

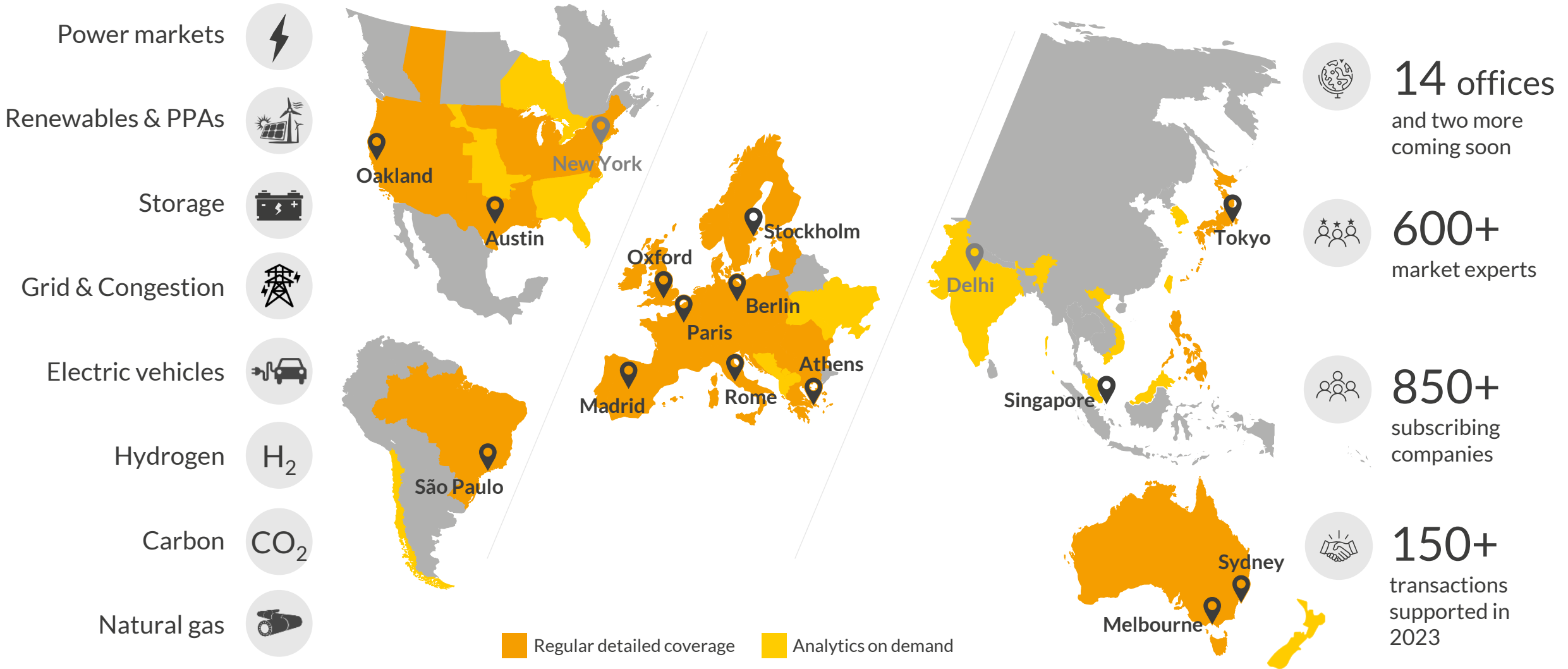
# The role of power storage systems and investment opportunities in Italy

Italian Energy Day

October 29<sup>th</sup> 2024



# Aurora provides market leading forecasts & data-driven intelligence for the global energy transition



# The essential steps towards the decarbonisation of power systems all contribute to increased need for storage...

## Decarbonisation drivers

**1** **Variable renewables (RES) deployment**  
Growing variable renewables capacity in countries' energy mixes

**2** **Thermal generation phase-out**  
Retirement of traditional baseload and thermal assets

**3** **Electrification of other sectors**  
Growing electricity demand thanks to electrification of transport, heat and hydrogen production (electrolysis)

