Decarbonising Profitability: The Regulatory Challenge

st INTERNATIONAL CONFERENCE ON THE EUROPEAN ENERGY MARKET

Lisbon, 27-29 May 2025 | Portugal

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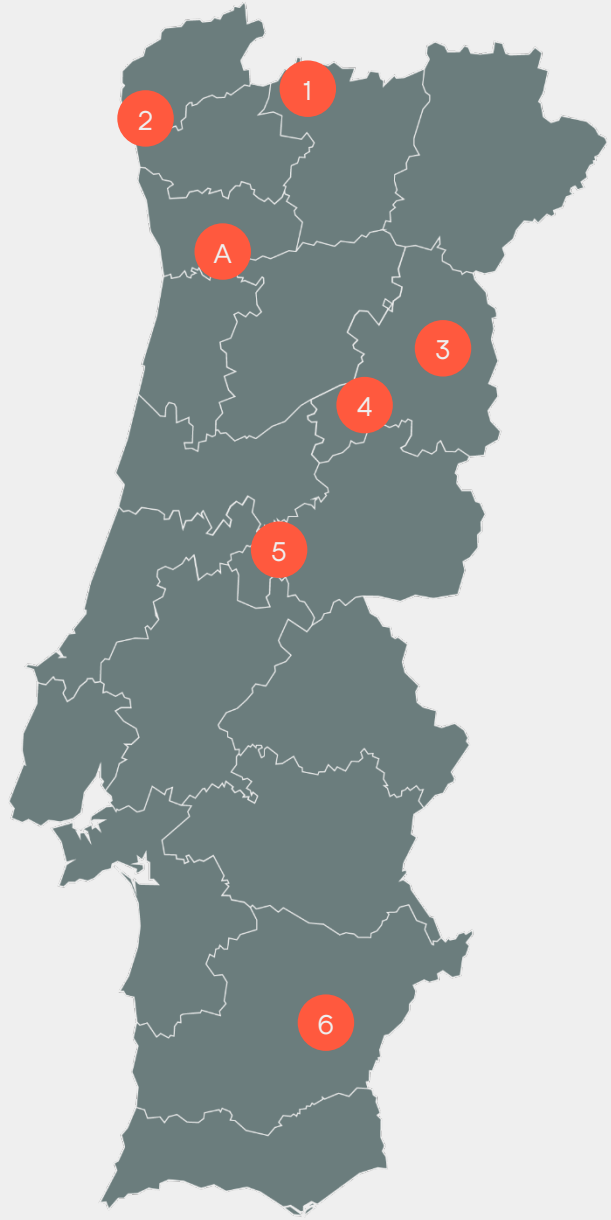
We are hybrid energy players.

EML SA Overview

Total Installed Capacity : 1,225MW

	Assets	Technology	COD	Capacity (MW)
A	Tapada do Outeiro *	CCGT	Aug-99	990.0
1	Terra Fria	Wind	Jan-10	104.0
2	Carreço-Outeiro	Wind	May-10	13.8
3	Penedo	Wind	Nov-14	25.3
4	Alvarrões	Wind	Jun-09	24.6
5	Bravo	Wind	May-09	24.0
6	Corredoura	Wind	Nov-13	43.7

* concession extended up to March 2026



Power & Infrastructure Dept.-II

Major Business and Areas

<Europe/ Central Asia/ Middle East/ Africa>

- Power Generation
- Distributed Generation
- District Cooling
- Gas, Transportation, Water Infrastructure
- Circular Economy

Power Generation/ De-centralized Power Generation/ District Cooling

UK /
Floating Offshore Wind Power Project in Scotland

Portugal /
EML Onshore Wind Power Project

UAE /
Sweihan Photovoltaic IPP Project

Qatar /
Mesaieed IPP Project

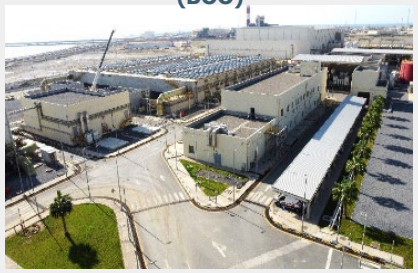
Gas, Transportation, Water Infrastructure

Portugal and Brazil /
AGS Water & Wastewater Service (Concession)

Portugal /
Gas Distribution（Floene）

Denmark /
AquaGreen
Manufacturing and Sales of Sewage Sludge Carbonization Facilities

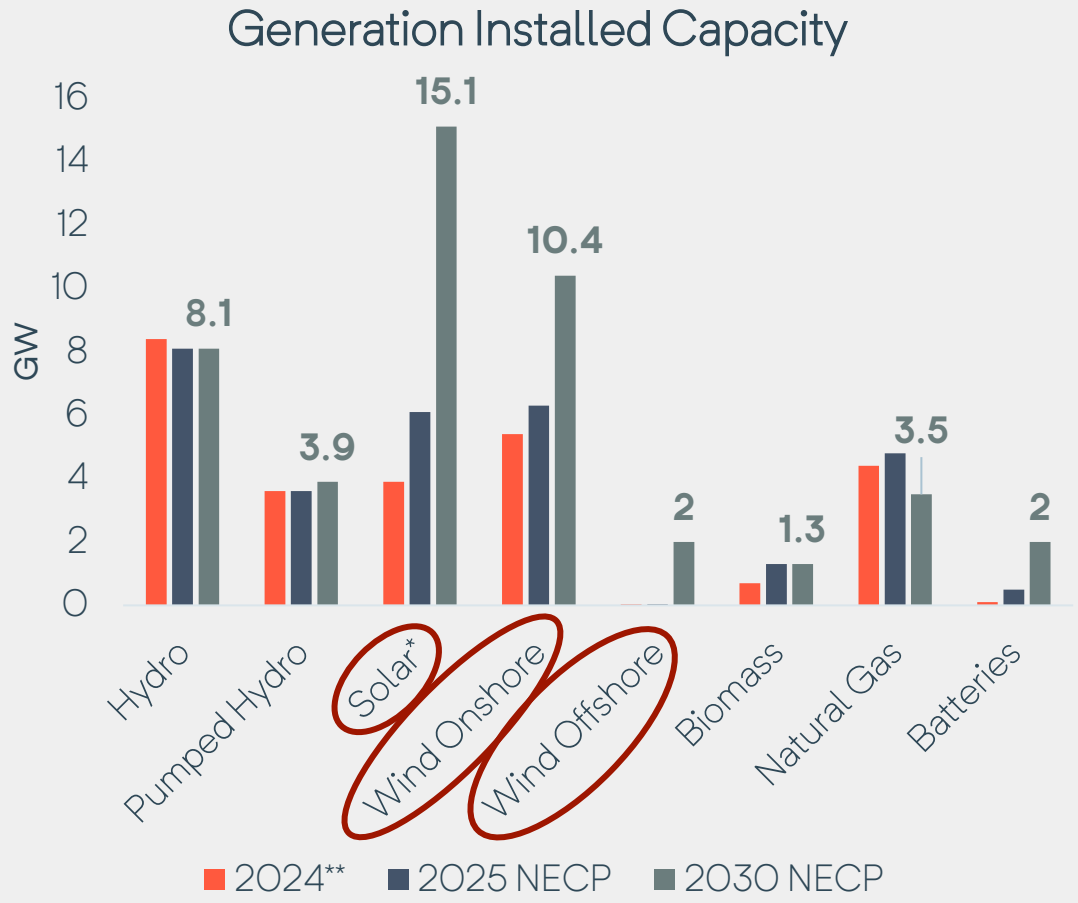
Saudi Arabia /
Shuqaiq3 Desalination (BOO)



