



# SPAIN

## Analysis of the Battery Storage Market



## Acknowledgements

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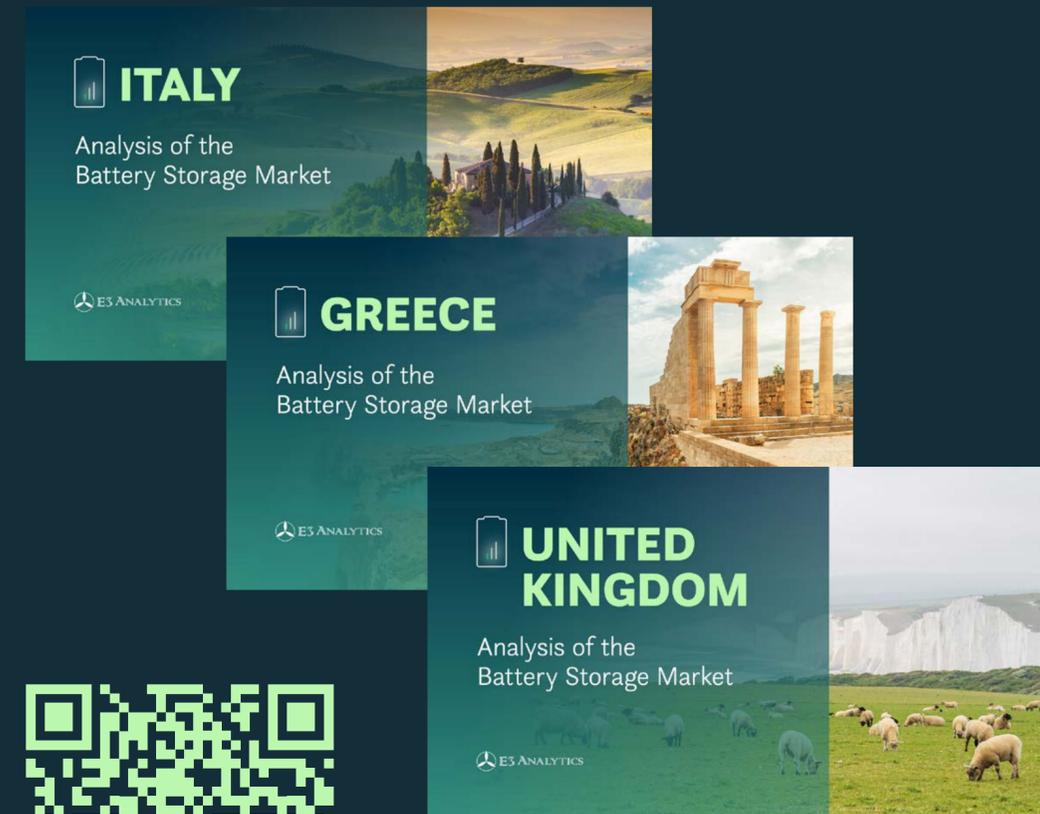


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This report is part of a series that analyses the battery storage market in select European countries.

