



The regulation of large-scale battery storage in Spain: A race against the clock to ensure fast decarbonisation and avoid growing price cannibalisation

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and Transformation (CENRIT), Macquarie University
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Iberian Centre for Research in Energy Storage (CIIAE)

A pioneering infrastructure to make renewable energy a real alternative to fossil fuels.



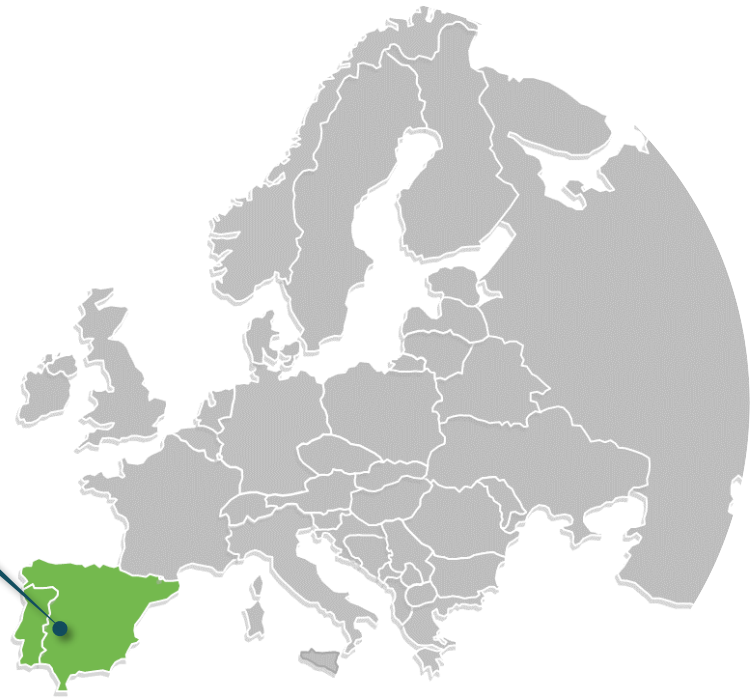
4th November 2022



≈80 M€
initial funding



>90 researchers & engineers

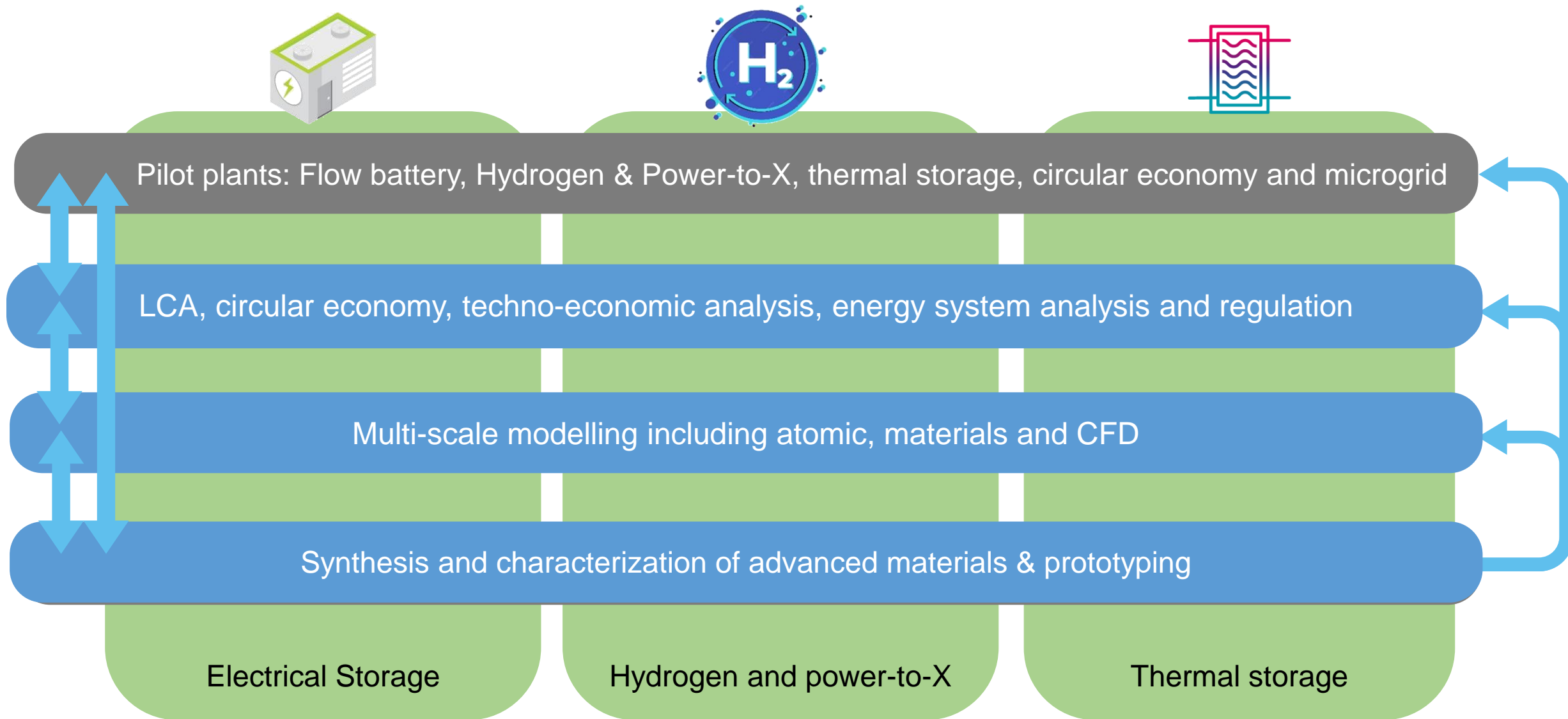