< Project Companies & Projects >

- Marubeni Europower (UK)
- Marubeni Middle-East & Africa Power (UAE)
- Ossian (UK)
- EML S.A. (Portugal)
- Sweihan (UAE)
- Al Kharsaa (Qatar)
- Mesaieed (Qatar)
- Sur (Oman)
- AGS (Portugal)
- Aqua Green (Denmark)
- Floene (Portugal)
- Shuqaiq 3 (Saudi Arabia)

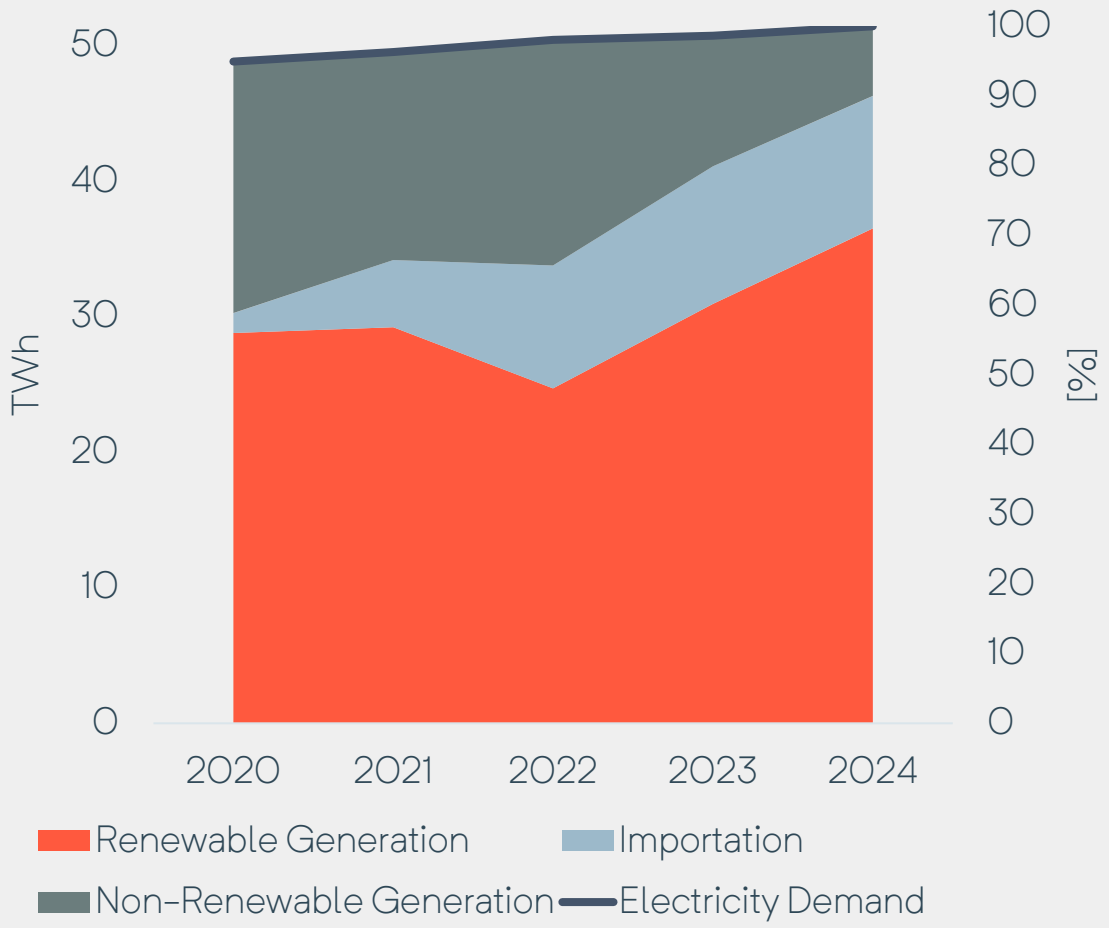
Portuguese National Energy and Climate Plan 2030 – NECP 2030



- Decarbonization and electrification
- Centralised to decentralized
- Delays on solar and wind:
  - Licencing
  - Regulatory framework
  - Market returns

*Centralized solar
** Data Source: REN

Portuguese Electricity Demand



Source: REN

90 TWh

Electricity Demand in 2030, NECP Projections

93%

NECP Goal for electricity generation trough renewable energy sources in 2030

1.3%

Average annual growth rate over the past five years

9.8%

Required average annual growth rate over the next five years to meet NECP projections

