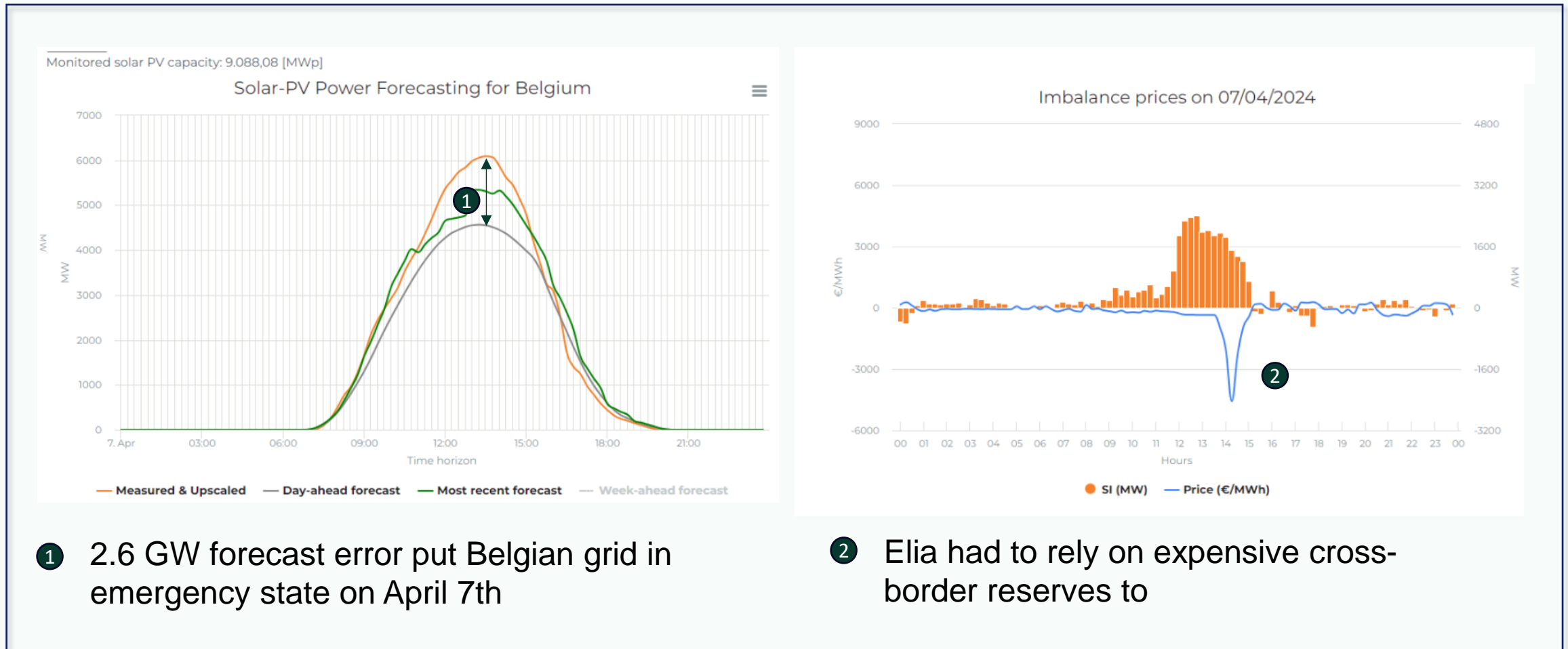


Solar forecasting error & limited generator flexibility put Belgian grid in emergency state on 7th of April 2024



De nood aan flexibiliteit

Flux 50: Smart Energy Academy 2024

*Niels Van den Driessche
Originator – Centrica Energy*

20 November 2024

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Energy
Movers
by
Nature





Renewable Energy Trading & Optimisation

The energy landscape is transitioning — with a projected 4.9T EUR¹ of sustainable investments needed by 2050 to transform the European energy grid to be powered entirely by renewables. We've spent the last fifteen years building and perfecting the commercial engine needed to accelerate the green transition and deliver on the net zero agenda.

Corporate Power Purchase Agreements

We tailor transparent and all-inclusive Corporate PPAs from source to delivery, connecting corporate energy consumption directly with sustainable sources, making any green energy procurement strategy a reality. We match, shape and trade desired energy production and associated green energy attributes to corporate off takers at stable costs.

Biomethane Sourcing

Providing long-term sourcing agreements for biomethane production, we handle nomination, transportation, and trading of green gas. Simultaneously we handle management, trading, and retirement of biogas certificates towards end-users, ensuring a transparent green gas footprint.

Certificates Trading and Management

We trade and manage Guarantees of Origin and other energy attributes, covering a variety of products that provide solutions for utilities, organisations and consumers seeking to support green energy sources and offset greenhouse gas emissions from their energy utilisation.

