

*European Market Monitor on  
Energy Storage 8.0*

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# Introduction slide

**More than 10GW of storage was deployed in 2023, with the installed base for storage set to grow by 6 times by 2030.**

## Synopsis

The 8<sup>th</sup> edition of the European Market Monitor on Energy Storage (EMMES) with updated views and forecasts towards 2030. Each year the analysis is based on LCP Delta's Storetrack database, which tracks the deployment of FoM energy storage projects across Europe.

EMMES focuses primarily on the deployment of electrochemical storage, providing data, insight and analysis across all segments (residential, commercial & industrial, FoM) for 14 countries across Europe. The accompanying database includes forecasts for 24 countries.

This report was produced by LCP Delta's Energy Storage Research Service



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<https://delta.lcp.com/research-services/energy-storage-research-service/>

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  - Co-location for FoM storage
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# About LCP Delta and EASE



LCP Delta was formed through the merger of Delta-EE and LCP Energy to bring together deep generation and consumer-side expertise, to provide our clients with a single partner to help them on their journey and provide them with a 360° view across the energy spectrum.

Based across the UK, France, the Netherlands and beyond, LCP Delta provides data-driven research, consultancy, technology products and training services to companies investing in and navigating the energy transition.

This research is part of our **Energy Storage Research Service** which provides insight into key markets, competitors and issues shaping the sector.

<https://lcpdelta.com/>



The European Association for Storage of Energy (EASE), established in 2011, is the leading member-supported association representing organisations active across the entire energy storage value chain.

EASE represents over 70 members including utilities, technology suppliers, research institutes, distribution system operators, and transmission system operators.

EASE supports the deployment of energy storage to enable the cost-effective transition to a resilient, carbon-neutral, and secure energy system.

<https://ease-storage.eu/>

# *Introduction*

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# European Market Monitor on Energy Storage 8.0

## Scope

- The report covers 14 countries; Belgium, Finland, France, Germany, Great Britain, Greece, Norway, Netherlands, Ireland, Italy, Poland, Spain, Sweden and Switzerland.
  - The regulatory and economic landscape of each of these countries is outlined and combined with project level information from LCP Delta's Storetrack database. In total, this database includes project information for 29 European countries, the rest of which have been aggregated.
- The focus of the report is electrochemical storage technologies (Lithium, non-Lithium and Flow batteries).
- The storage market is categorised into :
  - Behind-the-meter :
    - Residential
    - Commercial & Industrial
  - Front-of-meter
- Each segment includes both co-located and standalone projects.

## Storetrack database

- LCP Delta tracks over 3,000 energy storage projects in our interactive database, Storetrack. With information on assets in over 29 countries, it is the largest and most detailed archive of European storage.
   
<https://storetrack.lcpdelta.com/>
- While the report is focused on electrical storage, the database holds project information for multiple other storage technologies (e.g. pumped hydro, CAES, gravity, large-scale thermal etc).
- For information on access please contact:
   
[silvestros.vlachopoulos@lcp.com](mailto:silvestros.vlachopoulos@lcp.com)

# Yearly battery power capacity with 2030 forecasts

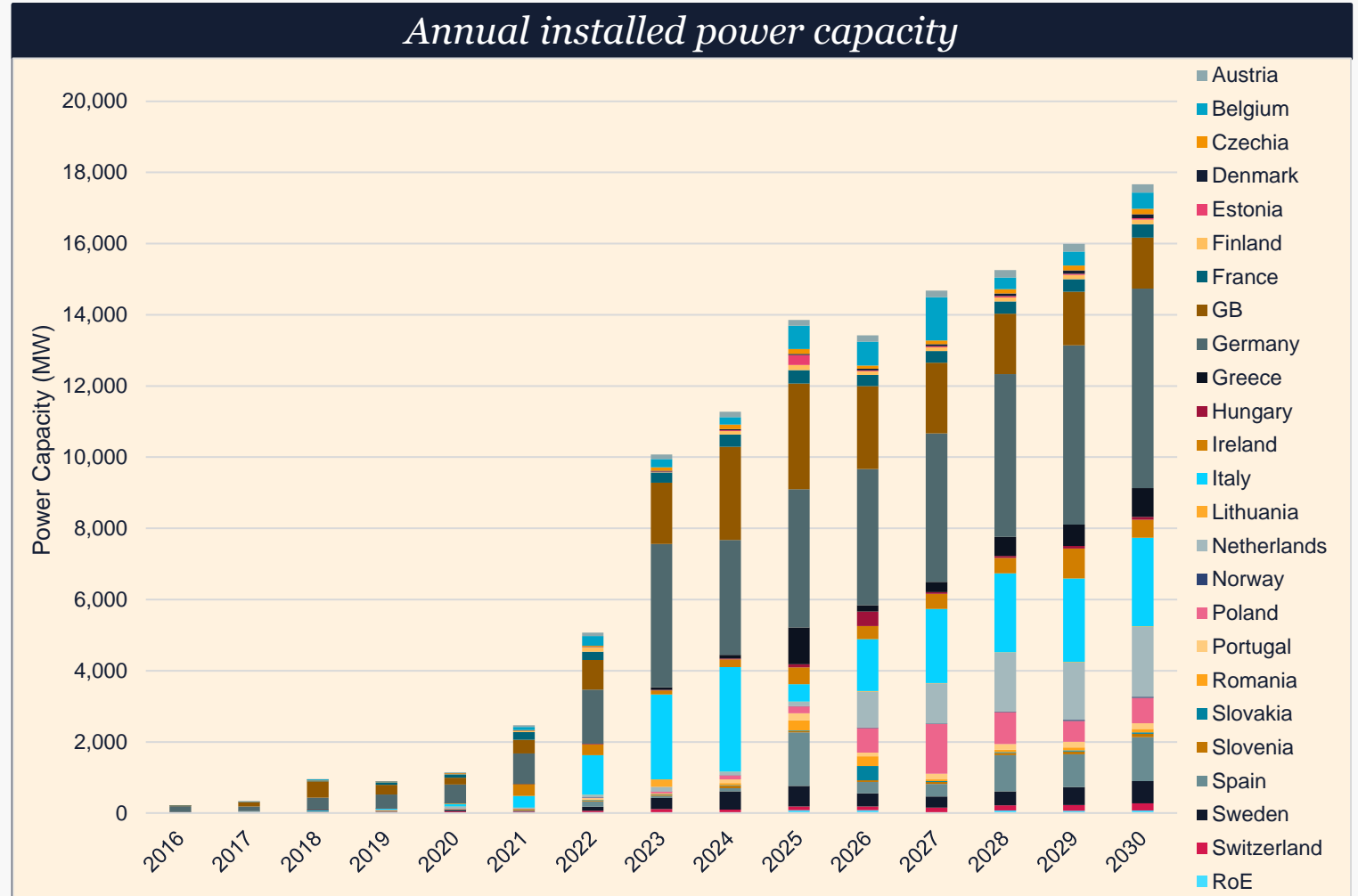
How much new battery power capacity will be added each year?

**10.1 GW**

2023 annual installed capacity

**17.6 GW**

2030 annual installed capacity



# Yearly battery storage capacity with 2030 forecasts

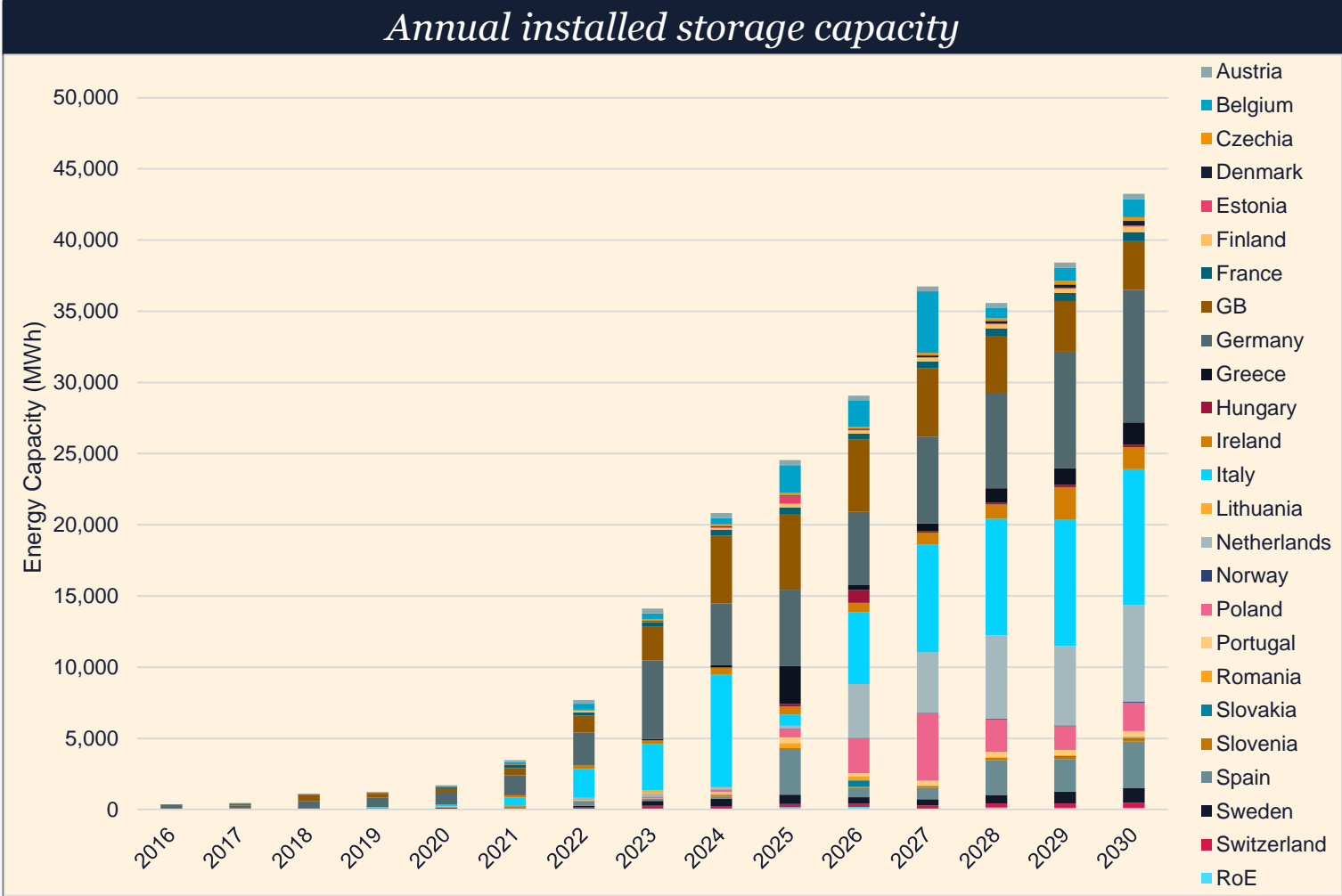
How much new battery storage capacity will be added each year?

14.1 GWh

2023 annual installed capacity

43.2 GWh

2030 annual installed capacity





# Cumulative battery power capacity with 2030 forecasts

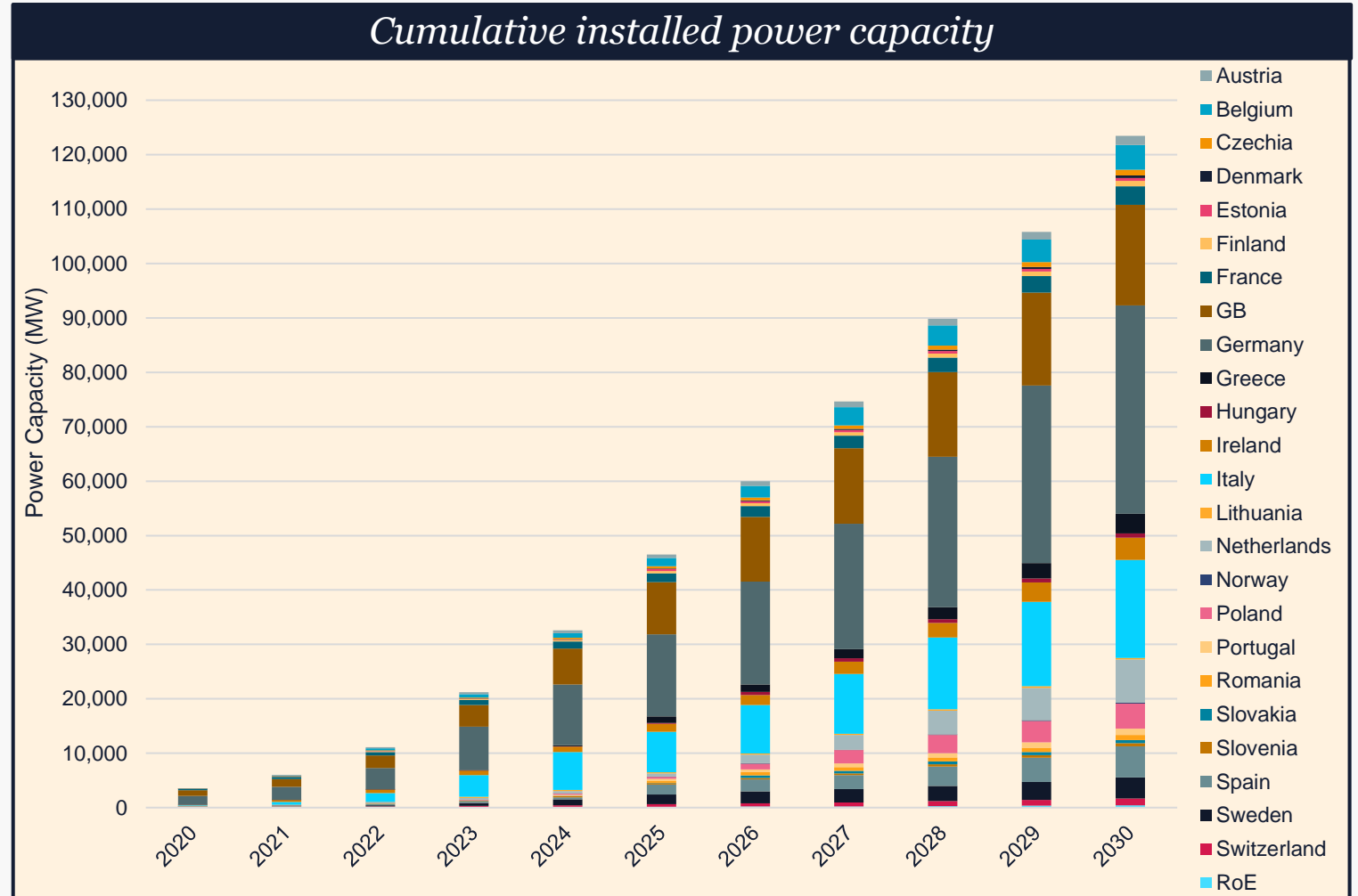
How much is the installed base for battery storage growing each year?

