AURORA
ENERGY RESEARCH

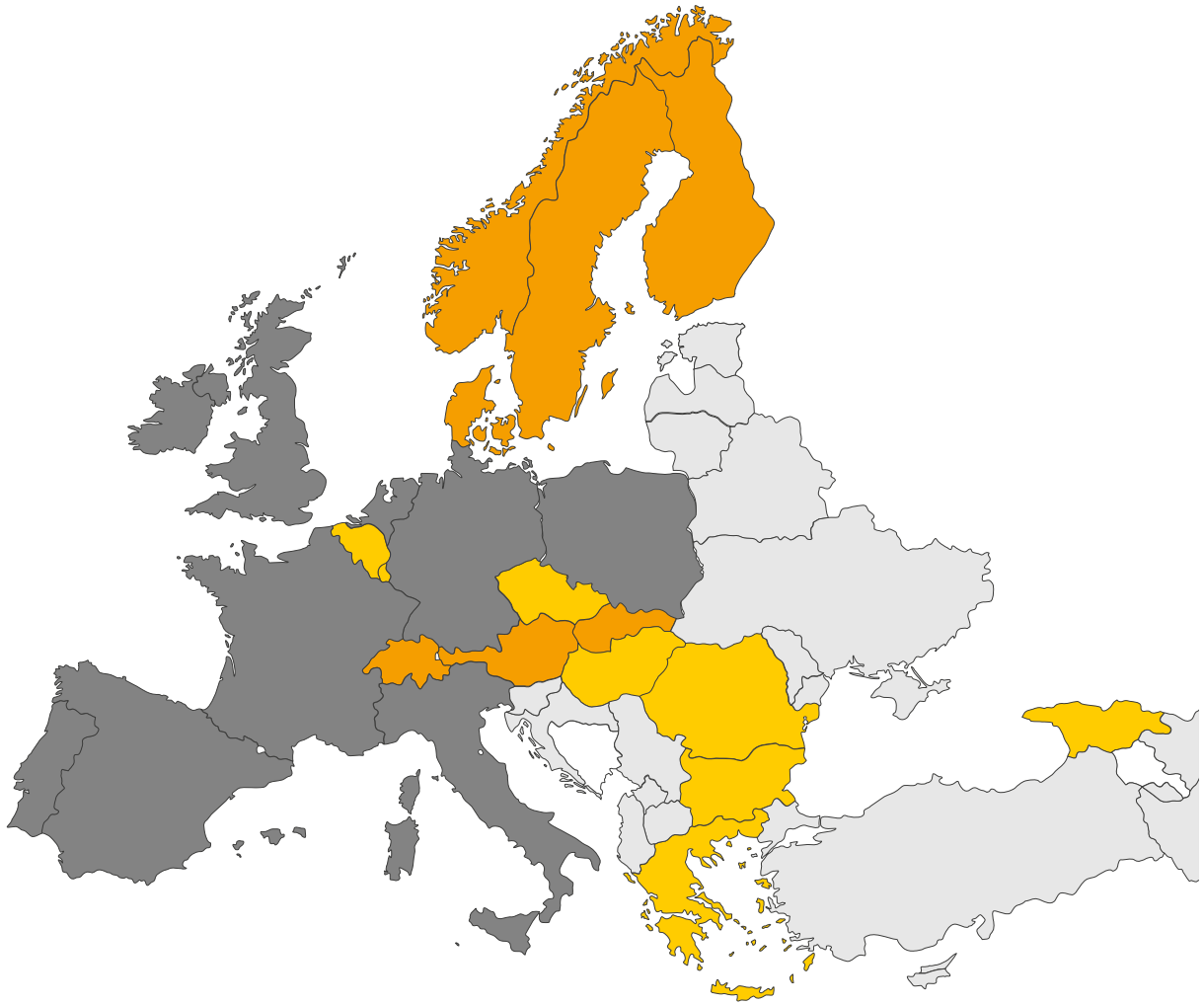
GB Wholesale Market Summary January 2021

