

Maximum Renewables' Share in Türkiye's Electricity System

Bariş Sanlı, barissanli2@gmail.com

Turkish energy system may be a bit away from 90-100% wind and solar rates momentarily, but in terms of total renewables it has achieved 82%. But the system is testing high levels, like 55% of solar and wind. Good news is that this level is getting higher. Bad news for the operator is that this level is getting higher. Therefore system is testing its limits in a progressive way.

In this brief, Türkiye's impressive maximum wind and solar generation rates will be visualized. It is impressive because with 330 TWh of demand Türkiye is one of the largest electricity systems in Europe. Also the progress, although never enough for clean energy enthusiasts, is remarkable.

Energy transition is not about "the war of resources". It is about an upgrade, a progress and building the next generation energy system. This can only be achieved by trial, experience, learning, sharing and through incremental steps. Türkiye's renewable progress is a classic example of a silent but firm advancement.

Essentials of Turkish Electricity Demand

Turkish electricity demand has a considerable seasonality component. There are two important moving parts of this demand like other systems: Summer and Winter demand humps.

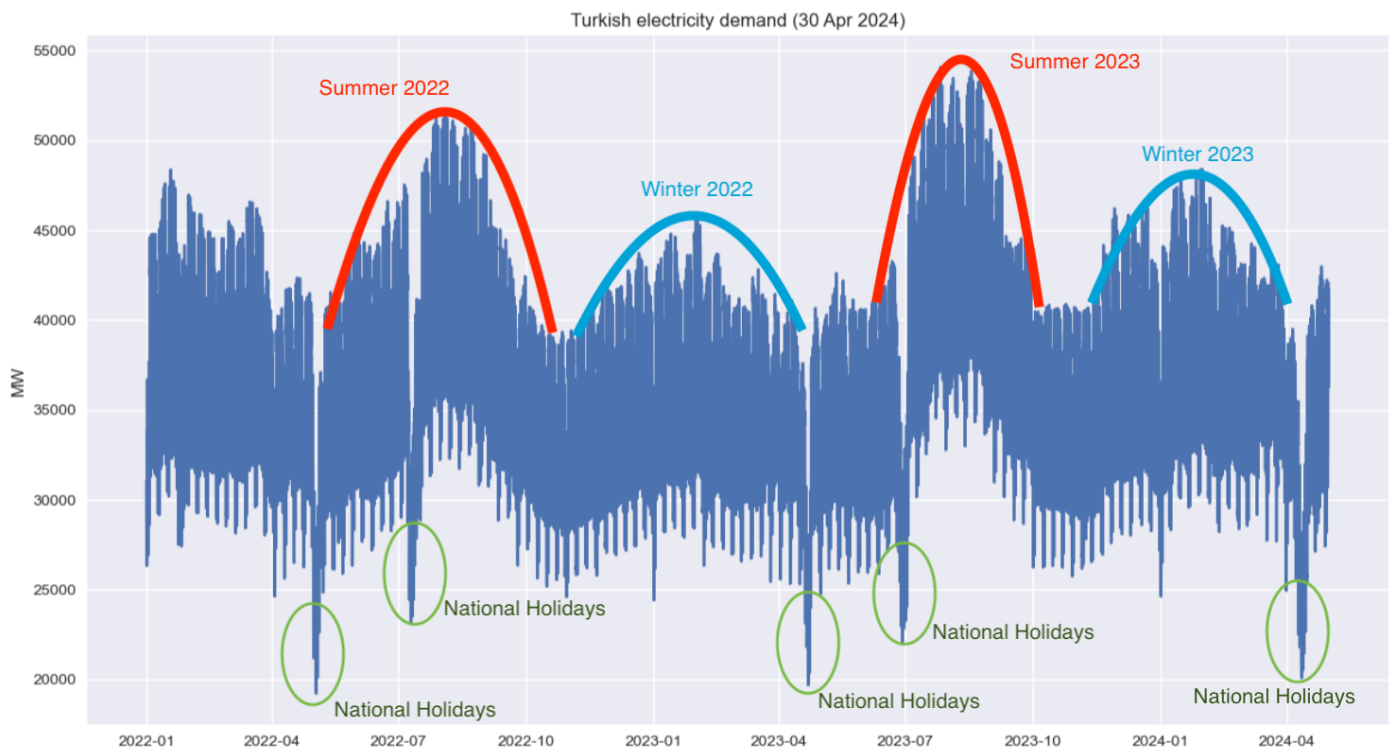


Figure 1 - Hourly Turkish Electricity Demand

Summer demand gradually shifts the peak demand from 40GW to close to 55GWs. Winter demand however, has half of the summer escalation. Also the duration of hot/cold periods and their intensity is affecting the length and height of this seasonality. For example Summer 2023 looks like shorter and sharper than summer 2022. Winter 2023 is nearly as cold but shorter than winter 2022.

