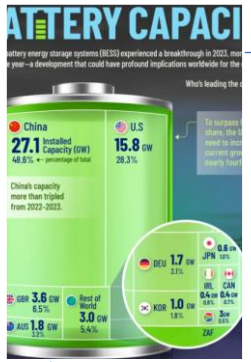
Battery Energy Storage Systems Development Perspectives in ERRA Member Countries: Case Study from Türkiye

Update by EMRA/Türkiye

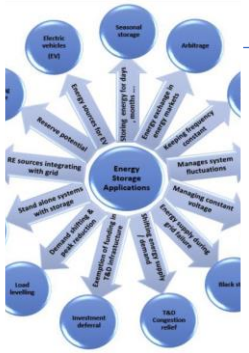
Murat ALDI
Energy Specialist

ERRA EMER Committee Meeting
November 6-7, 2024 | Istanbul, Türkiye

Content



Worldwide Battery Energy Storage Systems

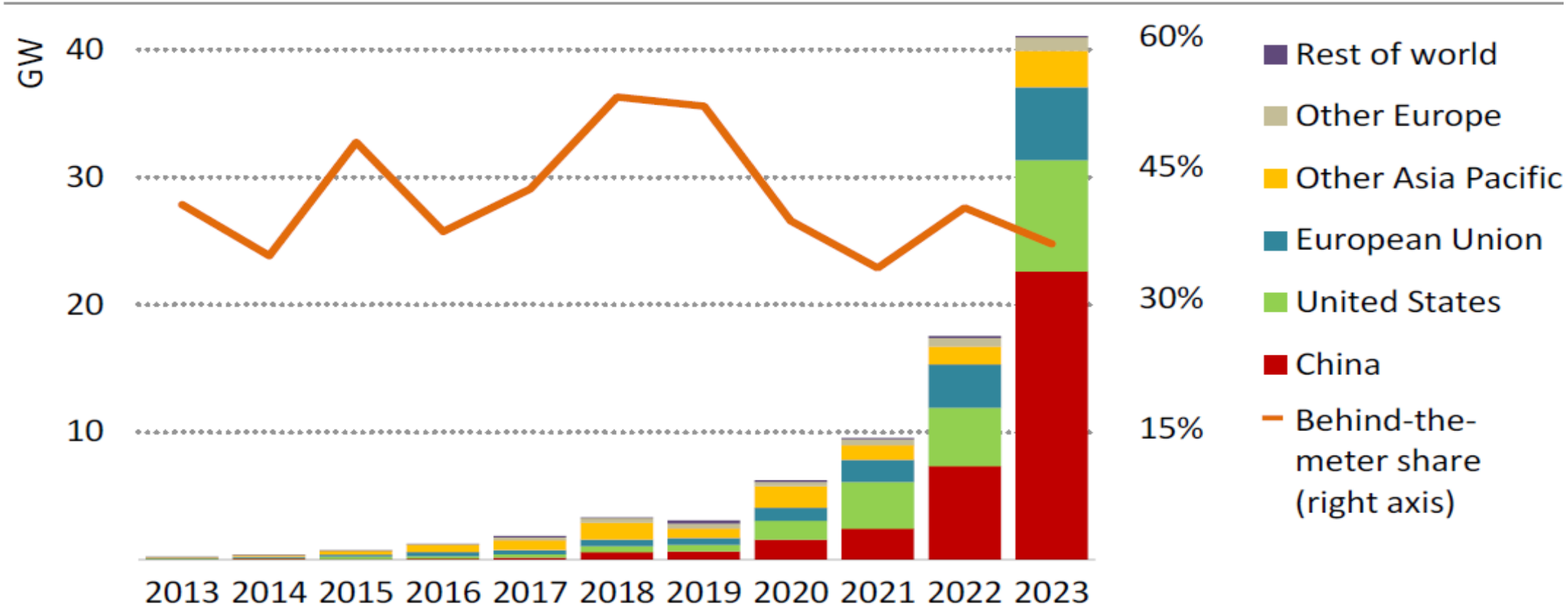


Applications of Battery Energy Storage Systems

Battery Energy Storage Systems, Türkiye Case

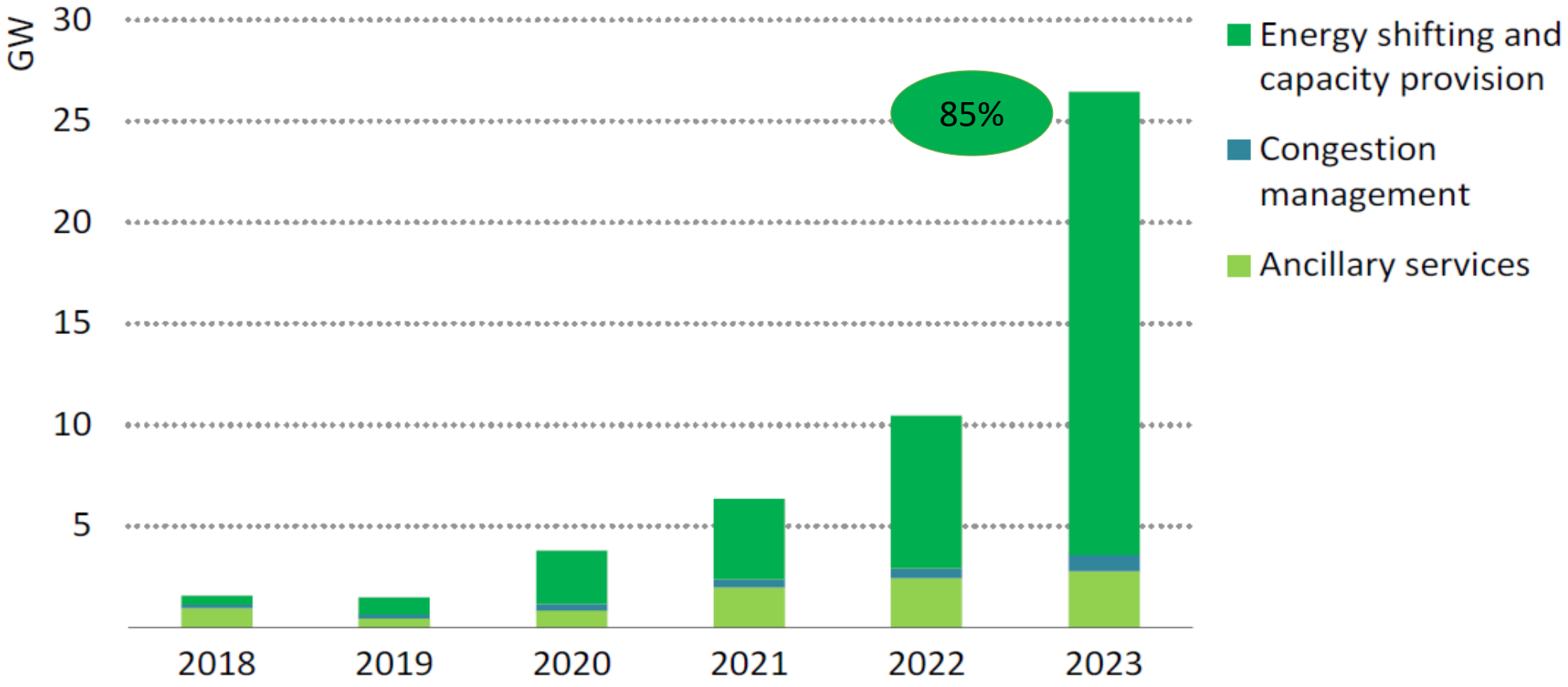
1. Worldwide Battery Energy Storage Systems

Battery Storage in the Power Sector



Project costs decreased from $1.4 Million to $140K per MW.

