Energy Storage the Spanish case

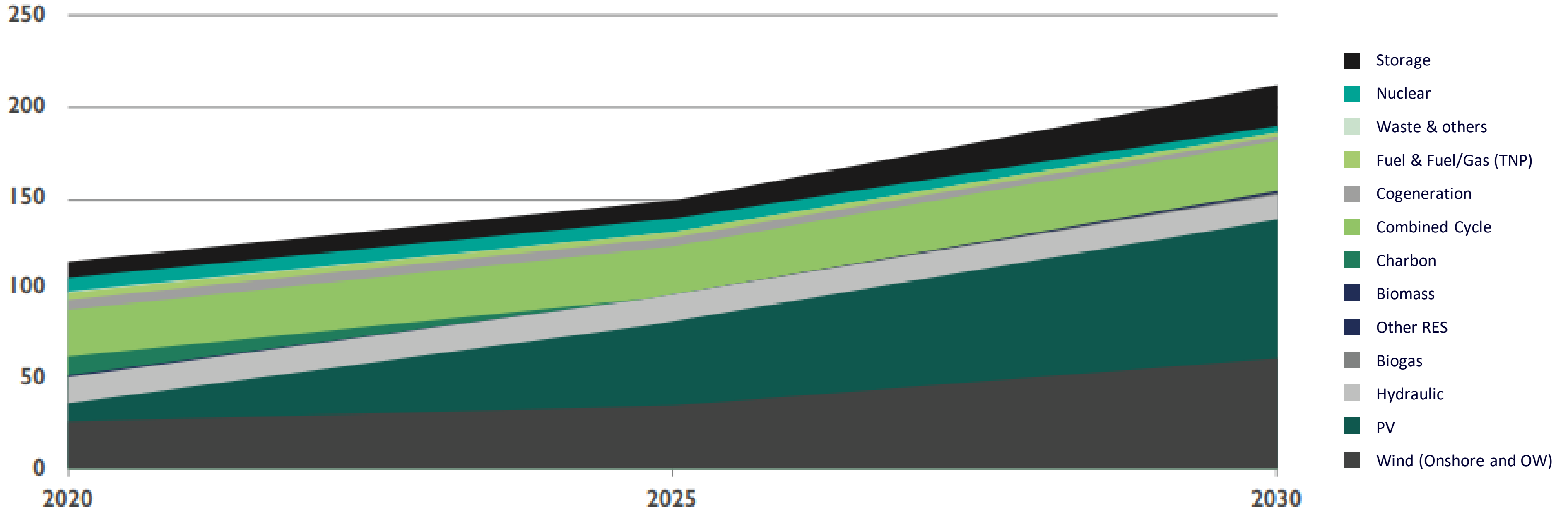
Coniben 2025

Lisboa 28th November 2025

The ground floor

- **The country National Integrated Plan for Energy and Climate (PNIEC 2023-2030) is ambitious**
  - **Reducing by 55% of 2005 emissions**
  - **Increasing the energy efficiency up to a 43% from 2007 by 2030**
  - **Increasing the penetration of renewables up to 48% of total consumption by 20230**
    - 81% of generation from renewables
    - +105GW of RES from 2023 (up to160 GW of renewables by 2030)
      - 62GW Wind (3GW OW)
      - 76GW PV (19 GW SC)
    - 22,5 GW of energy storage (c.12GW from BESS)
    - 19 GW self consumption
    - 12 GW electrolyzers
    - 3,2 GW nuclear
    - Coal phased out

PNIEC 2023-2030 (installed GW)

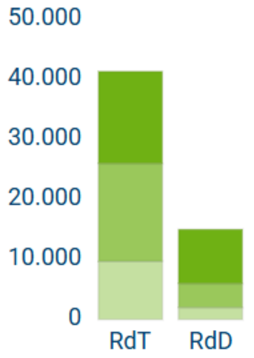


Source: MITECO (PNIEC 2023-2030)