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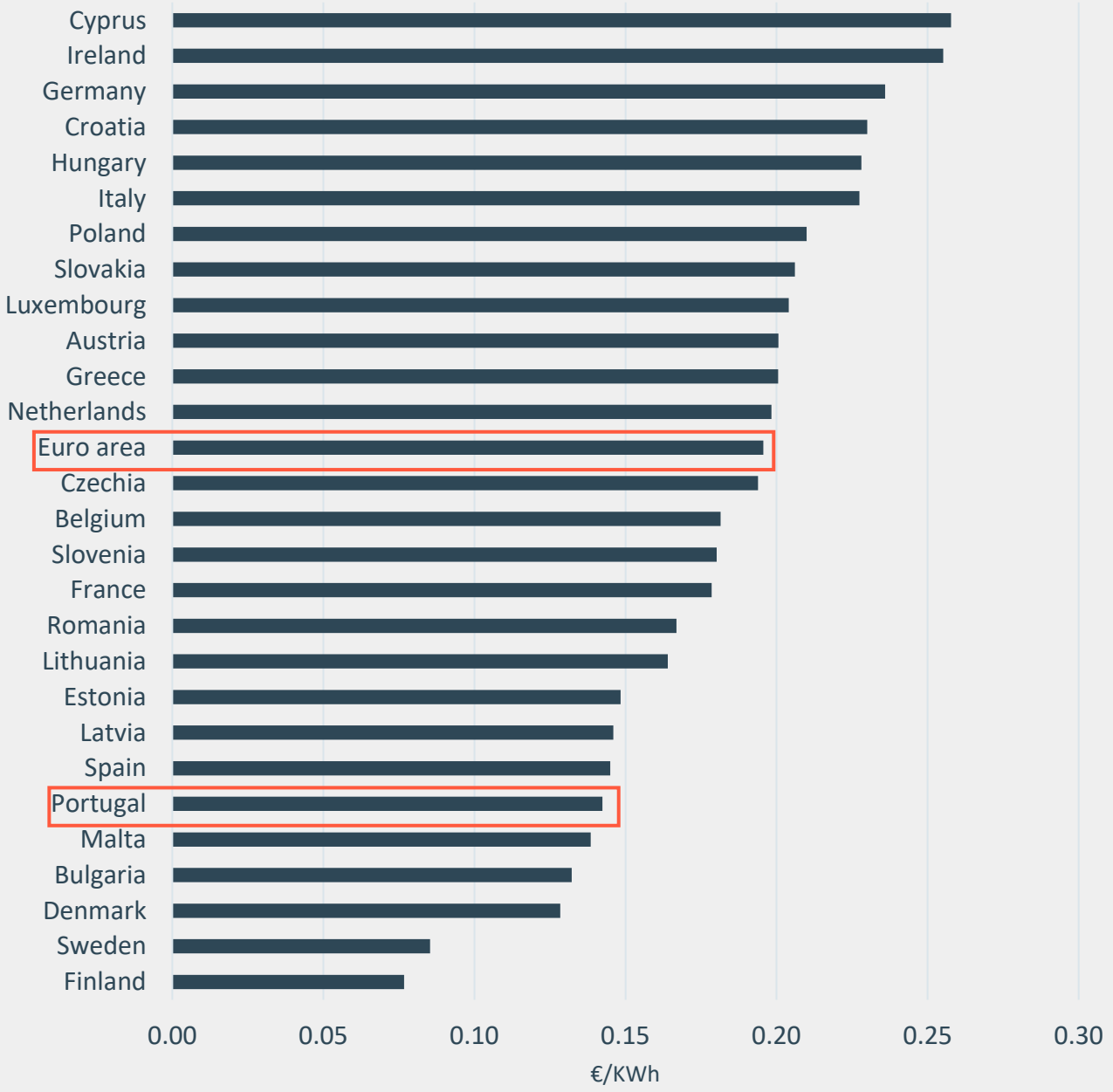
Portuguese Electricity Demand

In the second half of 2024, **Portugal** ranked as the **sixth European country with the lowest electricity prices** for non-household consumers*

*without VAT

Portugal holds significant potential to attract electro-intensive industries, which could substantially increase our national electricity demand



Source: Eurostat

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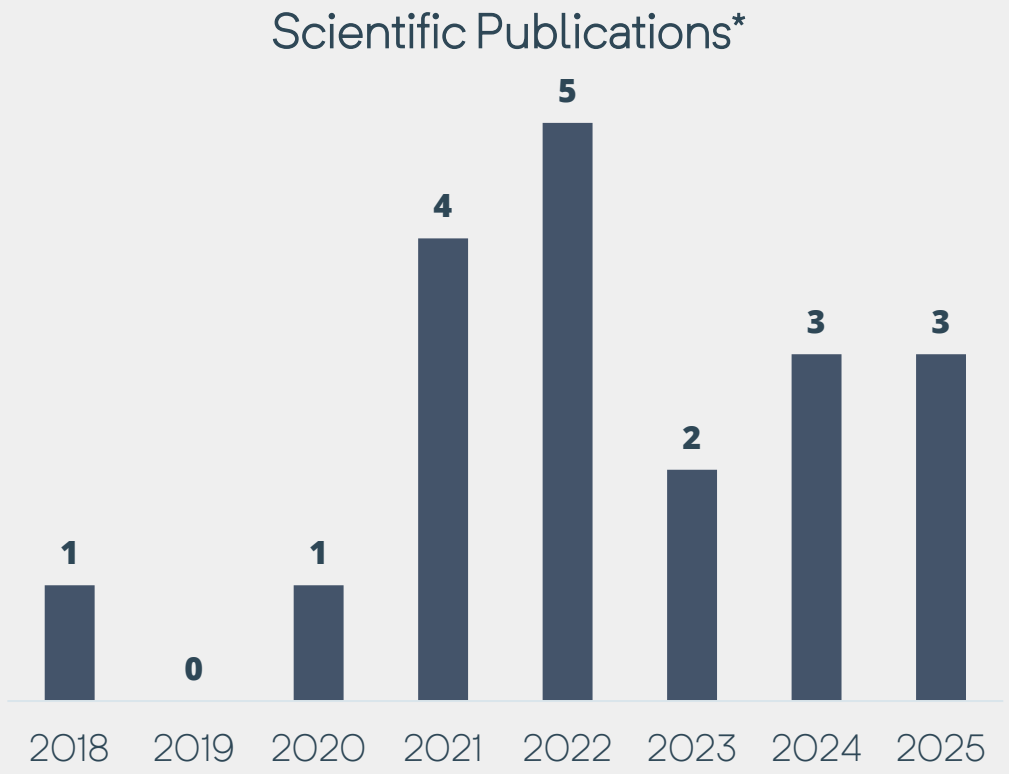
Merit-order effect
Market Price Cannibalisation