21.2 GW

2023 cumulative installed capacity

123.5 GW

2030 cumulative installed capacity

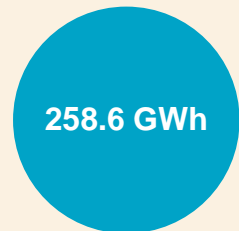


# Cumulative battery storage capacity with 2030 forecasts

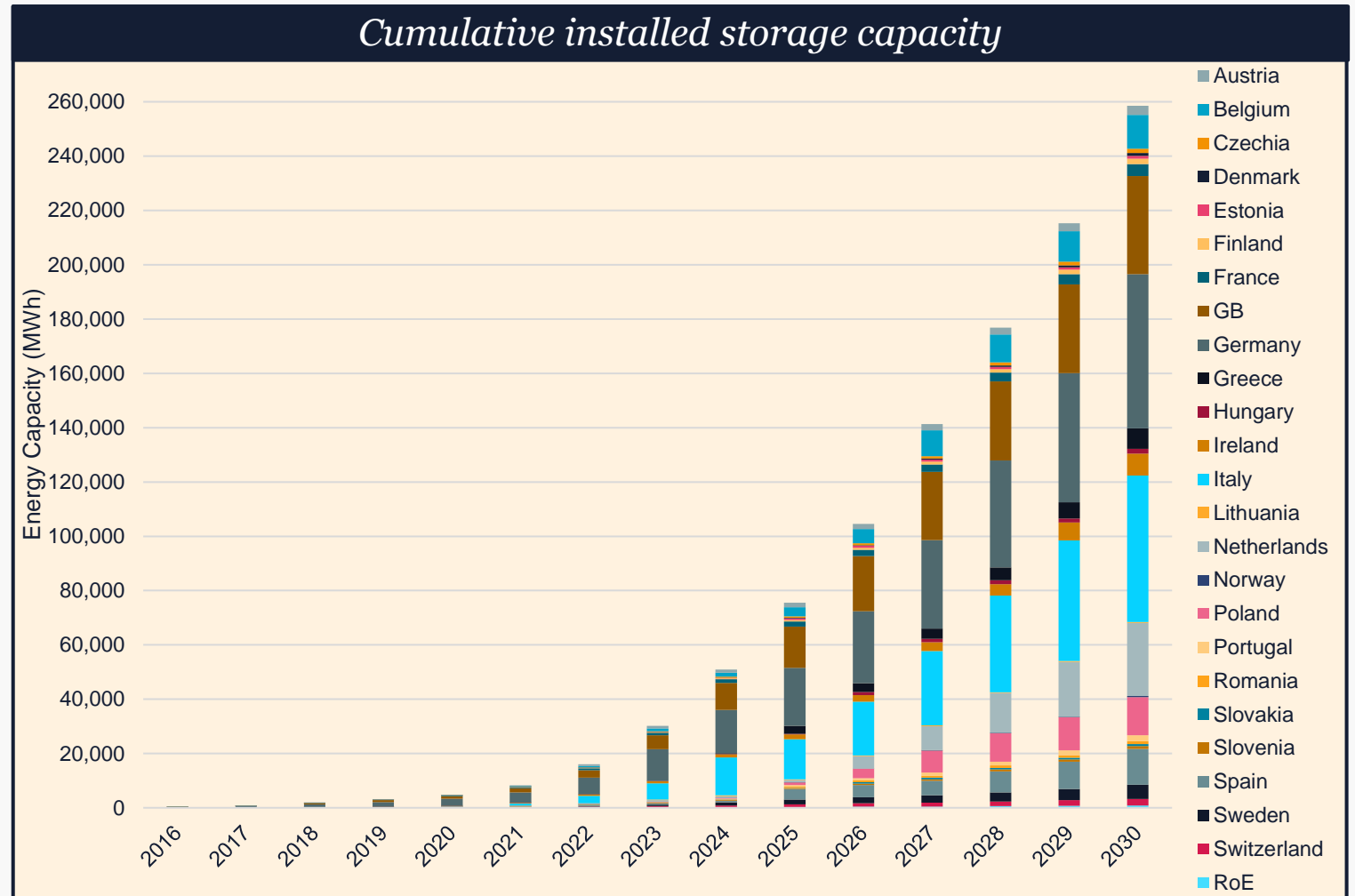
How much is the installed base for battery storage growing each year?



2023 cumulative installed capacity



2030 cumulative installed capacity



# What are the key market trends?

## Key trends in the European storage market in 2023...

### Decreasing battery prices

Following short-term increase in 2022, prices are back on a downwards trajectory.

### Growth in projects co-located with renewables

Around 300 MW of FoM projects co-located with renewables got connected in 2023, mainly in Germany. This is around 40% of the cumulative capacity of projects co-located with renewables.

### Increasing FoM average duration

The average duration of >10MW FoM projects connected in 2023 is around ~ 1.5 h, up from around 1.3h in 2022.

## ... and what will happen by 2030

### Increased lithium mining and alternative technologies

Potential fears of a short-term material unavailability are easing, as the output of critical raw materials for storage is increasing at a higher-than-expected pace. Alternative chemistries and technologies will supplement the market need by 2030.

### Stronger growth in co-located projects by 2030

As the energy transition accelerates co-location will help reduce project curtailment and enhance revenue opportunities for renewable projects. In the past some renewables auctions had co-location requirements, and more are planned in the future.

### Multiple 2h+ projects by 2027

There are several 4h duration projects planned by 2027 across Europe (for example in Italy, Spain, Benelux, Poland, Greece). The driver is to make the most of wholesale opportunities, but often these are set as requirements by specific auctions.

# What are the key market trends?

## Key trends in the European storage market in 2023...

### A record year for residential

A massive uptake of residential systems especially in the top 2 markets, Germany and Italy, resulted in over a million residential installations across the continent.

### Storage auctions as a tool to kick-start markets

Auctions specific for storage projects took place in Greece and Spain in 2023, while Terna is planning a massive storage auction scheme (over several rounds) in Italy to ensure the 11GW storage ambitions by 2030 are met.

### Project delays are pushing capacities further into the future

Another year when we saw multiple mature projects being delayed due to financing or supply chain difficulties. Grid connection applications and permitting also typically create bottlenecks across the continent.

## ... and what will happen by 2030

### But future is not looking as bright in the short-term

As pressures on electricity prices eases, subsidies are removed in key markets and access to capital for residential consumers becomes more challenging, we do not expect a repeat of the success of 2023 soon.

### More countries likely to follow

More countries are considering or already planning similar schemes for the future. These will be driven in cases where the existing market structures fail to deliver the necessary storage for the electricity system.

### NECP updates in 2023 bring more ambition

The updated NECPs brought in new targets and more ambitions for renewables by 2030, and in some cases storage targets by 2030. While it won't be an easy road, Europe seems closer to reaching its 2030 storage needs.

# *Policy Overview*

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- > **Market access**
- > **National policy**

# European overview of market access

Positive
Negative

	Fast acting services*	FCR	aFRR	mFRR	RR	ID/DA	Resource Adequacy
Belgium	NA	✓	✓	✓	NA	✓	✓
Finland	✓	✓	✓	✓	✓	✓	✓^
France	NA	✓	✓	✓	✓	✓	✓
Germany	NA	✓	✓	✓	NA	✓	✓^
GB	✓	✓	✓	✓	✓	✓	✓
Greece	NA	✓	✓	✓	NA	NA	NA
Italy	✓	NA	✓	✓	✓	✓	✓
Ireland	✓	✓	✓	✓	✓	✓	✓
Netherlands	NA	✓	✓	✓	NA	✓	NA
Norway	✓	✓	✓	✓	NA	✓	NA
Poland	NA	2024	2024	2024	2024	NA	✓
Spain	NA	NA	✓	✓	✓	✓	NA
Sweden	✓	✓	✓	✓	NA	✓	✓^
Switzerland	NA	✓	✓	✓	✓	✓	NA

\* Services faster than FCR, such as Dynamic Containment in GB.

^ Resource Adequacy Mechanisms exist, but no storage capacity has been awarded contracts

# European policy overview

Positive
Negative

	Residential storage incentives?	Solar injection tariff method	Smart meter rollout	Double charging of grid fees on projects connected to the transmission network?	Double charging of grid fees on projects connected to the distribution network?	Double charging of taxation on electricity from storage assets?
<b>Belgium</b>	X	Tariffs vary by region	37 %	X	✓	X
<b>Finland</b>	X	Net Metering	100 %	✓	✓	✓
<b>France</b>	X	FiT	94 %	✓	X	✓
<b>Germany</b>	✓*	Feed in Premium	3 %	X	X	X
<b>GB</b>	✓*	Smart Export Guarantee	63 %	X	X	X
<b>Greece</b>	✓	Self-consumption	0 %	X	X	X
<b>Italy</b>	✓	Net Metering	72 %	X	X	X
<b>Ireland</b>	X	Clean Export Guarantee	56 %	✓	X	✓
<b>Netherlands</b>	X	Net Metering	88 %	X	X	✓-
<b>Norway</b>	X	Spot price	100 %	✓	✓	X
<b>Poland</b>	✓	Net Billing	15 %	X	X	X
<b>Spain</b>	x	Net Billing	100 %	X	X	✓
<b>Sweden</b>	✓	Tax relief	85 %	✓	✓	X
<b>Switzerland</b>	✓*	Tariffs vary by municipality	38 %	X	X	X

\* Regional incentives

- Exemptions available

# *Overview by market segment*

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- > **Residential**
- > **Commercial and Industrial (C&I)**
- > **Front of Meter (FoM)**



# Overview of the Residential storage market in Europe

**Storage installations in 2023 were a peak that will likely not be seen again in the short-term.**

## 2023: Germany and Italy experience massive growth

In Germany, as stock availability for Solar PV and batteries improved in 2023, the market was able to meet a lot of the extreme unserved demand from 2022, reaching an extremely high peak of more than 500k installations.

A rush to take advantage of attractive schemes resulted in high installation numbers in Italy and Belgium in 2023.

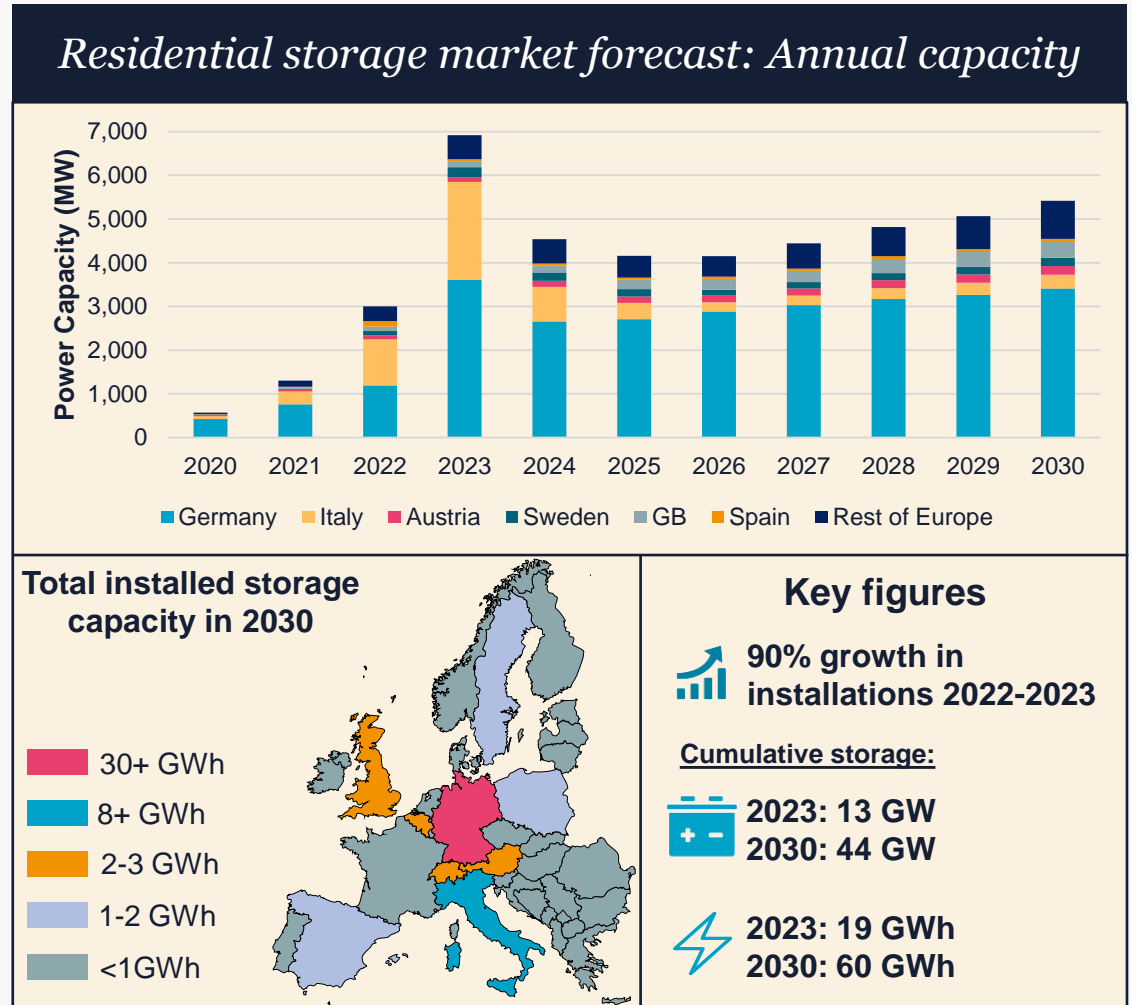
Other markets continued with a steady growth rate (e.g. Austria, Great Britain, Sweden), while some new residential markets sprung into existence (e.g. Poland).