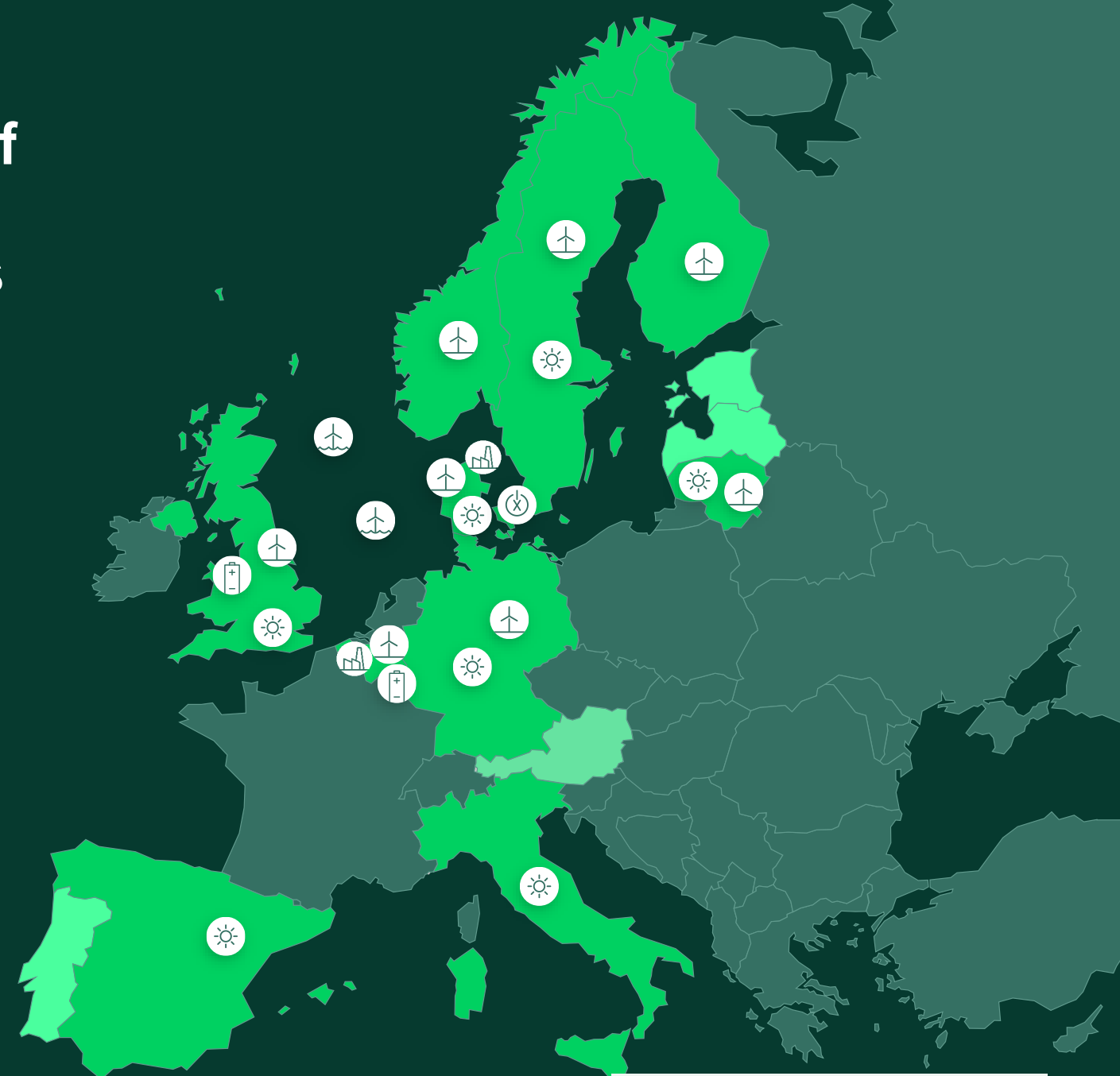
Renewable Power Purchase Agreements









Our market leading PPAs provide physical and financial optimisation of renewable energy assets to independent power producers across the continent, securing bankable revenue, transfer of merchant risks, physical balancing, and dynamic trading, alongside 24/7/365 market operations of intermittent renewable energy output.

Optimisation & Flexible Technologies

We provide optimisation of established and emerging flexible energy technologies including batteries, electrolysers, CHP's and other large-scale flexible assets. Our solutions include advanced digital management platforms with algorithmic automation alongside hedging structures and ancillary services with 24/7/365 operational duty.

