions Target. The cornerstone of this shift is the Climate Law, enacted in July 2025, which provides the legal mandate for a national TR ETS. These policies aim to preserve Türkiye's industrial competitiveness, particularly in light of the European Union's CBAM, while fostering a domestic green transformation.[142]

In the context of national climate mitigation framework, Türkiye's current mitigation strategy is driven by a dual-track approach: fulfilling international commitments under the Paris Agreement and ensuring economic resilience through domestic regulation.

The landmark Climate Law (2025) serves as the primary legislative engine for Türkiye's climate action. It enshrines the 2053 Net Zero goal into law and establishes the Directorate of Climate Change as the central coordinating authority. Key provisions include:

- Mandatory Emission Reductions: Establishing sectoral reduction targets aligned with the updated NDC.
- Institutional Governance: The creation of the Carbon Market Board, chaired by the Ministry of Environment, Urbanisation, and Climate Change, to oversee carbon pricing and allowance allocations.
- Adaptation and Mitigation Synergy: A legal requirement for public and private sectors to integrate climate risk assessments into long-term planning.

The Long-Term Climate Strategy (LTS), submitted in November 2024, provides the strategic roadmap for this journey.[143] The LTS encompasses 89 distinct strategies across 18 sectors and four cross-cutting areas, reflecting an integrated approach to decarbonization.[144] While the 2053 target is the long-term objective, the path toward it is characterised by intermediate goals that have drawn both praise and critical scrutiny. The updated first INDC pledges a 41% reduction in emissions by 2030 relative to a Business-as-Usual (BAU) scenario.[145] This translates

[141] SHURA. (2021, September 23). Electrification. SHURA. https://shura.org.tr/en/energy-transition/elektrifikasyon

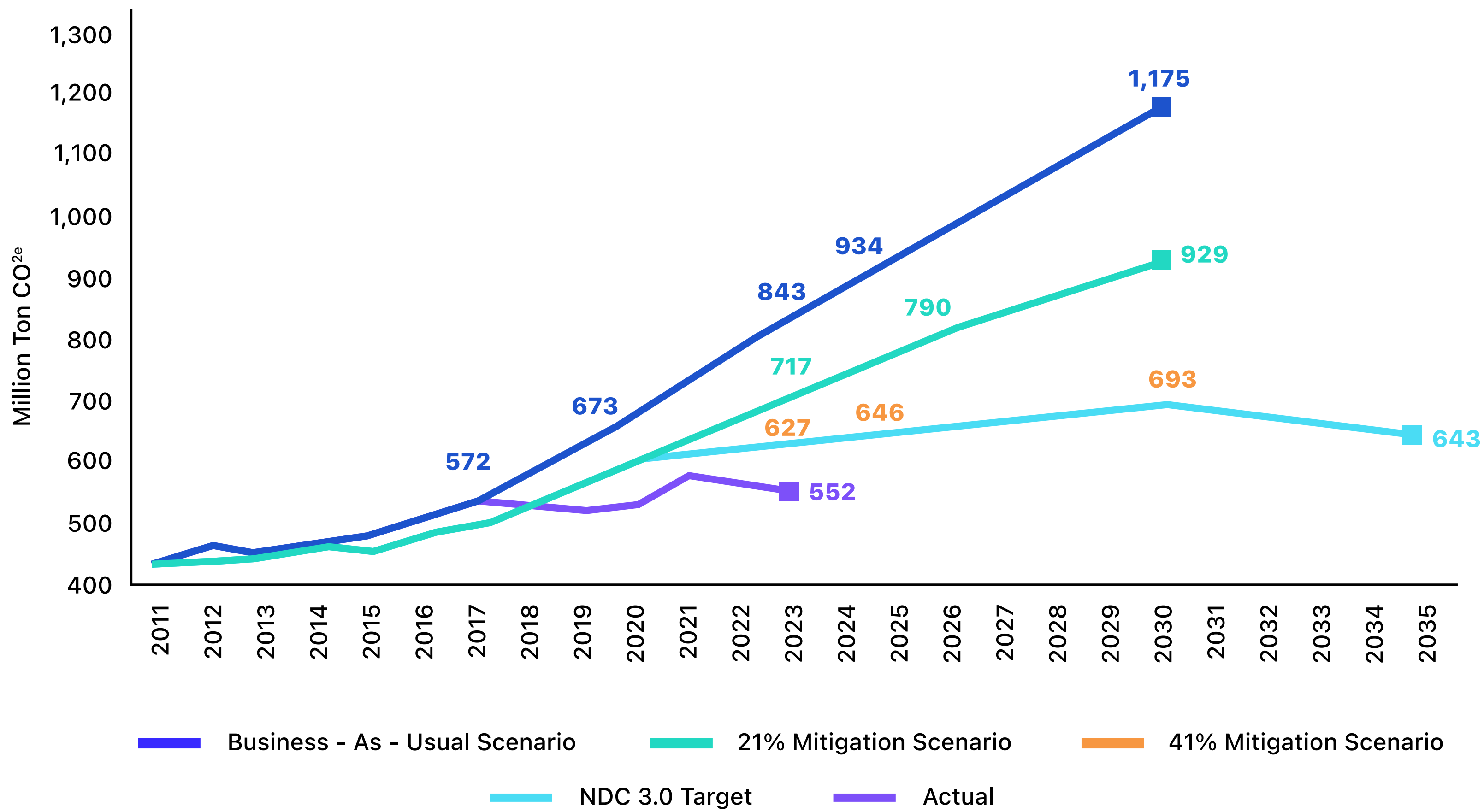
[142] Ministry of Environment, Urbanisation and Climate Change (MoEUCC). (2025). Türkiye's Green Deal Action Plan: 2025 Progress Report. Ankara: Directorate of Climate Change.

[143] Climate Action Tracker. (2025). Net Zero Targets. https://climateactiontracker.org/countries/Türkiye/net-zero-targets/

[144] UNFCCC. (2025). Türkiye's 2053 Long-Term Climate Strategy. https://unfccc.int/sites/default/files/resource/Turkiye_Long_Term_Climate_Strategy.pdf

[145] Net Sıfır Türkiye. (2025). The 2053 Net-Zero Target and Türkiye's Long-Term Climate Change Strategy. https://netsifirturkiye.org/en/the-2053-net-zero-target-and-turkiyes-long-term-climate-change-strategy/

Figure 16. Annual Greenhouse Gas Emissions



to an absolute emissions cap of approximately 699 $MtCO_2e$ (including LULUCF) by 2030.[146] Figure 16 represents the annual greenhouse gas emissions.

On the other side, the most significant development in 2026 is the operational launch of the TR ETS pilot phase. The Carbon Market has not yet been commissioned by EPİAŞ. It is expected to become operational in the third quarter of 2026. Building on a decade of Monitoring, Reporting, and Verification (MRV) data collected since 2015, the TR ETS is designed to mirror the EU ETS but with specific adaptations for the Turkish industrial base.

- **Pilot Phase (2026–2027):** The current phase serves as a "learning-by-doing" period. It focuses on the energy and heavy industry sectors (e.g., steel, cement, electricity) with installations emitting over 50,000 tonnes of CO_2e per year.[147]
- **Cap and Allocation:** Unlike the absolute caps of the EU, the TR ETS utilises an intensity-based cap during its early years. Most allowances are currently allocated for free based on performance benchmarks to prevent "carbon leakage" (industries moving to avoid costs).
- **Trading Infrastructure:** Trading is conducted via EPİAŞ (Energy Exchange Istanbul), providing a transparent market for buying and selling carbon allowances.

The 2025 Law also formalised a National Carbon Crediting Mechanism. This allows for domestic projects, such as reforestation or renewable energy installations not covered by the ETS, to generate credits.[148]

- **Offset Limits:** Regulated entities can use domestic offsets to meet up to 10% of their compliance obligations, providing a flexible pathway for lower-cost mitigation.

Table 16. TR-ETS Implementation Timeline and Technical Features

Phase	Years	Allocation Method	Scope (Estimated)	Penalty Mechanism	Offset Usage
Pilot Phase	2026-2027	100% Free Allocation	Facilities >50kt CO2e (CBAM Sectors + Energy)	Administrative fines with an 80% discount	Not Allowed
First Implementation Period	2028-2035	Gradual Phase-in of Auctions	All activities listed in Annex-1 (covering approx. 47% of national emissions)	Full Penalty + surrender of missing allowances in the following year	Allowed (Limited, e.g., 10% cap)

The transition to a priced-carbon economy carries profound implications for the Turkish market, affecting everything from industrial margins to international trade flows.

In the context of mitigation of CBAM exposure, the primary economic driver for the TR ETS is the EU's Carbon Border Adjustment Mechanism (CBAM). Without a domestic carbon price, Turkish exporters to the EU would effectively pay "carbon taxes" into the EU budget.[149]

- **Revenue Internalization:** By pricing carbon domestically, Türkiye keeps the revenue within its borders.
- **Cost Reduction:** Estimates suggest that a domestic ETS could reduce the total CBAM-related cost for Turkish industry by over 50% by 2027, as the carbon price paid in Türkiye is deducted from the liability at the EU border.

Furthermore, to protect its domestic industry, the EU will gradually phase-out free allocations starting in 2026. This process is the primary factor determining how CBAM costs will escalate over time. In accordance with World Trade Organisation (WTO) rules, the EU must apply the same regulatory standards to imported goods, including those from Türkiye, as it does to its domestic producers. The CBAM framework is fundamentally built upon this principle of equal treatment.

As illustrated in Table 7, Turkish exporters will not be liable for the total embedded emissions of their products in 2026, but only for an initial 2.5% portion. This rate is projected to rise to 48.5% by 2030, significantly multiplying the financial burden. By 2034, free allocations will be completely terminated (100%). This trajectory indicates that while 2026 will serve as an adjustment period, the costs will reach critical levels from 2028 onwards.

The carbon market is being integrated into a broader "Green Finance" architecture. The Tür-

[146] Directorate of Climate Change. (2024). Updated Nationally Determined Contribution (NDC) of the Republic of Türkiye.

[147] EPİAŞ (Energy Exchange Istanbul). (2025). TR-ETS Market Participation Manual and Pilot Phase Regulations.

[148] Directorate of Climate Change (DCC). (2025). Implementing regulation on national carbon credit mechanisms and offset registry. Republic of Türkiye Ministry of Environment, Urbanisation and Climate Change.

[149] European Commission. (2024). Guidance on the carbon border adjustment mechanism (CBAM) for third-country installations. EU Publications Office.

kiye Green Taxonomy, finalised in 2025, provides clear definitions of "sustainable activities," helping banks and international investors identify projects that are compatible with the TR ETS framework.

In summary, the operationalisation of the TR ETS and the legislative backing of the 2025 Climate Law mark a definitive turning point in Türkiye's economic and environmental history. The shift from voluntary participation to a regulated, priced-carbon economy is no longer a peripheral environmental goal; it is a core strategic pillar for maintaining industrial competitiveness in a "Green Europe" reality. While the transition presents immediate hurdles, specifically regarding the initial costs of compliance and the technicalities of grid decarbonization, the long-term benefits of internalizing carbon revenue and fostering domestic innovation far outweigh the risks of inaction. As Türkiye navigates the complexities of its pilot phase through 2026, the success of its 2053 Net Zero vision will ultimately depend on how effectively the state can support its industrial heartlands through this green evolution. Türkiye is no longer merely reacting to global climate trends; it is actively building the market infrastructure to lead a regional transformation.

