

TRANSFORMING ENERGY POLICIES –
ADAPTING ENERGY REGULATION

23rd ERRA ANNUAL
CONFERENCE

27-28 April, 2026

HOSTED BY ÚRSO
in Bratislava, Slovakia



SESSION II/A: DECARBONIZATION PATHWAYS: RENEWABLE INTEGRATION AND STORAGE REGULATION

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SESSION II/A: TRANSFORMING ELECTRICITY GENERATION AND STORAGE

#ERRAConference2026

OPTIMA ENERGY CONSULTING

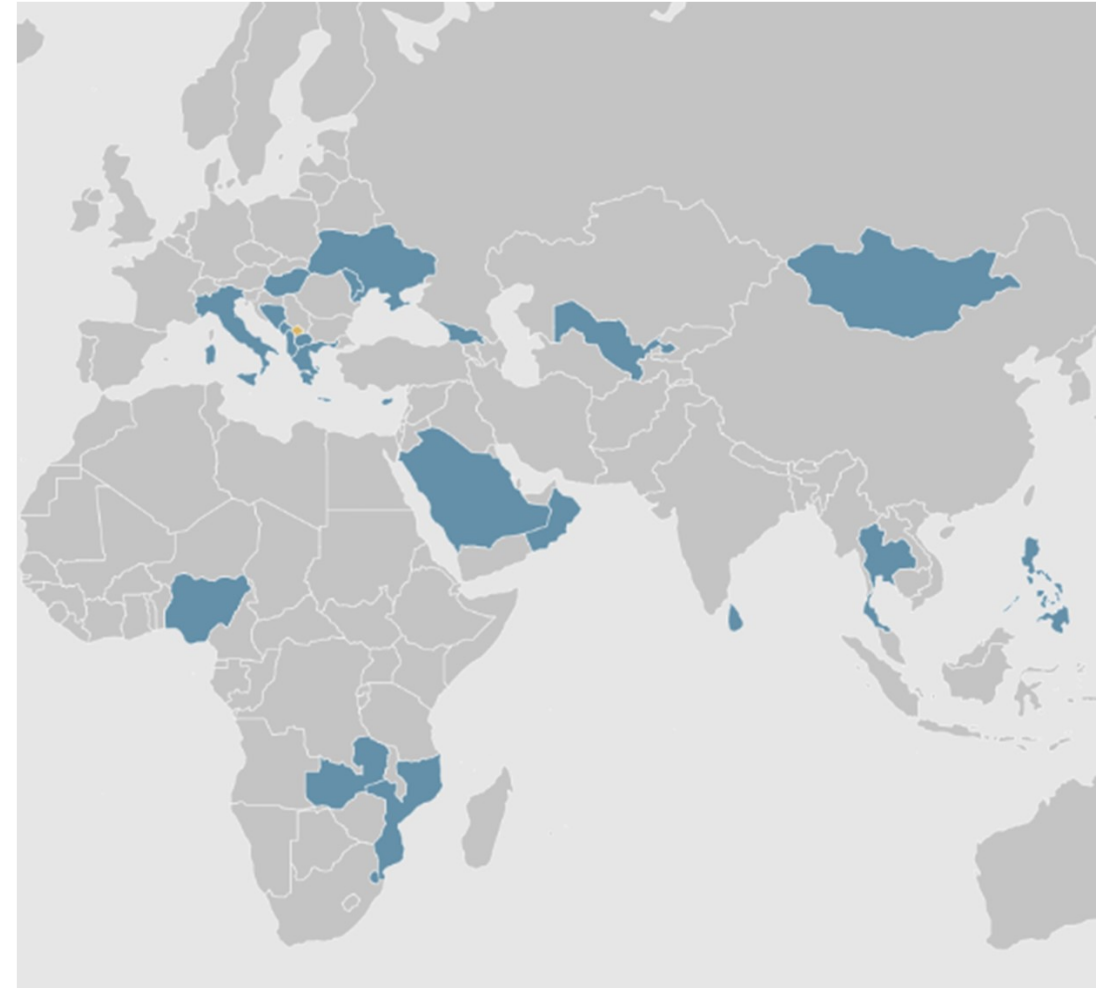


Established in 2013

100% employee-owned

80+ projects in 20+ countries

- Economic Regulation, Price Controls
- Renewable Energy Policy
- Legal and Policy Support
- Capital expenditure review and assessment
- District heating, energy efficiency and energy audits