The other important parameters are the long 9 days national holidays. These are religious holidays and shift 11 days every year. During these holidays, industrial complexes as well as offices are closed. Therefore demand hits the lowest level in a year.

These holidays are also the times for record level of solar and wind shares. The demand and real prices are the lowest in annual terms. The generation plants to generally dominate the system during these dates are zero marginal cost renewables. This creates an opportunity for the system to experience high levels of wind and solar and make corrections, updates to system operation

The breakdown of total installed capacity of 110 GW is as follows:

- a) Solar : 15 GW
- b) Wind : 12.1 GW
- c) Hydro: 32 GW
- d) Geothermal: 1.7 GW
- e) Biomass : 2 GW
- f) Natural gas : 24.7 GW
- g) Coal: 21 GW

In total, renewables are 62.8 GW out of 110 GW. Total generation is 330 TWh

When we look at the demand and demand without wind and solar, the impact is not as large as it was expected. In addition to that, Turkish electricity demand growth is another factor balancing this progress.

- a) 2% demand growth means 3000 MW of solar each year
- b) 3% demand growth is 5000 MW of solar each year.

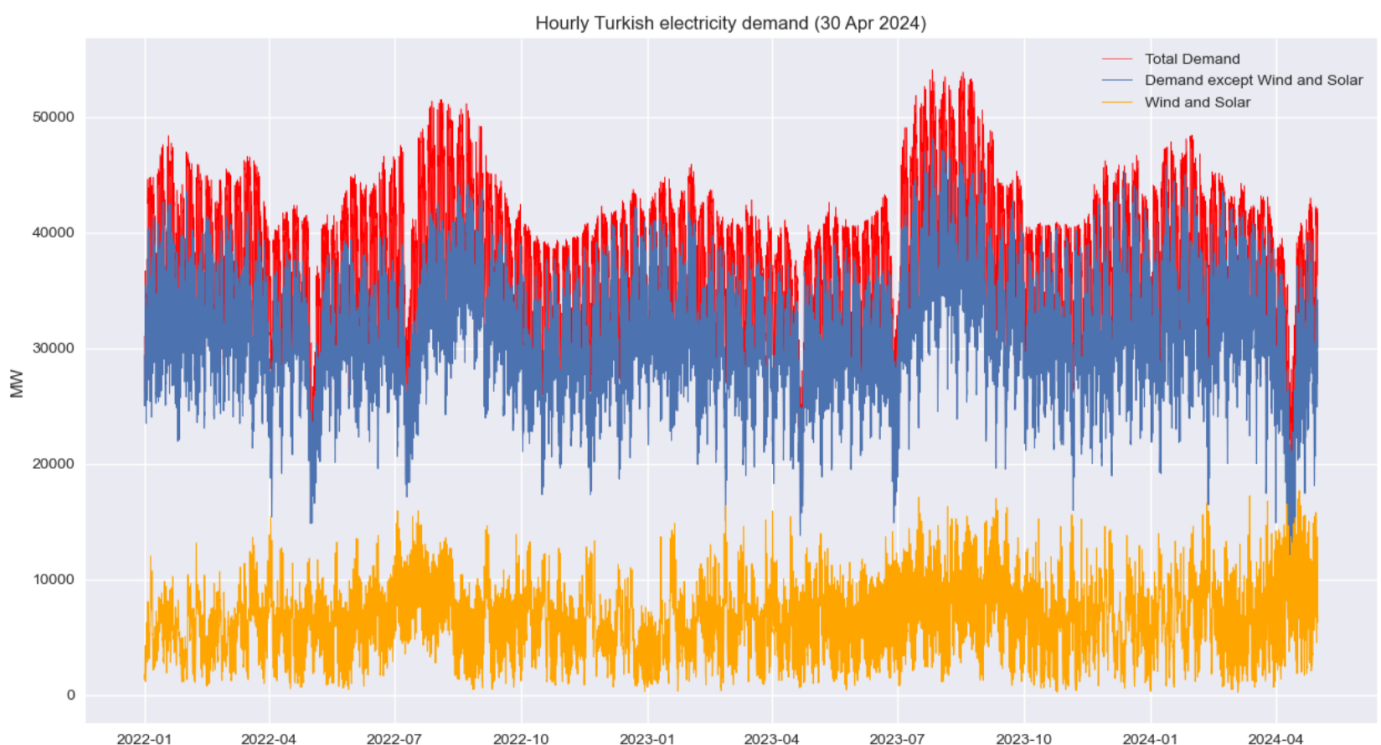


Figure 2 - Turkish hourly electricity demand, demand except wind and solar, wind and solar

Maximum Share of Renewables

Türkiye has a huge hydro capacity. Therefore the visualization of the maximum or record share of renewables needs a much more detailed approach.

