

Assessing the Spanish capacity market design: role of duration in storage

IGNACIO COBO

Agenda

- **Introduction**

- Methodology

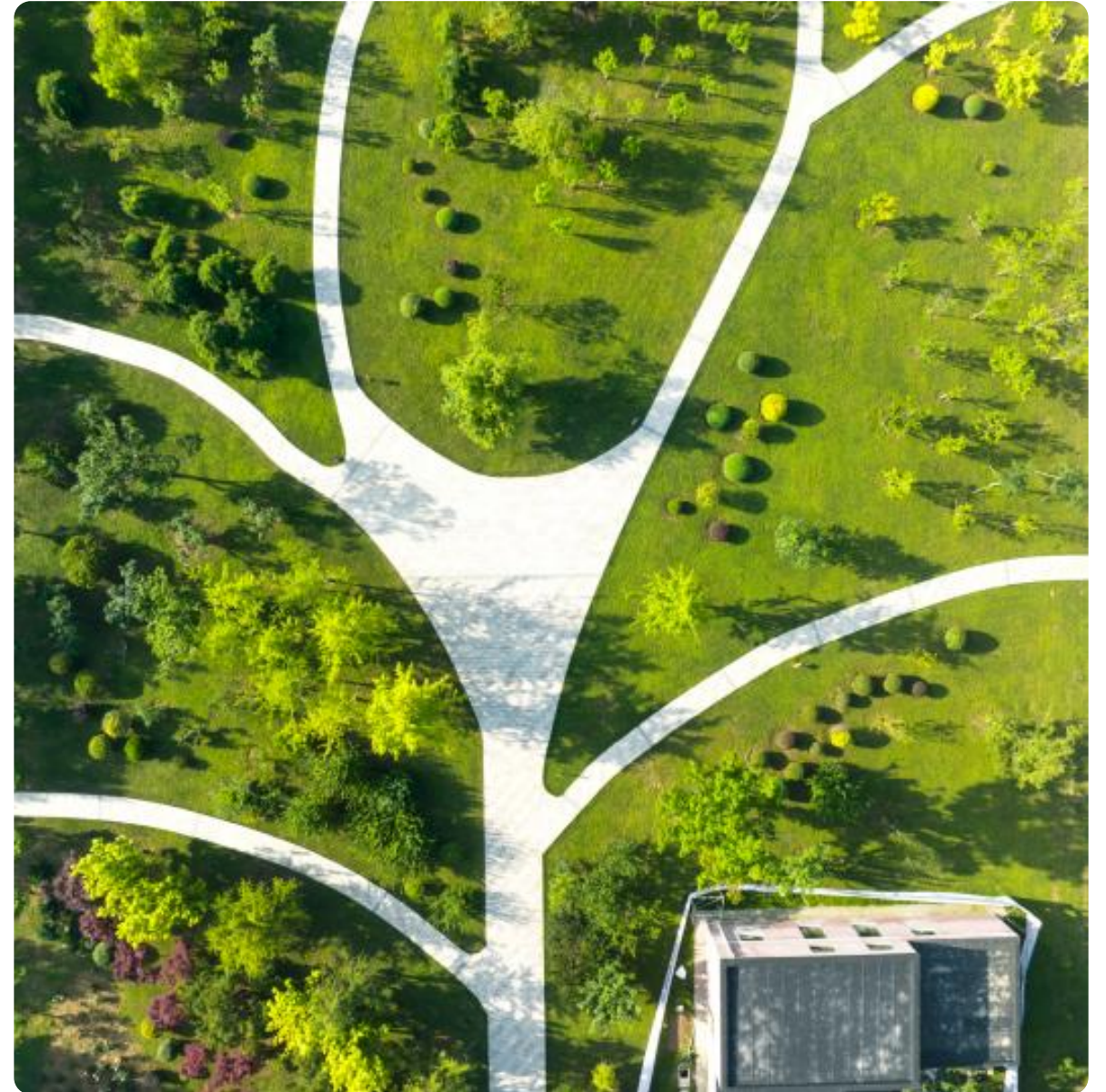
- Results

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Capacity market derating factors should reflect the contribution of storage towards adequacy