## Effects on power markets and battery storage requirements

### Energy markets (wholesale)

- Low marginal cost techs pushing average prices down – capture prices for RES assets increasingly decoupled from commodity prices
- Increases the intermittency of energy generation (increasingly reliant on weather patterns) leading to an increase in price volatility

*Battery storage complements RES intermittency by charging in periods of high renewables production and discharging when needed*

### Capacity Markets

- Thermal retirement and non-firm RES contribute to drop in firm capacity
- Increase in peak electricity demand can also increase the need for firm capacity

*Battery storage contributes to availability of firm capacity on the system*

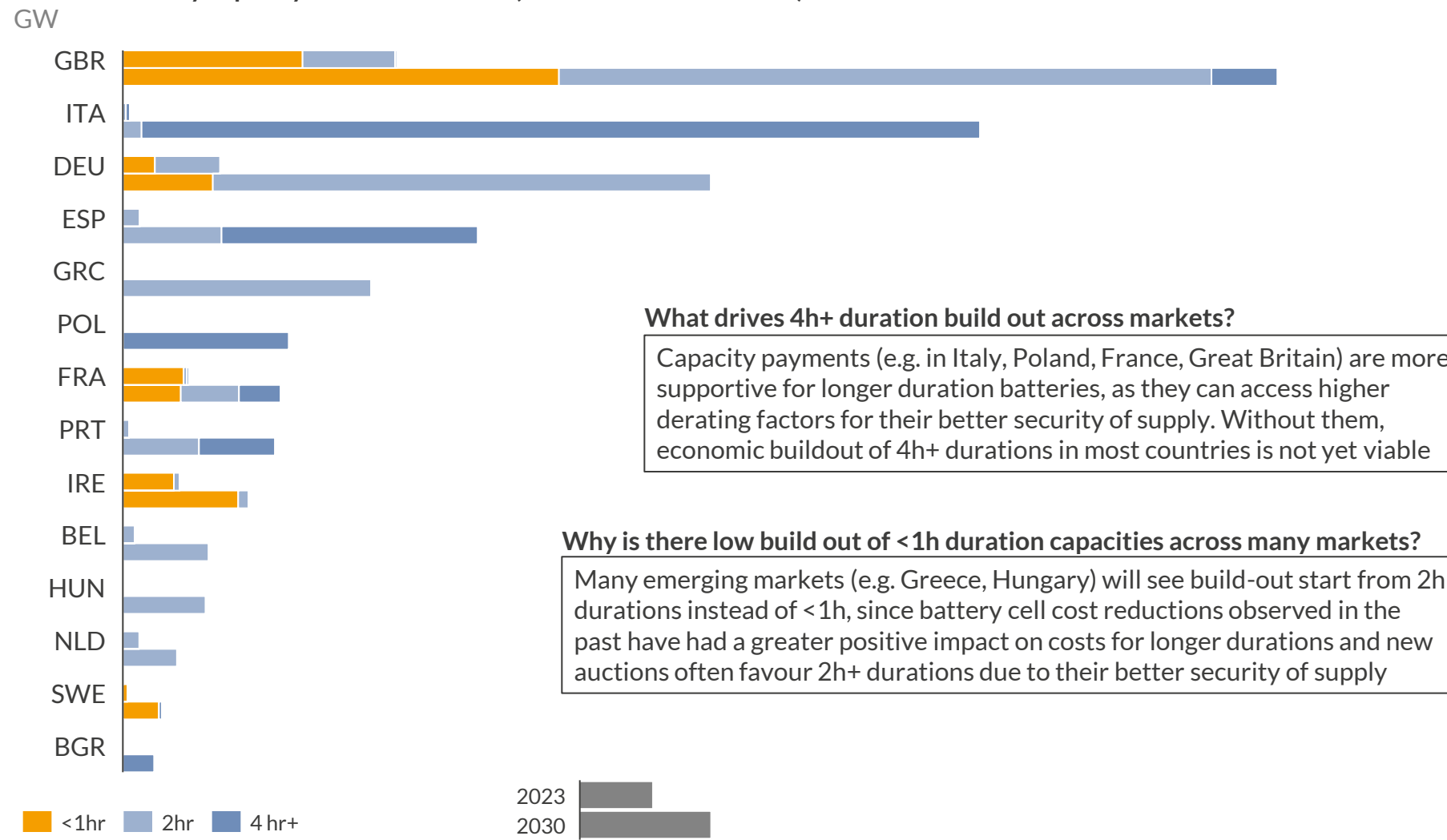
### Balancing and Ancillary Services

- Growth of variable renewables and general power demand increase the need for energy balancing and system services