MILLENNIUM
CHALLENGE CORPORATION
UNITED STATES OF AMERICA

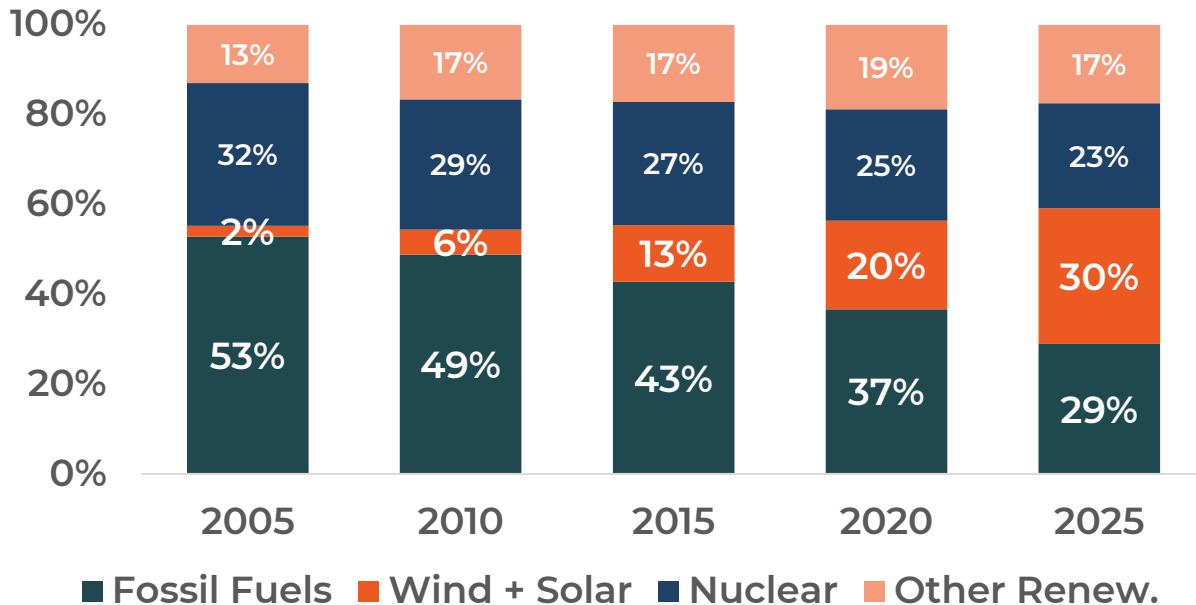


EVOLVING POWER SECTOR LANDSCAPE

47%
EU Renewables Share 2025
Up from 39% in 2020

211 GW
Solar Added in EU (2020-2025)
38 GW of coal shut down

30%
Wind + Solar Share (2025)
First time > fossil fuels



- Wind + solar overtook all fossil fuels combined in 2025 for the first time
- 12 EU countries saw solar cover $\geq 80\%$ of demand in at least one hour in 2024 (Ember 2025)
- In 14 EU countries wind + solar generated more electricity than fossil fuels.
- In 2025: Denmark 91% renewable; Germany 59%; Ireland 38% wind; Netherlands 21% solar.

Sources: Ember - European Electricity Review 2025/2026; Ember - Yearly Electricity Data

