



**Naturgy** 

# Storage Development in Spain

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# Storage Development

Countries with high penetration of renewables, high flexibility, and firm capacity requirements are those countries with mature storage markets and sustainable revenue models.



Different mechanisms rise the storage development, and every country adopt different strategies:

- ➔ Renewable generation manageability and **PPA requirements** force the growth.
- ➔ **Regulation requirements**
- ➔ **New energy or capacity markets for storage**
- ➔ **Grants, tax reduction,...**

## Storage development in Spain



Spain has increased renewable penetration the last years...

> **40%** of electricity production is renewable

# Storage development in Spain

Spain has a renewable electricity generation of 42.2 % of total generation in 2022 (46.6% in 2021) and targets of **74% in 2030** and 100% in 2050.

The increase in the penetration of renewables in the Spanish grid is raising significant challenges that need to be tackled mainly in the last two years:

- > Non-manageable renewable energy production
- > Mismatch of supply and demand
- > Sudden drops in production



Storage is essential in the Spanish electrical system, but it is a necessary condition, not sufficient, for its development.



# Storage development in Spain



*There are three key elements in storage development*

Regulation



Capex

Revenue



The **Spanish government considers Energy storage a pillar** supporting energy transition strategies **to provide flexibility and firm capacity** to a renewable electricity system; it is evident in the development of **regulation and markets (incomes)**.

▪

# Storage development in Spain



Regulation



Capex

Revenue

- ✓ Storage permitting has a regulatory framework that allows the development of hybrid and stand-alone projects. A complete regulatory framework is expected in the short term.
- ✓ Energy market participation is under development:
  - ✓ Balance markets (regulated)
  - ✓ Ancillary markets (in progress)

## Goals

2030 PNIEC

› 2,5 GW battery storage

› 3,5 GW pumped storage

18,5 GW in the non approved new version

## Grants

- › NextGen and REPowerEU.



## Regulation

- › Regulation and permitting are almost developed

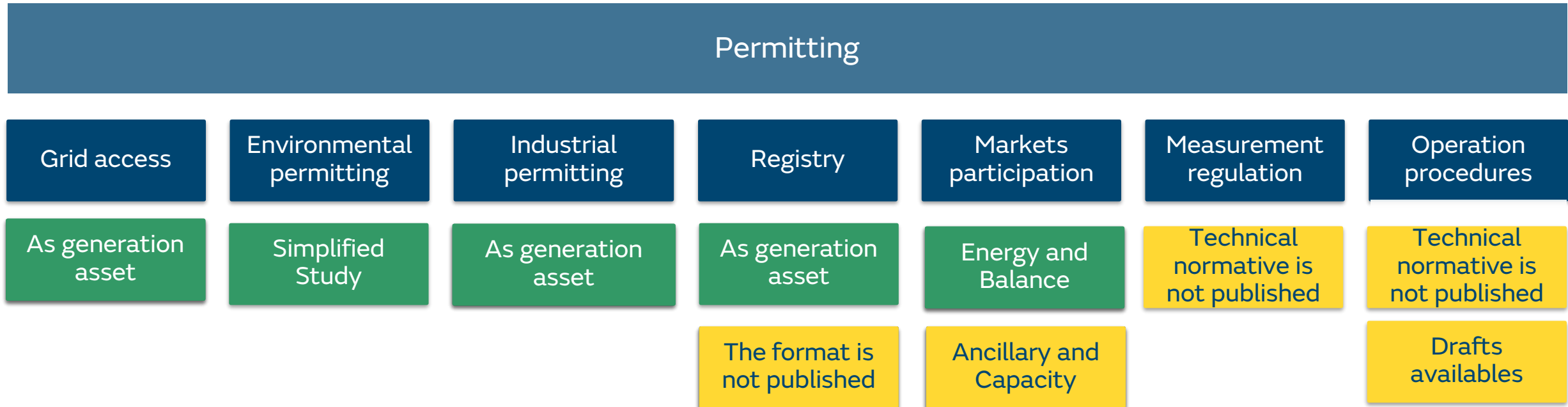
## Markets

- › Storage participation: Energy markets, aFRR, mFRR and RR and ancillary services
- › Capacity Market (under development)



# Regulation

Analysis of key milestones of permitting



Storage can be developed with the current regulatory framework, however the technical normative in draft can impact on economic models.