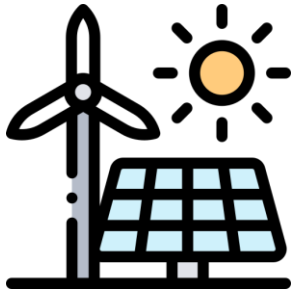
Utility-Scale Battery Storage

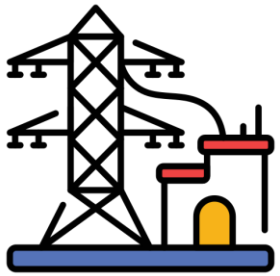


Functions of Battery: Energy Shifting – Congestion Management – Ancillary Services

2. Applications of BESS

Applications of Battery Energy Storage Systems





- Renewable Power Plants
  - Adjusting load profiles
- Residential and Commercial
  - Small-scale implementation
- Distribution and Transmission
  - Network Management

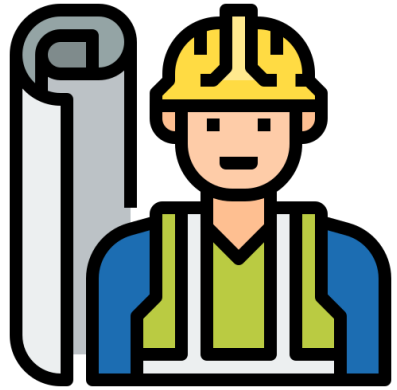
Applications of Battery Energy Storage Systems (2)