Meeting the generation targets

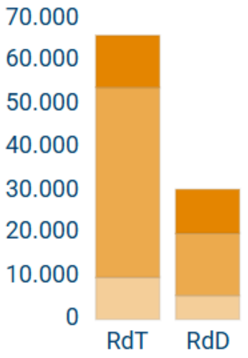
- **The market has been meeting the targets in generation**

Wind (Onshore)



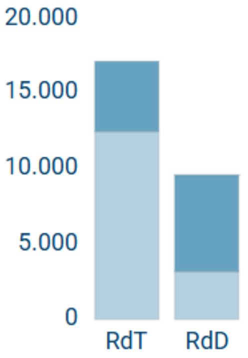
	RdT	RdD
Commissioned	21	9.205
With permits	06	4.051
Ongoing	26	1.709
total	41.053	14.965

Solar PV



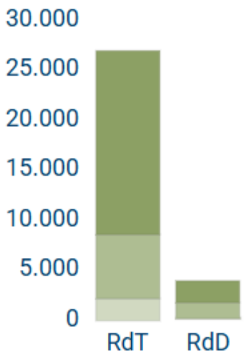
	RdT	RdD
Puesta en servicio	11.939	9.941
Con permisos	44.270	14.396
En curso	9.450	5.602
total	65.659	29.939

Batteries



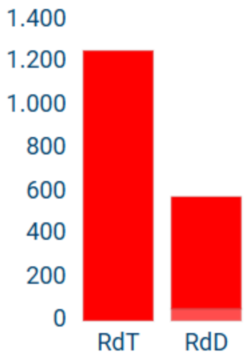
	RdT	RdD
Puesta en servicio	0	14
Con permisos	4.656	6.301
En curso	12.470	3.160
total	17.126	9.475

Hybrids



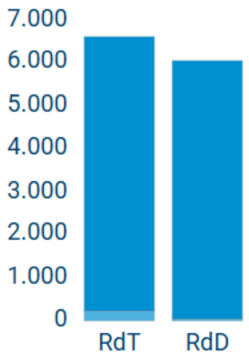
	RdT	RdD
Puesta en servicio	18.507	2.319
Con permisos	6.226	1.525
En curso	2.165	155
total	26.898	3.999

Solar Thermal



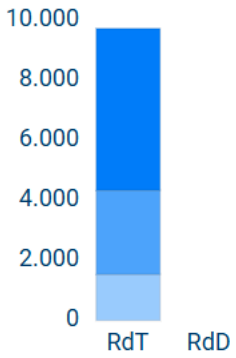
	RdT	RdD
Puesta en servicio	1.247	521
Con permisos	0	50
En curso	0	0
total	1.247	571

Hydraulic



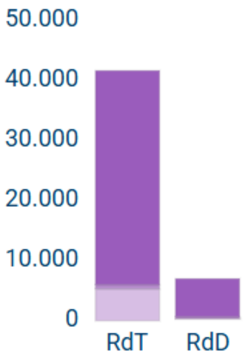
	RdT	RdD
Puesta en servicio	6.402	5.997
Con permisos	191	48
En curso	0	0
total	6.593	6.045

Pumping



	RdT	RdD
Puesta en servicio	5.378	0
Con permisos	2.747	0
En curso	1.522	0
total	9.647	0