Table 17. EU Free Allocation Phase-out Schedule and CBAM Liability Rate

Year	EU Free Allocation Reduction (CBAM Factor)	Emissions Subject to CBAM Cost
2026	2.5%	2.5%
2027	5.0%	5.0%
2028	10.0%	10.0%
2029	22.5%	22.5%
2030	48.5%	48.5%

3.3 Future Outlook for the Electricity Prices

Türkiye's wholesale electricity prices over the 2026 to 2035 period will be shaped through changes in the hourly price profile and technology specific capture prices, rather than through a single average price assumption, because the marginal unit will be displaced in an increasing number of hours by low variable cost resources while peak pricing remains tied to system flexibility and residual thermal needs. The main structural drivers are:

- the scale up of zero marginal cost renewables under the 2035 targets,
- the staged entry of nuclear baseload at Akkuyu,
- the introduction of explicit carbon pricing under the TR ETS framework discussed in Section 3.2, and
- the pace at which transmission and connection capacity expands in line with the renewable development pipeline.

These drivers affect different parts of the price curve differently and their combined implications for average price trajectory, technology-specific capture prices, carbon cost pass-through, nuclear and gas dynamics, and flexibility value are discussed in the subsections below.

3.3.1 Average Price Trajectory & Merit Order Effect

Türkiye's day-ahead market price in each hour is set by the last unit dispatched to meet demand. As zero-marginal-cost renewable generation displaces higher-cost thermal units from the margin during an increasing number of hours, average clearing prices across the year come under downward pressure relative to a system in which thermal generation dominates dispatch. Solar capacity grew from 10.9 GW in 2022 to 25.1 GW by end-2025,[150] an increase of more than 130 percent in under three years, and the progressive deepening of midday solar output has driven a structural widening of the discount between noon-hour and morning or evening prices. This pattern is expected to intensify as solar capacity advances toward the 76.9 GW target and wind toward 43.1 GW set out in the Renewable Energy Roadmap 2035.[151] Under this scenario, Ember projects the share of fossil fuels in electricity generation could fall below 20% by 2035, with wind and solar rising to approximately 49% of generation compared to 21% in 2025.[152]

This downward pressure on average prices will not, however, translate to a uniform price collapse. Gas-fired generation is expected to remain the marginal price-setter during peak and low-renewable hours throughout much of the transition period, functioning as a structural price floor linked to imported gas costs and,

[150] MENR. (2026, January 21). Electricity generation and consumption reached record levels [Press release]. https://enerji.gov.tr/haber-detay?id=31716

[151] MENR. (2024) Renewable Energy Roadmap 2035. https://enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular/Lansman%20EN_202410221149.pdf

[152] Ember. (2025, January 29). 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/

from 2028, to carbon pricing. Türkiye's dispatchable hydroelectric capacity serves alongside gas as a key balancing resource, deployed by TEİAŞ to manage solar and wind variability and meet peak demand. Demand growth partially moderates this dynamic: consumption is projected to increase by approximately 150 TWh by 2030 relative to the 2025 level of 360.9 TWh, a volume that wind and solar additions alone cannot fully cover, sustaining gas dispatch volumes through the late 2020s.[153] The net effect is a widening of intraday and seasonal price spreads rather than a collapse of the overall price level.

Financial models relying on annual average price proxies will systematically misstate revenue exposure in a high-renewables system. Investor and lender models should be built on hourly price distributions rather than annual averages, with explicit treatment of the widening spread between off-peak and peak hours.

3.3.2 Technology-Specific Capture Prices

As renewable penetration deepens, the revenues individual technologies actually capture diverge increasingly from the annual average market price. Solar generation faces the greatest exposure to this dynamic. Solar output is concentrated in midday hours, precisely the period when the collective output of a growing installed base most aggressively suppresses market-clearing prices. As solar capacity grows toward the 76.9 GW 2035 target, periods of near-zero midday pricing are expected to extend across a larger share of the calendar year, deepening the gap between solar capture prices and the annual average. Experience from markets in Southeastern Europe where solar penetration has advanced further indicates that solar capture prices in high-penetration scenarios can fall materially below wind capture prices within the same market, reflecting the concentrated and temporally correlated nature of solar generation profiles.[154]

Wind generation carries a more resilient capture price profile than solar because Türkiye's wind resource is distributed more broadly across hours and seasons, including winter evenings when demand is elevated and solar output is absent. However, wind capture prices also face growing downward pressure as aggregate wind capacity increases and simultaneous high-wind events push clearing prices toward zero across multiple zones concurrently. In 2025, wind and solar annual generation volumes converged for the first time at 39.4 TWh and 38.1 TWh respectively, indicating that the two technologies increasingly share overlapping generation windows and amplify mutual price suppression during favourable weather conditions.[155]

Reservoir hydropower occupies a structurally different position. Dispatchable hydro operators can shift generation toward high-price morning and evening hours and reduce output during low-price midday periods. As intraday price spreads widen, the dispatch flexibility of reservoir hydro is expected to generate increasing incremental value, allowing operators to sustain capture prices materially above the annual average. Nuclear capacity, operating with near-zero variable costs alongside run-of-river hydro and renewables, will occupy the low-cost end of the supply curve and is similarly insulated from capture price erosion, though its inflexibility means it cannot actively optimise toward high-price hours in the way dispatchable hydro can.

For projects approaching the end of their YEKDEM or YEKA contract periods, financial models must explicitly incorporate hourly price distributions rather than annual averages. This is particularly acute for solar projects commissioned between 2015 and 2021 transitioning to merchant exposure during the 2025 to 2031 period,[156] coinciding with the phase of deepest solar capture price erosion. Hybrid wind-solar-storage configurations reduce overall revenue exposure to single-technology price cannibalization throughout the year.

[153] Ministry of Energy and Natural Resources, Republic of Türkiye. (2022). Türkiye National Energy Plan. https://enerji.gov.tr/Media/Dizin/EIGM/tr/Raporlar/TUEP/T%C3%BCrkiye_National_Energy_Plan.pdf

[154] Balkan Green Energy News. (2024, April 9). Cannibalization in SEE to make solar power prices 40 to 50 percent lower than wind wholesale prices. https://balkangreenenergynews.com/cannibalization-in-see-to-make-solar-power-prices-40-to-50-lower-than-wind-wholesale-prices/

[155] Ember. (2025, January 29). 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/

[156] Republic of Türkiye, Ministry of Industry and Technology, Investment Office. (2021, February 1). New Feed-in Tariffs Enters into Force in Renewable Energy. https://www.invest.gov.tr/en/news/news-from-turkey/pages/new-feed-in-tariffs-enters-force-renewable-energy.aspx

3.3.3 Carbon Cost Pass-Through & Coal Dynamics

As of 2026, Türkiye's power sector enters this transition without an explicit carbon price. The TR ETS, discussed in detail in Section 3.2, introduces carbon costs in two stages: a pilot period from 2026 to 2027 with full free allocation, followed by a first implementation period from 2028 to 2035 during which free allocation is progressively reduced.[157] For price formation, the relevant implication is that carbon costs will begin to pass through into the variable costs of gas and coal generation from 2028 onward, adding an upward structural component to peak and scarcity-hour clearing prices at precisely the point when Akkuyu's baseload entry is compressing residual thermal dispatch volumes.

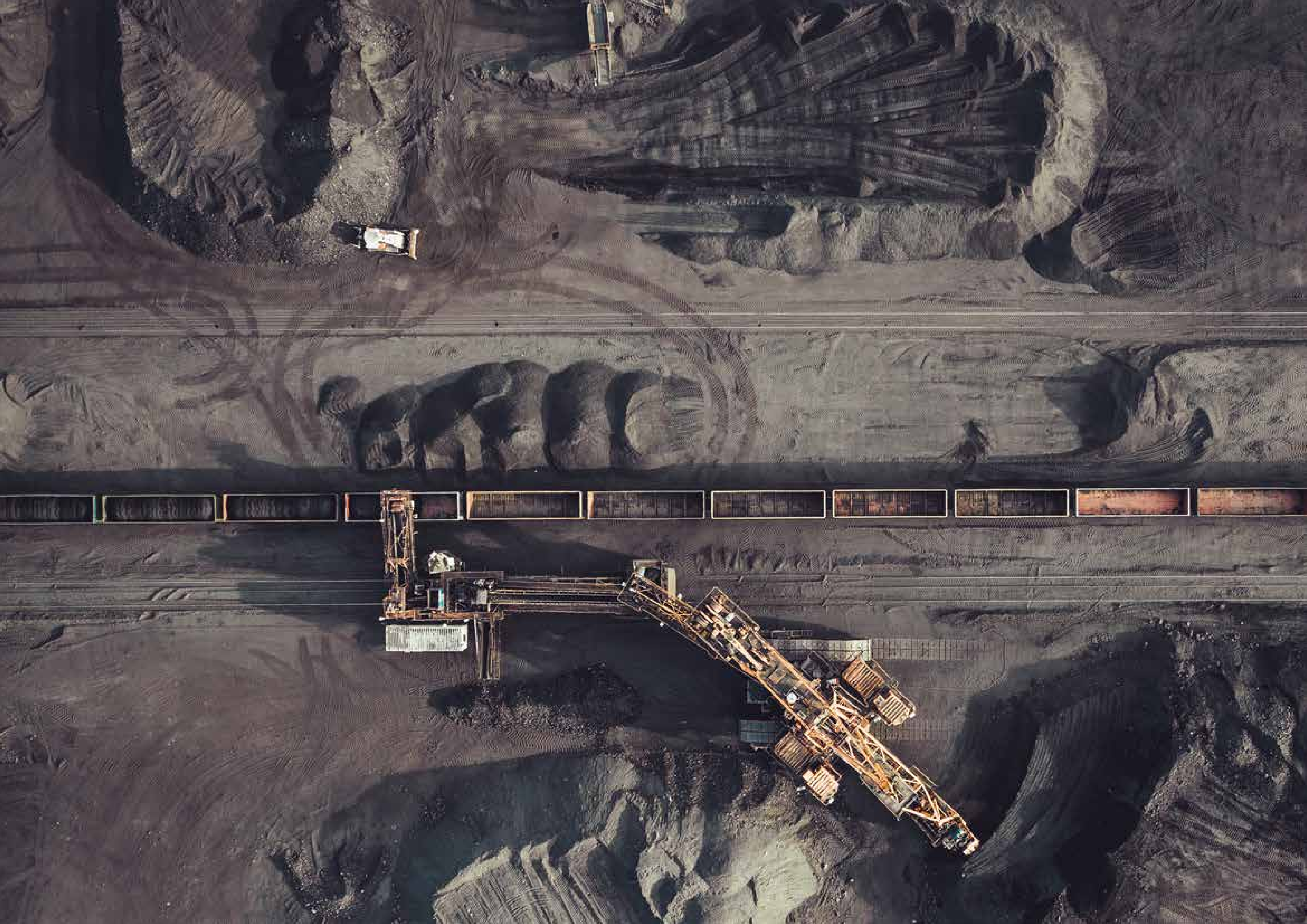
The domestic coal purchase guarantee introduced in September 2025 introduces a parallel near-term pricing dynamics. The programme guarantees purchases for domestically sourced coal plants at USD 75 per MWh through 2030, covering approximately 60 percent of electricity produced at eligible plants.[158] The price formation relevance is not that the guarantee directly sets wholesale prices, but that it alters bidding incentives for the covered volume. Guaranteed plants have an incentive to bid at or near zero in high-renewable hours rather than withdrawing capacity, which limits the depth of price troughs relative to a fully merchant coal fleet. The expiry of the guarantee for existing plants in 2030 coincides with the onset of meaningful TR ETS carbon cost pass-through, creating a structural transition in the cost and dispatch economics of domestic coal in the early 2030s that warrants explicit treatment in medium-term scenario modelling.