Today, Centrica holds one of Europe's largest third-party renewable energy portfolios and the most advanced, cross-European **virtual, renewable Power Plant**



	Active Markets	16,5GW	Power Assets
	Upcoming Markets	27	Trading Markets
	Battery	11,7M	Trades in 2022
	Offshore Wind	790	Total Headcount incl. Students
	Onshore Wind	8	Locations
	Solar		
	Electrolyser		
	Flexible consumers		

CE's Flexible Asset Optimisation Markets

4.0GW

of flexibility available to the grid from our industrial and commercial customers







+350* MW

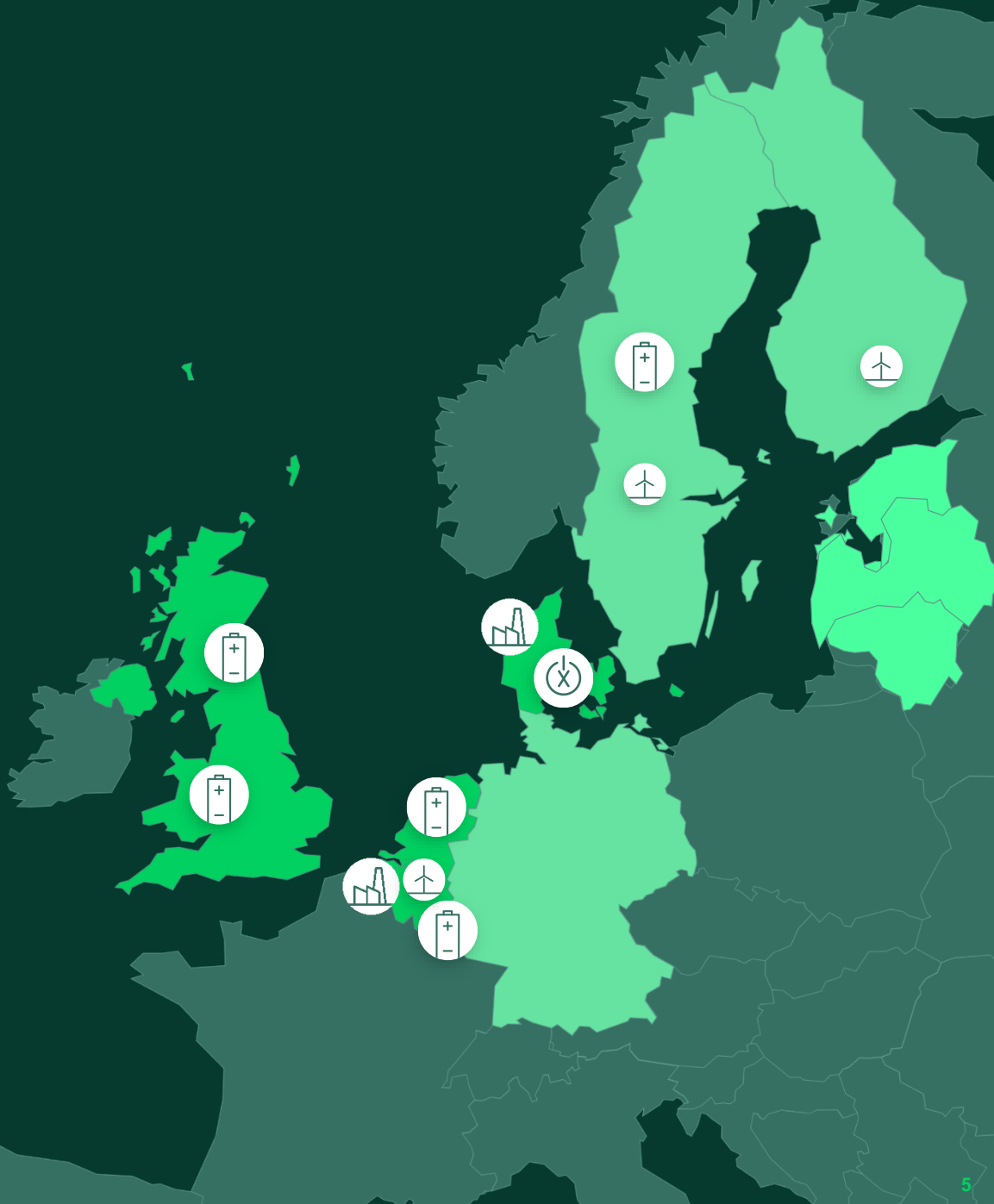
portfolio of BESS optimised by Centrica in the UK and EU, with grid-scale & residential

* +100MW BESS in Sweden acquired by Centrica not included

+20 BESS

More than 20 storage sites in UK & EU serviced by a multimarket optimisation agreement

-  Current markets
-  Upcoming markets
-  Battery
-  Electrolyser
-  Flexible renewable generation
-  Flexible industrial consumers



Our Trade Floors located in **Denmark & Singapore** (night shift) are active 24/7 over **ancillary & wholesale** markets.