- In this report, AFRY presents its independent research on the impact of different capacity market designs on the capacity auction's total costs.
- To do so, AFRY has evaluated two different scenarios:
 - **Static:** derating factors reflect the first delivery year system dynamics, recognizing a higher contribution from storage.
 - **Dynamic:** derating factors reflect evolving system dynamics during the duration of the capacity market contract, reflecting a more realistic value in AFRY's views of the contribution of storage.
 - The upside from long term-planning, i.e., **Dynamic** scenario approach, is quantified via capacity mix evolution and auction's cost comparison.
- The aim of this report is to assess the benefits from capacity market long-term planning by capturing a more realistic contribution of storage in AFRY's view.

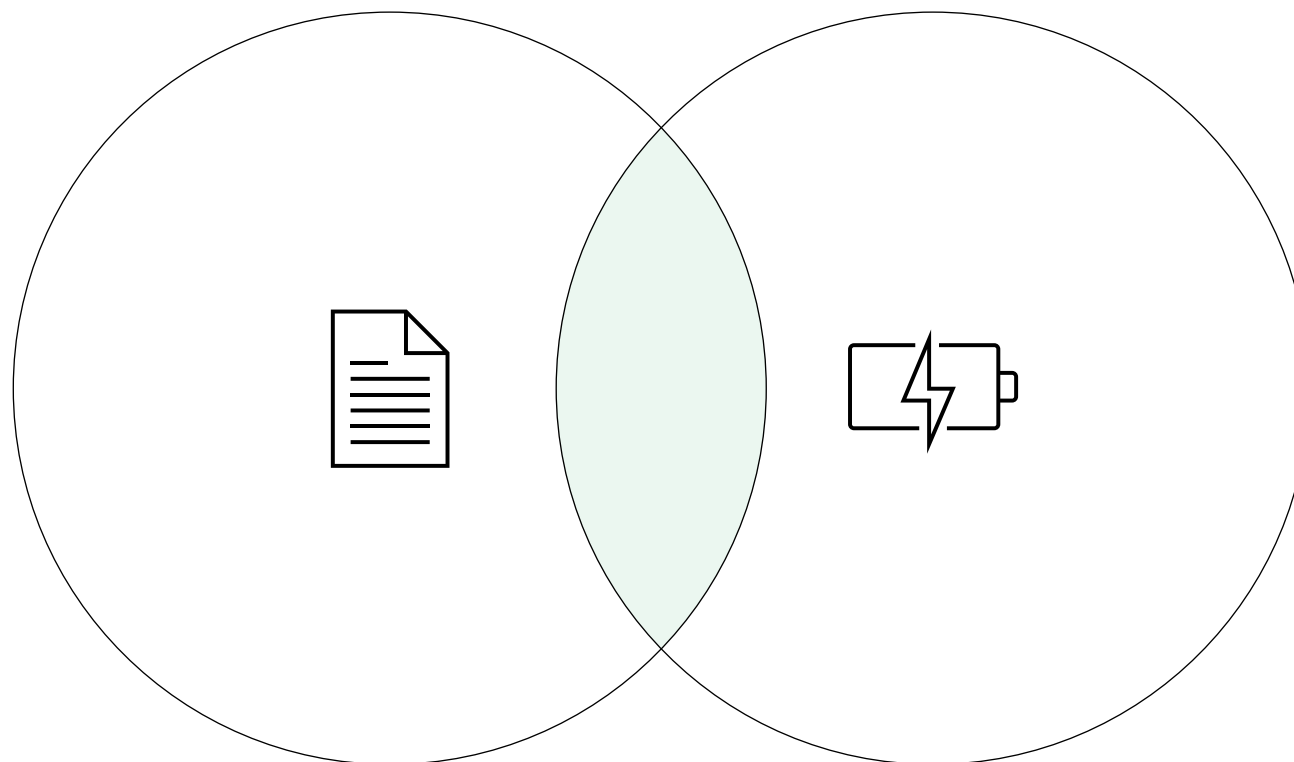


Capacity markets aim to guarantee security of supply; however, if derating factors fail to reflect evolving market dynamics, they may jeopardize energy security

Capacity markets status quo

The latest proposal for the Spanish capacity market clarifies some aspects of its design, but **some key parameters—such as the derating factors—remain uncertain.**

For existing technologies, derating factors reflect the availability during the top 10% tightest periods of the year. **For new technologies to be deployed (e.g., BESS), deratings will be calculated according to modelling approaches or other benchmarks.**



Derating factor role

Given that derating factors have a great impact on how market players bid, **misaligned values may lead to market distortions**, potentially displacing existing firm capacity from the merit order curve.