Carbon cost pass-through strengthens the commercial case for contracted procurement of low-carbon electricity. Industrial buyers in CBAM-exposed sectors such as iron and steel, cement, and chemicals, face a directly escalating carbon liability from 2026 onward, creating demand-side pressure for corporate PPAs that supports the bankability of clean generation assets independently of wholesale price movements.[159]

[157] Climate Change Directorate, Republic of Türkiye. (2025). Türkiye Emisyon Ticaret Sistemi Yönetmeliği taslağı yayımlandı. https://iklim.gov.tr/turkiye-emisyon-ticaret-sistemi-yonetmeligi-taslagi-yayimlandi-haber-4519

[158] Turkish Minute. (2025, September 6). Turkey sets 7.5 cents per kWh state guarantee for local coal power shifting market risk to the state. https://turkishminute.com/2025/09/06/turkey-sets-7-5-cents-per-kwh-state-guarantee-for-local-coal-power-shifting-market-risk-to-/

[159] Long, I., Inclan, C., Conway, D., Mikolajczyk, S., Voyvoda, E., Yeldan, E., Atl, A., & Mert, E. (2023). Potential impact of the Carbon Border Adjustment Mechanism on the Turkish economy: Quantification of the economic impacts and review of climate policy response options. EBRD, Climate Focus. https://iklim.gov.tr/db/turkce/haberler/files/20230523%20Impacts%20of%20CBAM%20on%20Turkiye%20phase%202%20report%20FV3%20(2)-sayfalar-1,3,5-16%20(1)%20(1).pdf



3.3.4 Nuclear Baseload & Gas Peaker Dynamics

The first 1,200 MW unit of Akkuyu Nuclear Power Plant entered its commissioning and test production phase in 2026, marking the first entry of nuclear generation into Türkiye's supply stack. The remaining three units are planned sequentially, with all four units targeted to be fully operational by end-2028 under the National Energy Plan, bringing total capacity to 4,800 MW. Given the early-2026 commissioning start, a 2029 to 2030 full-capacity scenario should be treated as a plausible stress case in financial models sensitive to the pace of nuclear baseload entry. At full output, Akkuyu is projected to generate approximately 35 to 40 TWh annually, equivalent to approximately 10 percent of Türkiye's 2025 national electricity consumption.[160] The Long-Term Climate Strategy further targets an additional 2.4 GW of nuclear capacity to be commissioned between 2030 and 2035, implying total nuclear installed capacity of 7.2 GW by 2035.[161]

Operating with near-zero variable costs, each Akkuyu unit progressively reduces the volume of residual demand that gas-fired plant must serve and, by extension, the number of hours in which gas plants can economically clear the market. The National Energy Plan projects gas-fired capacity to increase from 24.2 GW in 2025 to 35.5 GW by 2035, reflecting the continued role of flexible gas generation in balancing a much larger intermittent renewable fleet. However, as nuclear baseload grows and solar penetration accelerates toward the 2035 targets, the transition to a system in which gas operates primarily as a peaker rather than a mid-merit unit could materialise rapidly in the early 2030s. Gas-fired plants will consequently concentrate their fixed cost recovery into a declining number of peak and scarcity hours, making the adequacy of the price ceiling a critical variable in sustaining the revenue case for flexible capacity investment.

The current 4,500 TL/MWh ceiling (following the April 2026 revision), whose reform trajectory is discussed in Section 3.4[162], which is closely linked to this dynamic. If the TL-denominated ceiling does not keep pace with EUR-denominated gas fuel costs and, from 2028, with carbon cost pass-through, genuine scarcity signals will be suppressed. The combination of falling run hours, rising variable costs, and a static nominal price ceiling would simultaneously compress margins for existing gas assets and reduce incentives for new flexible capacity investment at precisely the point the system most requires it.

For investors in gas-fired capacity and lenders assessing long-term tolling structures, the pace of regulatory adjustment to the price ceiling is a material variable in revenue modelling through the transition period. Financial models for gas assets beyond 2030 should treat the gradual displacement by nuclear and renewables as a base case rather than a downside scenario, with explicit sensitivity analysis on annual run hours and ceiling reform timing.

[160] Ember. (2025). Türkiye Electricity Review 2025. https://ember-energy.org/app/uploads/2025/03/Turkiye-Electricity-Review-2025_11032025.pdf

[161] Republic of Türkiye. (2023). Long-Term Climate Strategy 2053. https://unfccc.int/sites/default/files/resource/Turkiye_Long_Term_Climate_Strategy.pdf

[162] EPDK. (2026, April 2). Gün Öncesi Piyasası ve Dengeleme Güç Piyasasında Asgari ve Azami Fiyat Limitlerinin Belirlenmesine İlişkin Usul ve Esaslar Hakkında Kurul Kararı (Karar No. 14459). https://www.epias.com.tr/tum-duyurular/piyasa-duyurulari/elektrik/dgp/gun-oncesi-piyasasinda-ve-dengeleme-guc-piyasasinda-azami-fiyat-limitinin-4-500-tl-mwh-belirlenmesine-iliskin-kurul-karari/

3.3.5 Flexibility Value & Curtailment Conditions

The widening of intraday price spreads creates growing revenue opportunities for battery storage and other flexible assets. A storage system charging during near-zero midday solar hours and discharging during elevated morning and evening ramp periods captures the spread through energy arbitrage. Although the National Energy Plan targets an increase in battery capacity to 7.5 GW by 2035, this target has since been revised upward. The Ministry's 2024-2028 Strategic Plan sets a more ambitious near-term objective, targeting cumulative battery storage capacity of 10 GW by 2028, which exceeds the longer-dated NEP projection. The planned transition from hourly to 15-minute imbalance settlement, targeted for 1 January 2027, will increase the granularity with which this spread can be captured and will simultaneously raise the financial cost of poor forecast accuracy for renewable generators.

Seasonal dynamics add a further structural dimension. Cooling-related demand is shifting Türkiye's system peak from winter to summer: on 28 July 2025, the country recorded its highest-ever hourly consumption of 59 GWh, with cooling accounting for 18 percent of that load.[163] Wind generation, structurally stronger in winter across Türkiye's coastal and highland regions, provides a natural seasonal complement to solar, reinforcing the commercial logic of hybrid wind-solar-storage configurations that reduce overall revenue exposure to single-technology price cannibalization throughout the year.

Beyond price-level and capture price risks, the scale of Türkiye's renewable expansion creates a growing risk of physical curtailment if transmission infrastructure does not keep pace with deployment, a constraint analysed in detail in Section 3.5. Curtailment exposure directly impairs effective generation volumes and makes grid connection position a material variable in site selection and revenue assumptions. The key implication for price modelling is that projects in congested network regions face a compounded risk of both lower capture prices and reduced generation volumes relative to unconstrained peers.

Projects holding existing grid allocations or co-located at thermal and hydro sites carry materially lower development risk than those dependent on new approvals in congested areas. The 15-minute settlement transition from 2027 onward raises the premium on accurate forecasting capability and real-time dispatch optimisation, particularly for hybrid and storage assets targeting arbitrage revenue.

[163] Ember. (2025, August 20). Solar and flexibility: key to Türkiye's rising cooling challenge. https://ember-energy.org/app/uploads/2025/08/Solar-and-flexibility-key-to-Turkiyes-rising-cooling-challenge.pdf

3.4 Expected Changes in Market Design

Türkiye's electricity market is entering a period of concurrent regulatory reforms that will materially affect how price signals are formed, how settlement costs are calculated, and how operational performance translates into financial outcomes. These reforms reflect the market's progressive alignment with European market design standards, a trajectory that expands the commercial opportunity set for investors capable of operating at higher levels of technical and financial sophistication. The near-term reform agenda covers three areas: the trajectory of wholesale price limits, the move toward finer temporal and regional settlement granularity, and the restructuring of imbalance cost rules effective from January 2026. Over the medium term, the entry of nuclear baseload at Akkuyu and the formalisation of ancillary services markets are expected to reshape the market's revenue architecture, creating asset classes and business models that are structurally new to the Turkish market.

3.4.1 Wholesale Price Limits Reform

The Day-Ahead Market and Balancing Power Market both operate within a price band set by EMRA. The upper bound, the Maximum Settlement Price, currently stands at 4,500 TL/MWh following a further upward revision on 4 April 2026, which superseded the 3,400 TL/MWh level set in April 2025 (the first adjustment since July 2023), reflecting continued upward pressure from natural gas tariffs and input costs. The removal of the Resource-Based Maximum Settlement Price, which previously applied differentiated caps by generation source, has simplified the framework and established a uniform ceiling applicable to all technologies. The ceiling's periodic adjustment in line with input cost dynamics, including fuel prices and exchange rate movements, reflects EMRA's intent to maintain cost-reflective price signals as the generation mix evolves.

The relationship between price ceilings and investment adequacy is well-documented in liberalised market experience. The IEA's analysis of OECD electricity markets finds that administrative price caps, when set below the level required to recover fixed costs during scarcity hours, reduce the investment signal for peaking capacity and demand response, and that any government signal of willingness to intervene in price formation adds regulatory uncertainty that deters long-term capital commitment. In Türkiye's evolving system, where gas-fired peakers will increasingly concentrate fixed cost recovery into a declining number of high-demand hours, the adequacy and reform trajectory of the ceiling is a material variable for investors in flexible capacity. The expected trajectory of ceiling reform, and its interaction with carbon cost pass-through from 2028, is discussed in Section 3.3.
On the floor side of the price band, Türkiye currently maintains a minimum price of 0 TL/MWh, preventing the negative hourly clearing prices

that have become common in high-penetration European markets. The IEA notes that markets including Australia and the Nordic region have experienced negative prices as renewable and nuclear generation created periodic supply surpluses, and that allowing negative prices strengthens the commercial case for demand response and battery storage by making the cost of surplus hours visible to the market.[164] As solar penetration in Türkiye deepens toward the 2035 targets, the 0 TL/MWh floor will increasingly moderate the depth of midday price troughs, providing a degree of downside protection for merchant solar assets while simultaneously limiting the arbitrage signal available to storage operators. Whether and when EMRA moves to permit sub-zero clearing prices represents a structural design choice with material implications for the relative value of solar generation and storage assets through the transition period. The current price band structure provides a degree of revenue floor protection for solar assets transitioning to merchant exposure. For investors in peaking gas, storage, and demand response assets, the reform trajectory of the ceiling is a key variable in long-term revenue modelling. Assets positioned to capture value from ceiling reform, including flexible gas capacity and battery storage, carry an embedded option on regulatory adjustment that strengthens as the system's flexibility requirement grows.

