# BATTERY ENERGY STORAGE AND ITS ROUTES TO MARKET

April 24th, 2026

ERG
EVOLVING ENERGIES

# AGENDA

- Company Overview
- BESS rationale
- Routes to market
- Development activities and hybrid projects

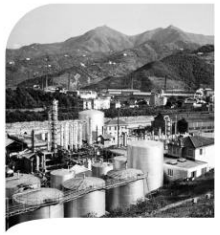
# COMPANY OVERVIEW

# A LONG HISTORY…

## 1938


**Foundation of ERG** in Genoa, by Edoardo Garrone

## 1947



Production begins at the **San Quirico Refinery** in Genoa

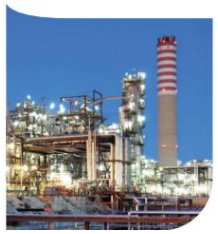
## 1975

Production begins at the **ISAB Refinery** in Priolo

## 1997


**ERG listed** on the Stock Exchange

## 2000



**ISAB Energy:** production and marketing of electricity begins from the gasification of heavy refinery residues

## 2006

**Entry into Renewables:** acquisition of **EnerTAD**

## 2008

**Sale** to LUKOIL of 49% **of the ISAB Refinery**

## 2010

Start-up of **ERG Power's** combined cycle power plant (480MW), and of **TotalERG**

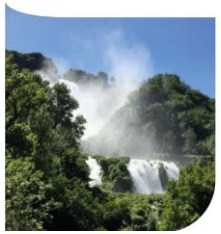
## 2013

**ERG leading wind operator in Italy** (1,087MW) and among the top 10 in Europe (1,340MW). Acquisition of a company for **O&M activities** of wind farms. Definitive **exit from refining**

## 2014

**Sale** of the **ISAB Energy** plant and of **ERG Oil Sicilia** fuel network

## 2015



**Entry into the hydroelectric business:** purchase of the Terni Complex (527MW).
**Wind:** growth in France and Poland (+146MW)

## 2018

**Entry into the solar power sector**: 30 photovoltaic plants acquired in Italy (89MW, in operation). Definitive **exit from the Oil sector** with the **sale** of **TotalERG**

## 2019

**Solar:** capacity increases to 141MW after the purchase of 51MW in Italy.
**Wind**: further growth in France and Germany (+86MW)

## 2021

**Solar:** entry in France (79MW).
**Wind:** entry in Sweden, and start of operations in the United Kingdom

## 2022

**Sale** of the **hydroelectric business.**
**Solar:** entry in Spain (92MW).
**Wind:** 172MW acquired in Italy, and ~230MW started up in Europe.
**IFM NZFI** indirect shareholder (with **35%** in **SQ Renewables SpA),** alongside the Garrone-Mondini Family

## 2023

**ERG:** a **pure renewable player** after the **sale** of the **thermoelectric business.**
**Wind: s**tart-up of the first 2 wind farms subject to **repowering.**
**Solar**: further growth in Spain (+149MW)

## 2024

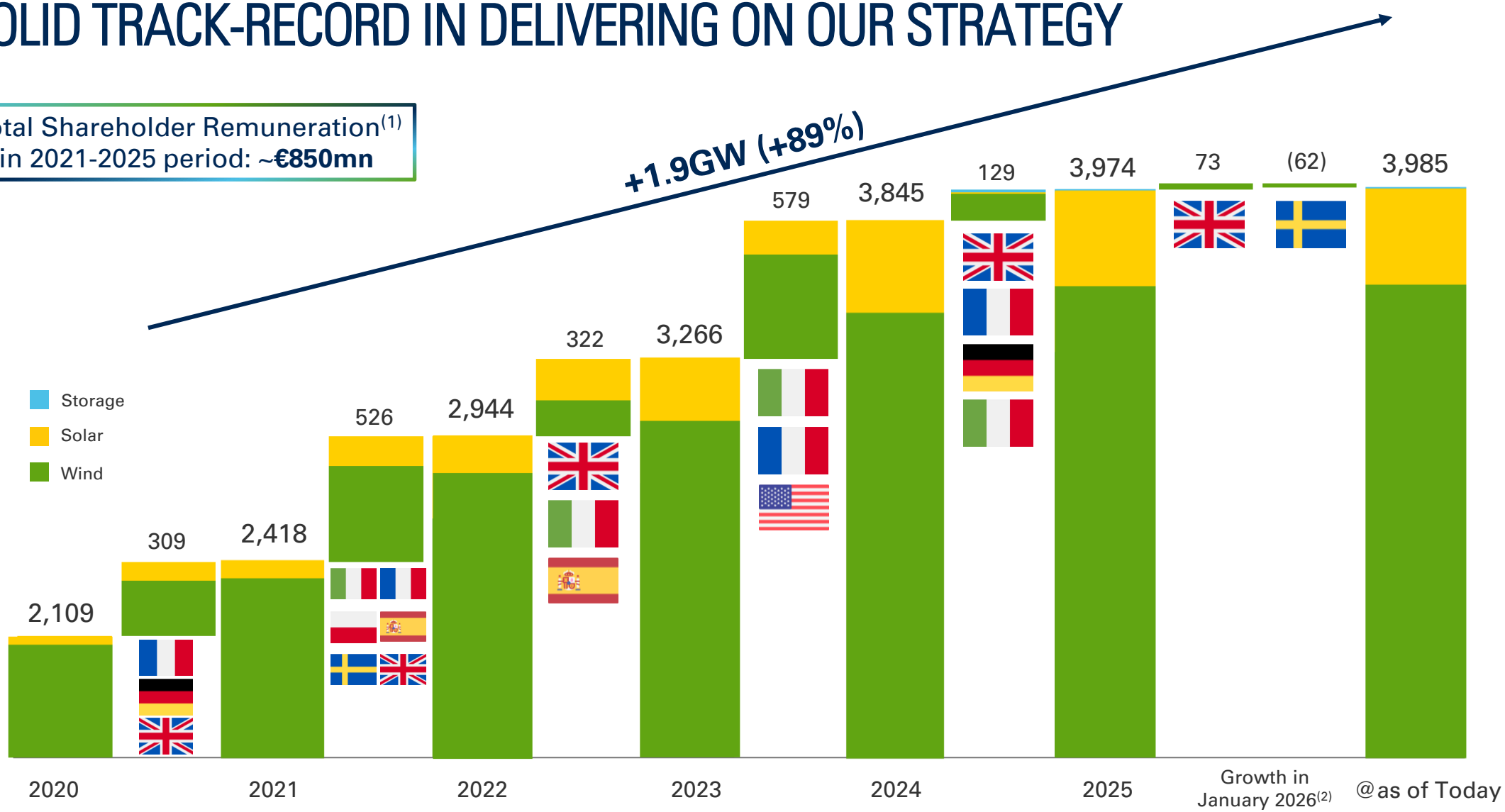
**Entry into the US:** partnership with Apex (317MW wind and solar). Growth in France (+114MW wind and solar), and start-up of 2 wind farms subject to **repowering**.
**IFM NZFI** increases to **49%** its stake in **SQ Renewables SpA**

## 2025

**Wind: new** installed **capacity** in Europe (**112MW**, of which 43MW acquired, and 65MW started up).
**PPAs** signed with **top offtakers in Europe**, totalling **~800GWh/y.**
**Entry into the BESS sector**: 1st electrochemical storage facility commissioned in Sicily (**Vicari**, 12.5MW)

# SOLID TRACK-RECORD IN DELIVERING ON OUR STRATEGY

Total Shareholder Remuneration[1] in 2021-2025 period: ~**€850mn**

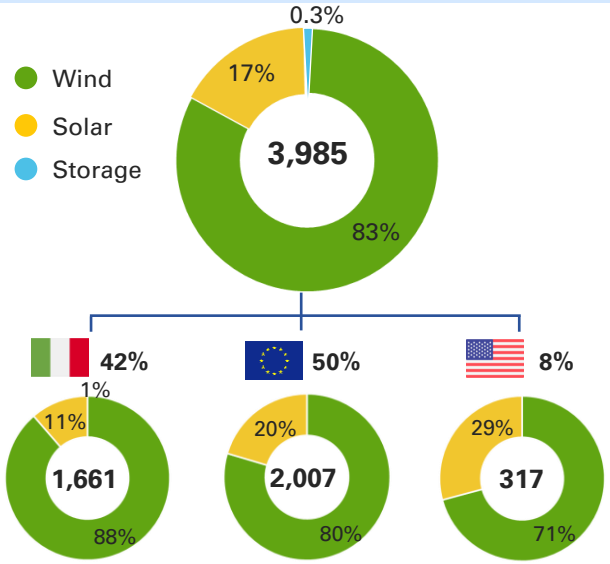



## Keep delivering on our growth strategy with a mix of internal projects and M&A

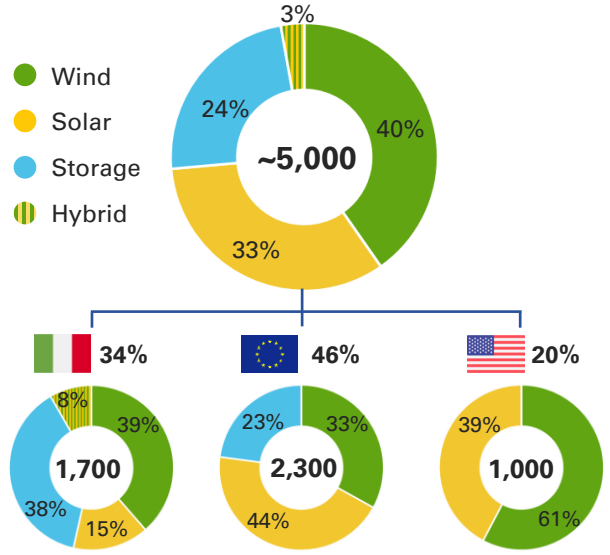
(1) It includes dividends paid in the 2021-2025 period + Buyback for €120mn
(2) It refers respectively to the acquisition of 7 wind farms in England (72.6MW), and the disposal of Furuby windfarm in Sweden, both of them with closing on January 20, 2026