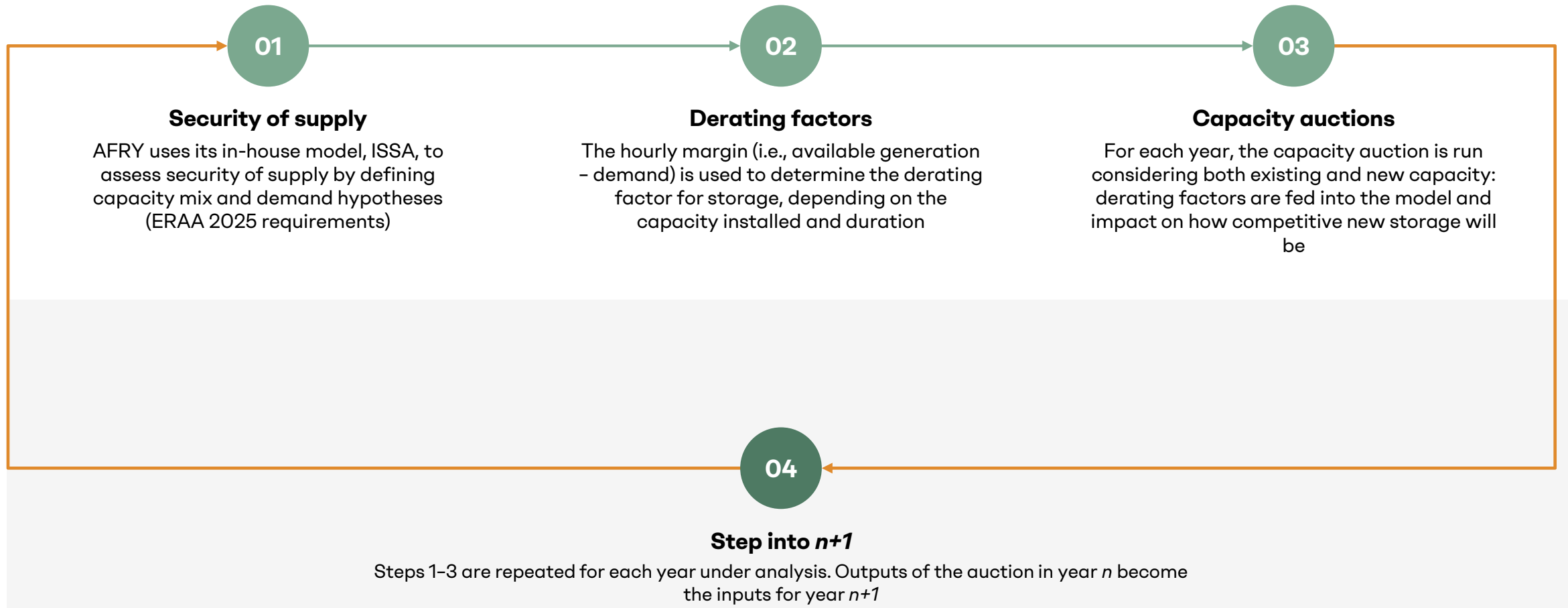
Derating factors should reflect evolving market dynamics in Spain, to ensure the right market signals are sent, safeguarding energy security while minimizing additional investments.