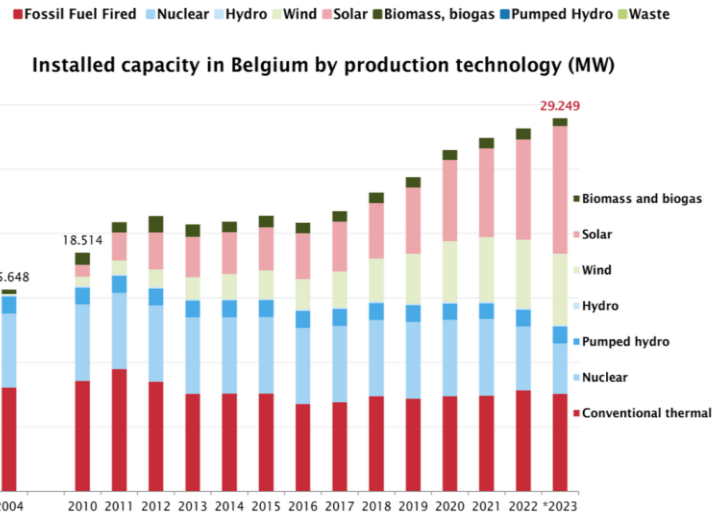


To decarbonize we need new carbon free production and flexibility

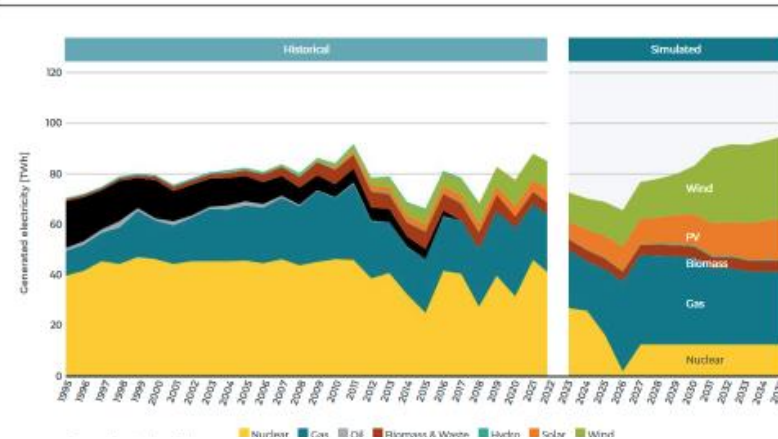
Evolution of our energy mix: 5 times more solar and +3 times more wind in 10 years

Demand will further rise due to electrification – double by 2050 - production must grow to secure the supply

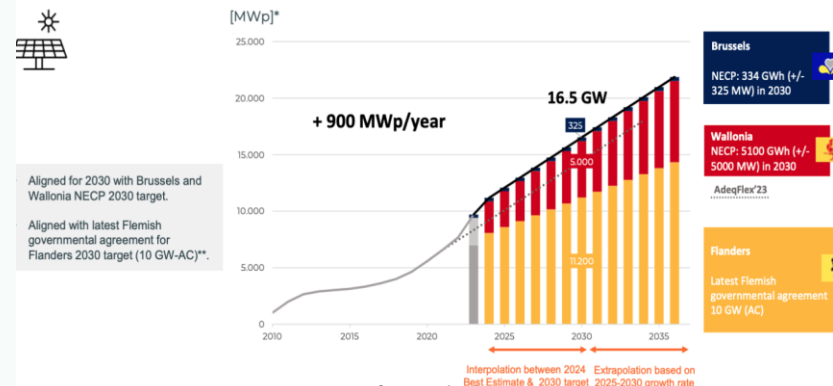
Flexibility is key and must grow with production and decarbonize



5. EVOLUTIE VAN DE BELGISCHE ELEKTRICITEITSMIX VOLGENS HET CENTRALE SCENARIO

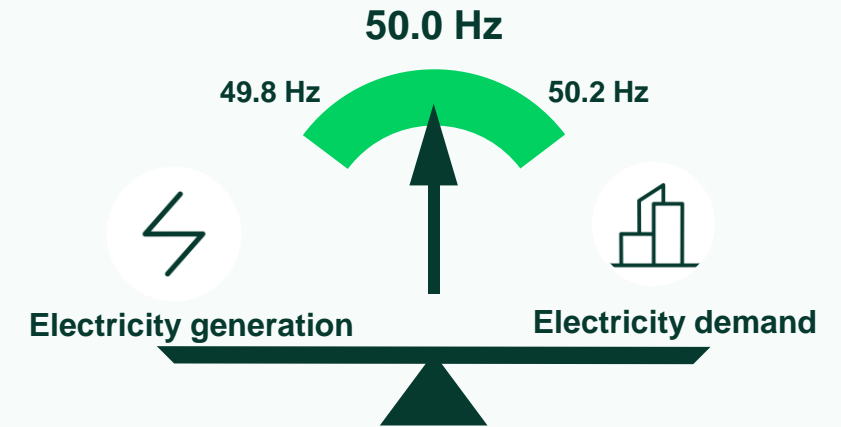


Proposal for solar PV in Belgium based on latest regional targets for 2030



- In the past and continuing into the current market, **flexibility** has been provided by **gas-fired engines**, including **Combined Heat and Power (CHP) systems** and **Combined Cycle Gas Turbines (CCGTs)**
- Going forward, more reliance is being placed on sun and wind production. As a result, there will be reduced demand for these flexible assets




- In the past the largest part of production was either:
 - Easy to forecast – Nuclear
 - Flexible – Gas powered engines
- Now and in the future production will be:
 - unpredictable
 - Intermittent



Everybody can participate in providing flexibility

Explicit flexibility refers to the deliberate and active management of energy consumption or production in response to specific requests or signals from the grid operator or market participants.

