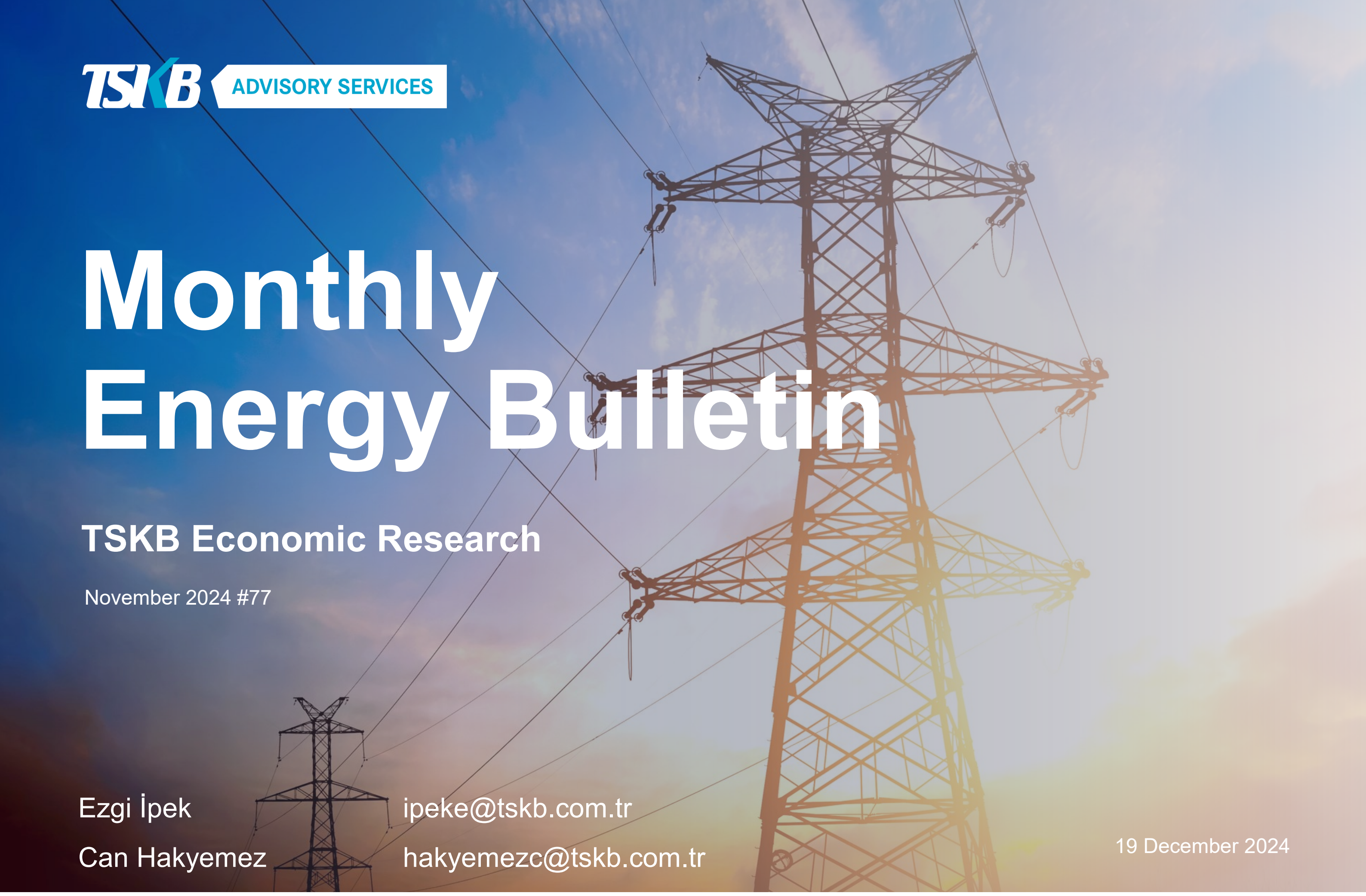

TSKB ADVISORY SERVICES

Monthly Energy Bulletin

TSKB Economic Research

November 2024 #77

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19 December 2024

Ministry of Energy and Natural Resources (MENR) publishes its 2024-2028 Strategic Plan

28.2 TWh	2,463.81 TL/MWh
October Gross Generation	Average MCP

1.2%

Daily average licensed electricity generation increased by 1.2% MoM and 9.6% YoY in November.

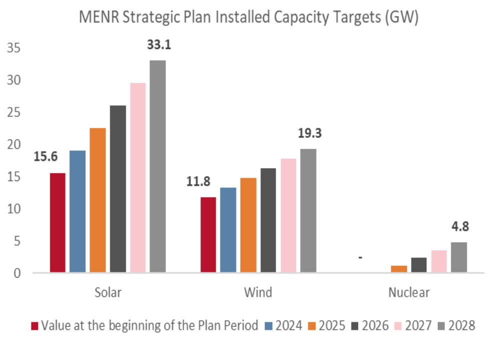
Click for details.

5.6%

Market Clearing Price (MCP) increased by 5.6% MoM and 19.2% YoY in November.

Click for details.