- displacement of higher marginal costs technologies
- increasing installed capacity of renewable generation will begin to "cannibalize" its own revenues



Source: ScienceDirect

*Search Keywords: Renewables AND Cannibalisation

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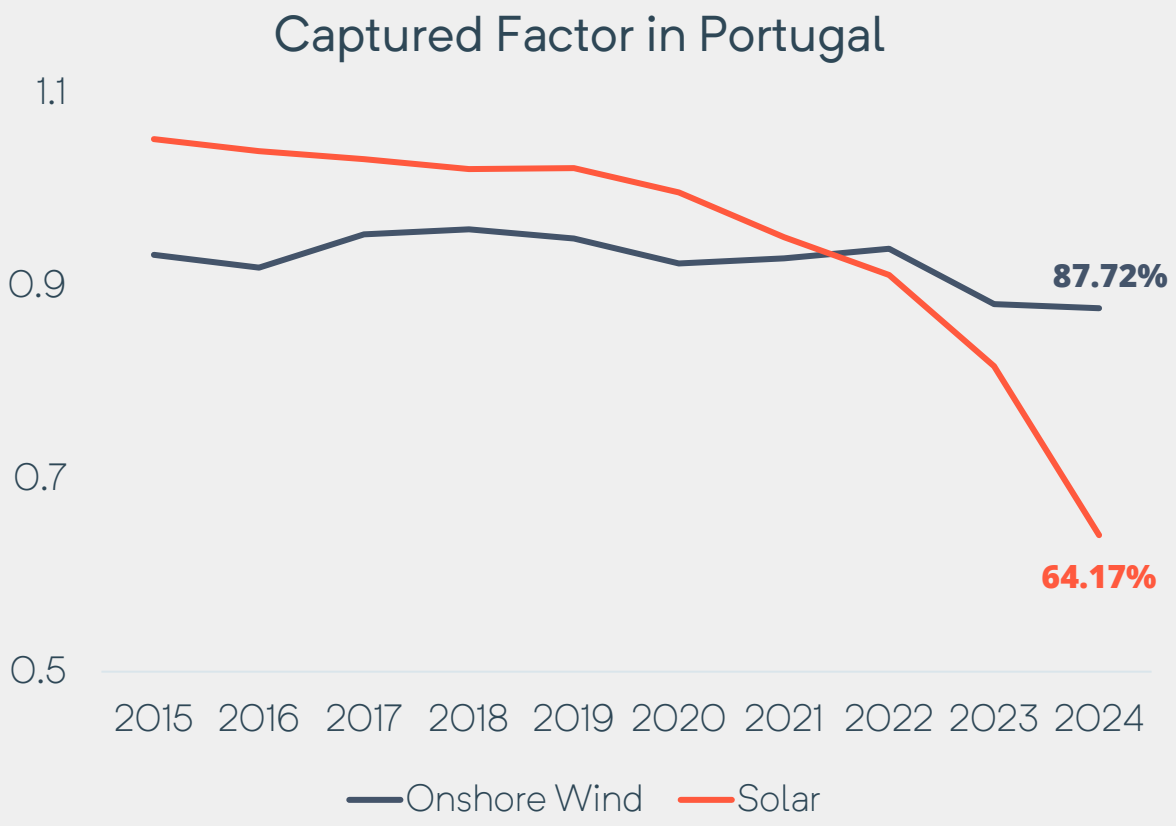
Market Price Cannibalisation



