

GB Market Summary May 2023

Published June 2023



Aurora provides market leading forecasts & data-driven intelligence for the global energy transition

A U R  R A

Power markets



Renewables



Storage



Electric vehicles



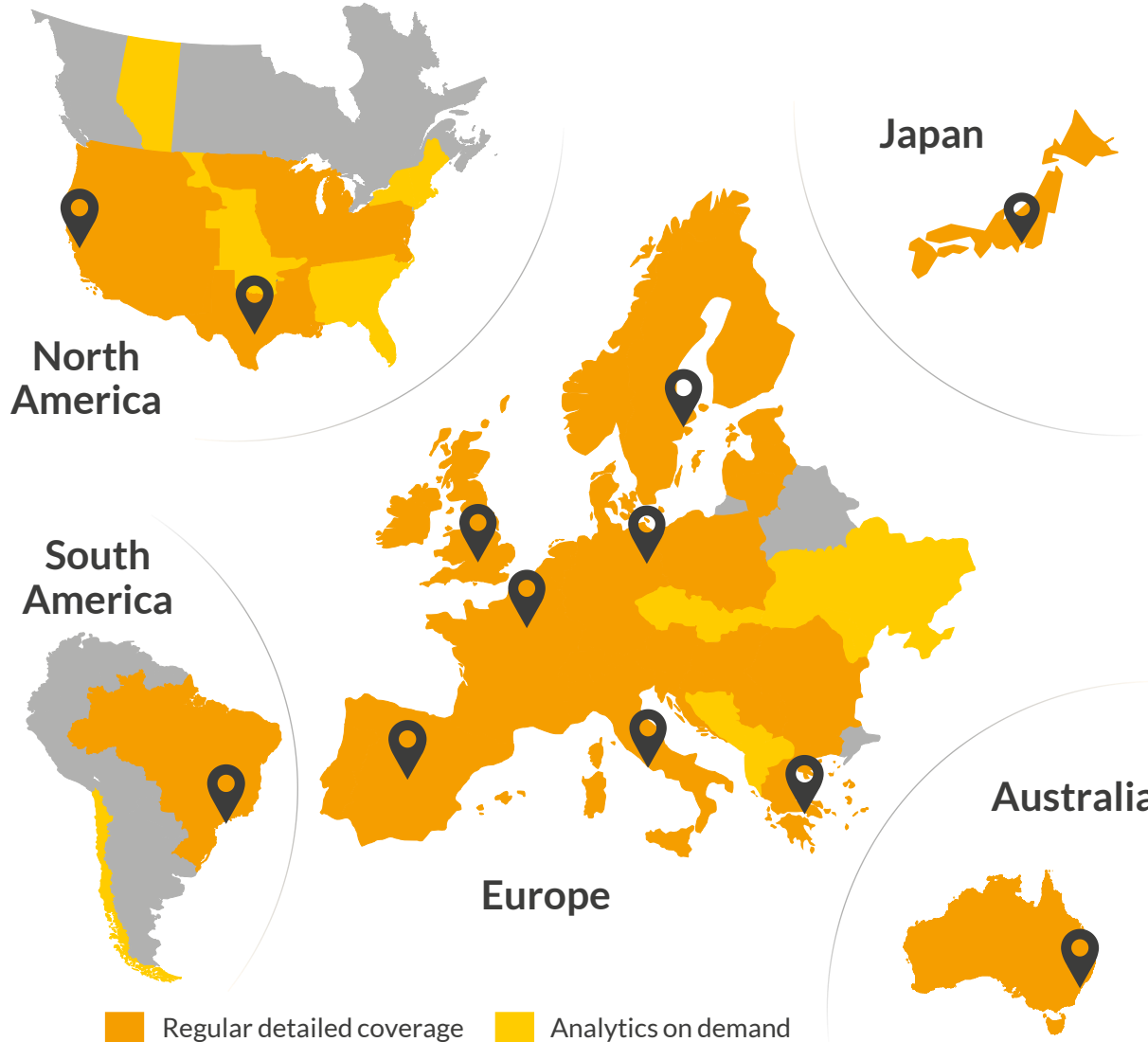
Hydrogen



Carbon



Natural gas



12 Offices

Oxford | Berlin | Madrid | Athens
Paris | Sydney | Austin | Oakland
Rome | Stockholm | Tokyo
São Paulo



440+

market experts



700+

subscribing companies



150+

transactions supported in 2022



Executive Summary

- The average power price in May was £78.5 /MWh, a 21% decrease since the average of £99.9/MWh in April, and a 40% decrease since the start of the year
- The fall in average power price is due to the ongoing fall in the carbon price and the gas price, which is now down 28% to £24.5/MWh, when compared to April. This is despite lower renewables load factors
- The UK-ETS traded at an average of £75.8/tCO₂ in May, a £11/tCO₂ decrease relative to April. Compared to the EU-ETS, it has fallen significantly and was, on average, 27% lower
- Total demand was 18.2TWh in May, a drop of 7% from April and 12% year-on-year

		Monthly value ¹	Month-on-month change	Year-on-year change	Slide reference(s)
System Performance	Power prices, £/MWh	78.5	-21.4 (21.4%)	-41.8 (34.8%)	<u>5, 6</u>
	Gas prices, £/MWh	24.5	-9.7 (28.4%)	-7.3 (23.1%)	<u>8</u>
	Carbon ² prices, £/tCO ₂	75.8	-11.1 (12.8%)	-25.9 (25.5%)	<u>8</u>
	Transmission demand, TWh	18.2	-1.3 (6.6%)	-2.5 (12.2%)	<u>12</u>
	Low carbon ³ generation, TWh	9.6	-1.4 (12.8%)	-2.9 (23.4%)	<u>13, 14</u>
	Thermal ⁴ generation, TWh	7.1	-0.3 (4.1%)	-3.3 (31.5%)	<u>13, 14</u>
	Grid carbon intensity, gCO ₂ e/kWh	168.4	-1.4 (0.8%)	-16.8 (9.1%)	<u>16</u>
Capture Prices	Offshore wind, £/MWh	76.8	-15.9 (17.2%)	-28.6 (27.1%)	<u>20</u>
	Onshore wind, £/MWh	76.2	-15.3 (16.7%)	-26.2 (25.6%)	<u>20</u>
	Solar PV, £/MWh	70.4	-21.3 (23.3%)	-45.5 (39.3%)	<u>20</u>

		Monthly value ¹	Variance to historical monthly average ³	Slide reference(s)
Load Factors	Offshore wind, %	26.4	-3.5 p.p.	<u>19</u>
	Onshore wind, %	16.6	-5.7 p.p.	<u>19</u>
	Solar PV, %	16.7	-0.2 p.p.	<u>19</u>

1) Values averaged over the calendar month. 2) Includes CPS and EU ETS until 18th May 2021 and UK ETS from 19th May 2021 onwards; 3) Includes renewables and nuclear generation 4) Includes CCGTs, coal and other fossil plants; 5) Comparing to the average of same month in the previous 5 years.

Sources: Aurora Energy Research, Thomson Reuters, National Grid, Ofgem, Elxon

- I. Wholesale market summary
- II. Renewable performance (redacted)
- III. Company performance (subscriber only)
- IV. Plant performance (redacted)
- V. Balancing mechanism summary

Historic monthly average EPEX spot price

Average EPEX spot price¹
£/MWh



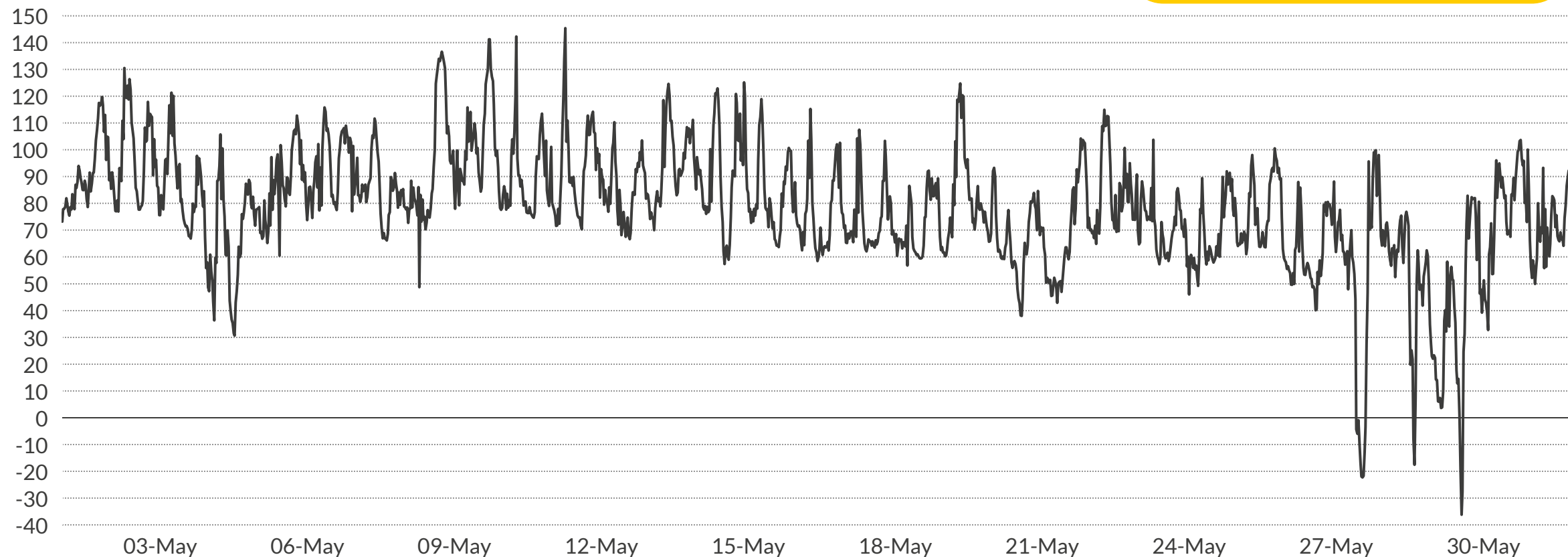
— Average monthly spot price — Annual average spot price (x) Month-on-month difference (x) Year-on-year difference

1) Average monthly EPEX is the average over the month of the volume-weighted reference prices for each half-hour interval.