Investor

- Arbitrage
- Renewable Investment
- Adjusting Generation
- Managing Imbalances

Consumer

- Load Shifting
- Energy Security

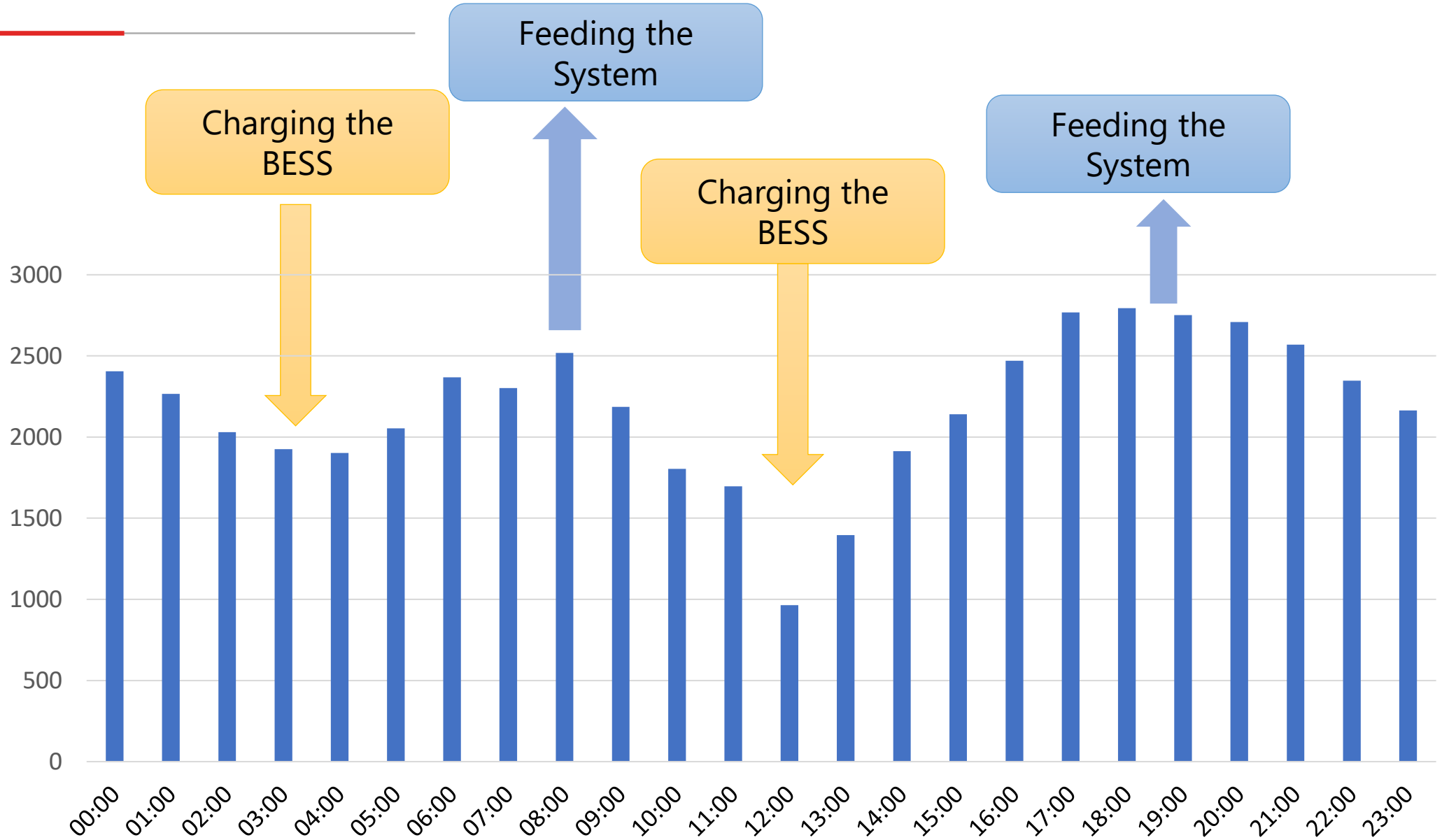


Network Operator

- Ancillary Services
- System Recovery
- Network Constraints

2.1 Investor

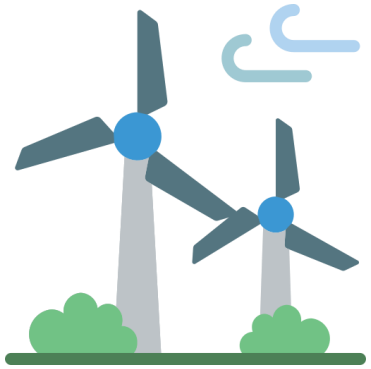
Price Arbitrage: Market Clearing Price

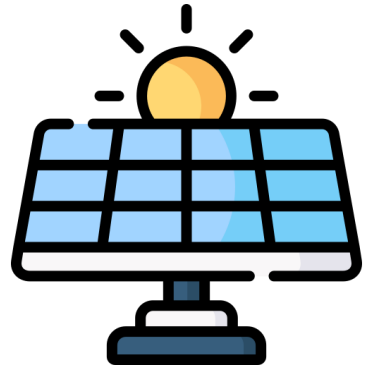


Accelerating the integration of renewable energy

- The intermittent nature of renewable energy plants
- Storing excess energy in storage systems
- Minimizing economic loss of investors