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AFRY has developed a methodology to calculate derating factors for storage in Spain, building two different scenarios with different derating factors



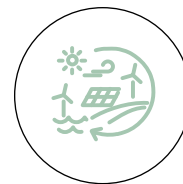
Two scenarios have been built to illustrate how different capacity market design approaches may impact capacity auction results



Static scenario

Short-term planning

- Derating factors reflect delivery year system dynamics, recognizing a higher contribution from storage in the first auctions held
- Pre-2030, a pipeline of 2h and 4h BESS is considered
- Post-2030, 8h BESS are considered to address adequacy issues



Dynamic scenario

Long-term planning

- Derating factors reflect evolving system dynamics, reflecting a more realistic contribution from storage in AFRY's view
- Pre-2030, the same pipeline assumptions as in the Static scenario are used
- Post-2030, PSP and 8h BESS are considered

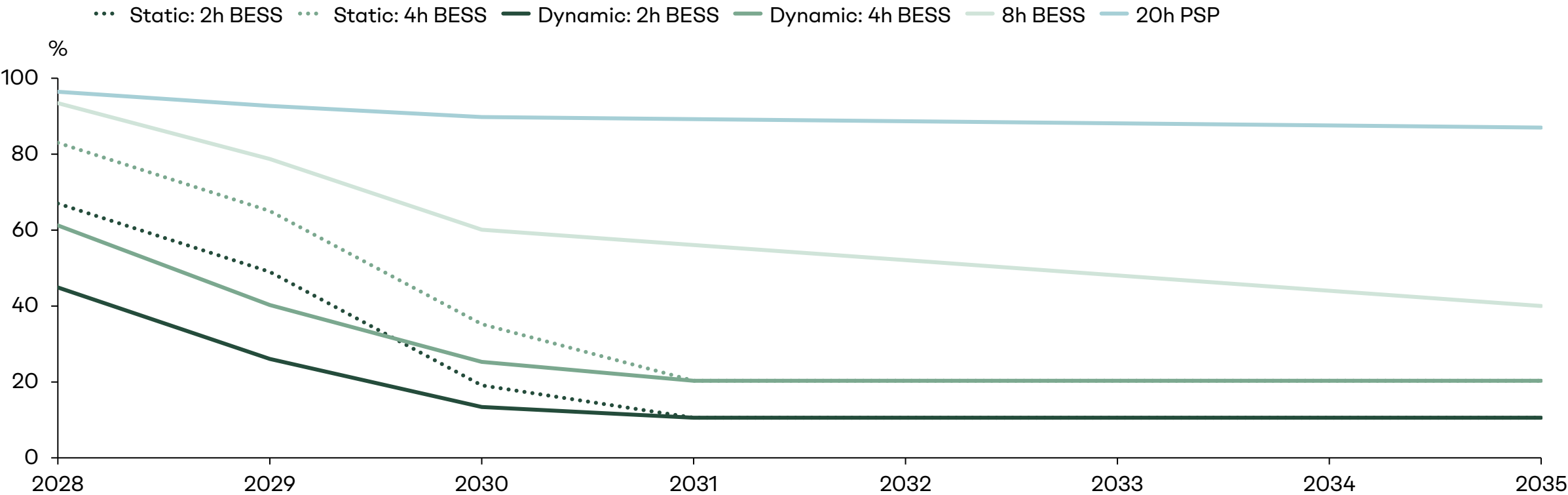
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Derating factors in the Static scenario are lower in the short term, reflecting the average contribution over a 10-year contract rather than the value on the first year, and they decrease over time as more storage gets deployed