According to the Strategic Plan, the government aims to increase the share of domestic resources in electricity generation from their current level of 57% to 63% in 2028. In addition, 33.1 gigawatts (GW) of solar capacity, 19.3 GW of wind capacity and 4.8 GW of nuclear capacity are expected to be commissioned by 2028. The plan sets out 30 targets for 7 purposes such as ensuring sustainable energy supply security, reducing foreign dependency, the zero carbon energy transformation, and safe, sustainable and value-added mining. The Minister of Energy and Natural Resources, Alparslan Bayraktar, called for investment in Türkiye in the field of renewable energy. Speaking at the Sixth Turkish-German Energy Forum, Mr. Bayraktar emphasized Türkiye's goals of increasing renewable energy, developing transmission infrastructure and tripling its interconnection capacity with Europe as it proceeds towards becoming a net-zero economy by 2053. Stating that there is an investment potential of USD 100 billion in these areas, Mr. Bayraktar stated that he welcomed German investment in Türkiye.



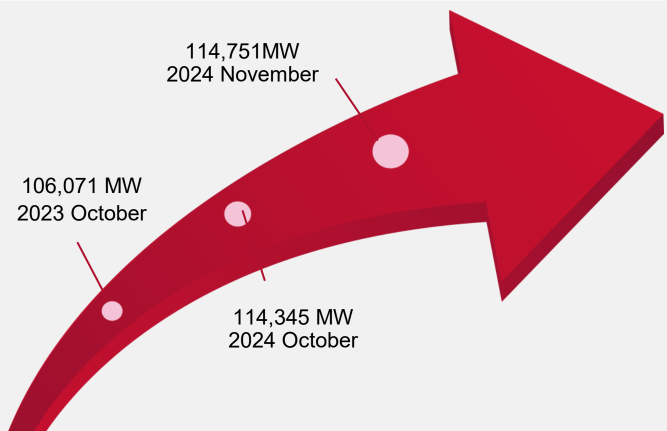
Source: MENR, TSKB Ekonomik Araştırmalar

In addition, World Bank Türkiye Director Humberto Lopez stated that Türkiye's electricity infrastructure needed to be strengthened, emphasizing that the World Bank had committed a total of USD 1.5 billion in investment to improve Türkiye's transmission lines. Humberto Lopez stated that negotiations with the MENR were continuing, with the first USD 750 million project aimed to be implemented in 2025.

In addition, Humberto Lopez reiterated that the European Bank for Reconstruction and Development (EBRD) and the International Finance Corporation (IFC) had signed USD 5 billion in financing for the industrial sector. The Ankara Director of the German Development Bank (KfW), Kirk Mildner, stated that Germany's green financing portfolio stood at EUR 1.4 billion and that the KfW had issued more than EUR 12 billion of green bonds in Türkiye in 2024. However, Mr. Mildner emphasized that the bank operated in the public sector in cooperation with development banks, adding that they focus on energy efficiency studies, especially in schools.

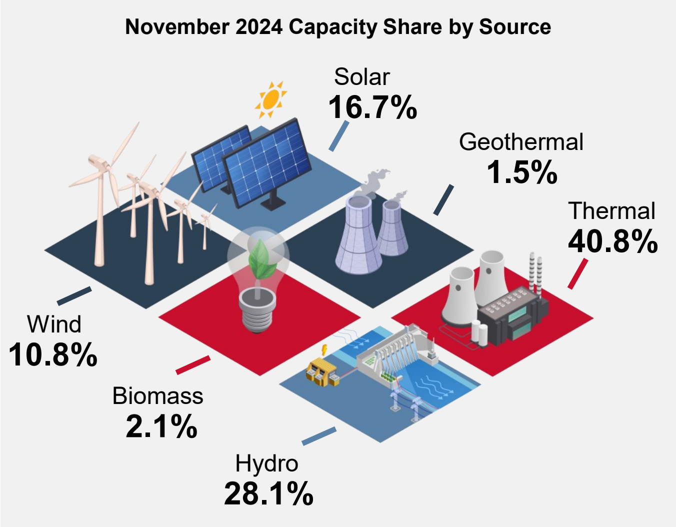
Installed Capacity Analysis

Türkiye's total installed capacity, which stood at 114,345 megawatts (MW) at the end of October 2024, reached 114,751 MW in November. A total of 405.5 MW of net installed capacity was commissioned in November compared to October, with 314.2 MW of this installed capacity provided by solar power plants. The installed capacity of wind farms increased by 76.9 MW, the installed capacity of power plants generating electricity from renewable waste increased by 13.9 MW and the installed capacity of hydroelectric power plants increased by 8.4 MW. Compared to the previous month, the installed capacity of natural gas and multi-fuel power plants decreased by 7.9 MW, while no change was observed in the installed capacity of other sources.



Source: TEİAŞ, TSKB Economic Research

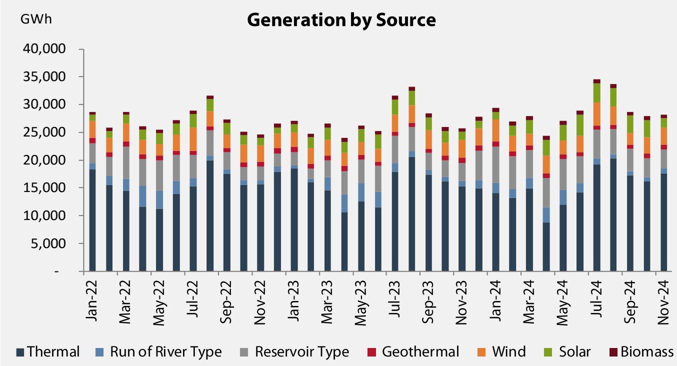
Of the power plants in operation in November, 59.2% of the capacity consisted of renewable capacity. Thus, the proportion of renewable resources continued to increase, approaching 60%. Hydroelectric power plants accounted for 28.2% of Türkiye's total installed electricity capacity, while the share of wind and solar power in total installed capacity stood at 27.5%.