NEGATIVE PRICES AND CURTAILMENT

2.08%

Occurrences of negative prices in DAM - EU-27/EEA(Norway)¹

Up from 0.17% in 2022

72 TWh

Renewables curtailed Europe incl. UK and Norway (2024)²

≈ Austria's annual consumption

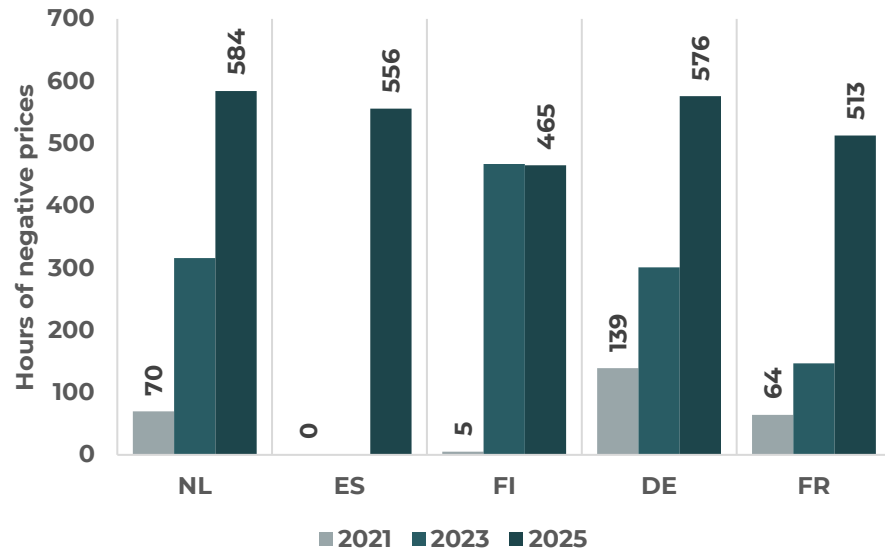
€8.9bn

EU congestion costs (2024)²

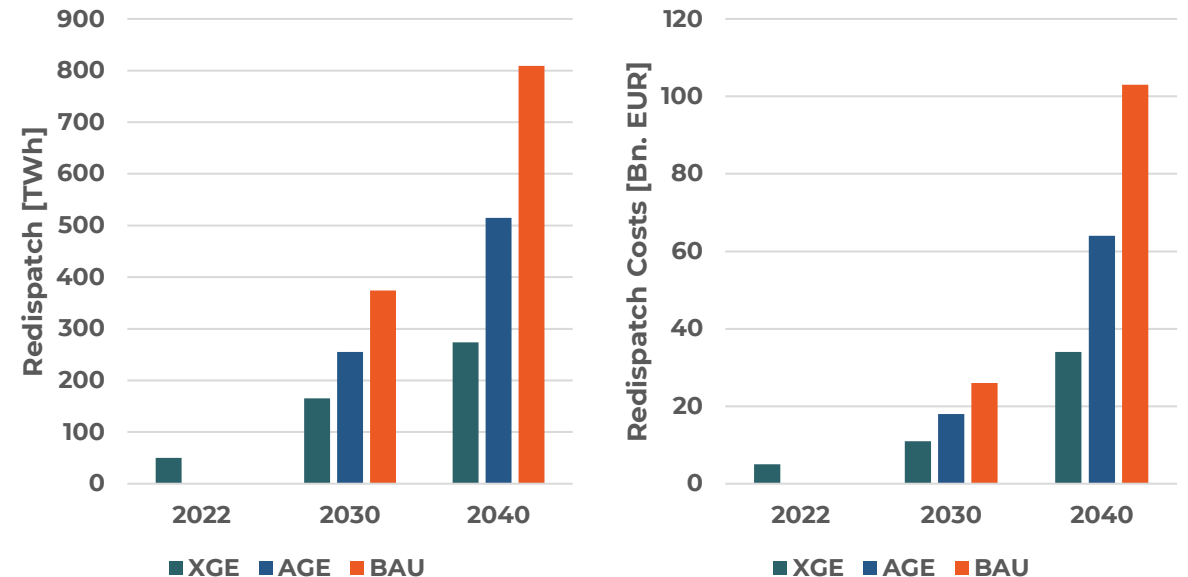
€103 bn

EU Grid Congestion costs projected by 2040 without action³

Hours of Negative Day-Ahead Price Hours by Country¹



EU projected grid congestion costs³



Sources: 1. ENTSO-E data; 2. Aurora Energy Research - The State of European Power Grids; 3. JRC - Future-Proofing the European Power Market: Redispatch and Congestion Management

XGE - Extreme Grid Expansion; AGE - Ambitious Grid Expansion; BAU - Business as Usual