Managing intermittency and the generation profile

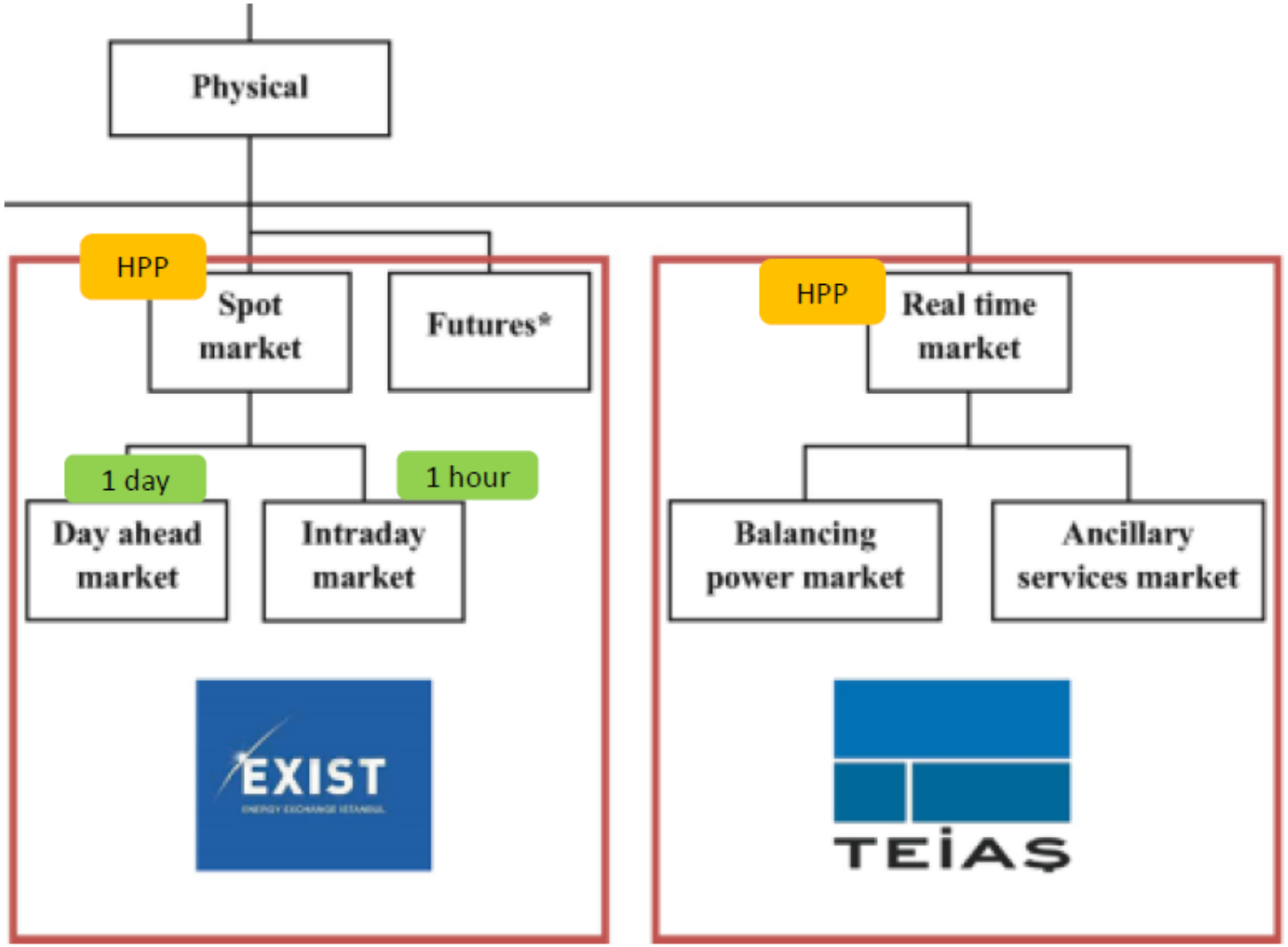




- Load Pick Up/Load Shedding
- Located around constrained nodes have the potential to generate more income

Managing imbalances and imbalance-related costs

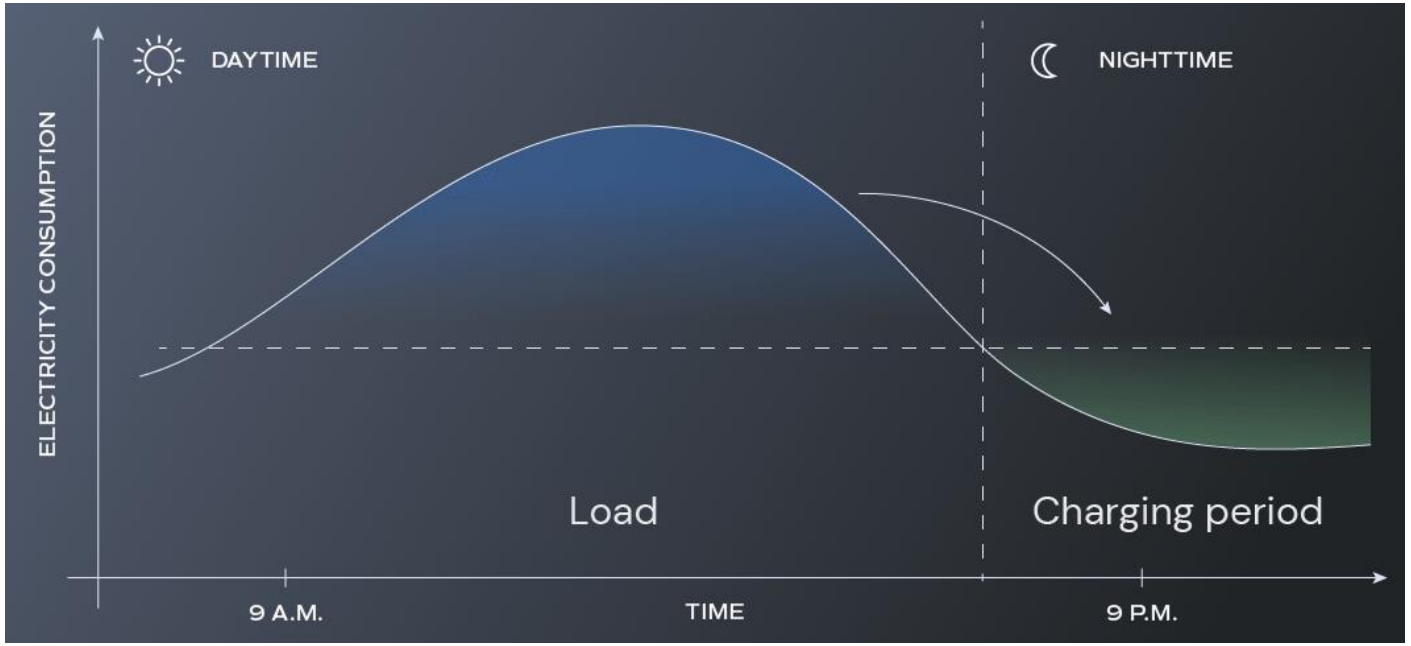
- To minimize costs
  - Balancing Market
  - Intra-Day Market
  - Storage facilities