2023

Renewable Generation — 61%

Average Market Price — 88.27 €/MWh

Wind Captured Price — 77.8 €/MWh

Solar Captured Price — 63.6 €/MWh

2024

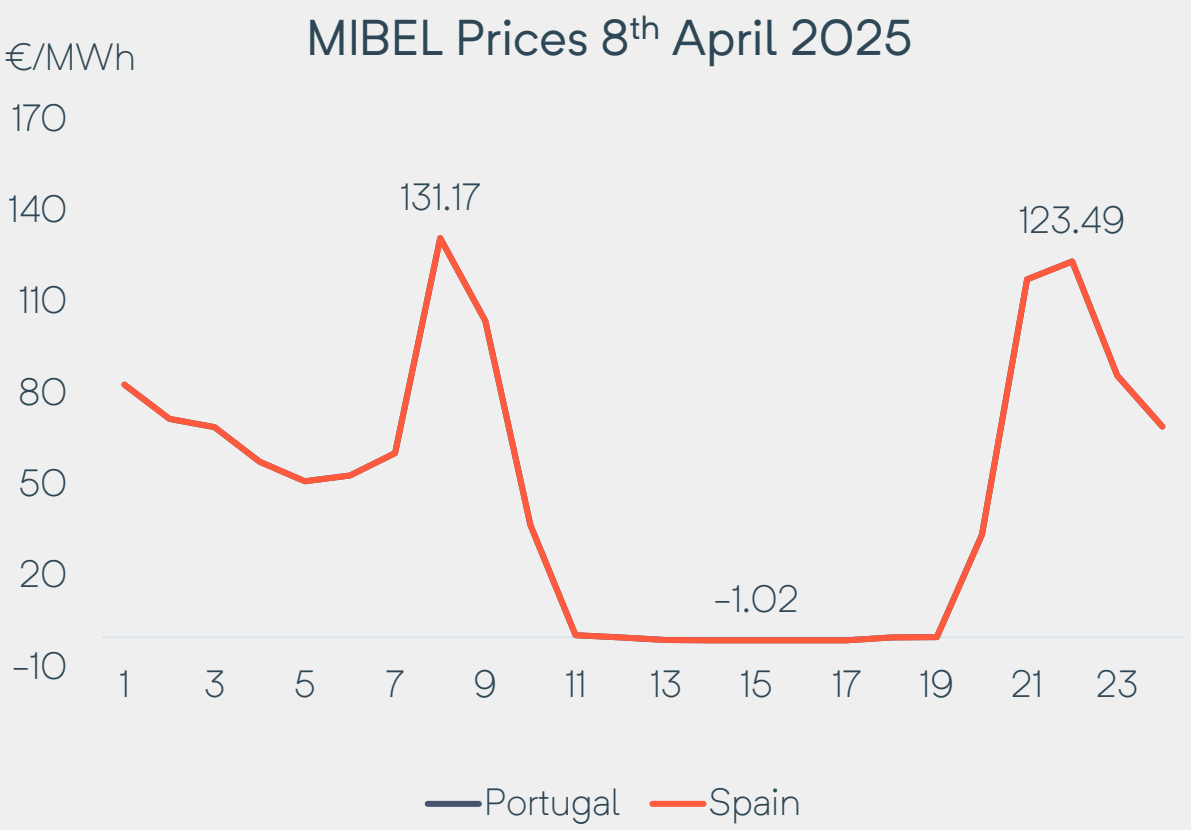
Renewable Generation — 71%

Average Market Price — 63.5 €/MWh

Wind Captured Price — 55.7 €/MWh

Solar Captured Price — 35.7 €/MWh

Market Price Cannibalisation



Source: OMIE

	Hours with Prices equal to Zero	Hours with Negative Prices
2023	70	0
2024	527	196
2025*	92	125

Comparing the first four months of 2024 with the same period in 2025 reveals a **20% increase** in the number of hours with negative prices.

In the first four months of 2025, negative prices reached record levels:

- -5 €/MWh in Portugal
- -6.01 €/MWh in Spain

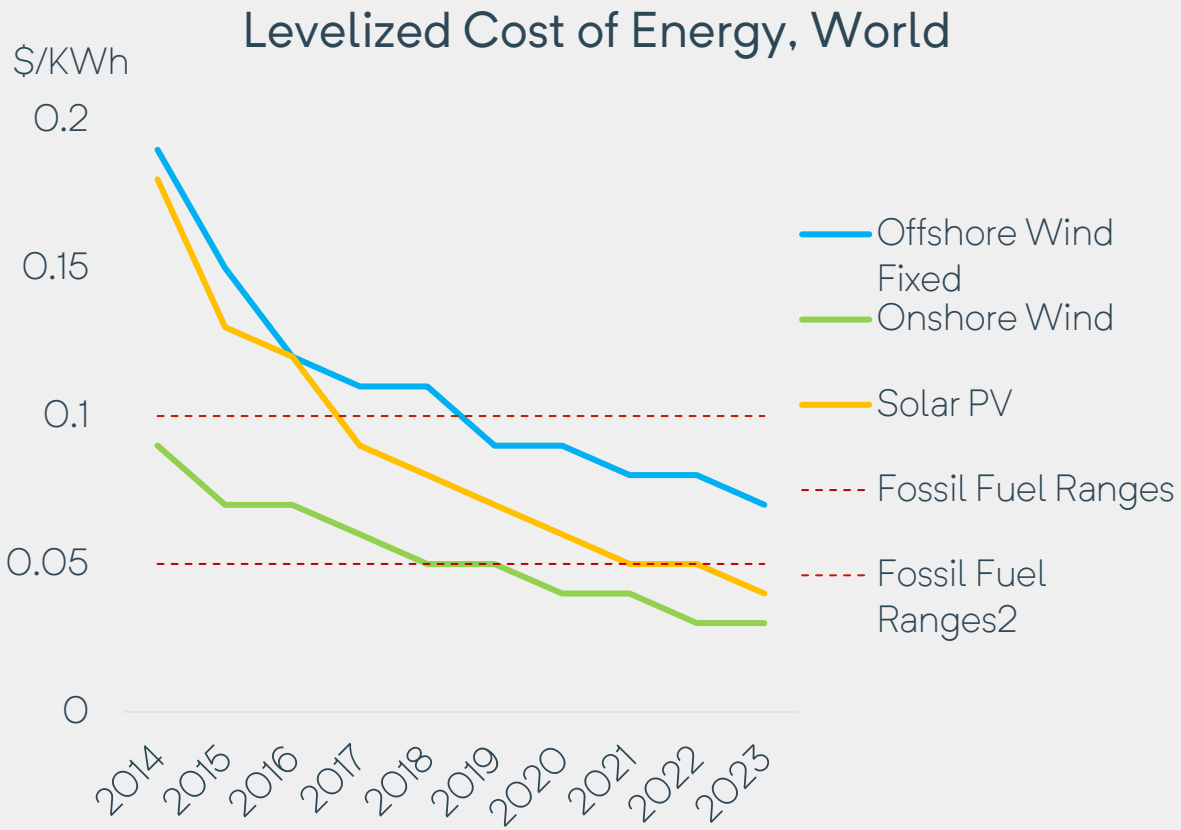
*Until April

Market Price Cannibalisation

What strategies can mitigate it?