Public-private financing strategy



Memberships



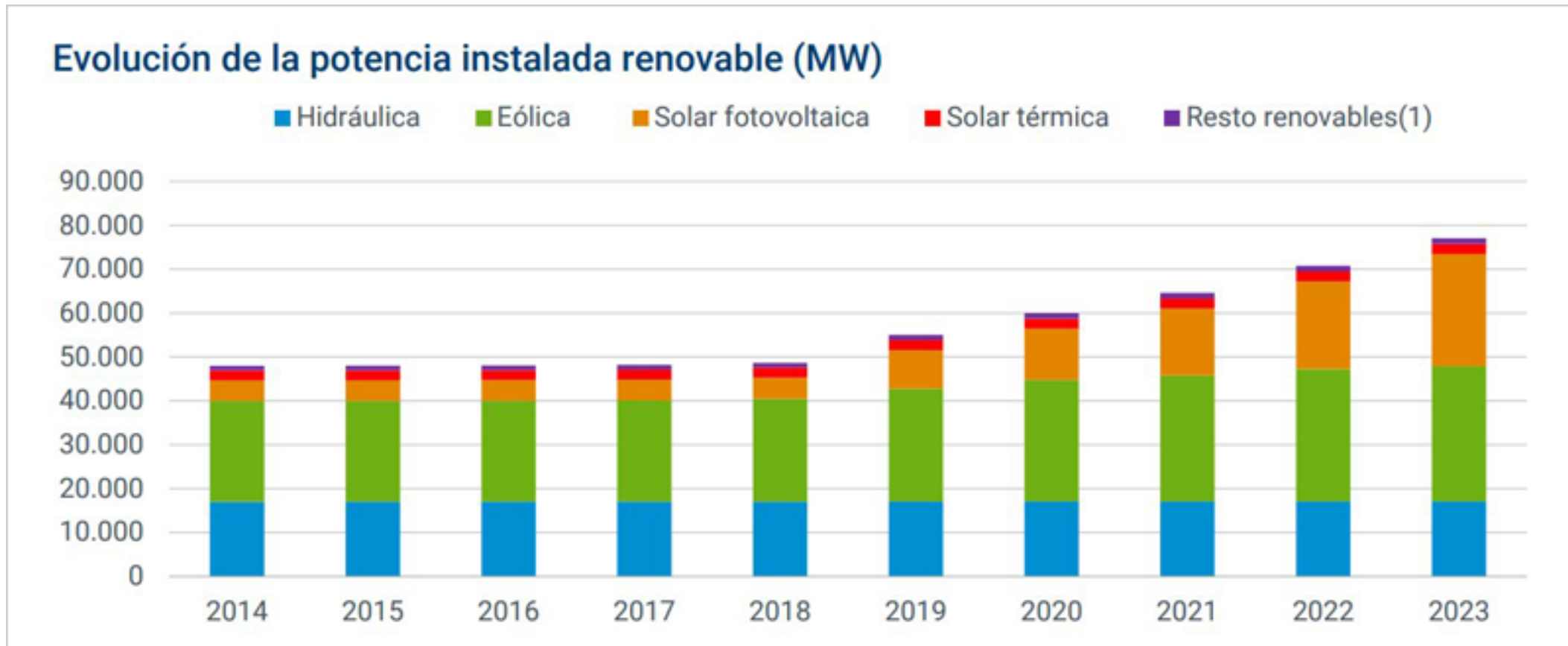


Outline

- RES Roll out in Spain: current situation and 2030 targets
- Negative prices and cannibalisation
- Spain: a future battery market
- Large-scale battery regime in the EU
- Large-scale battery regime in Spain
- Missing parts
- Main takeaways

RES Roll out in Spain

- Current situation:
- Installed capacity at end of 2023:
 - Total: 125 GW; RES: 77 GW



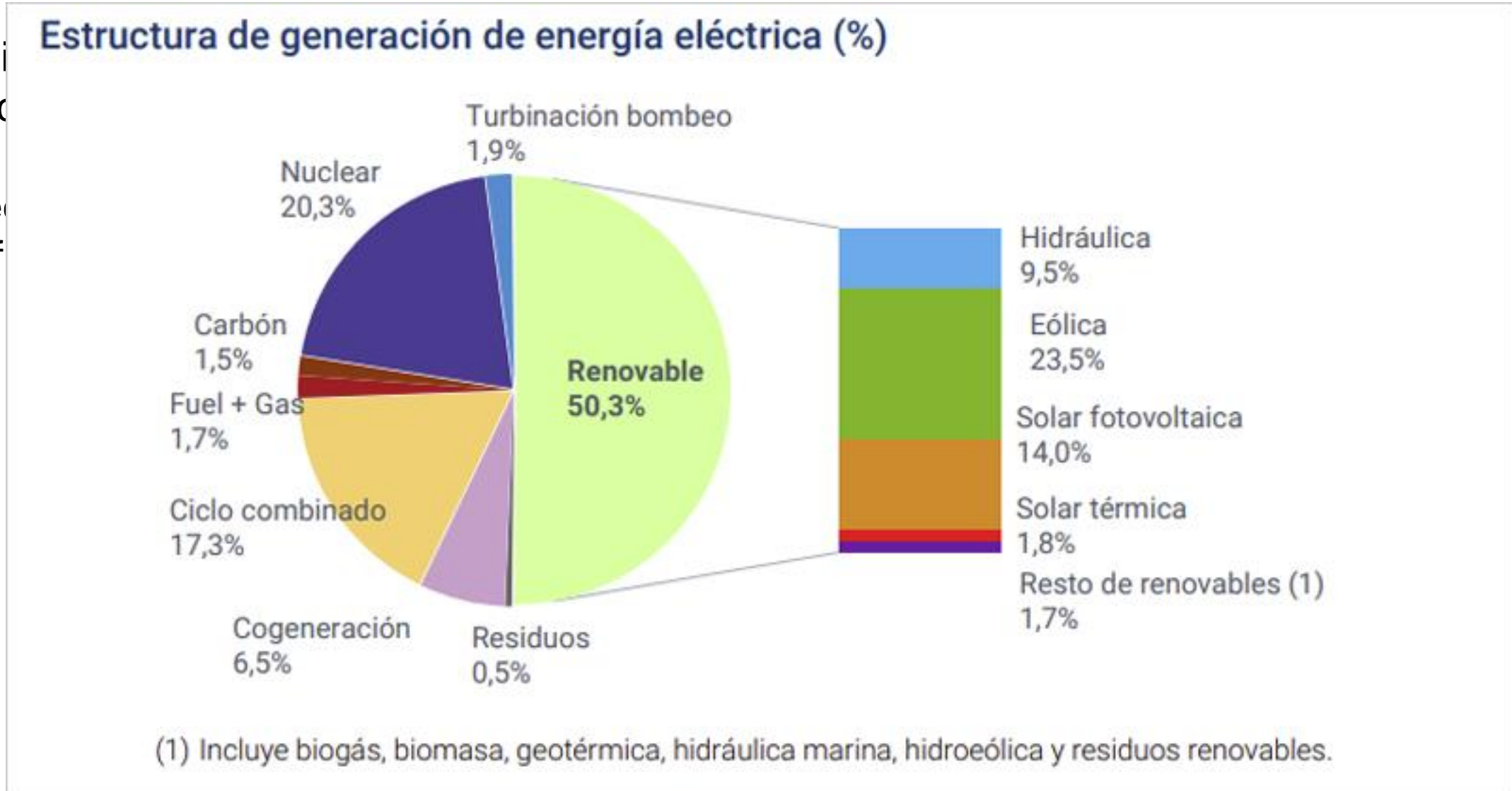
Source: <https://www.smartgridsinfo.es/2024/03/26/sistema-electrico-espanol-supero-2023-todos-records-materia-renovables>