2.2 Consumer

Consumer Applications of BESS

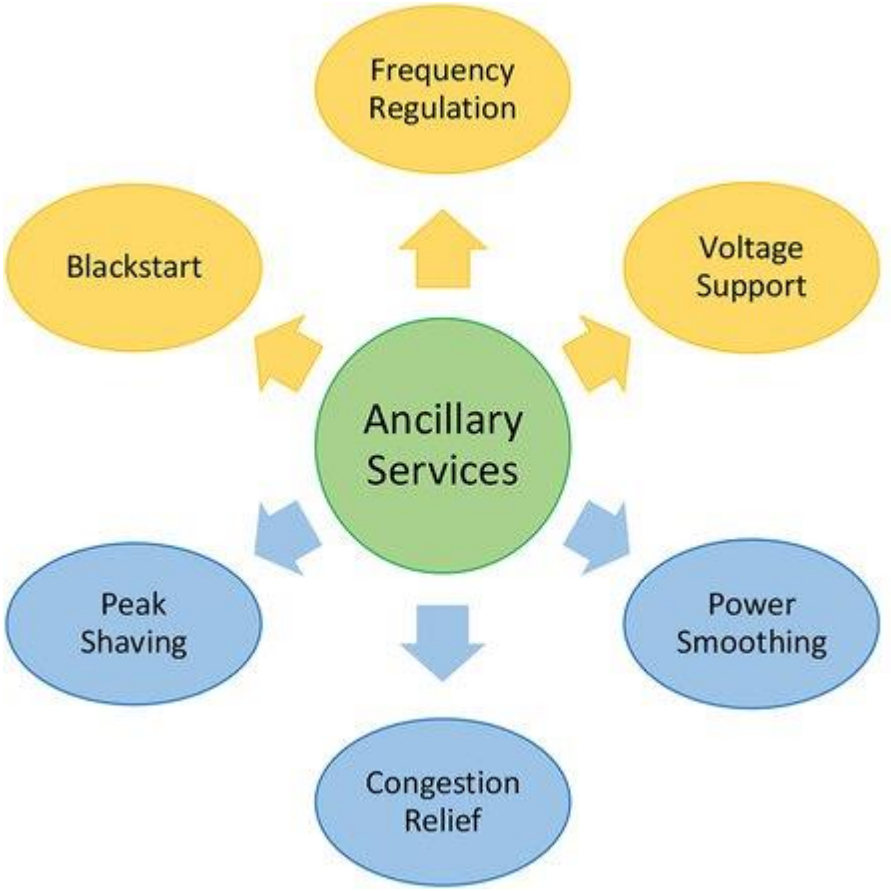
- Shifting consumption
  - Changing their daily routine energy consumption profiles
  - Reducing electricity costs
- Energy Security
  - batteries can be used during power outages