Other



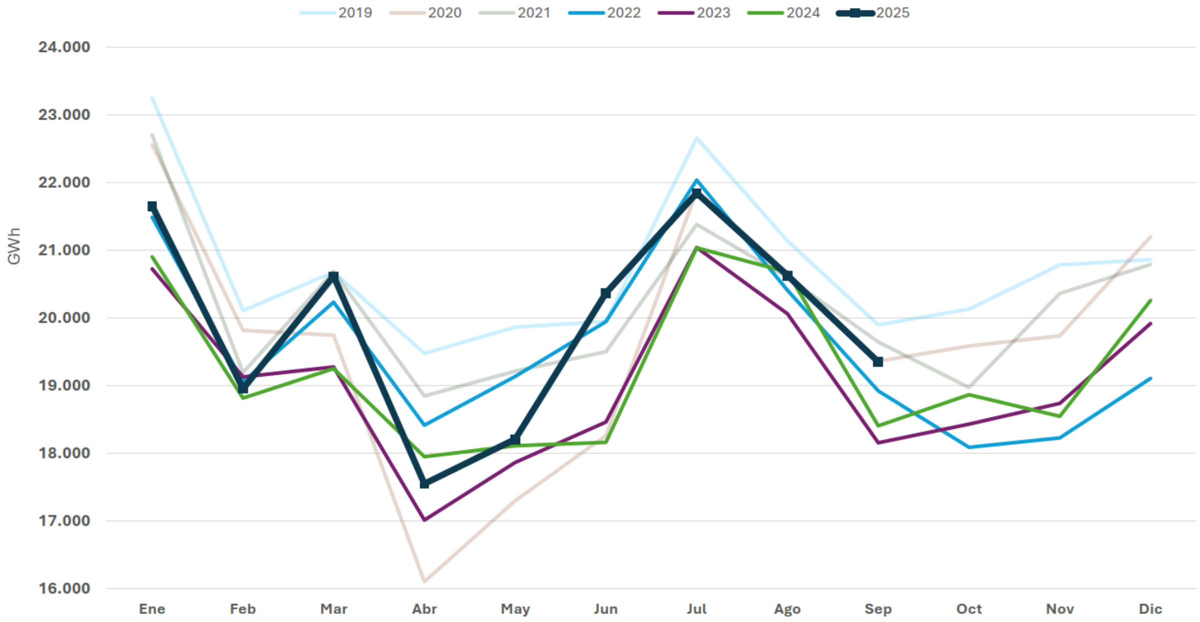
	RdT	RdD
Puesta en servicio	35.442	6.295
Con permisos	505	530
En curso	5.333	34
total	41.280	6.859

RdD: Distribution grid
RDT: Transport grid

Source: REE Nov. 2025

The current situation

- **The energy demand is not increasing at same speed as generation**

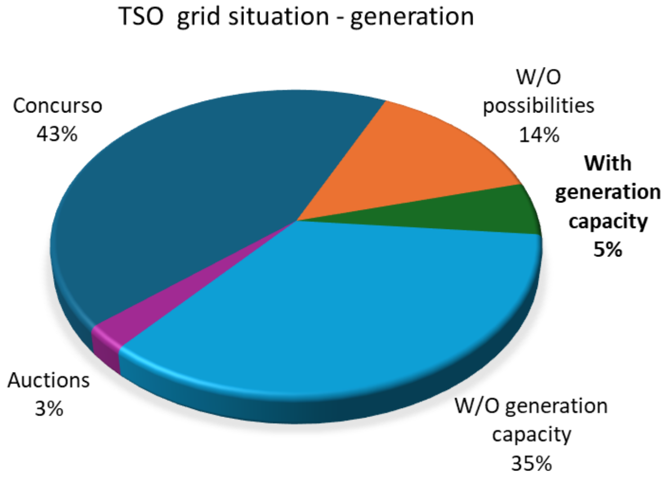


Source: AEE Sept. 2025

- **And the grid is blocked, also because of political reasons**

Available capacity at TSO:

- Generation 5% of the nodes (1,3GW)
- Demand 7% (3,2GW)