RES Roll out in Spain

- Current situation:
- Installed capacity at end of 2023:
 - Total: 125 GW; RES: 77 GW
- Generated power:
 - 50% from RES for first time in 2023

RES Roll out in Spain

- Current si
- Installed c
 - Total:
- Generate
 - 50% f



RES Roll out in Spain

- 2030 targets
 - Plan Nacional Integrado de Energía y Clima (PNIEC), update 2023-2030
Integrated National Energy and Climate Plan (NECP)
 - By 2030:
 - 48% RES in final energy consumption
 - 81% RES in electricity production
 - 22.5 GW of storage (incl. solar thermal storage capacity)

RES Roll out in Spain

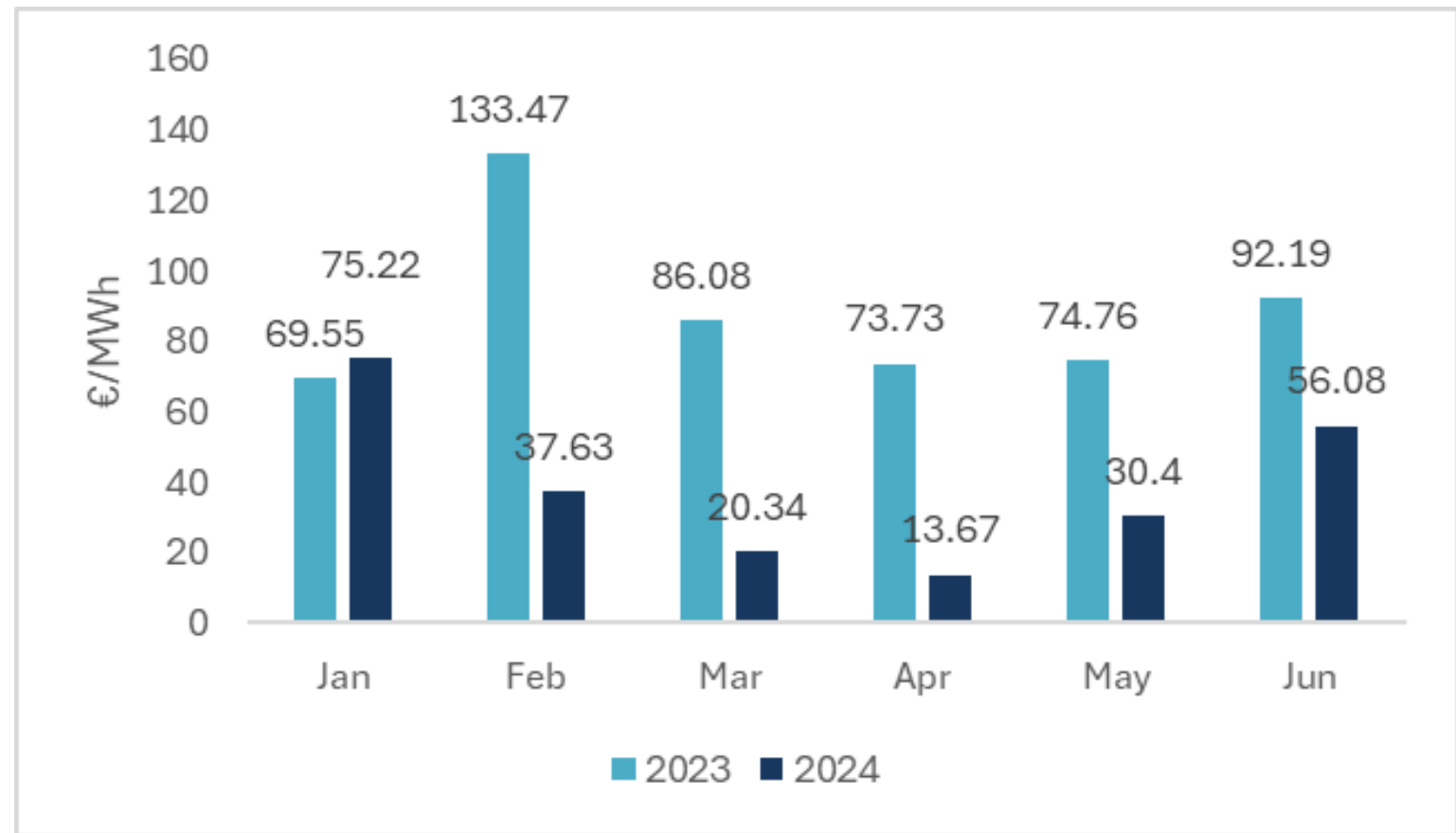
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 - By 2030:
 - 48% RES
 - 81% RES
 - 22.5 GW

Parque de generación del Escenario PNIEC 2023-2030. Potencia bruta (MW)				
Años	2019	2020	2025	2030
Eólica	25.583	26.754	36.149	62.054
Solar fotovoltaica	8.306	11.004	46.501	76.277
Solar termoeléctrica	2.300	2.300	2.304	4.804
Hidráulica	14.006	14.011	14.261	14.511
Biogás	203	210	240	440
Otras renovables	0	0	25	80
Biomasa	413	609	1009	1409
Carbón	10.159	10.159	0**	0
Ciclo combinado	26.612	26.612	26.612	26.612
Cogeneración	5.446	5.276	4.068	3.784
Fuel y Fuel/Gas (Territorios No Peninsulares)	3.660	3.660	2.847	1.830
Residuos y otros	600	609	470	342
Nuclear	7.399	7.399	7.399	3.181
Almacenamiento*	6.413	6.413	9.289	18.913
Total	111.100	115.015	151.173	214.236

Source: PNIEC 2023-2030, actualización, p. 75.