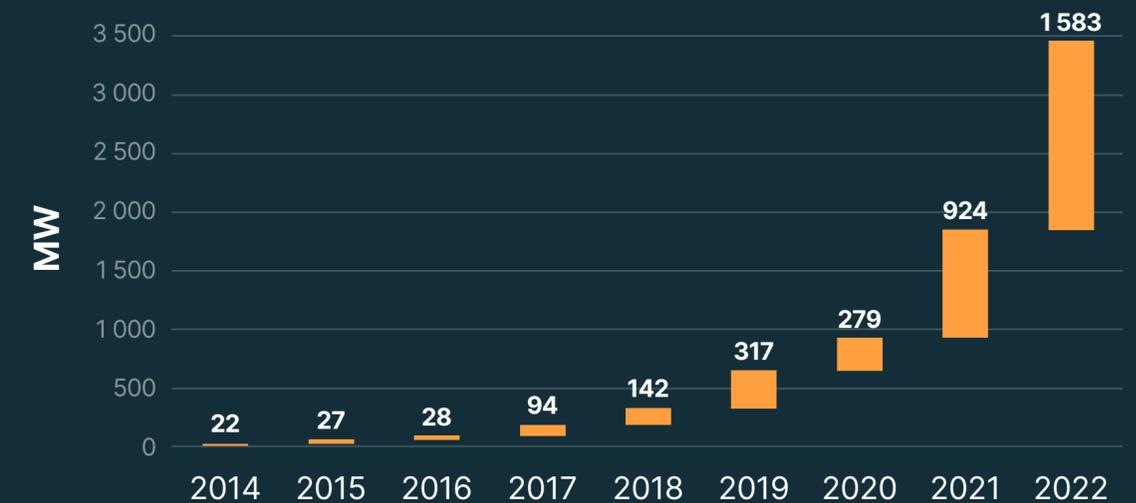
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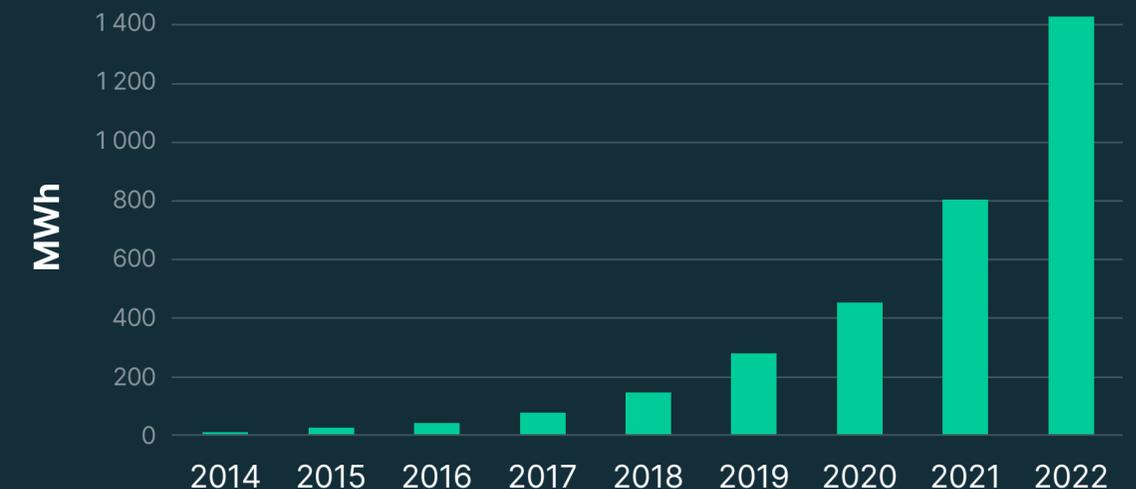
# Spain's battery storage market is dominated by customer-sited systems. Utility-scale storage remains nascent.

- Currently, Spain's storage market is mainly composed of small-scale batteries co-located with solar PV.
- As of early 2023, the total customer-sited storage capacity is estimated at approximately 1.4 GWh.<sup>1</sup>
- The market for utility-scale storage projects remains comparatively small at around 100MW, though a pipeline of projects is beginning to emerge.<sup>2,3,4,5</sup>
- Much of Spain's existing utility-scale storage capacity is in concentrating solar power plants (thermal storage) and pumped hydro.<sup>6,7</sup>

Cumulative customer-sited solar PV capacity (MW)<sup>1</sup>



Cumulative customer-sited storage capacity (MWh)<sup>8,9</sup>



# Customer-sited storage installations are **growing rapidly**, supported by high and increasingly volatile electricity prices

As in other European markets, the rate of installation of storage combined with solar PV is growing rapidly due to a combination of factors:<sup>10</sup>

- Battery cost declines
- Rising electricity prices
- A broadly supportive regulatory regime

Since 2019, small power generators have been able to receive compensation for their surplus solar generation.<sup>11</sup> This has led to a rapid growth of customer-sited solar PV projects, which in turn has triggered concurrent growth in battery storage adoption.<sup>12</sup>