REDUCED BESS COSTS & INCREASING INVESTMENTS

107.7 GW

Global BESS deployment in 2025¹

+39.7% YoY | IEA

\$108/kWh

Battery Pack price in 2025 (BNEF)²

Down from \$169 in 2020

750 GWh

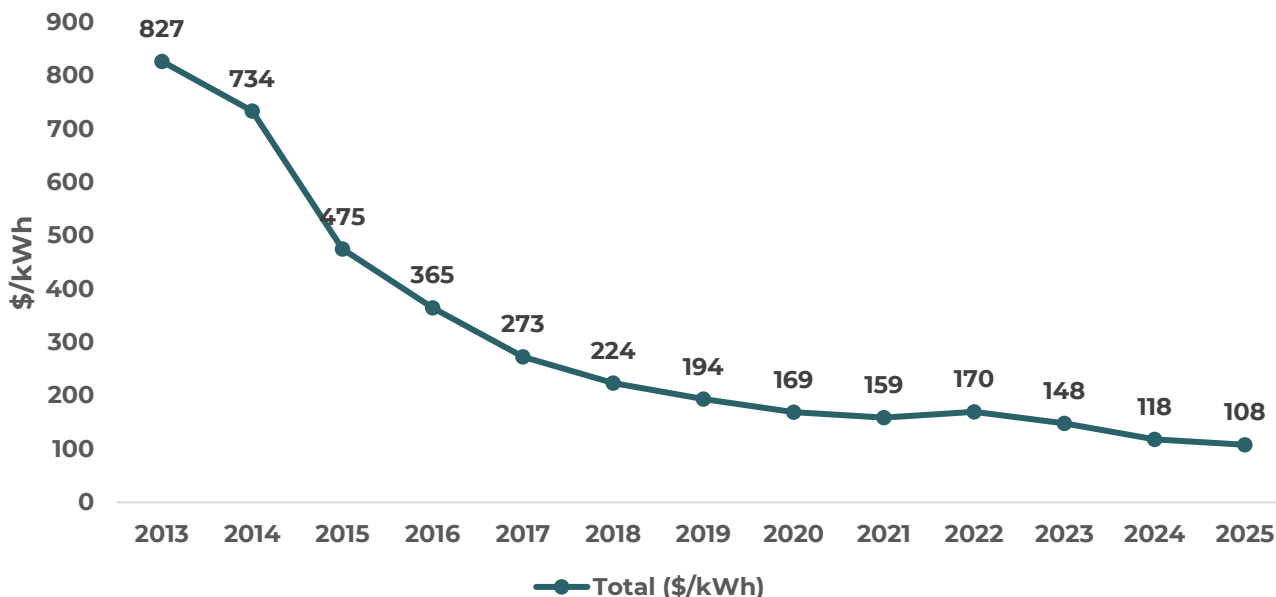
EU Storage Needed by 2030 to meet Renewable ambitions - Solar Power Europe³ vs 61 GWh today

2 TW

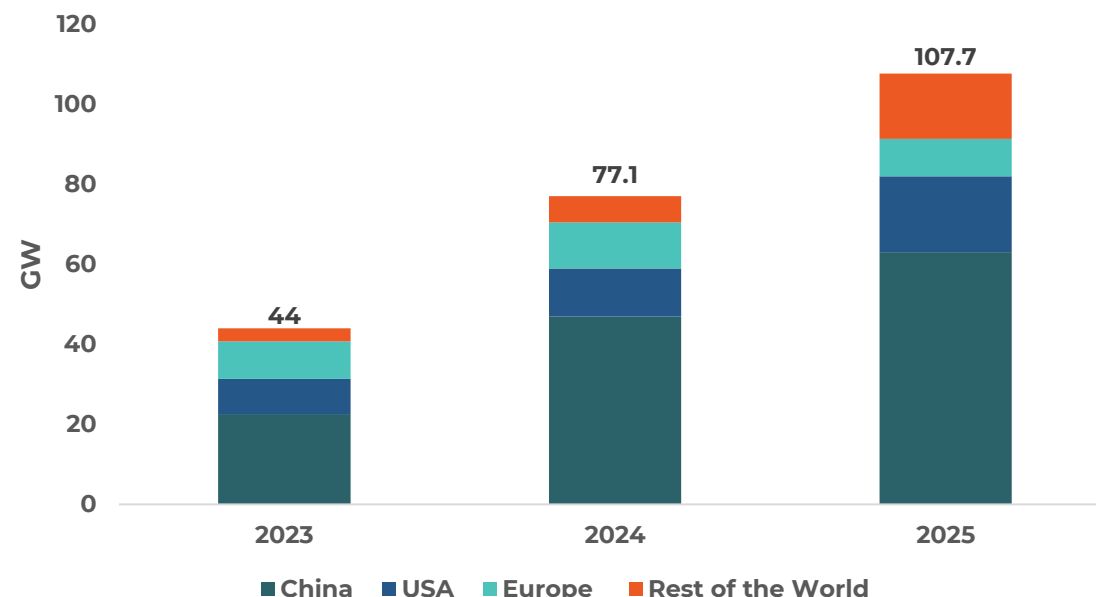
or 7.3 TWh

Global BNEF 2035 Forecast²

BNEF Lithium-Ion Battery Prices²



Battery storage capacity additions by region¹



Sources: 1. IEA - Global Energy Review 2026; 2. BNEF - Energy Storage Market Outlook; 3. SolarPower Europe - EU Battery Storage Market Review 2025