2.3 Network Operator

Battery Storage Systems by Network Operators

- Ancillary Services
  - Primary Frequency Control
  - Secondary Frequency Control
- System Recovery
  - Collapse of the network due to a fault
- Transmission Network Constraints



3. Türkiye Case

3.1 BESS Legislation in Türkiye

Battery Energy Storage Systems in Türkiye

Integrated Electricity Storage Unit in the Generation Facility

Independent Electricity Storage Facility

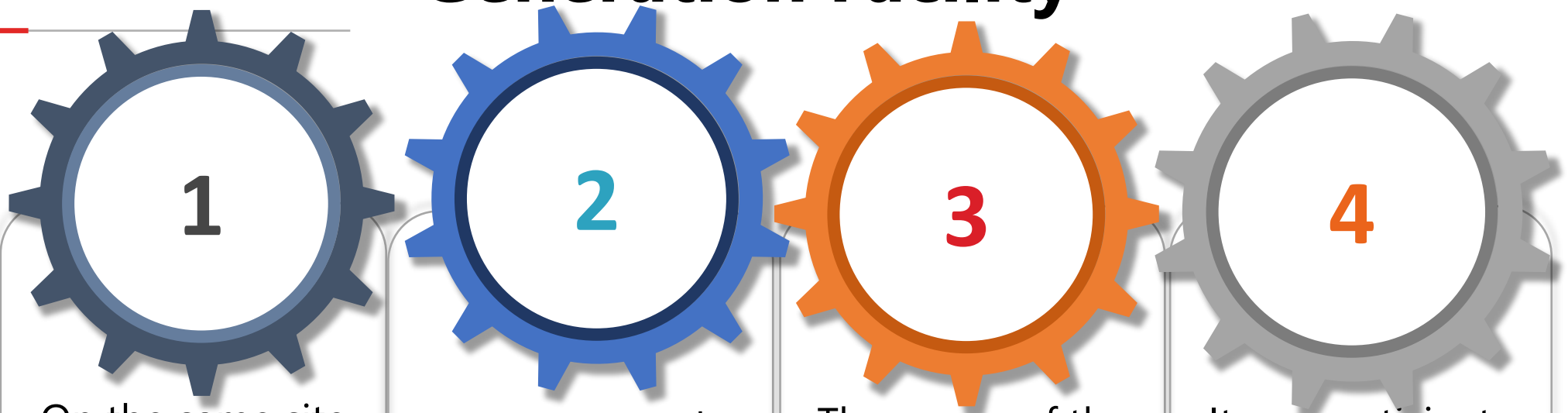
Integrated Electricity Storage Facility in the Consumption Facility

Electricity Storage Facility to be Established by Network Operators

Research and Development on Energy Storages

Energy Generation Facilities with Storage

1. Integrated Electricity Storage Unit in the Generation Facility



1. On the same site as the generation facility and network connection characteristics are the same
2. It connects to the transmission or distribution system and links to the relevant operator's SCADA system
3. The power of the storage facility may be higher, but the energy supplied to the network cannot exceed the electrical installed capacity of the generation facility
4. It can participate in wholesale/retail electricity markets, ancillary services, and the balancing power market

2. Independent Electricity Storage Facility

1

It can participate in ancillary services and wholesale/retail electricity markets with a supply license. Minimum limit: 2 MW

2

The construction, operation, maintenance, and renewal of the connection lines/facilities up to the distribution or transmission network belong to the relevant user

3. Integrated Electricity Storage Facility in the Consumption Facilities

01

Only for the purpose of regulating the load profile of the consumption point (for its own needs)

02

Up to the maximum consumption facility power.

03

The connection opinion is provided by the network operator

04

No payment is made for the energy supplied to the network

05

Organized Industrial Zones can establish electric storage facilities within this scope

4. Network Operators and Electricity Storage Facilities

Alternative to new investment in the distribution network

More economical than new network investment

Can only be used for distribution activities

The TSO can establish it within the scope of pilot projects but cannot commercialize it

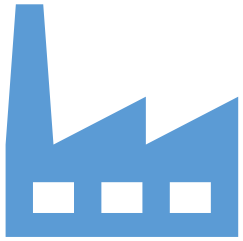
5. Electricity Storage Facility within the Scope of R&D

- With a maximum installed capacity of 1 MW.
- Cannot be commercialized.

