

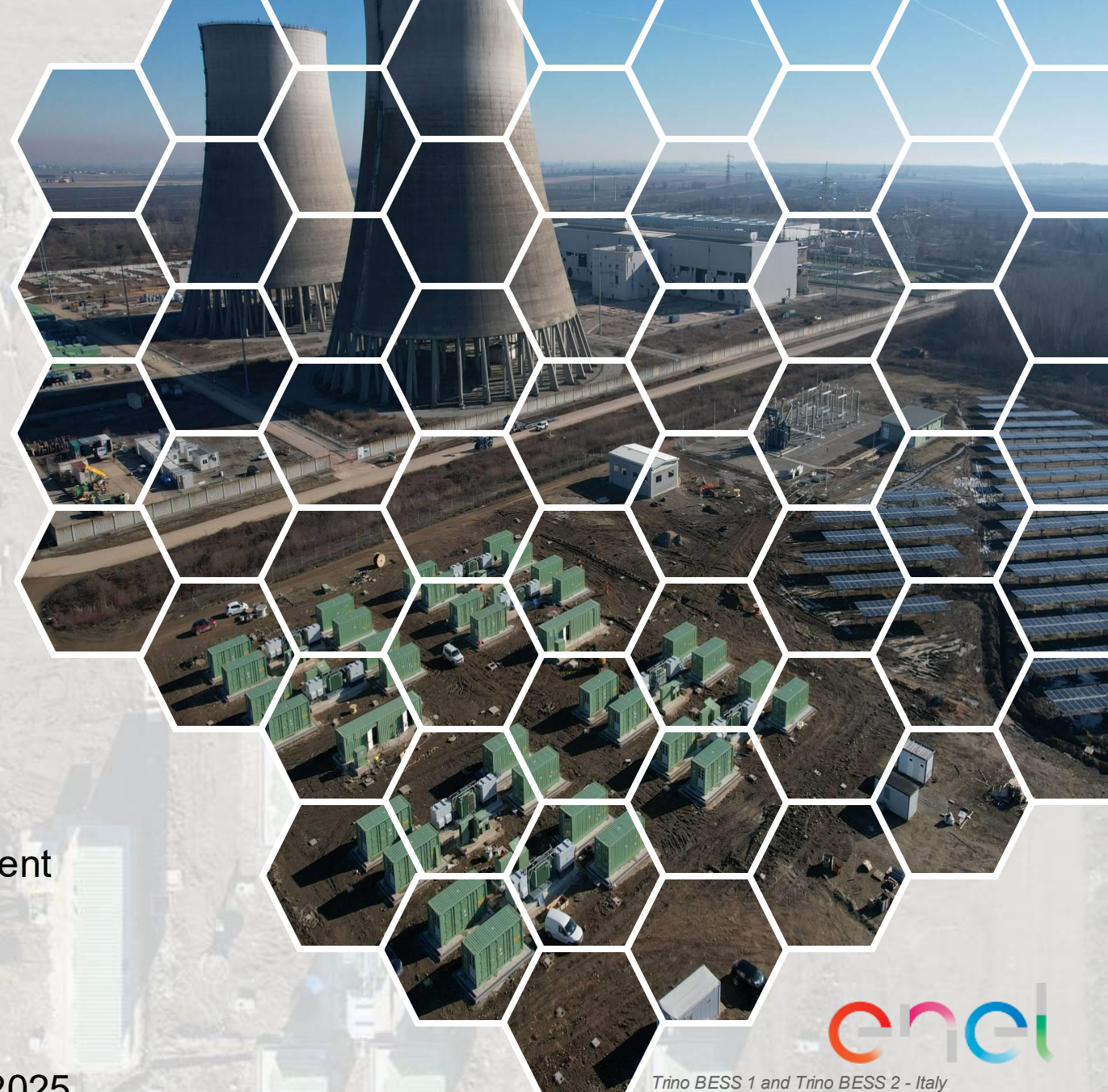
9th AIEE Energy Symposium

Current and future challenges to Energy Security

Grid security and energy storage

Giuseppe Cicerani, Head of Business Development
Energy Storage (Global) – Enel Green Power