Half-hourly EPEX spot price for May

EPEX spot price¹
£/MWh

Monthly average price in May 2023:
78.48 £/MWh



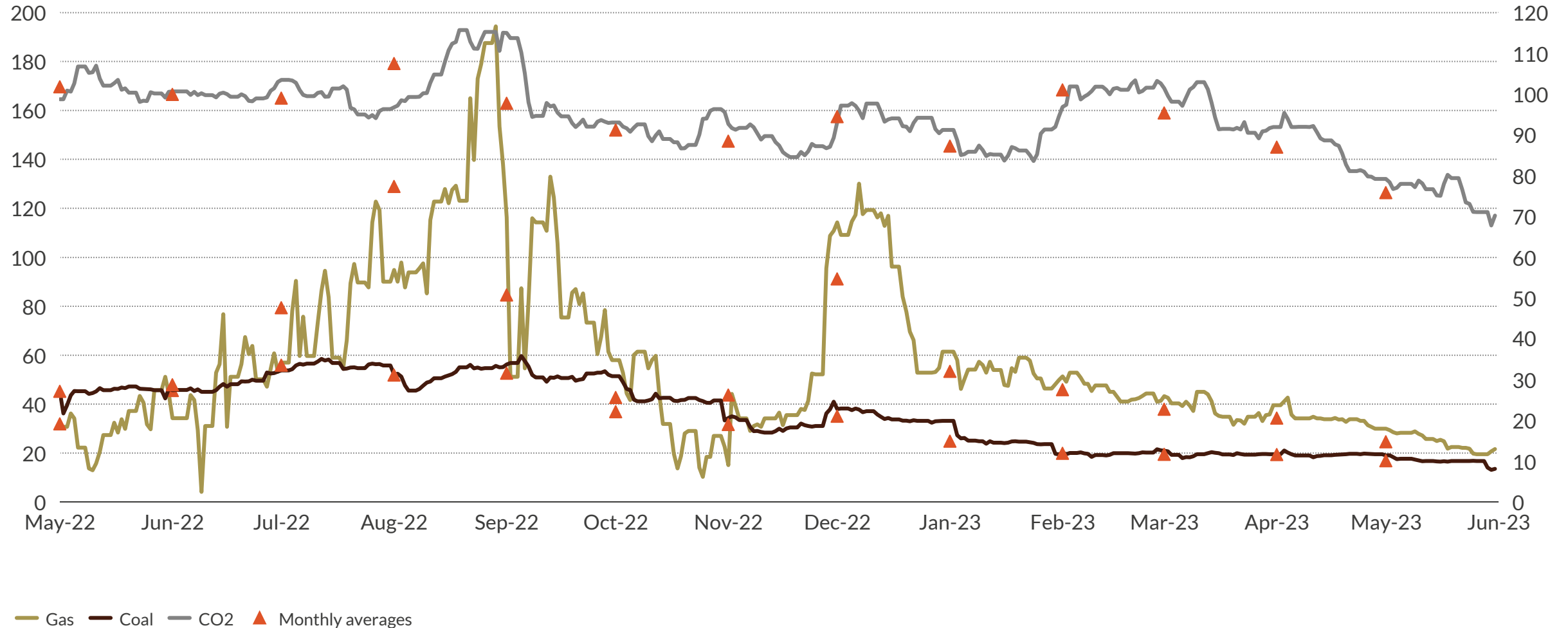
1) Half-hourly EPEX is the volume-weighted reference price over that half-hour interval, as provided by EPEX Spot