## 2024-2026: A decline in Europe-wide sales

We expect to see a smaller market in the short-term future as subsidies end in key markets, electricity prices stabilise, and access to capital becomes more challenging. These negative effects will be slightly offset by price decreases, as wholesalers and installers aim to get rid of batteries they overstocked in 2023 and as the average price of a battery system decreases over time.

## 2027-2030: Steady growth, with Germany remaining the key market

In the long term, a growing European residential PV market will drag on residential battery installations. More dynamic tariff options will become available, creating more opportunities for prosumers.



# Overview of the Commercial and Industrial market

## A second strong year in a row for C&I storage, with growth across several markets

### 2023: Germany tops deployment, but other markets also had significant deployment

2023 was another strong growth year for C&I scale PV, resulting in more sales for projects optimising PV consumption across the continent. Another growing application is storage as a tool to mitigate capacity constraints. This is a particularly strong driver in the Netherlands, but also growing elsewhere (e.g. Germany, UK). In Sweden, the remarkable market growth has been driven by the current attractiveness of ancillary services.

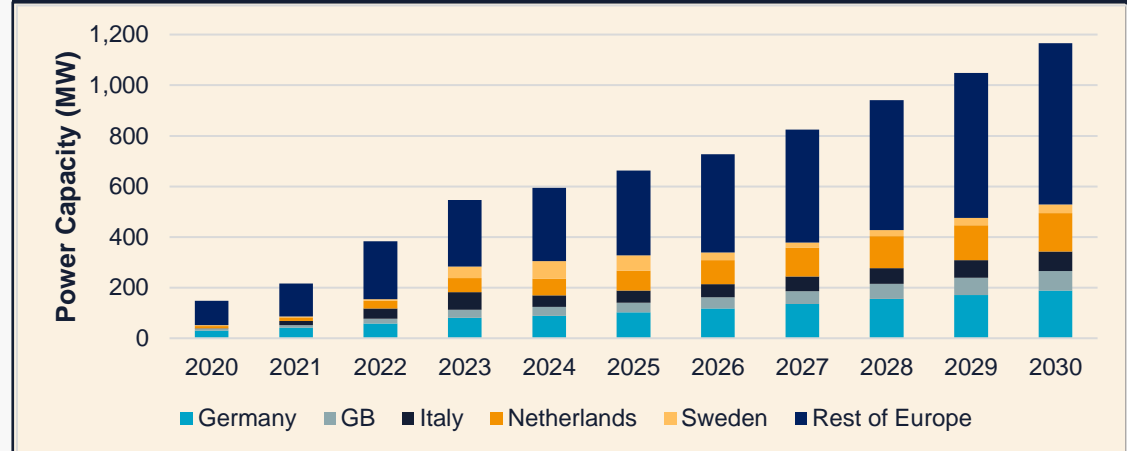
### 2024-2026: Continuous growth albeit with smaller annual growth rates

We don't expect to see a fundamental shift to the drivers for C&I storage in this timeframe. A potential slow-down of PV deployment may affect overall growth rates, especially in small scale systems. Other use-cases, will largely continue unaffected.

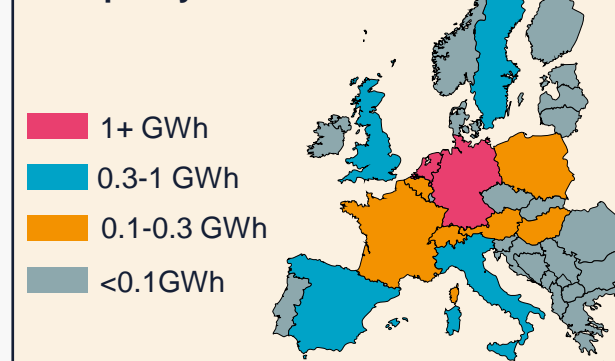
### 2026-2030: Faster growth rates post-2027

The implementation of the new Electricity Market Design will help accelerate the sector, as more opportunities for flexible operation open-up. The growing electricity demand from electrification and the strain it puts into electricity grids, will further increase the need for storage. At the same time, as technologies continue scaling, the average price of storage will decrease when compared to 2023 values, even if there may be short-term volatilities. This means that storage may be more affordable to a wider range of customers.

C&I storage market forecast: Annual capacity



Total installed storage capacity in 2030



### Key figures

42% growth in installations 2022-2023

#### Cumulative storage:

2023: 1 GW  
2030: 5 GW

2023: 2 GWh  
2030: 8 GWh

# Overview of the Front of the Meter market

## 56% growth by power capacity in 2023, most of it coming from Great Britain

### 2023: Great Britain leading market deployment

Britain's annual installations have doubled every year since 2020. Few countries had significant variation from 2022, except for Lithuania (4 x 50 MW projects), Germany (30% growth) and Ireland (a -200 MW decrease).

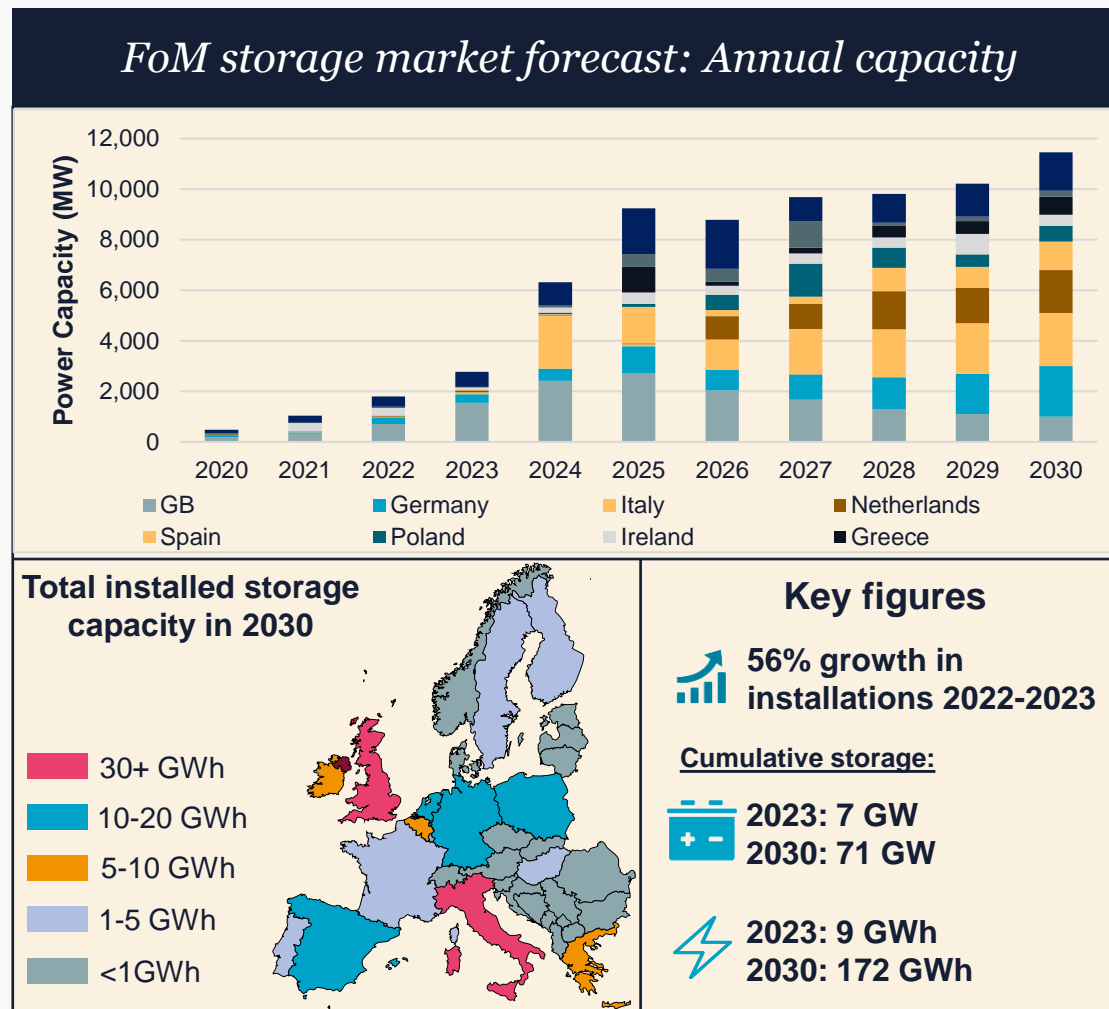
### 2024-2026: Support schemes drive smaller markets

The storage market enters a new dynamic era, with multiple countries installing high volumes, driven by past capacity market auctions (Italy), storage auctions (Spain, Greece, Hungary), innovation funds (Germany) and attractive revenues in the short-term (Sweden).

Some of the large projects currently developed in the Benelux are expected to come online by 2026. Mature markets experience revenue saturation from the high volumes of assets, leading to boom and bust cycles.

### 2026-2030: Policy developments will drive storage volumes towards 2030, as countries try and meet ambitious renewable and storage targets

A lot of the policy intervention that is currently proposed will have a positive impact on storage deployment post-2026: for example, the planned Italian storage auctions or a German capacity market. Procurement for storage-specific capacity is being considered in more countries, as grids congestion hinders the deployment of renewables. Hence, we expect support for storage to be strong in order to allow the achievement of 2030 targets. We should also see the positive effects from the implementation of the EMD during the same period.



# *Comparison with EMMES 7*

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# Analysis of 2023 deployment : FoM

What was the difference between reality and EMMES 7 forecast?

**We overestimated FoM installations by ~ 900 MW, largely due to unrealised projects in Italy that will come online in 2024.**

## General methodology in determining next year's installation

We look at the expected pipeline and determine the capacity based on the probability that projects will get constructed as planned. We consider factors such as market attractiveness, supply chain / construction delays, secured revenue streams etc to determine a reasonable ratio

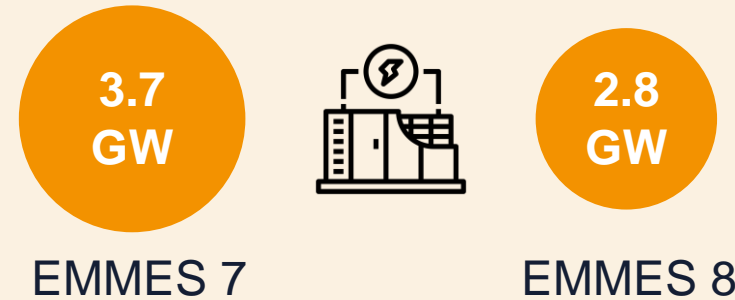
## Italy had the biggest difference

Last year we estimated that some of Enel's portfolio of projects will get connected in 2023. These projects started construction in 2023 but will commence operation in 2024. This created a ~800MW difference in our data.

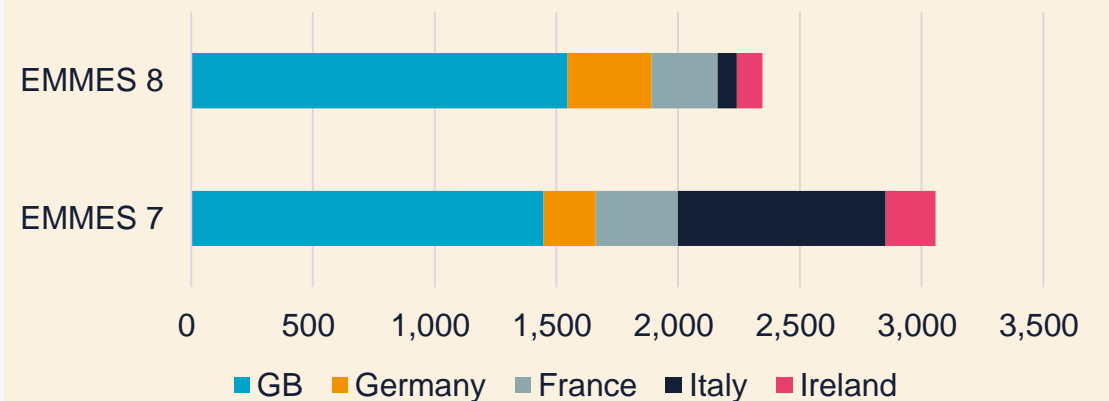
## Differences in other key markets

In Germany we underestimated the amount of co-located projects, while in Ireland we underestimated how many projects will stall development due to regulatory uncertainty. Great Britain and France had even smaller differences than the above two countries.

## FoM Storage in 2023



## Key markets comparison (MW)



# Analysis of 2023 deployment : BtM

What was the difference between reality and EMMES 7 forecast?