- Thermal generation currently provides majority of these services, putting pressure to find alternatives to accommodate its retirement

*Battery storage contributes to maintaining security of the grid*

# ... leading to an increase in forecasted installed battery capacity of over 40GW across Europe, with GB and Italy leading the charge

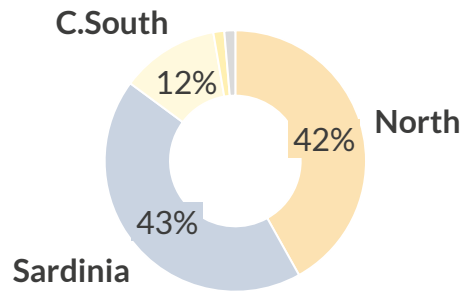
Installed battery capacity in 2023 and 2030 (Aurora Central scenario)



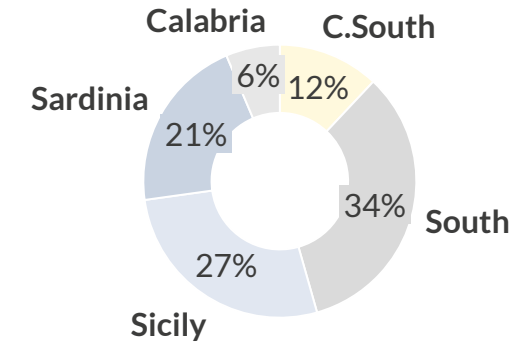
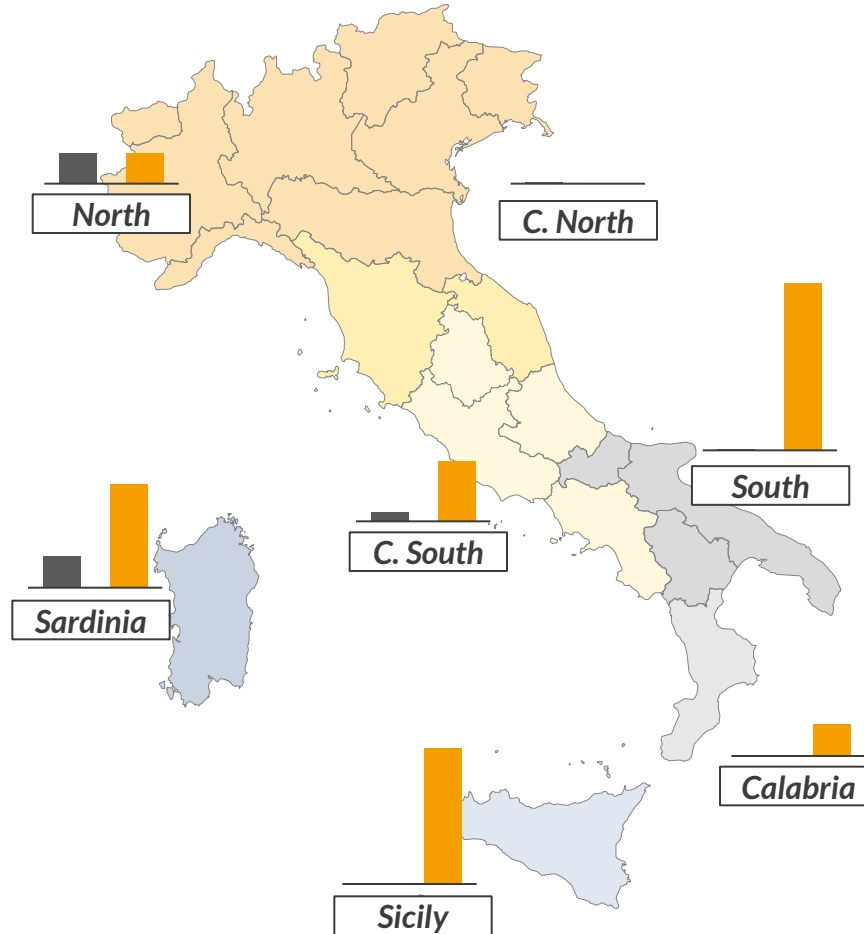
- Germany and Great Britain are market leaders by installed capacity today.
- By 2030, Great Britain and Italy are expected to have the greatest installed capacity of batteries, together making up almost 50% of the total European capacity growth.
- Great Britain, Italy and Germany see the largest capacity additions between 2023 and 2030.
- Significant battery growth is expected in emerging markets, driven by deployment targets in Spain and Greece, along with capacity market support in Poland and France.