Historic fuel prices

Gas, Coal and Carbon daily prices

Gas/Coal price
£/MWh

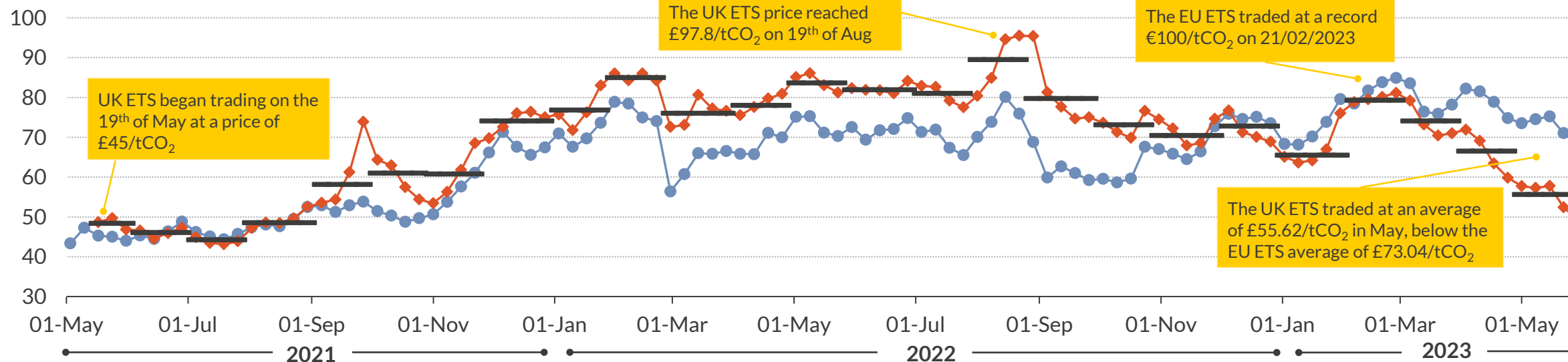
Total GB Carbon price
£/tCO₂



Historic weekly UK ETS and EU ETS Prices

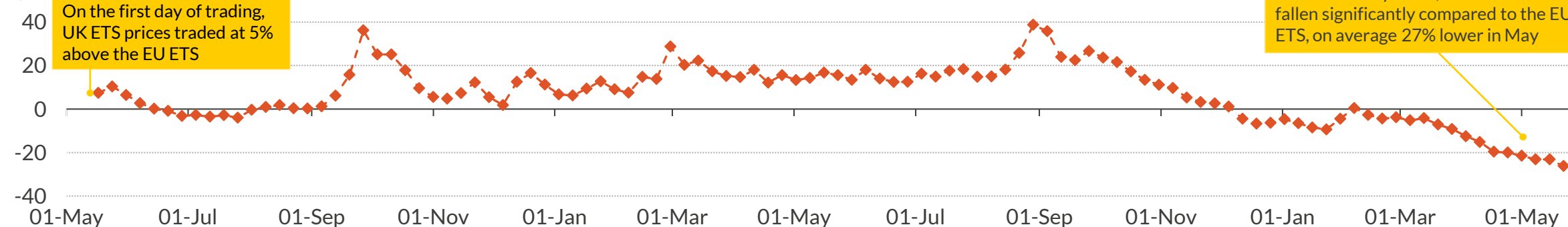
Weekly average EU and UK ETS prices

€/tCO₂



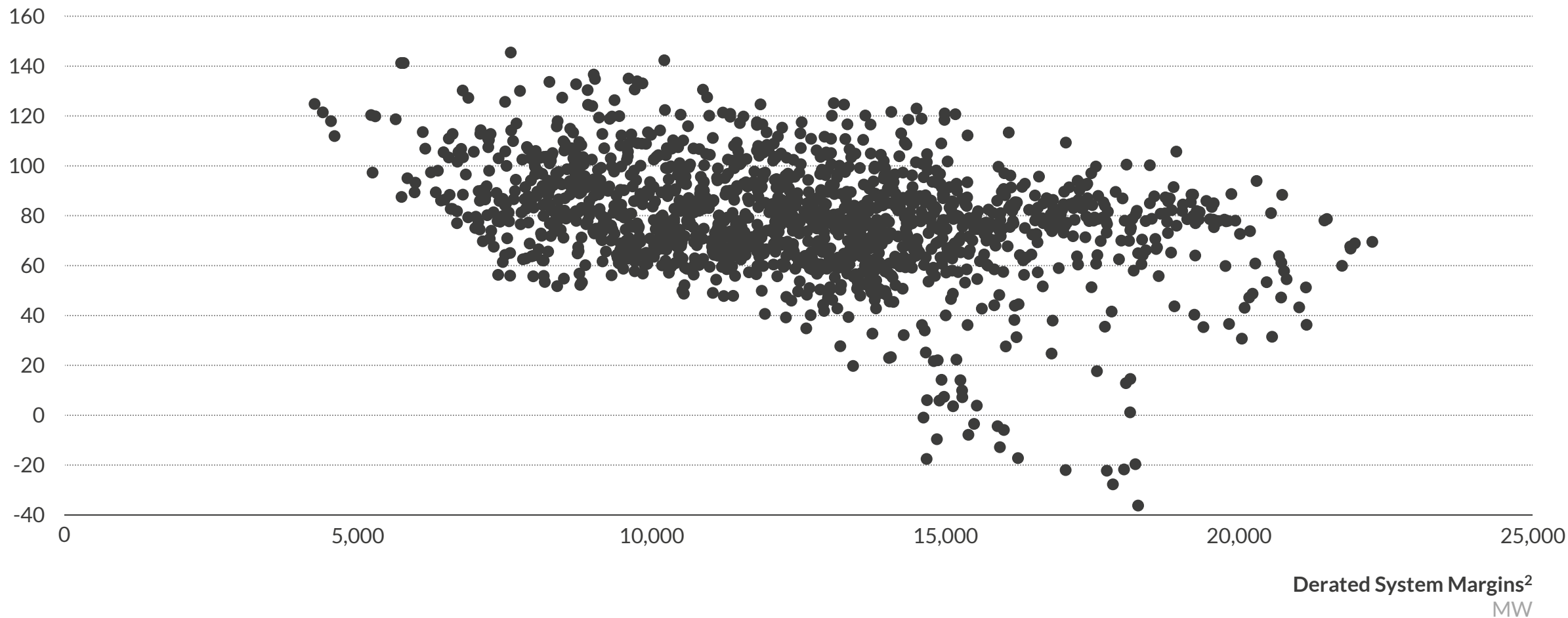
Relative difference between UK and EU ETS prices

%



Half-hourly spot prices against half-hourly system margins for May

EPEX spot price¹
£/MWh

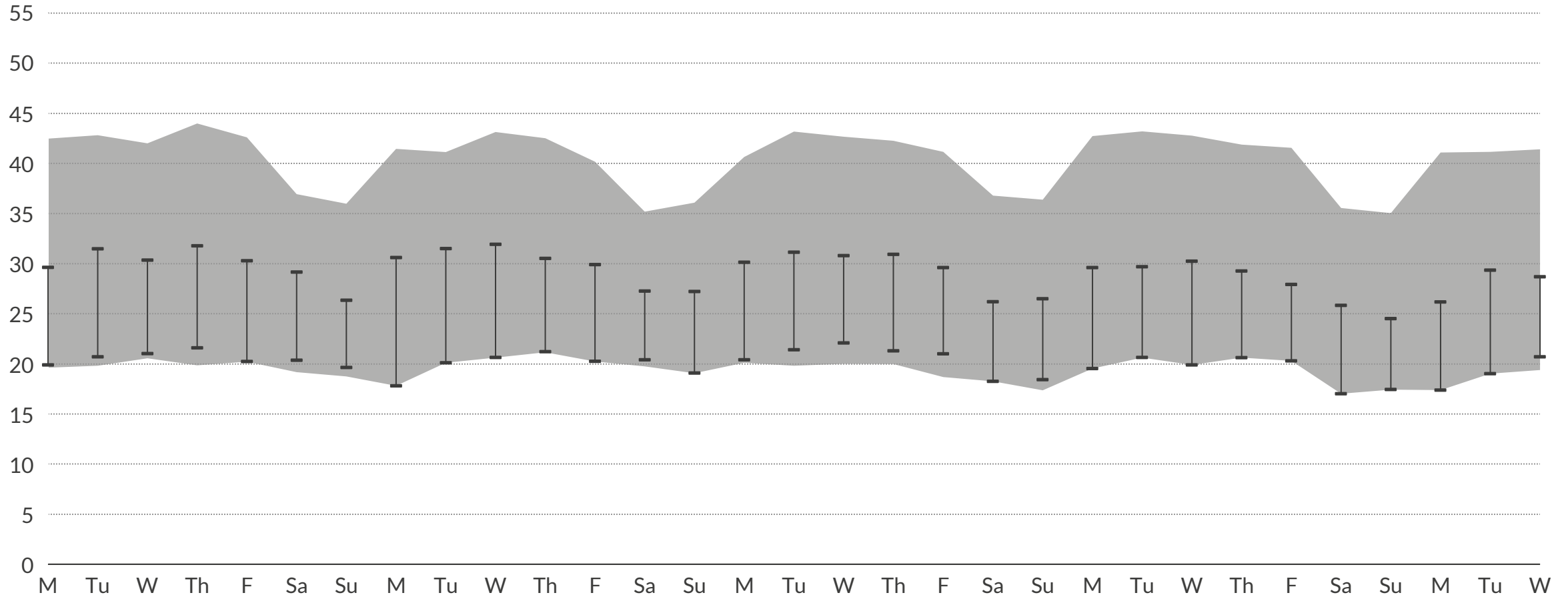


1) Half-hourly EPEX is the volume-weighted reference price over that half-hour interval, as provided by EPEX Spot. 2) De-Rated Margin Forecast calculated in accordance with the Loss of Load Probability Calculation Statement from Elexon.

Daily May max and min demand

Relative to historic May max and min demand since 2010¹

Demand²
GW



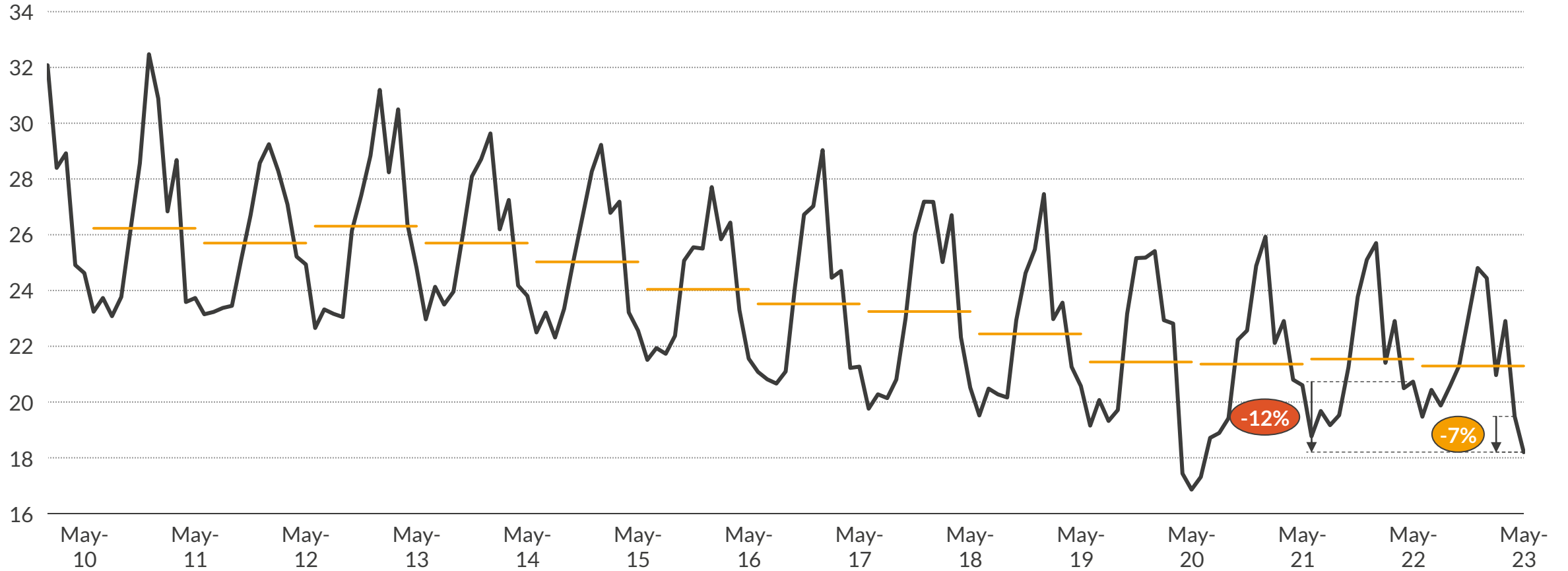
I Daily range ■ Historic maximum/minimum

1) Data from previous years is matched to the nearest weekday within the current month, to maintain the weekly demand pattern. 2) Demand data presented here is Initial Transmission System Demand Out-Turn, and does not include embedded demand.