3.4.2 Imbalance Cost Reform

Amendments to the Electricity Market Balancing and Settlement Regulation, effective 1 January 2026, introduced a state-contingent imbalance penalty structure that materially changes the financial exposure of generators operating in the merchant segment.[165] Under the previous framework, imbalance penalties were fixed regardless of whether the system was in surplus or deficit at the time of the deviation. The revised framework ties penalty levels directly to system conditions, such that participants whose imbalance position worsens the system state face significantly higher costs than those whose deviation is neutral or system supportive. Additional penalty mechanisms apply when prices reach extreme levels, further concentrating the cost of deviation in the highest-value hours.

For baseload and dispatchable generators with stable output profiles, the practical impact of these changes is limited. For merchant wind and solar plants, the new structure creates a strongly pro-cyclical cost exposure, as imbalances are penalised most heavily precisely when wholesale prices are highest and system conditions are tightest. This design is consistent with the broader European approach to imbalance pricing, which aims to align individual participant incentives with system needs rather than socialising deviation costs across the market. The IEA's analysis of liberalised electricity markets finds that state-contingent imbalance pricing creates a scale advantage for larger and more diversified market participants, as internal netting across assets with uncorrelated generation profiles reduces net imbalance exposure relative to standalone single-asset operators.[166]

The January 2026 imbalance reform structurally advantages diversified portfolios over standalone assets. Investors holding or assembling portfolios of generation, storage, and demand response assets can convert the new penalty structure into a competitive advantage through active imbalance optimisation. The mandated transition to fifteen-minute settlement periods by January 2027 further reinforces this advantage, as assets capable of sub-hourly response will capture a materially larger share of the available balancing value relative to inflexible generation.

[164] IEA. (2005). Lessons from liberalised electricity markets. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2005/12/lessons-from-liberalised-electricity-markets_g1gh5ff2/9789264109605-en.pdf

[165] EMRA. (2025, December 29). Regulation Amending the Electricity Market Balancing and Settlement Regulation [Elektrik Piyasası Dengeleme ve Uzlaştırma Yönetmeliğinde Değişiklik Yapılmasına Dair Yönetmelik]. Official Gazette of the Republic of Türkiye (No. 33122).

[166] IEA. (2005). Lessons from liberalised electricity markets. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2005/12/lessons-from-liberalised-electricity-markets_g1gh5ff2/9789264109605-en.pdf

3.4.3 Transition to 15-Minute Settlement

Pursuant to Transitional Article 40 of the Balancing and Settlement Regulation, TEİAŞ and EPİAŞ are required to complete the infrastructure preparations necessary to introduce fifteen-minute settlement periods in the Balancing Power Market by 1 January 2027.[167] This transition will increase the temporal granularity of settlement from the current hourly framework, creating finer price signals for flexible assets and strengthening the commercial case for battery storage and demand response assets with sub-hourly dispatch capability.

International experience shows that moving from hourly to half hourly or fifteen minute settlement enables the price formation process to capture short lived volatility events that are invisible in coarser time blocks. The IEA notes that in markets such as Australia and the Nordic region, shorter settlement intervals have sharpened scarcity pricing, improved the valuation of flexibility, and reduced the need for out of market interventions by system operators.[168] In practical terms, this means that intraday ramps in demand, weather driven swings in renewable output, and congestion driven redispatch requirements are more accurately reflected in spot prices.

For the Turkish market, the shift to fifteen minute settlement is particularly significant for storage and demand response business models. Battery storage assets capable of sub hourly cycling will be able to monetise intra hour spreads that are currently averaged out under hourly settlement, while responsive loads can target the most valuable quarter hours rather than whole hours. As temporal granularity increases, the revenue stack for flexibility shifts further from administratively determined mechanisms toward energy and balancing markets, reinforcing the commercial case for assets and portfolios designed around fast response and sophisticated short term optimisation.

[167] Republic of Türkiye. (2003, son değişiklik 2025). Elektrik Piyasası Dengeleme ve Uzlaştırma Yönetmeliği, Geçici Madde 40. Resmî Gazete.

[168] IEA. (2005). Lessons from liberalised electricity markets. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2005/12/lessons-from-liberalised-electricity-markets_g1gh5ff2/9789264109605-en.pdf

3.4.4 Ancillary Services Market Formalisation

Türkiye's ancillary services framework has historically been structured as an administrative procurement mechanism operated by TEİAŞ, covering primary and secondary frequency regulation, reactive power compensation, and black-start capability. These services have been procured outside of competitive market mechanisms, with costs recovered through system usage charges. The December 2024 regulatory package, which introduced the aggregation licensing framework and the balancing zone concept, established the operational and commercial preconditions for a market-based approach to ancillary service procurement, allowing aggregated portfolios of generation, storage, and demand response assets to offer frequency regulation and balancing services as a consolidated unit.[169]

The commercial significance of this shift is material for storage and flexible generation investors. The IEA's analysis of liberalised electricity markets finds that well-designed ancillary service markets have delivered substantial cost reductions in comparable settings: Australia achieved significant cost savings through the establishment of a competitive frequency control market, while Norway's TSO Statnett developed a market-based option contract mechanism for operating reserves that successfully attracted demand-side participation for the first time.[170] Both cases demonstrate that competitive procurement of ancillary services expands the pool of eligible providers, reduces system costs, and creates new revenue streams for assets capable of sub-minute response.

For the Turkish market, the limited frequency sensitivity mode service introduced in the December 2024 amendments represents the first formally defined ancillary service for which production assets commissioned after January 2025 carry a mandatory testing obligation, and for which battery storage assets are among the primary eligible technologies. Standalone battery storage facilities of 30 MW and above are subject to mandatory BPM registration as balancing units, providing the formal regulatory entry point for storage to generate ancillary service revenues; facilities below this threshold may participate on a voluntary basis or through an aggregator arrangement.[171] The system-level rationale for this demand growth is well-documented. SHURA's analysis of Türkiye's electricity system flexibility requirements identifies declining system inertia as a structural consequence of rising variable renewable penetration, noting that inverter-based assets do not provide the rotational inertia inherent to conventional synchronous generators. Pumped-storage hydropower can restore this capability through its directly grid-coupled synchronous machines. This is creating a growing requirement for synthetic inertia and fast-response balancing products.[172] This dynamic is corroborated by sector analysis published by the Turkish Energy Experts Association, which notes that TEİAŞ's secondary frequency control costs have risen materially as renewable penetration has increased, and that the system operator has historically preferred more stable dispatchable sources precisely because of the operational complexity introduced by variable generation.[173] As the installed base of inverter-based renewable capacity grows and the system's natural inertia declines, demand for synthetic inertia and fast frequency response products is expected to grow, progressively expanding the addressable revenue opportunity for storage assets that are actively positioned in the ancillary services market.

Battery storage and flexible generation assets that are structured to participate in the BPM and ancillary services market from commissioning will access revenue streams that are not available to passive generation assets. The formalisation of aggregation and balancing zone structures means that smaller storage assets and distributed flexible capacity can also access these revenues through aggregator arrangements, improving project bankability at sub-utility scale.[174]

[169] EMRA. (2024, December 17). Regulation Amending the Electricity Market Balancing and Settlement Regulation [Elektrik Piyasası Dengeleme ve Uzlaştırma Yönetmeliğinde Değişiklik Yapılmasına Dair Yönetmelik]. Official Gazette of the Republic of Türkiye (No. 32755).

[170] IEA. (2005). Lessons from liberalised electricity markets. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2005/12/lessons-from-liberalised-electricity-markets_g1gh5ff2/9789264109605-en.pdf

[171] EMRA. (2025, December). Electricity market balancing and settlement regulation. Republic of Türkiye Legislation Information System. https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=12985&MevzuatTur=7&MevzuatTertip=5

[172] SHURA Enerji Dönüşüm Merkezi. (2022). Türkiye Elektrik Sisteminde Esneklik Uygulamalarına Yönelik Politika Seçenekleri. Sabancı Üniversitesi. https://shura.org.tr/wp-content/uploads/2022/12/SHURA-2022-12-Turkiye-Elektirik-Sistemi.pdf

[173] Balik, N.. (2025). "Enerji Dönüşümünün Önündeki Büyük Zorluk: Elektrik İletim Sistemi." enerjiuzmanlari.org.tr, 26 Mayıs 2025. https://www.enerjiuzmanlari.org.tr/dergi/enerji-donusumunun-onundeki-buyuk-zorluk-elektrik-iletim-sistemi/

[174] SHURA Enerji Dönüşüm Merkezi. (2022). Türkiye Elektrik Sisteminde Esneklik Uygulamalarına Yönelik Politika Seçenekleri. Sabancı Üniversitesi. https://shura.org.tr/wp-content/uploads/2022/12/SHURA-2022-12-Turkiye-Elektirik-Sistemi.pdf

3.5 Evolution of the Transmission Grid

The historical evolution of the Turkish transmission grid serves as a compelling case study of a nation transforming from a localised, fragmented network into a highly synchronised, continental-scale energy bridge. For decades, the Turkish grid, managed primarily by TEİAŞ, was designed around a centralised philosophy, where large-scale hydroelectric plants in the East and thermal power plants near coal basins fuelled the industrial heartlands of the West. This unidirectional flow of power required a robust backbone of 400 kV and 154 kV lines, which historically prioritised reliability over flexibility. However, as Türkiye entered the 2020s, the imperative of the global energy transition and the nation's own 2053 Net Zero Emissions Target catalysed a fundamental shift in grid architecture. The traditional "hub-and-spoke" model is currently being dismantled in favour of a multidirectional, digitally enabled network capable of handling the high volatility of renewable energy.[175]

A pivotal milestone in this evolution was the full synchronisation of the Turkish grid with the European Network of Transmission System Operators for Electricity (ENTSO-E) Continental Europe Region in 2015. This synchronisation was not merely a technical alignment of frequencies; it was a strategic integration that allowed Türkiye to participate in international energy trading and provided a vital safety net for frequency stability. Today, the Turkish transmission system is one of the largest and most complex in the region, boasting over 75,000 kilometres of transmission lines. Despite this strength, the grid faces a geographic paradox: the highest potential for solar energy is in the Southeast and Central Anatolia, and the most consistent wind resources are in the Aegean and Marmara regions, yet the primary load centres remain concentrated in the Northwest. This mismatch creates massive internal congestion, necessitating a new generation of high-capacity corridors to prevent "bottlenecks" that would otherwise lead to the curtailment of green energy.[176]

The current state of the grid is increasingly defined by the rapid penetration of Inverter-Based Resources (IBRs), primarily wind and solar. Unlike the massive rotating turbines of thermal plants that provide natural mechanical inertia to keep the grid frequency stable at 50 Hz, solar panels and modern wind turbines interface with the grid via power electronics. This lack of inherent inertia makes the Turkish grid more susceptible to rapid frequency deviations during sudden drops in wind speed or cloud cover. To address this, TEİAŞ has begun implementing advanced ancillary services, requiring renewable energy plants to provide "synthetic inertia" and fast frequency response. This technological shift is essential as Türkiye aims to increase its installed renewable capacity to over 50% of its total mix by 2030, a goal that requires the grid to act less

[175] Ministry of Energy and Natural Resources (MENR). (2024). Türkiye National Energy Plan 2035 and 2053 Net Zero Roadmap. Republic of Türkiye.