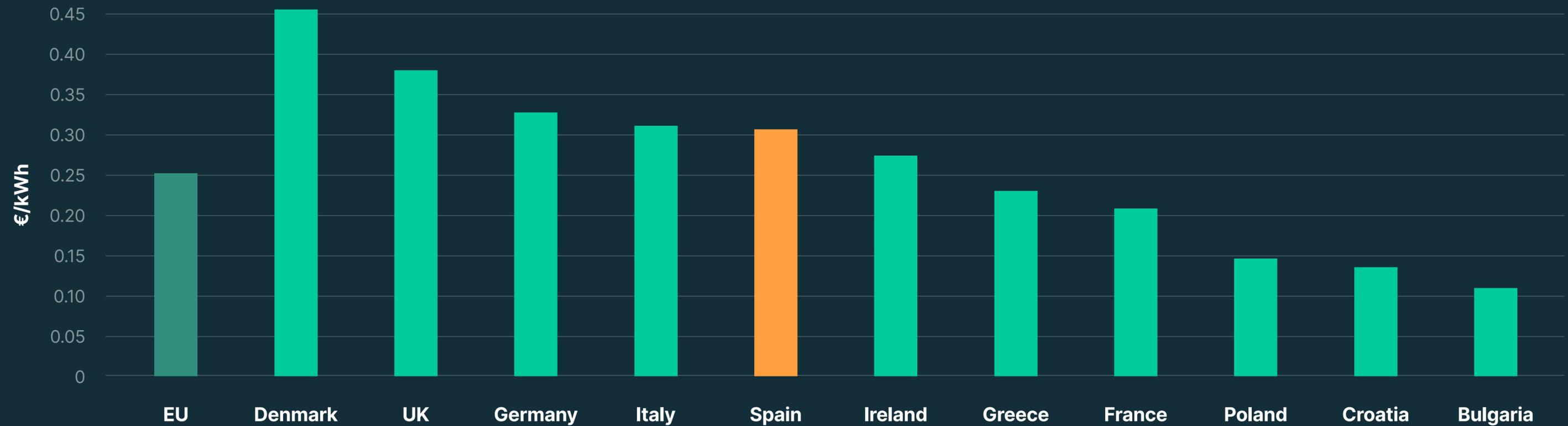
# Municipalities are starting to introduce their own measures to accelerate the energy transition

- Many Spanish municipalities provide tax reliefs for individuals and companies that install distributed PV for self-consumption.<sup>13,14</sup>
- Although much of the adoption of solar+storage installations to date has been concentrated in the residential sector, adoption is starting to occur in the commercial sector as well as in number of energy communities.<sup>15</sup>



# Spain's household **electricity prices** have nearly tripled since 2009

Spain's household electricity prices now stand at over EUR 0.30/kWh on average. In addition, Spain's reliance on fossil gas has increased price volatility in recent years.<sup>16,17,18,19</sup>



# Many electricity customers have **variable price contracts**, making customer-sited solar+storage more attractive

- In addition to higher prices, many customers in Spain have contracts with market-linked prices, which means that electricity prices can fluctuate considerably from one hour (or day, or month) to the next.<sup>20</sup>
- This variability, combined with Spain's excellent solar resources, make the economics of combining solar with storage increasingly favorable.