Rome, La Sapienza University, November 20th, 2025



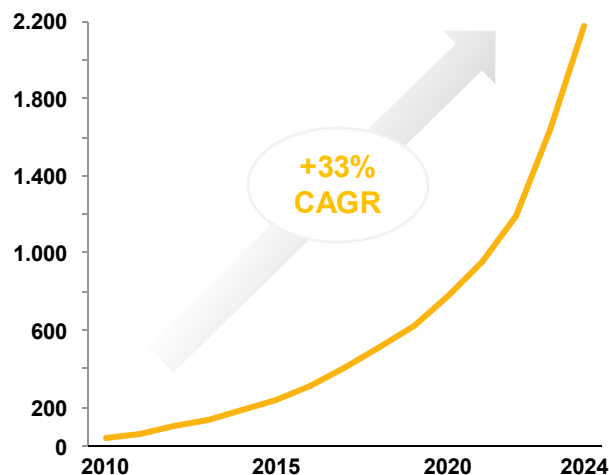
Trino BESS 1 and Trino BESS 2 - Italy
30MW/ 119MWh + 209MW/835MWh



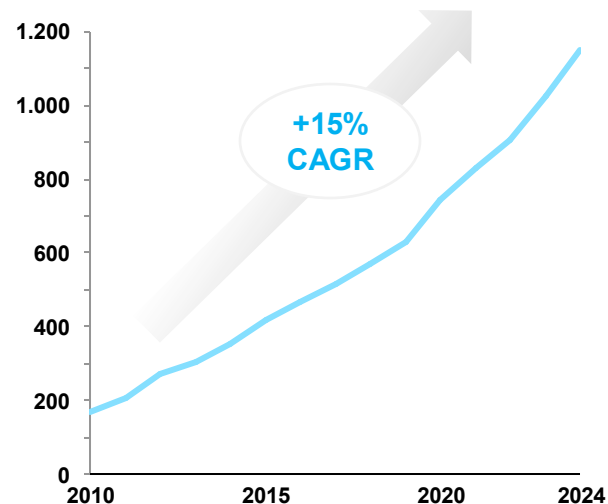
Battery storage is scaling exponentially

Growing renewable penetration and maturing technology drive higher demand for energy storage installations

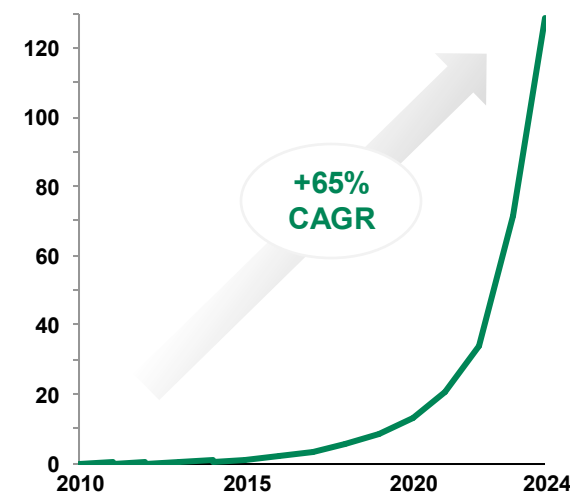
Global Installed Capacity PV (GW)¹



Global Installed Capacity Wind (GW)¹



Global Installed Capacity BESS (GW)¹



BESS shows a **steep growth rate**, reflecting a technology **maturing fast**, driven by system operators and developers deploying storage to provide **flexibility**, **integrate renewables**, and **replace retiring thermal capacity**.