- Reinforce Iberian Interconnections
- Increase Electricity Demand and Flexibility
- Incentives to bridge the maturity gap of Storage Technologies
- Develop and complement Ancillary Services markets — including Capacity Market
- Ensure a Stable Regulatory Framework
- Provide mechanisms to promote long-term electricity contracts

Long-term Financial Mechanisms

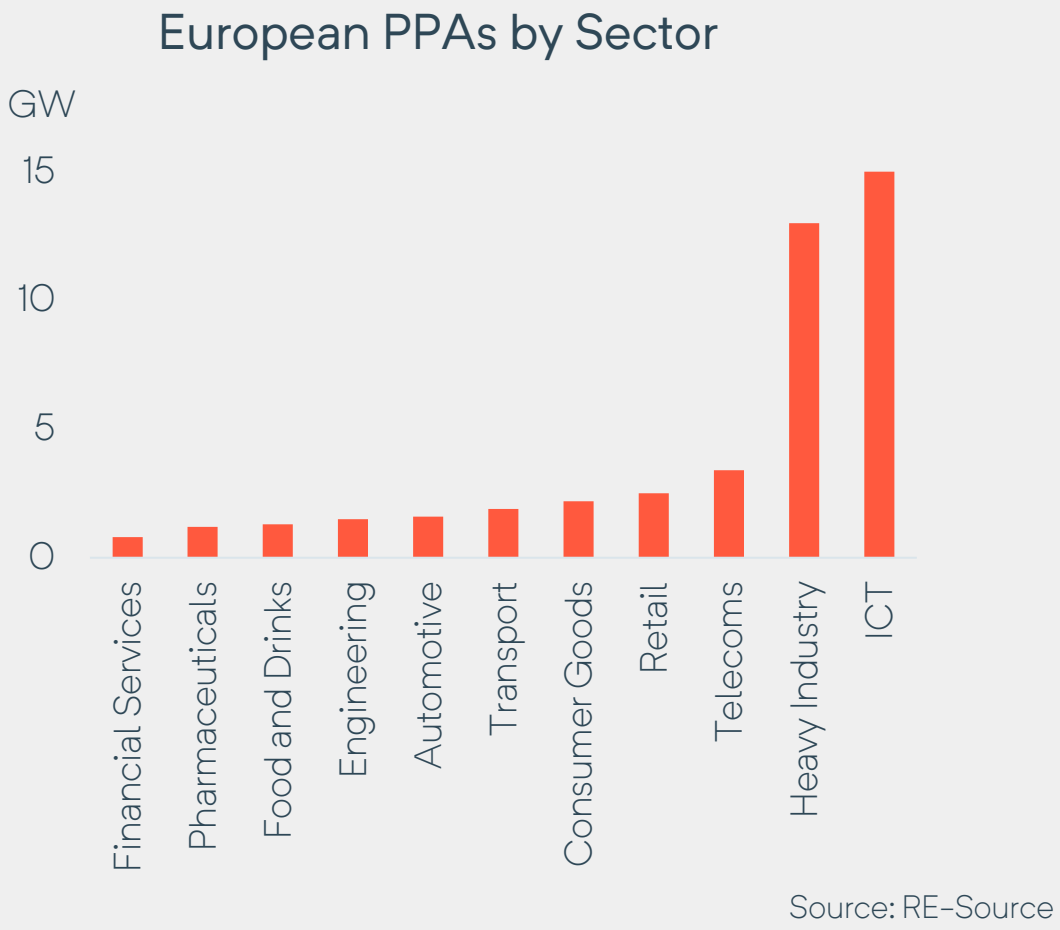


Source: Our World in Data

CAPEX-intensive projects need long-term stability of revenues :

- Non-mature technologies – public auctions with guaranteed revenue – FiT or CfD
- Competitive technologies – PPAs

Long-term Financial Mechanisms



Source: RE-Source

- Corporate demand for renewable energy is primarily seen in the Heavy Industry and Information and Communications Technology (ICT) sectors.
- Corporate PPAs can align the interests of energy developers and corporations

Key Initiatives

- Clean Industrial Deal – EIB Guarantee Scheme
- Manual of Procedures for the Activity of Registration and Bilateral Contracting of Electricity**

**Under Public Consultation by ERSE

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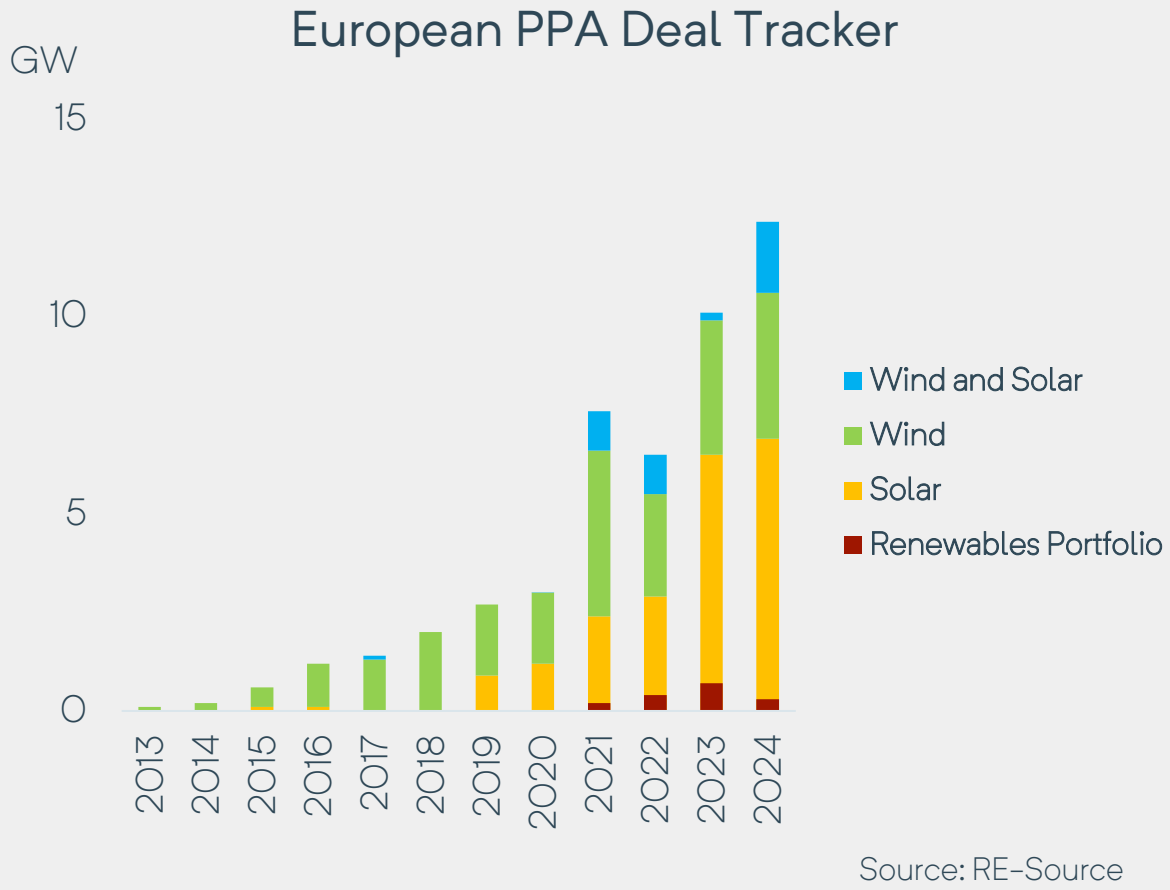
Long-term Financial Mechanisms – PPAs