Monthly historical demand on the transmission system

Total demand¹

TWh

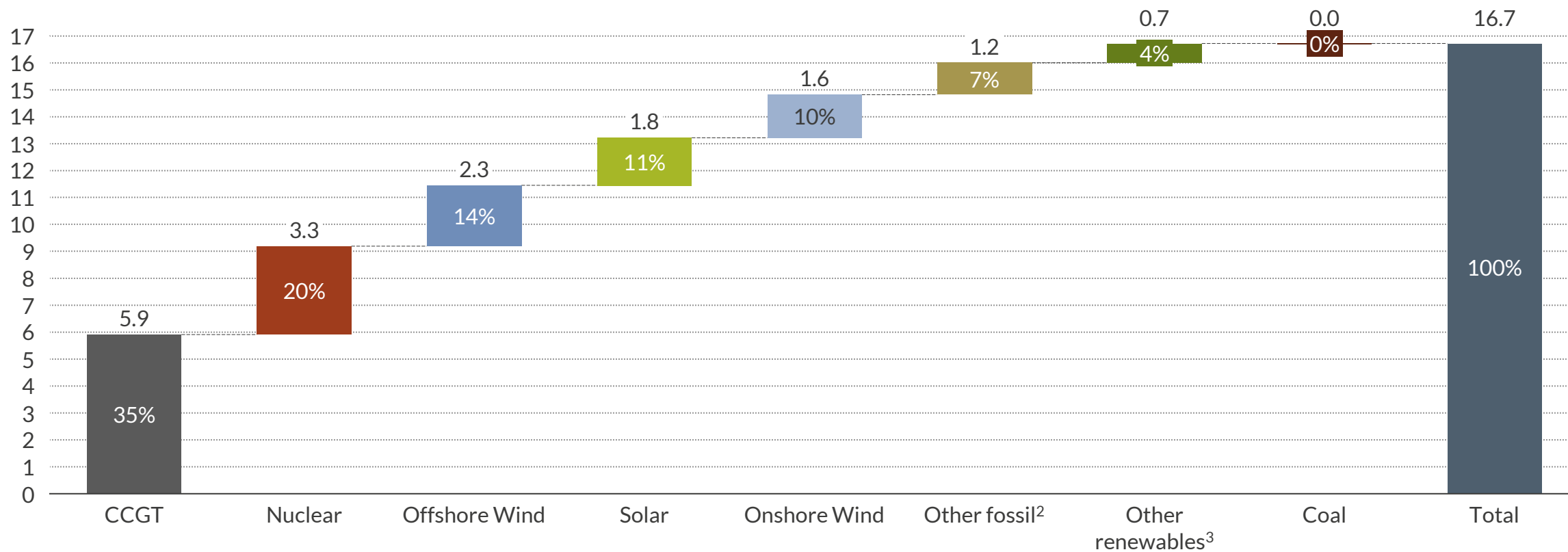


— Total monthly demand — Annual average demand (x) Month-on-month difference (x) Year-on-year difference

1) Demand data presented here is Initial Transmission System Demand Out-Turn, and includes station transformer load, pumped storage demand and interconnector demand, but does not include embedded demand.

Monthly fuel mix breakdown

Output¹
TWh



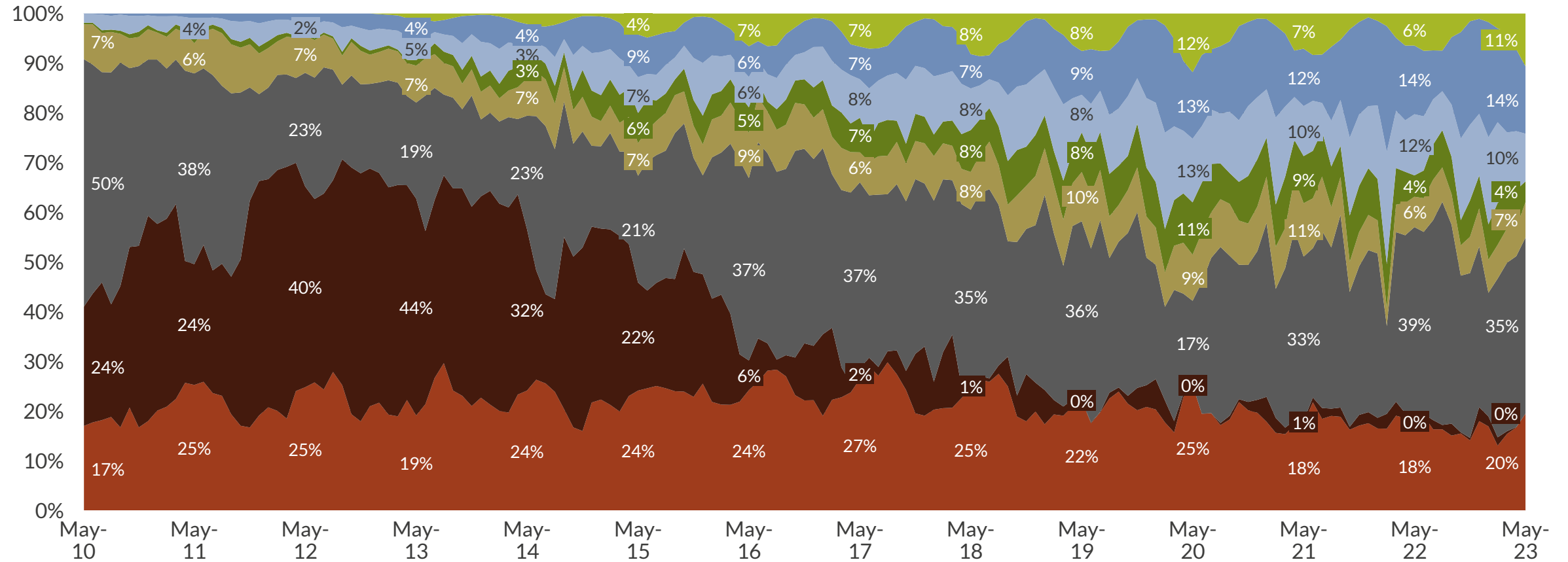
Load factor
%



1) Includes outputs from generators registered as BM Units as well as embedded wind and solar PV assets. All numbers are rounded to 0.1 TWh which means that subtotals may not sum to total value. 2) Other fossil includes oil, CHP-CCGT and OCGT. 3) Other renewables includes biomass and hydro.

Historical fuel mix breakdown

Output¹
% of total

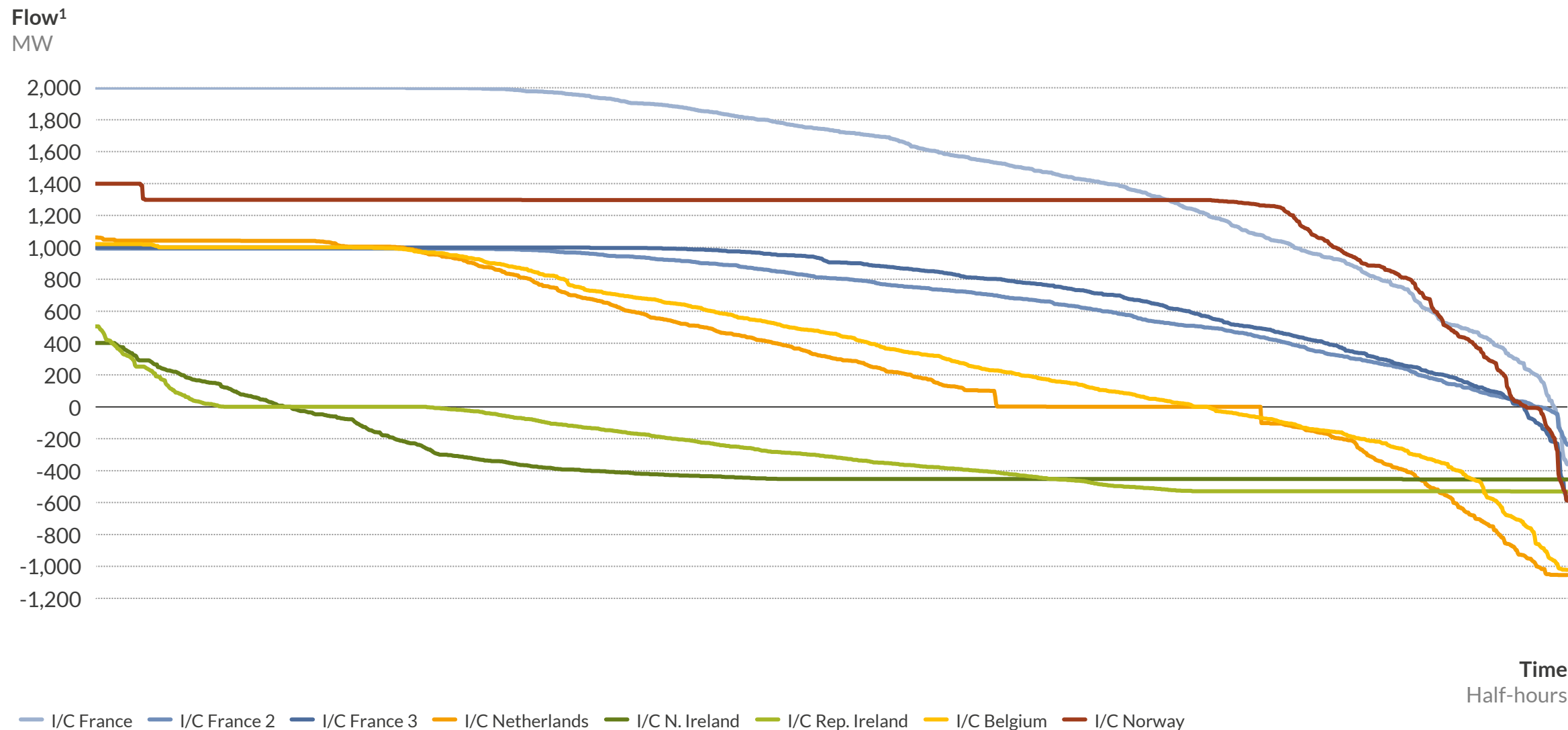


■ Nuclear
 ■ Coal
 ■ CCGT
 ■ Other fossil²
■ Other renewables³
■ Onshore Wind
 ■ Offshore Wind
 ■ Solar
 ■ Imports

1) Includes outputs from generators registered as BM Units as well as embedded wind and solar PV. 2) Other fossil includes oil, CHP-CCGT and OCGT. 3) Other renewables includes biomass and hydro.