Regulation



Capex

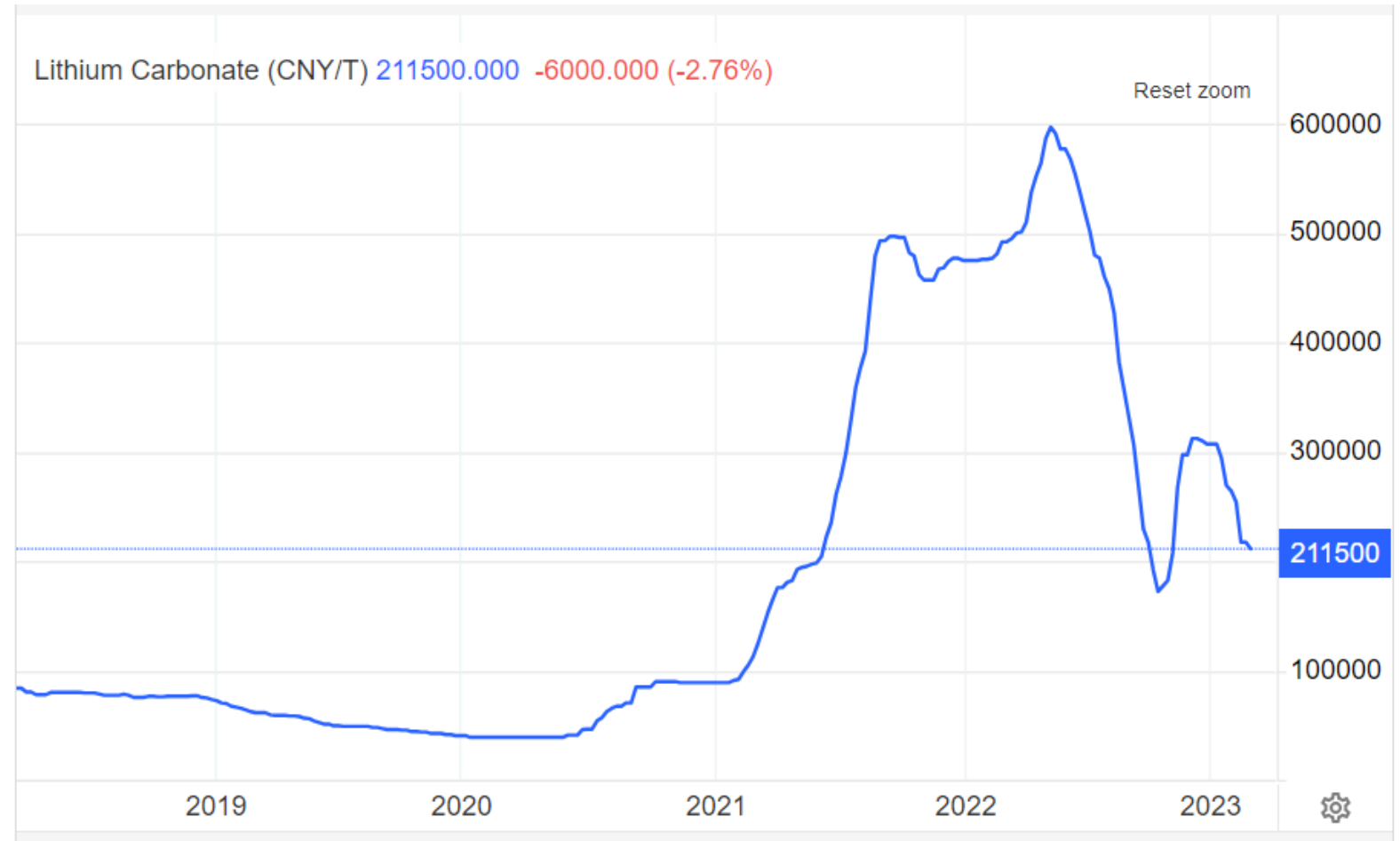
Revenue

## Capex

Lithium price trend is key because Spain has not development inertia and the business case is deficient.