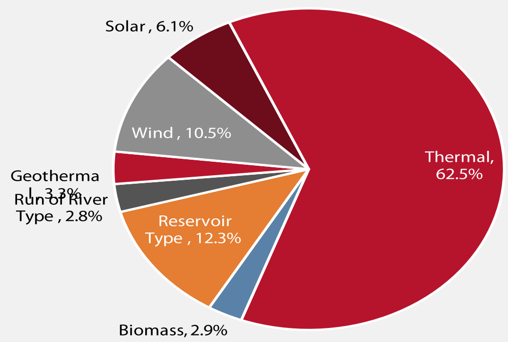


Source: TEİAŞ, TSKB Economic Research

Generation-Consumption Analysis

Total electricity generation stood at 28.2 TWh in November, compared to approximately 27.8 TWh in October 2024. The average daily electricity generation for November increased by 1.2% compared to the previous month and by 9.6% compared to the same period of the previous year.

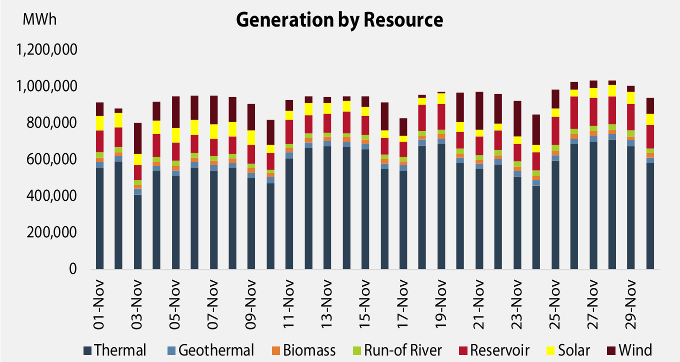




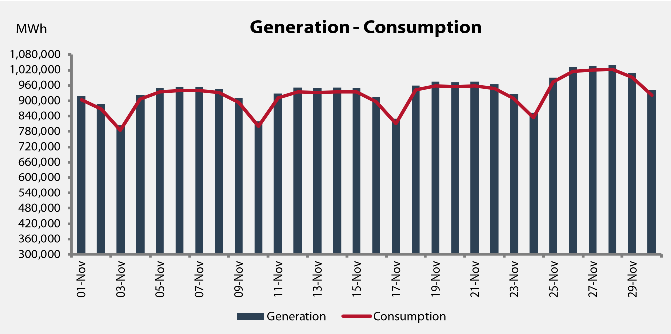
Source: TEİAŞ, YTBS Daily Reports, TSKB Economic Research

Thermal power plants, which accounted for 60.4% of the electricity generated in October, provided 65.0% of the total electricity generated in November. The source-based breakdown of electricity generated from power plants found that hydroelectric power plants generated 15.1% of all electricity in November, compared to 15% in the previous month. In the same period, solar power plants accounted for 6.1% of total electricity generation with geothermal power plants providing 3.3% of the total electricity produced.

The share of renewable energy plants in electricity generation, which was 39.6% in October 2024, declined to 35.0% in November 2024. In the corresponding period, dam-type hydroelectric power plants contributed 12.3% to total generation, while run-of-river type hydroelectric power plants accounted for 2.8% of total generation. In addition, the ratio of electricity obtained from wind and solar power plants stood at 16.1%. In November, with wind being the second source of renewable energy after dam-type hydroelectric power plants, with a share of 10.5% in overall electricity generation.



Source: TEİAŞ, YTBS Daily Reports, TSKB Economic Research



Source: TEİAŞ, YTBS Daily Reports, TSKB Economic Research

Electricity generation amount in November averaged 940,099 megawatt hours (MWh) per day, with the highest generation in the month being 1,038,402 MWh, recorded on Thursday, November 28, while the lowest generation in the same period was 803,592 MWh on Sunday, November 3.

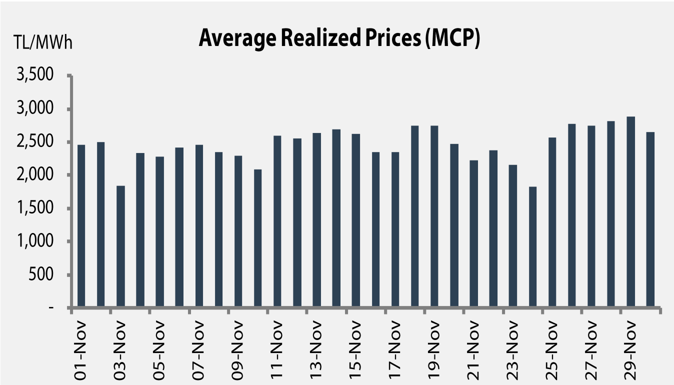
In the same period, the daily electricity consumption averaged 923,863 MWh with the highest consumption in November recorded on Thursday, November 28 at 1,023.28 MWh, and the lowest electricity consumption recorded on Sunday, November 3 at 784,355 MWh.