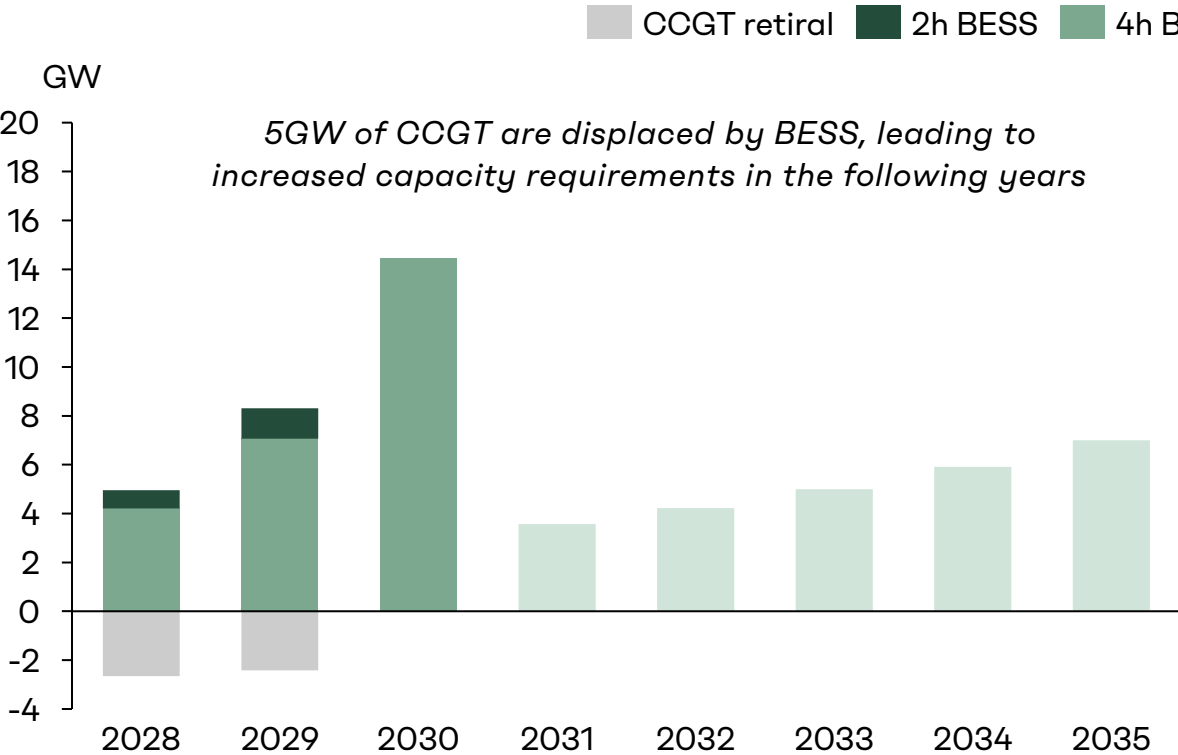
Derating factor evolution (%)



