

Revolutionizing Wind Energy with Advanced BESS Solutions



How Enercap's Supercapacitor Technology is Empowering Sustainable Energy Projects



Overview of Aliağa Wind Power Plant **DESCRIPTION OF THE PLANT:**

- annually.



• The Aliağa Wind Power Plant in İzmir Province, Turkey, consists of four fields operated by various companies. With 83 wind turbines and a total capacity of 193 MW, the plant generates approximately 480 GWh

 To integrate a Battery Energy Storage System (BESS) to store excess wind energy, stabilize the grid, and optimize energy dispatch.

Challenges Faced by Wind Energy Plants

Key Points:

- Intermittency: Wind energy production fluctuates due to variable wind speeds.
- Grid Stability: Difficulty maintaining frequency and voltage stability during high wind penetration.
- **Curtailment Issues:** Energy generation may exceed grid capacity, leading to wastage.
- **Inefficient Energy Utilization:** Lack of storage limits the ability to supply power during peak demand.



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Enercap's Solution – BESS with Supercapacitor Technology

- Key Advantages of Enercap's BESS:
- Long Lifespan: 25-year lifespan with 99% round-trip efficiency.
- Enhanced Grid Stability: Provides frequency and voltage regulation to the grid.

- Eco-Friendly and Safe: Non-chemical, fully recyclable technology.



- Fast Charging and Discharging: Handles sudden
 - fluctuations in wind energy production.

• Energy Optimization: Stores excess energy during high generation and releases it during peak demand.



Aliağa Wind Power Plant BESS Installation

Implementation Details:

- Capacity: 2MWh.
- Technology Used: Enercap's supercapacitor-based BESS.

Expected Impact:

- Reduce energy curtailment
- Enhance grid stability and flexibility.
- Optimize wind energy utilization, enabling reliable power supply.



• Objective: Replacing backup diesel generators and improving energy efficiency.

Benefits of Enercap's BESS for Wind Plants

Key Benefits:

- 1. Maximized Renewable Utilization: Avoids energy wastage through efficient storage.
- 2. Cost Savings: Reduces reliance on grid upgrades or backup generators.
- 3. Improved Reliability: Ensures continuous power supply even during low wind periods.
- 4. Carbon Emissions Reduction: Supports clean energy transitions by replacing fossil-fuel backups.



Size of the System (PCS and Storage)

- Power Conversion System (PCS): 1 MW.
- Storage Capacity: 2 MWh.

Technical Details on the System

- Technology: Supercapacitor-based BESS.
- Lifespan: 25 years with 500,000 cycles.
- Round-Trip Efficiency: 99%.
- Charge/Discharge Time: Capable of handling rapid fluctuations in wind energy output.
- Environmental Safety: Fully recyclable, non-chemical, and temperature resilient.





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Application

The BESS is deployed to:

- Replace backup diesel generators.
- Enhance grid stability and store excess wind energy during off-peak hours.
- Support renewable integration into the national grid.

Location: Aliağa, İzmir Province, Turkey.





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Information on Turkey's Energy Storage Market

Market Overview:

Turkey is targeting 5 GW of energy storage capacity by 2030, driven by its push for renewable energy integration.

The country aims to achieve 42 GW of wind capacity by 2035, necessitating advanced storage solutions.

Demand Growth:

Turkey's energy demand is growing at an annual rate of 4%-5%, with storage being critical for balancing renewable variability.

Technology Comparison Table

Metric	Enercap Supercapacitors	Lithium-ion	Redox Flow
Round-Trip Efficiency	99%	85%-90%	65%-70%
Lifespan (Years)	25	10-15	15-20
Cycles	50,000+	3,000-5,000	Unlimited
Charge/Discharge Rate	Rapid	Moderate	Slow
Environmental Impact	Fully Recyclable	Hazardous Materials	Chemical Wast
Maintenance	Minimal	High	Moderate





Information on the Industry

Industry: Renewable energy with a focus on wind power generation.

Context:

Wind farms in Turkey contribute significantly to the national grid, producing over 12% of total electricity in 2023. Challenges include intermittency, grid integration, and power curtailment-all addressed by advanced BESS solutions.





Why Enercap?

- Proven expertise in supercapacitor-based energy storage.
- Partnered with findustry leaders like Supracap for large-scale deployments.
- Flexible, scalable solutions tailored for wind energy projects.
- Commitment to sustainable energy transitions.





Conclusion – A Future Powered by Wind and Storage

Key Message:

Enercap's BESS solutions empower wind energy plants to operate efficiently, reduce emissions, and support a sustainable future.

Call to Action:

Let's collaborate to make your wind energy project a success.