- Reserve markets = Ancillary services (Elia)

- A. FCR: 93 MW 
- B. aFRR: 140 MW in up and down 
- C. mFRR: 844 MW in up 

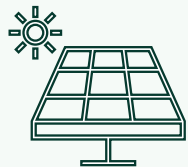
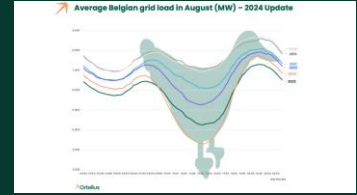
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Implicit flexibility refers to the consumer's ability to adjust their energy usage in response to price signals. This type of flexibility is often called "price-based" demand response:

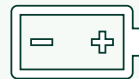
- Wholesale

- A. Day-ahead ~ +4 GW
- B. Intra-day ~ 1GW

- Imbalance

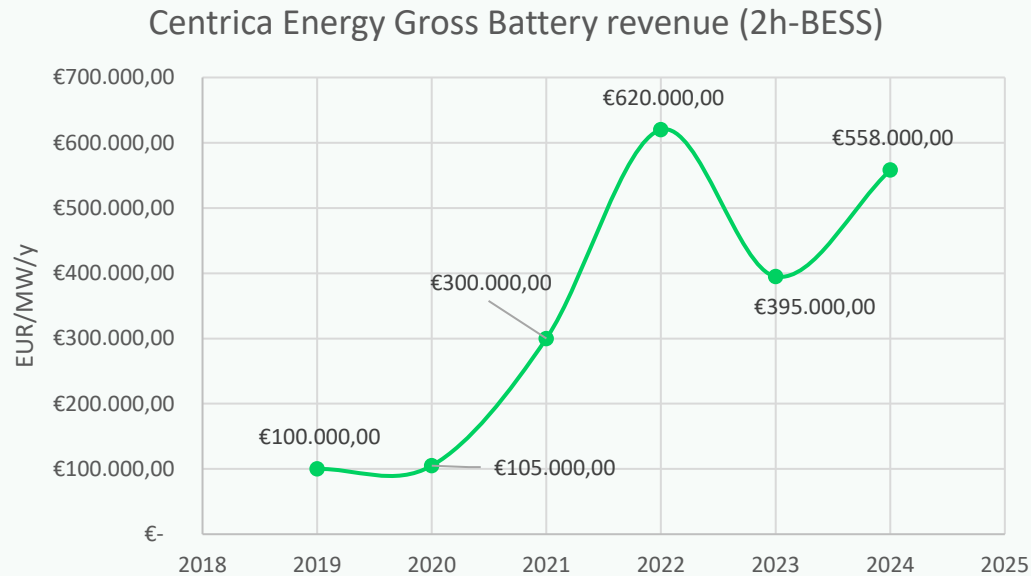


Electric boiler/CHP



Increased battery revenues and negative pricing show the need for flexibility in 2024

Battery revenue 2024, generated from grid services, UP from an already high level at 2023, illustrating the need for additional flexibility



Centrica Energy Gross Battery revenue (2h-BESS) in Belgium

2022	620.000 EUR/MW
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2023	395.000 EUR/MW
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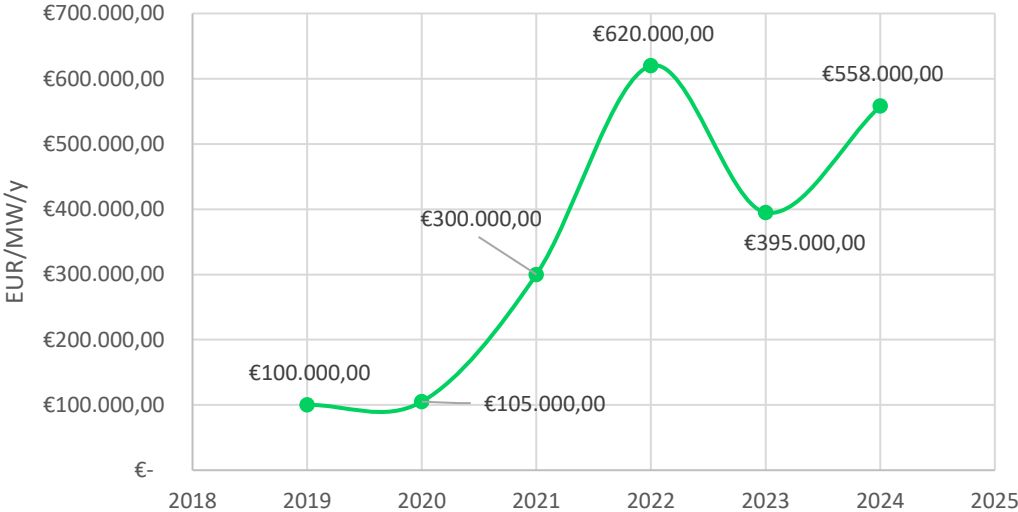
2024	558.000 EUR/MW
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Increased battery revenues and negative pricing show the need for flexibility in 2024