6. Energy Generation Facilities with Storage (2)

- Minimum 20 MW for Wind
- Minimum 10 MW for Solar
- Maximum 250 MW
- Facility capacity <= storage capacity

6. Energy Generation Facilities with Storage



wind and solar power plants

- supply security
- reducing dependency

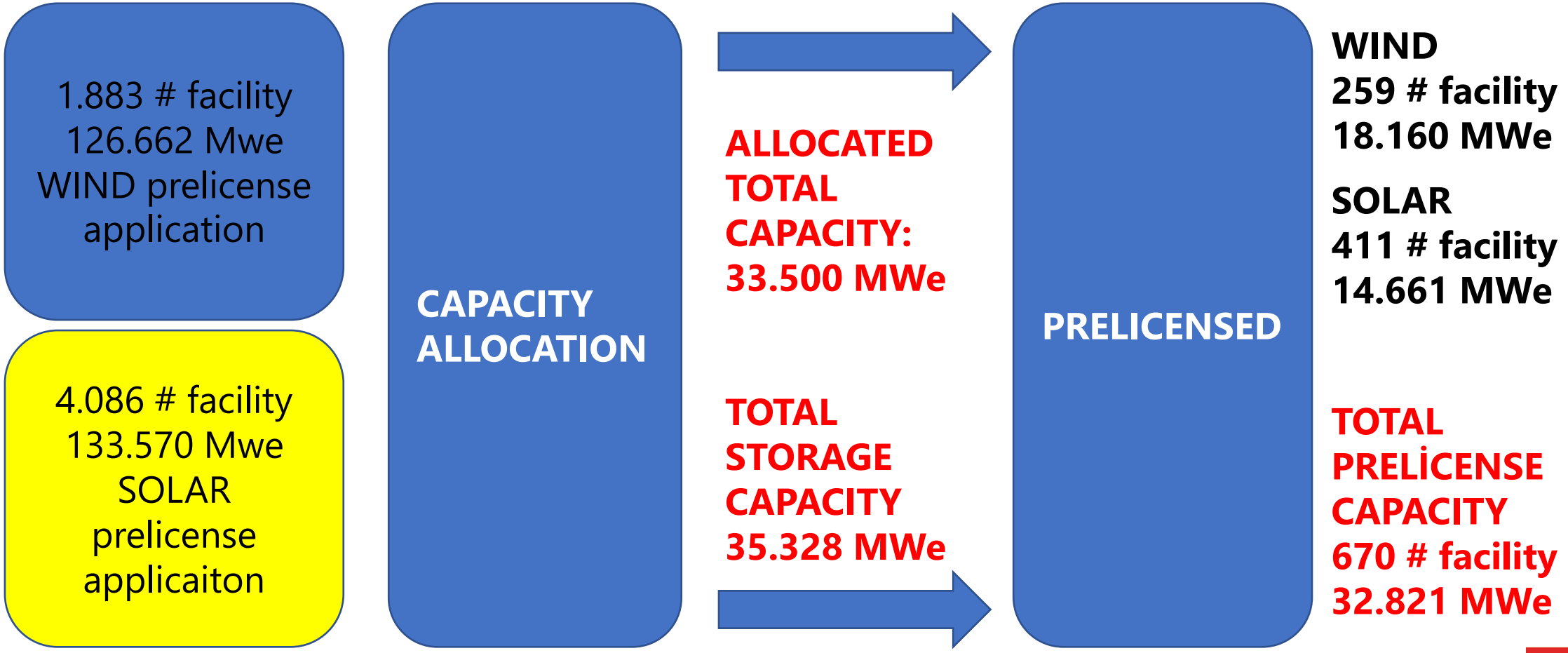
reduction of carbon emissions

Intermittent renewable energy

- addressed through energy storage systems

3.2 Türkiye Case with Quantities

The current status of energy generation facilities with storage in Turkey.



THANK YOU
FOR YOUR ATTENTION!

Murat ALDI
maldi@epdk.gov.tr