# Spain's **renewable energy share** is growing steadily, with both wind and solar breaking output records in 2022

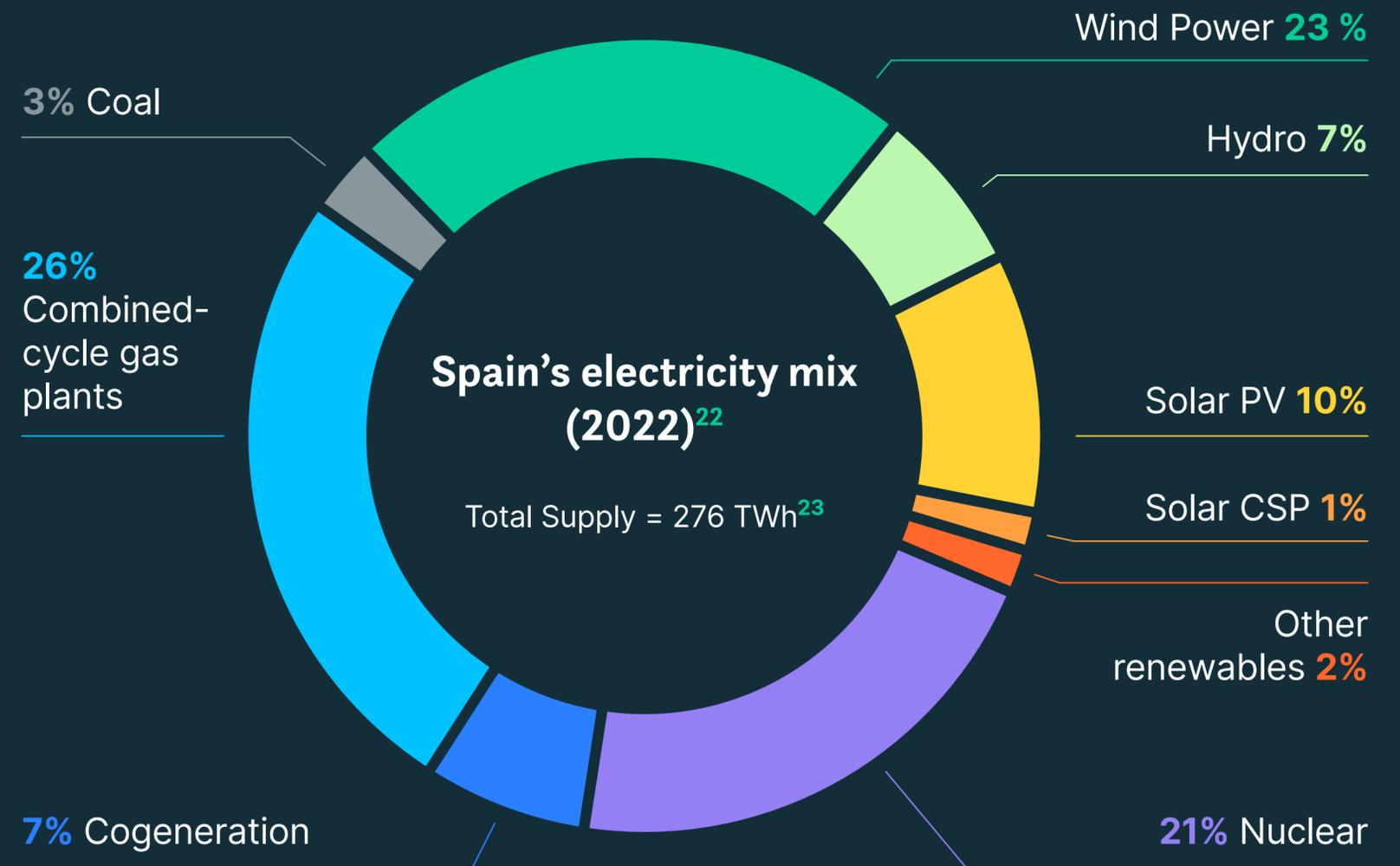
Total installed capacity in 2022 (all sources)<sup>21</sup>

