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Will the growth of stationary storage (BESS) systems re-shape the future of the Turkish energy market?

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The Turkish BESS market is expected to achieve a considerable growth in the next decade. The growing non-hydro renewables capacity, demand from industry and increasing Electric Vehicle (EV) penetration in the country as well as the impacts of the recent Storage License applications and National Energy Action Plan targets are expected to become the most prominent growth drivers for the Turkish BESS market, among others.

In this study, a high-level assessment of the global BESS market from size, growth, competition, and regulations perspectives helped us lay out key prospects on the future evolution of the emerging Turkish BESS market. As Strategy&, we support our clients to answer the six inevitable strategic questions for a successful entry into the Turkish BESS market.

What is Battery Energy Storage System (BESS) and how does the value chain emerge?

Battery energy storage system products have been recognized as an effective and viable solution in the market today to minimize the potential risk of blackout events and load fluctuations so that the flexibility and stability of the grid is ensured. They have started to become an essential part of the national energy strategies of the leading countries around the globe, as exemplified in the EU (European Union)'s RePowerEU plan and US (United States) Defense Act. In this study, we focus on industrial and grid-size stationary storages that are usually implemented as a combination of BESS with above 1 MWh capacity and 1-6 hours discharge duration per day.

The major application areas for BESS includes renewables smoothing (e.g., peak load shaving), ancillary services such as frequency regulation and control, non-renewable (thermal) power plants, industrial usage, residential (mostly for solar PVs and EV charging) and off-grid remote area applications.

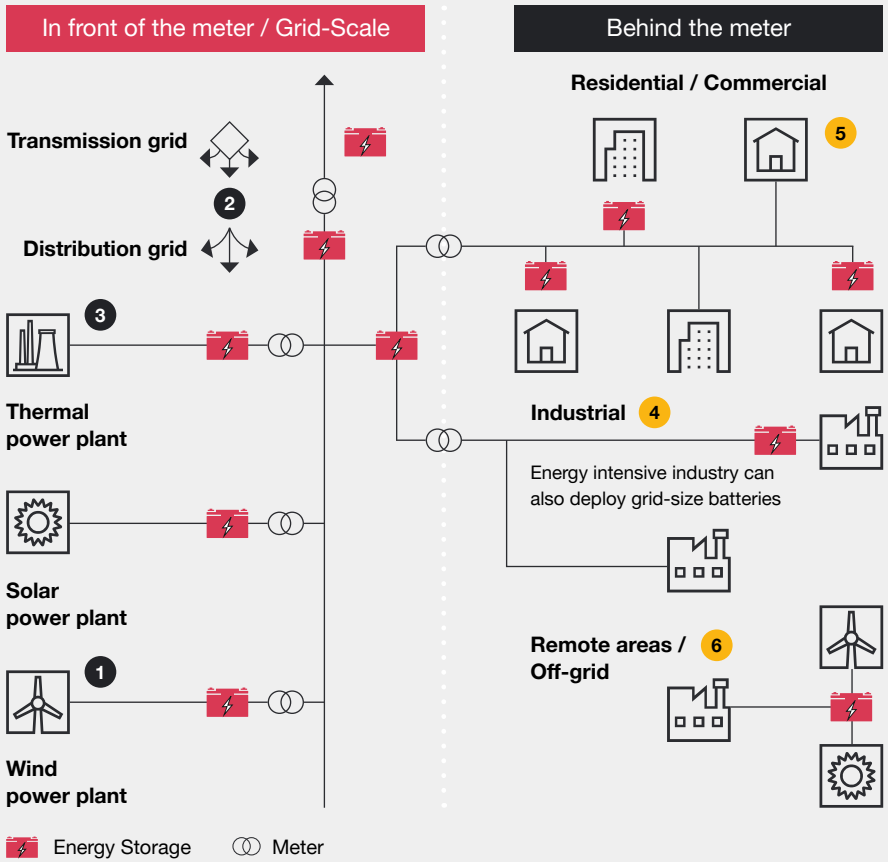
BESS value chain consists of seven steps starting from the mining of raw materials to component manufacturing, cell production, packing & assembly, application (i.e., battery management software) development, sales, after-sale service, and recycling.

The technology advancement steps for the BESS systems are quite encouraging. Although Li-Ion is expected to remain the leading technology towards 2030, several innovative technologies including lead-acid, nickel-metal and redox-flow can have sizeable deployments in the same time period.