Published February 2021

Executive Summary

1. January 2021 saw the monthly average power price soar to a decade-high of £71.2/MWh. The £17.1/MWh (or 32%) increase from December 2020 and £36.4/MWh (or 104%) increase from January 2020 was the result of a combination of higher fuel prices, carbon prices and demand. See slides 5, 6, and 7.
2. Due to colder temperatures, low renewable output levels and limited generator availability, January saw several periods of tight system margins. This resulted in National Grid ESO issuing both Capacity Market Notices (CMN) and Electricity Margin Notices (EMN) and turning to higher marginal cost generators. Consequently, these periods saw wholesale prices in excess of £500/MWh. See slide 5.
3. Colder temperatures caused monthly transmission power demand in January to increase by 1.0 TWh (or 4%) relative to December 2020, while the share of low carbon generation fell 8 p.p. to 51% of total generation in January. See slides 10 and 11.
4. Thermal generation in January increased by 2.3 TWh relative to December to meet the increase in demand and meet the shortfall from lower renewables output. As a result, carbon emissions rose by 1.2 $MtCO_2e$ (or 26%) compared to December. See slides 11 and 14.
5. Wind assets saw an increase in their profitability in January as the significant increase in wind capture prices (£15.1/MWh or 31% relative to December) outweighed the 5 p.p. decrease in load factors (to 37%). See slides 20 and 22.

Aurora offers power market forecasts and market intelligence spanning Europe's key markets & Australia



Comprehensive Power Market Services

- Power market forecast reports
- Forecast data in Excel
- Global energy market forecast reports
- Strategic insight reports
- Regular subscriber group meetings
- Bilateral workshops
- Analyst support