Negative prices and cannibalisation

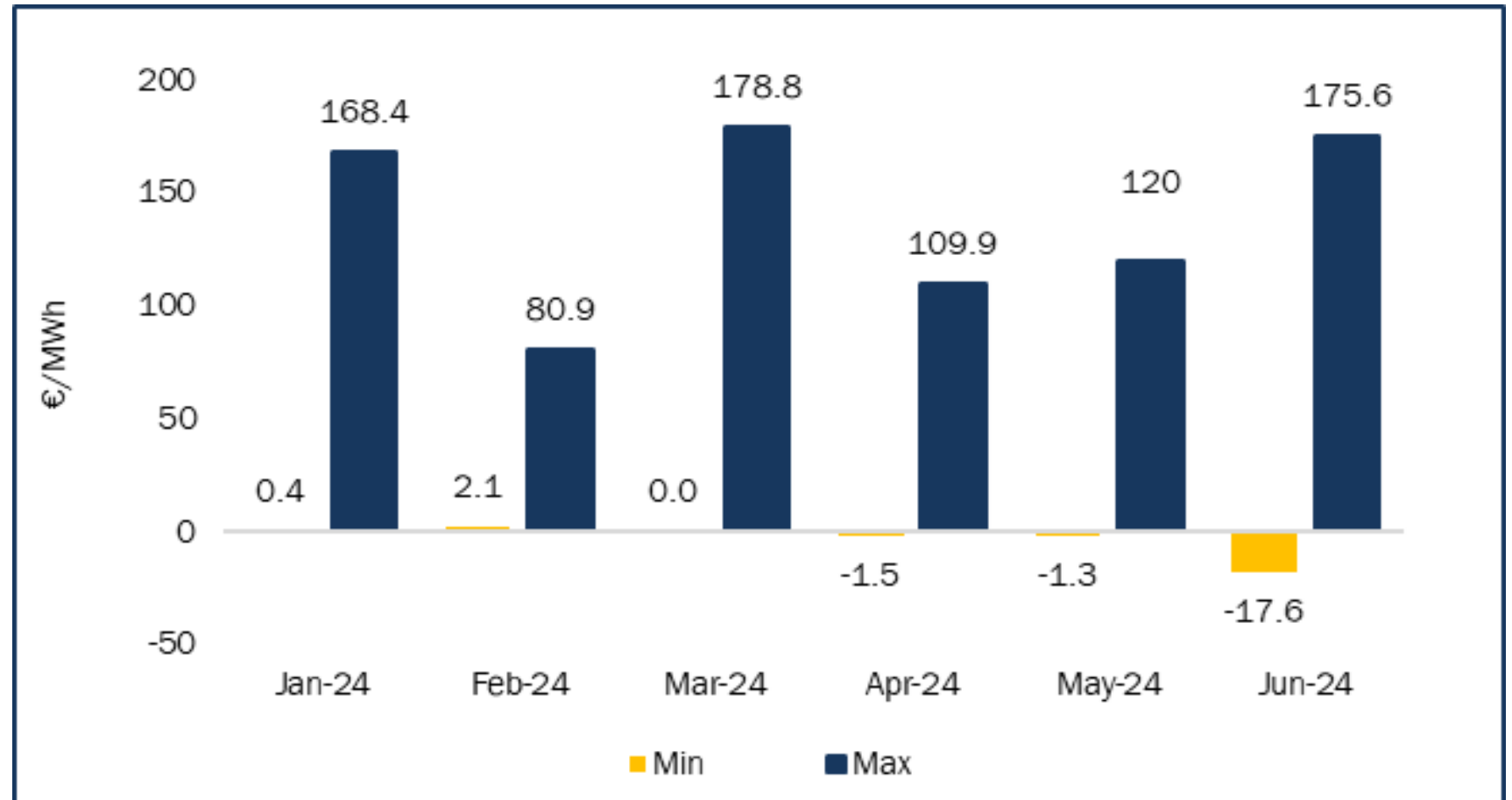
- Average spot prices going down
- Growing number of hours with very low or even negative prices in Spain (already 200h+ since start of 2024)



Spot Average prices 2023-2024. Source: Haya Energy Solutions

Negative prices and cannibalisation

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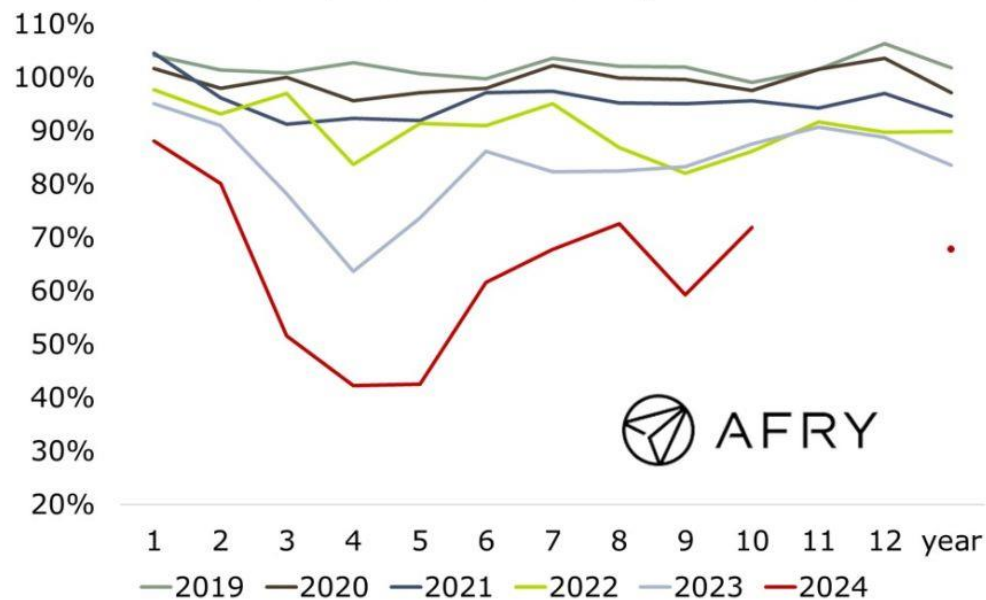


