

Turkey: Wind and solar saved \$7 bn in 12 months

As fossil gas prices skyrocketed globally, Turkish electricity prices took off. Wind and solar have already saved Turkey billions of dollars on fossil fuel imports, but they could do more with the right policy.

Published date: 24th May 2022

Lead author: Ufuk Alparslan



Contents

Contents	1
About	2
Highlights	2
Executive Summary	3
Key findings	3
Fossil gas prices led to high electricity prices in Turkey	3
Wind and solar saved 7 billion dollars in 12 months	3
Market interventions do not lower the cost burden on the country	3
Capacities for wind & solar need to rise dramatically	4
Power prices on the rise	5
Fossil gas prices led to high electricity prices	5
Rising cost of electricity	5
Gas reliance leaves Turkey vulnerable to rising costs	6
Renewables to lower bills	7
Wind and solar saved 7 billion dollars in the last 12 months	7
A volatile year for gas	7
Gas import savings thanks to wind and solar	7
Market interventions to lower prices	9
Turkey's market interventions do not lower the costs	9
Keeping prices down	9
Market redesign	9
The impact on Turkey's renewables	10
The way forward	11
Tapping into wind and solar potential	11
Renewable is the future	11
Routes towards new deployments	11
Crisis needs rapid action	12
Supporting Materials	13
Methodology	13
Gas import savings by wind and solar power generation	13
Windfall tax estimation to be collected from the wind power plants	13



About

Ember's analysis reveals that the recent surge in electricity prices in Turkey has been led by globally high gas prices, with wind and solar power generation lowering electricity bills by replacing fossil gas imports. Accelerating wind and solar power in an effort to lower electricity bills will require a significant expansion in auctions and reserved capacities for wind and solar, and removal of the obstacles against the free market disrupting new investments.

Highlights

x5.9

x7.4

\$7 bn

The rise in monthly wholesale electricity price in a year

The rise in gas price for power generation in a year

The gas imports replaced by wind and solar generation in a year

Executive Summary

Key findings

O 1 Fossil gas prices led to high electricity prices in Turkey

A more than sevenfold rise in gas prices in a year translated into a sixfold increase in electricity prices. The depreciation of Turkish lira exacerbated the impact of the fossil gas prices on the power prices.

Wind and solar saved 7 billion dollars in 12 months

Wind and solar power generation lowered Turkey's import bills by preventing seven billion USD fossil fuel imports in the last 12 months. In the following months, approximately 700 million USD in savings is expected each month if the gas price remains the same.

Market interventions do not lower the cost burden on the country

Turkey tried to keep electricity prices down by suppressing the marketwide price caps, national electricity tariff prices and gas tariff prices. However, market interventions do not lower the cost of electricity generation and the total cost burden on the country remains the same.



04

Capacities for wind & solar need to rise dramatically

While the Transmission System Operator reserves limited capacities for wind and solar, auctions attract 10-15 times more applications than the auctioned capacities. The investment appetite needs to be utilized more efficiently by raising these capacities.

"Gas prices and the weak currency lead to high electricity prices in Turkey, while renewables prevent billions of dollars of fossil fuel imports. Renewable energy could do more with the right policy. After the end of feed-in tariff, the free market and the auctions will be the main routes towards new renewable deployments in Turkey. However, the capacities reserved for wind and solar power need to be scaled up dramatically and the market interventions damaging the investment appetite in the country should be avoided. The energy crisis needs quick solutions, like solar power, which can be deployed very fast."

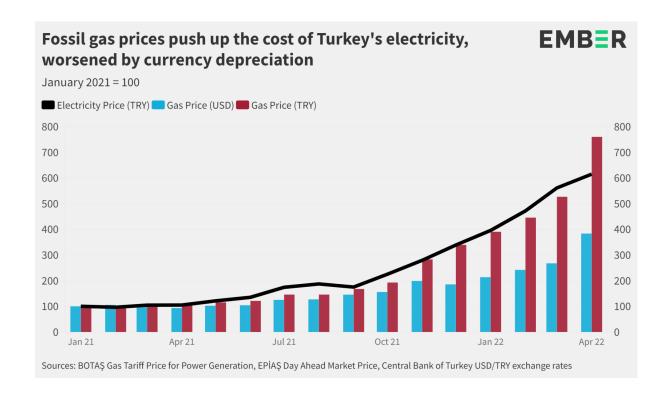
Ufuk AlparslanElectricity & Climate Data Analyst
Ember



Power prices on the rise

Fossil gas prices led to high electricity prices

Like many countries, Turkey has recently suffered from soaring electricity prices. The monthly wholesale power price has risen by almost sixfold in a year, with fossil fuel prices playing a significant role.