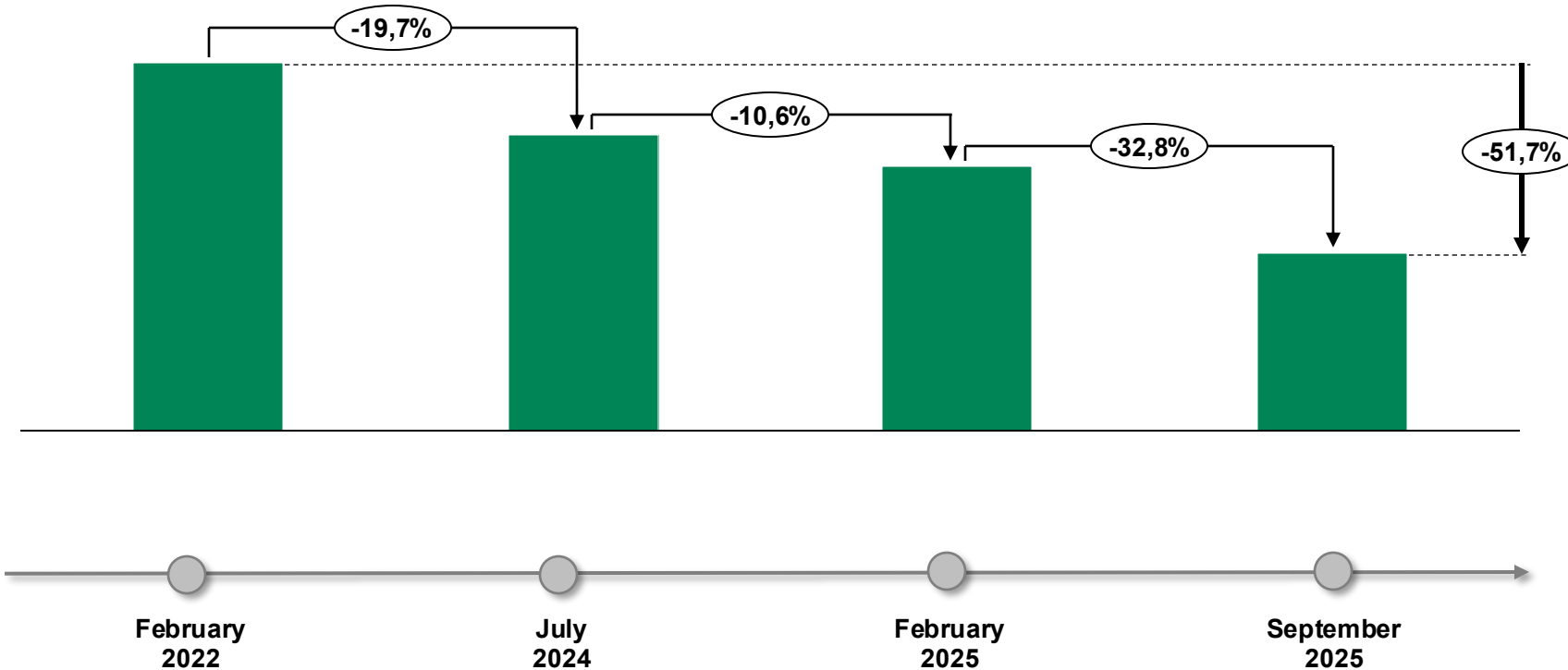
Main drivers of BESS exponential growth:

- **Regulatory frameworks** are being implemented across different geographies, making a BESS an investable business case
- **Technological evolution** is improving project economics mainly due to:
 - *reducing costs*
 - *increasing energy density*