Spot Min & Max prices. Source: Haya Energy Solutions

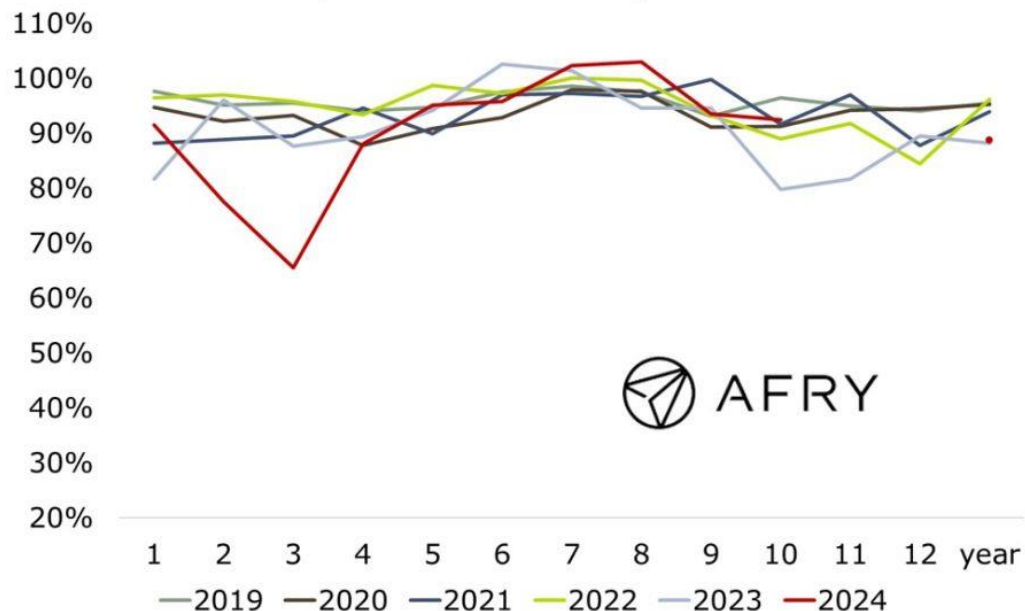
Negative prices and cannibalisation

- PV struggles to capture attractive prices: its income (if limited to merchant) diminishes, and it will continue to do so (if not enough storage is rolled out)

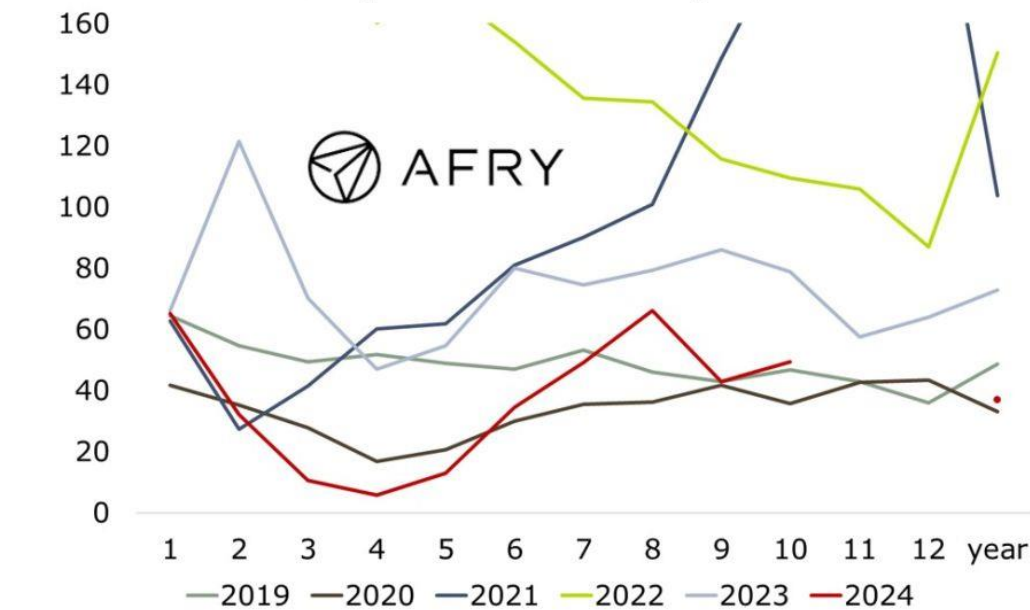
Solar PV Captured rates in the Spanish Market



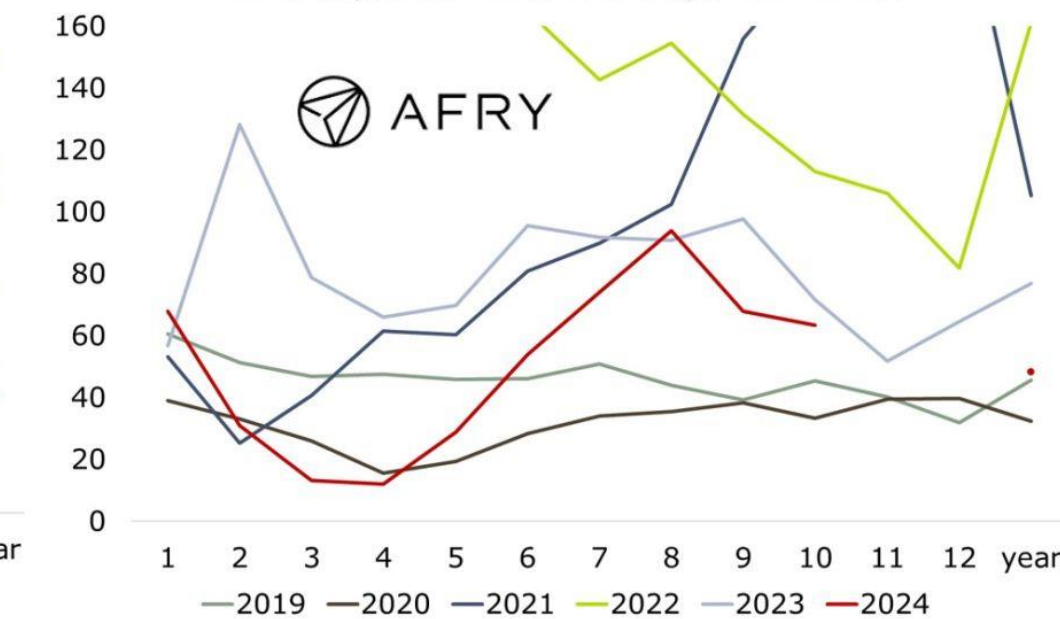
Wind Captured rates in the Spanish Market



Solar PV Captured Prices in the Spanish Market



Wind Captured Prices in the Spanish Market



Source: ESIOS and AFRY analysis. Captured prices based in PBF schedule until 31/10/2024