# In Italy, full achievement of national targets would see utility-scale battery capacity grow sevenfold to 58GWh by 2030, a ~50GWh increase

Installed utility-scale battery capacity in Italy, 2025 vs target 2030  
GWh



The past Capacity Market rounds awarded 7.4GWh BESS by 2025



The TSO identifies the need of ~58GWh BESS in 2030 +50GWh vs 2025

■ Installed capacity (2024) ■ National target (2030)

# BESS investors in the Italian market can access different business opportunities...

## Dispatch-based business model

### Wholesale Market and Ancillary Services Market (MSD – Mercato dei Servizi di Dispacciamento)

- Arbitrage trading to exploit price volatility in the wholesale market and ancillary services market (MSD)
- In July 2023 participation in the MSD has been extended to new categories of resources on a voluntary basis, including battery storage systems.
- A structural reform of dispatch procurement will be applied after 2025 (TIDE), potentially opening up new market-based services.

### Capacity Market (Ministerial Decree 28/06/2019)

- Capacity-based remuneration: 15-year contract for new capacity, 1-year contract for existing capacity.
- Obligation to participate in wholesale market and MSD.

### Auction scheme for storage (MACSE – Meccanismo di Approvvigionamento di Capacità di Stoccaggio Elettrico)

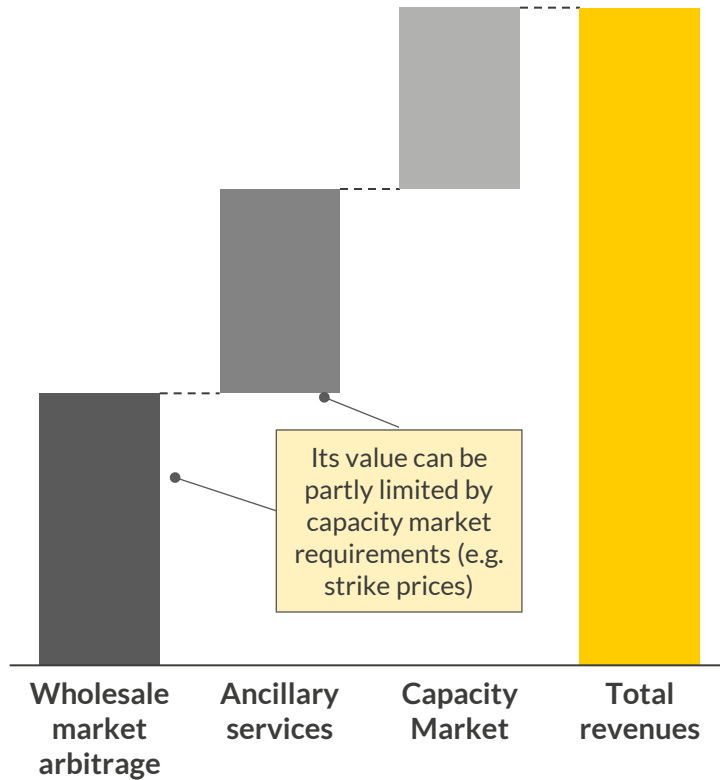
- Proposed auction scheme for the procurement of storage capacity.
- Capacity-based payments for the entire investment horizon in exchange for the obligation to make the capacity available to third-parties through a centralized “time-shifting products” platform, managed by the Energy Markets Manager (GME), and to Terna for use in the MSD market.