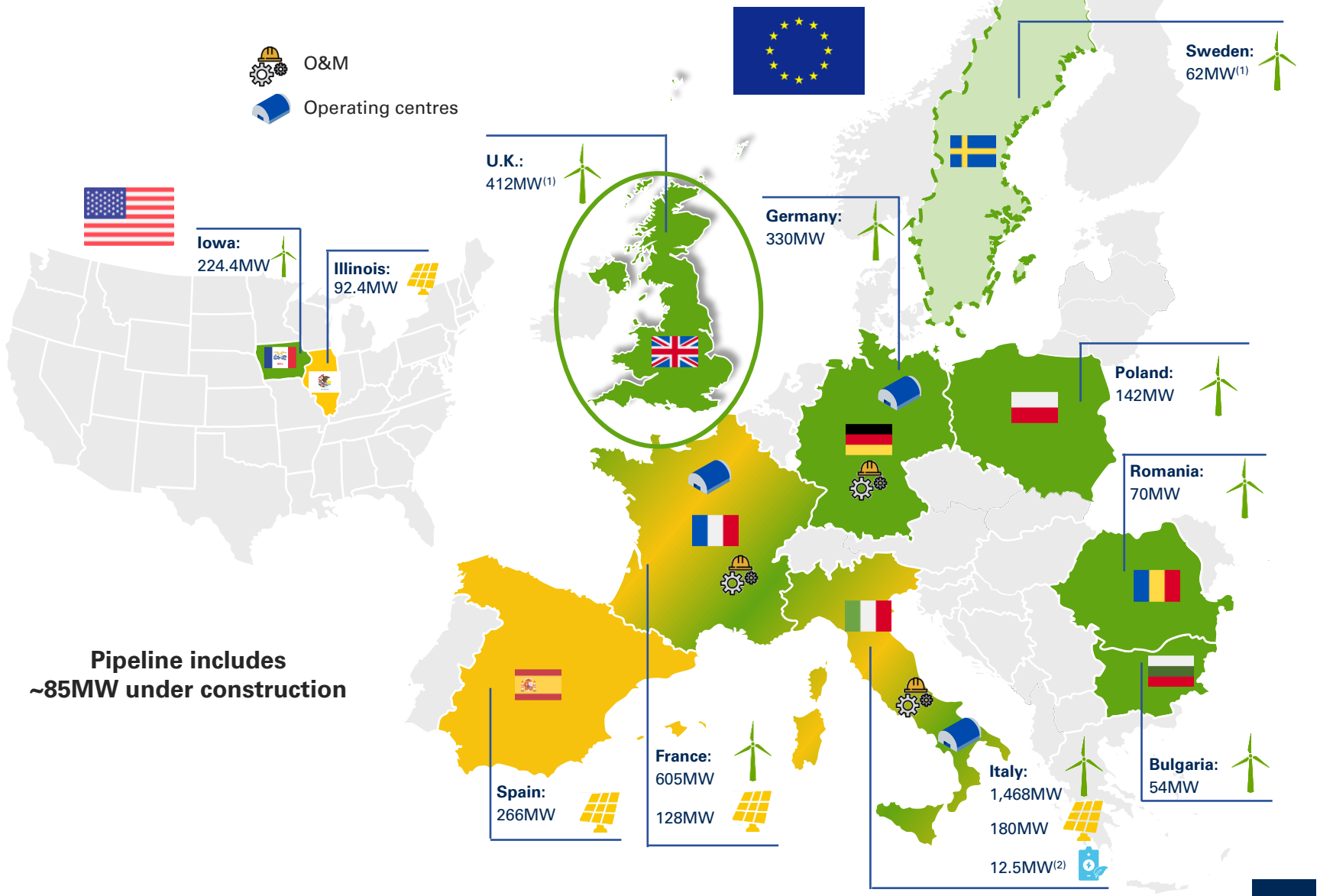
# ERG AS OF TODAY: A SOLID AND INTERNATIONAL PLATFORM

## Installed Capacity (MW)




## Pipeline (MW)




**Pipeline includes ~85MW under construction**

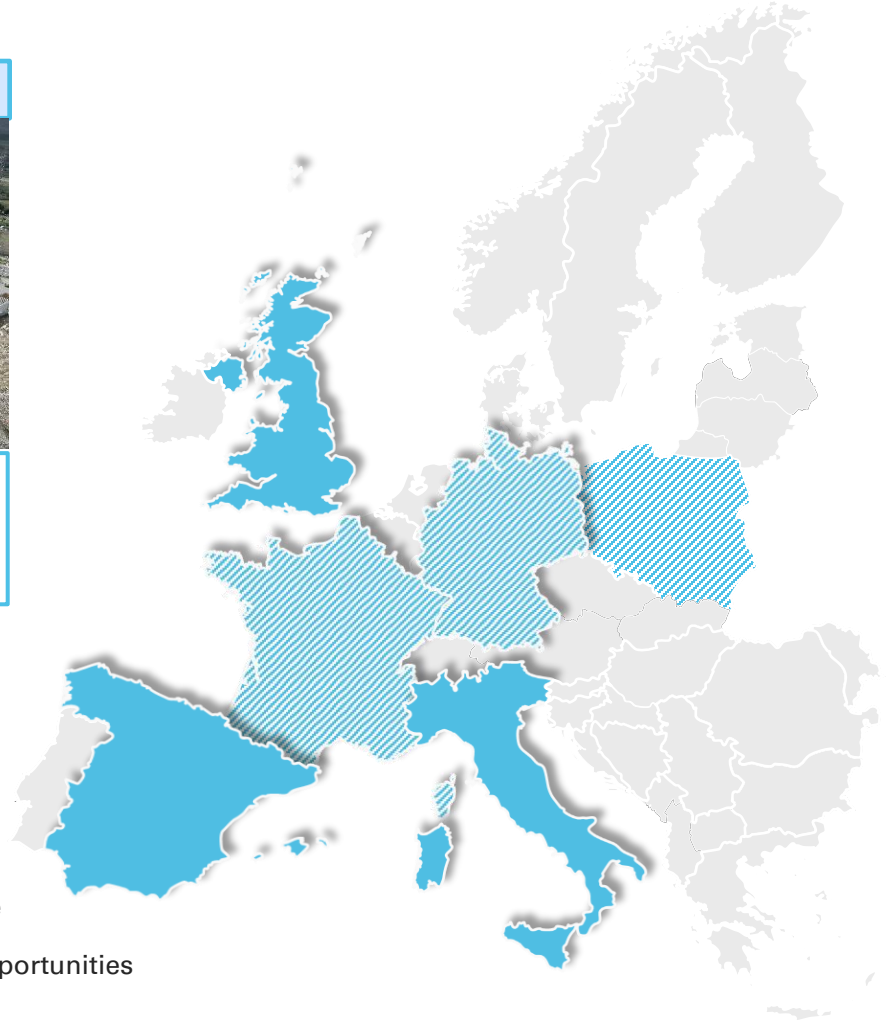
(1) It includes 73MW in England acquired on January 20, 2026 and it excludes 62MW in Sweden sold as of January 20, 2026
(2) It refers to Vicari BESS (12.5MW), entered into operation on November 5, 2025

# BESS - BATTERY ENERGY STORAGE SYSTEM

**Vicari**

Capacity: 12.5MW

COD: 4Q 2025

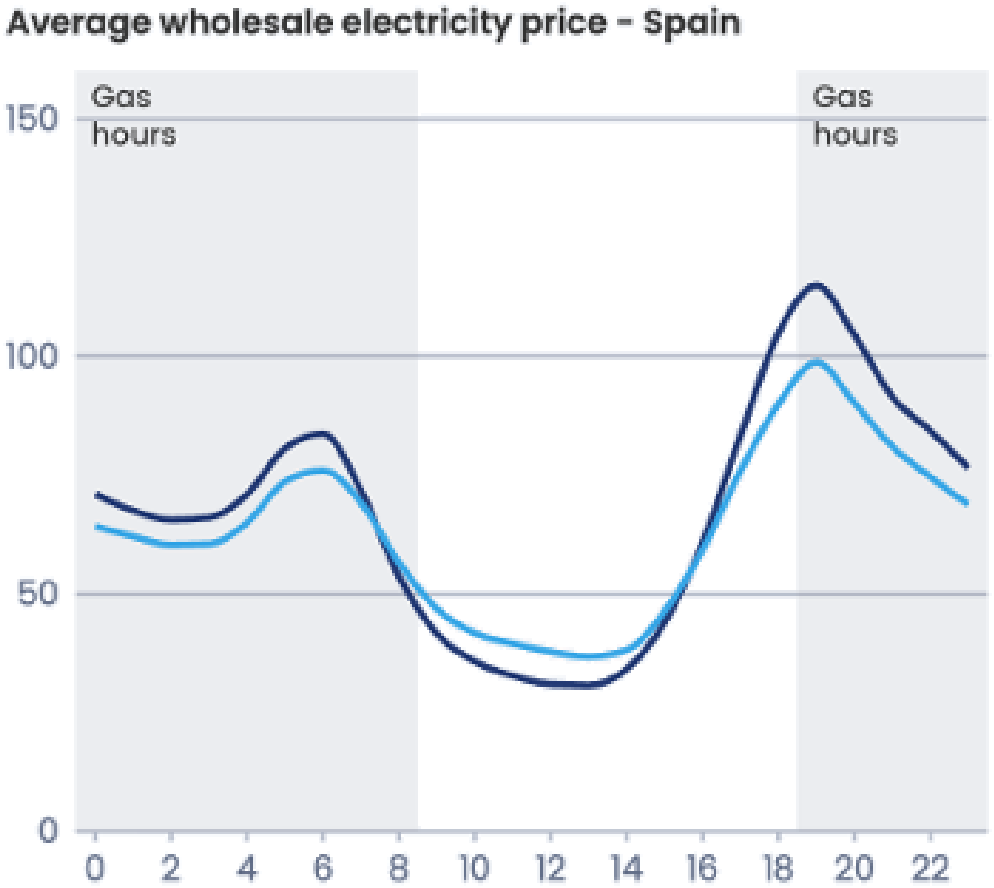


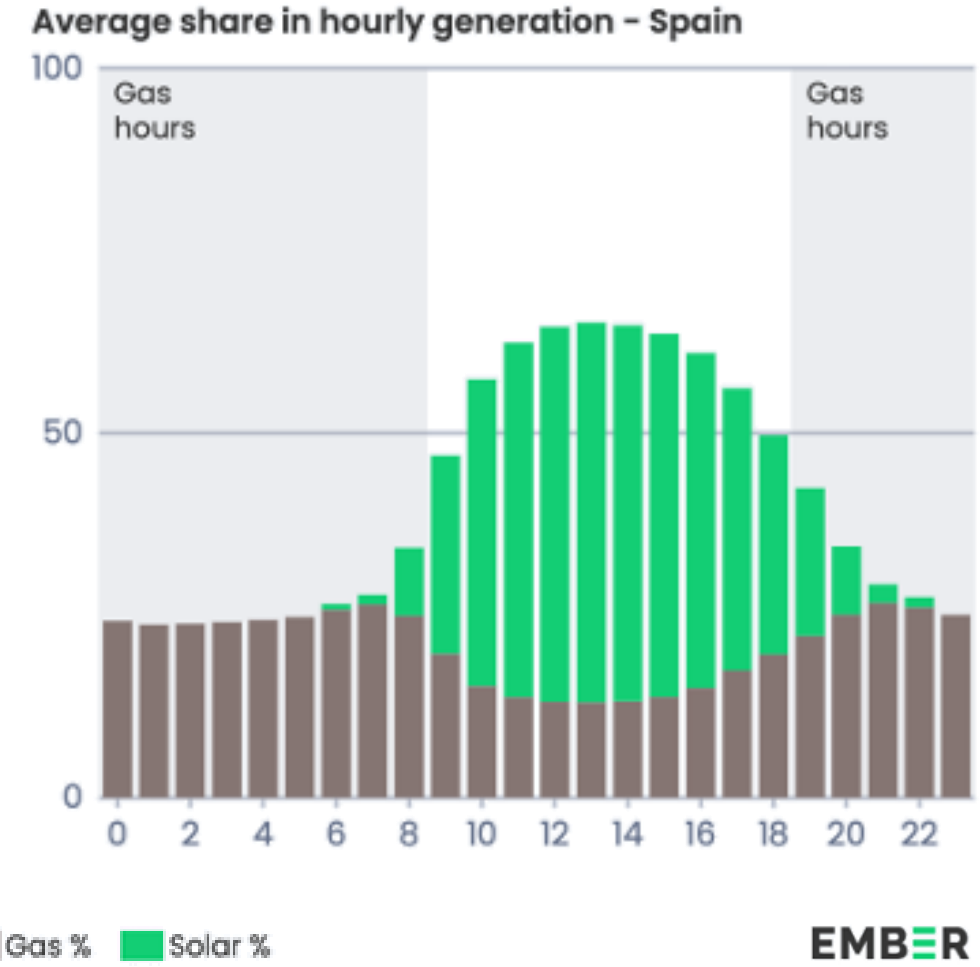

**Working on building up a solid Pipeline:**

**BESS as a new stream of growth to add flexibility in RES portfolio**

# BESS RATIONALE

# WHY BATTERY STORAGE? THE SOLAR DUCK CURVE

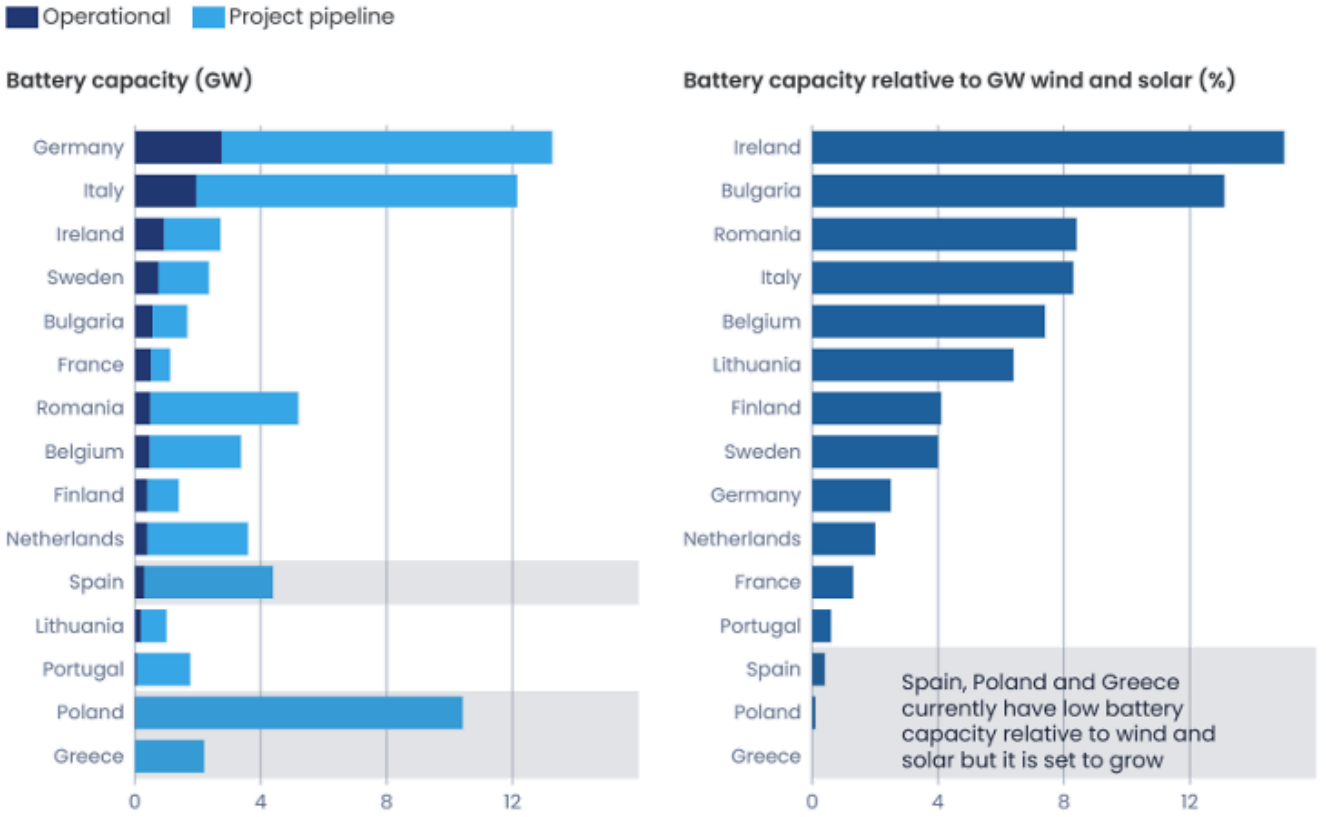



**Currently Spain market is becoming un-investible for PV**

# BATTERY PIPELINE IN EUROPE

EU countries ranked by operational grid-scale battery capacity (GW) and by battery capacity relative to installed wind and solar (%)