Battery revenue 2024, generated from grid services, UP from an already high level at 2023, illustrating the need for additional flexibility

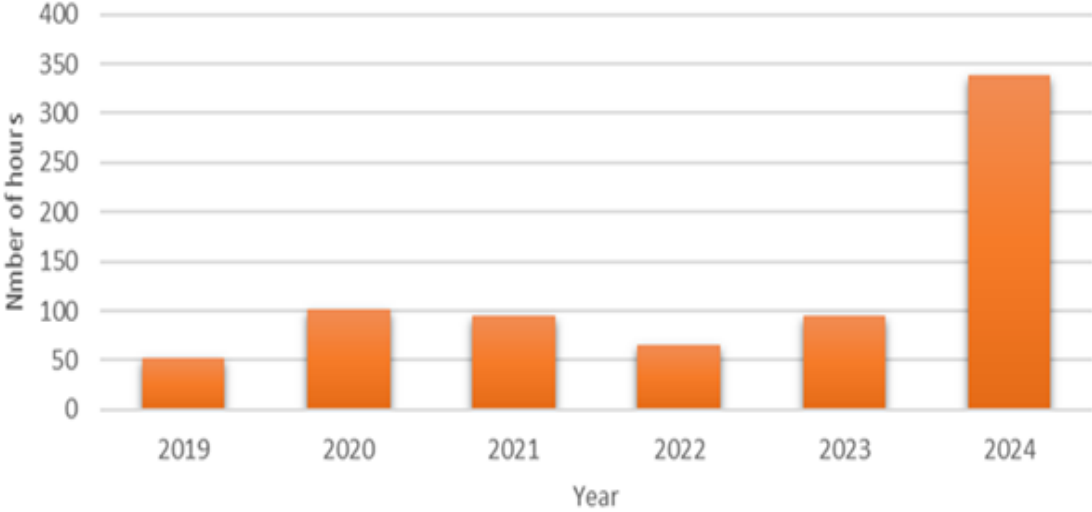
Heavy increase in negative pricing in 2024

Centrica Energy Gross Battery revenue (2h-BESS)



Centrica Energy Gross Battery revenue (2h-BESS) in Belgium	
2022	620.000 EUR/MW
2023	395.000 EUR/MW
2024	558.000 EUR/MW

Aantal uren met negatieve Day-Ahead prijzen in de maanden april tot en met augustus



Negative pricing in Belgium:	
2022	55 hours
2023	97 hours
2024	345 hours

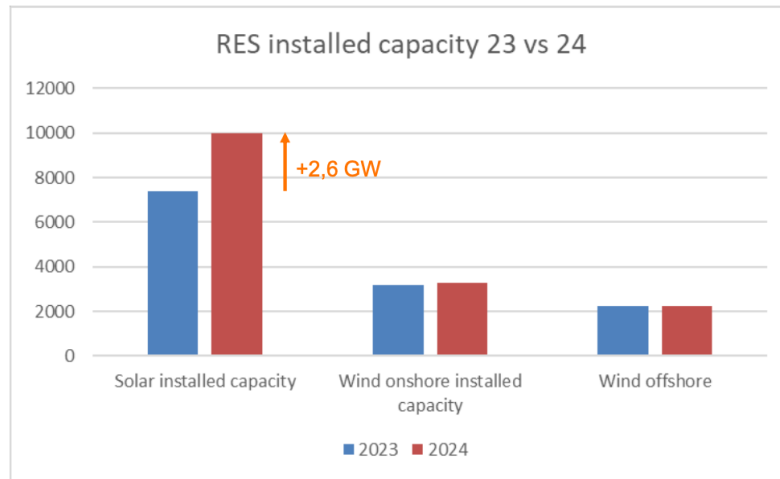
Source: A. Centrica Energy's revenue generation data. B. Elia WG balancing

Accelerated solar deployment will bring large surplus renewable generation and push out CCGT's

Increase of non-flexible generation and lack of flexibility options will create significant stress on the Belgian grid in Summer 2024 and beyond.