[176] TEİAŞ (Turkish Electricity Transmission Corporation). (2025). Transmission System Investment and Development Plan: 2025-2029. Ankara: TEİAŞ Publications.

like a passive pipe and more like an active, responsive organism.

Future developments in the Turkish grid are set to be dominated by the integration of BESS. Following the regulatory milestones of 2023 and 2024, the EMRA has granted pre-licenses for tens of gigawatts of renewable energy projects linked to storage. This "storage-first" approach is a gamechanger for the transmission grid; it allows for the "time-shifting" of energy, where excess solar power produced during the afternoon can be stored and injected into the grid during the evening peak. This significantly reduces the thermal stress on transmission lines and mitigates the "Duck Curve" phenomenon, which has begun to emerge in Türkiye's Mediterranean and Aegean regions where solar density is highest. By 2028, these integrated storage facilities are expected to provide a critical buffer, acting as virtual transmission assets that can defer the need for expensive physical line upgrades.

The physical hardware of the Turkish grid is also poised for a revolution through the deployment of High-Voltage Direct Current (HVDC) technology. While the Turkish grid has traditionally relied on Alternating Current (AC), the limitations of AC for long-distance, high-capacity transfers are becoming apparent. Future plans include the potential development of a North-South HVDC corridor to bring offshore wind energy from the Black Sea, a frontier with estimated potential exceeding 10 GW, directly to the industrial zones of Kocaeli and Istanbul.[177]

Digitalisation and the implementation of Smart Grid technologies represent the "brain" of this evolving system. TEİAŞ is currently upgrading its National Load Dispatch Centre with AI-driven predictive analytics that can forecast renewable generation with unprecedented accuracy. By utilising "Digital Twins" of the transmission infrastructure, operators can perform real-time simulations to predict how the grid will react to a sudden trip of a large power plant or a storm affecting wind farms in Çanakkale. Furthermore, the deployment of Dynamic Line Rating (DLR) sensors across the 400 kV backbone allows TEİAŞ to adjust the capacity of transmission lines based on real-time weather conditions. For instance, on a windy day, the cooling effect of the wind allows a wire to carry more current without sagging dangerously, potentially increasing transmission capacity by 20% without the need for new construction.[178]

At the regulatory and market level, the evolution of the grid is being supported by the modernisation of the EPİAŞ/EXIST. The introduction of intraday and balancing markets has provided the economic signals necessary for grid flexibility. As the price of electricity fluctuates based on the availability of intermittent renewables, market participants are incentivized to invest in demand-side response and flexible generation. This market-driven flexibility is vital for the transmission grid, as it encourages large industrial consumers to reduce their load during peak times, thereby alleviating the stress on the transmission infrastructure. The synergy between market mechanisms and grid operations is the hallmark of a mature energy system, moving Türkiye closer to the "Utility 2.0" model.

The long-term vision for the Turkish grid also includes a deeper regional integration that extends beyond ENTSO-E. Türkiye is strategically positioned to act as a regional energy hub, potentially connecting the vast solar resources of the Middle East and the wind potential of the

[177] International Energy Agency (IEA). (2024). Türkiye. IEA Publications. https://www.iea.org/countries/turkiye

[178] Aktaş, A., & Kirschen, D. (2023). Digitalisation and Dynamic Line Rating for High-Penetration Renewable Grids: The Turkish Case Study. IEEE Power & Energy Society.

Caspian region to the European market. Future interconnections with Georgia, Azerbaijan, and potentially Iraq and Iran (under synchronised conditions) would allow for a transcontinental balancing of energy. If a cloud cover moves across Central Anatolia, the deficit could be balanced by wind power from the Caspian or solar power from the Gulf, provided the transmission corridors are in place. This "Interconnected Super-Grid" concept is the ultimate solution to the intermittency of renewables, as it leverages the geographical diversity of weather patterns across thousands of kilometres.

However, this evolution is not without its challenges. The capital expenditure required for these upgrades is immense, estimated in the tens of billions of USD over the next decade. Funding this transition requires a stable regulatory environment that attracts both domestic and international green finance. Furthermore, the technical complexity of managing a grid with a high share of power electronics requires a new generation of power engineers skilled in both electrical engineering and data science. The human element of grid evolution, the training of operators to manage a system that changes by the millisecond, İs just as important as the physical pylons and wires. Türkiye's ability to navigate these financial and human resource constraints will determine the speed at which it can achieve its decarbonization goals.[179]

Furthermore, Minister of Energy and Natural Resources Alparslan Bayraktar has recently highlighted the need for substantial investment in Türkiye's electricity infrastructure. These investments will be essential for integrating large-scale renewable energy projects into the national grid and strengthening system flexibility.

- USD 200 Billion Energy Investment Potential: At the Türkiye Clean Energy Transition Investment Forum held in London in June 2026, Minister of Energy and Natural Resources Alparslan Bayraktar stated that Türkiye's total energy investment potential through 2035 could reach approximately USD 200 billion. This figure covers renewable energy, supporting infrastructure and nuclear energy investments.[180]

- USD 80 Billion Grid Infrastructure: Approximately USD 80 billion of this investment is planned for transmission, distribution and wider grid infrastructure through 2035, in support of Türkiye's 120 GW wind and solar target.

- System Modernisation: Beyond network expansion, this investment will support a smarter, more flexible and digitally enabled electricity system. It will enable higher shares of variable renewable energy and meet rising demand from electric vehicles, data centres and other electrified end uses.

Significant progress has been made in securing low-cost, long-term financing for these infrastructure projects:

- $750 Million World Bank Loan: In late 2025, a $750 million loan agreement was finalised with the World Bank for the "Türkiye Transmission System Transformation Project." This funding is dedicated to digitalising the transmission network and expanding high-voltage infrastructure.[181]

- Strategic Support from EBRD: The European Bank for Reconstruction and Development (EBRD) continue to be a primary partner in Türkiye's green transition. While the World Bank focuses heavily on the public transmission side (TEİAŞ), the EBRD has been providing extensive financing for grid strengthening, energy efficiency, and low-carbon technologies, often working with private distribution companies and renewable energy developers to bridge the gap between generation and consumption.

- $6 Billion Framework: The Ministry recently indicated that the total financing package under discussion with the World Bank and other international partners could reach up to $6 billion, specifically targeting green energy and energy efficiency initiatives over the next few years.

Ultimately, with these targets and significant developments, the evolution of the transmission grid in Türkiye is a transition from a rigid, mechanical system to a flexible, electronic, and intelligent network. The grid of the future will not merely be a transporter of electricity; it will be a platform that integrates millions of decentralised assets, from electric vehicles and rooftop solar to massive offshore wind farms and battery arrays. By embracing HVDC technology, digitalisation, and storage-integrated markets, Türkiye is positioning itself to not only meet its own climate targets but to serve as a vital stabiliser for the entire Eurasian energy system. The next decade will be the most transformative in the history of the Turkish grid, as the infrastructure catch up to the ambitious reality of a renewable-dominated world.

[179] SHURA Energy Transition Centre. (2021). Socioeconomic Impact of the Power Systen Transition in Türkiye. Istanbul: SHURA.

[180] Anadolu Agency. (2026, June 24). Türkiye courts global investors in London for energy transition push. https://www.aa.com.tr/en/energy/energy-diplomacy/turkiye-courts-global-investors-in-london-for-energy-transition-push/57905

[181] Enerji Terminali. (2025). TEİAŞ ile Dünya Bankası iletim sisteminin dönüştürülmesine yönelik 750 milyon dolarlık anlaşma imzaladı.

3.6 Risks Related to Project Development

The landscape of project development in Türkiye is characterised by a unique intersection of high growth potential and a complex web of multifaceted risks that demand meticulous strategic planning. As a bridge between Europe and Asia, Türkiye has historically leveraged its geographical position to become a regional energy and infrastructure hub, yet the path from initial project conception to operational reality remains fraught with bureaucratic and financial hurdles. The primary challenge for developers in the current era is navigating the shifting regulatory environment while managing the macroeconomic volatility that has defined the Turkish market over the last decade. While the Turkish government has introduced significant reforms to streamline procedures, the inherent complexity of multi-layered licensing and the necessity of securing large-scale international financing create a high-stakes environment where project delays can lead to terminal financial losses.

The licensing process in Türkiye is often cited as the most significant non-technical barrier to project development, particularly in the renewable energy and infrastructure sectors. Under the framework provided by the Electricity Market Law No. 6446, developers must navigate a tiered system of preliminary licenses and final licenses overseen by the EMRA. While this structure is designed to ensure technical and financial competence, the reality involves interacting with numerous government bodies, including the Ministry of Environment, Urbanisation and Climate Change, the Ministry of Agriculture and Forestry, and various local municipalities. Each of these entities operates under its own set of regulations, and a delay in one department frequently creates a domino effect across the entire project timeline. This fragmented bureaucratic structure has historically led to "permitting fatigue," where projects with sound technical fundamentals were abandoned due to the sheer length and unpredictability of the administrative cycle, though Law No. 7554, published in the Official Gazette on 24 July 2025, introduced a new, streamlined mechanism to address these bureaucratic procedures and permits for wind and solar energy investments.[182]

Access to land and forestry permissions has historically been a notable consideration within the licensing phase. A significant portion of Türkiye's renewable energy potential, especially for wind and geothermal projects, is located on land categorised as forest or treasury land, and securing the necessary permits from the General

[182] Energy Market Regulatory Authority (EMRA). (2024). Electricity Market Licensing Regulation: Procedures and Principles. Ankara, Türkiye.

Directorate of Forestry has traditionally required a multi-year process involving assessments of ecological impact and public benefit. This has been substantially addressed by the "Süper İzin" reform (Law No. 7554, published 24 July 2025), which consolidates forestry permits into a single approval valid for the duration of the pre-license and automatically extended upon issuance of the generation license, and removes the Environmental Impact Assessment (ÇED) as a precondition so it can proceed in parallel with other permits. These changes target a reduction in overall permitting timelines for wind projects from roughly four years to as little as 18 months, and for solar projects to around 18 months. The legal status of land in Türkiye nonetheless remains subject to periodic zoning changes, which can still affect a project's preliminary license if the local municipality modifies land-use plans during the application period, so developers continue to monitor zoning stability as part of standard project due diligence.