Rising cost of electricity

In Turkey, the gas market is regulated by the state-owned gas and oil company, BOTAŞ. Each month BOTAŞ sets a gas tariff price for different types of consumers, including power generators. Recently, gas-fired power plants have set the price by having the highest costs,



hence any change in the gas tariff for power generation is immediately reflected in electricity prices.

Gas prices have been the major driver behind the skyrocketing electricity prices in Turkey. The rise in gas prices has been mimicked by increases to the cost of electricity, with the more than sevenfold rise in gas price in a year (from 1.46 TRY/Sm³ to 10.75 TRY/Sm³) raising electricity prices by almost the same level during that period. Hard coal prices also rose by four times in a year. Even if the gas prices did not change, coal prices would drive the electricity prices higher.

The magnitude of changes in the prices differ between the US dollar and Turkish lira. While the prices in these two currencies mirrored each other during the first half of 2021, they decoupled towards the end of the year. As a result, the gas price saw a more than six times year-on-year increase in Turkish lira, whereas its price in US dollar only quadrupled over the same period. Turkey's 99% gas import dependency and the recent depreciation in Turkish lira worsened the impact of rising gas prices.

Gas reliance leaves Turkey vulnerable to rising costs

Turkey is vulnerable to changes in gas prices, as the country generated almost <u>one third of its electricity from gas</u> last year. Its annual <u>gas consumption set a new record</u> in 2021, <u>45% of which was imported from Russia</u>. Dependency on fossil gas raised the country's import bills and caused the Central Bank of Turkey to sell a <u>record amount of US dollars</u> to the state owned gas importer BOTAŞ.

Rising global fossil gas prices last year were driven by a mix of supply-and-demand driven reasons, together with geopolitical disputes. This year, the Russian invasion into Ukraine exacerbated the gas crisis even further. With prices soaring across the world, Turkey is intervening in the market to limit the rising cost of electricity.

Renewables to lower bills

Wind and solar saved 7 billion dollars in the last 12 months

While fossil fuel prices are on the rise, wind and solar power generation helped to dramatically reduce fossil fuel imports. Without wind and solar, electricity bills would have been even higher.

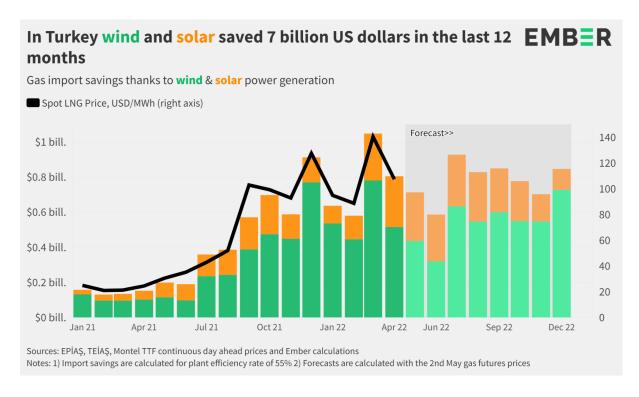
A volatile year for gas

For international gas prices, the recent months can be divided into several periods. During the first quarter of 2021, the prices were still low (20-25 USD/MWh) under the continuing impact of COVID. As of 2021-Q2, prices started to gradually increase (25-35 USD/MWh). In July-August 2021, the prices almost doubled and reached 40-50 USD/MWh. However, the worst had not been seen by then, average monthly gas prices went beyond 90 USD/MWh level in September 2021. Although prices loosened a bit with the new year; following the Russian invasion of Ukraine on 24th February, gas prices soared once again.