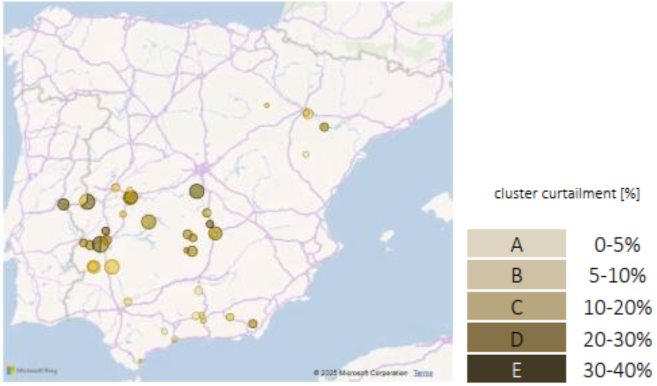
Source: REE Nov. 2025

Current implications in the market

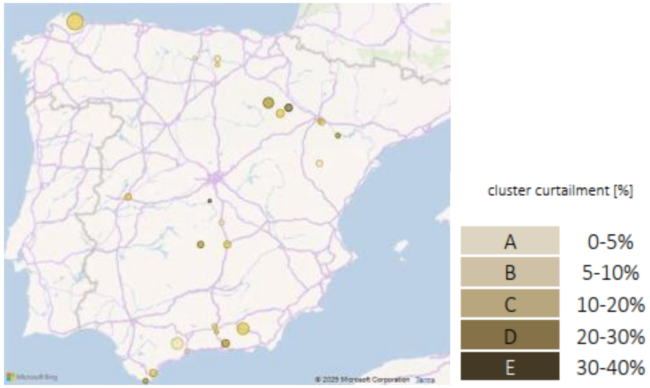
- Generation capacities outpassed the demand
- The large consumers (i.e. DataCenters and Industries getting electrified) have no access to the grid

- **Curtailement increased**
  - It depends on the location although it is frequently widespread

Solar PV

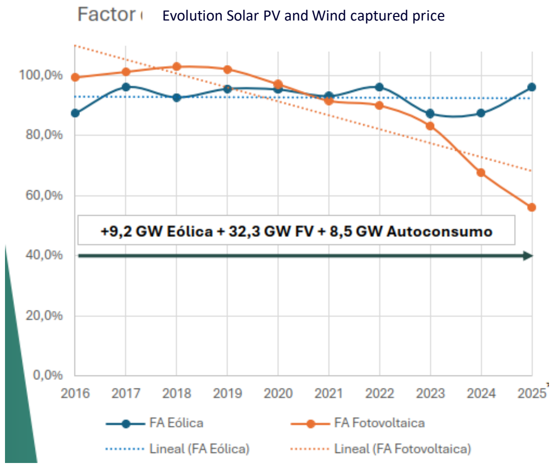


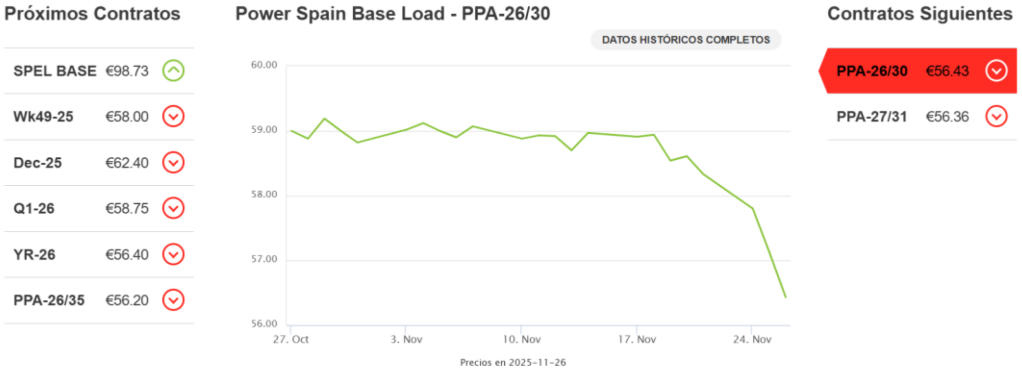
Wind



Source: Alantra Sept. 2025

- **Solar PV and Wind captured price declined**:
  - Finance for non-PPA has dried up
  - 100% merchant structures have disapeared