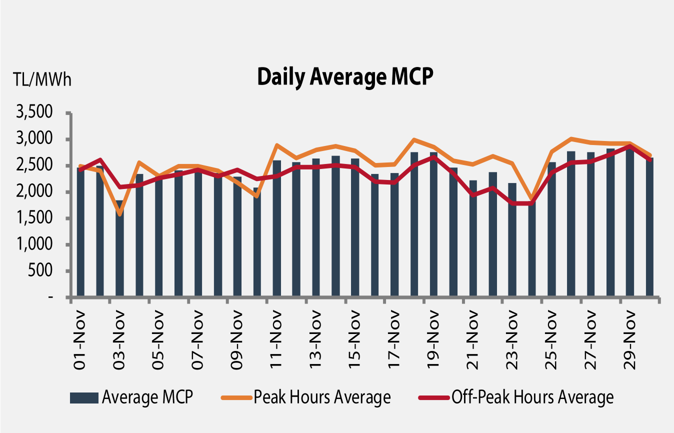
Electricity Price Analysis

The daily average market clearing price (MCP) varied between TL 1,830 and TL 2,900 per MWh in November. The daily average MCP in November stood at TL 2,463.1 /MWh with the highest daily average MCP recorded on Friday, November 29 at TL 2,888.5 /MWh and the lowest daily average MCP on Sunday, November 24, at TL 1,829.2 / MWh.

On an hourly basis, the MCP stood at its maximum price limit of TL 3,000 TL/MWh for a total of 169 hours. The minimum hourly electricity price of TL 170 /MWh was recorded for 1 hour.

Looking at November's MCP, the peak hours average (between 8AM and 8PM) was 4.4% higher than the average value of all hours, to come in at TL 2,570.9 /MWh. The maximum limit price of TL 3,000 / MWh was recorded 134 times during peak hours with the lowest price of TL 170 /MWh realized for 1 hour during peak hours.



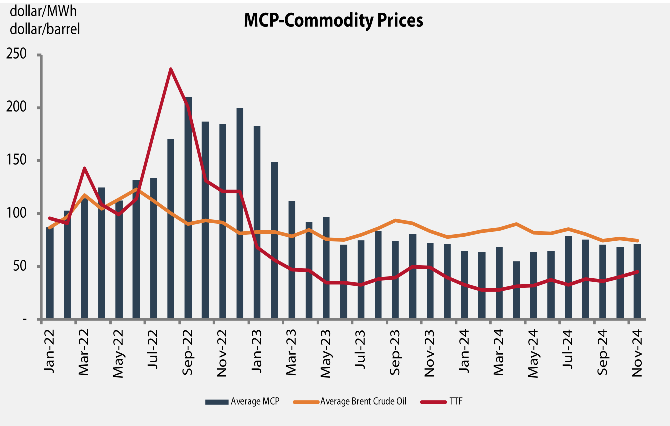


Source: EXIST, TSKB Economic Research

In the same period, the average for off-peak hours (between 8PM and 8AM) was TL 2,355.4 /MWh. The maximum limit price of TL 3,000 /MWh was realized for 35 hours during off-peak hours with lowest price in off-peak hours, of TL 645.7 /MWh, recorded on Friday, November 22 between 11PM and midnight.

The average MCP increased from an average of USD 68.2 /MWh in October to an average of USD 71.5 /MWh in November, marking a dollar-based fall of 0.9% compared to the same period of the previous year.

Average Commodity Prices



Source: EPİAŞ, TCMB, EIA, TSKB Economic Research

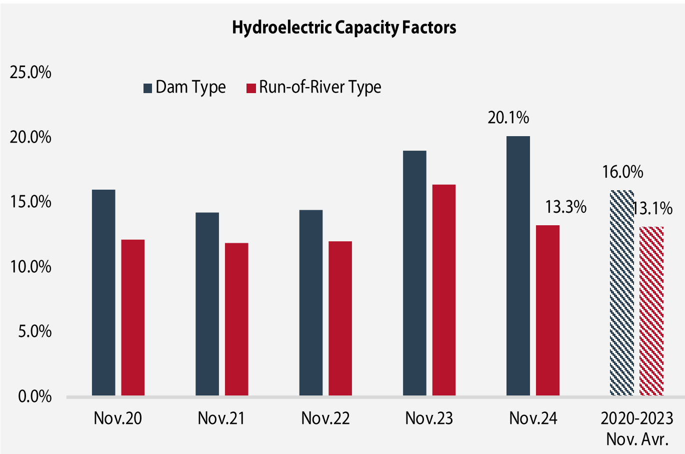
Brent oil prices, which averaged USD 76.1 /bbl in October, decreased by 2.2% month-on-month to USD 74.3 /bbl in November, marking a fall of 10.3% compared to the same period of the previous year.

The TTF natural gas contract price, which averaged USD 40.3 /MWh in October, increased by 11.0% month-on-month to USD 44.8 /MWh in November. The TTF was down 9.2% compared to the same period of the previous year.

Hydroelectric Capacity Factors

The capacity factors stood at 20.1% for dam-type hydroelectric power plants and 13.3% for run-of-river type hydroelectric power plants in November 2024. When compared to November 2023, the capacity factors were up by 1.1 percentage points for dam-type power plants but down by 3.2 percentage points for run-of-river type hydroelectric power plants. Looking at the months of November over the last 5 years, November 2024 was the month with the highest capacity factor for dam-type power plants, while the capacity factor for run-of-river type power plants reached their highest value in November 2023.