## Contracted revenues business model

# ...with routes-to-market allowing different revenue stacking opportunities and risk profiles

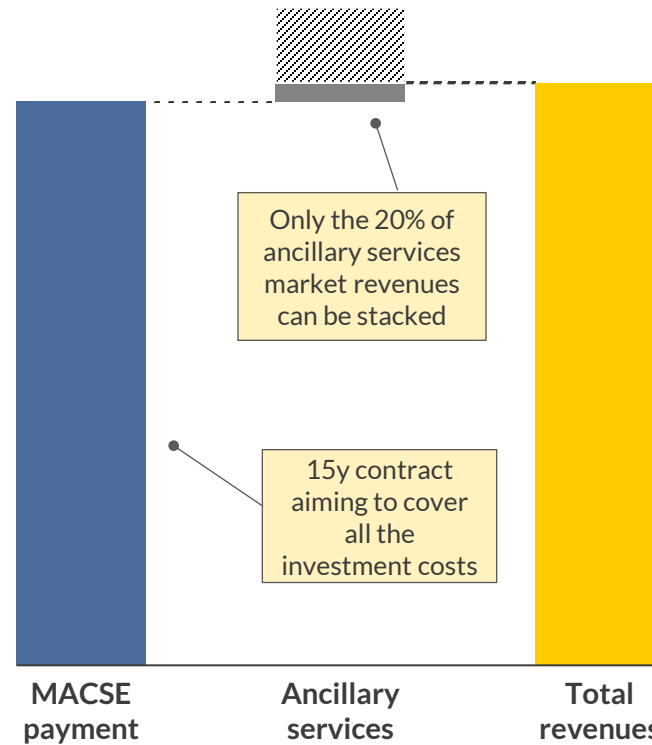
## 1 Dispatch-based business model

Capacity Market + merchant trading  