Source: RE-Source

- Power Purchase Agreements (PPAs) have become a key driver of the energy transition in liberalized electricity markets.
- Over the past decade, PPAs have enabled the installation of **49.6 GW of renewable electricity** capacity across Europe.
- It ensures the bankability of energy developers' projects and provides price certainty for energy offtakers.

Projects Hybridization + BESS

Advantages:

- Maximizes the use of limited grid injection points
- Enhances the financial performance of renewable energy projects
- Improves grid stability and operational flexibility
- Supports a more reliable and cleaner energy transition

Projects Hybridization + BESS

$$\textbf{Load Factor} = \frac{Total\ Annual\ Injected\ Generation\ (MWh)}{Grid\ Injection\ Capacity\ (MW) * 8760(hours)}$$

Load Factor	2022
Combined Cycle Gas Turbine	46%*
Onshore Wind Project	23%*

*Derived from real data within EML SA's technology portfolio.

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Projects Hybridization + BESS

Case Study – 2024

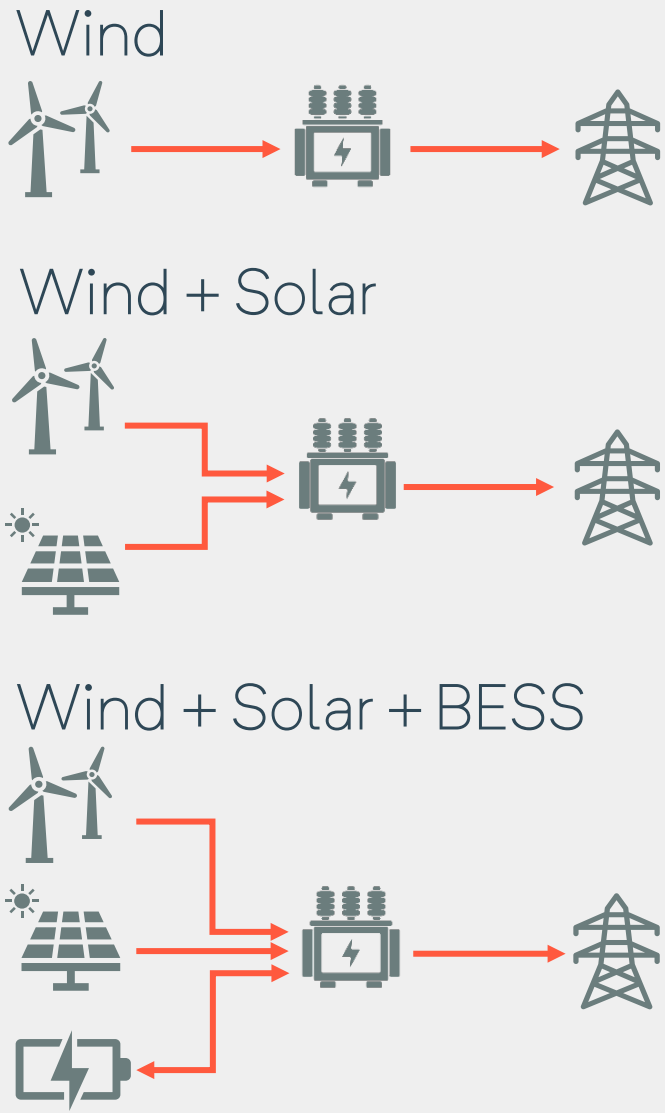
How does combining wind with other technologies optimize the use of a grid injection point?

Technologies	Load Factor
Wind*	25%
Wind + Solar**	52%
Wind + Solar + BESS***	53%

*Wind generation real data from 2024.

**Solar generation based on simulation data.

***Battery charging from the grid was not taken into account in this study.



Projects Hybridization + BESS

Case Study — 8th April 2025

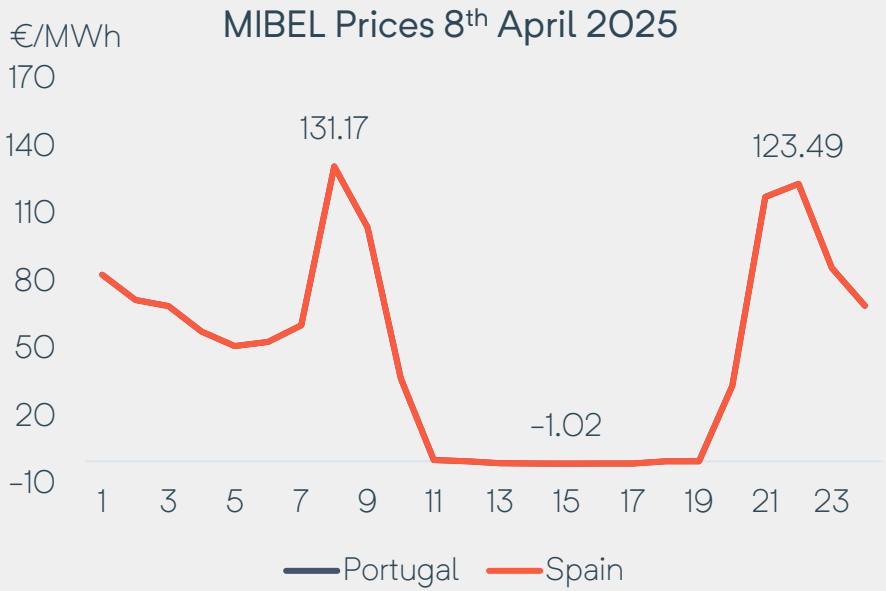
How does combining wind with other technologies improve financial performance of the project?