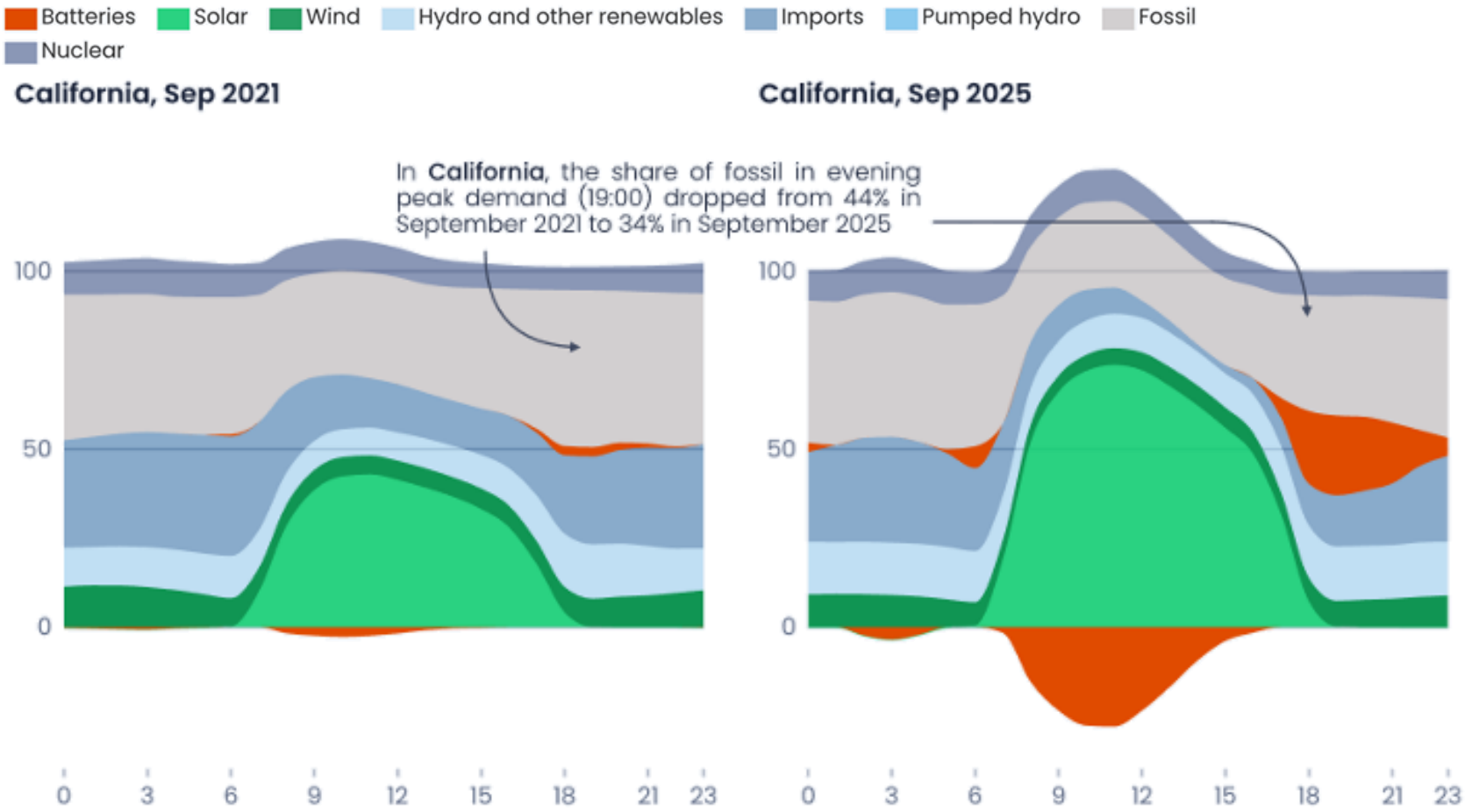



Source: European Energy Storage Inventory, Ember monthly capacity data
Countries with battery pipeline < 0.5 GW excluded. Pipeline includes announced, permitted and in-construction projects as of 16th December 2025. Solar includes utility-scale installations only.

EMBER

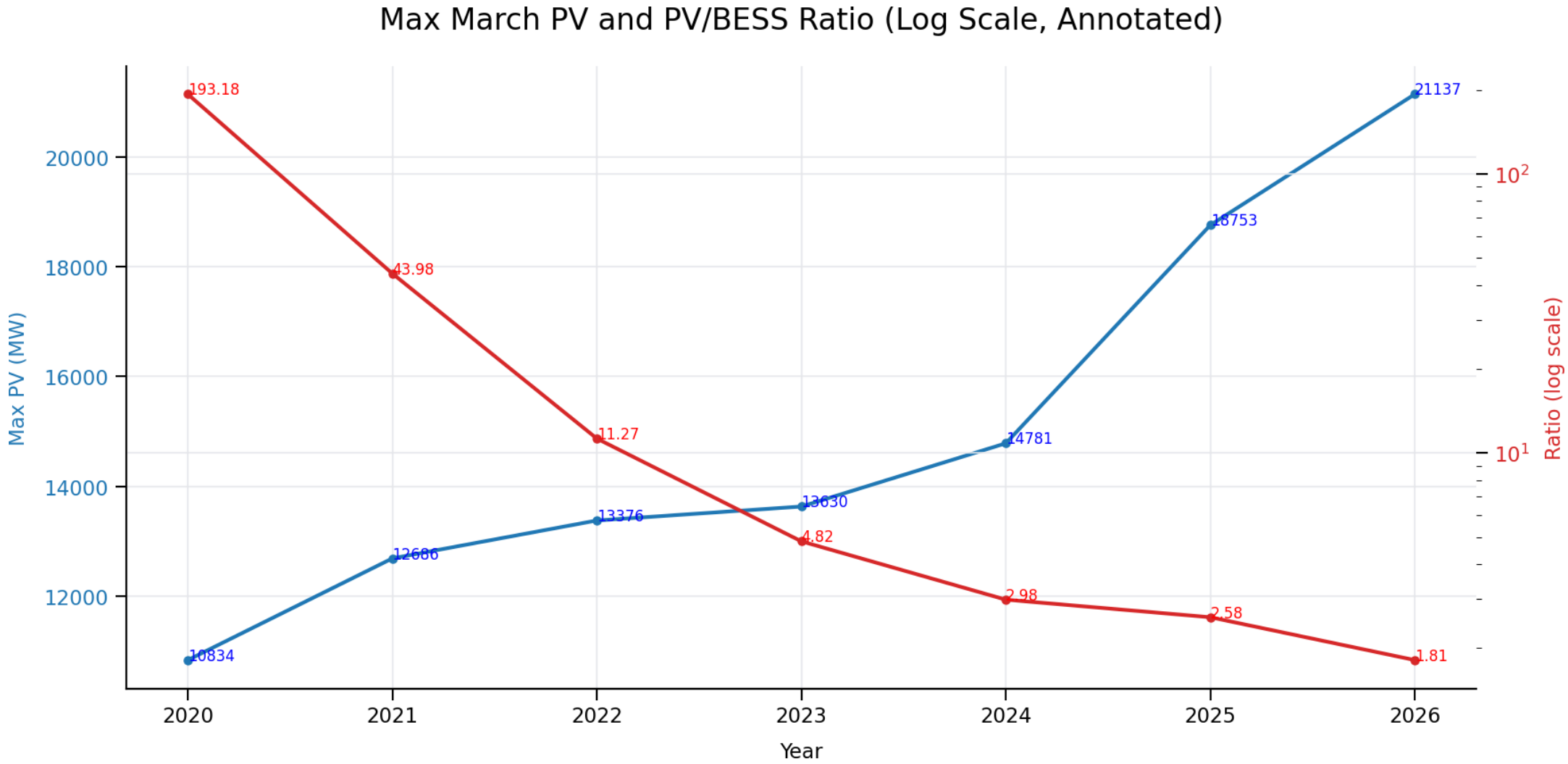
**Few countries present relevant battery/PV ratio, not Spain**

# CALIFORNIA: A GLIMPSE INTO THE FUTURE




**Evening peak in CAISO is more and more dominated by BESS**

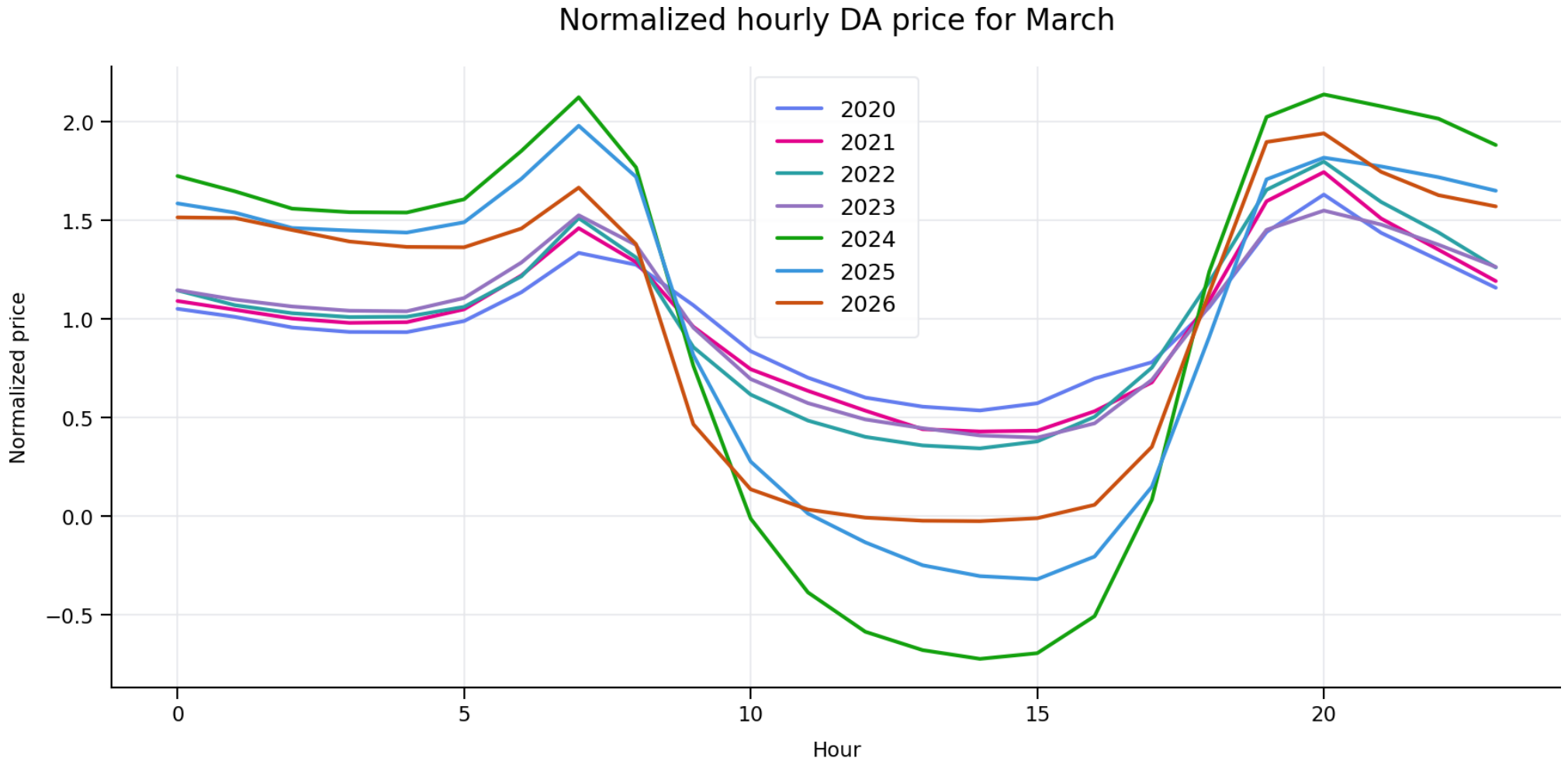
# MARCH, A CRITICAL MONTH FOR SOLAR




**March as a critical month, almost 50% of PV/BESS power ratio**

**Source**: ERG based on CAISO data

# EVOLVING DUCK CURVES IN CAISO




**Impact of BESS into the system is more than evident**

**Source**: ERG based on CAISO data

# BESS SWOT

## Strengths

- **Key enabler of renewable integration**, mitigating variability and reducing the need for fossil-based balancing.
- **Fast deployment relative to conventional flexibility assets**, enabling rapid response to market signals and policy incentives.
- **Low marginal operating costs** combined with high cycling capability in modern chemistries support participation in high-frequency service markets.
- **Grid supportive functions and synergy with grid upgrades**, including voltage control, synthetic inertia, congestion relief and peak shaving at strategic grid nodes.
- **Minimal land footprint** compared with other infrastructures of similar system value.
- **Fast construction and limited disturbance during installation** and operation.

## Opportunities

- **Price volatility and spreads expected to increase**, linked to RES penetration, improving arbitrage revenues and peak-shaving value.
- **Expansion of ancillary service markets**, including new products for inertia, fast frequency response and congestion management.
- **Emergence of long-term flexibility mechanisms**, capacity markets or tenders supporting bankability.
- **Technological improvements in battery chemistry**, efficiency and lifetime reduce cost per MWh and increase cycling capability.
- **Contribution to reduced curtailment**, improving societal value from public renewable investments.
- **Scalability and modularity**, allowing flexible sizing and phased expansions as grid needs evolve.

## Weaknesses

- **High dependency on market design,** requiring robust price signals and clear rules for service procurement.
- **Shorter asset lifetime compared to traditional infrastructure**, with degradation affecting usable capacity.
- **Safety considerations,** necessitating advanced fire protection and monitoring systems.
- **Concerns over battery sourcing and materials,** including sustainability of critical minerals and end-of-life handling.

## Threats

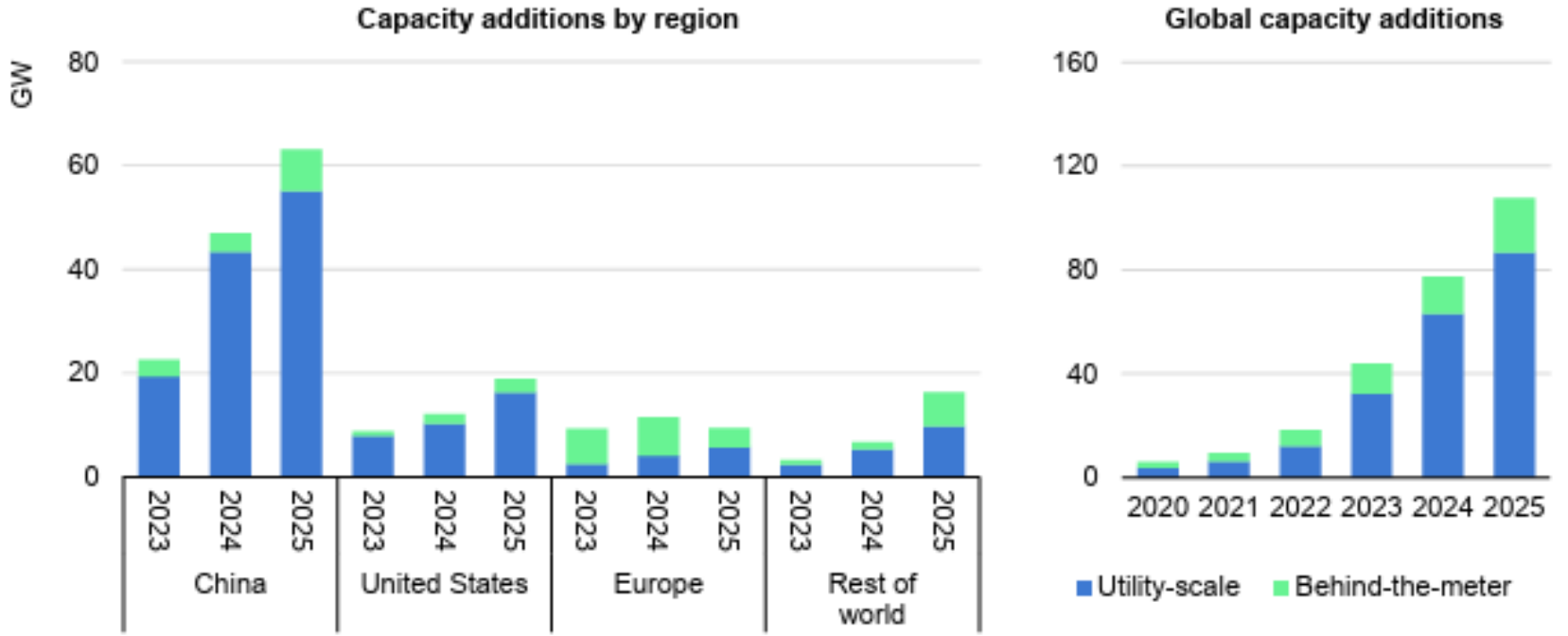
- **Lack of long-term revenue certainty**, limiting bankability in regions without regulated schemes or multi-year contracts.
- **Market saturation risk in key grid services**, reducing prices and squeezing margins for stand-alone assets.
- **Competition from hybrid projects**, with similar revenue streams and potentially stronger economics.
- **Current monopolism of Lithium-ion** BESS, with related risk of price fluctuations.