The Environmental Impact Assessment (ÇED) process represents another dimension of regulatory and judicial risk, though the practical likelihood of a project being halted is often overstated. While the ÇED is a standard requirement for large-scale developments globally, in Türkiye it has occasionally become a focal point for local litigation, with local NGOs or community groups filing lawsuits in administrative courts even after a developer receives a "ÇED Positive" certificate. However, under Article 27 of the Administrative Procedure Law (Law No. 2577), a court may only grant a stay of execution, and must state its reasoning, where both of the following conditions are met simultaneously: (i) implementation of the administrative act would cause damage that is difficult or impossible to remedy, and (ii) the administrative act is manifestly unlawful. For a project that has been properly licensed and has obtained a lawfully issued "ÇED Positive" decision, the likelihood of a court finding this dual threshold met, and therefore of a stay being granted, is very low. Where litigation nonetheless proceeds to a full hearing on the merits, it can still extend the overall project timeline, so developers should factor this into scheduling even where near-term suspension risk is limited.

Access to finance has been an important consideration for the scaling of project development in Türkiye, shaped by the broader macroeconomic climate. For over a decade, Turkish projects relied on the Renewable Energy Resources Support Mechanism (YEKDEM), which provided fixed, USD-based feed-in tariffs. This mechanism made Turkish projects highly attractive to international lenders because it eliminated currency risk. The subsequent transition toward a Turkish Lira-indexed system introduced "escalation" factors that account for Lira depreciation when calculating producers' receivables, preserving the underlying US Dollar value of the guaranteed tariff levels. This design, together with the sustained tight economic programme that has delivered measurable progress in stabilising the Lira against the US Dollar and Euro, has meaningfully reduced the currency-risk concerns that characterised the early stages of the transition, supporting continued engagement from international lenders alongside local banks.[183]

The country's risk premium, as measured by Credit Default Swap (CDS) spreads, directly affects the cost of capital for any project developer. When Türkiye's CDS spreads are high, the interest rates on foreign-denominated loans rise sharply, making capital-intensive projects like offshore wind or large-scale solar parks economically unviable. Furthermore, the high inflation environment in Türkiye has led to a surge in the cost of raw materials and labour, often referred to as CAPEX inflation. Because project licenses are often granted based on price bids made years before construction begins, many developers find that the "strike price" they agreed to in government auctions is no longer sufficient to cover the increased costs of turbines, solar panels, and steel.[184]

The role of International Financial Institutions (IFIs) such as the EBRD, the International Finance Corporation (IFC), and the World Bank is crucial in mitigating these financial risks. These institutions provide not only capital but also "political risk insurance" and technical guidance that help projects reach financial close. However, IFI financing is contingent upon strict adherence to ESG standards that often exceed Turkish national requirements. For many local developers, meeting these international standards requires significant additional investment in social impact assessments and biodiversity studies, adding another layer of cost and time to the development cycle. Despite these challenges, the involvement of an IFI is often the only way for a project in Türkiye to secure the long-term, low-interest debt necessary for sustainability.

Grid connection capacity and the infrastructure managed by TEİAŞ represent a technical risk that translates directly into financial uncertainty. As the share of intermittent renewables grows, the available capacity at many regional substations has reached its limit. Developers may secure a generation license from EMRA only to find that TEİAŞ cannot grant them a connection point for several years due to grid congestion. This "grid risk" is particularly prevalent in the YEKA model, where the government tenders' large capacities in specific locations. If the grid infrastructure is not upgraded in tandem with the project development, the developer faces the risk of "curtailment," where they are forced to stop production

[183] International Energy Agency (IEA). (2024). Türkiye. IEA Publications. https://www.iea.org/countries/turkiye

[184] European Bank for Reconstruction and Development (EBRD). (2024). Türkiye Country Strategy 2024-2029.

without compensation during periods of low demand or high supply.

The YEKA model itself, while successful in attracting global players and lowering energy prices, carries specific project risks related to localisation requirements. Many YEKA tenders require a high percentage of "domestic content," meaning that components like wind turbine blades or solar cells must be manufactured within Türkiye. While this policy aims to foster a local industrial base, it can lead to supply chain risks. If a local manufacturer fails to deliver components on time or to the required quality standards, the developer is still held responsible for the project's commissioning deadline. This creates a reliance on a relatively small number of local suppliers, reducing the developer's ability to leverage global supply chains to manage costs and schedules.

Political and regulatory stability is a permanent consideration for any long-term project in Türkiye. While the fundamental laws governing energy and infrastructure are robust, secondary legislation and "communiqués" are subject to frequent changes. For example, changes in the regulations regarding "unlicensed" electricity generation or sudden modifications to tax incentives can overnight alter the financial feasibility of existing projects. Developers must maintain high levels of legal and governmental affairs expertise to anticipate these changes. The lack of a "grandfathering" clause in some new regulations, where old projects are not protected from new rules, remains a significant concern for international investors who prioritise long-term predictability.

Future expectations in the Turkish project development sector are increasingly tied to the alignment with the European Green Deal and the implementation of the New Climate Law. As Türkiye's major trading partner, the EU is moving toward a CBAM, which will penalise products with high carbon footprints. This creates a massive incentive for Turkish industrial projects to decarbonize. Consequently, we are seeing a shift toward "hybrid" projects, such as solar plants integrated with hydroelectric dams, and the emergence of green hydrogen initiatives. These new project types bring their own set of risks, including a lack of established regulatory frameworks and the need for specialised technical expertise that is still being developed within the Turkish workforce.

The integration of BESS is perhaps the most significant technological development expected in the near future. Recent changes in the Electricity Market Licensing Regulation have paved the way for "storage-linked" renewable projects. This is expected to mitigate grid stability risks and provide developers with a new revenue stream through ancillary services. However, the high cost of battery technology and the uncertainty surrounding the long-term degradation of storage assets add a new layer of technical and financial risk. Developers must now become experts in battery chemistry and market-clearing algorithms to ensure that their storage assets are dispatched profitably.

Digitalisation of the bureaucracy is one area where expectations are positive. The government's "E-Devlet" initiatives are slowly being integrated into the licensing process, with the goal of creating a "one-stop-shop" for investors. If successfully implemented, this would significantly reduce the time spent on manual document submissions and increase transparency in the approval process. A digitalised system would allow developers to track their applications in real-time across different ministries, reducing the opportunities for administrative delays and ensuring that all parties are working from a single source of truth.

In conclusion, the risks related to project development in Türkiye are significant but manageable for those with deep local knowledge and strong financial backing. The transition from a subsidy-driven market to a competitive, market-indexed environment has increased the complexity of project finance, while the bureaucratic landscape continues to demand high levels of patience and legal resilience. The barriers in the licensing process, particularly regarding land use and environmental litigation, remain the primary cause of project delays. However, the future outlook is bolstered by the clear strategic direction provided by the 2053 Net Zero target and the increasing sophistication of the Turkish financial sector. As Türkiye continues to modernise its grid and integrate new technologies like storage and green hydrogen, the developers who can navigate the current risks will be well-positioned to lead the nation's green transformation. Success in the Turkish market will ultimately depend on the ability to balance technical innovation with a sophisticated understanding of the local regulatory and macroeconomic landscape.

3.7 Expected Developments in Bilateral Electricity Trade

The evolution of bilateral electricity trade in Türkiye is currently undergoing a transformative shift, moving from a rigid, state-supported model toward a sophisticated, market-driven landscape defined by long-term Power PPAs. Historically, the Turkish electricity market was dominated by centralised procurement and the YEKDEM, which provided fixed, USD-denominated feed-in tariffs to developers. While this system was instrumental in building Türkiye's initial renewable energy capacity, the maturity of the market and the national commitment to a 2053 Net Zero target have necessitated a transition toward private bilateral contracts. Bilateral trade, which occurs outside the centralised day-ahead and intraday markets managed by EPİAŞ , allows for customized price and volume arrangements between generators and consumers. This transition is not merely a technical adjustment but a strategic response to global economic shifts, particularly the European Green Deal and the rising demand for traceable green energy among Turkish industrial exporters.[185]

The current state of the bilateral trade market in Türkiye is increasingly shaped by the emergence of Corporate PPAs. Unlike traditional utility PPAs, CPPAs enable large industrial and commercial consumers to source electricity directly from renewable energy producers over long periods, typically ten to fifteen years. This provides a hedge against price volatility in the spot market and ensures a stable revenue stream for developers, which is critical for the bankability of new projects in a post-feed-in-tariff era. As of 2025 and 2026, the Turkish regulatory framework has been significantly updated to facilitate these arrangements, particularly through the introduction of self-consumption regulations that allow companies to establish renewable plants in different geographical locations from their consumption points. This "off-site" self-consumption model has become the primary driver for bilateral trade, as it bypasses the physical limitations of industrial zones.[186]

In parallel with the expansion of Corporate PPAs, the role of public generators in the bilateral market has also gained strategic importance. In particular, EÜAŞ, as Türkiye's largest portfolio owner of lignite, imported coal, hydro, and other conventional generation assets, has increasingly utilised bilateral contracts as a portfolio optimization and risk management tool. While EÜAŞ historically operated under regulated supply obligations and centralised allocation mechanisms, the gradual liberalisation of the market has encouraged the company to structure bilateral agreements with eligible suppliers and large consumers, particularly for coal-based generation assets with predictable baseload profiles.

For coal-fired power plants within EÜAŞ's portfolio, bilateral agreements provide revenue visibility in an environment characterised by volatile spot prices and fluctuating fuel costs. Unlike renewable-based CPPAs that are primarily driven by decarbonization commitments, coal-based bilateral contracts are generally structured around supply security and price stability considerations. These agreements enable counterparties to hedge against short-term price spikes in the day-ahead market, while allowing EÜAŞ to secure capacity utilisation rates for assets that would otherwise face margin compression during periods of low marginal clearing prices driven by high renewable output. In this sense, bilateral contracting serves as a balancing mechanism between intermittent renewable growth and the operational sustainability of conventional baseload plants.

Moreover, EÜAŞ's bilateral activity has indirect systemic implications. By locking in certain volumes under medium- to long-term agreements, the company contributes to dampening spot market volatility and enhances predictability for both supply and demand sides. However, this also introduces a structural interaction between public portfolio management and private PPA expansion. As renewable penetration increases and marginal prices are increasingly shaped by low-variable-cost generation, the competitiveness of coal-based bilateral contracts will depend on carbon pricing dynamics under the forthcoming Turkish Emissions Trading System. Consequently, EÜAŞ's bilateral strategy is expected to gradually evolve, potentially incorporating more flexible contract structures or hybrid arrangements that align conventional capacity with storage-backed or renewable-linked supply models.

[185] Ministry of Energy and Natural Resources (MENR). (2024). Renewable Energy Roadmap 2035.

[186] Official Gazette. Energy. (2025). Regulation on Unlicensed Electricity Generation.

On the other side, a significant catalyst for the expansion of the PPA market is the European Union's CBAM. Türkiye, being a major industrial partner to the EU in sectors such as steel, cement, aluminium, and chemicals, faces substantial financial risks if its exports are deemed carbon intensive. To mitigate these "carbon taxes" at the border, Turkish exporters are aggressively seeking long-term bilateral contracts for verified renewable energy. This demand has transformed the PPA from a simple procurement tool into a vital strategic asset for international competitiveness. Consequently, the market is seeing a rise in "Green PPAs," where the electricity is bundled with YEK-G certificates.