Gas import savings thanks to wind and solar

Every unit of generation by renewables prevents a unit of electricity to be produced by fossil fuels and the corresponding fossil fuel imports. Similarly any unrealized unit of renewable generation will be compensated by fossil fuel imports. Wind and solar power plants generated 46.3 TWh of electricity between 1st May 2021 and 30th April 2022. Without these power plants, underutilized gas-fired plants or coal power plants relying on imports would have had to run in order to compensate for them. Assuming that all 46.3 TWh power was generated by gas-fired plants, this would mean wind and solar power replaced 7 billion USD extra gas imports during that 12 month period.





Wind power plants, with their 32.2 TWh generation between May 2021 - April 2022, own the lion's share in the import savings with 5 billion USD. Solar power plants account for 2 billion USD import savings, with 86% of that from unlicensed solar power plants.

The Russian invasion of Ukraine deepened the fossil fuel crisis across the world, keeping prices high, with correspondingly painful fossil gas import bills for Turkey. Between the beginning of the war on 24th February and the end of April, 2 billion USD of potential fossil fuel imports were replaced by wind and solar power generation in Turkey. As long as the escalation continues, the contribution from wind and solar power in lowering these bills will continue rising at the same speed. We expect roughly 700 million USD savings in gas imports thanks to wind and solar generation every month, if the price of gas remains at these levels.

Market interventions to lower prices

Turkey's market interventions do not lower the costs

Interventions in both retail and wholesale energy markets help to some extent, but do not lower the cost of electricity generation and the total cost burden on the country

Keeping prices down

In response to soaring electricity prices, Turkey has taken various measures to keep prices low both at retail and wholesale levels. The natural gas tariff price for power generators set by the government (~65 USD/MWh) still remains much lower than the gas prices in Europe (100 USD/MWh) even after the 44% rise on April 1. Similarly, after the dramatic rise in electricity tariffs in 2022, the active energy price¹ for the households remains as low as 50-85 USD/MWh² while the average monthly wholesale power prices have recently stayed around 120-130 USD/MWh.

For many years, Turkey applied a marketwide price cap on the power market (2000 TRY/MWh). A much lower cap with monthly revisions was introduced in October 2020 and replaced the previous one. These interventions help to lower electricity prices to some extent; however, the cost of electricity generation and its total cost burden on the country remain unchanged. Market interventions may also cause more uncertainty, jeopardize the confidence in the market and may disrupt new investments.

Market redesign

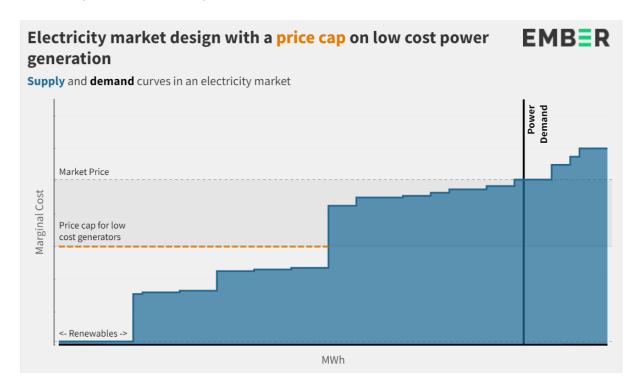
Alongside these market intervention tools, changes to the electricity market design came into force as of April 1st, which set new price caps on low cost generators. Following the change, electricity producers continue to receive the wholesale market price. However, when

¹ Electricity tariff price for residential consumers excluding taxes and distribution fees.

² 50 USD/MWh up to 8 kWh/day consumption, 85 USD/MWh for consumption exceeding 8 kWh/day.



the hourly market price exceeds their price cap, excess revenues above the price cap are invoiced to the generator at the end of each month. Under predetermined conditions and formulas, the energy market regulator distributes the collected money to the incumbent power suppliers and/or high cost power generators. As the idea behind new caps is to limit excess earnings, we can refer to the revenue collected as *windfall tax*. If the windfall tax is transferred to high cost generators, renewables will be directly supporting fossil fuels: a completely unprecedented dynamic.



The impact on Turkey's renewables

Renewables in the feed-in tariff scheme and unlicensed power plants are exempted from the newly introduced price caps. Hence the renewables capacity subject to the new design is slightly higher than 5 GW— mostly hydro (3.2 GW) and wind (1.8 GW), and not including any licensed solar power plants.

In six months, which is the initial planned duration of new market design, an estimated 6 TWh of wind power generation will be affected by the new price cap. Estimated revenue collected from wind power in that time frame is slightly less than 300 million USD, using April's parameters. A drastic change in the market design only for monthly 50 million USD saving may not be the best solution to rising bills.