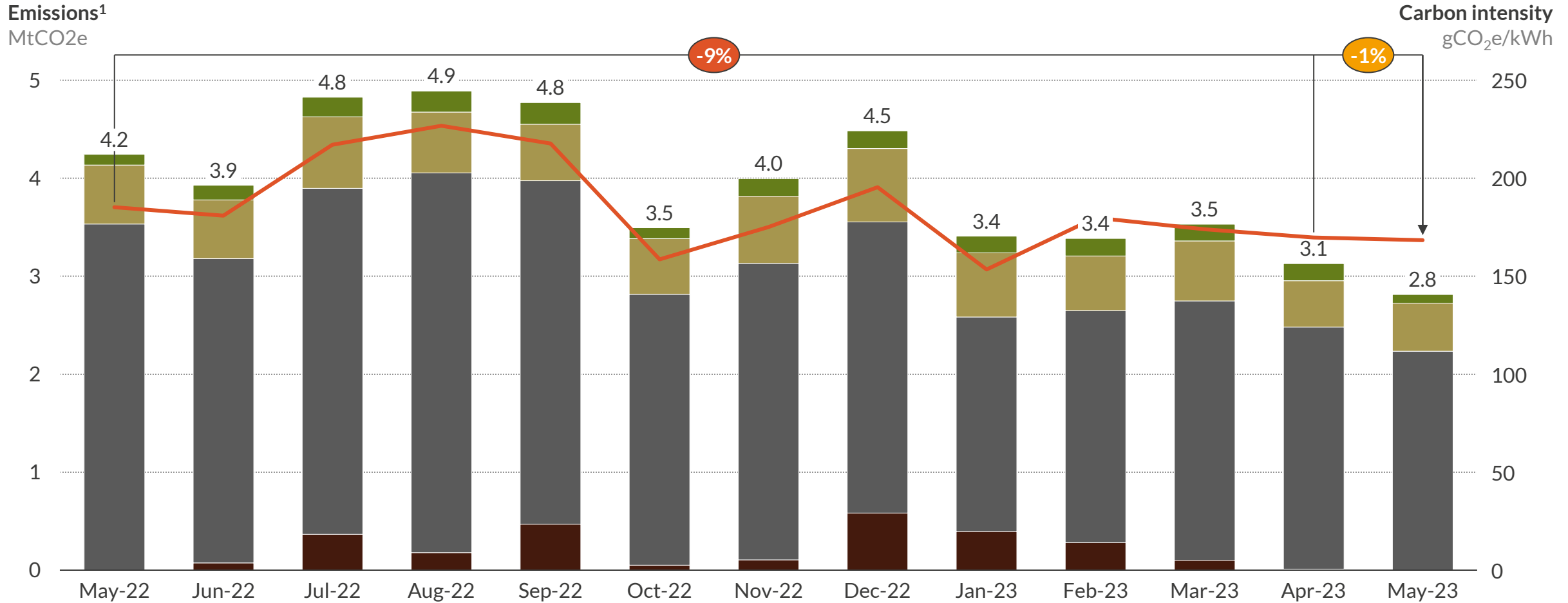
Monthly interconnector flow duration curve

Flow in each half-hour for GB interconnectors



1) Positive flow is imports into GB, negative flow is exports.

Monthly emissions by technology



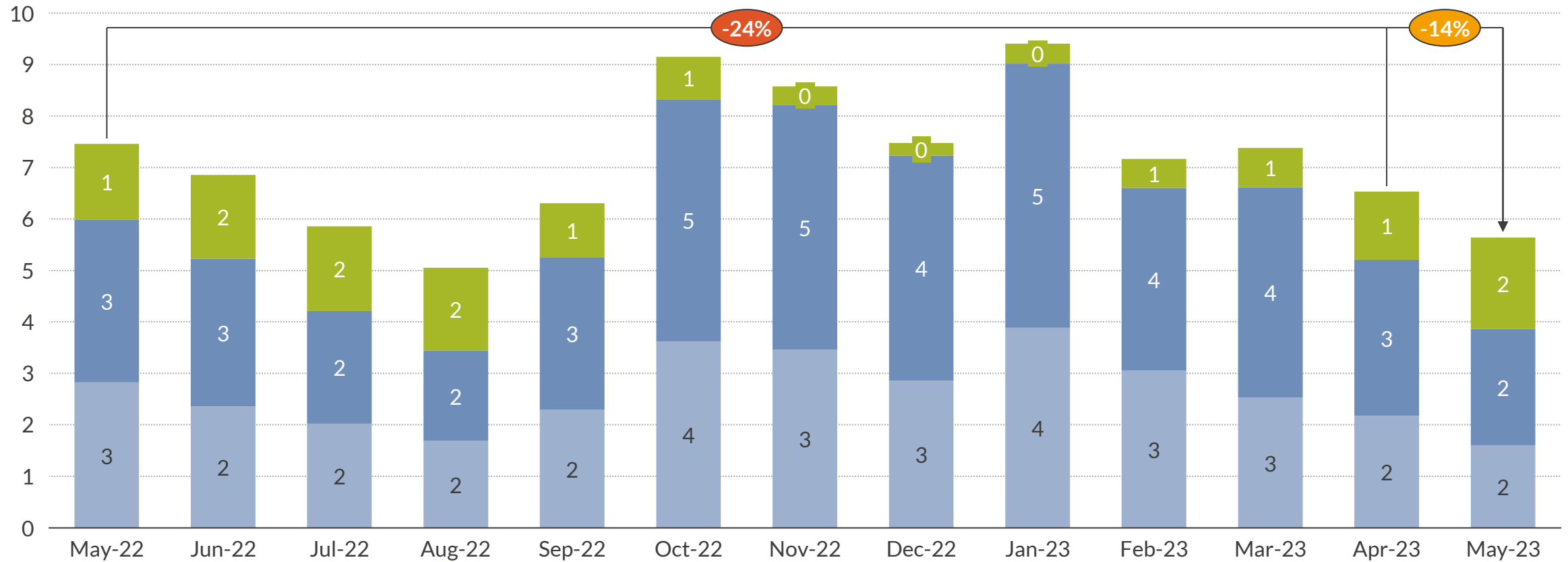
1) Please refer to Appendix for details of methodology employed to calculate emission amounts. Includes all Balancing Mechanism plants. 2) Other fossil includes oil, OCGT and gas CHP-CCGT.

Agenda

- I. Wholesale market summary
- II. Renewable performance (redacted)
- III. Company performance (subscriber only)
- IV. Plant performance (redacted)
- V. Balancing mechanism summary