€/kW



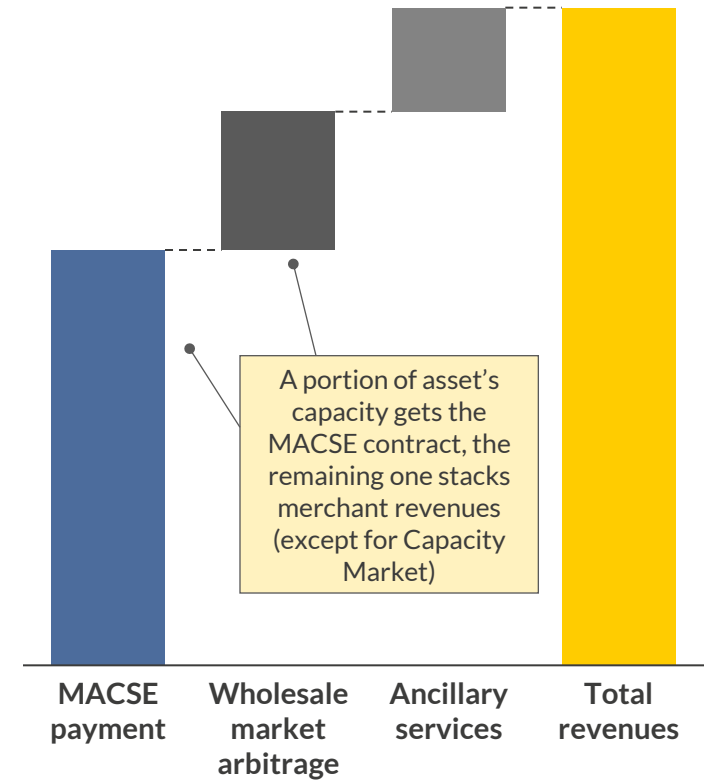
## 2 Contracted revenues business model

Full participation to MACSE  
€/kW



## 3 Hybrid business model

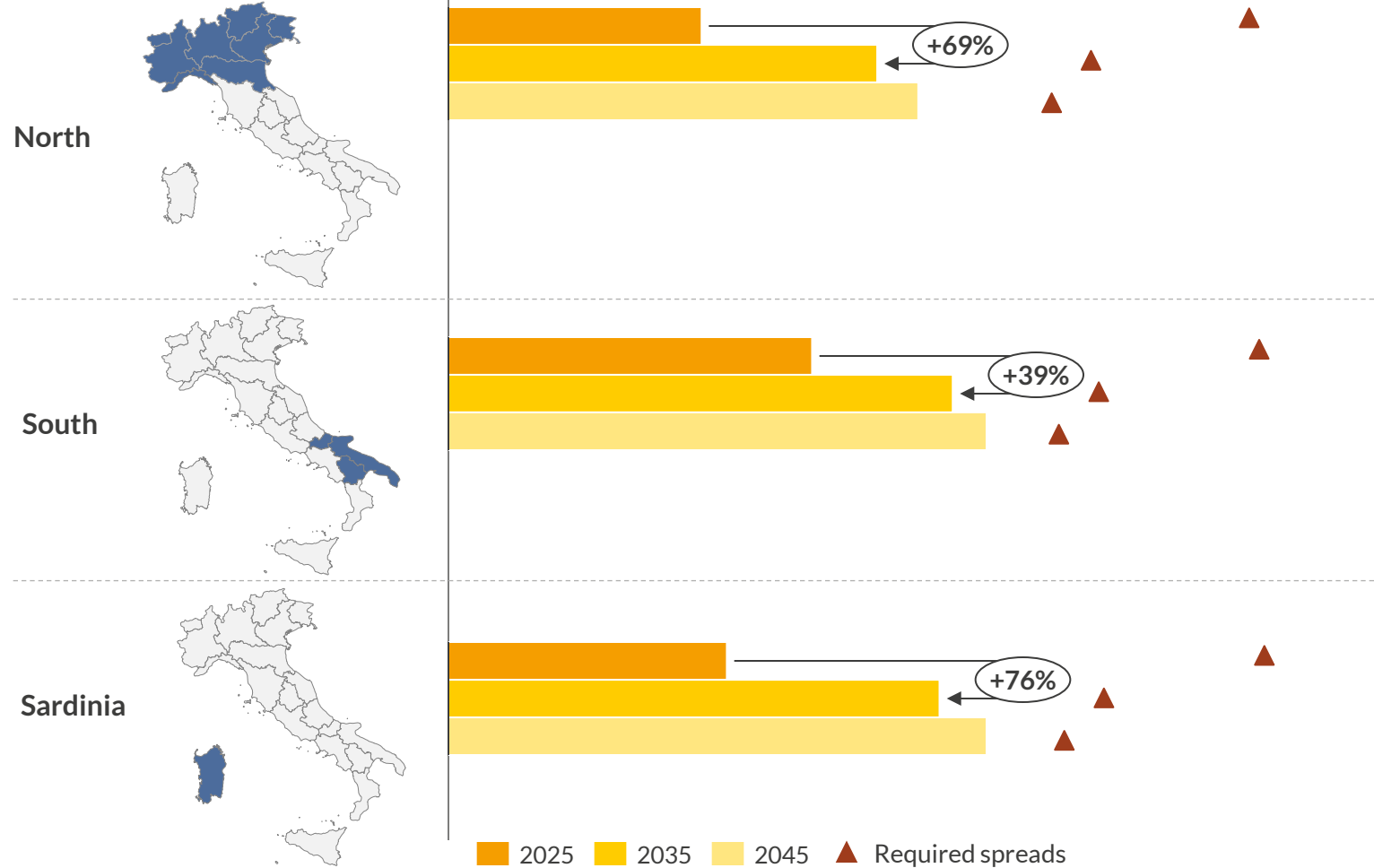
Participation to MACSE + merchant trading  
€/kW