**We underestimated the size of BtM installations by ~4.6 GW due to underestimating the growth potential in Germany and Italy**

Ability of the market to serve demand in Germany

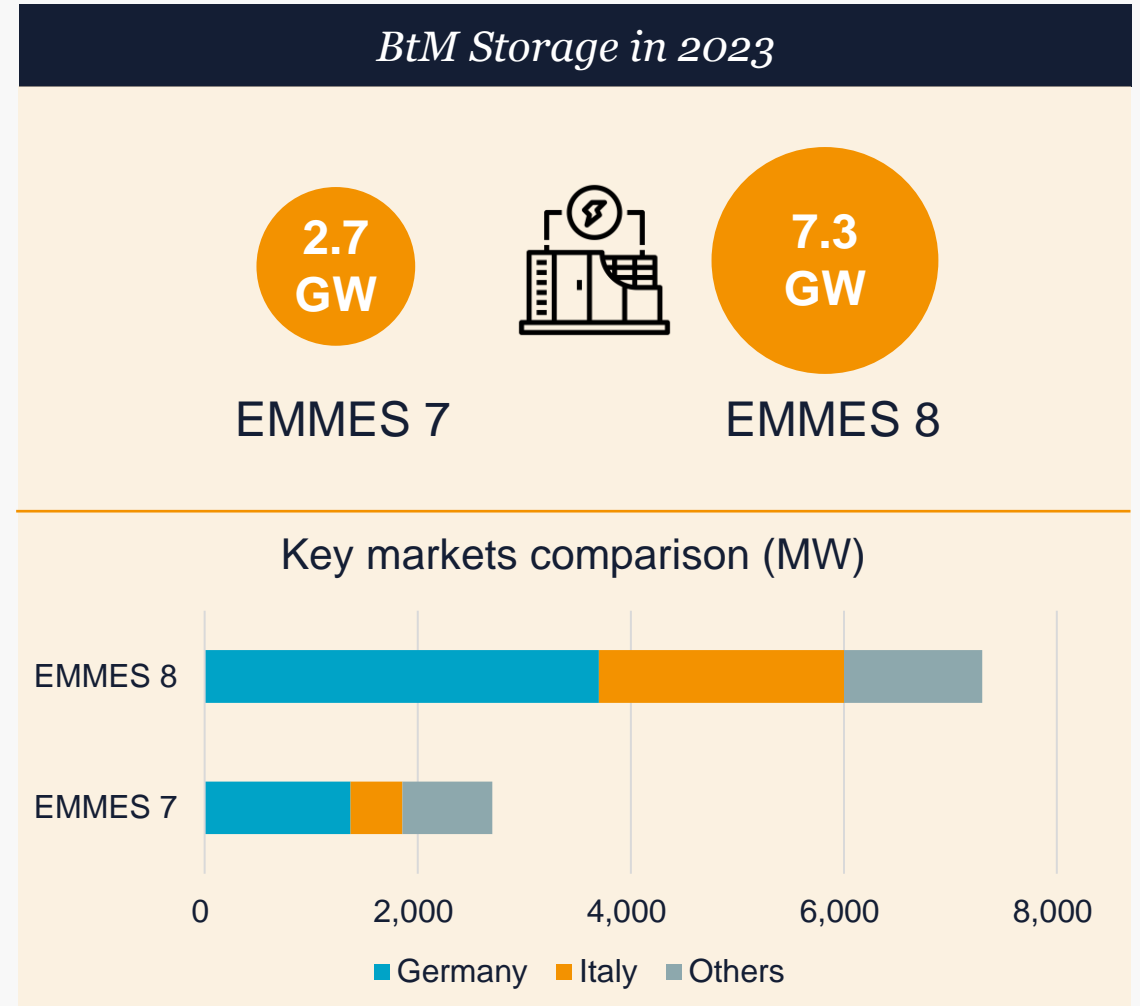
We were aware that in 2022 the waiting time for a new PV + battery project was more than a year. On that basis we assumed that although demand was very high, the installers wouldn't be able to follow it at a big extend. This didn't happen however: stock availability for batteries increased in 2023 and installers managed to meet the bulk of the demand that was in waiting from previous months including additional projects.

Overestimation of the impact of the end of subsidies

In Italy we assumed that the market would slow down with a lower Superbonus subsidy, but it was extended to December 2023. Rush to get subsidies before they got removed led to higher-than-expected installations in Belgium.

Improved market visibility increased average power and storage capacities

We also improved our market intelligence on average system sizes. This means that for similar volumes of number of installations (the key datapoint we collect for residential) we get different (on average higher) power capacities and storage capacities. We also underestimated the growth potential of C&I, especially in capacity constraint and flexibility applications.



# *Front of Meter storage analysis*

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- **Storage duration**
- **Co-location for FoM storage**
- **Largest grid-scale battery projects by country**

# Storage Duration

**Storage durations continued to increase:  
Average: 1.49 h in 2023 for projects > 10MW**

## Differing market strategies

Projects targeting only revenues from ancillary services typically have 1h duration (or shorter). Duration increases as projects start aiming for revenues from energy arbitrage. Storage duration is also affected by policy requirements (e.g. minimum duration for participation in an auction)

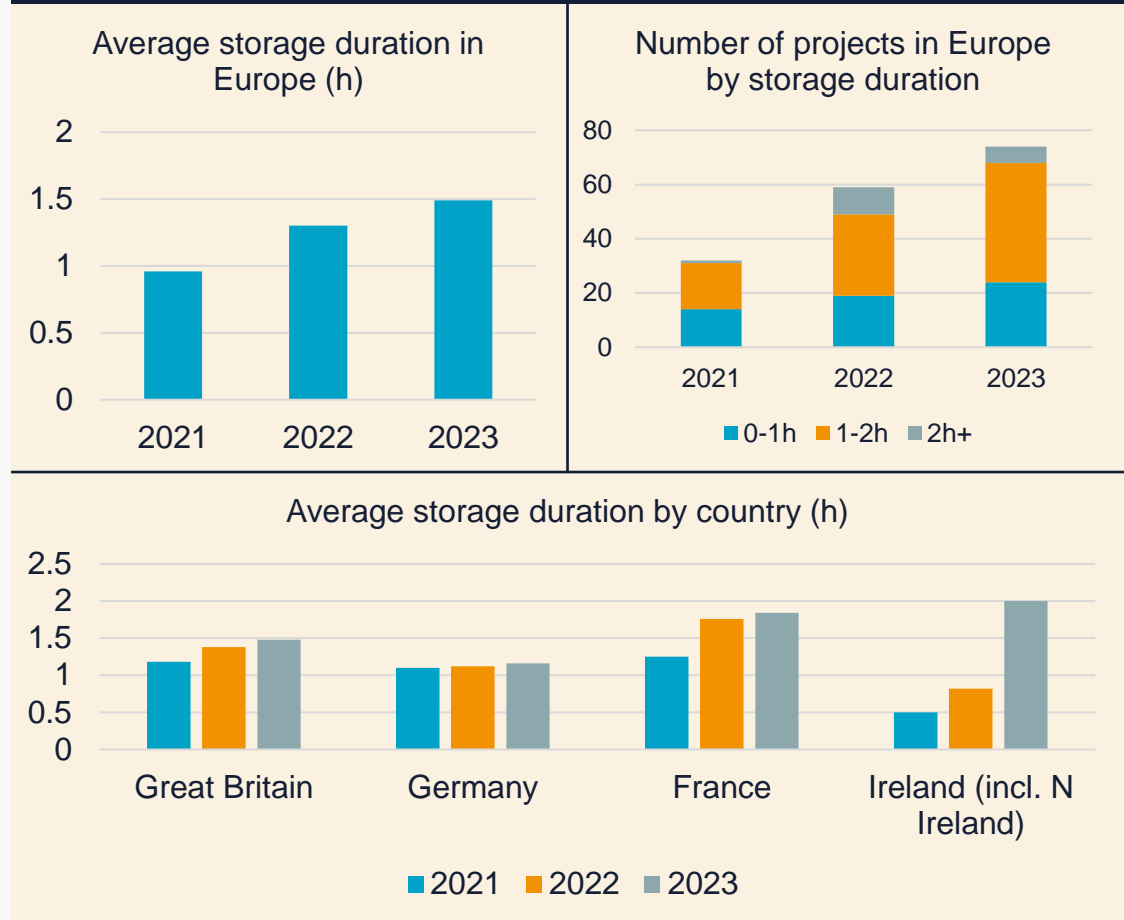
## Historical evolution

With revenues from ancillary services in mature markets becoming less certain, storage duration has been on an upwards trajectory since 2021 to target wholesale markets. 2h+ duration is common for projects connected in 2022-2023.

## 4h duration projects are very near

There are currently only 3 operating 4h+ duration projects in Europe, but the move towards 4h duration is already happening with many projects in pipeline for the next 3 years across Italy, Spain, Benelux, Poland, Greece.

## Project duration trends (for projects >10MW)





# Co-location for FoM storage

## Co-location with renewables is increasingly popular

### Conventional generation

Co-located batteries are often installed with conventional generation, such as fossil-fuels, nuclear and hydro. These connections are often driven by availability of grid connection and easier permitting, and that storage can enhance flexibility of these assets.

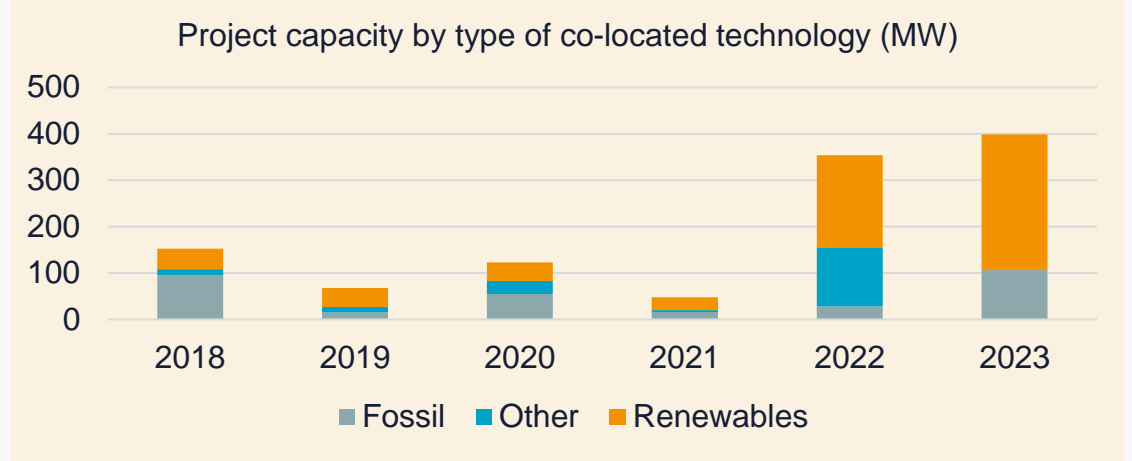
### Strong growth in co-location with renewables in 2022-2023

Around 40% of the installed base of projects co-located with renewables was installed in 2023. Due to the innovation auction scheme, Germany is a leading market, ~55% of the capacity installed in 2023 was in Germany.

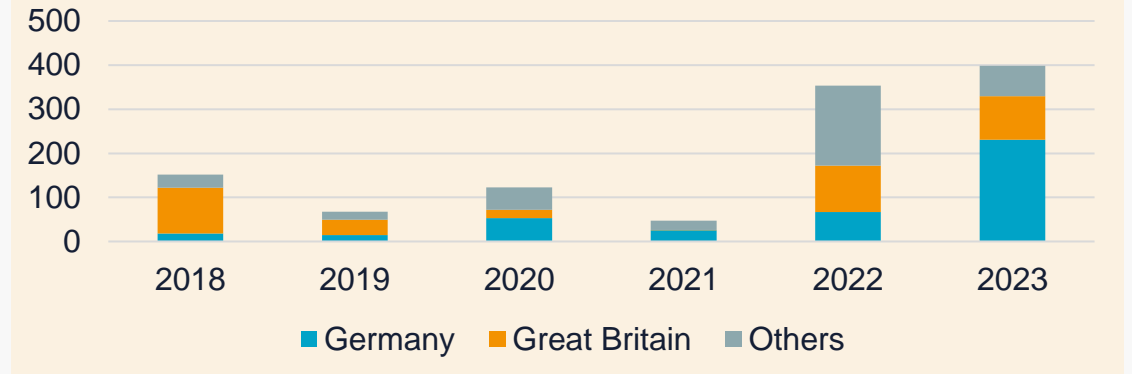
### Growing application towards 2030

Co-location will be a growing application for large-scale storage. Several countries had auctions for co-located projects, and more are planned in the future. Beyond policy developments, increased grid congestion will result in further need for co-location.

Project capacity by type of co-located technology (MW)

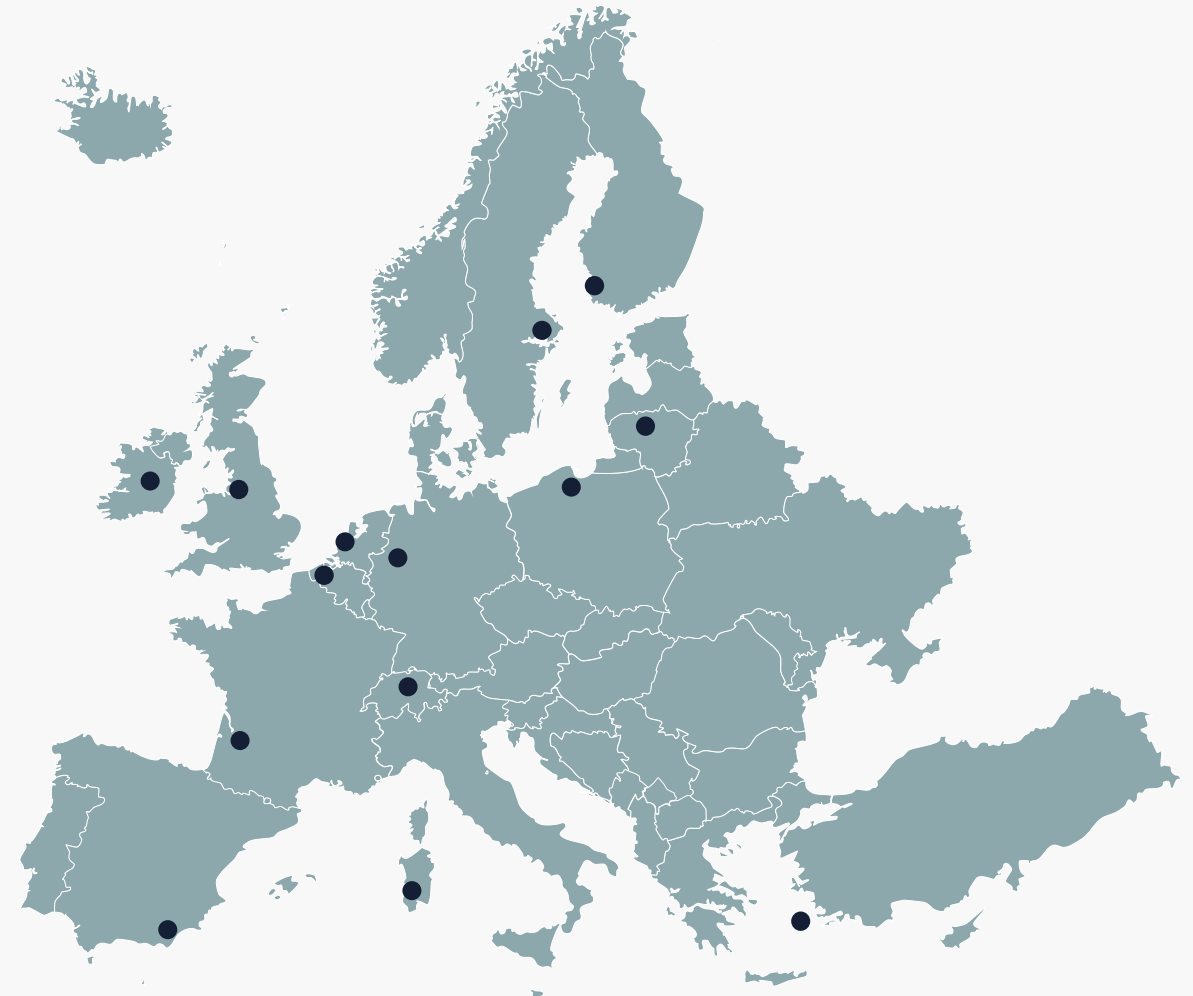


Project capacity by country (MW)