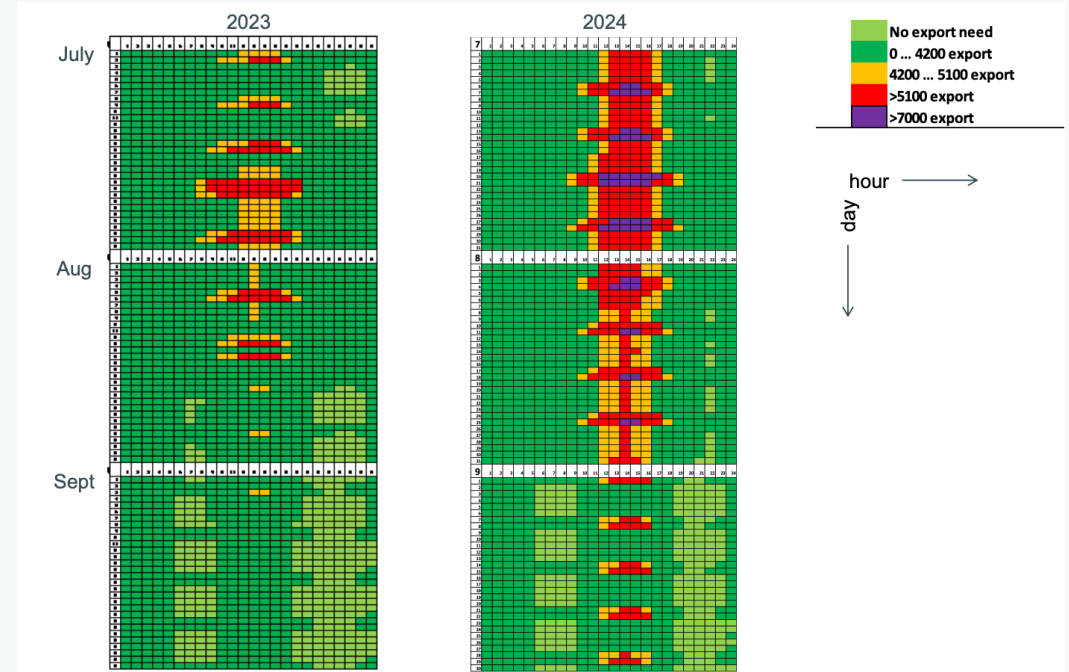
High-level BE incompressibility risks parameters for summer 2024 (versus 2023)

- Increased installed capacity of **renewables** : 10 GW Solar & 5,5 GW Wind



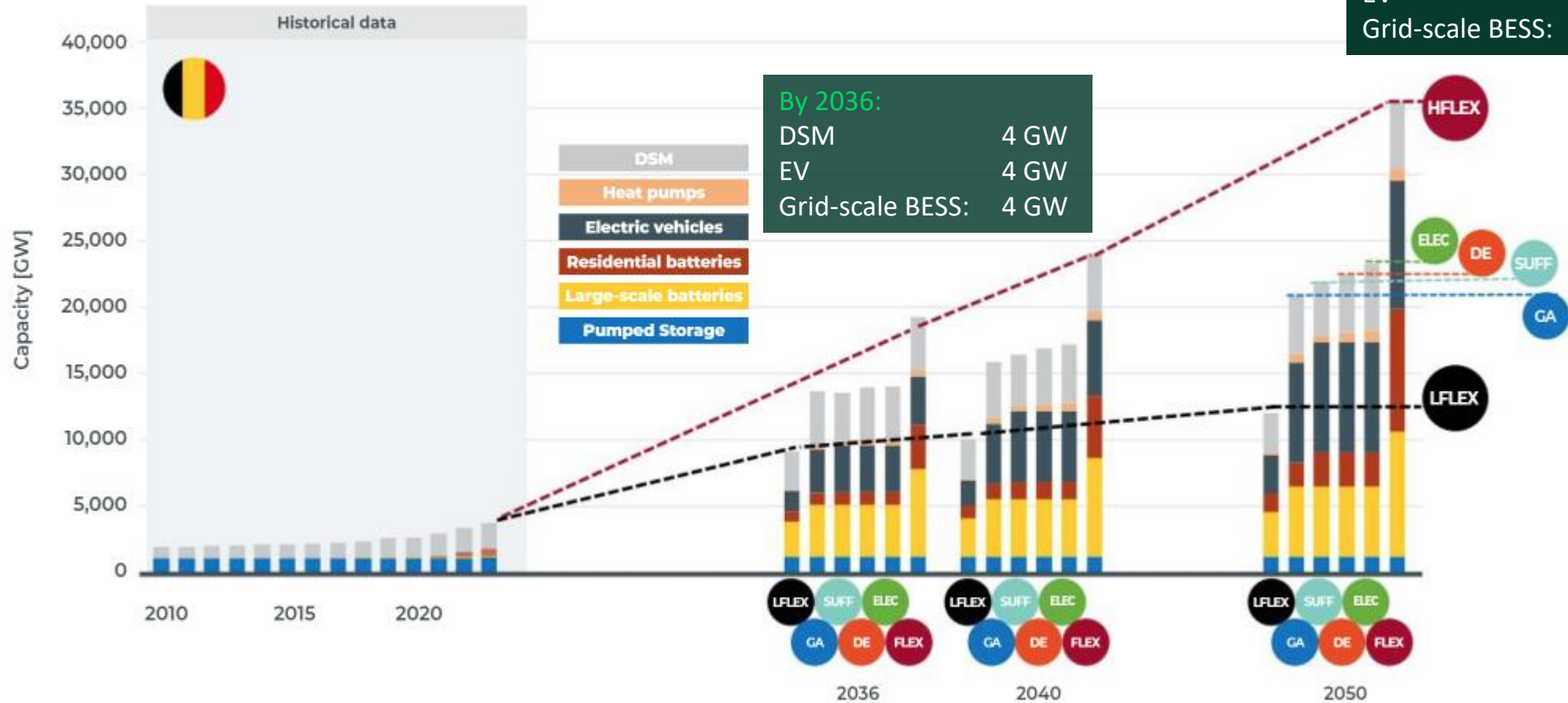
- Lower **Nuclear power plant** maintenance this summer
- Lower **availability of pump storage** expected this summer
- Lower **offtake** during the summer months : [5,7 GW – 10,7 GW]

Non-flexible must-run generation units, including **CCGTs**, will need to export to neighbouring countries to maintain grid stability.