Power Market Forecast Reports

- Power market forecast reports
- Forecast data in Excel
- Analyst support

Bespoke forecasts

- Aurora can provide power market forecasts upon request

Source: Aurora Energy Research

Agenda

AURORA

I. System performance

II. Company performance (available to subscribers only)

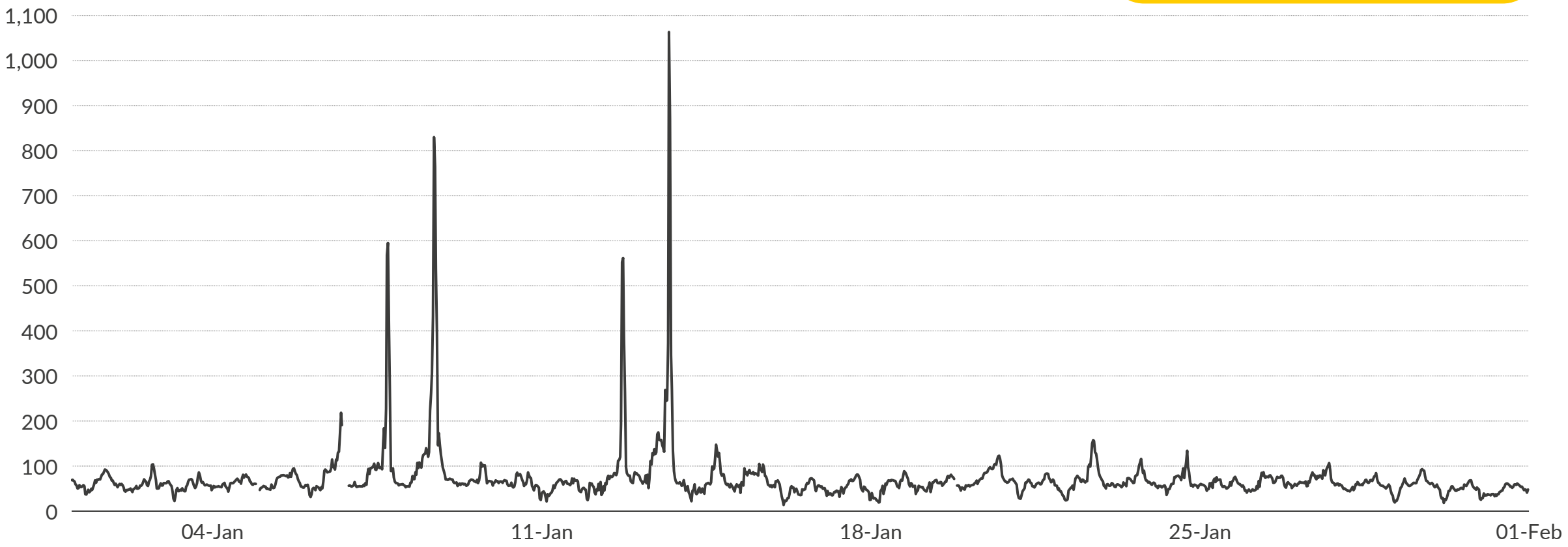
III. Plant performance

Half-hourly APX spot price for January

AURORA

APX spot price[1]
£/MWh

Monthly average price in January 2021: £71.16/MWh



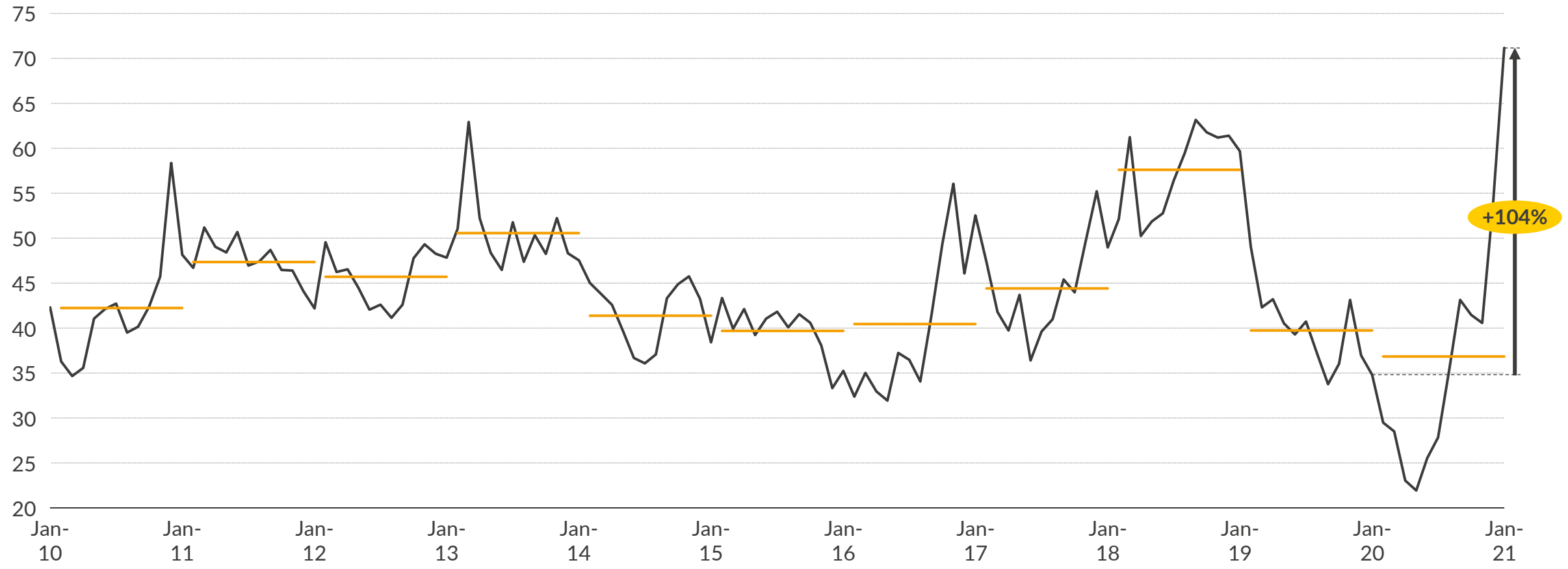
1) Half-hourly APX is the volume-weighted reference price over that half-hour interval, as provided by APX Power UK