Funded by the European Union

LUMENS

# BESS IS THE FASTEST GROWING POWER TECHNOLOGY TODAY

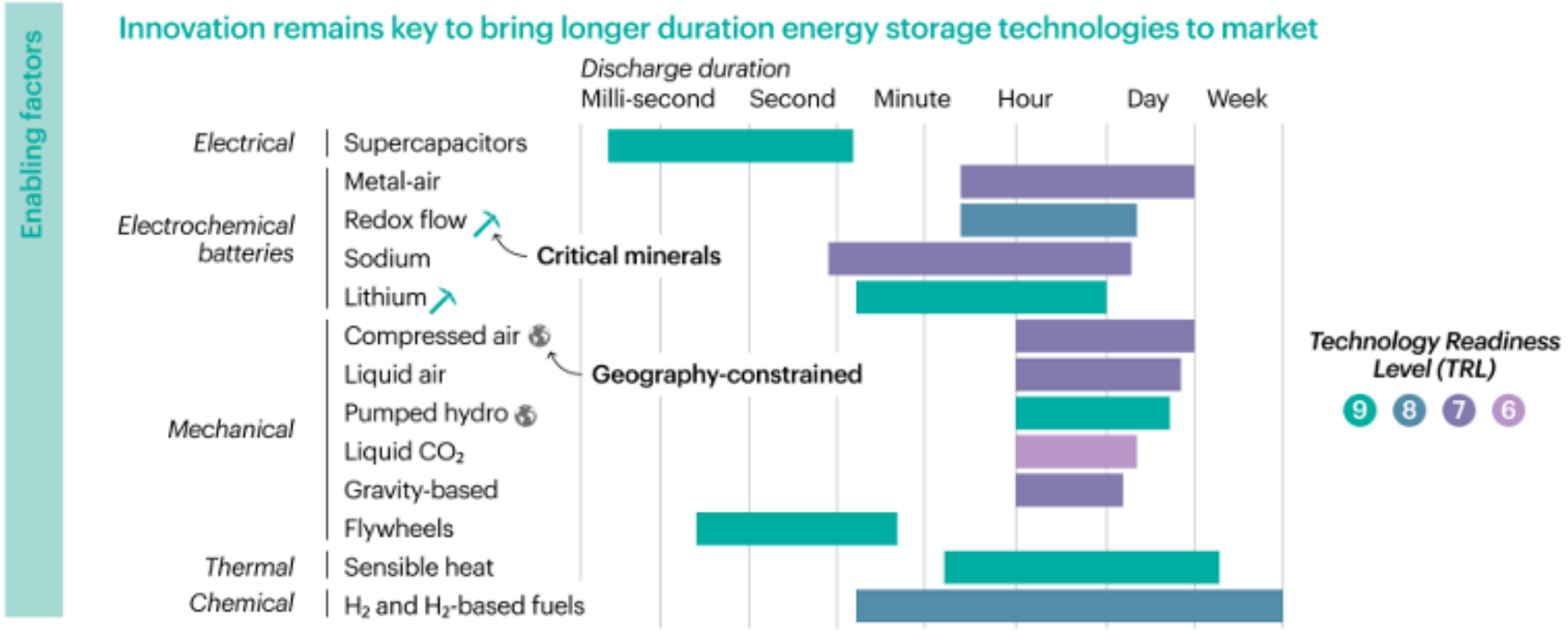
**Battery storage capacity additions in selected regions, 2023-2025, and global capacity additions, 2000-2025**




IEA. CC BY 4.0.

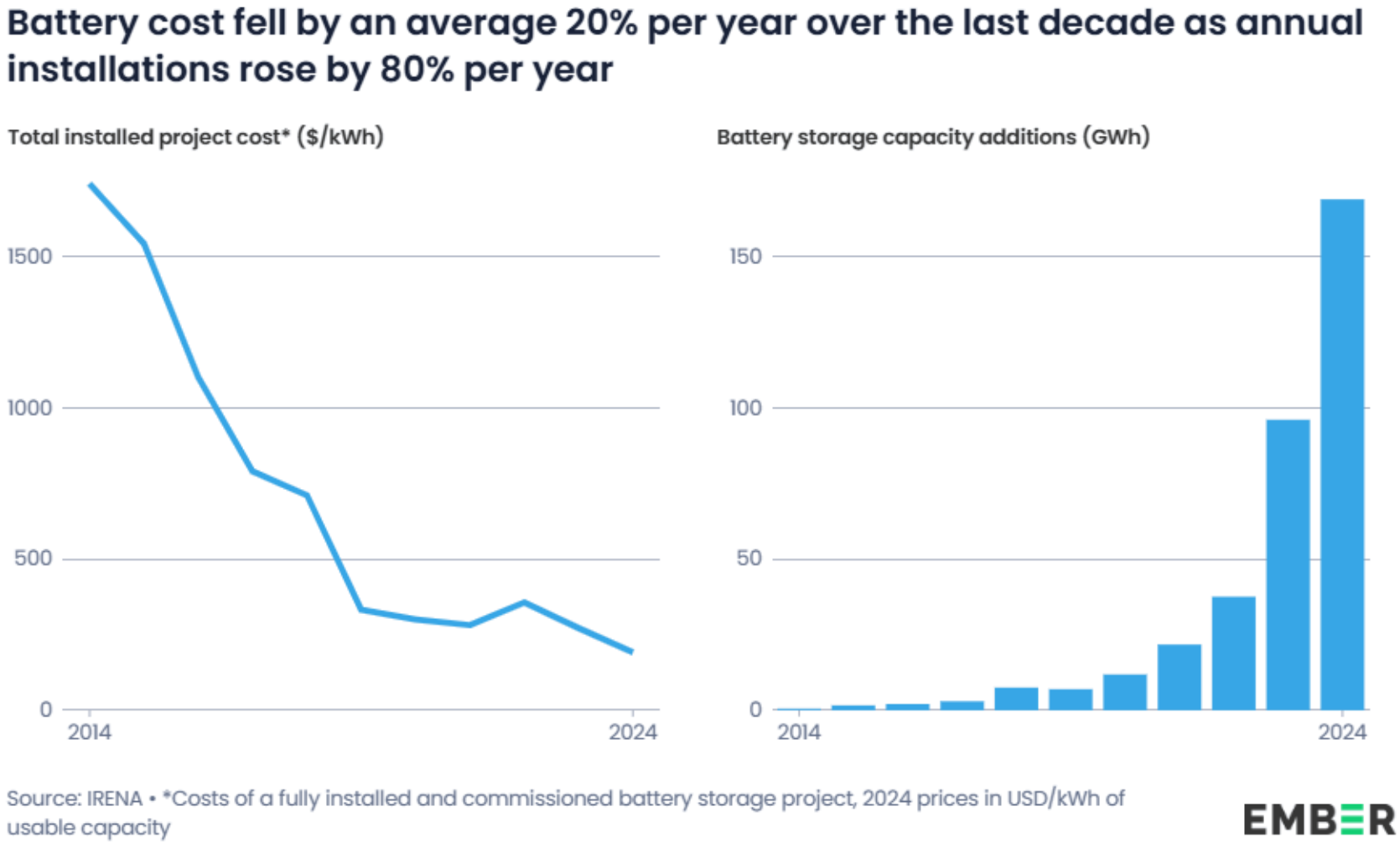
**Around 80% of new battery capacity in 2025 was utility-scale.**

# STORAGE IS NOT (ONLY) BESS



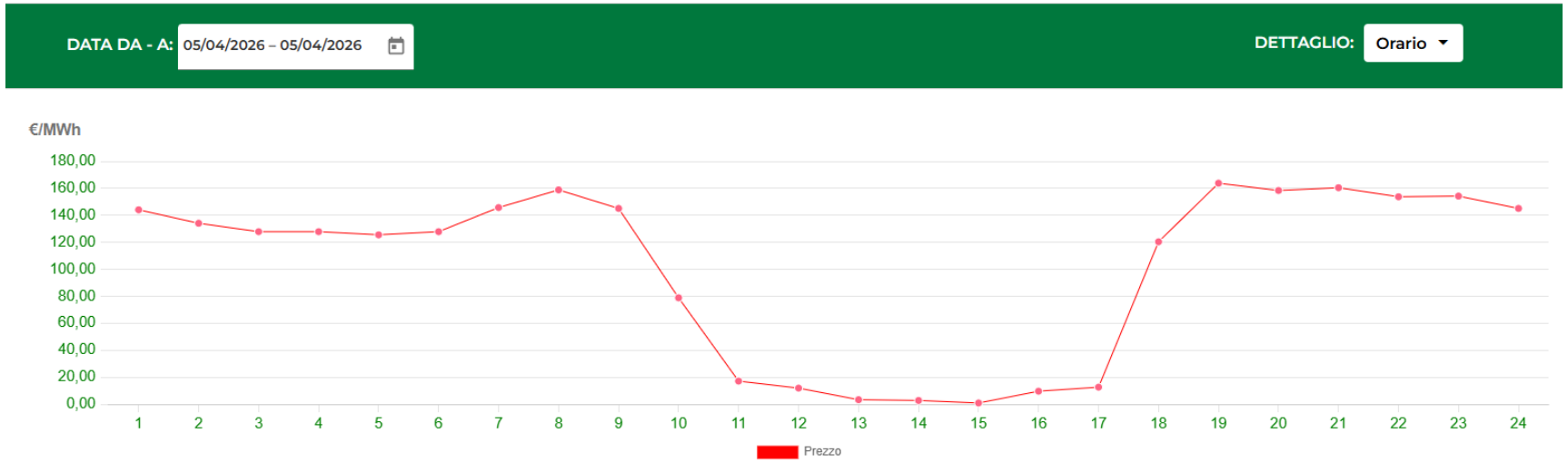

**Source:** IEA - Energy Technology Perspectives 2026

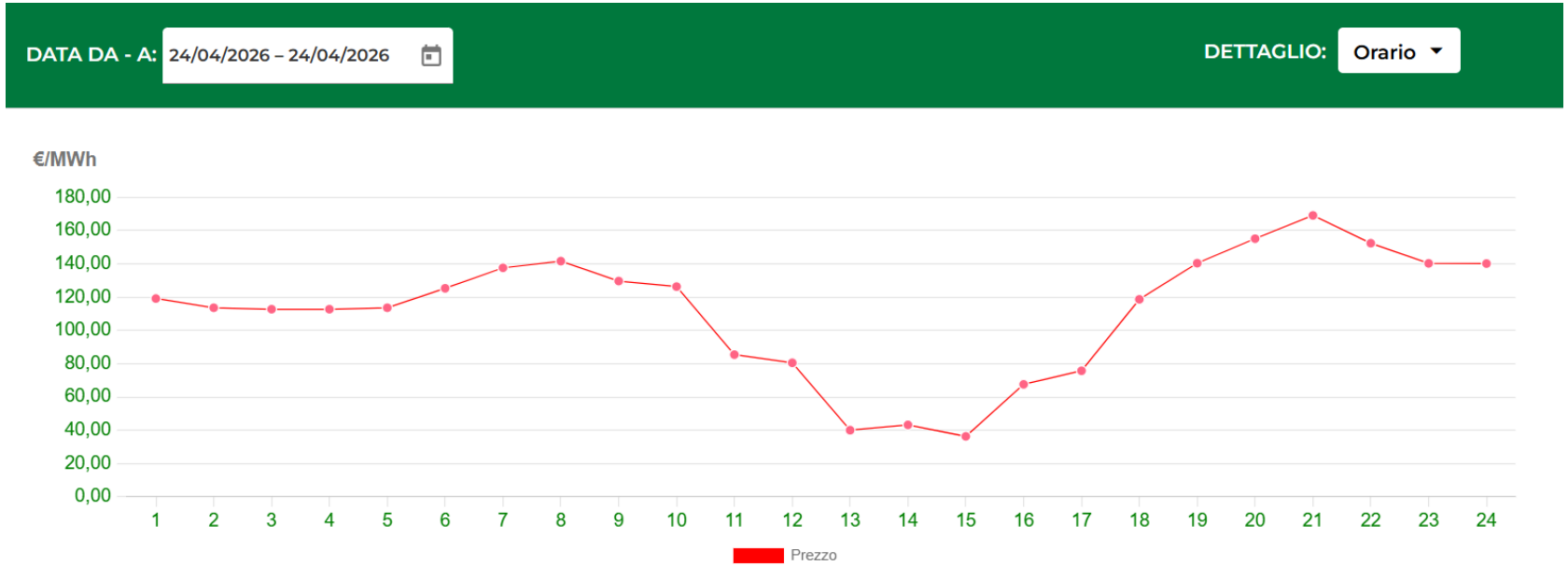
# . . . BUT STORAGE IS CURRENTLY LI-ION BESS