# Largest grid-scale battery projects by country

Country	Name	Power (MW)	Storage (MWh)	Year
Belgium	Deux-Acren	50	100	2022
Finland	Olkiluoto	90	90	2022
France	Claudia	105	230	2023
Germany	Werne	72	78	2023
Great Britain	Capenhurst	100	107	2023
Greece	Tilos	0.9	2.8	2018
Ireland	Lumcloon	100	60	2021
Italy	Assemini	15	9	2023
Lithuania	Šiauliai	50	50	2023
Netherlands	Castor	30	63	2023
Norway	Longyearbyen	6	7	2022
Poland	Bystra	6	27.4	2020
Spain	Carboneras	20	11.7	2018
Sweden	Haninge	20	20	2023
Switzerland	Fairpower	20	20	2020



# *Other storage technologies*

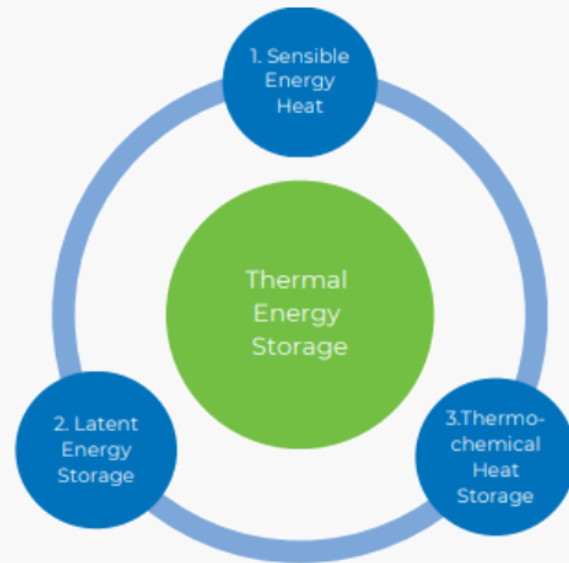
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- **Thermal Energy Storage (TES)**

# Thermal Energy Storage (TES)

## What is Thermal Energy Storage?

Thermal Energy Storage (TES), as one of the energy storage technologies, refers to means of deferring the final use of thermal energy (or of electrical energy through thermal means) to a moment later than when it was generated, or the conversion of any form of energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical or thermal energy<sup>1</sup>



## Power-to-Heat-to-Power

TES technologies can play a role in a variety of technical applications and multiple storage technologies. For the purposes of this report, we will focus on Power-to-Heat-to-Power application:

- **Operating principle:** electricity is converted to heat, stored, and then back into electricity again
- **Applications:** Grid-scale energy storage and to decarbonise industrial energy.
- **Potential services:**
  - Grid Balancing
  - Renewable Energy Integration
  - Load Shifting
  - Load Following
  - Optimising Electrified Heating and Cooling
  - Waste Heat Recovery

1. European Association for Storage of Energy (EASE): Thermal Energy Storage, p. 5, September 2023, Brussels (available at: [link](#))

# What is the outlook for Power-to-Heat-to-Power storage?

## Looking to enter the commercialisation stage, but without any currently operating projects in Europe.

- There are different technologies based on the way that the heat is converted to electricity. The technology at the most advanced stage of development is **Pumped Thermal Energy Storage**.
- There are **no commercial operating projects in Europe with these technologies as of end of 2023**.

### Major barriers :

#### Building a feasible business case

Projects like that will require additional support, as the current revenue stack is not enough to justify the initial investment. Technology cost and efficiency compared to alternatives are big barriers.

#### Competition by electrochemical storage

Batteries continue to scale up and with dropping prices are now expanding into medium to long durations. Flow batteries are maturing and can provide longer durations than lithium batteries.

## We don't expect any significant scale from these technologies within this decade, but there is potential for the future.

- It would take a few years (~4-5) for a large TES project to go through the full development cycle into construction and then operation.
- Therefore, in order to see any notable volumes of projects before 2030, we would already need to have multiple projects at least in the early development stage in Europe, but this is not the case.
- In the meantime, the environment for Power-to-Heat-to-Power will likely improve in some ways this decade. For example:
  - As conventional power plants get decommissioned and the share of renewable energy increases, the system need for long duration storage will increase, improving the business case for longer-duration storage
  - From a technical perspective, Power-to-Heat-to-Power technologies could provide black-start and inertia services to the system, in cases these services are specifically procured and compensated by network operators in the future.

# *Country reports*

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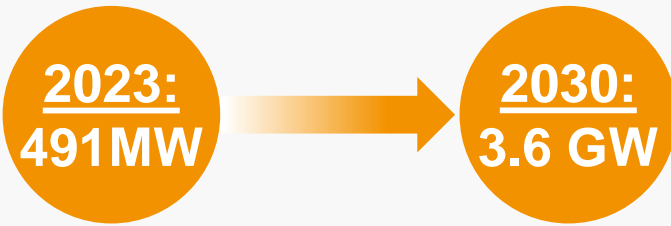
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- **Germany**
- **Great Britain**
- **Greece**
- **Norway**
- **Netherlands**
- **Ireland**
- **Italy**
- **Poland**
- **Spain**
- **Sweden**
- **Switzerland**

# *Belgium*

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# Belgium: market overview

## Capacity growth and key trends



**Attractive landscape**  
FoM battery assets benefit from a strong business case thanks to low grid fees, no double charging and a good range of accessible revenue streams.

**Policy support**  
11 new batteries were awarded capacity market contracts for over 363 MW indicating that the nuclear extension may not have a much of an impact as feared.

**Slow-down in BtM**  
The removal of subsidies for residential storage systems has slowed the growth of the BtM sector.

## A storage friendly market with a range of accessible revenue streams aided by annual capacity market auctions.

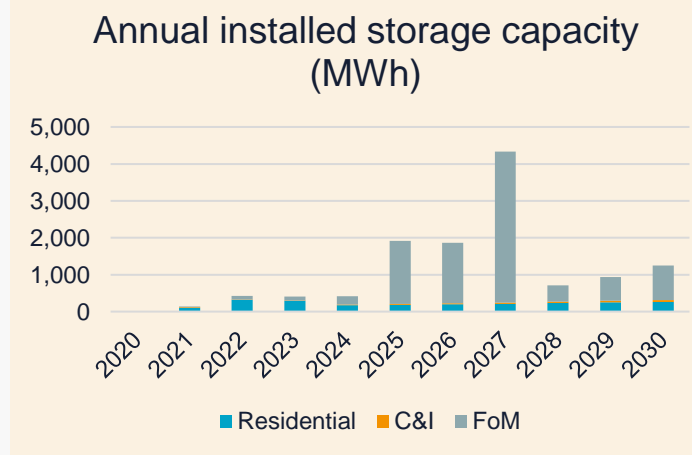
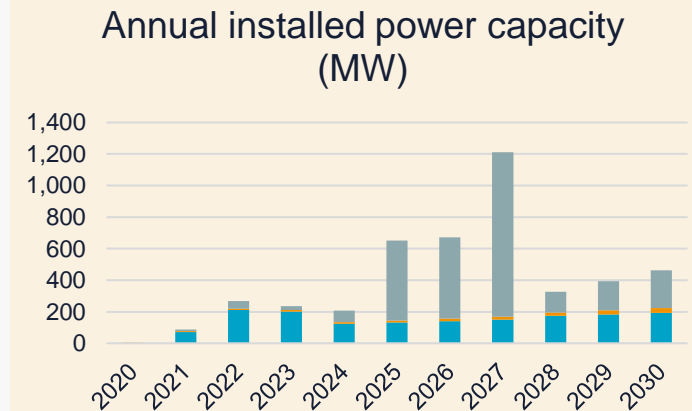
From a modest currently operational portfolio, the market is expected to grow significantly from 2025.

A positive regulatory environment with no double charging and a range of ancillary services is complemented by ambitions to build an extra 20 GW of renewables by the end of the decade making Belgium's market attractive to storage.

In 2025, we expect over 500 MW/year of new FoM capacity to commission. This rate could peak in 2027 with the commissioning of the second round of capacity market winners and a Giga storage plant.

Growth is expected to continue until the end of the decade with the likelihood of further capacity market contracts and revenues from flexibility markets attracting developers.

## Electrochemical storage market forecast



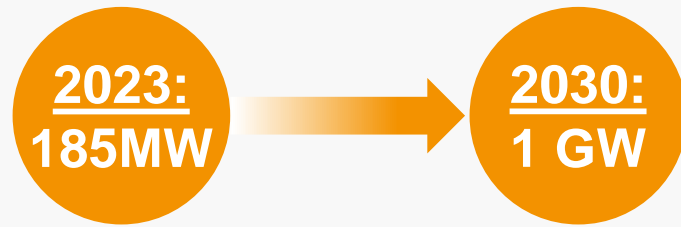


# *Finland*

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# Finland: market overview

## Capacity growth and key trends



**Variable wind generation**  
 Aggressive increases in installed wind capacity will increase the need for storage as Finland looks to develop its off-shore fleet.

**A small market**  
 Only 3 projects above 10MW are operational: one 22MW C&I project, and two FoM projects of 30MW and 90MW.

**Net-metering**  
 The residential market is unlikely to grow significantly due to net-metering PV tariffs.

**While currently moderate in size, the rapid deployment of wind generation should drive growth in FoM capacity.**

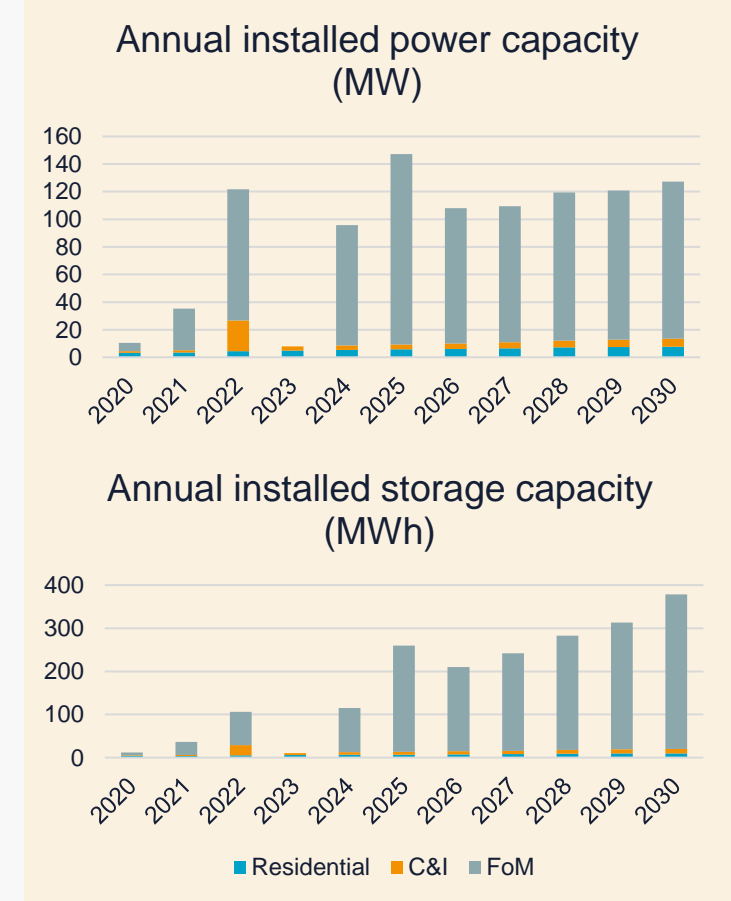
The current market for FoM battery storage is limited to fewer than 10 operational projects ranging from 1 to 90 MW.

It is likely that the market will experience steady growth in the future, driven by the increasing Finnish wind portfolio and the resulting transmission grid constraints. Having almost already met its target for wind generation, the government is planning an auction for 7.5 GW of offshore wind in the coming years. This may increase the proportion of co-located projects (such as the BESS installed in the Olkiluoto nuclear plant) to improve the access of traditional power plants to different ancillary services.

However, this will likely be limited by Finland's integration in the joint Nordic market and Nuclear baseload generation.

Net metering reduces the financial case for Finnish households to install storage, leading to a very small market.

## Electrochemical storage market forecast

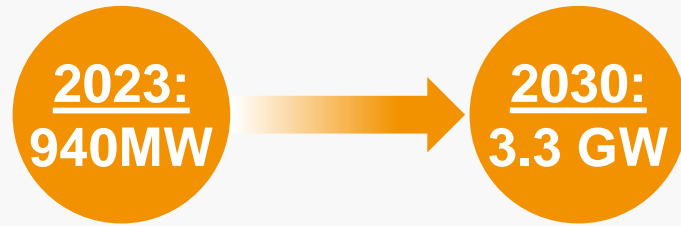


# *France*

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# France: market overview

## Capacity growth and key trends



### Ancillary service market revenues

The expected opening up of aFRR to storage assets in 2024 should drive the market in the short term.

### Few long-term incentives

Storage auctions (like the AOLT, 2019) or a redesigned Capacity Market would provide long term incentives for BESS.

### Small BtM market

The residential storage market is small will remain at low single figure attachment rates with PV.

## A moderate FoM market which will remain small without additional ancillary service market revenues or a redesigned Capacity Market.

The market has been driven by a wave of ~ 1 MW projects and larger units supported by the AOLT scheme. However, with a relatively low share of intermittent renewables and interconnections with neighbouring countries, the potential size of the FoM battery market will remain small compared to the overall energy market.

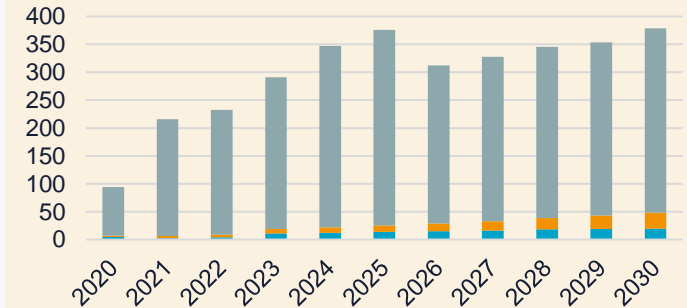
Well-developed ancillary services markets provide revenue opportunities for grid-scale projects, but overall volumes will remain limited. With aFRR market tenders opening to storage in 2024, there is hope for short term growth.