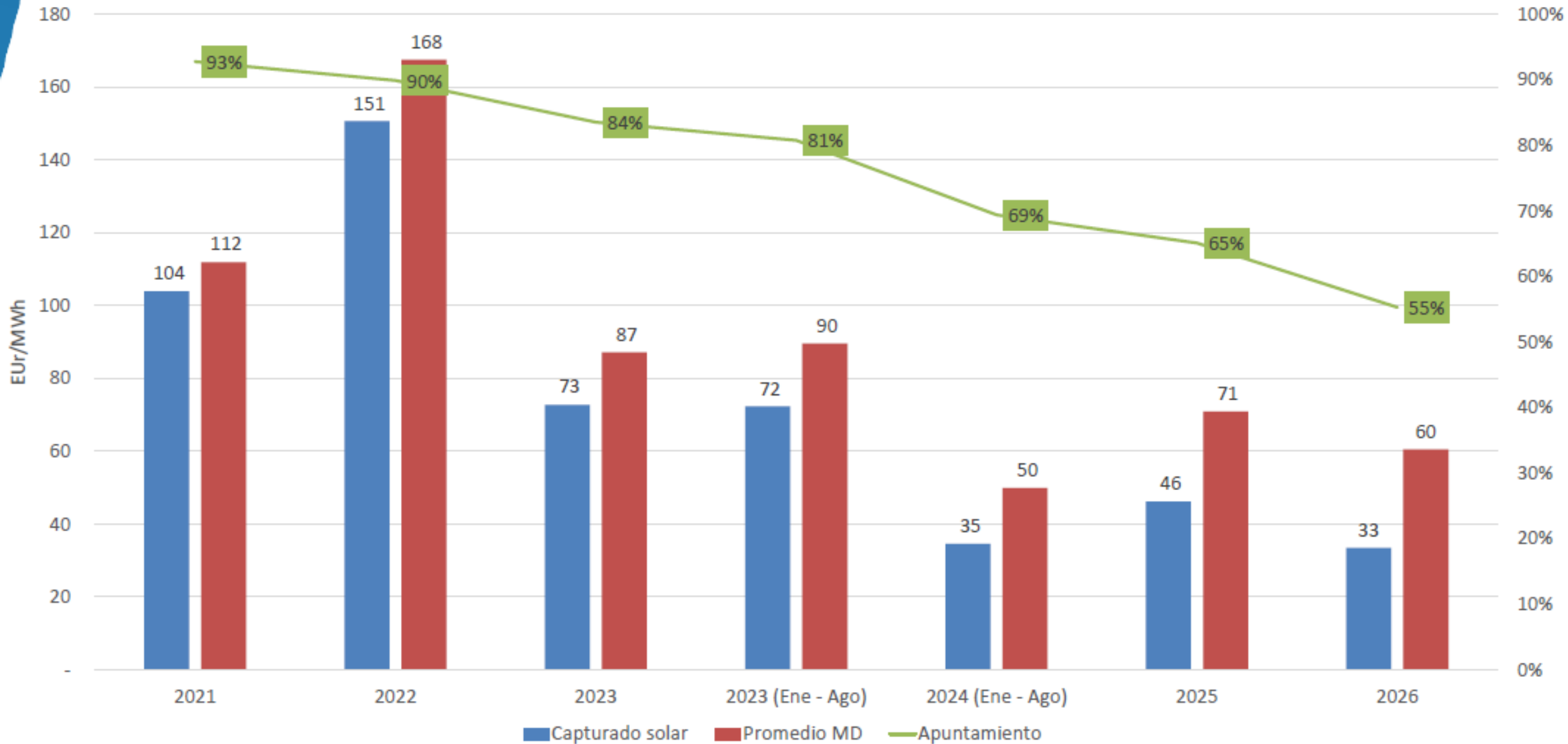
Solar PV Captured rates in the Spanish Market