First, let us look at the key findings about the global BESS market and their implications to the emerging Turkish BESS market…

There are six major application areas for BESS, covering the value chain from production to operations

Application areas of battery energy stationary storage



Overview of main services offered
(non exhaustive)

Location	Application
In front of the meter / Grid-Scale (10 MW-1 GW)	1 Renewable power plants (RE Smoothing[1])
	2 Frequency Control and Regulation
	3 Thermal power plant
Behind the meter (3 kW – 5 MW)	4 Industrial
	5 Residential / Commercial / EV (Electric Vehicle) charging
	6 Remote areas / Off-grid

[1] RE smoothing is the term generally used when a battery is adapting the profile of solar or wind generation, for example, to fit with the needs of a power system

BESS: Battery energy storage systems

Source: World Energy Council, IRENA, Science Direct, PwC Strategy& analysis

How is the global BESS market expected to grow?

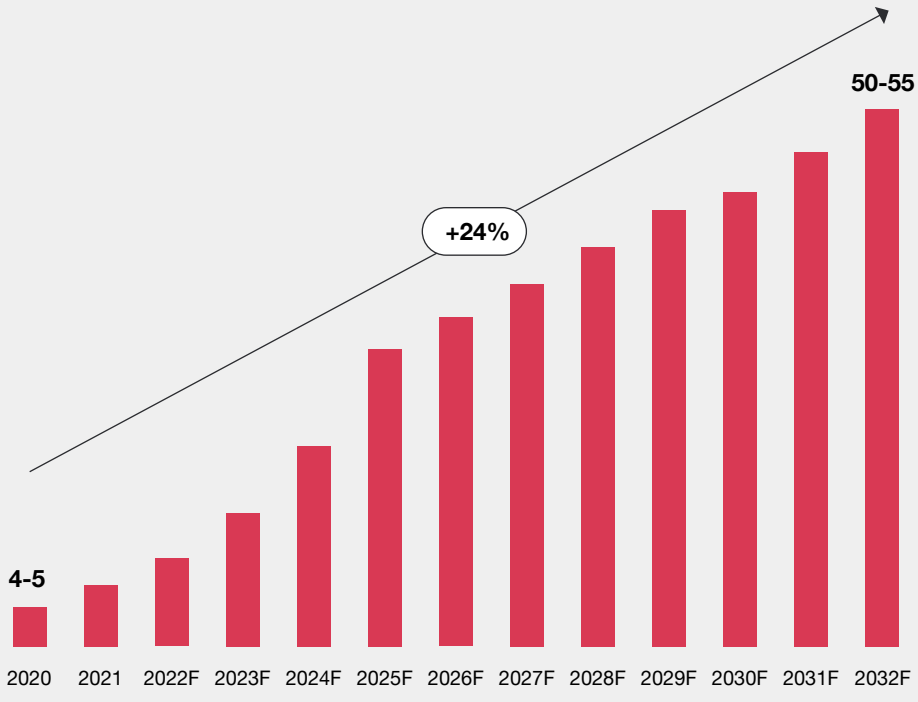
According to our estimates, the size of the global BESS demand is expected to reach USD 50-55 billion with a 22% growth per annum in 2032. US and China can capture more than half of the global demand, while Europe constitutes 10-15% with Germany and UK (United Kingdom) as the leading markets.

The growing share of renewables reaching to nearly 60% in the global energy installed capacity in 2030 (Source: IEA World Energy Outlook 2022), industry demand with the increasing electricity wholesale prices, and decreasing battery pack prices are expected to become the most critical growth drivers. Furthermore, key regulations in mature energy markets (i.e., US, UK, and Germany) support the growth of BESS capacities with capacity obligations, nation-wide or state-level targets and tax exemptions.

The size of global BESS market is expected to reach USD 50-55 bn

Global battery energy stationary storage market size by demand

Global battery energy stationary storage market size (2020 – 2032F, USD bn)



[1] Market sizing is calculated according to the middle scenario for the 4-hour grid-scale storage installed costs

BESS: Battery energy storage systems

Source: PwC Strategy& analysis

Key remarks

- Global battery energy stationary storage market size is expected to reach to ~USD 50-55 bn in 2032
- The market is expected to grow with a CAGR of 24% between 2020 and 2032
- The 4-hour grid-scale storage installed costs are expected to go down with the decreasing Li-Ion battery pack prices assuming no raw material shortage
- The main driving factor of the market size growth is expected to be growing demand for battery energy stationary storage
- The market size consists of the global stationary demand and the 4-hour grid-scale storage installed costs

What are the prospects for the emerging Turkish BESS market?