**Lithium-iron phosphate (LFP) batteries now account for around 90% of deployments**

# WHAT ABOUT ITALY'S PRICES?

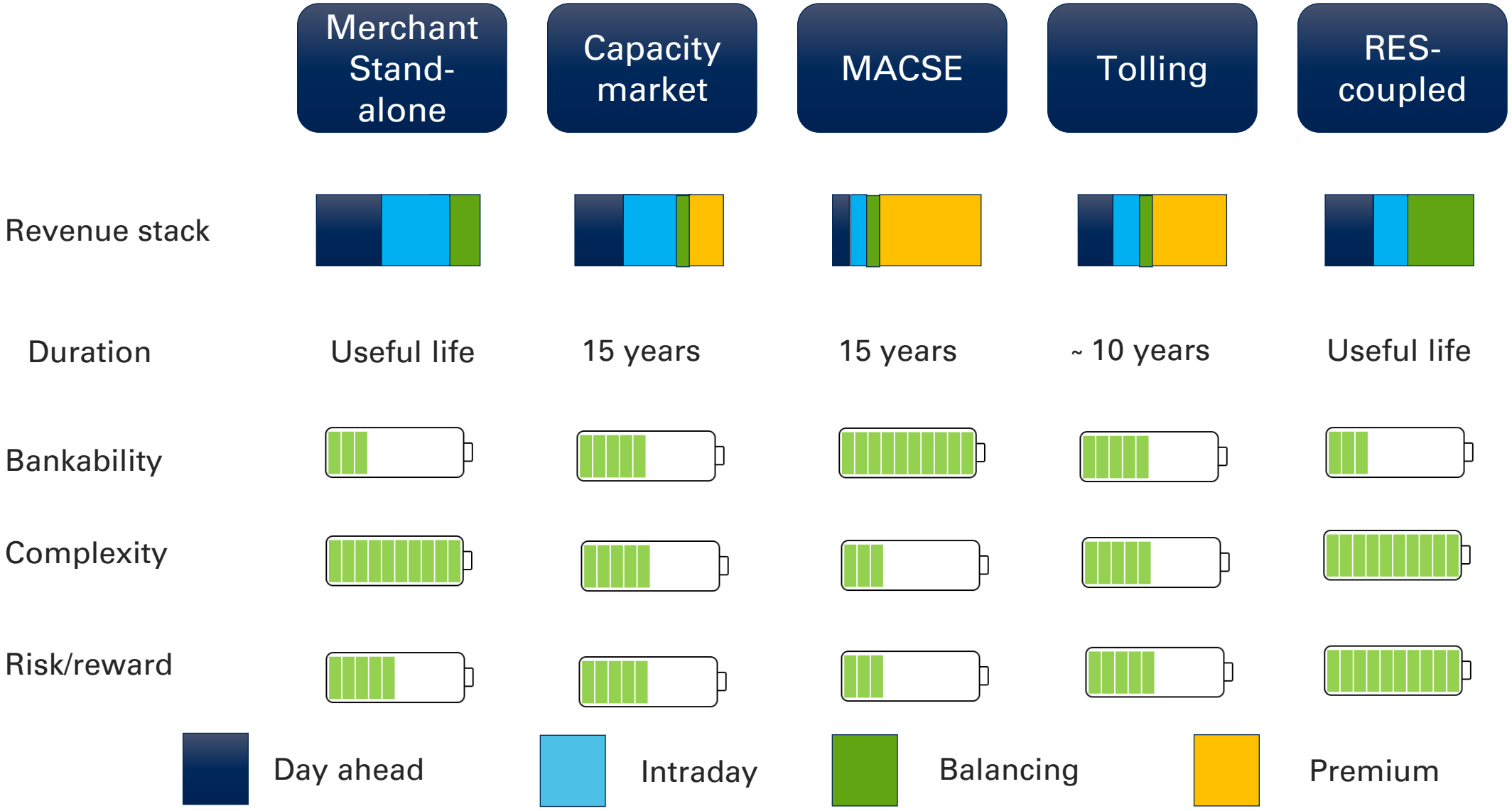



**Source:** https://www.mercatoelettrico.org/it-it/Home/Esiti/Elettricita/MGP/Esiti/PUN

# ROUTES TO MARKET

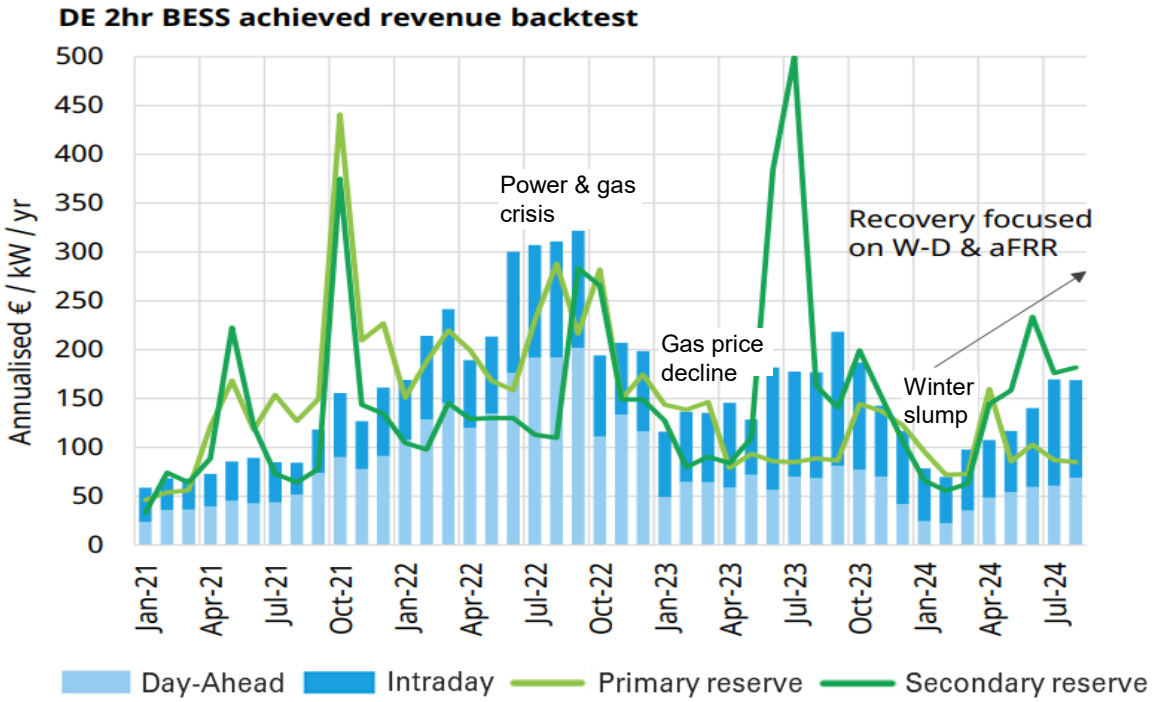
# POSSIBLE ROUTES TO MARKET

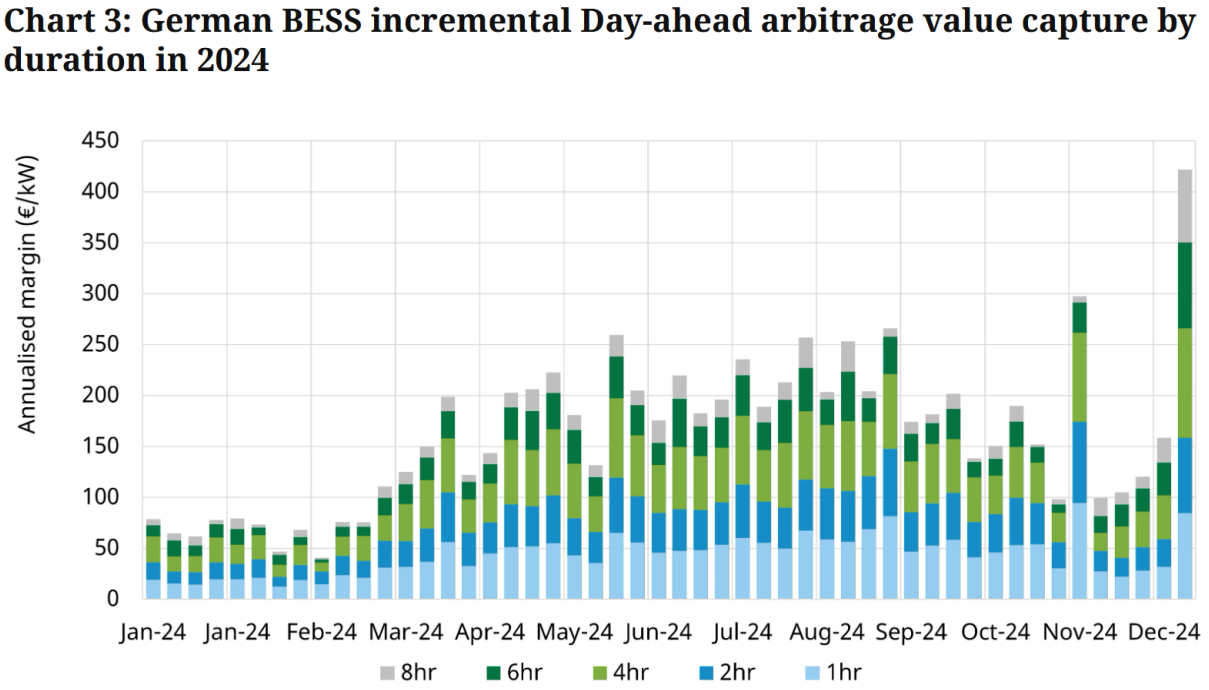


# MERCHANT STAND-ALONE – GERMAN CASE

- Batteries can participate in wholesale markets, capitalising on price **arbitrage opportunities,** and to all **frequency reserve services**.
- German BESS revenues has driven **strong investor interest** in acquiring & developing projects, but **actual price volatility is to be evaluated**.

- Looking at 2024 in the graph below, **Q1 was challenging for German BESS**, as a mild winter & weak gas prices took hold.
- However, the combination of **low residual load and high solar generation** has resulted **in significant intraday market volatility and higher FCR and aFRR prices** across midday. This has driven a **sharp recovery in the revenue stack** throughout Q2-Q3.
- Two recent **Dunkelflaute events in Q4 2024** make good case studies for this increasingly common phenomena. German **thermal generation ramped up significantly** to compensate for the shortfall in renewable output. The resulting dynamics drove a **sharp increase in baseload power prices and within-day price volatility**, which supported flexible asset value capture.



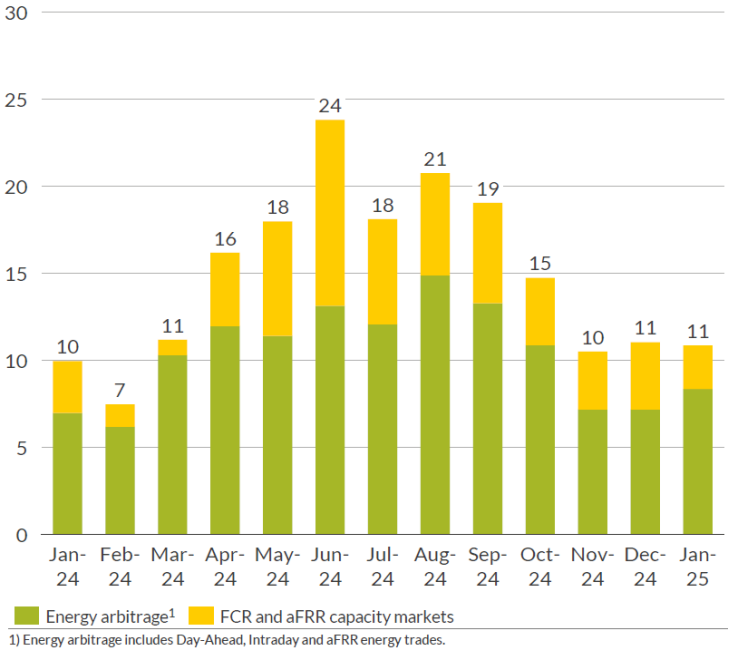




Source: Timera energy – September 2024 & January 2025
Gridcog – March 2025

# MERCHANT STAND-ALONE – GERMAN CASE

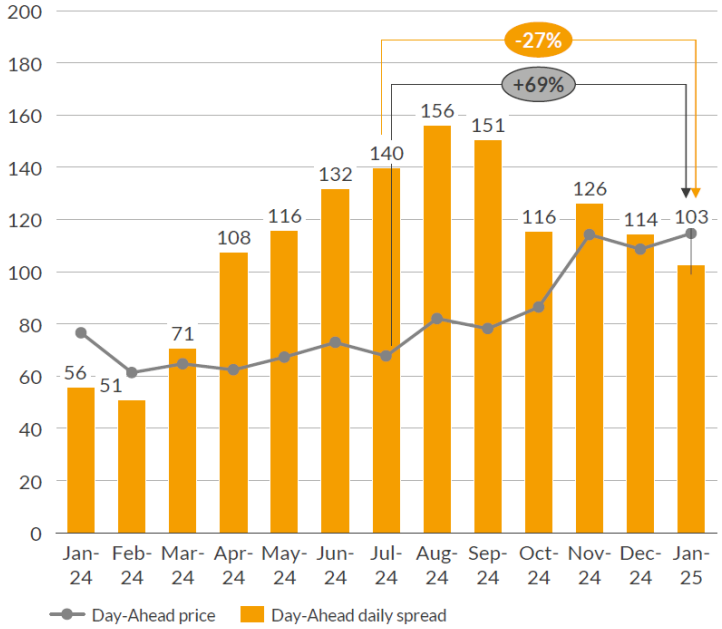
- Battery operations are **most profitable during the summer**, when wholesale spreads are the highest.
- In general, ancillary market prices tend to peak **when solar generation is high and thermal plants not running**, which decreases supply for these markets.

Total gross margins for a 2h battery system with 1.5 cycles, undegraded
€/kW, (nominal)



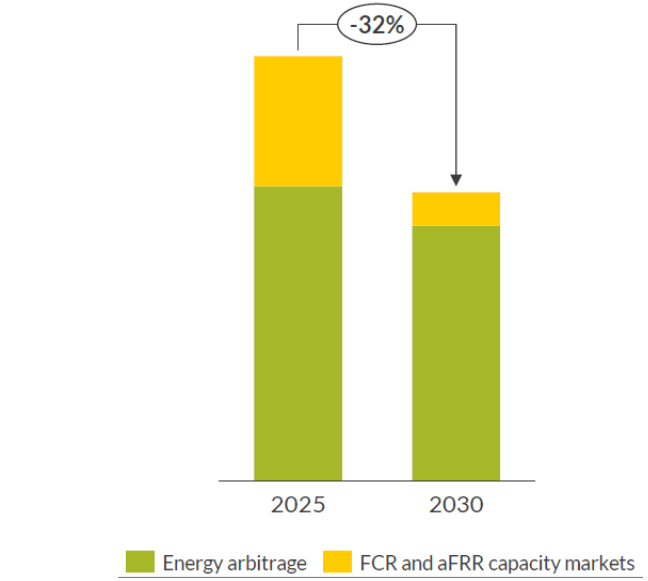

1) Energy arbitrage includes Day-Ahead, Intraday and aFRR energy trades.