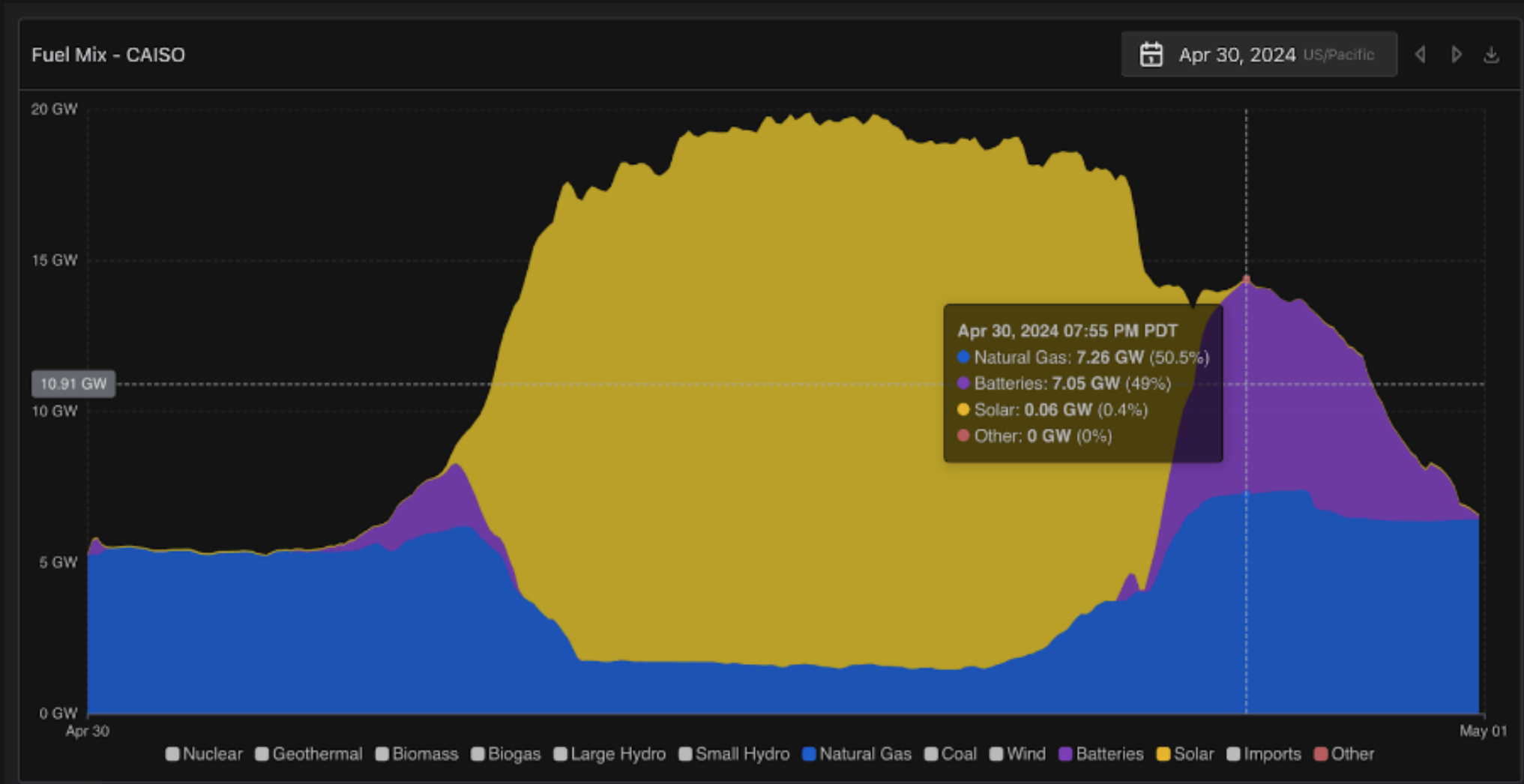


How much do we need?

OVERVIEW OF STORAGE AND DEMAND RESPONSE CAPACITIES FOR BELGIUM



The figures given represent capacities (power), but the flexibility of the system is modeled based on its energy content and other constraints. Therefore, the values provided are an estimate of the flexible power at a certain point in time, as it fluctuates depending on the availability of the different components.



Data from April 30th when battery discharge hit an all-time record in CAISO



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