However, it is an external input, for the **global market sets the trend.**

The challenge is to modulate storage incentives development, without going overboard and in a variable environment, with tools such as grants or a capacity market.



Regulation



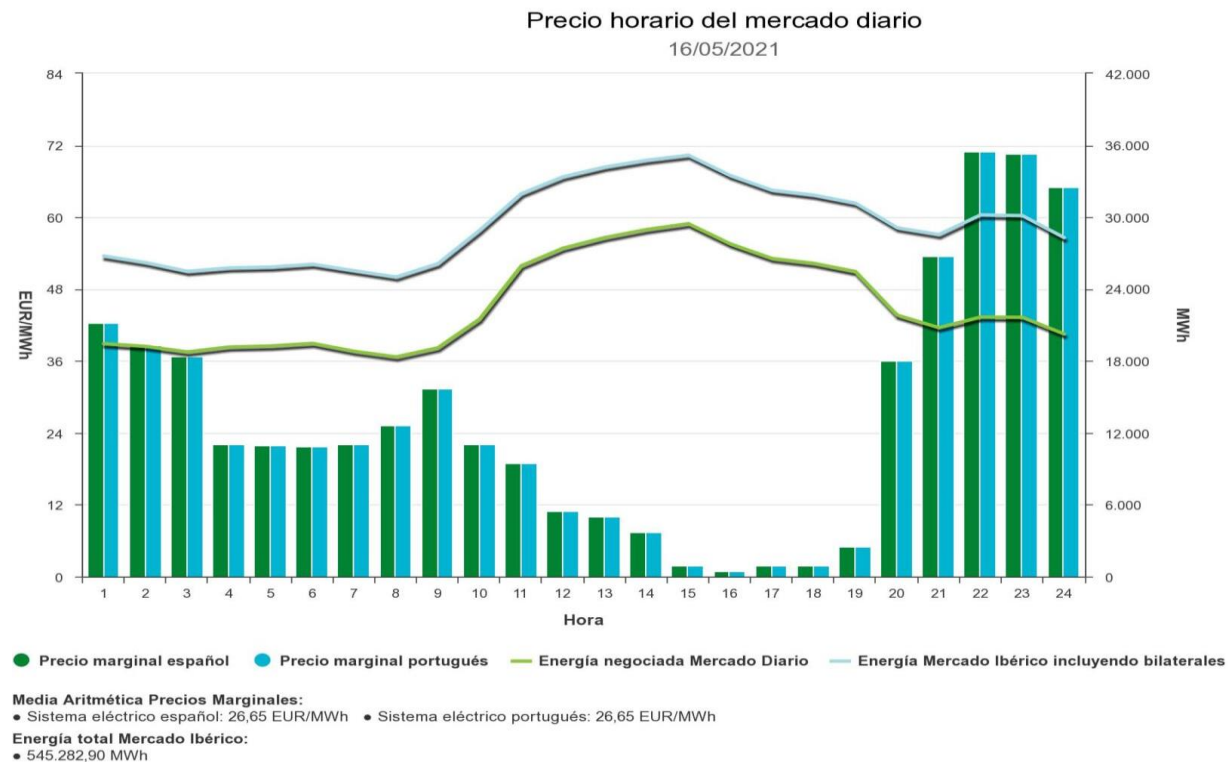
Capex

**Revenue**

- › Markets
- › Configuration

## Arbitrage

The current electricity market is already beginning to show greater volatility and duck curves