Monthly average Day-Ahead price and daily spread
€/MWh (nominal)



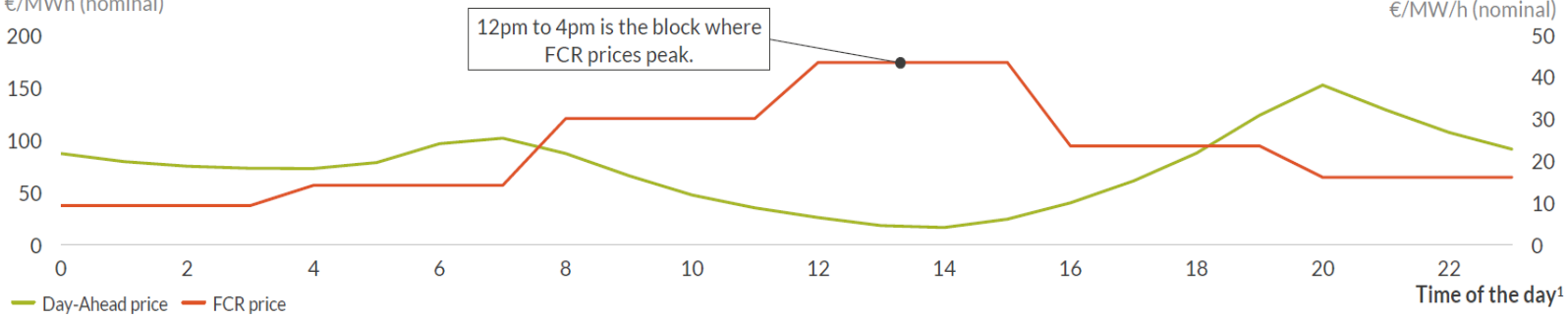

- However, ancillary markets **will saturate quickly** with increasing battery capacity entering the German market, thanks to increasing flexibility and reduction of negative prices.

Gross margins for a 2h battery system with 1.5 cycles, undegraded
€/kW, (real 2023)




Average hourly Day-Ahead price
€/MWh (nominal)

Average hourly FCR price
€/MW/h (nominal)




**Source**: Aurora's Battery Benchmark: Bridging the Gap Between Revenue Indices and Forecasts, February 2025

# REGULATED REVENUES – ITALIAN CAPACITY MARKET

In addition to the Energy Markets (MGP/MI/XBID) and the Balancing Services Markets (MSD/MB), a **Capacity Market** is also operating in some countries, aimed at **ensuring the adequacy of the electricity system**.

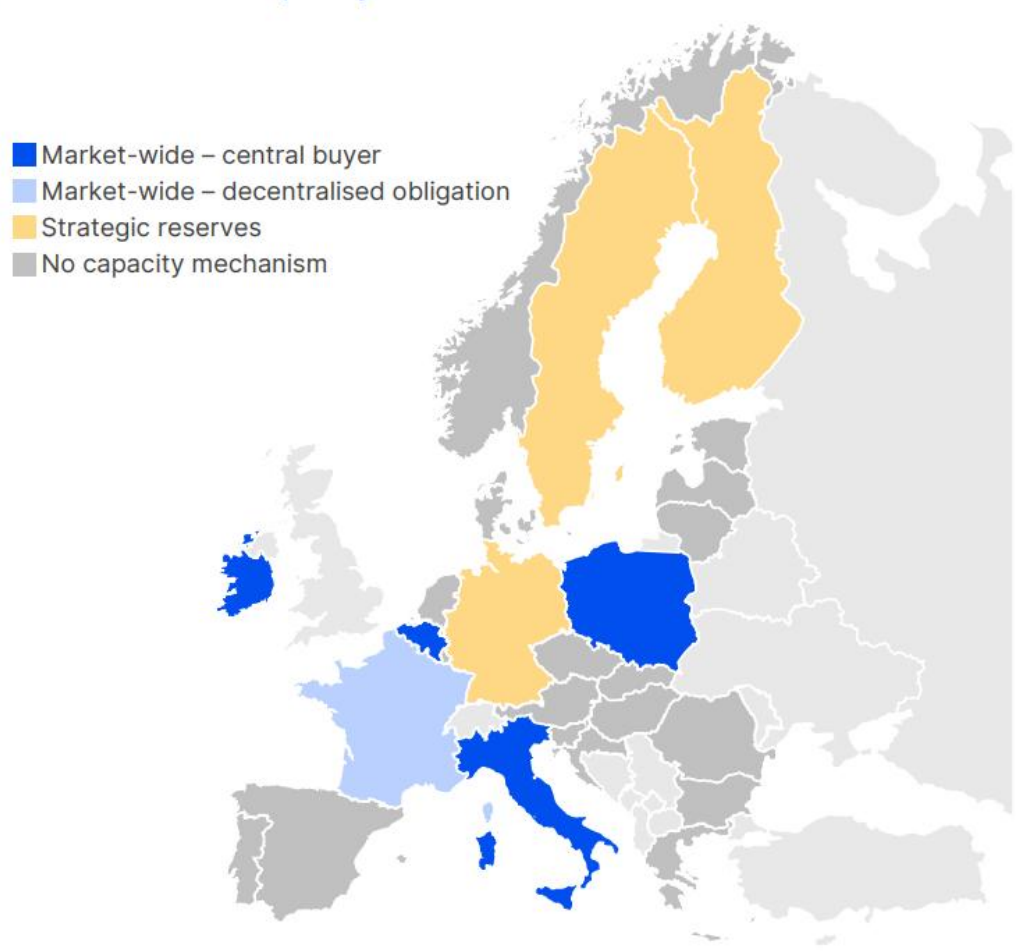
## Adequacy

Ensuring that the **available generation capacity**, including imports and storage, **is sufficient to meet electricity demand** at every moment and in every area of the country, including an **appropriate reserve margin** to cope with potential contingencies.

The Capacity Market aims to **maintain the efficiency of existing capacity** and to **encourage the development of new capacity**, providing producers with appropriate **long-term price signals**.

The CM was originally introduced as an **"emergency" tool**, activated by countries that considered it necessary. Some countries address the issue of system adequacy through "strategic reserves".

With the **reform of the European electricity market**, the temporary nature of capacity mechanisms has been removed, with the intention of **making them a more structural element of the electricity market**.




*Source: Created by ACER based on NRA data.*

**Source:** RSE – Appunti di Energia

# REGULATED REVENUES – ITALIAN CAPACITY MARKET

**Eligible units**

**Existing/new** generation units (UP), either already authorized or not, that comply with a **specified $CO_2$ emissions limit**.
During the delivery period, the awarded capacity **cannot receive any other incentives**.
**Technological neutrality**: generation units (UP) and consumption units (UC), both **dispatchable and non-dispatchable**, are eligible to participate.

**Contracts**

Capacity Market auctions refer to a **delivery period of one year**, always starting on 1st January.
**New generation units may request a 15-year contract**, also starting on 1 January of the delivery year.

**Premium**

Pricing: **System Marginal Price with a cap price**. The awarded price (premium) is assigned monthly.
The **auction cap** is **different for new and existing units**.
Existing units: CAP = € 46,000/MW/year for 2026;
New units: CAP = € 86,000/MW/year for 2026.

**Obligations**

The selected **capacity must be offered** on the energy and services markets for **every hour of the delivery period**.
Moreover, certain **constraints** must be respected **in terms of price offered** on the market (below a defined Strike Price)

# REGULATED REVENUES – ITALIAN CAPACITY MARKET

The installed capacity of plants participating in the Capacity Market is adjusted by a **technology-specific derating factor**, reflecting the average **unavailability rate** of the generating units.

The capacity value resulting from this adjustment is referred to as Probabilistic Available Capacity (Capacità Disponibilie in Probabilità - CDP), which represents the capacity available for the purposes of the Capacity Market.

Derating factors are calculated and **updated 60 days ahead of each auction**, based on historical performance data.

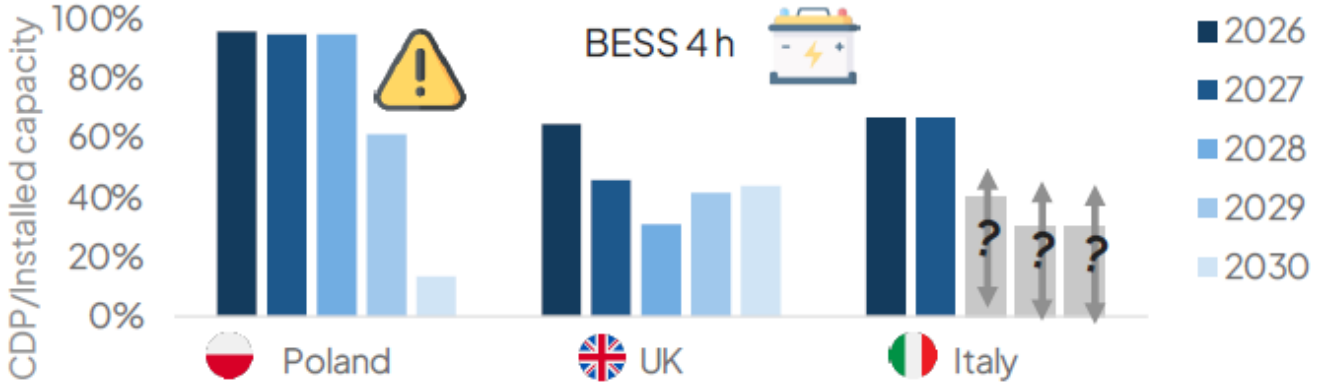
The derating factors applied to non-programmable RES and storage for the 2027 delivery year auction are reported below, together with the proposed values for the 2028 delivery auction, that will be held in July 2026.

**Rating factors – Probabilistic Available Capacity (CDP)**

| Technology | Delivery 2027 Applied | Delivery 2028 Consulted |
|---|---|---|
| Solar | 12% | 8,3% |
| Wind | 16% | unchanged |
| run-of-river hydro | 33% | unchanged |
| Thermal | 90% | unchanged |
| BESS – 2h | 44% | 34% |
| BESS – 4h | 67% | 51% |
| BESS – 6h | 81% | 62% |
| BESS – 8h | 90% | 69% |

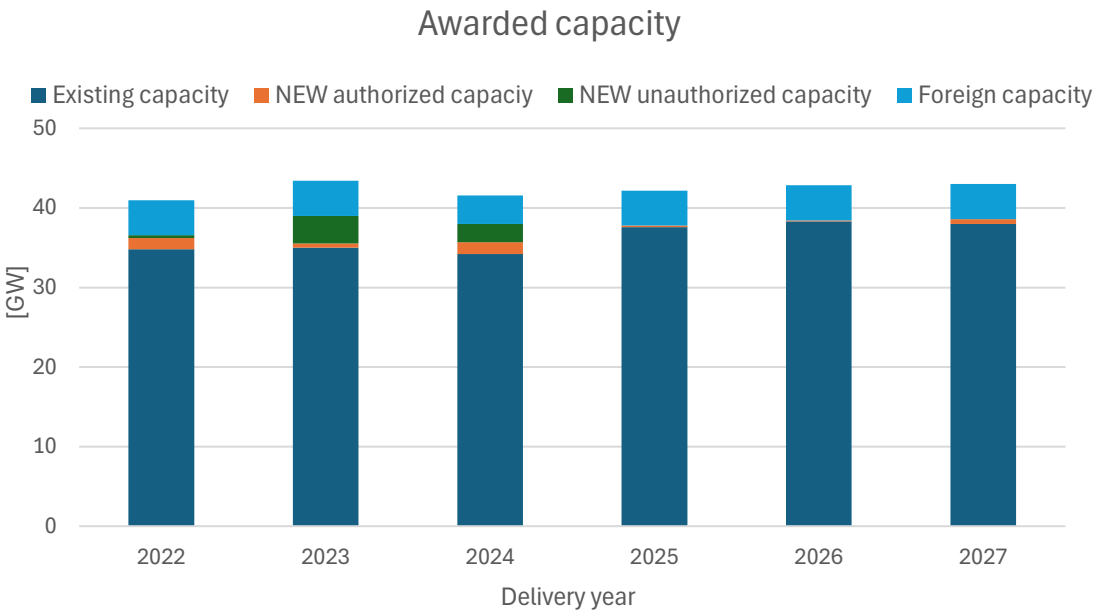
derating factors applied

The experience of other countries with Capacity Markets, such as Poland and the United Kingdom, shows that over time the batteries' capacity considered "available" (CDP) has been progressively reduced, precisely to reflect the increase in BESS penetration