**118GW**



Share of wind and solar in the electricity mix in 2022<sup>22</sup>

**over 32%**



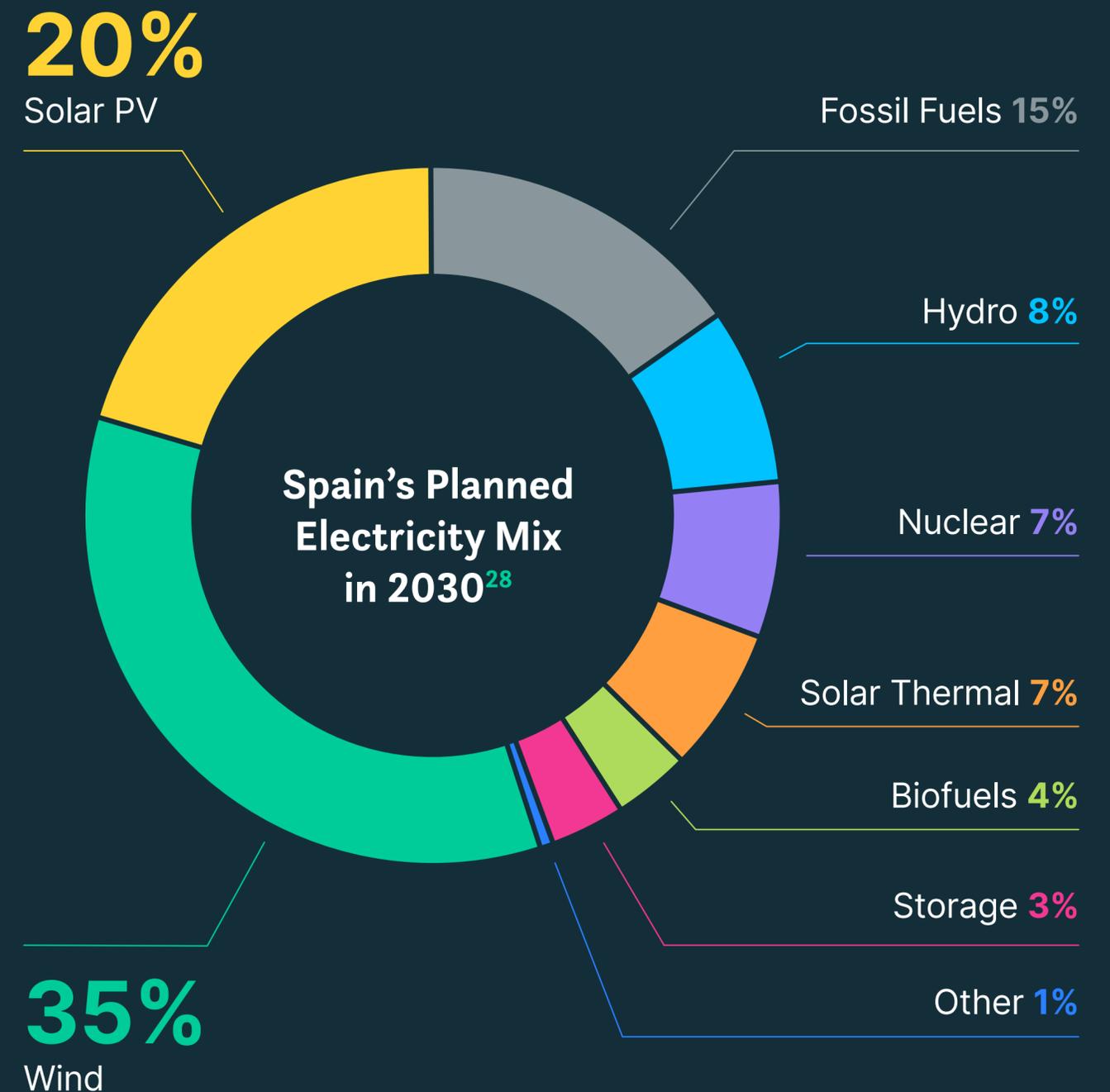
# The market for **utility-scale storage** remains in its infancy

- The market for utility-scale batteries has been almost non-existent until recently as the market has lacked a clear policy and regulatory framework.
- However, ambitious renewable energy targets combined with recently announced government subsidies are expected to spur the adoption of larger-scale battery storage projects in the coming years.<sup>24,25,26</sup>



# The massive deployment of renewables is likely to **require further growth** in utility-scale storage

- The Spanish TSO currently maintains grid stability and security of supply mainly by relying on approximately 40 GW of thermal and nuclear plants.<sup>27</sup>
- According to Spain's NECP, the share of variable renewable energy sources in the power mix is expected to grow to 62% by 2030 (from roughly 32% today).<sup>28</sup>
- The planned growth of renewables creates a clear rationale to further scale-up utility-scale battery storage.<sup>29</sup>



# A lack of **supportive regulations**, including an inability of operators to engage in “revenue stacking” is holding the market back

There are several factors that explain the relatively nascent stage of Spain’s utility-scale battery storage market:

- Price arbitrage is not yet sufficiently attractive in Spain as a stand-alone business model.<sup>30,31,32</sup>
- Revenue stacking is currently not allowed.<sup>33</sup>
- The risks with regard to double charging remain unclear.<sup>34</sup>
- Capacity markets are not yet attractive for developers of storage assets in Spain.