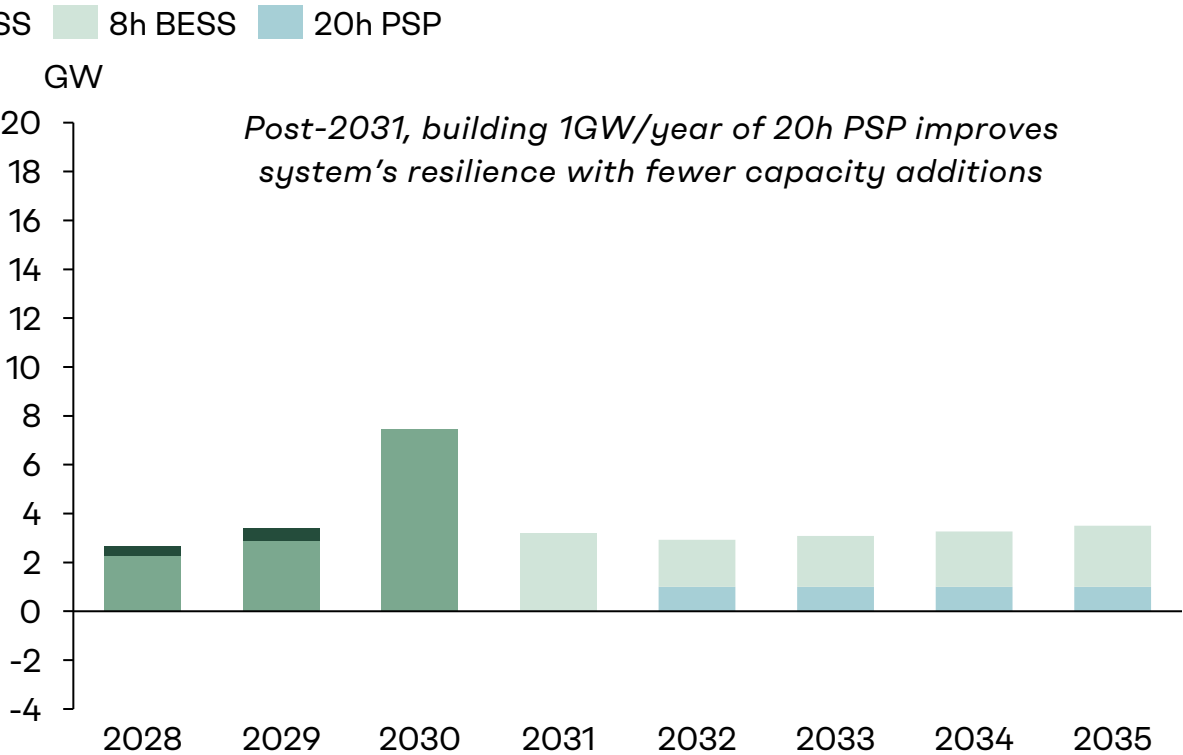
Source: AFRY

A capacity mix weighted toward short-duration BESS can displace firm generation and reduce its contribution to security of supply, increasing longer-term capacity needs

Capacity evolution (GW): Static scenario



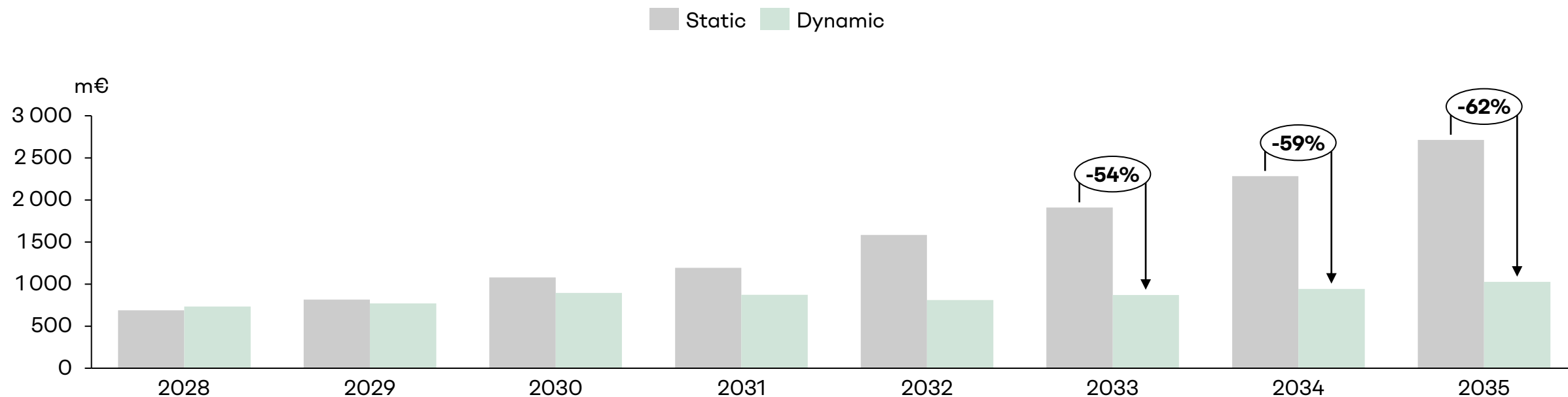
Capacity evolution (GW): Dynamic scenario



Source: AFRY

The Dynamic scenario leads to costs that are c. €3,000m lower over the observed period, highlighting the importance of a well-thought-out market design

Capacity auctions cost (m€)