During the month, the capacity factor for dam-type power plants was 4.2 percentage points above the average for the months of November between 2020 and 2023, with the capacity factor for run-of-river type power plants being 0.1 percentage points above the average.



Source: TEIAS, EPIAS, TSKB Economic Research

Türkiye's Long-Term Climate Change Strategy

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On November 11, 2024, at the 29th Conference of the Parties (COP 29) held in Baku, Türkiye announced its climate roadmap by publishing its "Long-Term Climate Change Strategy". The announced strategy includes the targets set by Türkiye to become net zero in 2053 and the actions it will take to achieve these goals. While the strategy does not include a plan to exit fossil fuels, especially coal, it includes targets and roadmaps for renewable energy sources, nuclear energy, and the decarbonization of sectors.

The strategy highlights targets for the energy sector, which is responsible for 72% of Türkiye's total emissions. Prominent targets include increasing the share of renewables in primary energy from 17% to 50% by 2053, increasing the capacity of electrolysers used in hydrogen production to 70 GW by 2053, and adding nuclear power to the energy mix with a capacity of 7.2 GW by 2035.

Hydrogen and carbon capture, utilization and storage (CCUS) technologies in the clean energy transition are two topics among the objectives of the strategy for the energy sector. While it is stated that blue and green hydrogen, in particular, can be used in fertilizer production in hydrogen technologies, it was pointed out that CCUS technology could play an important role in the decarbonization of the cement and iron and steel sectors.

As has been set out in the recently announced targets for Türkiye's energy sector, the renewal of the electricity transmission network and infrastructure also stands out in the Long-Term Climate Change Strategy. The strategy sets out that the high-voltage and ultra-high-voltage power lines required for the transmission of electricity to be carried out more comprehensively, and the electricity generated from renewable energy plants to be taken to the transmission lines without any problems will be installed when technically and economically feasible.

In this context, the topic of renewal of the network and infrastructure also speaks to the investments planned to be made in electricity transmission lines in the "2035 Roadmap in Renewable Energy".

Stating that Türkiye ranks 5th in Europe and 11th in the world in renewable energy capacity, the strategy also sets out the aim to increase wind capacity to 43.1 GW and solar energy capacity to 76.9 GW by 2035. However, the strategy also points out that in order to achieve the goal of net-zero emissions by 2053, solar, wind, hydroelectric, geothermal, biomass and nuclear energy sources would need to be included in the energy mix. The strategy is aimed at increasing the share of renewable energy in electricity generation from 42.4% in 2020 to 69.1% by 2053, setting out that investments will be made in hybrid power plants, floating solar power plants and offshore wind farms to reach this rate.

The strategy states that the Akkuyu Nuclear Power Plant will play an important role in nuclear energy, which is expected to reach a capacity of 7.2 GW in 2035, adding that once completed, the Akkuyu Nuclear Power Plant will meet 10% of Türkiye's electricity consumption needs and reduce carbon emissions by 30 million tons per year.

In this context, the "Long-Term Climate Change Strategy" announced at the COP 29 is an important document which shows the steps that Türkiye needs to take towards becoming net zero and the targets within the scope of these steps, while shining a light on the path that Türkiye will follow in tackling the climate crisis and achieving its green development goals.

Sector News

Local News

- Final energy consumption of the industrial sector reaches 1,706,480 terajoules in 2023. According to the "Industrial Sector Final Energy Consumption Statistics" published by TurkStat, the "manufacture of other non-metallic mineral products" sector had the largest share in this consumption with a share of 28.6%, followed by the "basic metal industry" with a share of 22.4%, and the "manufacture of food products" at 9.4%. Looking at the distribution of energy consumed in the industrial sector by type, 27.9% of the energy consumed was electricity, 24.6% was solid fossil fuels, 23.4% was natural gas and 12.6% was petroleum products.

- Competition Announcement for the Allocation of Solar Energy-Based Renewable Energy Resource Areas and Connection Capacities (YEKA-GES 2024) is published. According to the announcement published by MENR, six YEKA-solar power competitions, for solar power plants with a total capacity of 800 megawatts, will be held in Konya, Karaman, Malatya, Van, Antalya and Kütahya in January 2025.

- Türkiye acting with a climate-friendly and green transformation-oriented approach in line with Türkiye's 2053 Net Emission and Green Development Goals, according to the Minister for the Environment, Urbanization and Climate Change, Murat Kurum. According to the statement from Mr. Kurum, Türkiye is successfully implementing the Zero Waste Model and aims to increase the recovery rate to 60% by 2035 with the implementation of the National Deposit Management System. In addition, the reuse rate of treated wastewater, which increased from 1.2% in 2018 to 5.5%, is targeted to reach 15% by 2030. He went on to state that the ministry had carried out national coordination tasks on issues related to climate change, adding that the Climate Change Mitigation Strategy and Action Plan covering the 2024-2030 period had also been prepared.