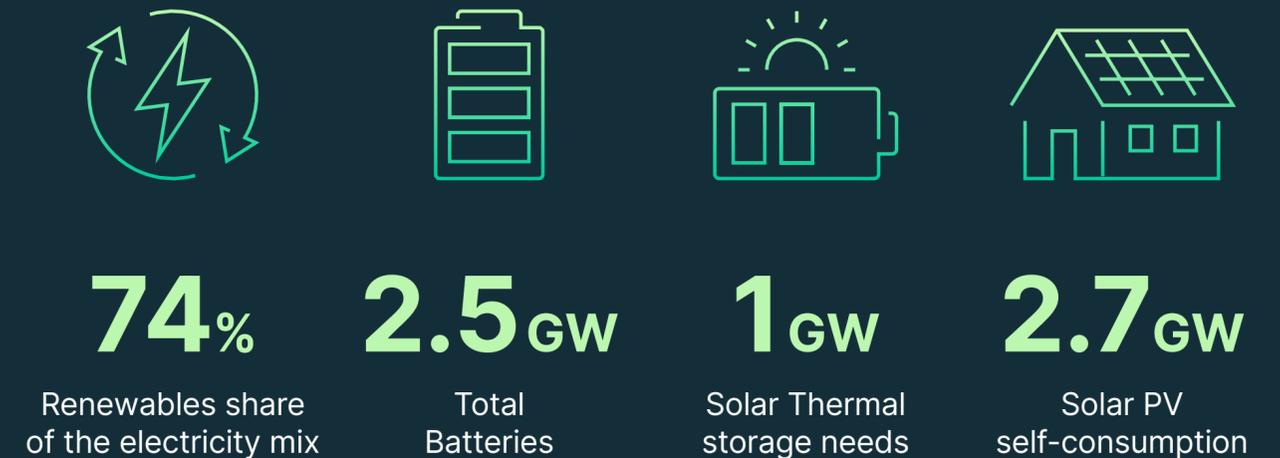
However, the government is developing new schemes to incentivise storage deployment, including adapting capacity markets under a new scheme named ‘Renewable Energy Economic Regime’. In addition, Spain has recently introduced subsidies specifically for storage systems co-located with solar PV.<sup>35</sup>



# Spain's national targets will see the country meet 74% of its electricity needs from renewables by 2030

- Spain's energy transition targets are among the most ambitious in Europe.
- Unlike a number of other EU countries, Spain's National Energy and Climate Plan (NECP) specifically includes targets and policies aimed at encouraging storage projects.
- In addition, Spain has developed a national storage roadmap that includes a target to achieve 20GW of storage by 2030. However, current levels of customer-sited storage adoption already exceed its 2030 targets.<sup>37</sup>