The pace of capex reduction is accelerating



EUR/kWh full installed system



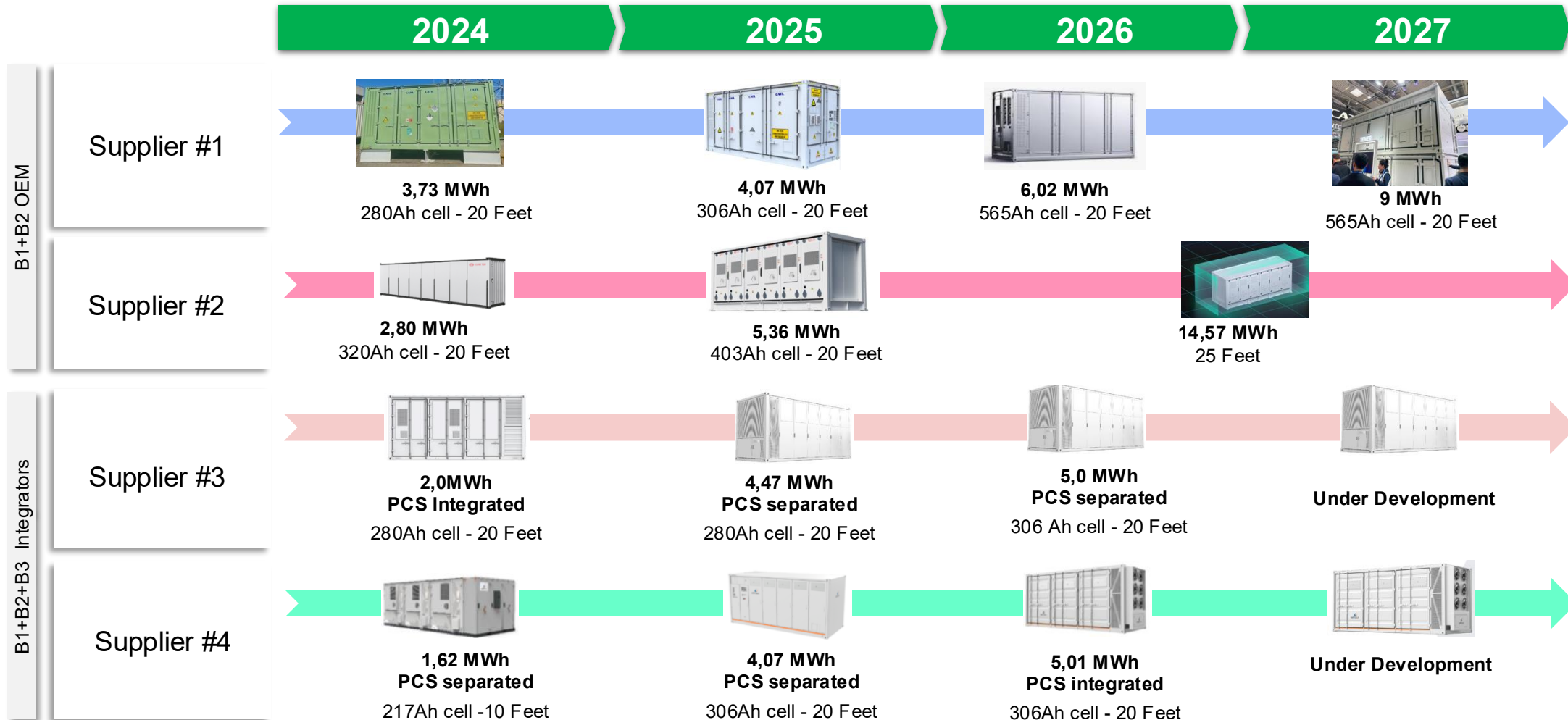
Timeline

On the full system scope the market shown a capex reduction of more than 50% in just 3 years

And so the deployment of new products



The growth in energy density is also showing an exponential path



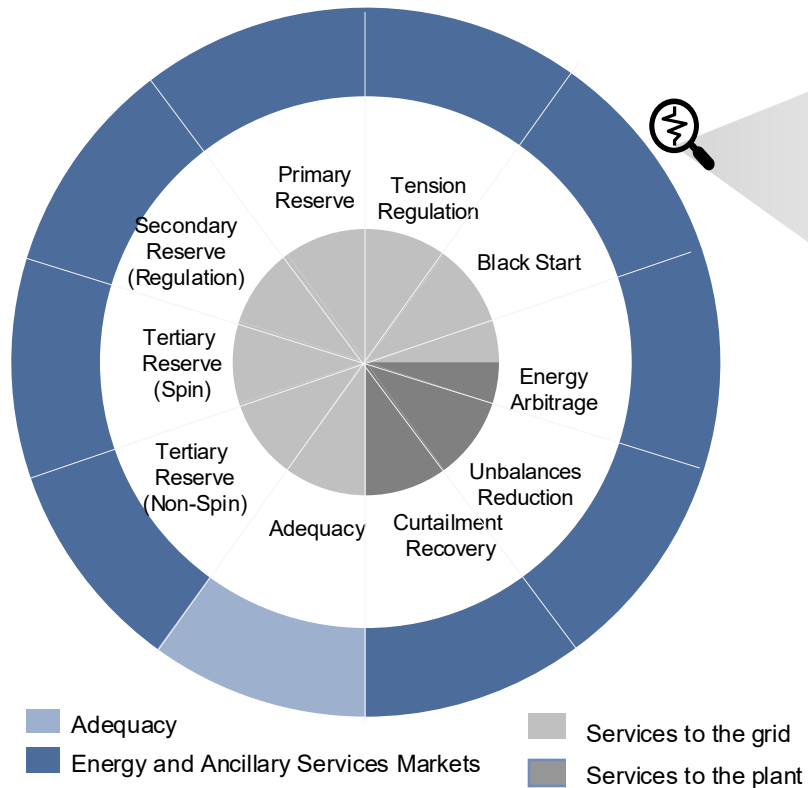
New products are entering into the market every year