- World Bank Group (WBG) publishes Offshore Wind Energy Roadmap for Türkiye. The Roadmap states that Türkiye's geographical features are suitable for offshore wind energy, adding that the cumulative capacity of offshore wind energy could reach 0.5 GW by 2030, 3.5 GW by 2040 and 16 GW by 2050 in a low-growth scenario. In a high-growth scenario with offshore wind power as a priority, cumulative capacity is estimated to reach 2 GW in 2030, 7 GW by 2040 and 26.8 GW by 2050. The WBG states that the costs for offshore wind power are higher than for onshore wind and solar energy, and that turbine technology suitable for Türkiye's low to medium offshore wind speeds has not yet been optimized. The WBG emphasizes the need for the Ministry of Energy and Natural Resources to set clear medium and long-term targets, to regulate the regulatory framework and permit processes and to conduct network impact analyses in order for Türkiye to realize its offshore wind potential.

- Türkiye signs "Declaration to Triple Nuclear Energy capacity" during the COP 29. Türkiye joined the 25 countries that signed the declaration to triple global nuclear energy capacity by 2050 at the COP 29 in the statement made by the World Nuclear Association. According to the statement from the Minister of Energy and Natural Resources, Alparslan Bayraktar, the planned 20,000 MW in installed nuclear power capacity, which is planned to be commissioned by 2050, is expected to contribute to the efforts to meet the net zero emission target.

- EBRD announced its Türkiye strategy covering the 2024-2029 period. The strategy identified four key investment priorities: intensifying the green transformation, enhancing the development of human capital, enhancing the country's global competitiveness, and strengthening regional integration. The EBRD stated that approximately EUR 10 billion had been invested in the country strategy in the last five years.

- Energy Market Regulatory Authority (EMRA) amends the final resource supply tariff for 2025. According to the amendment published in the Official Gazette, as of February 1, 2025, the amount of consumption that determines the final source consumer groups, public institutions and organizations within the scope of the residential consumer group, detached buildings used as homes together with local administrations, apartment buildings and independent sections within the apartment buildings, housing cooperatives and housing estates, and the heating of these places measured with separate meters, will be applied as 5,000 kWh per year for elevators, hydrophores, automatic landing lighting, caretaker apartments and similar common use places. Likewise, this consumption amount was determined as 100 million kWh per year for the temporary accommodation centers established by the Disaster and Emergency Management Presidency of the Ministry of Interior of the Republic of Türkiye, facilities used for the supply and distribution of drinking water belonging to the village legal entity, other consumers and those engaged in agricultural activities which are within the scope of the residential consumer group, and 15,000 kWh per year for the remaining consumer groups.

- National Energy Balance Table for 2023 published. According to the table published by MENR, the total primary energy supply in 2023 increased by 0.4% compared to 2022 to reach 158.4 million tons of oil equivalent (toe), while the localization rate in primary energy supply was 31%. The renewable energy supply increased by 5.9% compared to 2022 to reach 28.7 million toe, while the renewable resource to record the highest increase in supply was solar power, with an increase of 19.3%. Looking at the final energy consumption for each sectors, the industrial sector commands the highest share at 30.3%, followed by transportation (27.4%) and housing (21.8%).

- Half of domestic natural gas needs to be met from local sources once floating platform in Sakarya Gas Field commissioned in 2026. According to press reports, in his 2025 budget presentation to the Parliamentary Plan and Budget Commission, the Minister of Energy and Natural Resources, Alparslan Bayraktar, stated that the natural gas production in the Sakarya Field would increase to 20 million cubic meters with the floating platform. Emphasizing that TL 275 billion worth of electricity and natural gas bills were covered by the state in the first 10 months of 2024, Mr. Bayraktar said that USD 28 billion would be invested in electricity transmission infrastructure until 2035 in order to contribute to supply security.

- Final energy consumption statistics for transportation sector in 2022 published. According to the Final Energy Consumption Statistics Survey of the Transportation Sector published by TurkStat, the final energy consumption in road transport in 2022 was 1.15 million terajoules. Cars consumed 39.1% of the final energy consumed in road transport, followed by Heavy Goods Vehicles (28.6%), vans (18.4%) and buses (8.9%). The final energy consumption for railway transport in 2022 was just 10,080 terajoules.

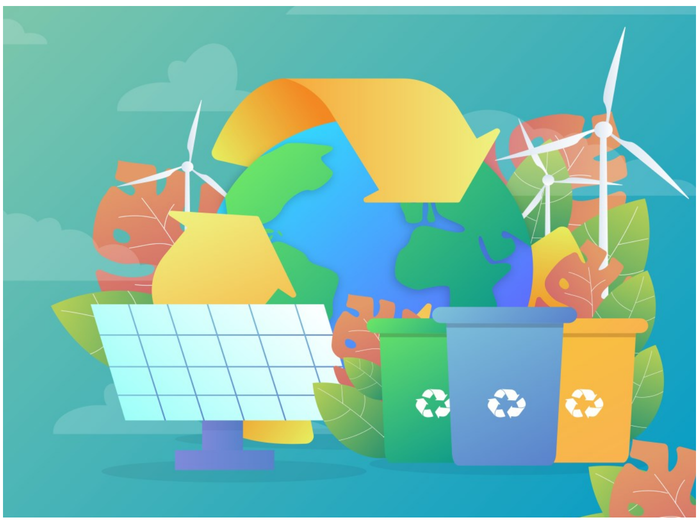
- Sustainable Economics and Finance Research Association (SEFiA) publishes its report entitled "Banks' Climate Change Approach 2024 in Türkiye". According to the report, which examines the stance of 17 banks on climate change, there are four banks that have decided to completely exit coal investments in Türkiye by 2024 - Türkiye **İş Bankası, QNB, Türkiye Ekonomi Bankası** and Garanti BBVA. While ten banks had pledged not to finance new fossil fuel projects, 12 banks committed to clean energy projects within the scope of net zero targets. While emphasizing the need for standardized reporting and comprehensive sustainability strategies across the sector, SEFiA states that banks' increasing clean energy investments and green financing products will be critical for Türkiye to achieve its climate goals.