## Spain's 2030 NECP targets<sup>36</sup>

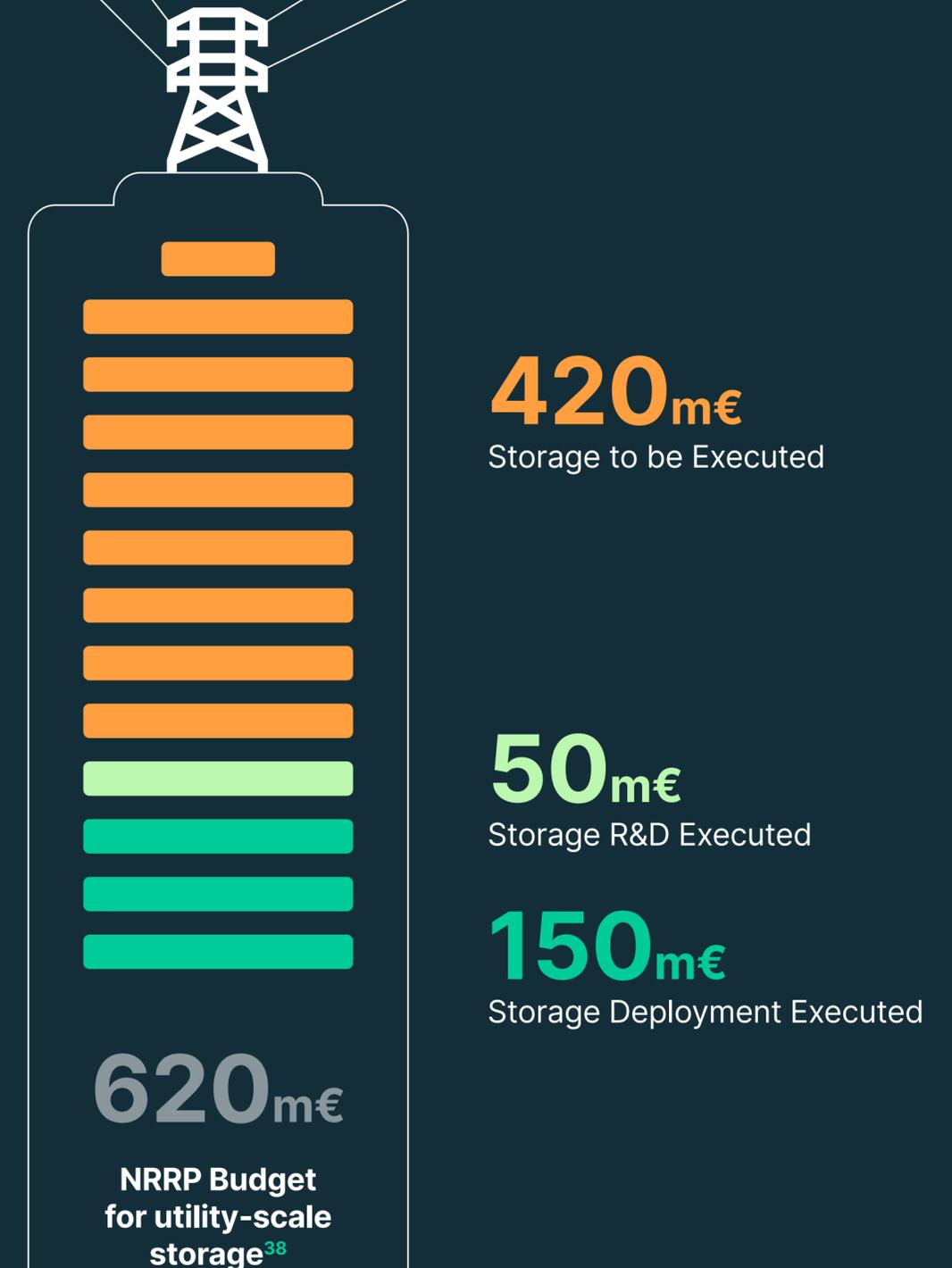


## Spain's 2030 storage roadmap targets<sup>37</sup>



# Spain's National Recovery and Resilience Plan (NRRP) is providing targeted support to storage projects

- The NRRP, a funding package from the EU, has promised a funding pot of 620m€, extendable to 1.320m€, specifically for energy storage and flexibility at both utility- and distributed-scales.<sup>38</sup>