# Growing daily spreads increase opportunities for day-ahead market arbitrage, though they are not sufficient alone to achieve the required rate of return




Average daily 4-hour spreads  
€/MWh (real 2023)







South hosts the highest share of demand from RES  
~70% vs 12% in the North in 2025



North will see a significant increase in RES capacity  
+28GW (+135%) by 2035



Increased interconnector capacity leads to long-term convergence of daily spreads across zones



In the long term, spreads increase at a slower pace and flatten out thanks to increased flexibility  
~19GW nationwide by 2045 (3GW in 2025)

1) Fixed spread necessary to reach an IRR of 11% over the lifetime of the battery; values for required and realized spreads are theoretical and based on no battery degradation and 100% system efficiency. Including these would further increase the disparity between the two.






# Conversely, the MACSE business case is not exposed to merchant risks as it offers predictable revenue for 15 years

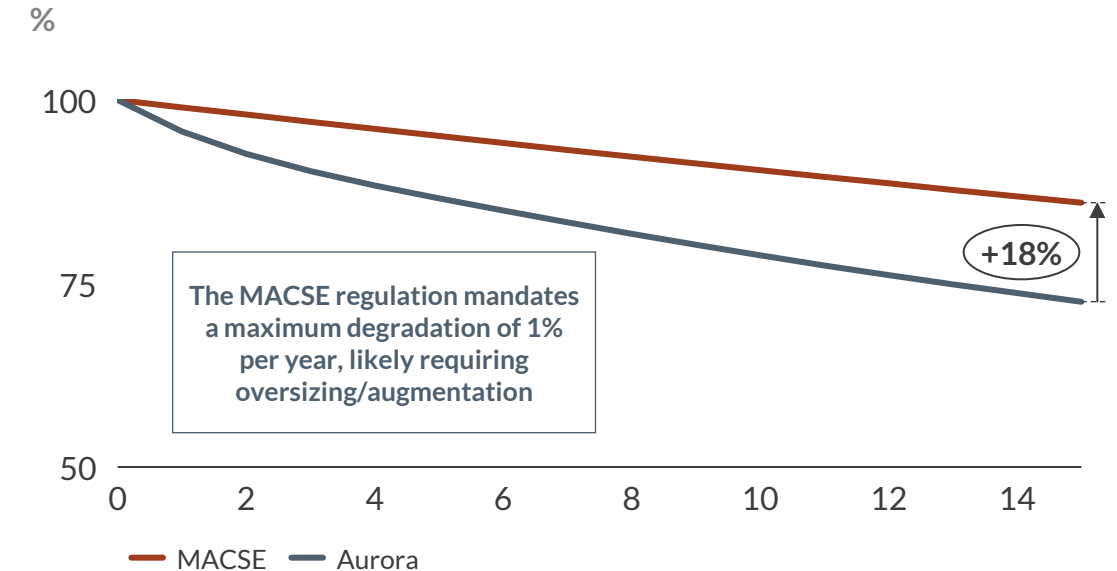
## MACSE contract payments

- MACSE payments (€/MWh) are fixed for 15 years and are partially adjusted for 20% of yearly inflation
- Awarded capacity receives fixed payments determined through a pay-as-bid auction scheme
- The bid submitted in MACSE auction should aim at recovering capital and operational costs, including the remuneration of invested capital