Monthly renewables output

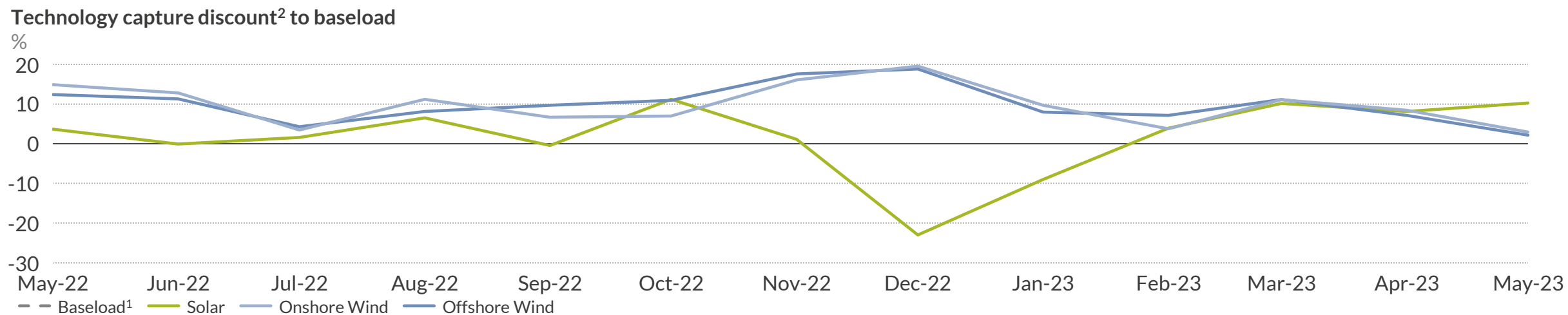
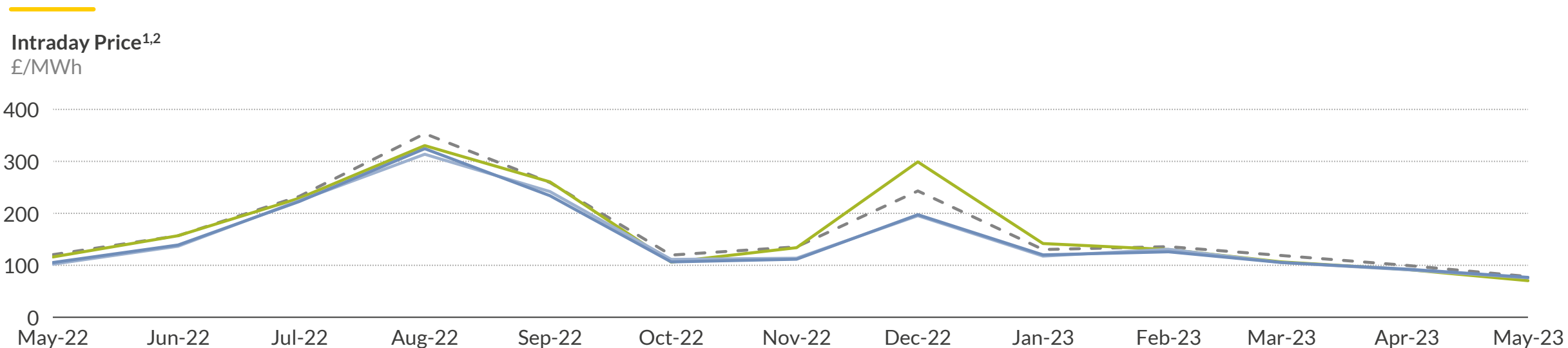
Output¹
TWh



■ Solar
 ■ Offshore Wind
 ■ Onshore Wind
 ⓧ Month-on-month difference
 ⓧ Year-on-year difference

1) Includes outputs from wind generators registered as BM Units as well as embedded wind and solar PV

Capture price versus baseload APX price



1) The baseload price is the average monthly APX spot price. The capture price of a technology is the load-weighted monthly average APX price across all half-hourly periods; 2) Includes generators registered as BM Units as well as embedded wind

Agenda

- I. Wholesale market summary
- II. Renewable performance (redacted)
- III. Company performance (subscriber only)
- IV. Plant performance (redacted)
- V. Balancing mechanism summary

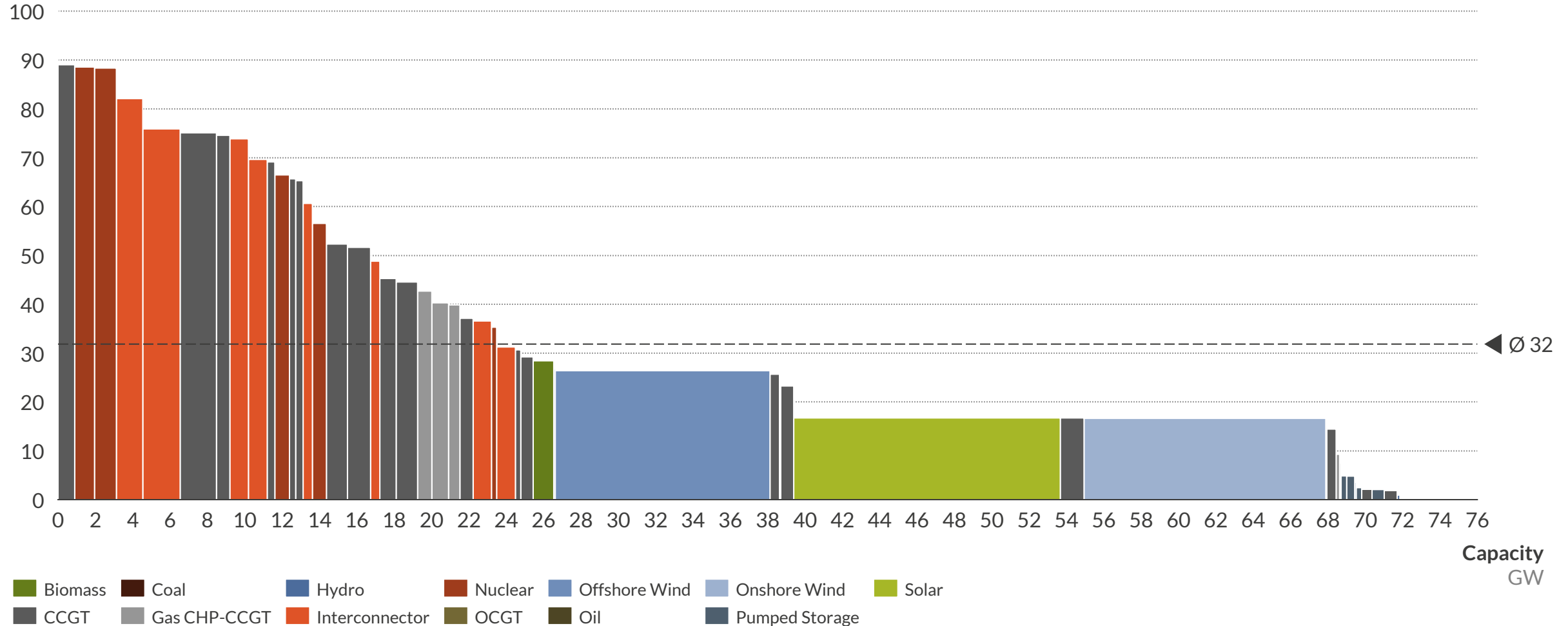
Agenda

- I. Wholesale market summary
- II. Renewable performance (redacted)
- III. Company performance (subscriber only)
- IV. Plant performance (redacted)
- V. Balancing mechanism summary

Plant utilisation – load factors by plant for May

Load factor¹
%

Column width
reflects capacity



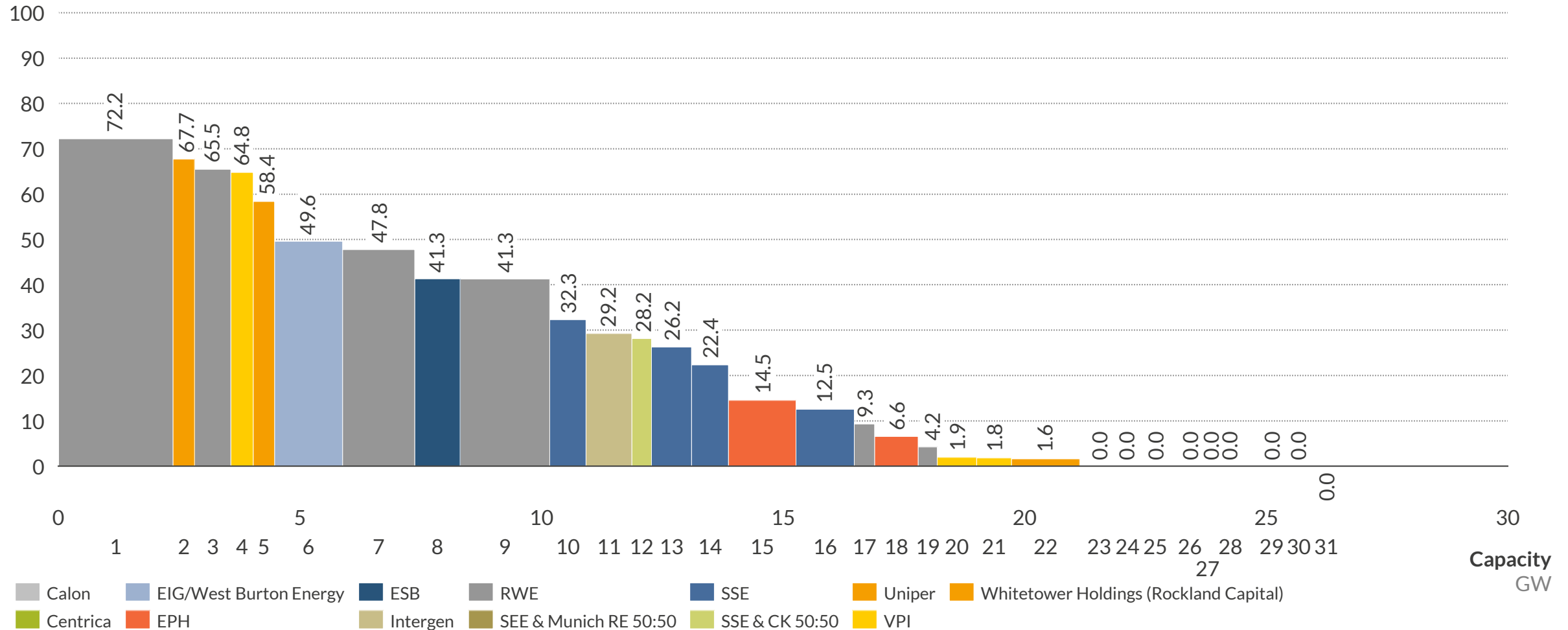
1) Represents 60 plants with highest capacity according to the Balancing Mechanism (BM) database, as well as aggregated data for wind and solar. Capacity of each plant represents the sum of capacities of all its generators that have been active at least once in the last three months. Please refer to Appendix for a detailed description of the data used and categories presented