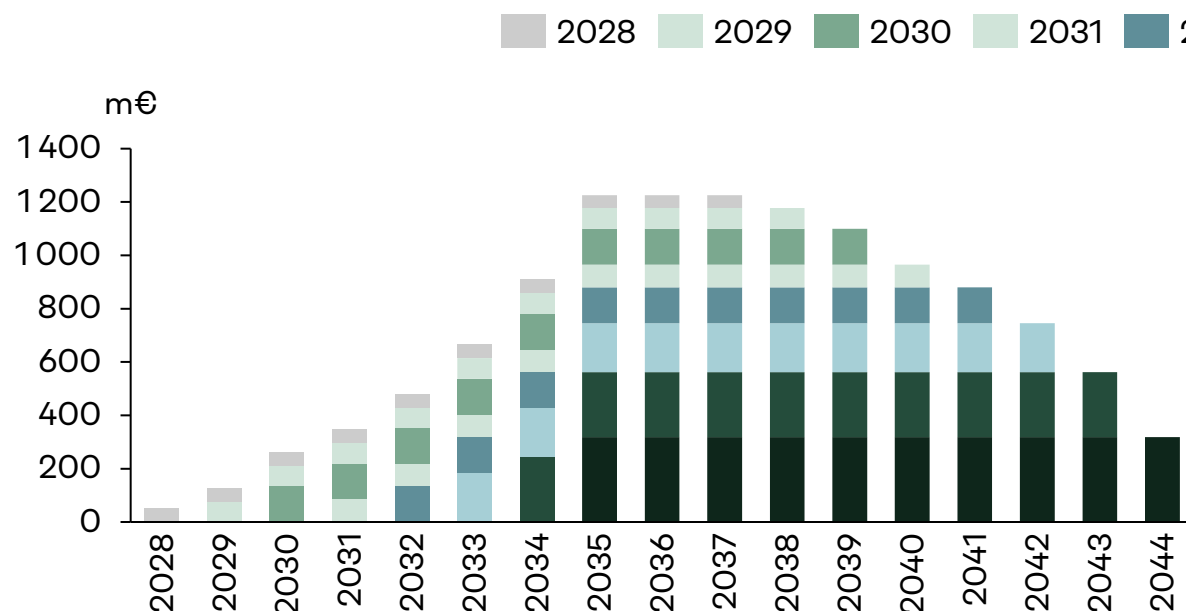
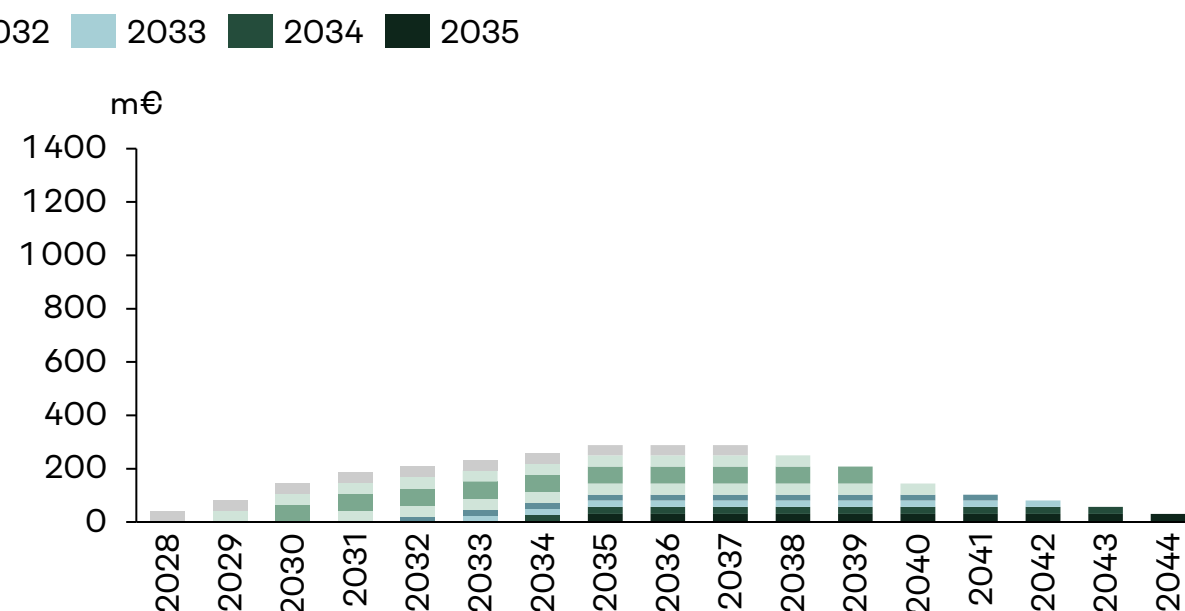


A capacity market design with a long-term planning can reduce overall consumer costs over time, saving up to 50-60% in capacity payments post-2033, compared against the short-term planning approach (Static scenario).