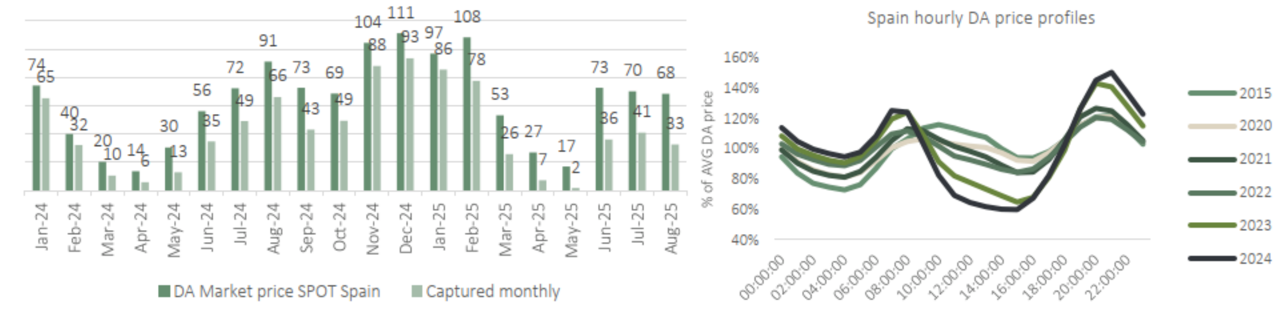
Source: AEE Sept. 2025. OMIP Nov. 2025

The role of Energy Storage

Qair

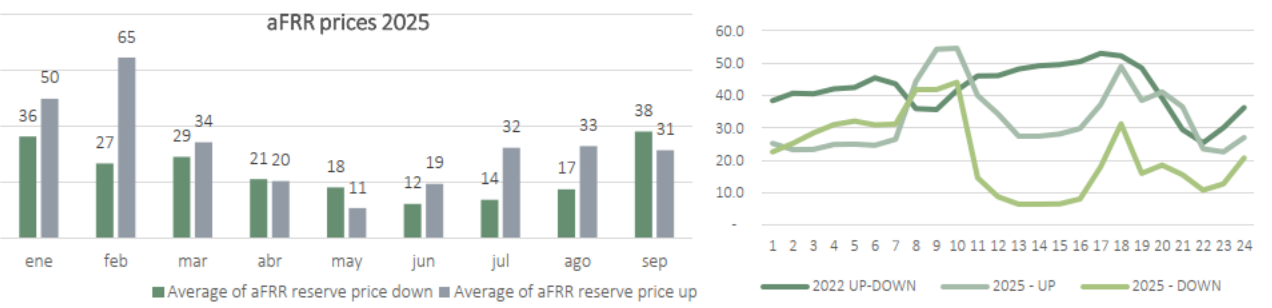
- Falling captured prices and volatile services highlight the growing need for storage and flexibility strategies

Spot price vs PV Captured DA Spot Price Spain €/MWh



Widening gaps between Day-Ahead and PV prices highlight solar cannibalization and monetization challenges