Turkish BESS market is driven by 4 main demand trends: (i) growing renewable energy sources (RES) capacity, (ii) increasing demand from industry, (iii) electricity demand increase by EV penetration, and (iv)pilot projects in the electricity distribution front. Furthermore, we observe 3 supply trends: (i) regulations and national energy targets, (ii) increasing competition, (iii) import dependency on Li-ion batteries.

The most important demand-side trend is the growing non-hydro RES capacity in Turkey which is expected to hit the levels of ~80-90 GW in 2035 with 45-50% share in the overall electricity installed capacity, according to the Ministry of Energy and Natural Resources' latest National Energy Plan.

The growing renewable capacity of the Turkish BESS market is expected to develop in parallel with rising demand and the guidance of regulations

Selected trends for Turkish BESS market

Main demand trends	
Growing renewable capacity[1]	**45-50%** non-hydro renewables penetration in Turkey's total installed energy capacity in 2032
Increasing electricity demand from industry	**40-45%** share of industry in total electricity consumption in Turkey
Electricity demand by EV penetration	**5-10 TWh** EV public charging demand in Turkey in 2031
Electricity distribution	**Initial pilot BESS projects** started to emerge in several electricity distribution areas in Turkey

Main supply trends	
Regulation and policies	**2,700 applications** were made for the **160 GW** of capacity available for **storage licenses. The National Energy Action Plan** lays out **7.5 GW of battery capacity** in 2035. The future holds tax exemptions, Renewable Energy Resource Area (YEKA) obligations and R&D projects
Increasing local & global competition	**20+** local and global suppliers may operate in the Turkish BESS market in 2032
Import dependency on Li-Ion batteries	**~USD 380 mn** net trade deficit for Lithium-Ion batteries in 2021

[1] Imbalance management / prevention

BESS: Battery energy storage systems

Source: TEİAŞ, EPİAŞ, EMRA, PwC Enlight, Shura, TEHAD, IHS, Fitch, Trademap, Company websites, expert interviews, PwC Strategy& analysis

On the supply side, the recent Storage License regulation, approved by the Turkish Parliament in July 2022 and published in the Official Gazette on November 19, 2022, accelerated the emergence of the BESS market in Turkey. The regulation allows BESS players acquire solar or wind power plant pre-license without any auction up to the installed BESS capacity. They are also allowed to either sell their electricity at market clearing price under EPİAS (i.e., energy markets stock exchange) or their generated electricity will be purchased under YEKDEM (i.e., feed-in tariff) scheme.

Within two weeks after the publication of the regulation, more than 2,700 “power plant license with storage” applications have been made to EMRA, with a total capacity of 160 GW and a total investment value of USD 230 billion, according to the latest EMRA announcement in January 2023. Several energy generation and industrial companies are among the applicants of the license.

With the increased demand for BESS installations, as Strategy&, we expect more than 20 BESS suppliers in the Turkish market by 2032.

Under the lights of the demand and supply drivers, we expect the Turkish BESS market to exceed USD 400-500 million annual sales volume in 2032. Renewables smoothing and ancillary services are expected to represent more than 60% of the overall demand.

As a company, how can you benefit from the growing BESS market in Turkey and globally?

Based on our experience, entering into the BESS market presents several opportunities as well as challenges for power generators, new private investors, industry players, grid & transmission operators, EV charging operators and regulators. For instance, renewable power generators can evaluate the opportunities of primary / secondary frequency control, demand shifting and frequency smoothing with BESS.

Furthermore, private investors (e.g., private equities, banks, and telecom companies) can develop a business model with BESS capacities installed for virtual power plant, energy flexibility, ancillary services, and arbitrage while BESS can be evaluated as an alternative market entry strategy for renewables industry.

We suggest the companies that consider entering the Turkish BESS market to thoroughly assess the potential of the market in terms of the size, growth, and BESS application areas. A diligent competitive assessment can help you identify a unique market positioning across the value chain and yerine reveal the differentiating capabilities to invest in.

Key strategic questions for new BESS market entrants

Then, your company needs to answer six strategic questions to guarantee a win in the Turkish BESS market.

- What are the strategic options that we can evaluate for a successful market entry into the Turkish BESS market?
- What are the key market, competitive and regulatory risks that we need mitigate?
- Which part(s) of the BESS value chain can we create most value? How can we start a local cell production capacity in Turkey?
- How does the BESS operations fit our existing or future capabilities? Can we tap into synergy opportunities? What kind of business models can we create with partnerships?
- What is the size of the addressable market and expected profitability levels for these strategic options? How much do we need to invest?
- How should we design our go-to-market strategy around key target clients, products, pricing levels, supplier network and required capacity?

BESS: Battery energy storage systems

Source: PwC Strategy& analysis

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