By anticipating the decreasing contribution of short-duration storage the Dynamic scenario can reduce the capacity auctions cost from €7,775m to €4,705m.

Note: (1) The European Commission approved €9,000m for Spain's capacity market under EU State Aid rules on 20th May 2026. (2) NPV has been calculated using an IRR of 9% | Source: AFRY

Dynamic scenario fosters the most efficient capacity mix, reducing the volume of new capacity required and thus committed long-term payments for new capacity

Capacity contracts for BESS (m€): Static scenario**Capacity contracts for BESS (m€): Dynamic scenario**

The charts illustrate how capacity contracts for BESS evolve in both scenarios (i.e., new BESS are assumed to receive a 10-year capacity payment). Dynamic scenario fosters the most efficient capacity mix, storage additions are lower, reducing the volume of new capacity to be awarded with payments, as well as experiencing lower BESS revenue cannibalization, which ultimately leads to lower bidding.

Accumulated nominal costs in the Static scenario are c. €17,000m higher than in the Dynamic scenario

Spain has a unique opportunity to recognize the actual value of storage through its derating factors, reducing capacity payment costs in the medium to long term

Spanish context

01.

Electricity demand is expected to grow rapidly in the short term, driven by the expanding fleet of EVs, data centers, and the electrification of the economy. Additionally, a relevant share of the CCGTs may require non-energy market payments to remain under operation, and the Spanish nuclear fleet is scheduled for decommissioning starting in 2027

Capacity Market aim

02.

Capacity Market emerges as the solution to the increasing scarcity of firm capacity amid growing electrical demand. However, the capacity market design must capture evolving system dynamics to reach the optimal solution that ensures security of supply, fostering cost-effective technologies to cover future adequacy issues

Storage role

03.

A well designed and thought mechanism that considers a holistic and complete view over the contractual period of the capacity product will lead to a better allocation of resources. By comparing a scenario that does a long-term planning against a scenario that prioritizes short-term planning, a c. 39% reduction in total capacity payments can be obtained

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The current design for the CM in Spain has similar features to the already existing CMs in other European countries, such as the price setting mechanism

Active CM	 GB	 Ireland	 Italy	 France	 Belgium	 Poland	 Spain
Mechanism type	Centralized	Centralized	Centralized	Decentralized	Centralized	Centralized	Centralized
LOLE	LOLE < 3 hours/year						1.5 hours/year
Price setting mechanism	<i>Pay-as-clear</i> , same price cap for existing and new capacity	<i>Pay-as-clear</i> , with different price cap for existing and new capacity		<i>Pay-as-clear</i> (EPEX spot auctions)	<i>Pay-as-bid</i> , different price cap for existing and new capacity	<i>Pay-as-clear</i> , same price cap for existing and new capacity	<i>Pay-as-bid</i> , different price cap for existing and new capacity
Motivation	Nuclear phase out 2011-2013	Shortage of funding for system adequacy plans	Coal phase-out	Nuclear phase-out, new capacity requirements	Coal phase-out, coupled with ageing of power plants	Shortage of funding for system adequacy plans	Scheduled nuclear shutdown, expiry of availability payments to CCGTs
							Spanish CM proposal

Note: 1) Data updated as of January 2025 | Source: AFRY

Spain may face the challenges that other reference capacity mechanisms are already experiencing, hence anticipating them is crucial



GB

In GB, newly awarded capacity is almost exclusively short-duration BESS, leaving the system exposed during extended critical periods

In Poland, the BESS derating factor collapsed from 95% to 13% in three years as fleet size grew, pushing less competitive gas back into the merit order

Both markets reacted rather than anticipated—significant adjustments to market design only came after the auctions had closed



Poland



Spain

- As BESS deployment grows, storage's collective contribution to firm capacity declines—a trend already observed in Poland, where the derating factor dropped sharply
- The derating factor calculation methodology may overlook the value of duration in future capacity auctions; as the system tightens, critical periods last longer and duration becomes increasingly important
- Without a specific scheme differentiating non-fossil flexibility from conventional capacity, the CM risks sending the wrong investment signal

Existing hurdles and lessons learned

Potential risks for Spain

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