aFRR Reserve Band €/MW/hour



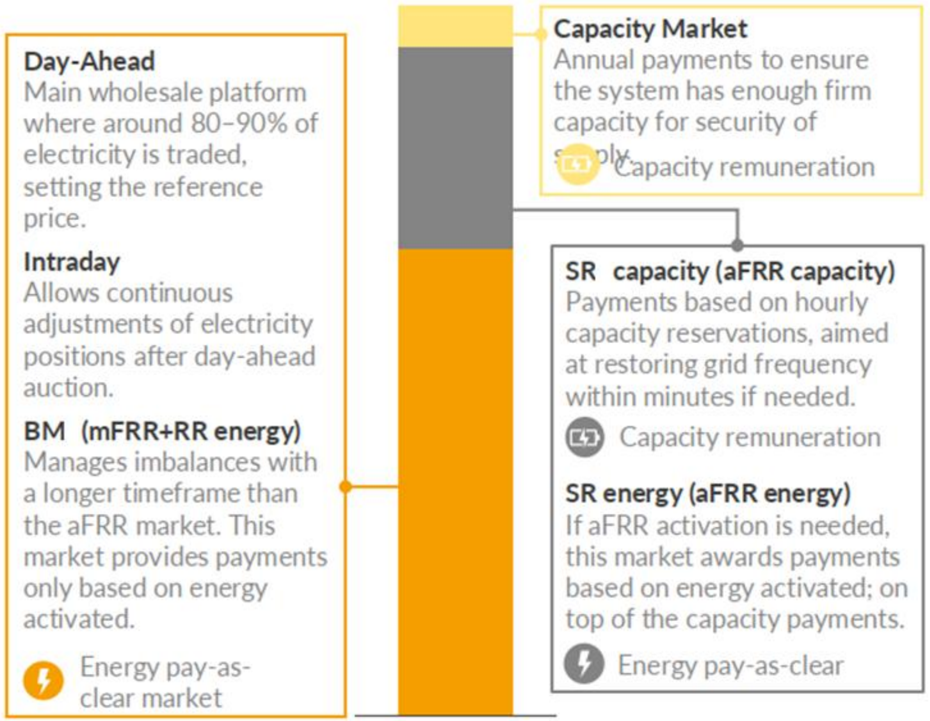
Secondary reserve prices fluctuate sharply, emphasizing the rising importance of flexibility and reserves in Spain

Source: AEPIBAL Sept. 2025

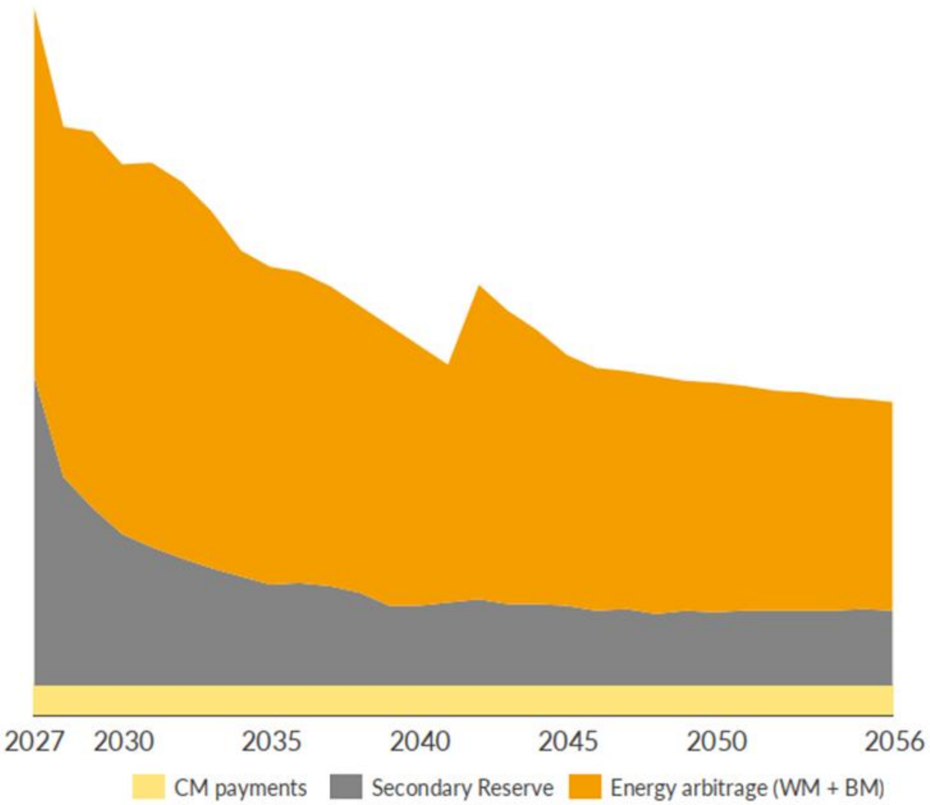
The value of Energy Storage

- Balancing markets cannibalization and new markets driven future business models
- From 2027, BESS can profit from new services leveraging its flexibility
- Considering +6GW of BESS by 2031, balancing markets will decrease due to cannibalization