New regulatory schemes are being introduced

Main markets

Energy Storage Applications



Revenues Streams

Country	Energy and Ancillary Services Markets	Adequacy (often regulated)	Long-Term Remuneration	Other Support Schemes
ITALY	Existing: Energy Arbitrage, Secondary, Tertiary Planned: Primary (from 2026)	Existing: Capacity Market (reg. 15y)	Existing: MACSE tenders (overgeneration)	-
SPAIN	Existing: Energy Arbitrage, Secondary, Tertiary	Emerging: Capacity Market (reg.)	Absent	EU Recovery Fund/FEDER
BRAZIL	Absent	Existing: LRCAP 2025 (reg.)	Absent	-
SOUTH AFRICA	Absent	Absent	Existing: ESIPPPP, BESS Stand Alone	-
CHILE	Existing: Energy Arbitrage, Ancillary Services	Existing: Potencia Suficiencia	Absent	-
COLOMBIA	Planned: Energy Arbitrage, Ancillary Services	Absent	Absent	Favorable tax regime (1715 Law) for RES+BESS
GREECE	Existing: Energy Arbitrage, Ancillary Services	Absent	Absent: Grants + two way CfD 3 windows tender concluded in March 2025	Merchant Call for 4.7GW BESS to provide priority grid connection
AUSTRALIA (NEM)	Existing: Energy Arbitrage, Ancillary Services	Absent	Existing: CIS and LTESA Tenders	-
US	Existing: Energy Arbitrage, Ancillary Services	Absent	Absent: RES+BESS, RFP	Standalone ITC = 30% of eligible capex +10% EC +10% local content

Some markets are introducing **regulated schemes** as an alternative to purely spot market revenues.



Italy has one of the most structured market design

MACSE (long duration) and Capacity Market auctions



Capacity Market auctions

MACSE

Tender scope

- Long-term adequacy remuneration (bid €/MW-y)
- **New capacity demand especially in the North**

- Auctions for long-term contracts for **storage capacity** (expected **50 GWh at 2030**, of which **10 GWh at 2028**) in the **Center, South and islands of Italy** (bid €/MWh-y)

Participation requirements

- *Technology neutral* (thermal, BESS, RES)
- **Authorized and not authorized projects**
- MW bid based on tech-specific derating

- **Separate auctions for BESS and Pumped Hydro**
- **Only fully permitted projects**
- Derating factors for different durations)

Contract obligations

- **Revenue stacking** between regulated and merchant streams (MGP/MSD)
- Awarded Capacity must be available to deliver energy subject to *strike price*
- **15-years contract** (new capacity)

- Almost **fully regulated mechanism**
- Limited *merchant* tail + 20% profit-sharing on MSD revenues
- **15-years contract** for BESS and **30-years contract** for Pumped Hydro

Timeline

- **Next Auction: beginning 2026**
- Delivery (COD) years: next auction **2028**

- **First BESS Auction** held on 30/09/2025 for BESS COD 2028 (10 GWh awarded)

Projects in the North can only bid in the Capacity Market



MACSE demand limited to center-south and islands (50 GWh @2030)

In Italy two alternative route to market for new investments in storage have been setup