In the longer term, without changes to the Capacity Market or the introduction of auctions for storage, France's annual capacity installations will likely remain at around 300 MW/year.

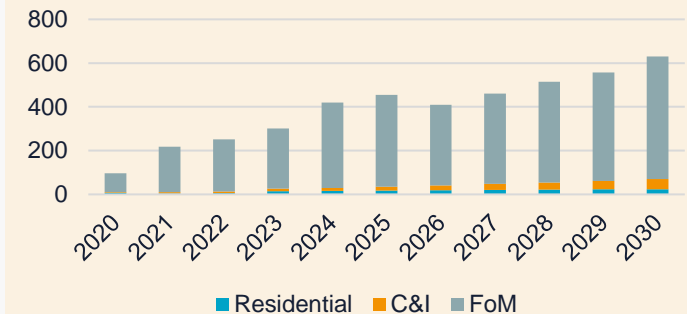
Lack of battery subsidies, relatively low energy prices and slow uptake of dynamic pricing all disincentivise residential storage.

## Electrochemical storage market forecast

Annual installed power capacity (MW)



Annual installed storage capacity (MWh)

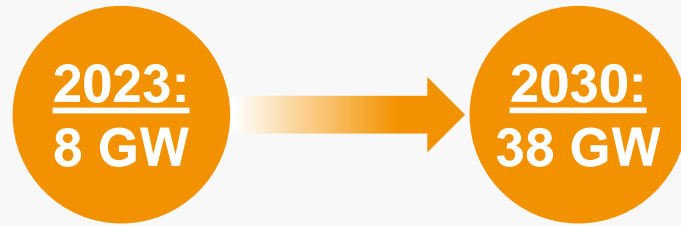


# *Germany*

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# Germany: market overview

## Capacity growth and key trends



**Europe's largest market**  
By September 2023, over a million residential BESS had been installed. We expect the market to contract but remain above 400,000 / year.

**Innovation tenders**  
Innovation tender auctions are expected to continue incentivising new co-located BESS.

**Renewable targets**  
The need for FoM storage will be driven by targets for over 360 GW of variable renewable generation by 2030.

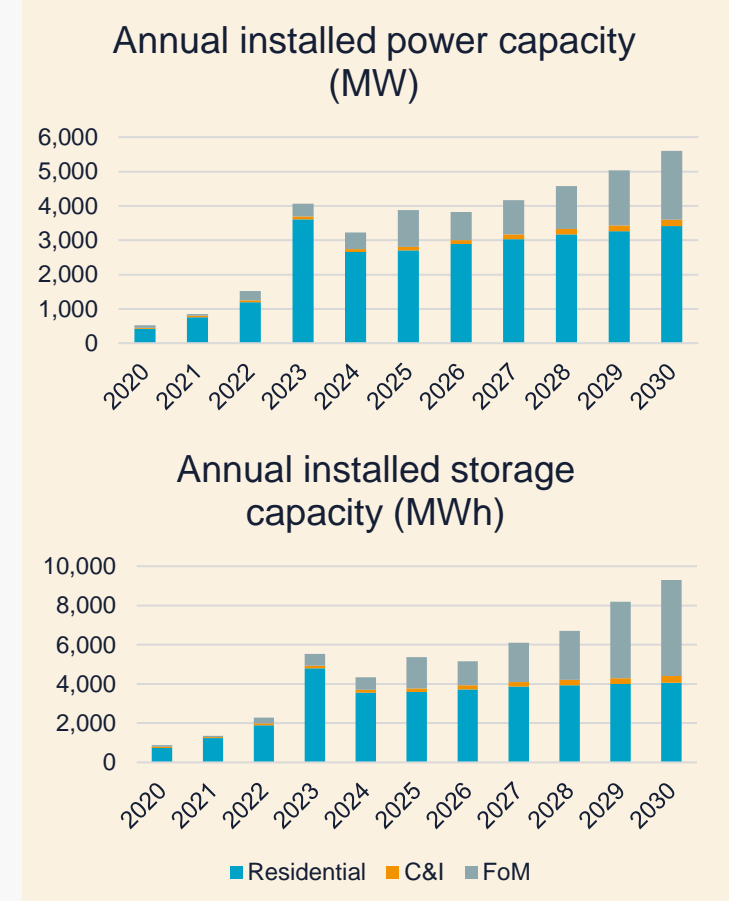
## Germany is, and will remain, the largest BtM market in Europe. FoM installations are expected to boom.

With the intention to more than double solar and wind capacity by 2030 (and co-location becoming increasingly more common), the storage market is expected to grow strongly to 2030 as energy price volatility increases. This will bring opportunities for standalone projects and projects co-located with these renewable assets.

The government & TSO have provided some support to storage through the innovation and gridbooster auctions. Germany is aiming to hold the first auction of a new capacity market in 2028.

As the installer backlogs clear (from overwhelming interest off the back of the energy crisis), rates of residential installations are expected to decrease in the short term. Out to 2030, the market should remain large with households looking to reduce energy bills and green finance available to help with CapEx. Germany is, and will remain, the largest market for residential PV in Europe. As PV self-consumption is a common business case, sales of BESS should continue well into the future.

## Electrochemical storage market forecast

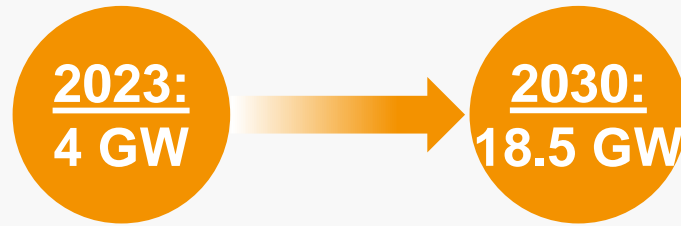


# *Great Britain*

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# Great Britain: market overview

## Capacity growth and key trends



**Decreasing revenues**  
Saturation of historically attractive ancillary service revenue streams will weaken the business case for BESS.

**Grid reforms**  
Updates to grid connection queues, battery dispatching, and ancillary service market designs are all positive drivers for the FoM market.

**Big project pipeline**  
Over 30 GWs of BESS has applied for grid connection. Out of this large volume of projects, we expect only ~ 16 GW to commission by 2030.

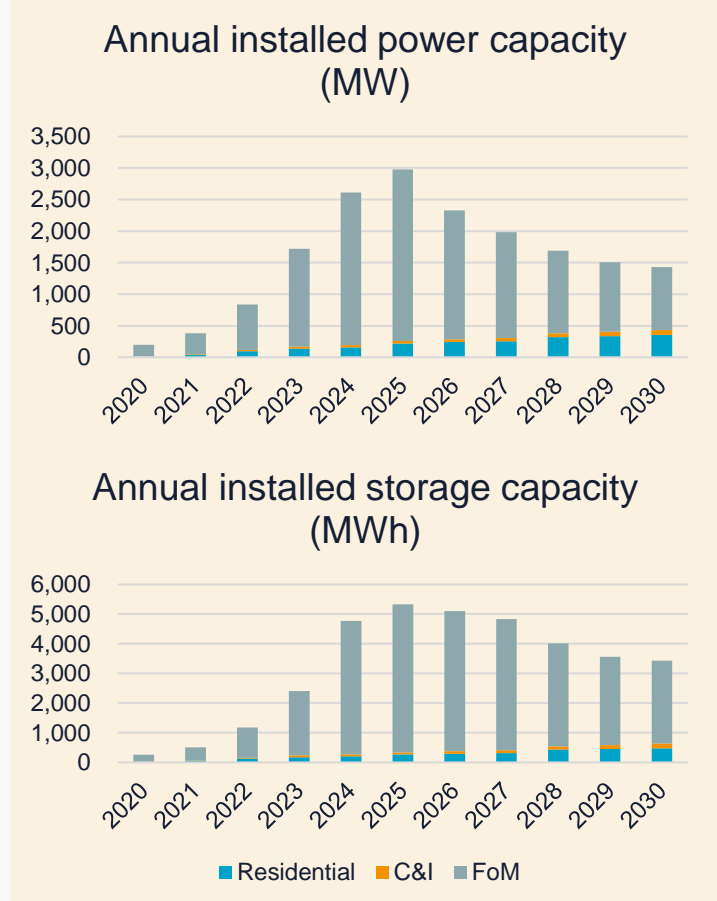
**Saturating markets and declining revenues will deter investment in Britain's FoM market in the coming years; however, prevailing favourable conditions should maintain interest.**

FoM installations have grown exponentially every year since 2020, however with ancillary service markets saturating and limited availability of grid connections, the number of commissioning projects is likely to peak in the next two years.

Improvements to some of the issues with grid connection queues, new ancillary service markets, increased procurement volumes and more advanced dispatching should prove sufficient to maintain Britain's market as one of the biggest in Europe.

One of Europe's larger markets, residential storage is becoming more attractive in GB with VAT set at 0% until 2027 and a co-location rate of ~ 20%.

## Electrochemical storage market forecast



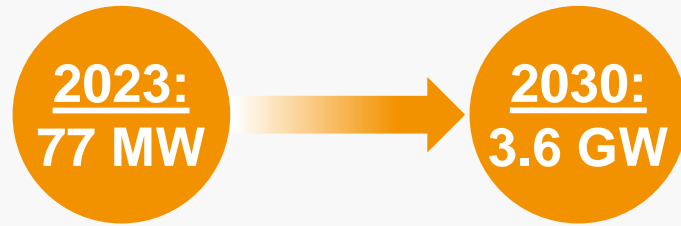


# Greece

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# Greece: market overview

## Capacity growth and key trends



**2023 storage auction**  
A total of 1GW of storage auctioned in 2023-2024, will create a market peak in 2025

**Resi Policy support**  
Support for residential storage + PV, will incentivise about 25-30k new installations in the next years

**Co-located projects**  
There is future potential for co-located projects, as the electricity grid is congested and Greece's solar PV targets are very ambitious

## Strong policy support for storage drives growth across the residential and FoM segments in the short-term. Greece's ambitious energy targets will drive further growth towards 2030

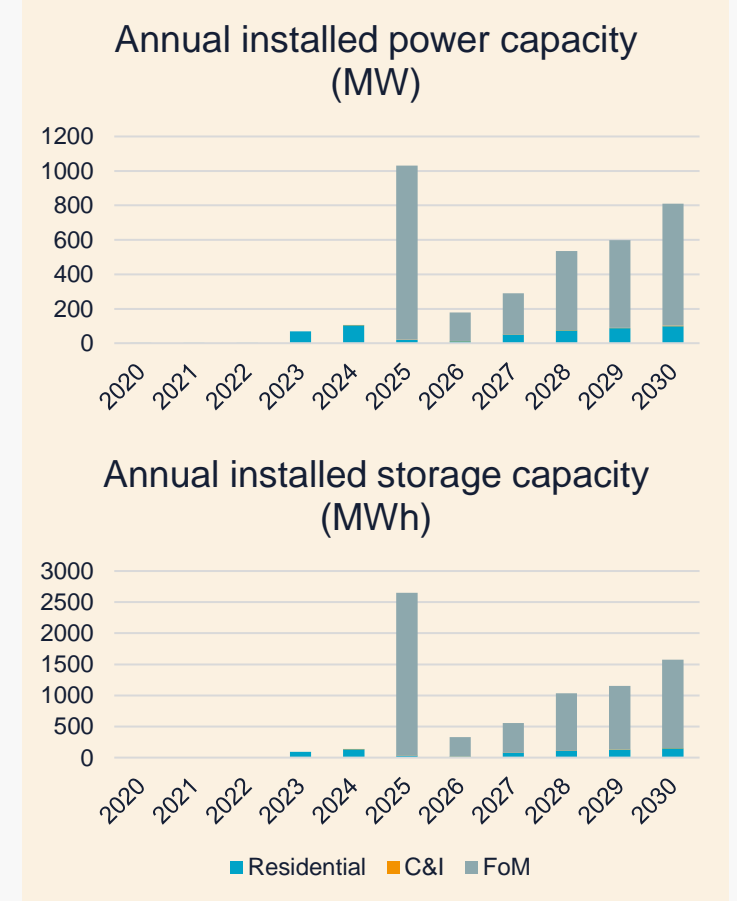
Lignite plants that formed the backbone of Greece's electricity system for decades are being phased-out. This, coupled with Greece's ambitious renewable targets and a constrained grid, create a necessity for energy storage that will only increase by 2030.

Policy support will drive short-term growth, however implementation is going slowly :

- There are delays in awarding the support for residential storage
- After multiple delays, the FoM project auction hasn't been finalised yet, with only 1 of the 3 phases taking place in 2023

In the long-term this will likely be supplemented by growth in co-located projects in the islands and in mainland Greece. A 200MW renewables + storage auction will take place in 2024.

## Electrochemical storage market forecast

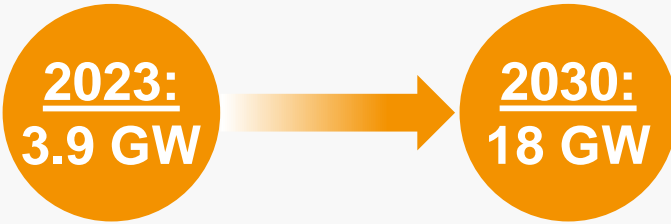


# *Italy*

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# Italy: market overview

## Capacity growth and key trends



**Capacity Market**  
Over 2 GW of BESS is expected in 2024 as Capacity Market projects commission.

**MACSE**  
Terna's storage procurement mechanism will be used to try and meet Italy's 11GW utility scale storage target by 2030.

**Super-bonus phase out**  
Tax breaks for residential storage will decrease to 70% of system costs in 2024 and 65% in 2025 before ending in 2026.