The following graph is the “maximum record shares” of solar, solar plus wind and addition of other renewable resources in total hourly demand. The graph reads as follows. If record solar share is 20% in April 2022, it will stay 20% until another record is achieved. This data does not include the recent 44% solar generation record on the 16th June 2024, since the data has not been officially published.

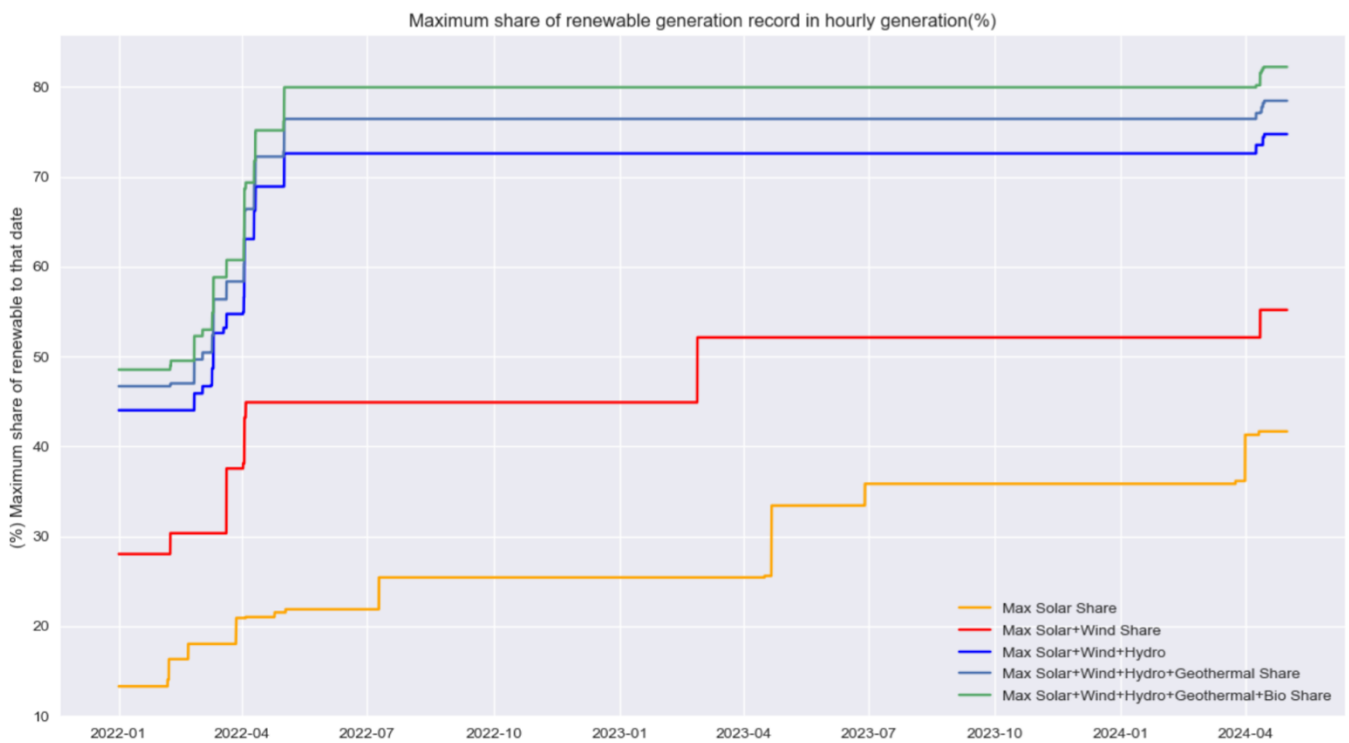


Figure 3 - Record share of renewables, updated on record dates for solar and other renewables

Solar has achieved max 41.6% (Until end of April 2024, data period. Probably it has achieved 44% on 16th June). Solar plus wind has reached 55%. Hydro added another 20% and all three resources reached 75% of total demand. When geothermal and biomass is added, the maximum generation of renewables reached 82.2% .

Data Sources:

EXIST Transparency Platform, seffaflik.epias.com.tr

TEİAŞ YT Data System, ytbsbilgi.teias.gov.tr