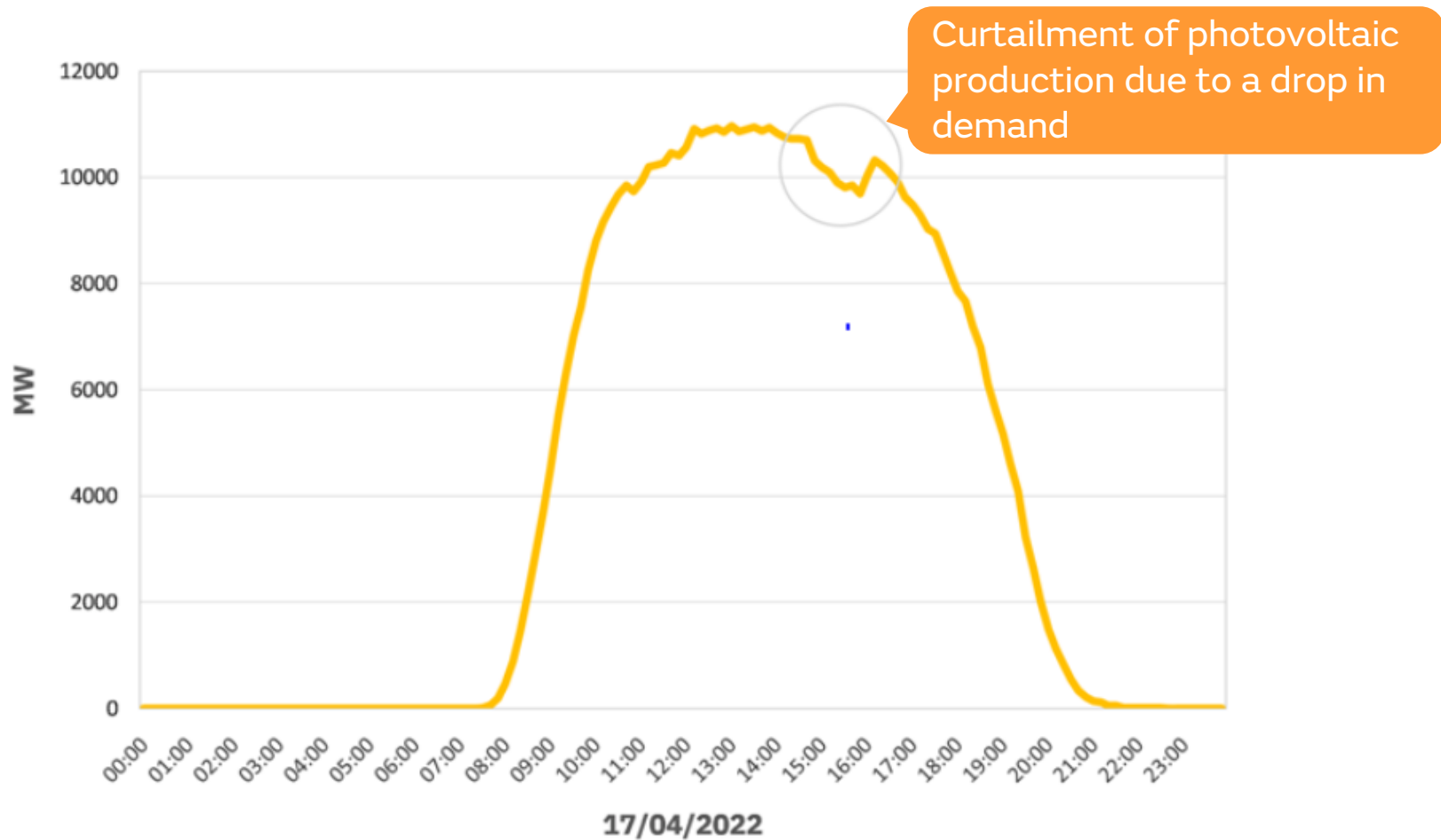
2021 started to have duck curves on some weekends.

In 2023, the energy pool shows this trend more frequently. Spread is significantly higher than before, even on working days.

# Revenue: Markets

## Curtailment

On April 17, 2022, the first general PV curtailment took place.



The profitability of photovoltaic development is being questioned.