EUROPE: DIFFERENT ISSUES - DIFFERENT BUSINESS MODELS

Country	Current storage fleet ¹	Grid problem	Main revenue sources
UK	10.83 GW / 43 GWh	Adequacy gap + frequency	Capacity Market (15-yr contracts) + Balancing Mechanism dispatch + Frequency Response + Wholesale arbitrage
Germany	9.4 GW / 54 GWh	Frequency + renewables integration	aFRR/FCR ancillary + day-ahead/intraday arbitrage
Italy	9.04 GW / 65 GWh	Zonal adequacy (South/islands)	MACSE long-term contracts + merchant arbitrage
France	6.49 GW / 43 GWh	Frequency (nuclear gap)	aFRR/FCR ancillary + wholesale arbitrage (growing)
Ireland	1.27 GW / 3 GWh	Non-synchronous penetration (75% SNSP)	DS3 fixed-tariff ancillary services (expiring 2026)

NOTEWORTHY PROJECTS

Blackhillock, Scotland (Zenobē)

300 MW / 600 MWh - Europe's largest BESS

First providing grid stability services

Italy MACSE Auction (Sep 2025)

10 GWh awarded at €12,959/MWh-yr

4x oversubscribed
€1bn investment unlocked

Giga Storage, Belgium

600 MW / 2,400 MWh
largest permitted BESS in continental Europe

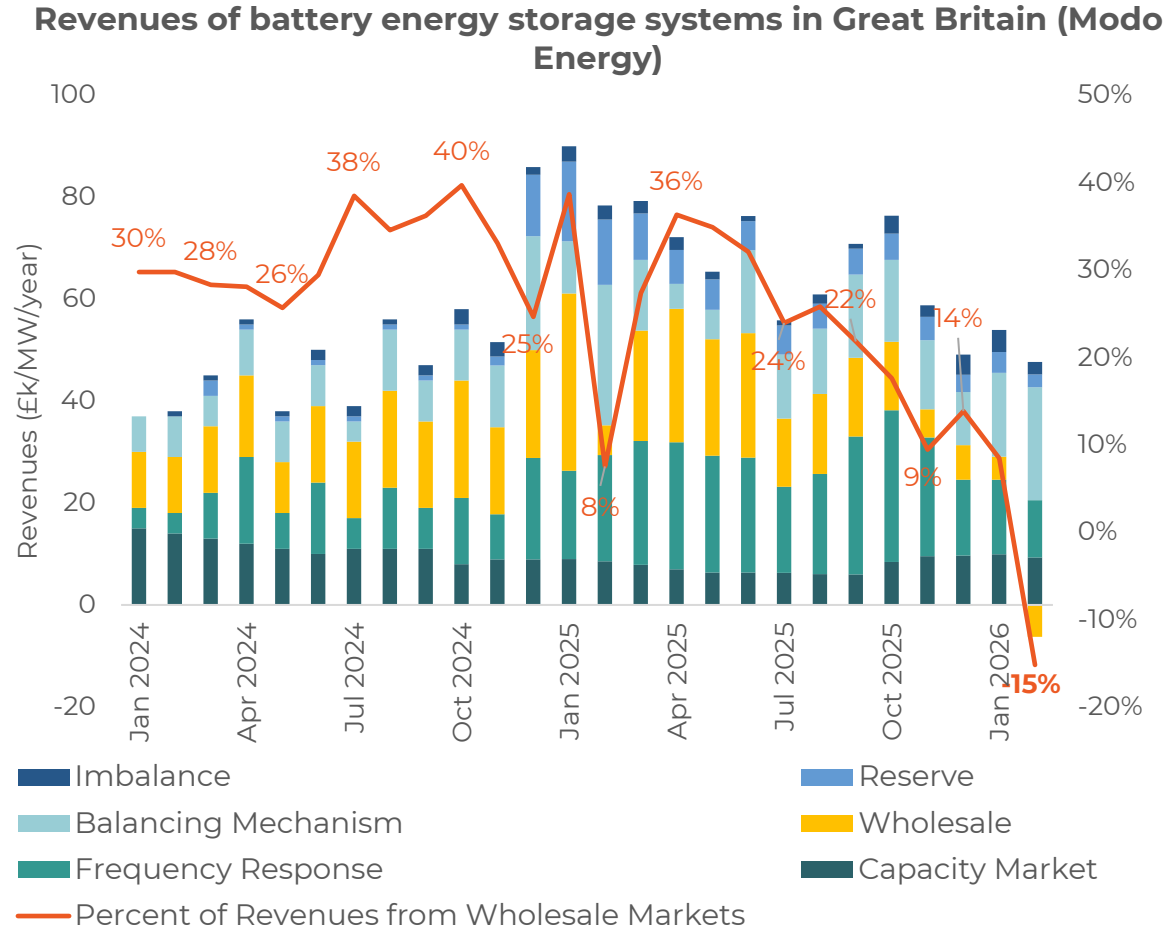
Ore Energy, Netherlands

World's first grid-connected 100-hour iron-air BESS (May 2025)