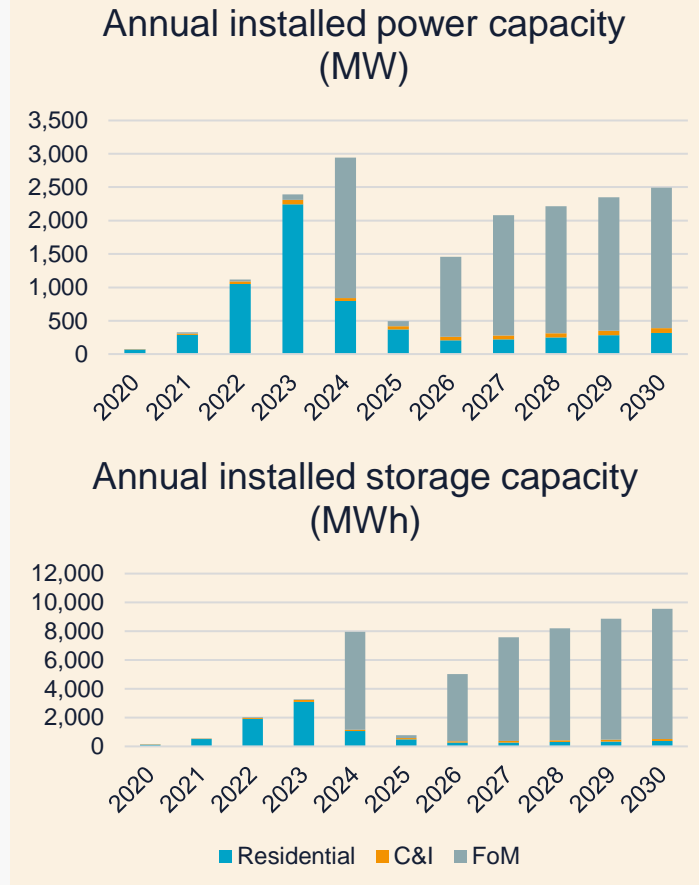
## The MACSE storage procurement mechanism will drive FoM storage.

Italy has a target of 11 GW FoM, utility-scale storage by 2030 however, the exact technology and duration mix is still to be decided by Terna.

Following a spike in project deployments in 2024 from the 2022 Capacity market auction, the FoM market will be driven in the long-term by the MACSE procurement mechanism which will hold its first auction in 2025. This mechanism will provide €/MWh/year load-shifting contracts for projects based in the South and on the Islands and help to support the intense renewable roll out in these regions and aid transmission to the demand centres of the North. Average project durations will increase as Terna uses the mechanism to tackle the problem of intermittent renewable generation.

The COVID recovery Superbonus scheme aided the residential market in 2021-2023 which will likely remain larger than FoM until 2027. The number of installations is expected to decrease as this scheme phases out. In the longer term the removal of net-metering will improve the business case for domestic storage.

## Electrochemical storage market forecast

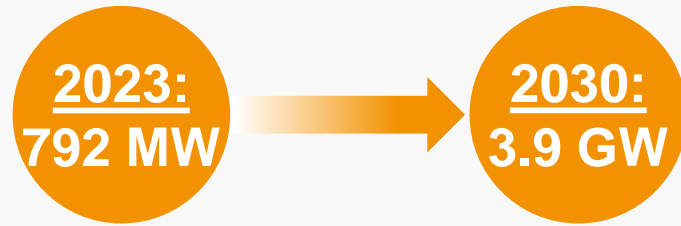


# *Ireland*

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# Ireland: market overview

## Capacity growth and key trends



**Ancillary services**  
DS3 ancillary services currently provide the revenues for FoM battery systems

**Slow development**  
Regulatory uncertainties and lack of revenues beyond DSR3, have slowed the market in 2023-2024

**Low uptake in BtM**  
Lack of significant drivers in the BtM segment keeps overall uptake very low

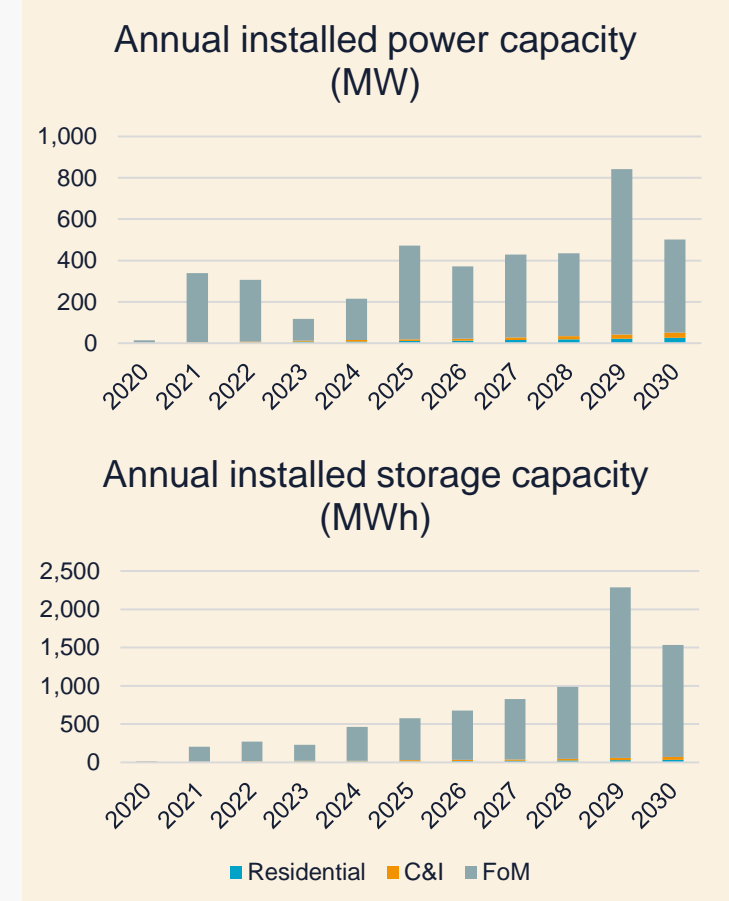
## Following a strong start in its storage rollout in the early 2020s, the market has contracted in 2023-2024

There is around 0.5 GW of projects close to construction or being operational in 2024. We expect some of them to be delayed towards 2025 in line with better battery accessibility in the day-ahead market.

Looking towards the second half of the decade, both the DSO and the TSO are considering schemes to procure flexibility from batteries to ease network constraints. Early consultation indicates that the procurement will involve larger projects in terms of duration. These are expected to further increase towards 2030, due to Ireland's ambitious renewable targets.

The BtM storage market is relatively small and will be challenging to grow substantially without any additional incentives.

## Electrochemical storage market forecast

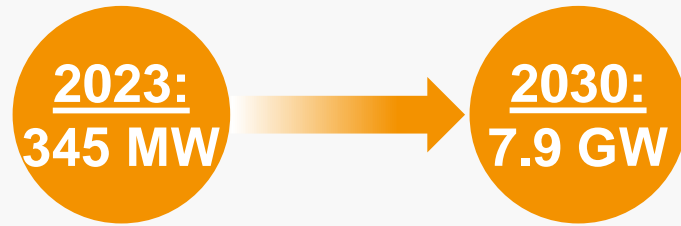


# *Netherlands*

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# Netherlands: market overview

## Capacity growth and key trends



**Discount on grid fees**  
Storage projects will now pay reduced grid fees, reducing an important market barrier for FoM storage.

**Good drivers for C&I storage**  
Growing capacity demand due to electrification in a congested electricity network, provides good opportunities for storage.

**Net-metering**  
Net-metering is holding back the potential for residential battery installation.

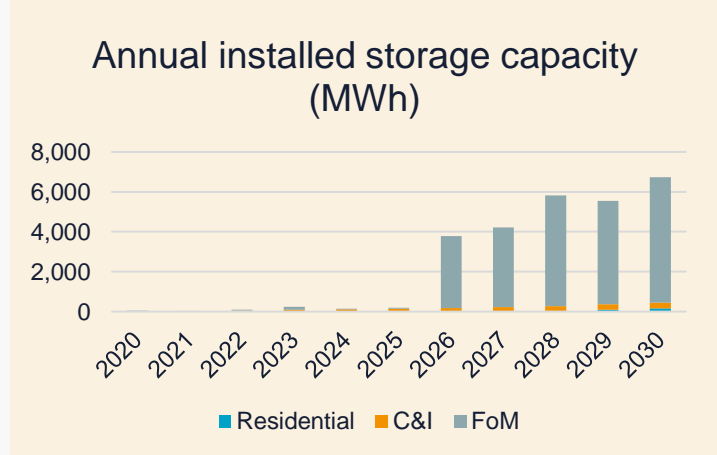
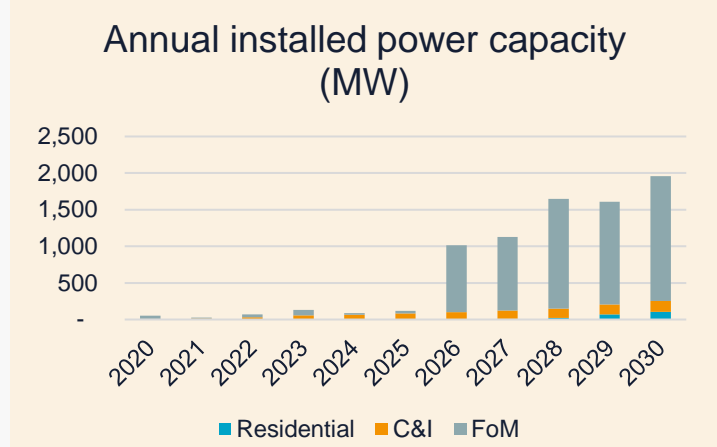
## The market in the Netherlands has the potential to grow into one of the largest in Europe

With a very high renewable energy penetration and a congested electricity grid, the Netherlands has a big need for energy storage. This is highlighted by the TenneT's estimation for ~9GW of storage needs by 2030.

The regulatory environment improved for FoM in 2023 with a reduction on grid fees. More projects are now going ahead with plans for construction, and we expect to see significant impact in installations post-2026. Grid connection and permitting will be barriers to a more accelerated growth. TenneT may also introduce specific auctions for storage, if the market structures fail to bring the desired volumes online.

Net-metering is a very big barrier for residential storage, but a bill to phase it out has been recently rejected by the Dutch Senate. On the other hand, there is significant C&I storage in the Netherlands – with EV charger rollout playing an important part in its growth.

## Electrochemical storage market forecast



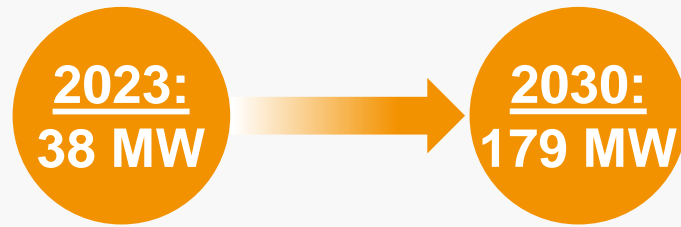


# *Norway*

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# Norway: market overview

## Capacity growth and key trends



**Hydro dominated system**  
90% of Norway's electricity production comes from hydropower, providing the country with a large firm capacity.

**Low solar potential**  
The limited uptake of PV and low solar irradiance reduce the need for residential batteries in Norway.

**Off-grid projects**  
A small but steadily growing market exists for off-grid projects.

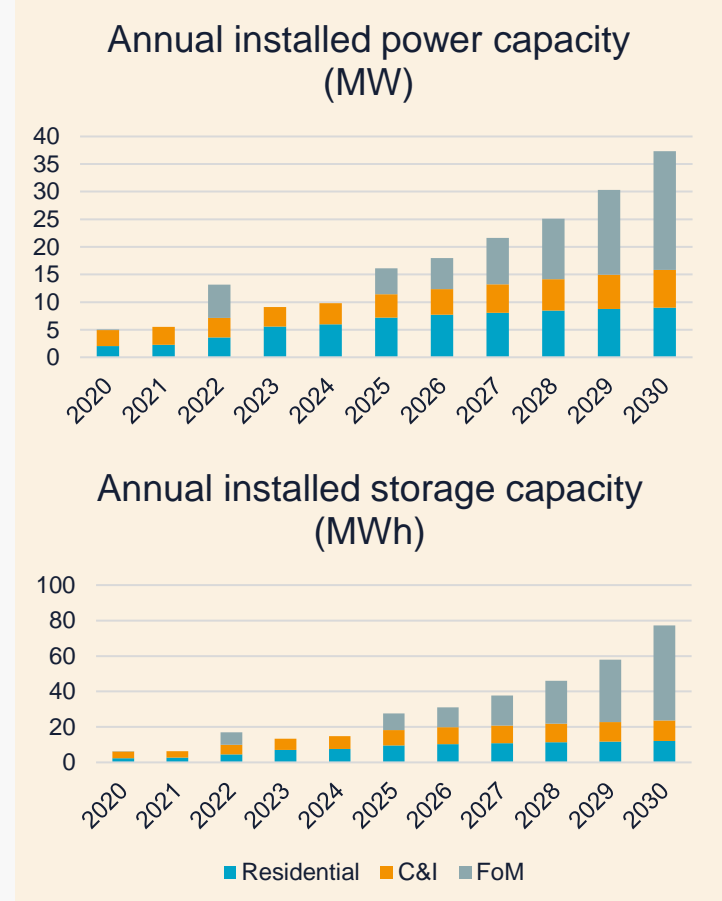
With most of its flexibility needs covered by pumped hydro storage, the BESS market is expected to remain small in all segments.

Flexibility in the Norwegian power system is largely covered by the country's 1.4GW portfolio of pumped-hydro storage, limiting the need for additional grid-scale battery storage.

In addition, the country's very small residential solar market so far has meant an extremely low uptake of residential batteries.

Nonetheless, due to Norway's geography, some opportunities still exist for micro-grid projects in islands or remote communities. Electrification in Norway may increase the use of batteries to reduce grid congestion.

## Electrochemical storage market forecast

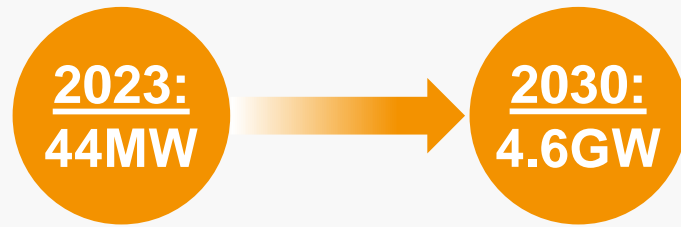


# *Poland*

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# Poland: market overview

## Capacity growth and key trends



### Improved policy for FoM

Flexibility markets open in 2024 and capacity market contracts provide secure revenues for a 17-year period

### High interest

Over 16GW of storage assets have pre-registered for the 2023 capacity market auction, showing the big volume of projects currently developed

### Support for BtM

Version 5 “Moj Prad” subsidy scheme, included incentives for residential storage, driving sales in 2023.