However, **arbitrage** with storage **is not enough for a profitable business model.**

## Revenue : Markets

Economic Model 



Markets		Remuneration	State
Energy Markets	MD	✓	
	MI	✓	
	MIC	✓	
Balance markets (regulated)	Primary Regulation (Fast Frequency Market) *	X	
	aFRR	✓	
	mFRR	✓	
	RR	✓	
Ancillary markets (in progress)	Technical Restrictions*	✓ (Not in Fase 1)	Draft
	Power Control*	✓	Sandbox
Grants		✓	Exceptional (until 2026)
Capacity Market		✓	Draft

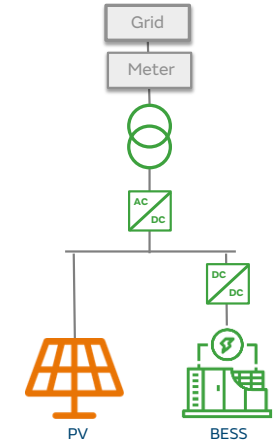
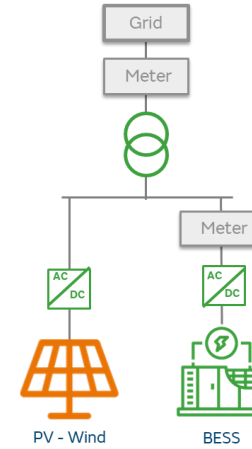
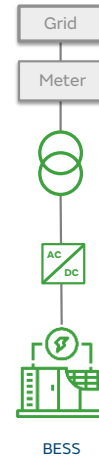
Spanish storage sector demands a **capacity market** that completes the business model and reduces uncertainty.

In the meantime, government has articulated **grants based in Next Gen funds** to help start the deployment.

Primary Regulation , Technical Restriccions and Powe Control (>5MW assets) are mandatory

# Revenu: Configurations

Currently, there is no clarity about the most profitability configuration



**Stand alone**

**AC coupling hybridation**

**DC coupling hybridation**

## Profits

Shifting (Energy Market)



aFRR (regulation zone is mandatory)



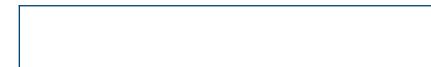
mFRR and RR – Ancillary services



Curtailement decrease



PV Clipping decrease



Energy Market and Power Control (*under development*)



## CAPEX



## OPEX

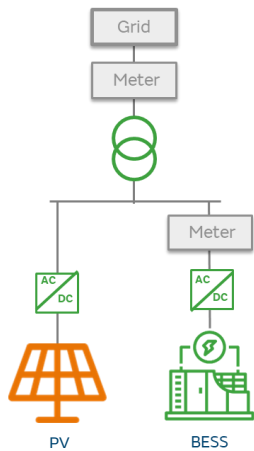




# Configuration

Despite no clarity about profitable between configurations, AC and DC coupling have significant differences to take into account to select the most appropriate one.

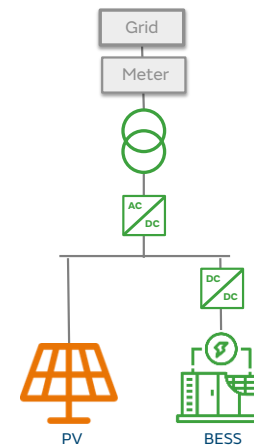
## PV plants + BESS AC Coupling



- > AC configuration allows hybridization without modifying the existing assets (PV maintains grid codes permission and without inverters changeover being required).
- > AC coupling is compatible with the existing feed-in tariff (not DC).
- > AC has more flexibility to participate in balance and ancillary services to complete the business model (vs AC).

New or existing assets: Focus on staking revenius

## PV plants + BESS DC Coupling



- > Decrease CAPEX (VS AC)
- > Optimize plant sizing: decrease curtailment and inverter clipping
- > Grid charge is not allowed.
- > Less flexibility to participate in balance and ancillary services.

Only for new assets: Focus on energy manegability

# Storage development in Spain

Currently, the energy market situation and grants allow the development of profitable projects, but only a few MW.



Other mechanisms such as capacity or flexible markets, will be necessary for a sustainable development in GW.



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