## Summary of accessible revenue streams

Wholesale Market		Storage capacity is pooled into <i>time-shifting</i> products and sold to third parties
Ancillary Services Market		The BESS owner is entitled to retain only 20% of MSD margins
Capacity Market		MACSE revenues are not stackable with Capacity Market revenues

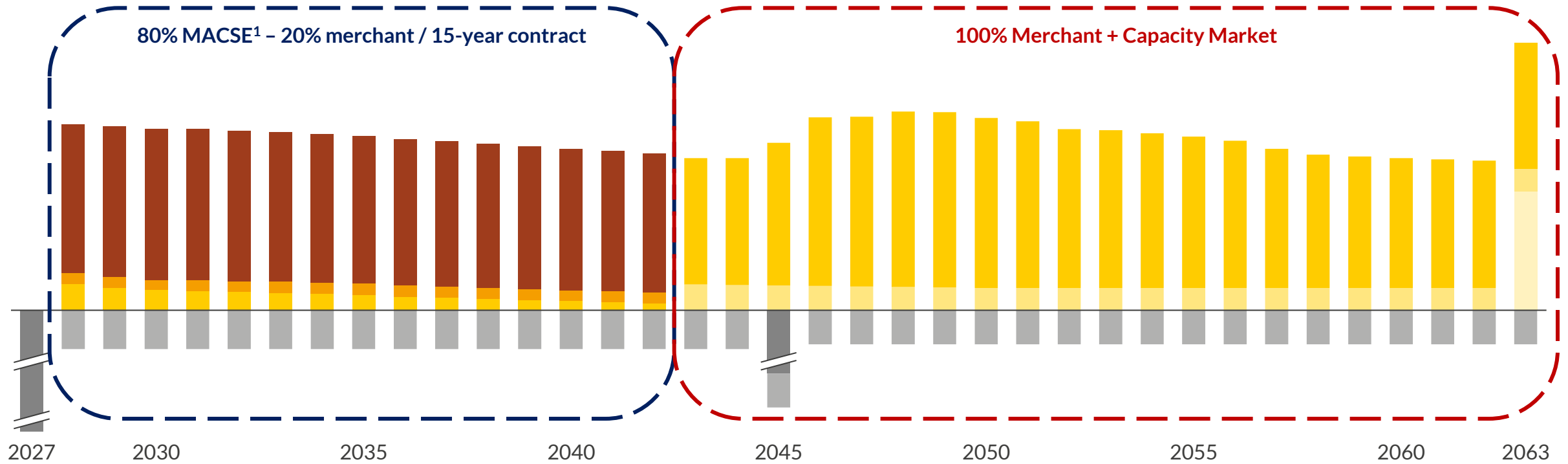
## MACSE permitted degradation vs Aurora degradation curve<sup>2</sup>



1) Assuming 1 cycle/day.

# An asset can participate in MACSE with only a share of its capacity, avoid additional costs of oversizing & gaining merchant upside

MACSE & merchant split investment case - 4h asset, South, COD 2028  
 €/kW (real 2023)



■ Revenues - MACSE 
 ■ Revenues - MSD profit sharing 
 ■ Revenues - Energy arbitrage 
 ■ Revenues - Capacity Market 
 ■ Revenues - End of life value 
 ■ CAPEX 
 ■ OPEX

1) Initial % of asset dedicated to MACSE will increase over time to account for permitted degradation profile of 1%/year in the MACSE not being sufficient.

## Details and disclaimer

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