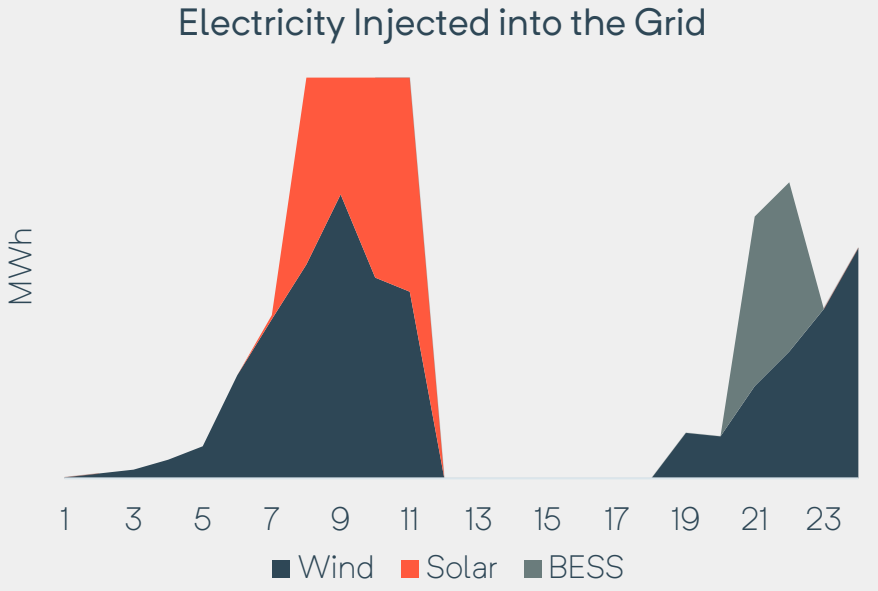
Technologies	Load Factor	Revenue Increase
Wind*	22%	-
Wind + Solar**	30%	+ 31%
Wind + Solar + BESS***	34%	+ 60%

*Wind generation real data from 8th April 2025 .

**Solar generation based on simulation data.

***Battery charging from the grid was not taken into account in this study.





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Projects Hybridization + BESS

Case Study — 8th April 2025

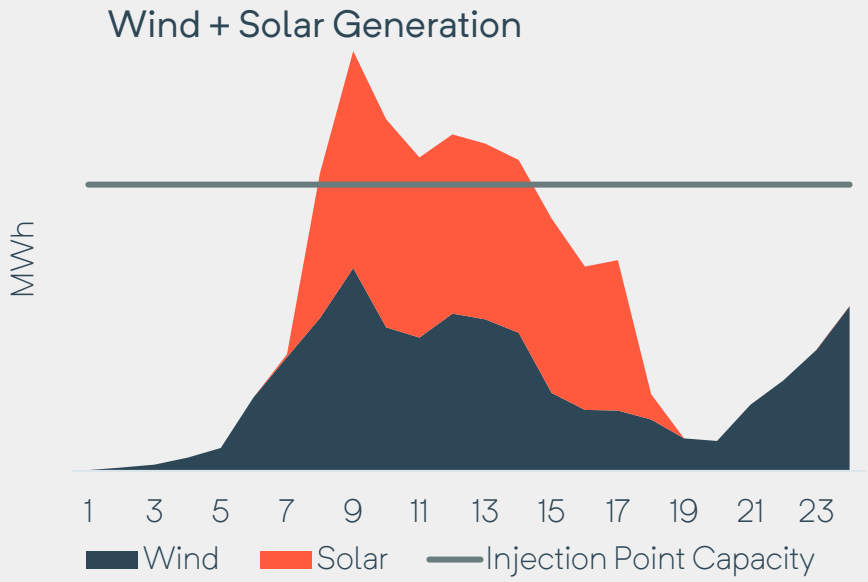
How does combining wind with other technologies impact the energy curtailment?

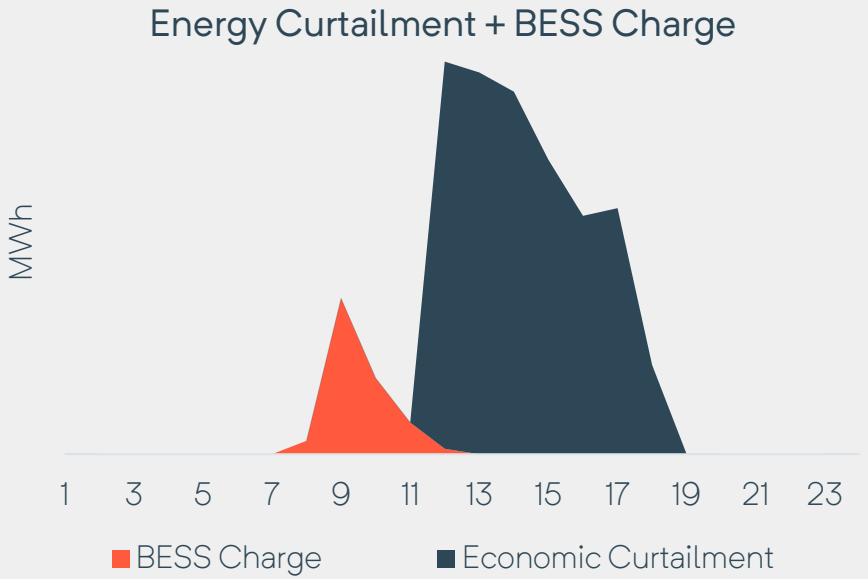
Technologies	Technical Curtailment	Economic Curtailment
Wind*	0%	34%
Wind + Solar**	8%	45%
Wind + Solar + BESS***	0%	44%

*Wind generation real data from 8th April 2025 .

**Solar generation based on simulation data.

***Battery charging from the grid was not taken into account in this study.





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Final Remarks

The success of the energy transition must rest on three fundamental pillars

- Well-aligned market incentives
- Coherent and stable regulation
- Investor confidence

Thank you!

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