Long-duration breakthrough

Sources: 1. European Commission - European Energy Storage Inventory

PRICE SPREAD COMPRESSION IMPACTING INVESTMENT DECISIONS



- GB wholesale revenues turned negative (-£6k/MW/yr) for the first time in February 2026. Capacity Market and frequency response provided the floor.
- France's aFRR market opened June 2024; prices fell 55% within 12 months as battery supply exceeded demand.
- Germany day-ahead spreads fell 14% summer 2025 vs summer 2024; intraday spreads fell 35%
- Long-term secure revenues are needed for bankability

Sources: Modo Energy - GB battery energy storage research; Modo Energy - French BESS; Pexapark - "What Is Behind the Dip in Europe's BESS Revenues This Summer; Aurora Energy Research — "European BESS market: Revenue outlook trends and bankability"

Capacity Mechanisms

Great Britain¹ - T-4 2028/29 cleared at £60/kW-yr; 1.8 GW derated BESS secured 15-yr contracts.

Poland² - 4.4 GW contracted across three auctions since 2022; clearing price fell from PLN 406 to PLN 265/kW/yr; de-rating factor compressed from 95% to 61%.

LDES Cap & Floor

UK⁵ - 171 applications (52.6 GW); 77 projects (28.7 GW) shortlisted; 2.7-7.7 GW to be supported on 25-yr terms; 8-hr+ duration threshold. Final awards summer 2026. First dedicated LDES instrument in Europe.

Storage-Specific Auctions

Italy MACSE³ - 10 GWh awarded at €12,959/MWh-yr on 15-yr terms; €1 bn unlocked; 4x oversubscribed; 35% below market expectations. Two further rounds targeting 50 GWh by 2030.

France AOFD⁴ - 2024 ceiling €65,000/MW reached; 2025 volume cut from 4,900 to 2,400 MW, clearing price fell to €28,863/MW. 1-2 year terms only.

EU-Level Funding

Innovation Fund⁶ - €2.9 bn announced across 61 projects (Nov 2025); separate €1 bn battery manufacturing call closed April 2025.

Modernization Fund (Poland)⁷ - €1 bn supporting 5.4 GWh by 2028; grants cover up to 45% of capex.

Sources: Modo Energy – 1. GB Capacity Market 2024 T-4 Auction Results; 2. Solar Media - Energy Storage Summit Central Eastern Europe; 3. Pexapark - "With MACSE, the Italian BESS Market Looks to Stability Instead of Merchant Upside"; 4. Enerdigit - "Résultat de l'Appel d'Offres Flexibilités Décarbonées 2025"; 5. Ofgem / DESNZ - "Long Duration Electricity Storage: Technical Decision Document"; 6. European Commission - Innovation Fund IF24 Call results. 7. European Commission - State Aid approval SA.104106 / Modernisation Fund decision

POSSIBLE POLICY CONSIDERATIONS

1 Aggregation

Directive 2019/944 Art.17 requires independent aggregators to access all markets. Implementation remains uneven across Member States.

2 Co-location rules

Most grid codes still treat co-located solar+storage as separate assets, wasting connection capacity and adding cost.

3 Double-charging

Storage charged as load when charging and as producer when discharging. ACER (March 2025) calls this the single largest financial barrier - still present in >10 MS.

4 Revenue stacking

Maximum value requires combining wholesale + intraday + balancing + ancillary revenues. Many MS still restrict simultaneous participation.

5 Market access

Market access rules were designed for power plants. Minimum bid sizes, different prequalification requirements, trading restrictions, and uneven integration into pan-European markets can make market access challenging.

PANEL COMPOSITION



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Turkiye

SOME QUESTIONS FOR DISCUSSION

1. How is storage expected to impact the current price volatility in power markets?
2. What does an enabling regulatory environment for storage look like?
3. Are market price spreads alone sufficient to incentivizes investment?
4. How might the expectation of narrowing price spreads influence investment decisions?

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**THANK YOU
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