PV of total gross margins for a 4h battery COD 2027
€/kW (real 2024)



Battery gross margins for a 4h battery COD[2] 2027
€/kW (real 2024)



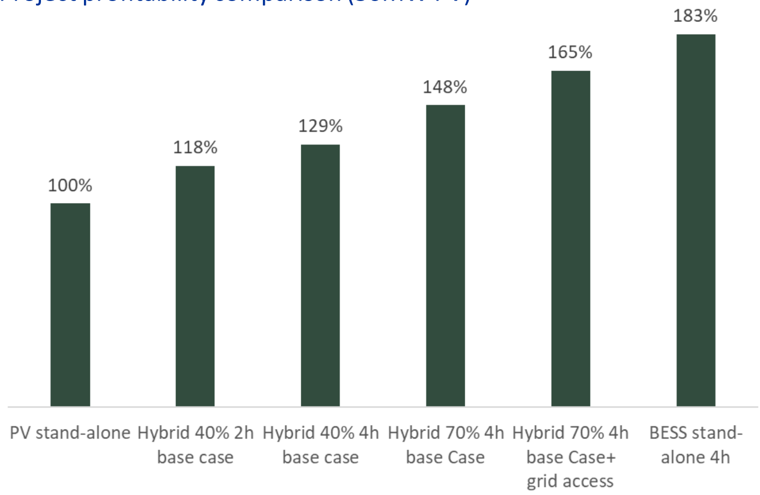
Source: AURORA Nov. 2025

Applied Energy Storage to the real case

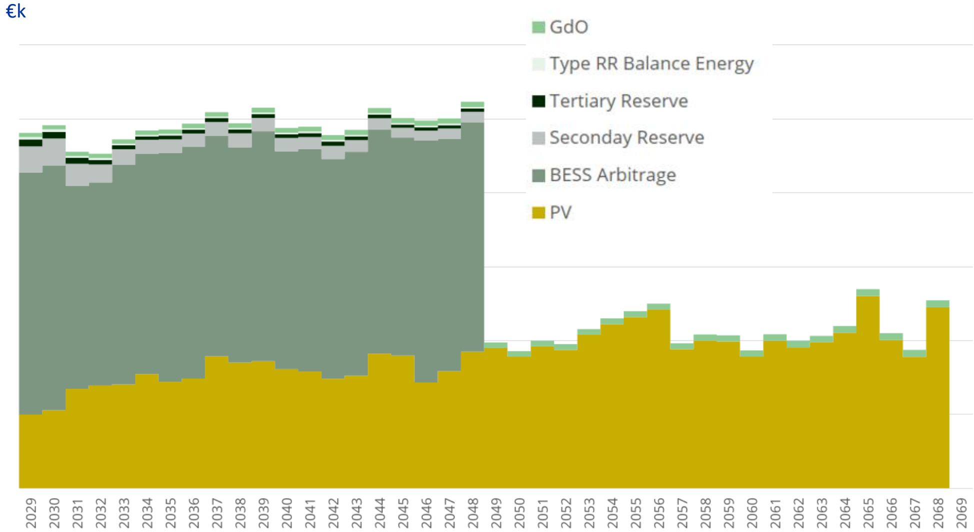
Qair

Even under a conservative scenario, battery hybridization would allow a PV project to become economically viable again

Project profitability comparison (50MW PV)