The way forward

Tapping into wind and solar potential

Accelerating wind and solar power in an effort to lower electricity bills would need a rise in wind and solar capacities and removal of obstacles disrupting new investments.

Renewable is the future

The future of energy lies in renewables. In accordance with this, 97% of the new capacity that Turkey added into its power stack last year consisted of renewable sources. And there is the opportunity for much more growth, with <u>untapped potential in wind</u> and <u>solar</u> power in Turkey. However, <u>Turkey has not deployed enough renewables</u> to meet the surge in its power demand in recent years.

Three main forces are behind recent wind and solar investments in Turkey: feed-in tariff, auctions and the free market.

Routes towards new deployments

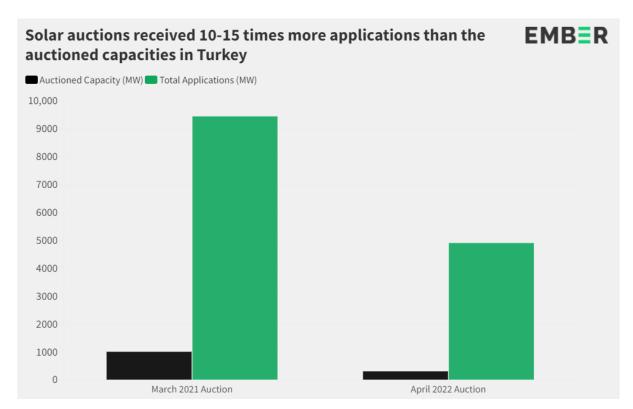
Participation in the generous renewable feed-in tariff scheme paid in US dollar ended as of July 2021 in Turkey. However, <u>wind and solar have already become the cheapest source</u> of generating power in the country, so similar subsidies should not be needed to incentivize future investments.

While the free electricity market should favor affordable renewables, this is under threat from frequent interventions. Market interventions risk disrupting new investments by damaging investor confidence, so Turkey needs to reconsider if interventions do more harm than good. For instance in the new market design, which applies a windfall tax on renewables, contributions from wind and solar power in six months are very limited (0.3 billion USD).



Turkey should therefore consider an exemption for wind and solar power from this change. By doing so, Turkey would provide a clearer direction to investors for the country's future energy plans: wind and solar should be rapidly growing.

The Transmission System Operator (TSO) in Turkey is responsible for reserving new capacities at the transformer stations. New capacities are not reserved for licensed solar, although there is an investment appetite. Last year a 1000 MW solar auction received 9440 MW applications in total, and in April this year another 300 MW solar auction received 4900 MW applications. To harness this demand and take advantage of the opportunity for cheap, home-grown power, Turkey should consider scaling up auction and reserved capacities for wind and solar power.



Crisis needs rapid action

The energy crisis needs quick solutions. Solar panels especially can be deployed quickly and play a key role in the fight against the rising fossil fuel prices and high electricity bills. Turkey has the <u>highest solar panel manufacturing capacity in Europe</u> with 8 GW annual capacity. However, <u>Turkey adds less than 1 GW solar power plants every year</u>. By fully utilizing its domestic solar panel manufacturing capacity, Turkey can reduce the electricity bills further by replacing costly fossil fuel imports.

Supporting Materials

Methodology

Gas import savings by wind and solar power generation

Continuous day ahead TTF prices were first converted into USD/MWh from EUR/MWh by using Central Bank of Turkey's EUR/USD daily forex rates. Then these prices were used to calculate the generation cost of a gas-fired power plant with 55% efficiency. The generation cost is then multiplied by the wind and solar generations of that period.

Windfall tax estimation to be collected from the wind power plants

The wind power plants that completed the ten year term to participate in the feed-in tariff scheme were filtered out of the energy regulator's annual lists of feed-in tariff participants. Half of their annual generations (to find their expected six monthly generation) mentioned on these official lists were multiplied by the difference between average monthly April power market price and the price cap applied to renewables.

© Ember, 2022

Published under a Creative Commons ShareAlike Attribution License (CC BY-SA 4.0). You are actively encouraged to share and adapt the report, but you must credit the authors and title, and you must share any material you create under the same license.