**Source:** ELEMENS

# REGULATED REVENUES – ITALIAN CAPACITY MARKET

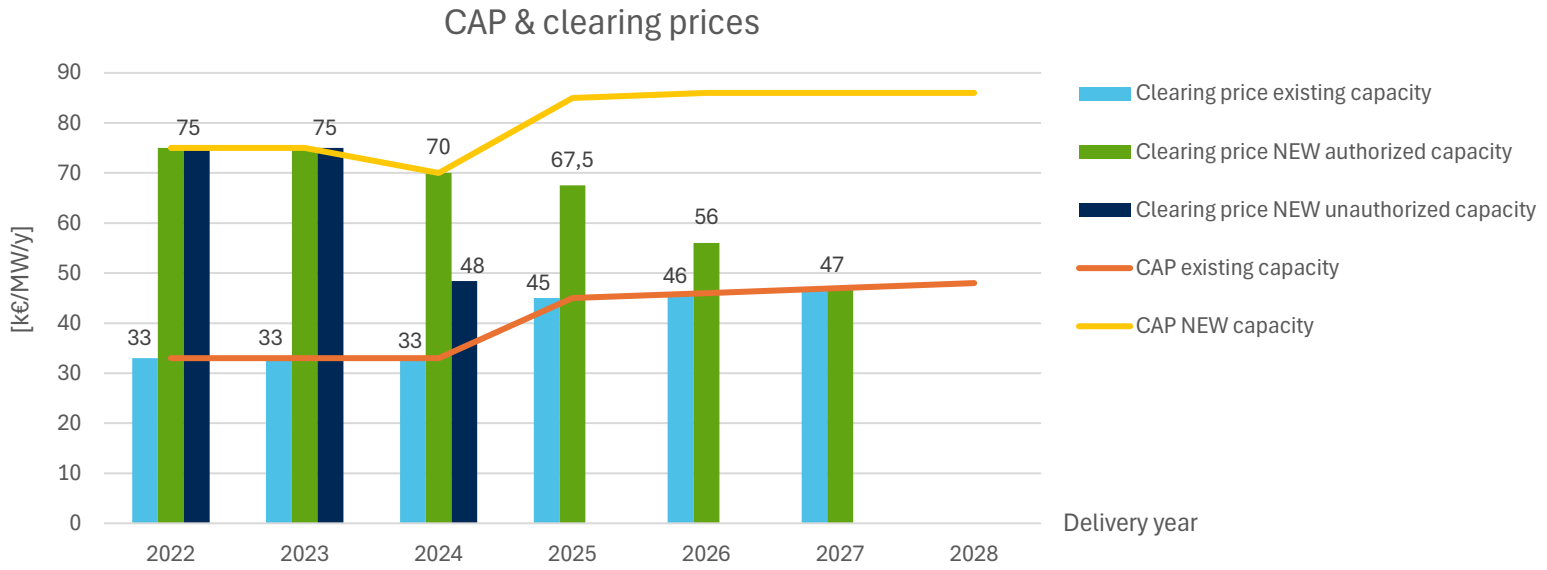



To date, **BESS** have only participated as NEW capacity:

| Delivery Year | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|
| BESS Capacity assigned [MW] | - | 96 | 1121 | 89 | 84 | 563 |
| % on total NEW capacity assigned | - | 2,4% | 29,7% | 51% | 60% | 95% |

**Little new capacity** has been allocated in recent years

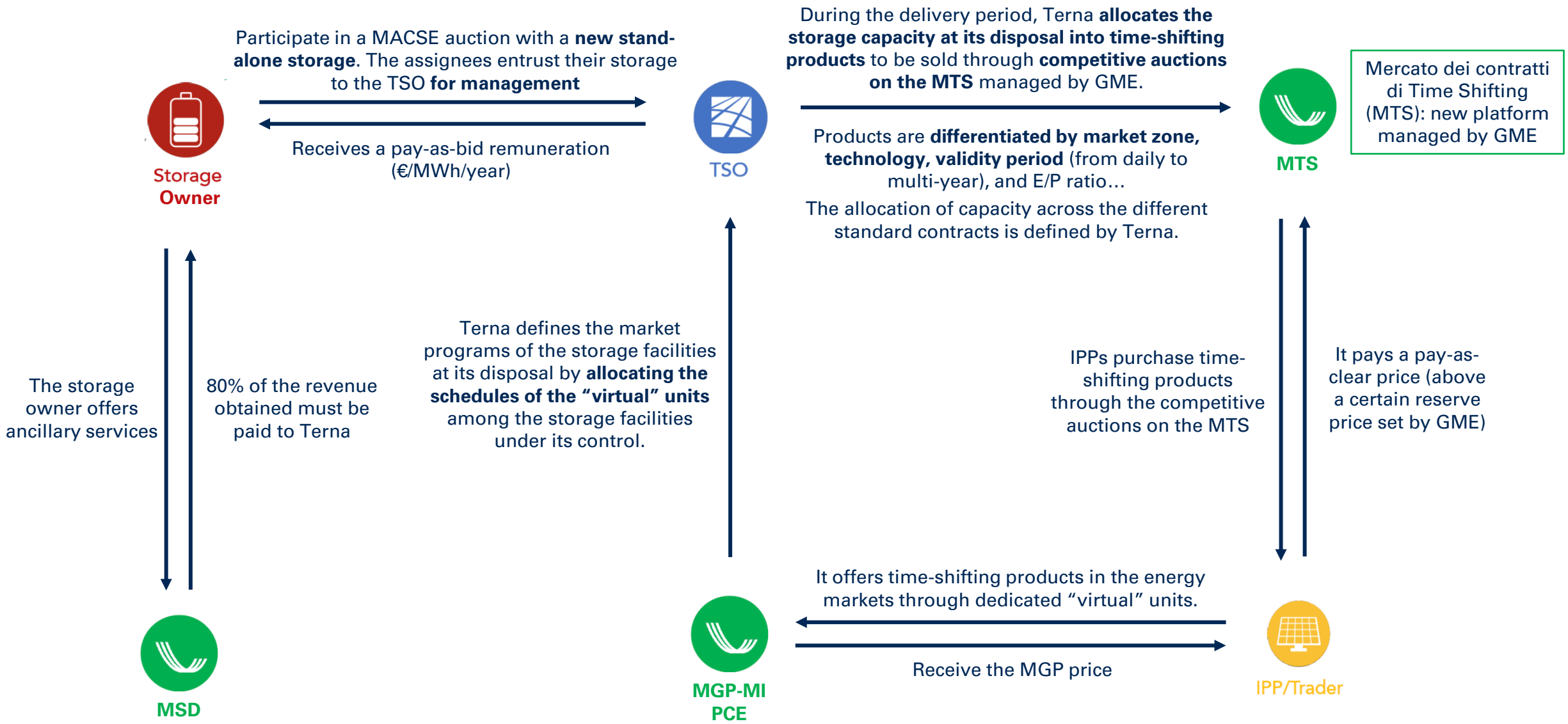
In the 2027 auction, the allocated BESS capacity increased, covering almost all the new allocated capacity.




- In 2025 delivery year auction, for the first time, NEW authorized capacity did not close at its CAP
- In 2027 delivery year auction, for the first time, NEW capacity closed at the same premium as existing capacity

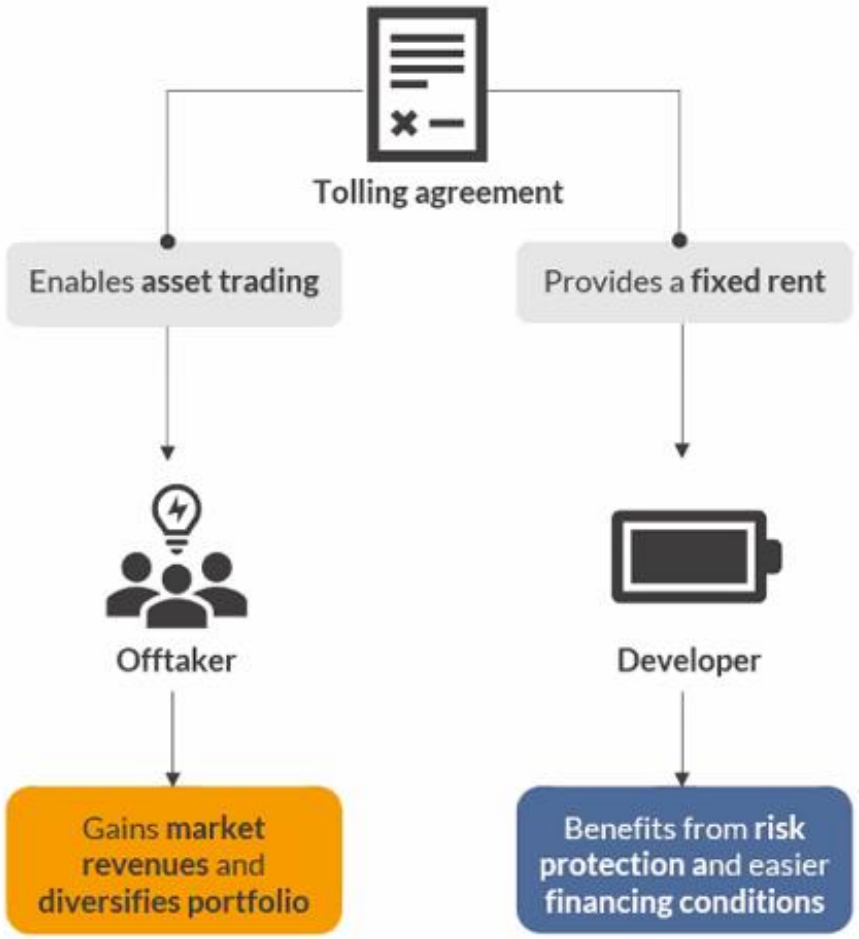
# REGULATED REVENUES – ITALIAN MACSE

EU Electricity Market Directive 2019/944, Article 54.1: TSOs shall not own, develop, manage or operate energy storage facilities



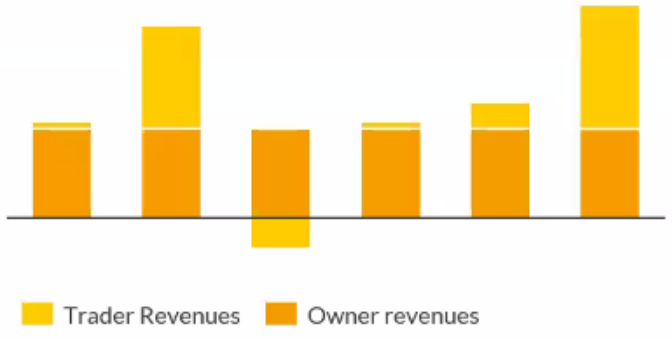
# TOLLING AGREEMENTS, WHAT ARE THEY?

High-level overview



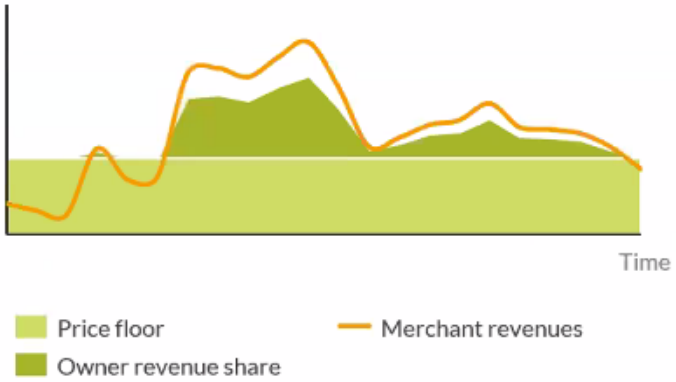

A Fixed price tolling agreements

Fixed price tolling agreement revenue share
€/kW/year, illustrative




B Floor price agreements

Floor price and revenue share agreement illustration
€/kW/year, illustrative

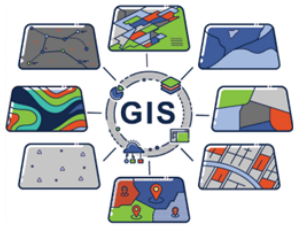



**Offtaker can benefit from tolling agreements through access to high battery revenues, reduced imbalance costs and mitigated portfolio risks.**

**Source:** Aurora Energy Research

# DEVELOPMENT ACTIVITIES AND HYBRID PROJECTS

# DEVELOPMENT ACTIVITIES




## Scouting of potential new projects

Keeping up-to-date with changes to renewable energy regulations (national and regional) and the state of existing and planned future power grids

Downloading GIS Data (environmental constraints, urban and landscape plans, digital terrain models) and uploading to a GIS software system

Analsysing environmental constraints which overlap with cadastrial land parcels, and researching potential interconnection points in order to find suitable sites

## Feasibility study: layout and wind/solar assessment

Doing site surveys and preliminary layouts to identify the power capacity of the plant

Doing wind and solar assessment for the estimated energy production

## Project definition

Negotiation and signing of land agreements

Submitting the grid connection request and preparing the final design

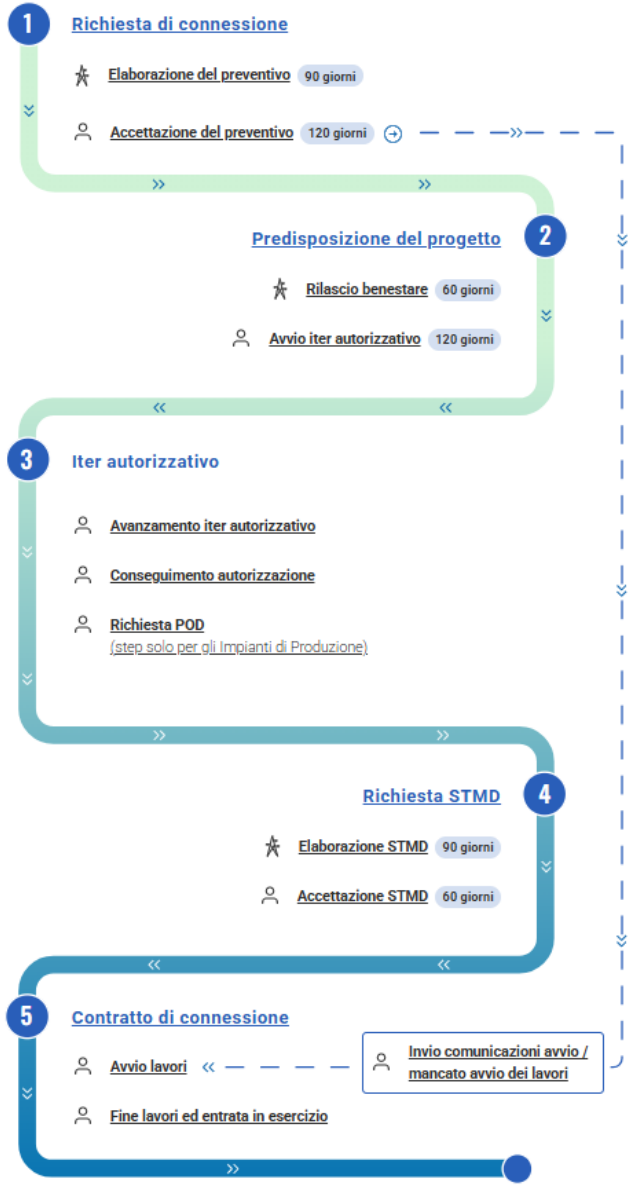
## Grid connection and Authorization process

Submitting authorization requests and obtaining authorization decrees

Obtaining the grid connection point and signing the interconnection agreement with timeline and cost for the construction of the grid connection