- Goal of tripling global renewable energy capacity by 2030 will require an effort which exceeds current trends. The Director of the International Renewable Energy Agency (IRENA), Francesco La Camera, said renewable energy installations, which set a record of 473 GW in 2023, would need to increase to more than 1,000 GW each year to meet the targets, Anadolu Agency reported. La Camera states that a new energy system dominated by renewable energy sources, complemented by the sustainable use of green hydrogen and biomass, emphasizes the need for a flexible and balanced grid for the faster spread of renewable energy. However, structural barriers such as subsidies for fossil fuels also slow down the process, La Camera said, adding that a workforce that can adapt to the new energy system must be created. He added that Türkiye needed more integration into energy systems because of its position at a geographical crossroads.

- Energy and Natural Resources Minister Alparslan Bayraktar stresses that Türkiye needs to accelerate electrification and diversify its supply chains while acknowledging the continued role of oil and natural gas. Speaking at the Istanbul Energy Forum, Mr. Bayraktar underlined the increasing importance of critical minerals and stated that cross-border cooperation should increase in order to overcome the challenges in the field of energy. While emphasizing the critical importance of affordable financing, he highlighted the need for international financing institutions to take action to provide fair and accessible financing. In addition, President Recep Tayyip Erdoğan, who made a speech at the forum, stated the aim of benefiting from Türkiye's potential to the highest level for all energy resources, emphasizing that the uninterrupted supply of quality and clean energy at affordable prices was critical for all countries.

- Seven-fold increase in the rate at which solar energy meets peak electricity demand in Türkiye since 2017, from 2.5% to 18%. According to Ember Climate's new study, peak demand, which refers to the level of demand with the highest electricity consumption, has increased by 8.7 gigawatthours (GWh) over the last 5 years to reach 55.1 GWh, with solar power plants providing 70% of this increase. While this increase reflects the increasing role of solar energy in Türkiye's energy system, the increase is expected to continue with the growth in investment and development of storage solutions. The study emphasizes that in 2024, solar energy will generate more than 10 GWh of electricity per peak demand hour, meeting the electricity needs of more than 10 million people. However, Ember Climate states that solar energy will continue to stand out as a critical solution in meeting the increasing cooling needs in parallel with the increasing temperatures every year due to the impact of climate change.

- EMRA publishes its "Electricity Market Sector Report" and "Natural Gas Market Sector Report" for September. Accordingly, electricity consumption in September decreased by 0.7% compared to the same month of the previous year, to 28.5 TWh. Electricity consumption was recorded at 33.5 TWh in August. Billed electricity consumption decreased by 0.5% year-on-year to 24.5 TWh. In addition, natural gas consumption decreased by 4.0% compared to the same month of the



previous year, falling to 2.9 billion cubic meters (bcm), while 42.1% of the natural gas consumed was used by the conversion/cycle sector. Natural gas imports, on the other hand, increased by 2.6% compared to September 2023 to reach 3.3 bcm.

- Türkiye Climate Portal launched. The Türkiye Climate Portal, launched by the Climate Change Presidency, aims to be a guide for decision-makers, individuals and stakeholders by providing accurate and up-to-date information. Thanks to the portal, climate data such as greenhouse gas emissions, temperature changes, project follow-up and climate action plans will be monitored.

Foreign News

- European Union (EU) greenhouse gas emissions 31% lower in 2023 than in 1990. According to the "Trends and Projections in Europe in 2024" report published by the European Environment Agency (EEA), emissions across the EU fell by 8% in 2023. The report highlights that this decline in emissions represents the largest annual reduction in several decades, excluding 2020 due to the impact of COVID-19. The EEA stated that the energy sector played a role in the decline in 2023, highlighting that emissions in this sector have halved since 2005. According to the report, these developments indicate that the EU is moving in the right direction to meet its climate neutral goals, while additional policies and measures are required to achieve the targets. The EEA stresses that policies should focus on issues such as energy import dependency and energy efficiency, as well as increasing the share of renewables in the EU's gross energy production.

- International Energy Agency (IEA) publishes its "Energy Efficiency 2024" report. The report notes that primary energy intensity, which is used to measure global energy efficiency progress, has recorded a 1% improvement in 2024. This value, which is similar to the 2023 level, corresponds to half of the energy intensity improvements achieved between 2010 and 2019. While the IEA states that developments in energy efficiency, which accelerated after the global energy crisis, have slowed after this period, it emphasizes that there are regional differences in the pace of development. However, the IEA states that energy efficiency investments in end-use sectors (buildings, transportation and industry) will increase by 4% in 2024 to approximately USD 660 billion, and that these investments will have to reach USD 1.9 trillion by 2030 to achieve the Net Zero targets. It emphasizes that energy efficiency improvements contributed to a cumulative reduction of about 7 gigatons in global CO_2 emissions between 2019 and 2022, while accelerating their development could provide more than a third of CO_2 emission reductions by 2030.