The expected developments in the Turkish PPA market are also deeply intertwined with the implementation of the National Climate Law and the subsequent establishment of the TR-ETS. With a domestic carbon price now a reality in 2026, the economic value of a PPA has increased. By locking in a fixed price for renewable energy, corporations not only protect themselves from electricity price spikes but also reduce their future carbon liabilities under the TR-ETS. This synergy between the carbon market and bilateral electricity trade is expected to lead to the development of "virtual PPAs" or financial PPAs. In these models, no physical delivery of electricity occurs between the producer and the buyer; instead, the parties enter into a "contract for difference" where they settle the difference between a fixed strike price and the market spot price. This allows for greater flexibility for companies that may not have the technical capacity to manage physical energy flows.[187]

However, the outlook for the PPA market in Türkiye is not without its hurdles, particularly regarding access to long-term financing and currency risk management. Historically, Turkish energy projects were financed in USD or EUR, creating a natural alignment with the USD-based YEKDEM tariffs. The move toward a Turkish Lira-indexed market has introduced significant currency mismatch risks for developers who still carry foreign-denominated debt. For the PPA market to reach its full potential, the Turkish financial sector must develop more sophisticated hedging instruments that allow for long-term Lira-based contracts or facilitate EUR-denominated PPAs for exporters with foreign currency revenues. International Financial Institutions (IFIs) such as the EBRD and the World Bank are playing a crucial role here, providing credit enhancement tools and partial risk guarantees that help local banks provide the ten-year tenors required for PPA-backed projects.[188]

One of the most anticipated developments in bilateral trade is the integration of BESS into PPA structures. Intermittency remains the Achilles' heel of wind and solar energy; a factory needs power twenty-four hours a day, but a solar plant only produces during daylight. The new regulatory wave in Türkiye allows for "storage-integrated" generation licenses, which will enable the creation of "baseload PPAs." In this model, the generator uses on-site batteries to smooth out the production peaks and valleys, delivering a more consistent flow of energy to the buyer. This reduces the buyer's reliance on the balancing market and lowers the "imbalance costs" that have historically made PPAs expensive for the industrial sector. By 2027, it is expected that most new large-scale bilateral agreements in Türkiye will include some form of storage component.

The role of "Aggregators" is also set to expand within the bilateral trade ecosystem. Currently, the PPA market is accessible primarily to "Tier 1" industrial giants with massive energy demands. However, small and medium enterprises (SMEs) also face CBAM pressures and need green energy. Aggregators act as intermediaries, pooling the demand of multiple SMEs to sign a single large-scale PPA with a renewable developer. This "Sleeve PPA" model, where a licensed supplier manages the physical delivery and balancing on behalf of the grouped buyers, is expected to democratize access to renewable energy in Türkiye. This development will be supported by

[187] Ministry of Environment, Urbanisation and Climate Change (MoEUCC). (2025). Climate Law of Türkiye.

[188] World Bank. (2024). Türkiye Country Climate and Development Report.

the digitalisation of the grid and the use of blockchain-based tracking for YEK-G certificates, ensuring that even a small manufacturer in an Anatolian industrial zone can claim verified green energy usage.

On an international level, the outlook for bilateral electricity trade includes an increased focus on cross-border PPAs. Türkiye's synchronisation with the ENTSO-E grid allows for limited but significant trade with Greece and Bulgaria. As the European market becomes more integrated, Turkish renewable developers may eventually sign PPAs with European corporate buyers, effectively exporting Türkiye's wind and solar potential in the form of electrons. While current interconnector capacities are a limiting factor, the planned upgrades to the Bulgaria-Türkiye and Greece-Türkiye lines will provide the physical infrastructure needed for such high-level bilateral trade. This would position Türkiye not just as an energy bridge for gas and oil, but as a regional green power hub.[189]

The evolution of the PPA market will also be characterised by a shift in "contractual sophistication." Early PPAs in Türkiye were relatively simple documents, but the future market will see the rise of more complex clauses dealing with "curtailment risk" and "negative pricing." As the share of renewables on the grid grows, there are periods when supply exceeds demand, leading to zero or negative prices in the spot market. Future PPAs in Türkiye will need to clearly define who bears the cost when the grid operator orders a plant to stop production to maintain stability. Developing standardised "Turkish Model PPAs" that address these local technical realities will be essential for reducing legal costs and accelerating the time to financial close for new projects.

At the heart of these developments is the ongoing digitalisation of the Turkish energy exchange, EPİAŞ. The exchange is moving toward a more transparent "OTC (Over the Counter) Registration Platform," where bilateral deals can be registered and cleared with higher security. This reduces counterparty risk, which is a significant concern in long-term contracts where one party might face financial distress over a decade-long period. By providing a centralised clearing mechanism for bilateral trades, EPİAŞ can provide the same level of security found in the spot market, thereby attracting more conservative institutional investors to the Turkish PPA space.

In conclusion, the future of bilateral electricity trade in Türkiye is moving toward a highly decentralised, green-focused, and financially complex market. The decline of state-guaranteed tariffs has opened a new era where corporate demand, driven by climate necessity and international trade requirements, is the primary engine of renewable energy growth. The transition will be marked by the rise of Corporate PPAs, the integration of energy storage, and the maturation of green certification systems. While challenges related to currency volatility and grid congestion remain, the strategic alignment of the Turkish energy market with European standards and the 2053 Net Zero goal provides a clear and irreversible path forward. The developers and consumers who can navigate this new bilateral landscape will be the primary architects of Türkiye's green economic transformation over the next decade. Success will depend on the ability to blend technical energy management with sophisticated financial engineering, ensuring that the Turkish grid becomes an enabler of a sustainable industrial future.

[189] European Network of Transmission System Operators for Electricity (ENTSO-E). (2024). Ten-Year Network Development Plan: Southeastern Europe Regional Focus. Brussels: ENTSO-E.

EVALUATION OF RISKS & OPPORTUNITIES FOR DIFFERENT SEGMENTS

Evaluation Of Risks & Opportunities For Different Segments

The strategic transformation of Türkiye's energy portfolio is guided by the 2053 Net Zero Emissions Target, necessitating a radical shift in the nation's economic and industrial structure. This section provides an in-depth evaluation of various energy technologies, their market positioning, and the specific investment landscapes they inhabit within a SWOT matrix framework. By analysing the interplay between state-guaranteed mechanisms like YEKDEM and YEKA alongside emerging market-driven structures, this assessment aims to highlight the primary drivers and barriers for each segment.

4.1 Wind Energy

Wind energy has evolved into one of the most mature and localised manufacturing ecosystems in Türkiye, supported by over two decades of rapid industrial scaling. As a cornerstone of the national energy transition, wind power benefits from high technical potential and a robust supply chain that positions the country as a leading regional player. For investors, this segment represents a blend of high-efficiency resource zones and a stable regulatory environment designed to foster long-term technological growth.

Strengths

- Türkiye possesses highly competitive wind resources, particularly along the Aegean and Marmara coastlines where capacity factors are most favourable. Türkiye ranked as one of the top European countries for new wind energy capacity in 2025.
- Wind energy in Türkiye benefits from a favourable geographical alignment between resource potential and demand centres, particularly in the Aegean and Marmara regions where electricity consumption is relatively high. This proximity reduces transmission constraints and grid integration costs compared to a scenario in which high wind capacity was concentrated in the eastern or southeastern regions, far from major load centres such as Istanbul.
- The local OEM market is highly developed, with Türkiye ranking fifth in Europe for wind equipment manufacturing and exporting components to 45 countries and placed second in Europe for new wind capacity installations in 2025 with 1.9 GW of additions.[190]
- Domestic contribution rates exceed 50% across all manufactured categories, including towers, blades, and generators.
- Wind generation offers a resilient capture price profile because its output is distributed across hours and seasons when demand is often high, unlike the concentrated midday peaks of solar.
- The authorities' commitment to holding new YEKA tenders on an annual basis provides enhanced visibility for investors.

[190] TEİAŞ (Turkish Electricity Transmission Corporation). (2025, December 31). Kuruluş ve Kaynaklara Göre Kurulu Güç Raporu [Installed capacity by institution and source]. Genel Günlük İşletme Neticesi. Yük Tevzi Bilgi Sistemi (YTBS).

Weaknesses

- The project development cycle is lengthy, with preliminary licenses typically lasting 24 to 36 months before construction can even begin; however, ongoing "super-permit" regulatory reforms are expected to streamline procedures and shorten this timeline in the coming years.
- A significant portion of wind potential is located on forest or treasury lands, which may require multiple permitting processes involving the General Directorate of Forestry and could, in some cases, lead to extended development timelines.
- The lack of inherent mechanical inertia in modern inverter-based wind turbines makes the grid more susceptible to frequency deviations as penetration increases.

Opportunities

- The Renewable Energy Roadmap 2035 sets a combined target of 120 GW for wind and solar, with wind specifically planned to reach 43.1 GW.
- Battery-integrated wind projects also represent a notable opportunity, given the substantial pre-licensed capacity currently in the pipeline. As these projects progress toward realisation, hybrid configurations are expected to enhance system flexibility, support grid stability, and improve the overall investment case for new wind capacity.
- Offshore wind presents a massive frontier for growth, with technical potential estimated at 27 GW by 2050 in high-growth scenarios.
- Hybrid project regulations allow investors to add secondary solar capacity to existing wind farms, maximising the utilisation of existing transmission infrastructure and land.

Threats

- Internal grid congestion may present localised challenges for certain wind projects, particularly in parts of the Aegean region where generation sites can be relatively distant from major consumption hubs. While Marmara-based capacity generally benefits from closer proximity to high-demand areas, some Aegean projects could be more exposed to potential curtailment risks associated with transmission constraints.
- Wind power may face a degree of cannibalization risk, as periods of high wind output can coincide with similar generation profiles across the fleet, potentially contributing to downward pressure on spot market prices during certain periods.
- Local litigation related to EIA decisions may, in some cases, contribute to judicial or permitting delays, which could affect project development timelines after capital deployment has commenced.

4.2 Solar Energy

Solar energy is the fastest-growing segment in the Turkish power market, driven by declining costs, scalability, and high irradiation levels. It serves as a vital tool for industrial and residential self-consumption, allowing prosumers to reduce energy bills and carbon footprints. As the most decentralised form of generation, solar is central to Türkiye's strategy of diversifying its energy mix while meeting rising summer cooling demands.

Strengths

- Türkiye's geographic latitude provides high solar irradiation, with levels in southern and southeastern regions reaching up to 2,000 kWh/m² per year.
- The technology is highly modular, enabling rapid deployment in both the large-scale licensed segment and the distributed unlicensed segment.
- Solar generation profiles align closely with summer peak loads driven by cooling demand, providing high system value during periods of maximum stress. This alignment is expected to strengthen further with the anticipated expansion of data centres, whose cooling-intensive operations typically concentrate around midday, reinforcing the natural synergy with solar production patterns.
- The unlicensed framework has successfully delivered gigawatts of capacity by enabling businesses to meet their own consumption needs without full generation licenses.