**Ready to build status: start the construction**

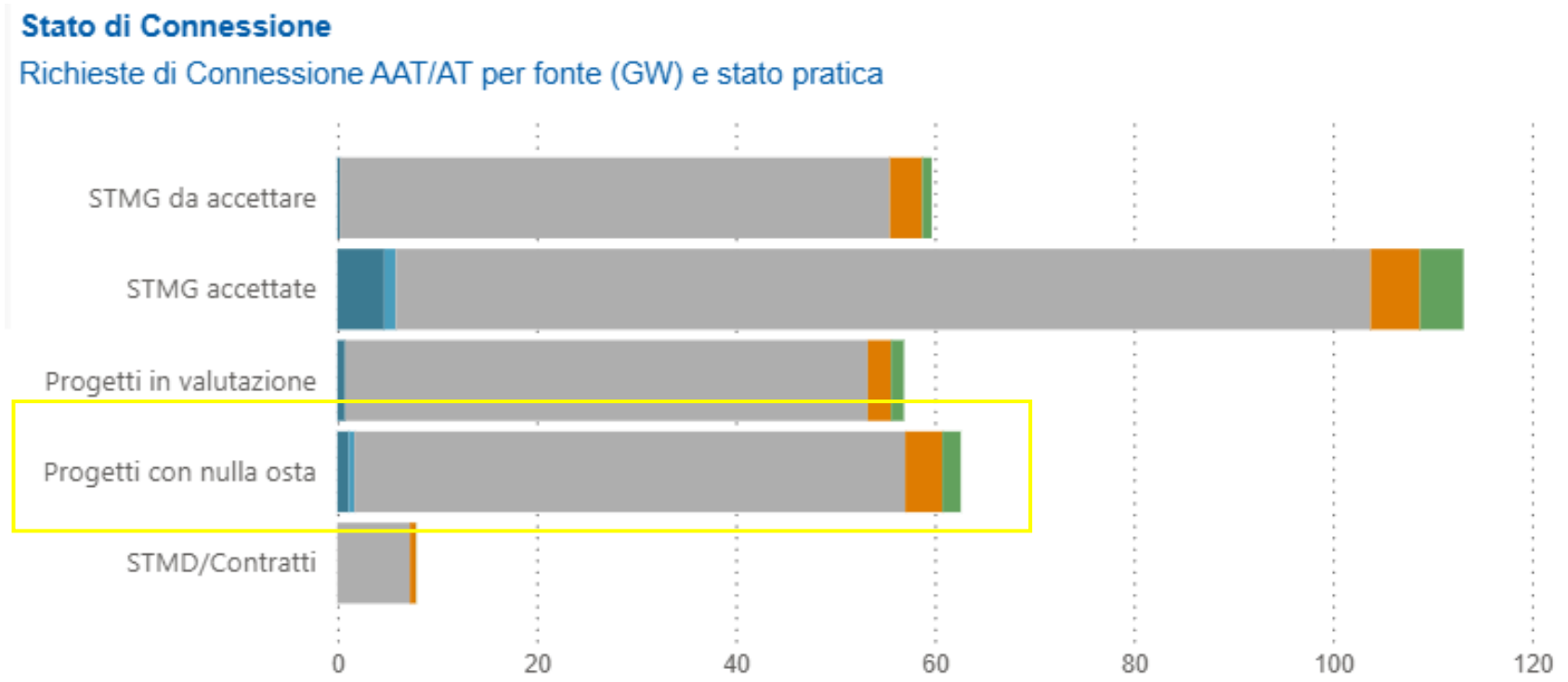
# GRID CONNECTION AND AUTHORISATION




**Richieste di connessione** al 31/03/2026

| Totale | Pompaggio Puro | Pompaggio Misto | Accumulo Stand-Alone | Accumulo Integrato a Solare | Accumulo Integrato a Eolico |
|---|---|---|---|---|---|
| **300.35** GW | **6.96** GW (2.32%) | **1.68** GW (0.56%) | **268.34** GW (89.34%) | **14.86** GW (4.95%) | **8.52** GW (2.84%) |
| **3,572** Pratiche | **23** Pratiche | **6** Pratiche | **2,441** Pratiche | **786** Pratiche | **316** Pratiche |

**Legenda** Pompaggio puro · Pompaggio Misto · Accumulo stand-alone · Integrato a solare · Integrato a eolico






**Source:** https://dati.terna.it/econnextion#accumuli

# Hybrid plants - SWOT

## Strengths

- **Higher captured prices** due to shifting production to higher-value hours or combining complementary generation profiles.
- **Reduction of curtailment**, where storage absorbs oversupply and releases it during peak demand.
- **Improved utilisation of existing grid connections**, enabling greater annual MWh without reinforcing the network.
- **Enhanced grid friendliness** by controlling ramp rates, provide synthetic inertia, stabilise voltage, and contribute to frequency control.
- **Hybridisation of existing assets allows legacy plants to adapt to new market conditions** without losing value.

## Opportunities

- **Lower environmental footprint** by leveraging existing corridors, access roads and substation footprints.
- **Revenue diversification via participation in multiple market segments** including arbitrage, reserve services, congestion management and flexibility schemes.
- **Wind+PV+BESS delivers the most complete hybrid profile,** capable of providing quasi-firm power in several market setups.
- **Enabling large-scale integration of RES clusters** as part of regional flexibility strategies.
- **Advanced optimisation software continues to improve** hybrid dispatch efficiency and MWh value.

## Weaknesses

- **Higher upfront CAPEX** due to additional assets (storage systems, advanced controls, hybrid inverters,..).
- **Complex revenue modelling,** requiring accurate forecasting of price spreads, volatility and ancillary service values.
- **Uncertain regulatory frameworks in several jurisdictions** for hybrid participation in energy and capacity markets.
- **Market cannibalisation** persists if storage is undersized or if wind/PV ratios are poorly balanced.
- **Increased engineering complexity** for both native and ex-post hybrid plants, including sizing, dispatch logic and grid code compliance.

## Threats

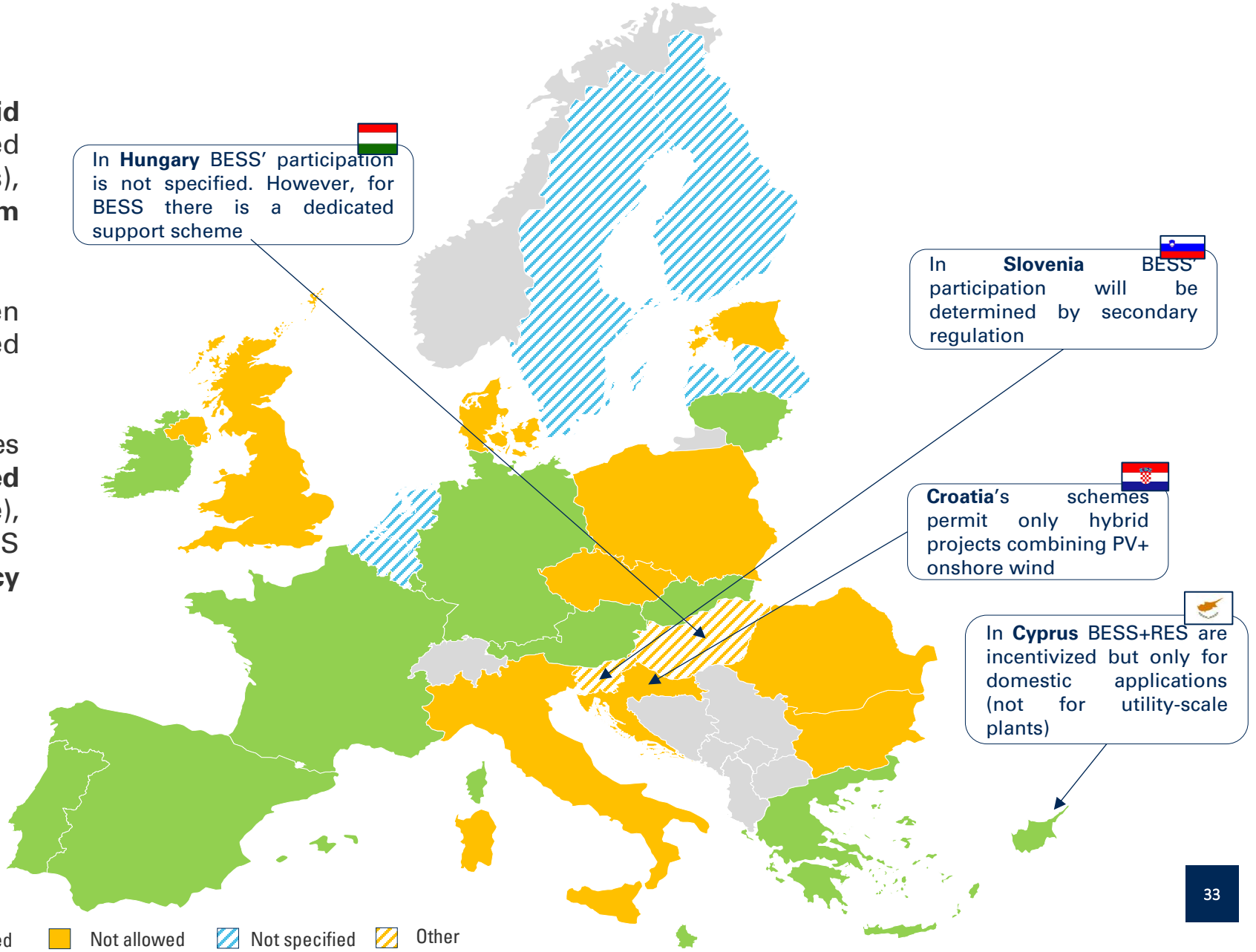
- **Policy lag: regulatory frameworks in some Member States still treat hybrid systems as separate assets**, reducing economic efficiency.
- **Market saturation risk,** reducing ancillary service prices and revenue opportunities.
- **Complex grid studies required for hybrid configurations** may prolong permitting or connection approval.

Funded by the European Union

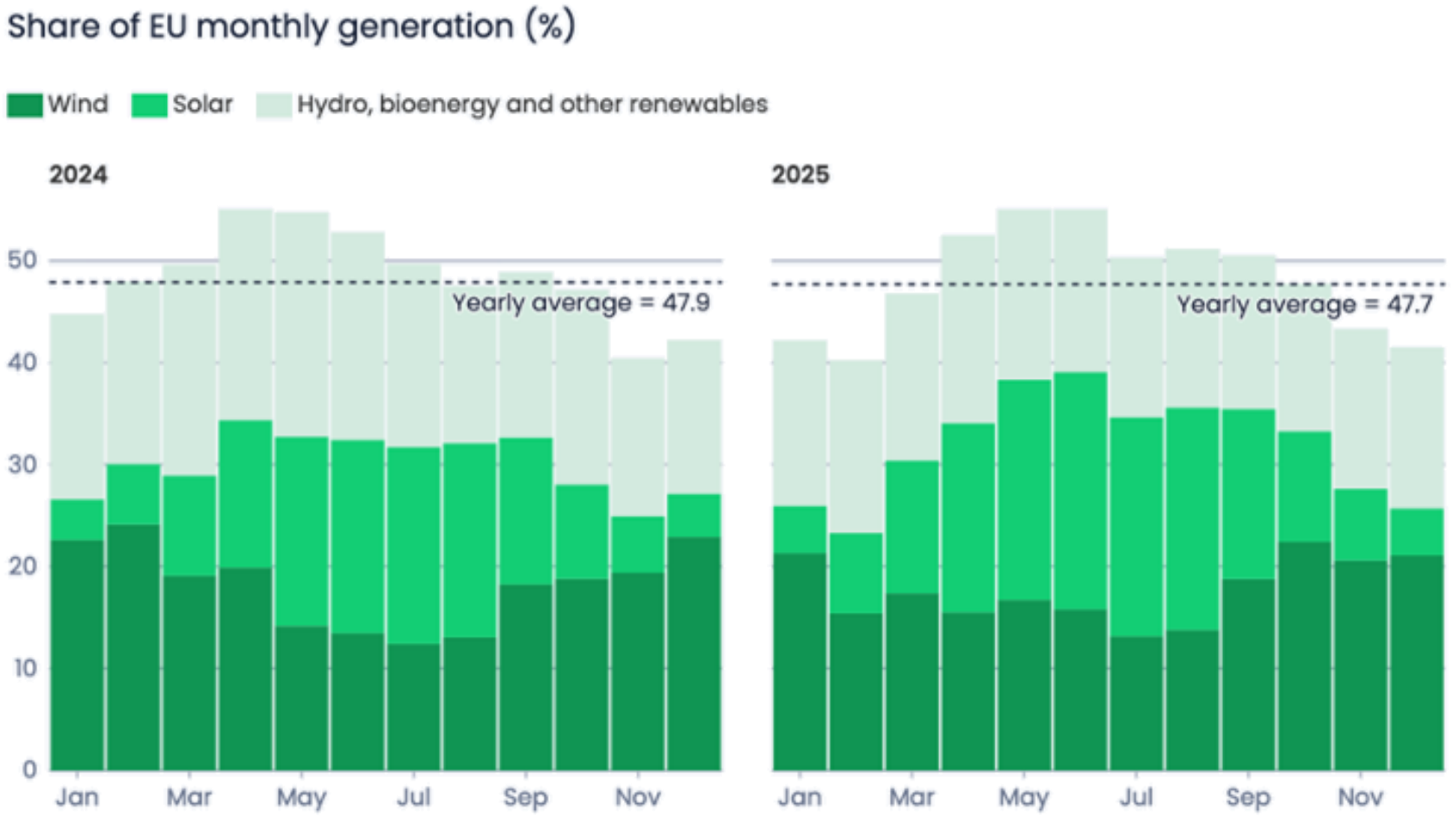
LUMENS

# ARE BESS ALLOWED TO PARTICIPATE TO CFD UNDER HYBRID CONFIGURATION?

- Several EU Member States, **hybrid projects** are increasingly being included in public support schemes (e.g. CfDs), highlighting the **growing need for system flexibility**
- BESS are generally allowed when electricity is stored before being injected into the grid (**behind-the-meter BESS**)
- At the European level, some countries have implemented **dedicated regulated schemes** (Italy, Hungary, Greece), whereas others facilitate BESS deployment through **specific policy measures** (France)



# A GOOD COMPLEMENTARITY?



# VICARI BESS PROJECT

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# INSPIRING CHANGE TO POWER THE FUTURE

**Paola Boccardo** - Regulatory, market analysis & scenario
**Francesco Peccianti** - Energy Studies

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