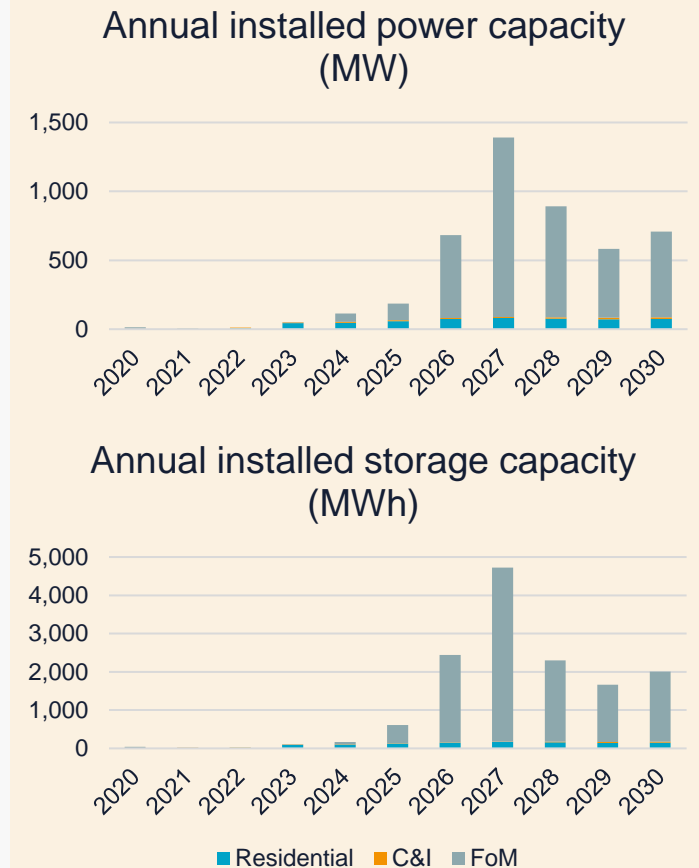
## Good upcoming market conditions and an aggressive renewables rollout towards 2030, will make Poland the leading market in Eastern Europe

A current small market size across all segments, but this is changing due to:

- The emergence of a small residential market driven by the “Mój Prąd” subsidy
- Improved policy conditions and capacity market contracts driving the interest of storage developers.

The largest potential in terms of volume lies with FoM installations. Around 2GW of storage projects have won contracts in the last 2 years capacity market auctions, with delivery years of 2027-2028. The majority of the volume is hence expected post 2026; some of the projects will likely aim for an earlier connection than the one expected from their capacity market contract to make the most of the upcoming market opportunity.

## Electrochemical storage market forecast



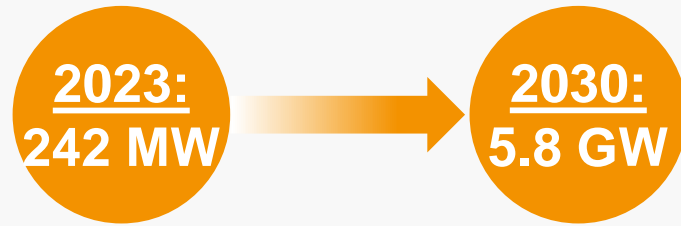
# *Spain*

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# Spain: market overview

## Capacity growth and key trends



**2023 storage CapEx auctions**  
 Winners must commission by 2026. Standalone, co-located, hydro and thermal projects were all eligible for state funding.

**Limited revenue streams**  
 The lack of accessibility to ancillary service revenues and no functioning Capacity Market damages the case for storage in Spain.

**Home battery slow-down**  
 Regional grants for residential storage will not be available after 2023, reducing the size of the residential market.

## Auctions for renewables and storage in 2023 are expected to add over 4 GWh of projects by 2026, kick-starting the FoM market.

Spain’s historically unfavourable economic and regulatory landscape has hampered the development of storage. However, government funding will encourage growth across the market.

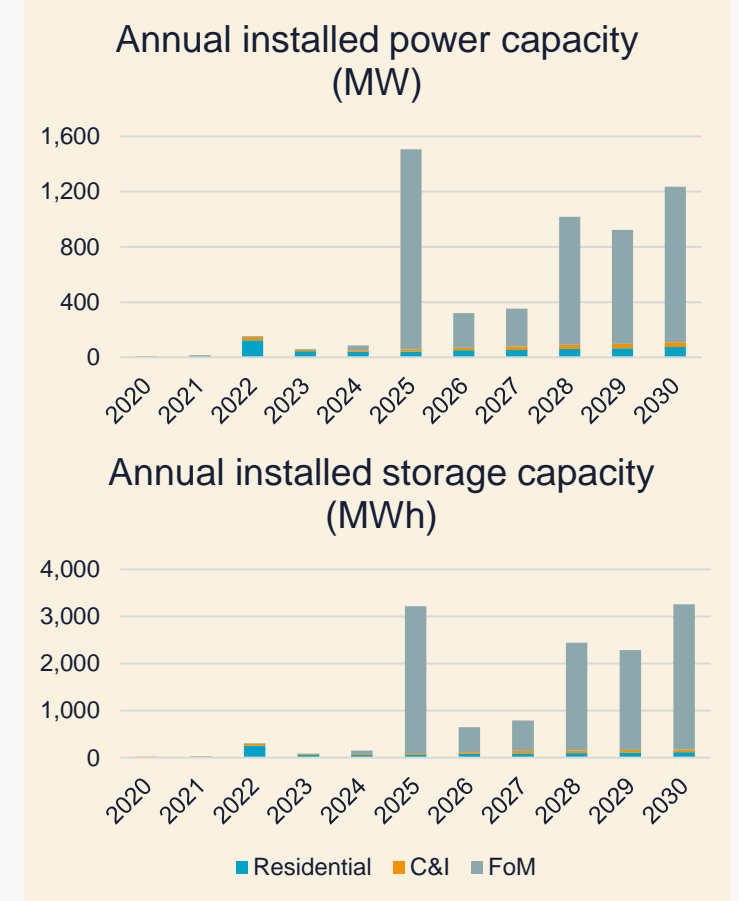
In 2023, four auctions were held to support storage projects. Over one gigawatt of projects have already received provisional funding with the standalone auction results still to be announced. Most of these projects should commission in 2025.

The Spanish government is aiming to launch a new Capacity Market by 2025. If they are successful, then this could support new installations from 2028.

Further favourable changes such as access to ancillary service markets or further Capex support will be necessary for Spain to meet its 2030 NECP target of ~ 9 GW of BESS.

Subsidies temporarily inflated Spain’s BtM market. In the long-term we expect a smaller market without additional incentives.

## Electrochemical storage market forecast

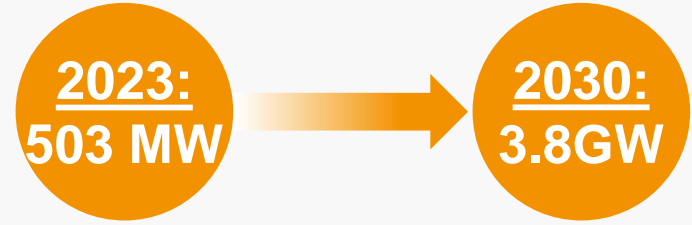


# *Sweden*

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# Sweden: market overview

## Capacity growth and key trends



**Growing electricity demand**  
 The current base of hydro and nuclear generation will not be able to keep pace with Sweden's rapid electrification.

**Very attractive ancillary services**  
 The revenues offered by ancillary services are currently very attractive, driving growth across all market segments.

**Short duration market**  
 As projects are focusing on ancillary services, the typical project size in Sweden is 1h.

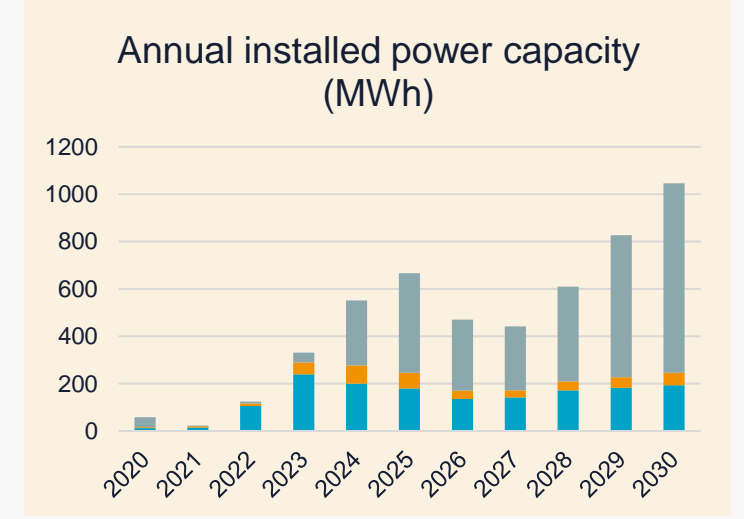
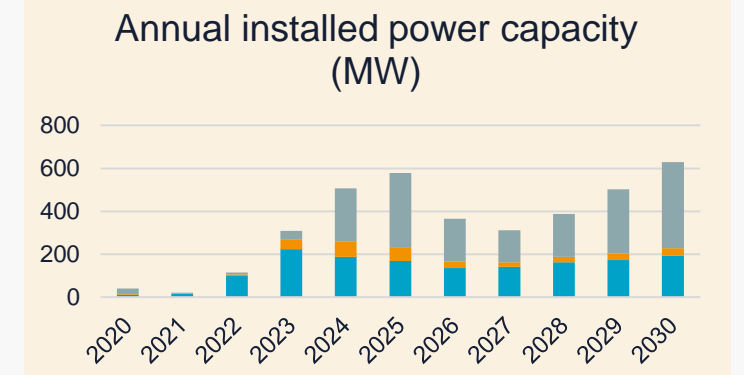
## Although limited in size up until now, the Swedish battery market is growing rapidly.

Ancillary service revenues are currently very high. Over the next two years, 500-600MW of FoM projects will come online as developers rush to bring projects online before ancillary service revenues saturate. We expect this to be followed by a period where the market declines and then grows again towards 2030 as the share of intermittent renewables on Sweden's system grows. We are also expecting a redesigned capacity market mechanism around 2028/29 that will support new storage projects.

The attractiveness of ancillary services has also massively driven BtM storage, especially C&I, as projects there have much shorter lead times than FoM and can easier take advantage of the opportunity.

Beyond ancillary services, Sweden's subsidy on the installation of residential storage has been successful at incentivising deployments.

## Electrochemical storage market forecast



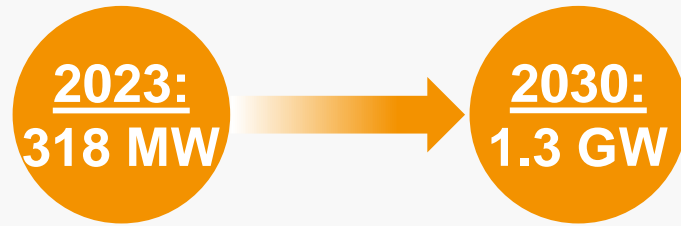


# *Switzerland*

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# Swiss: market overview

## Capacity growth and key trends



**Electricity transfer hub**  
Switzerland's standing as a transfer country for electricity makes it extremely well interconnected, reducing the need for grid-scale storage.

**Policy support**  
Residential and C&I PV systems benefit from a national CapEx grants program, as well as feed-in tariffs.

**Co-located projects**  
In addition, there are regional subsidies for residential storage in the cantons of Schaffhausen and Thurgau.

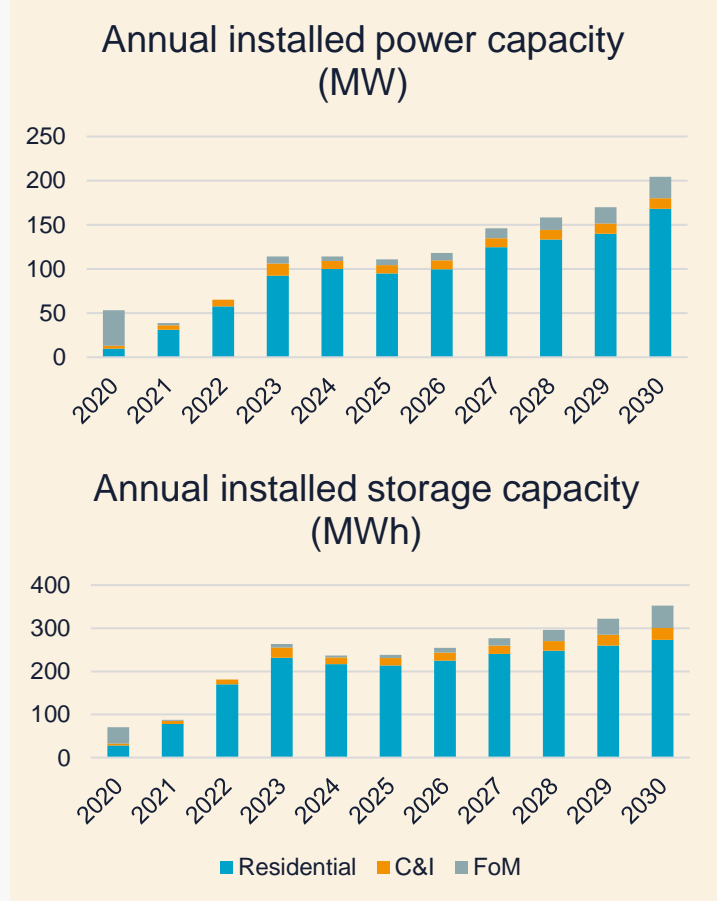
**While the Swiss FoM battery market is limited by a significant PHS capacity and high interconnection, the residential storage market has been very active thanks to subsidies**

With close to 4 GW of pumped-hydro storage capacity and very good levels of interconnection, the potential for grid-scale battery storage is limited in Switzerland.

Some opportunities remain for projects meant for congestion management or to increase the access of PHS projects to a wider range of ancillary services.

In contrast, the residential segment has been very active in Switzerland, driven by both national solar subsidies and regional storage subsidies. The C&I segment also benefitted from such subsidy-led growth, although to a much lesser extent.

## Electrochemical storage market forecast



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