Weaknesses

- Solar faces high "price cannibalization" risks because concentrated midday production aggressively suppresses market-clearing prices during those hours.
- The variability of solar output requires significant grid flexibility or backup from dispatchable resources to manage intermittency.

Opportunities

- The 2035 target for solar capacity is set at 76.9 GW, requiring an average of 8 to 9 GW of annual additions across all technologies.
- Untapped potential exists in rooftop PV for residential and commercial buildings, which helps reduce transmission losses by bringing generation closer to consumption.
- Floating solar power plants on hydroelectric reservoirs could theoretically provide over 50 GW of incremental capacity while utilising unused water surfaces.
- The EU CBAM is driving massive demand for Corporate PPAs as exporters seek verified green energy.
- In addition, the growing interest in agrivoltaics solar projects presents a positive structural opportunity, as dual land use models can enhance land efficiency, support agricultural productivity, and strengthen social acceptance of new solar investments.
- The authorities' commitment to holding new YEKA tenders on an annual basis provides enhanced visibility for investors, supports a steady project pipeline, and contributes to long-term market predictability in renewable energy deployment.

Threats

- The transition from monthly to hourly netting for unlicensed projects, effective since 1 May 2026 and applicable to both new and existing facilities, has reduced the temporal flexibility previously available to distributed generation assets and is expected to compress the achievable revenue capture for variable-output facilities such as rooftop solar.
- High local content requirements in YEKA tenders, while supporting the development of domestic industry, may create implementation challenges if local manufacturing capacity faces constraints related to quality standards or delivery timelines.
- Grid connection availability remains relatively limited in certain regions, and developers that secure licenses may still encounter delays in obtaining physical connection capacity due to network congestion and infrastructure constraints.

4.3 Battery Storage

Battery energy storage has moved to the forefront of the reform agenda as a core pillar for integrating variable renewable energy. By enabling the time-shifting of energy and providing essential frequency response, storage is no longer viewed as a niche tool but as a strategic infrastructure component. Türkiye's regulatory framework now explicitly links storage with renewable generation, creating a powerful incentive for private investment in system flexibility.

Strengths

- A decisive regulatory breakthrough in 2022 allows investors to develop wind or solar plants with capacity equal to their storage units without competing for capacity allocation.
- Storage-integrated facilities can “time-shift” production, storing excess midday solar and releasing it during evening peaks when prices are higher.
- Domestic battery manufacturing is scaling rapidly, with several “Giga-factories” like Pomega and Siro targeting gigawatt-scale annual production.
- Batteries provide critical ancillary services like synthetic inertia and fast frequency response, which are essential for grid stability in a high-renewables system.

Weaknesses

- Although capital expenditure for battery systems has declined significantly in recent years, investment costs remain comparatively high relative to conventional generation technologies, and the sector continues to depend on imported lithium-ion cells from East Asia.
- Technical considerations, including the long-term performance and degradation of storage assets as well as the complexity of market-clearing algorithms, may introduce additional uncertainty into revenue projections and operational planning.
- Localisation of upstream materials, including anodes and cathodes, remains at a relatively early stage, which may contribute to the sector’s continued reliance on global supply chains.

Opportunities

- The national energy strategy targets 7.5 GW of battery capacity by 2035, though some documents set a more ambitious goal of 10 GW by 2028.
- The planned transition to 15-minute settlement in 2027 will allow storage operators to capture intraday spreads that are currently invisible under hourly settlement.
- The formalisation of the ancillary services market and aggregation licenses allows even smaller storage assets to access new revenue streams.

Threats

- Although lithium-ion supply chains have become increasingly globalised, their geographic concentration in a limited number of regions means that escalating geopolitical tensions or trade restrictions could exert upward pressure on critical raw material costs, introducing supply-side uncertainty for domestic deployment and system scaling.
- If administrative price caps are set below market expectations, investors may struggle to recover fixed storage investment costs, placing pressure on project returns.
- The 51% local content requirement may represent a demanding threshold, and project developers may face financial consequences should they fall short of compliance.

4.4 Hydropower

Hydropower remains the backbone of Türkiye's domestic renewable generation, benefiting from early infrastructure development and favourable geography. As a dispatchable resource, it plays a unique role in system balancing and price moderation, acting as a "natural battery" for the national grid. However, the sector must now adapt to increasing climate variability and the emergence of more competitive intermittent technologies.

Strengths

- Hydropower accounts for 26.4% of total installed capacity, providing a massive baseload of domestic, carbon-free energy.
- Reservoir-based plants offer exceptional dispatch flexibility, allowing operators to shift generation to high-price morning and evening hours.
- The technology is fully mature with very low marginal operating costs and provides natural rotating inertia to keep grid frequency stable.
- The YEKDEM v3.0 mechanism provides long-term, 15-year purchase guarantees for pumped-storage facilities, encouraging investment in high-flexibility assets.

Weaknesses

- Generation is highly sensitive to precipitation patterns; severe drought in 2025 caused a decline in hydro output, forcing a reliance on natural gas imports.
- Hydropower projects typically involve high upfront investment and maintenance costs, which can limit economic flexibility compared to other generation technologies.
- Most economically viable large-scale sites have already been developed, meaning future growth is limited compared to wind and solar.
- Run-of-river plants lack storage capacity and are subject to strict environmental regulations regarding water usage and ecological flow.

Opportunities

- Hybridization offers a major opportunity to install floating solar on existing reservoirs, potentially adding tens of gigawatts of capacity without new land use.
- Pumped-storage hydropower is a key focus for future system flexibility, with targets for new capacity beginning to emerge in strategic plans.
- Widening intraday price spreads increase the value of hydro dispatch flexibility, allowing operators to earn a significant premium over average market prices.

Threats

- State-owned plants are sometimes dispatched independently of marginal costs to moderate market prices, which can act as a soft ceiling on peak wholesale revenues for private owners.
- Shifts in hydrological patterns driven by climate change may gradually affect the capacity factors of existing hydropower assets.
- Permit processes for hydropower projects can be subject to judicial review, with environmental litigation representing a notable consideration in project planning.

4.5 Geothermal

Geothermal energy holds a distinctive position within Türkiye's renewable portfolio due to favourable geological conditions and dispatchable generation characteristics. Concentrated largely in Western Anatolia, it provides a stable source of baseload renewable power that is less sensitive to weather patterns than wind or solar.

Strengths

- Türkiye hosts approximately 1,000 geothermal sites, providing a rare and valuable source of baseload renewable power.
- Geothermal generation is dispatchable and not subject to the intermittency issues associated with wind and solar.
- The sector has a high concentration of resources in Western Anatolia (78%), close to major industrial demand centres.
- YEKDEM v3.0 offers a 15-year implementation period and robust floor prices, specifically tailored for geothermal technology.

Weaknesses

- While Türkiye holds significant geothermal potential, the majority of identified resources consist of low- to medium-temperature reservoirs.
- Expansion projections for new geothermal power capacity remain relatively modest, with only an additional 0.4–0.5 GW expected by 2031. This stands in contrast to the estimated 4–4.5 GW electricity generation capacity potential, suggesting that a substantial portion of Türkiye's economically viable geothermal power resources may remain underutilised.
- High upfront exploration and drilling risks may act as a constraint compared to solar or wind developments.

Opportunities

- The YEKDEM v3.0 LC premium provides additional financial support for projects using locally manufactured components.
- Geothermal's baseload nature makes it highly attractive for Corporate PPAs in carbon-intensive, export-oriented industries.

Threats

- Reservoir performance may be affected over time if reinjection practices or reservoir management strategies are not implemented effectively, which could contribute to pressure decline and reduced long-term resource efficiency.
- Zoning plan approvals and site acquisition processes may present additional development challenges, particularly where geothermal resources are in agricultural or environmentally sensitive areas.
- The high cost and risk profile associated with exploration activities may increase the sector's reliance on the continuity and adequacy of existing support mechanisms.

4.6 Biomass

Biomass generation's controllable output profile distinguishes it from wind and solar resources, enabling participation in ancillary service provision and system balancing. It provides diversification benefits while intersecting with waste management and circular economy objectives in Türkiye.

Strengths

- Biomass offers a controllable and dispatchable output profile, ideal for providing flexibility and system balancing functions.
- The sector supports national waste management policies and agricultural residue valuation.
- Biomass facilities are eligible for YEKDEM support, including specific tariffs for biomethanisation and landfill gas.
- Local Content Premiums are available for biomass projects using domestic equipment.

Weaknesses

- Biomass has experienced slower growth rates compared to wind and solar technologies.
- Fuel supply chains for biomass projects may involve operational complexities, as they require consistent and reliable access to agricultural or municipal waste streams.
- Installed biomass capacity remains relatively limited compared to the broader renewable energy portfolio, which may constrain the sector’s overall contribution to electricity generation growth.

Opportunities

- Biomass can contribute to circular economy goals and rural development.
- Aggregation licenses allow distributed biomass assets to be pooled into virtual portfolios for market participation.
- Modernisation of biomass facilities through hybridization with solar could increase overall site efficiency.

Threats

- Recent regulatory developments have excluded certain thermal disposal-based biomass facilities from the scope of YEKDEM support mechanisms, which may affect investment considerations for some projects.
- Environmental Impact Assessment-related litigation may, in certain regions, contribute to permitting or development delays for waste-to-energy projects.
- Carbon pricing under the Turkish ETS may influence the operating economics of certain biomass technologies, depending on their emissions profiles and regulatory treatment.

4.7 Green Hydrogen

Green hydrogen represents a critical component of Türkiye's long-term energy and climate targets, specifically for decarbonizing hard-to-abate industrial sectors. While currently in a nascent stage, ambitious electrolyzer targets and the development of a national strategy highlight its future role as an engine for green transformation.

Strengths

- National policy documents, including the 12th Development Plan, set clear targets for green hydrogen and electrolyzer capacity.
- Türkiye's high renewable energy potential may provide the low-cost green electricity required for competitive hydrogen production in the future.
- The country's strategic geographic position facilitates potential future hydrogen exports to Europe.

Weaknesses

- Green hydrogen production currently involves relatively high capital and operational costs compared to fossil-fuel-based alternatives, which may affect near-term competitiveness and project bankability.
- Specialised infrastructure for large-scale hydrogen transport and storage is still at an early stage of development in Türkiye, which may present additional challenges for market scaling and integration.
- The technical expertise and specialised workforce required to support a hydrogen economy are continuing to develop, and capacity-building efforts may be needed as the sector expands.

Opportunities

- Türkiye targets 2 GW of electrolyser capacity by 2030 and up to 70 GW by 2053.
- Green hydrogen is essential for the iron, steel, cement, and chemical sectors to comply with the EU's CBAM and remain competitive.
- International financial institutions like the World Bank are providing financing for green energy and efficiency initiatives that could support hydrogen.

Threats

- The absence of a fully mature regulatory framework and established market structure for green hydrogen may introduce additional uncertainty into project development and investment planning.
- Grid congestion in certain regions may affect the ability to locate electrolyser facilities at the most efficient or commercially attractive production points.
- Global competition for hydrogen-related investment is increasing, which may require Türkiye to maintain stable and attractive support mechanisms in order to mobilise long-term financing.

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