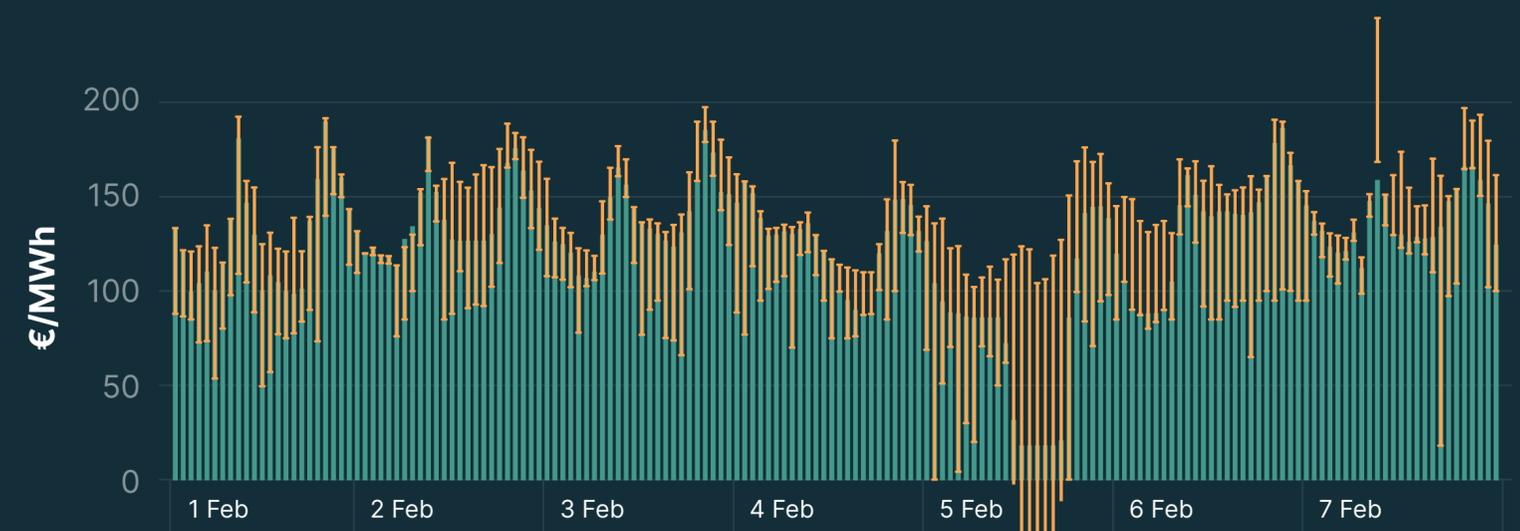


# Price arbitrage is possible, but has thus far been economically unattractive

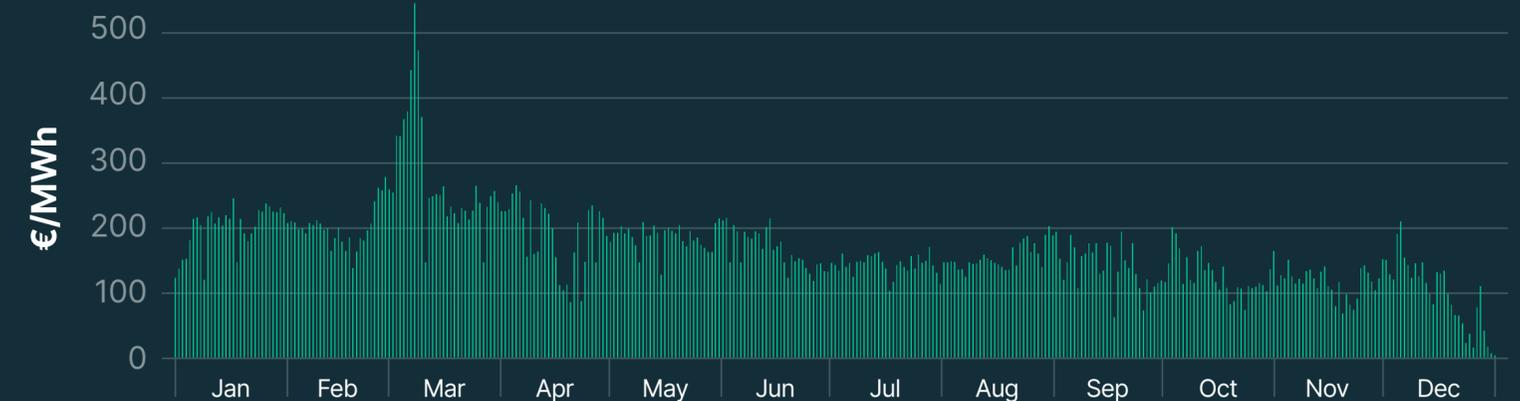
- As it stands, price arbitrage has not yet been profitable as a stand-alone business model for battery storage projects in Spain.<sup>39,40,41</sup>
- Since revenue stacking is not allowed, utility-scale battery storage plants must choose between price arbitrage in wholesale markets or operating in Spain's capacity markets.<sup>42</sup>
- To date, neither has been sufficiently attractive to mobilize investments at scale.

Hourly Day-Ahead Market prices (teal) and min/max continuous market (orange)

First week of February 2023<sup>43</sup>



Daily average prices in 2022<sup>43</sup>



# Recent changes to Spain's renewable energy auctions provide additional support to storage systems

- In the past, Spain's renewable energy auctions were based on a 'first come first serve' principle in terms of securing grid access.
- Recently, Spain has shifted its auction design and identified 34 grid access points.<sup>44</sup>
- Projects bidding to secure access to these sites are scored according to certain criteria (technical requirements, socioeconomic impact, environmental impact, etc.)
- In addition, one of the criteria is the hybridization with storage technologies.



# Continued growth of customer-sited battery storage is expected

- With NRRP funds and recently announced tax incentives, the market for customer-sited storage is expected to maintain its recent growth rates in the coming years.
- If energy communities grow, the market for medium-size batteries (in the tens of kWh) is likely to expand further. Currently, there are 289 energy communities in total, of which 9 have storage systems.<sup>45</sup>
- Over a longer timescale, the uncertainty is higher, as a higher share of renewable generation is likely to lower wholesale electricity prices. If household electricity prices follow, this could weaken the economics of customer-sited storage.



# The economics of utility-scale projects likely to improve due to recent **policy and regulatory changes**

- At the beginning of 2023, the Spanish government submitted a power market reform proposal to tackle the growing volatility of electricity prices. Among other changes, the proposals could provide further support to flexible assets such as storage.<sup>46</sup>
- In another potentially transformative development for Spain's fledgling utility-scale storage market, the government is developing legislation to allow revenue stacking.<sup>47</sup>
- As these and other policy changes start to take effect, the utility-scale market is expected to play an increasingly important role in helping Spain achieve its broader energy and climate goals.



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