Sources: Aurora Energy Research, Elexon, BEIS

CCGT plant utilisation – by plant for May

Full load hours¹
% of total for the period

Column width
reflects capacity

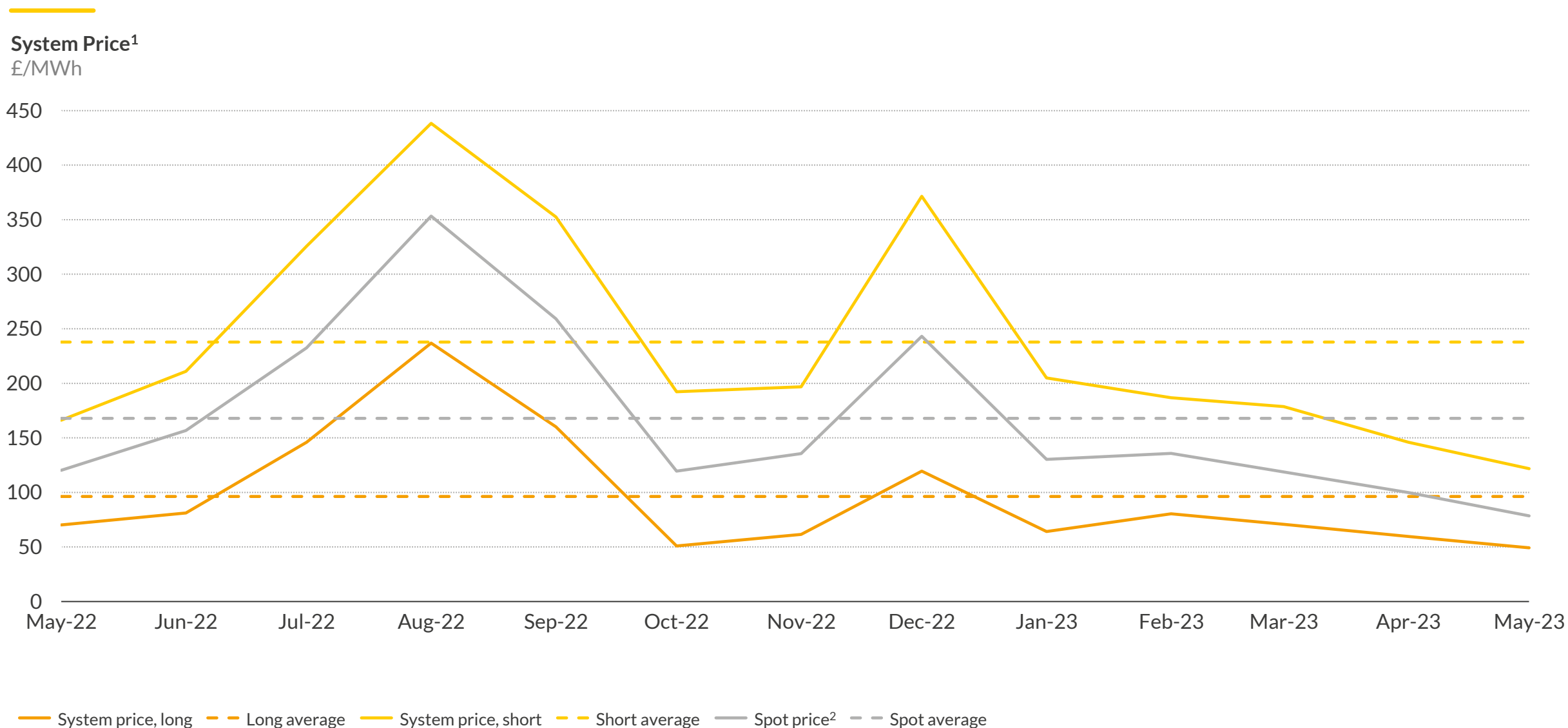


1) Includes all CCGT plants of the presented companies that report to the Balancing Mechanism. Plant Names: 1. Pembroke, 2. Cottam Dypt Centre, 3. Little Barford, 4. Shoreham, 5. Enfield Energy, 6. West Burton B, 7. Didcot B, 8. Carrington, 9. Staythorpe, 10. Medway, 11. Spalding, 12. Seabank 2, 13. Seabank 1, 14. Keadby, 15. South Humber Bank, 16. Peterhead, 17. Great Yarmouth, 18. Langage, 19. Kings Lynn, 20. Damhead Creek, 21. Rye House, 22. Connahs Quay, 23. Rocksavage, 24. Corby, 25. Coryton, 26. Killingholme 2, 27. Glanford Brigg, 28. Severn, 29. Sutton Bridge, 30. Peterborough, 31. Marchwood. Sources: Aurora Energy Research, Elaxon

Agenda

- I. Wholesale market summary
- II. Renewable performance (redacted)
- III. Company performance (subscriber only)
- IV. Plant performance (redacted)
- V. Balancing mechanism summary

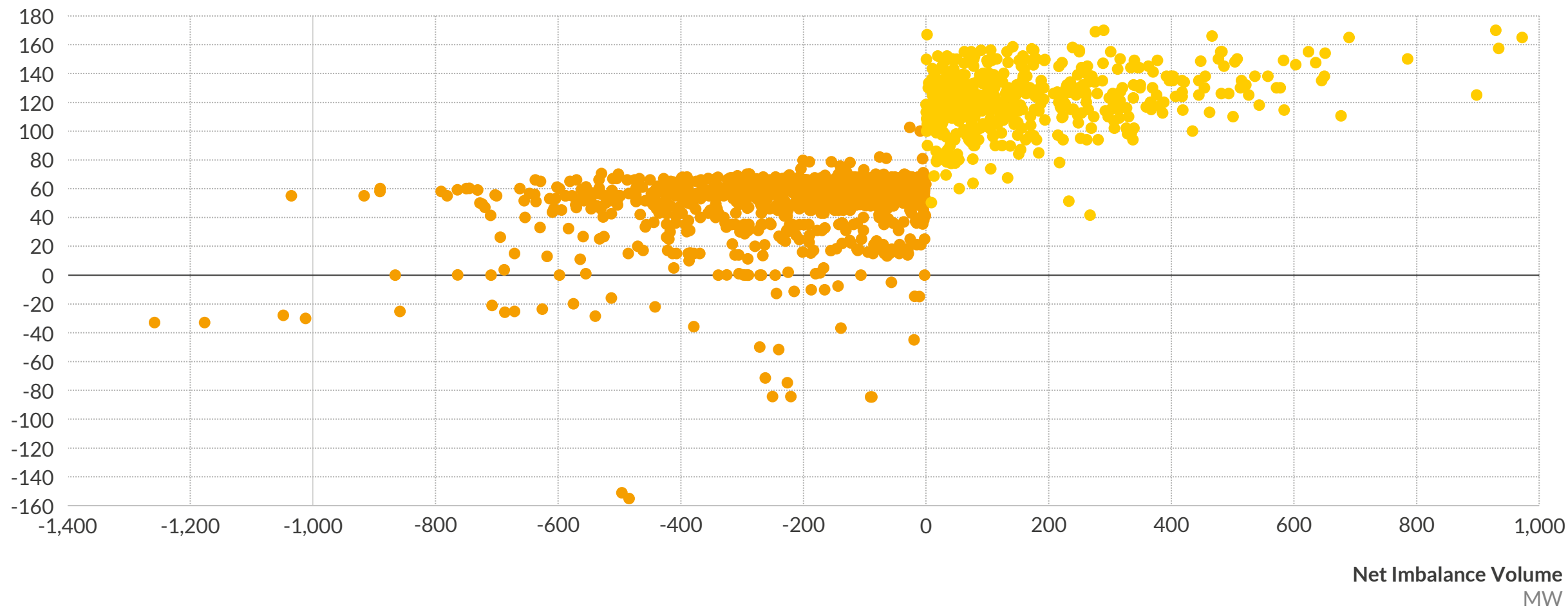
Monthly average system prices for the last 13 months



1) Monthly average; 2) Half-hourly wholesale spot price is the volume-weighted reference price over that half hour interval, as provided by APX Power UK