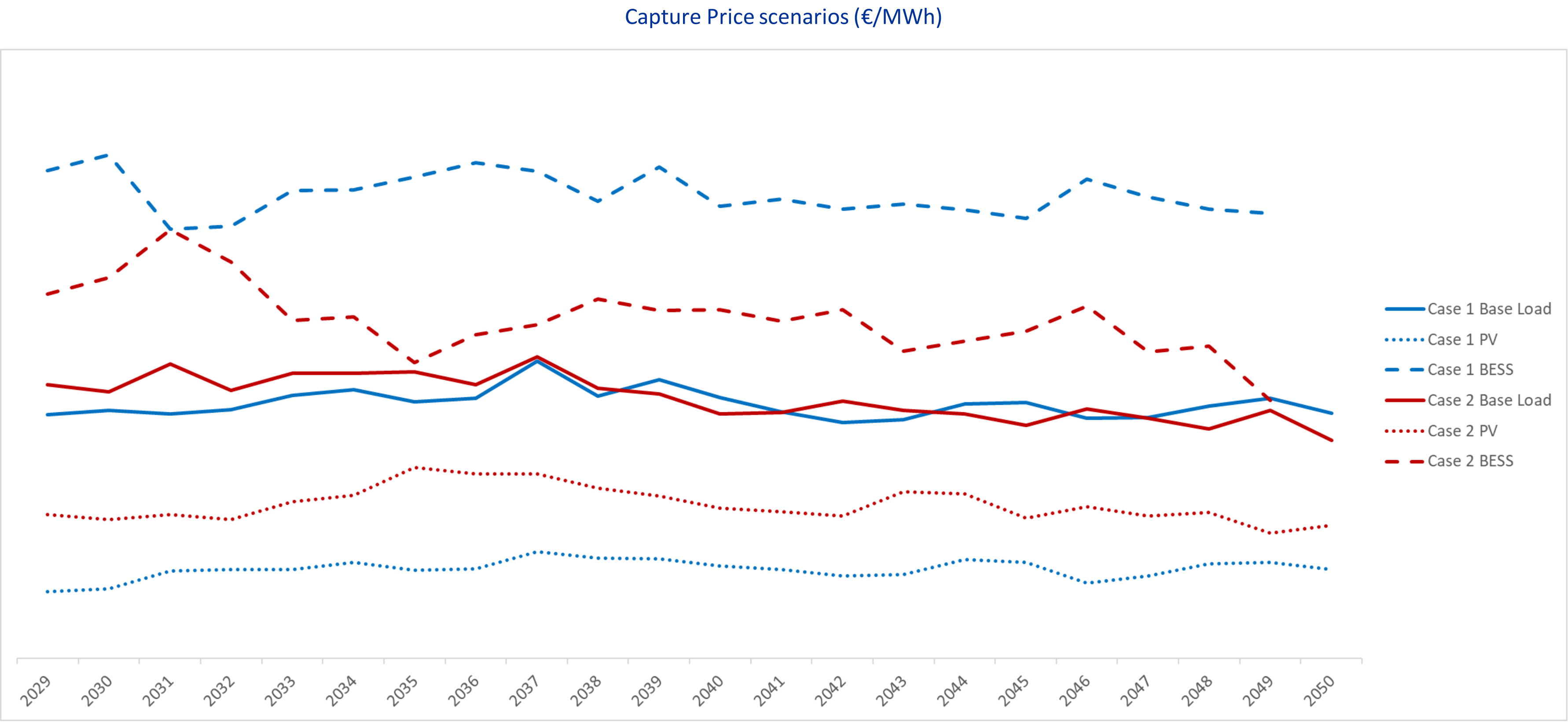
Revenue stack BESS/PV 70% 4h



- Hybridization
  - Returns:
    - Without grid imports, hybridizing PV and BESS boosts returns and increases project value versus stand-alone PV
    - When grid import capacity is enabled, an extra pick-up in return can be added
  - Access to finance:
    - Because of its load profile and captured price, new scenarios are opening to gest off takers onboard again, then, being able to finance the Project
- Stand-alone
  - It is the most profitable scenario, but performs below the hybrid case in low-volatility scenarios
  - PV+BESS with flexible grid access can reach similar profitability with higher operational stability
  - In Spain its dispatch priority order comes after renewables

The importance of the scenarios

As usual, the results are very dependent of the energy curves scenarios



Thank you !

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