- National renewable energy targets fall short of market forecasts and the goal of tripling renewable energy capacity by 2030. According to the study carried out by Ember Climate, countries have set out national targets to double renewable capacity, while the total 2030 national targets of the 96 countries included in the study was 7,242 GW. At the end of 2023, this value of 7,238 GW was double the 2022 capacity, while there was a shortfall of 3,758 GW for meeting the target of tripling renewables capacity. Ember Climate notes that governments have been left behind in the rapid evolution of the renewable energy markets. However, while emphasizing that its targets for solar energy - the only technology in line with the target of tripling capacity - could be revised upwards to reflect the rapid growth in the market, it highlighted that storage **targets should also be set out.**

- IRENA publishes its "Global Energy Transition Outlook 2024" report. According to the report, renewable energy capacity increased by 473 GW in 2023, of which 347 GW came from photovoltaic solar installations. The fact that China, the European Union and the United States are responsible for 83% of these capacity additions reveals the geographical disparities in the energy transition. IRENA also states that improvements in energy efficiency have been insufficient, stipulating that investments in energy efficiency and electrification in sectors such as transportation, buildings and industry needs to increase. However, while IRENA emphasizes that it is technically and economically feasible to meet the target of limiting global warming to 1.5℃ by 2050, it points out that investment in the energy transition will need to grow from USD 1.29 trillion per year in 2023 to USD 4.5 trillion per year between 2024 and 2030. While the report emphasizes the need to overcome structural and systemic obstacles in order to achieve the targets, it also emphasizes the need to modernize and expand networks and infrastructures, establish the necessary regulatory frameworks and provide institutional and human capacity to support the energy transition.

- IEA publishes the "World Energy Jobs 2024" report. According to the report, in 2023, the global energy sector created 2.5 million jobs and increased total employment to over 67 million thanks to increased investment. Employment in the clean energy sector increased by 4.6% in 2023, with solar photovoltaic leading this growth. Although the IEA states that net energy employment will remain positive at the global level until 2030, it referred to regional differences, while adding that the lives and livelihoods of workers could be improved with the right policy choices.

- U.S. aims to triple its nuclear power capacity by 2050. In a statement issued by the White House, the US needs an additional 200 GW of new nuclear capacity to reach its 2050 Net Zero target, while an additional 35 GW of new capacity is aimed to be commissioned by 2035.

- Carbon emissions from fossil fuels projected to reach 37.4 billion tons by the end of 2024. According to a study carried out by the Global Carbon Project science team, this value indicates an increase of 0.8% compared to 2023, while an increase of 0.2% in coal-related emissions, 0.9% in oil-related emissions and 2.4% in natural gas-related emissions. With the inclusion of emissions from land use, total CO_2 emissions will reach 41.6 billion tons in 2024, according to the study. However, India is expected to play the biggest role in the rise in emissions, with an increase of 4.0%.

- The IEA published its November Oil Market Report. According to the report, the global oil demand growth expectation for 2024, which was announced as 900 thousand barrels per day in the previous month, increased to 920 thousand barrels per day, while the total oil demand for 2024 is predicted to be 102.8 million barrels per day. The IEA emphasizes the impact of the normalization of post-pandemic demand, global economic conditions and the spread of clean energy technologies in the slowdown in oil demand in recent years. The report expects global oil demand to grow by 1 million barrels per day to reach 103.8 million barrels per day in 2025.

- Number of people without access to electricity falls by more than 10 million in 2023 compared to 2022, to below 750 million. The IEA's study finds that the number of people without access to electricity will decrease by a similar amount this year, while global progress remains below pre-2020 levels. While developing Asian countries such as India and Indonesia and Latin America have played a role in the increase in the number of people with access to electricity, the most serious difference is observed in Sub-Saharan Africa. Although development has been observed in this region with the acceleration of grid connections, the growth of solar energy home systems and the development of mini-grids, 600 million people in the region still lacked access to electricity in 2023. While the IEA emphasizes that countries are progressing below the levels required to achieve access to electricity by 2030, it noted that financing must be forthcoming if energy access efforts are to move forward.

- IEA publishes its report on "Recycling of Critical Minerals". The report emphasizes that while recycling does not eliminate the need for investments in mining, it reduces dependence on new mines and creates a secondary source of supply for mineral-importing countries, while separating critical minerals from fossil fuels that cannot be reused. Despite increased policy targets, the IEA notes that the use of recycled materials has not kept pace with rising demand. However, it highlights that the need for new mining activities could be reduced by 25-40% by 2050, depending on the scenario in which recycling is successfully scaled up and national climate commitments are met. Although improving the recycling of critical minerals provides financial and sustainable advantages, a major difference has been observed in the recycling rates between developed and developing countries. While emphasizing the need for long-term policies to increase the rate of recycling of critical minerals, the IEA emphasizes that policymakers should also consider circular economy principles beyond recycling.

- Artificial intelligence (AI) could be transformative in energy innovation according to the IEA. The IEA's study claims that AI, which could bring a change to the global economy and the world's energy system akin to steam engines and electricity, has been helping to reduce the costs of energy technologies in recent years. AI is paving the way for the development of lithium-based batteries, the design of enzymes for biofuel synthesis, the identification of different catalysts for hydrogen-producing electrolyzers and the production of materials for carbon capture. While the IEA emphasizes that AI is playing an increasingly important role in the research processes of energy technologies, it notes that there are still serious challenges in the use of AI in the industry. Overcoming these challenges will require investment in databases, the necessary workforce and equipment.

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