Half-hourly System Price against Net Imbalance Volume for May

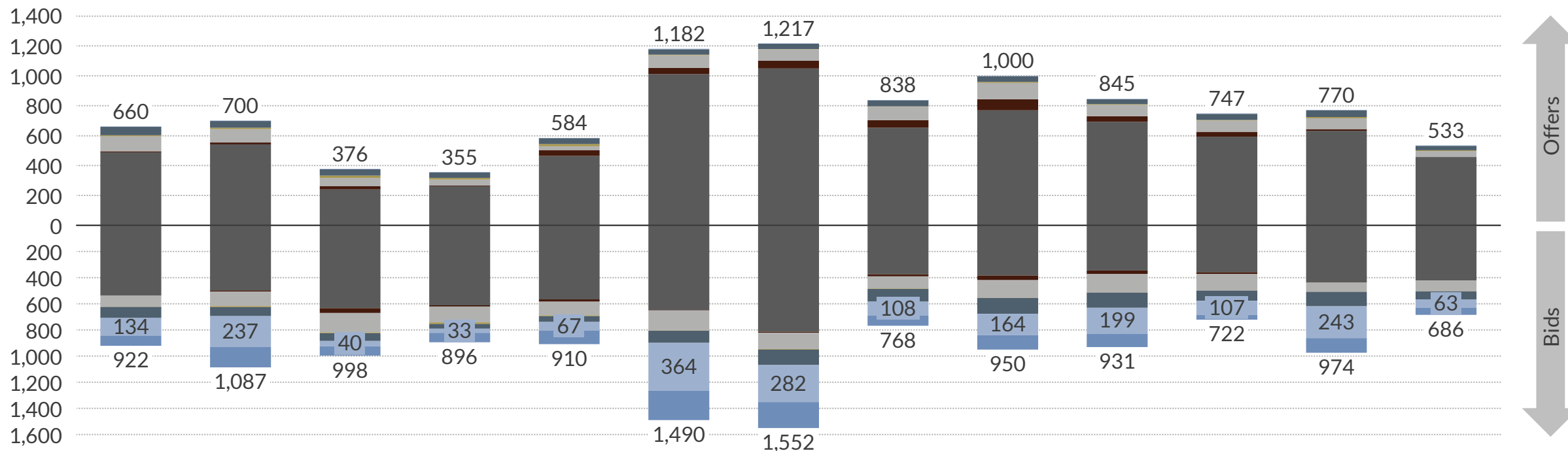
System Price
£/MWh



System imbalance: ● Long ● Short

Bid-offer acceptance volumes breakdown by technology for the last 13 months

Accepted offer¹ volumes
GWh



Accepted bid² volumes
GWh

May-22 Jun-22 Jul-22 Aug-22 Sep-22 Oct-22 Nov-22 Dec-22 Jan-23 Feb-23 Mar-23 Apr-23 May-23

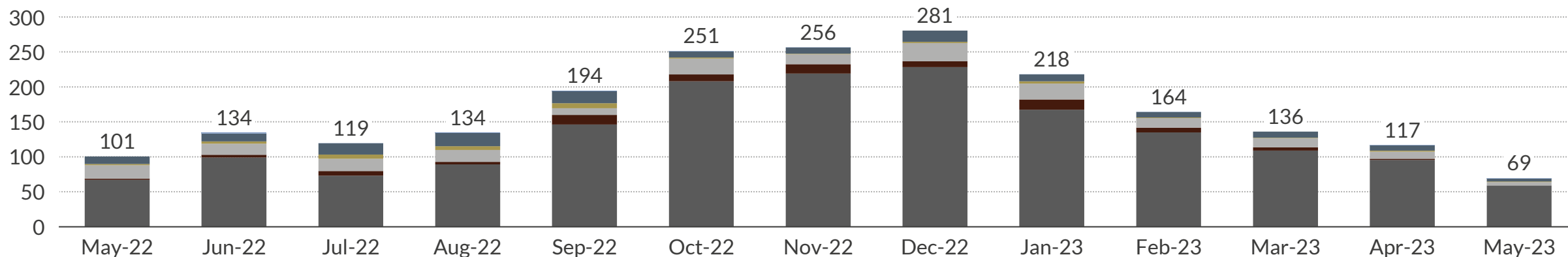
CCGT Coal Other³ Peaking⁴ Storage⁵ Onshore Wind Offshore Wind

1) Offers to increase generation or reduce demand; 2) Bids to reduce generation or increase demand; 3) Other includes oil, CHP-CCGT, biomass and hydro; 4) Peaking includes OCGT, reciprocating engines and DSR; 5) Storage includes batteries and pumped storage

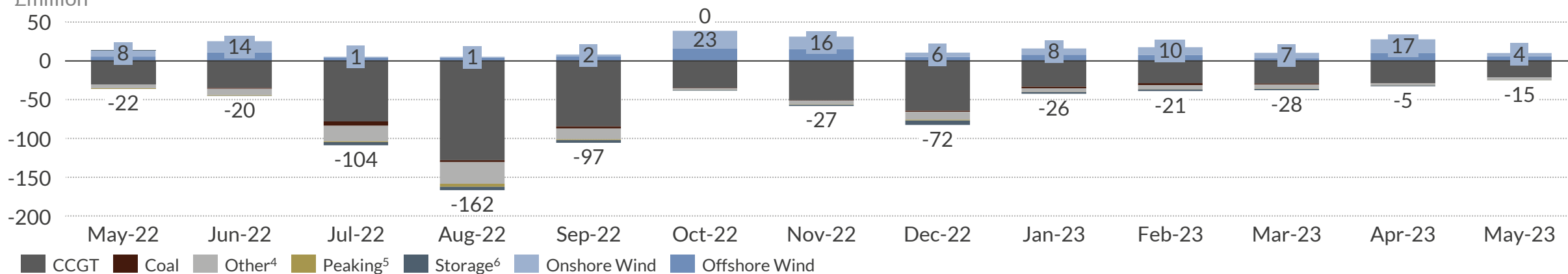
Sources: Aurora Energy Research, Elexon

Bid-offer payments breakdown by technology for the last 13 months

Accepted offer¹ payments³
£million



Accepted bid² payments³
£million



1) Offers to increase generation or reduce demand; 2) Bids to reduce generation or increase demand; 3) Positive cashflow means payment to generators, negative is payment to National Grid; 4) Other includes oil, CHP-CCGT, biomass and hydro; 5) Peaking includes OCGT, reciprocating engines and DSR; 6) Storage includes batteries and pumped storage

Sources: Aurora Energy Research, Elexon

Data used

- Output values used in this summary reflect the sum of Final Physical Notifications (FPN) submitted by all BM Units of a given plant that have been active over the last three months.
- Capacity values used in this summary reflect the sum of capacities of individual BM Units, as reported to the Balancing Mechanism, that have been active over the last three months. They reflect long-term capacities and exclude temporary fluctuations due e.g. to plant failures or scheduled maintenance.
- Prices used in this summary are the EPEX half-hourly Reference Prices for half-hourly, two-hourly and four-hourly spot products.

Categories presented

- Full-load hours represent the plants' load factors, calculated as the ratio of the output produced in a given month to the maximum possible output given the plants' capacity.
- Running hours represent the proportion of time in a given month when a plant has been active, i.e. when at least one of its BM Units produced output greater than zero.
- Capture prices (or average output-weighted prices) are calculated as an average of EPEX half-hourly prices per MWh weighted by the plants' corresponding half-hourly outputs for all periods.
- Average gross margins are calculated as a sum of the uplift and inframarginal rent. Uplift is calculated as the difference between the EPEX price and the system marginal cost (SMC). SMC is the maximum marginal cost of all the plants with at least one generator producing above 80% of its installed capacity in a given half-hour.
- Emissions are calculated as plant output divided by electrical efficiency, multiplied by theoretical carbon content of the fuel input. The carbon content of fuel inputs is sourced from BEIS's Greenhouse gas reporting – Conversion factors 2016. System carbon intensity is calculated as the total emission divided by total electricity generated.

General Disclaimer

This document is provided "as is" for your information only and no representation or warranty, express or implied, is given by Aurora Energy Research Limited and its subsidiaries Aurora Energy Research GmbH and Aurora Energy Research Pty Ltd (together, "**Aurora**"), their directors, employees agents or affiliates (together, Aurora's "**Associates**") as to its accuracy, reliability or completeness. Aurora and its Associates assume no responsibility, and accept no liability for, any loss arising out of your use of this document. This document is not to be relied upon for any purpose or used in substitution for your own independent investigations and sound judgment. The information contained in this document reflects our beliefs, assumptions, intentions and expectations as of the date of this document and is subject to change. Aurora assumes no obligation, and does not intend, to update this information.

Forward-looking statements

This document contains forward-looking statements and information, which reflect Aurora's current view with respect to future events and financial performance. When used in this document, the words "believes", "expects", "plans", "may", "will", "would", "could", "should", "anticipates", "estimates", "project", "intend" or "outlook" or other variations of these words or other similar expressions are intended to identify forward-looking statements and information. Actual results may differ materially from the expectations expressed or implied in the forward-looking statements as a result of known and unknown risks and uncertainties. Known risks and uncertainties include but are not limited to: risks associated with political events in Europe and elsewhere, contractual risks, creditworthiness of customers, performance of suppliers and management of plant and personnel; risk associated with financial factors such as volatility in exchange rates, increases in interest rates, restrictions on access to capital, and swings in global financial markets; risks associated with domestic and foreign government regulation, including export controls and economic sanctions; and other risks, including litigation. The foregoing list of important factors is not exhaustive.

Copyright

This document and its content (including, but not limited to, the text, images, graphics and illustrations) is the copyright material of Aurora, unless otherwise stated.

This document is confidential and it may not be copied, reproduced, distributed or in any way used for commercial purposes without the prior written consent of Aurora.