Wind Captured rates in the Spanish Market

110%
100%

110%
100%

Capturado solar

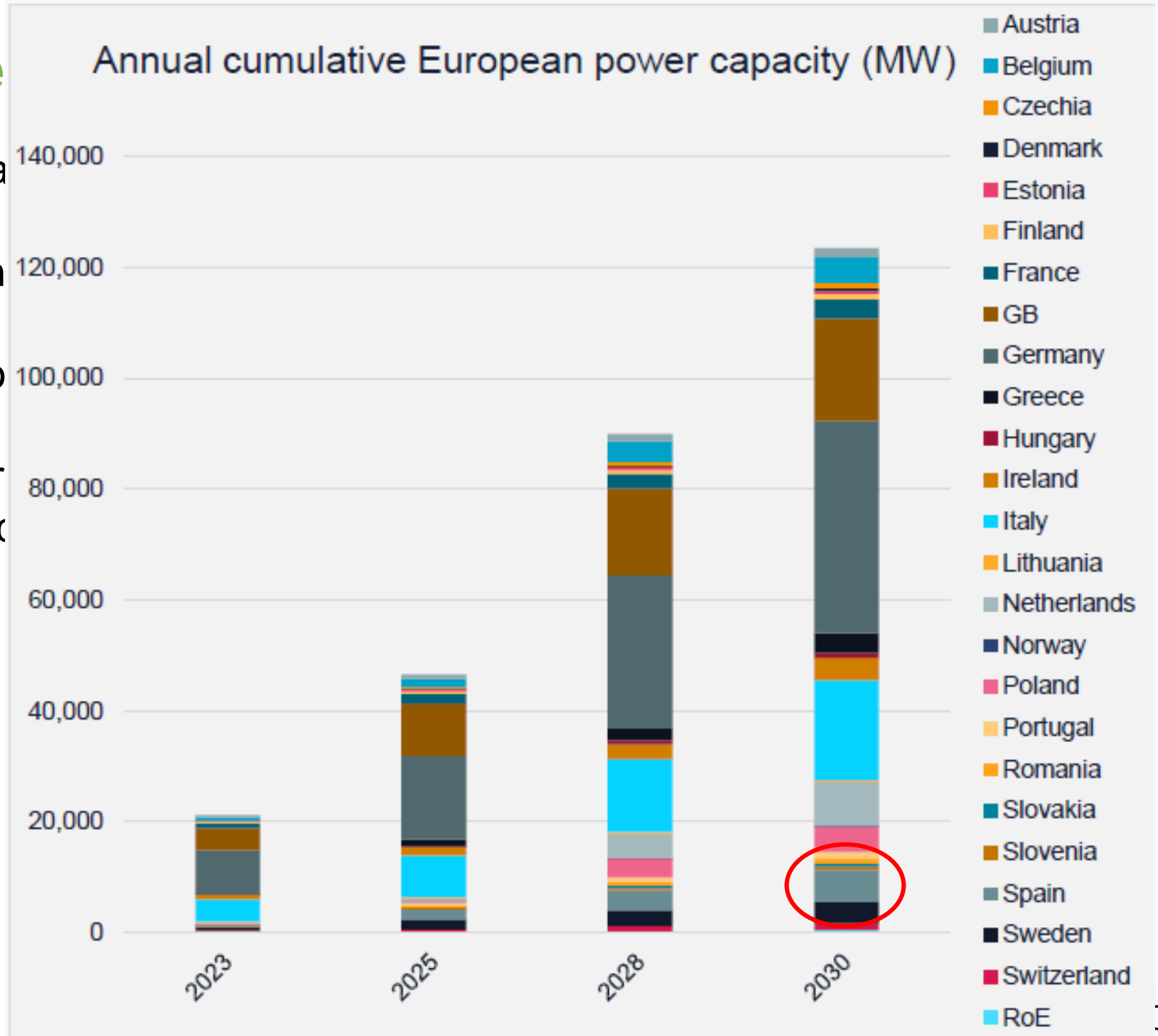


Spain: a future battery market

- As of 2024, very limited installed battery capacity (25 MW)
- Yet, as of Sep 24:
 - 8.318 MW grid connection requests at distribution level, 4.298 MW granted, 4.020 MW waiting
 - 10.763 MW grid connection requests at transportation level, 7.465 MW granted, 3.298 MW waiting
- Expected as 5th biggest market in Europe by 2030
- Deployment esp. in 2025 and from 2028 onwards (thanks to support schemes and storage auctions)

Spain: a future battle

- As of 2024, very limited installation
- Yet, as of Sep 24:
 - 8.318 MW grid connection
 - 10.763 MW waiting
- Expected as 5th biggest market
- Deployment esp. in 2025 and 2030 (storage auctions)

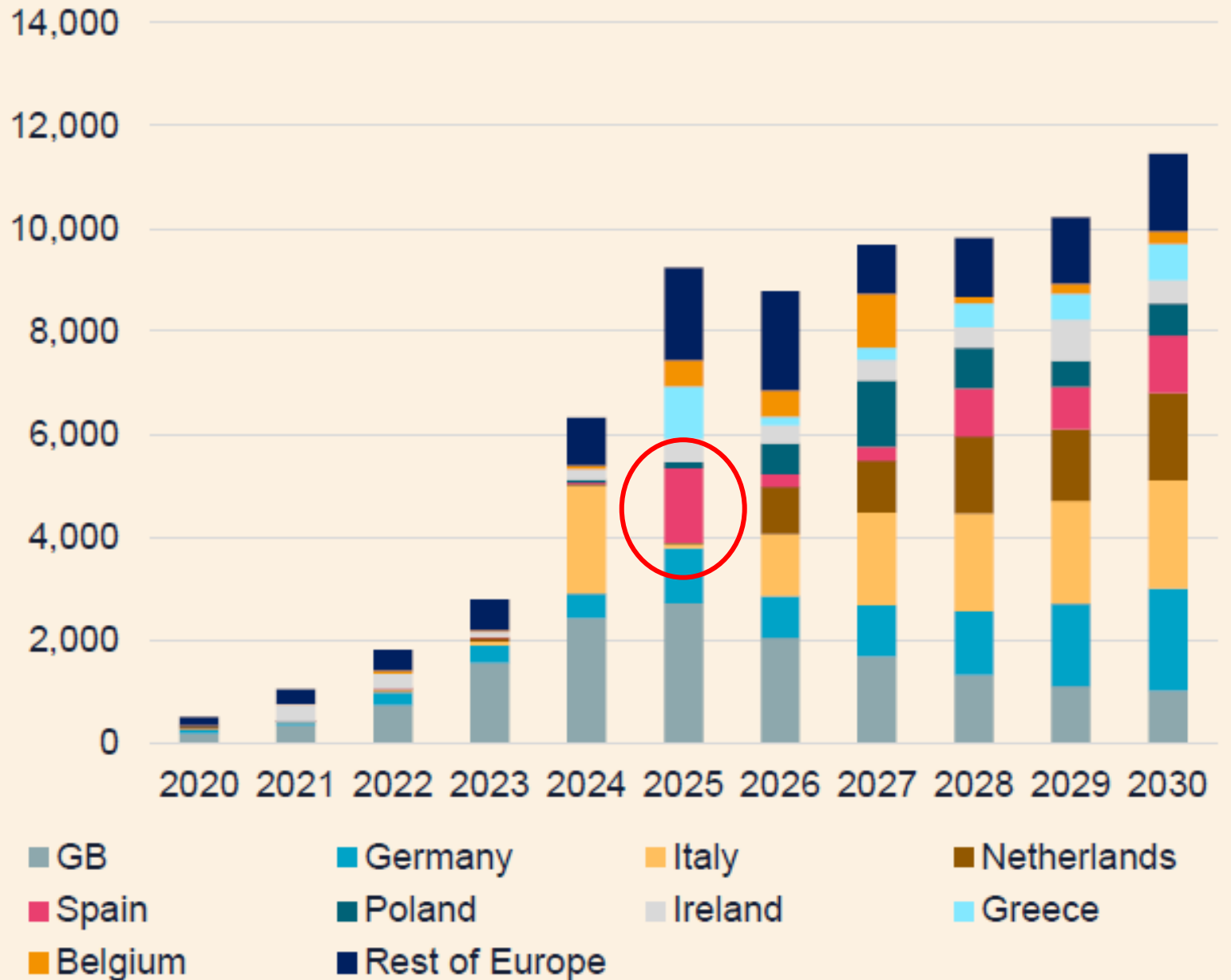


Source: LCP Delta, Europe's Energy Storage Ambition: Charging Towards 2030 Targets, 2024

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FoM storage market forecast : Annual capacity (MW)



Source: LCP Delta, Europe's Energy Storage
Ambition: Charging Towards 2030 Targets,
2024

Large-scale battery regime in the EU

- 2019 Electricity market Directive (2019/944):
 - Defining storage (art. 2(59)): *in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier*
 - Setting a regime: market-based activity with limited exceptions (art. 36 (DSOs) and art. 54 (TSOs))
 - Provisions on flexibility and (local) flex markets (especially art. 32)
- 2022 Regulation to accelerate the deployment of RE (2022/2577)
- 2023 revised RES directive (2023/2413)
- 2023 recast Energy efficiency directive (2023/1791)
- 2023 Battery regulation (2023/1542)
- Commission Delegated Regulation 2023/2450 establishing a list of essential services
- 2023 revised General Block Exemption Regulation (2023/1315) (State aids)
- 2024 Critical Raw Materials (CRM) Act (Regulation 2024/1252)
- 2024 Electricity market design reform (Amending Directive 2024/1711)

Large-scale battery regime in Spain

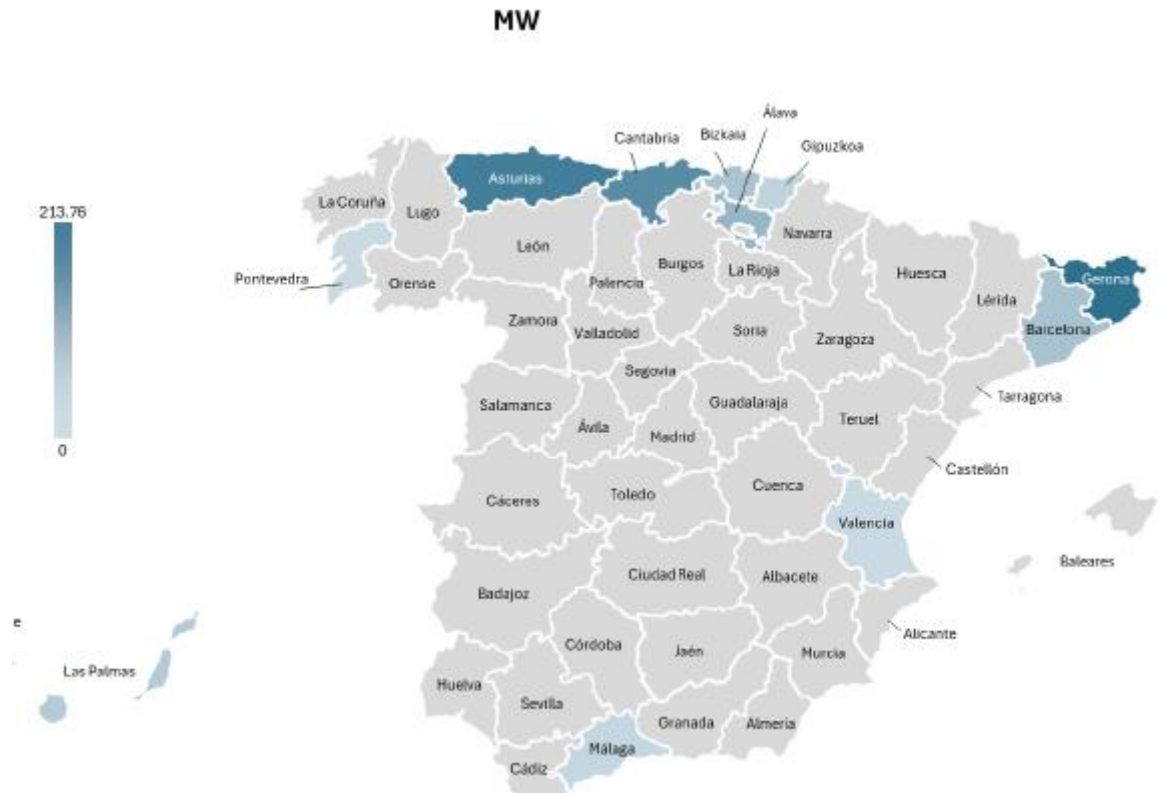
- Huge transposition load
- Royal Decree-Law 23/2020:
 - Defined energy storage (almost like in 2019 E-Dir.)
 - Authorizes power generators with grid access to use it for storage co-location (at condition of respecting technical requirements)
 - Allows to request grid connection permits for new co-located storage installations
- Memorandum 1/2021 from CNMC (Spanish NRA):
 - On the procedure for new grid connection and access requests for generation, integrates storage
- Decree-Law 1183/2020:
 - Considers storage installations as generation for administrative procedures (access and connection, etc.)

Large-scale battery regime in Spain

- CNMC Memorandum 3/2020:
 - Waves network tariffs for battery installations
- Royal Decree 148/2021:
 - Waves storage installations' network charges for the energy consumed and then reinjected into the grid
- Royal Decree-Law 8/2023:
 - Amends RD 1183/2020 for storage to still request grid access for demand installation, but with half the economic guarantees of classic demand installations
- Royal Decree 445/2023:
 - Simplified EIA for stand alone and co-located battery installations
- CNMC memorandum 1/2024:
 - Establishing methods and conditions for grid connection by demand installations, integrates storage (but more detailed technical rules still missing)
 - Introduces flexible connection (100% access not guaranteed at all times)

Large-scale battery regime in Spain

- Storage auction launched in 2023, results in September 2024:
 - 150 M€ in investment support in total for stand alone (battery) storage
 - 35 projects (709 MW) granted (out of 280 projects for 4.4GW)
 - Location: at end of lines
 - Projects should come on line by April 26



Missing parts

- Legal regime for aggregation:
 - More for small/medium scale batteries
- Transposition of 2023 Battery regulation:
 - Mostly about providing transparency about the battery itself + waste collection and recycling and use in new batteries
- Transposition of 2024 CRM Act:
 - Mostly about diversifying providers of SRM and CRM and relocating activities in Europe (10% of extraction, 40% of processing and 25% recycling in the EU + no single supply country accounting for more than 65%)
 - Accelerated permitting at some conditions
- Capacity mechanism (to provide payment for capacity):
 - Deemed key for battery development in Spain, expected first half of 2025.
- No FCR (Frequency Containment Reserve) market:
 - Mandatorily provided for free by producers with inertia
- Lack of local flexibility markets

Main takeaways

- Massive influx of PV and wind in Spanish energy mix and high ambitions
- Income for (PV) generators is plummeting
- Income streams for battery operators not yet clear/established:
 - Capacity mechanism + benefit stacking required
- Legal framework in Spain developed since 2020, many obstacles removed (definition, setting applicable rules for administrative instructions) but still issues:
 - Detailed demand installation connection rules
 - EU legislation transposition backlog
 - Lack of experience from local administrations (for urban planning authorisations)
 - Insufficient grid capacity
 - Some local opposition emerging (Asturias)



Thank you for your attention

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