Sources: Aurora Energy Research, Thomson Reuters

Historic monthly average APX spot price

AURORA

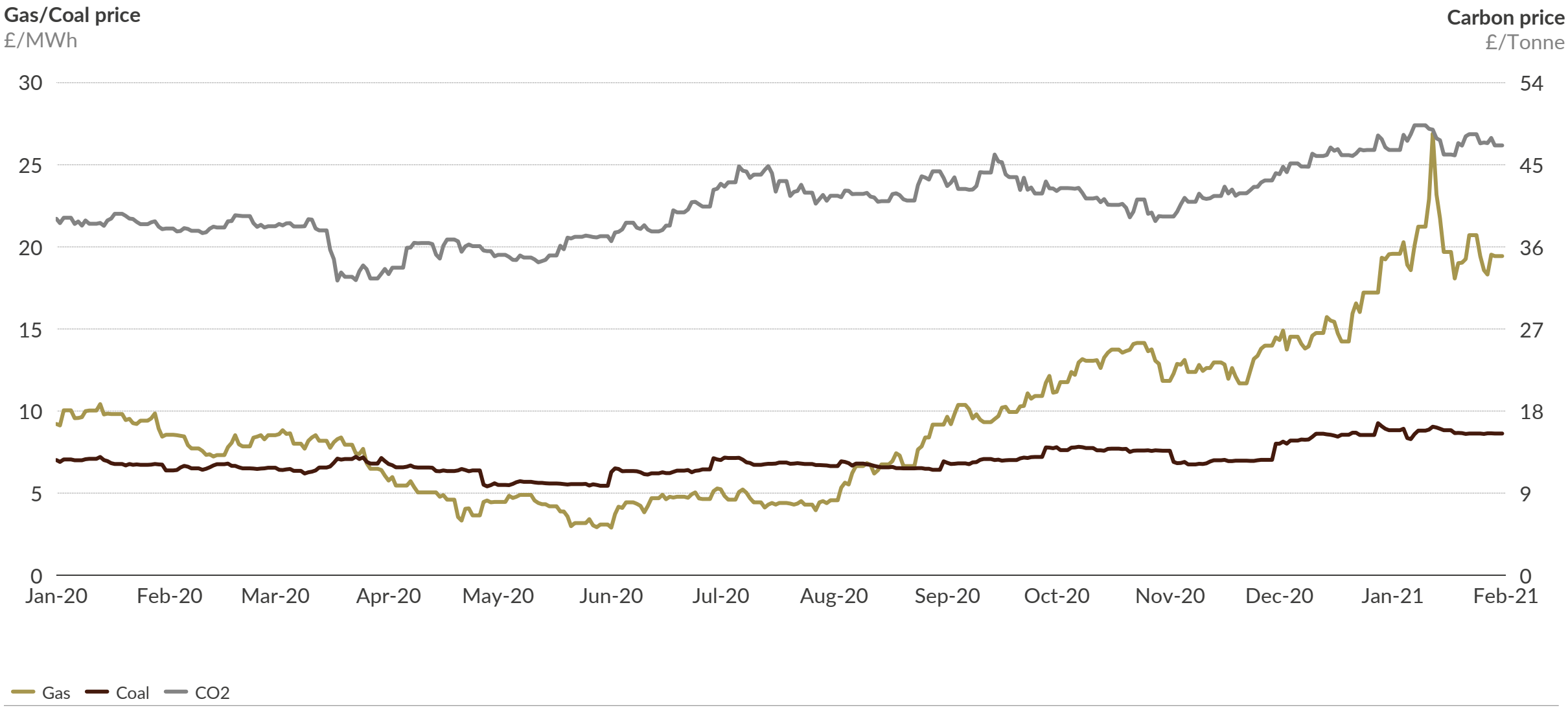
Average APX spot price[1],
£/MWh



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

Sources: Aurora Energy Research, Thomson Reuters

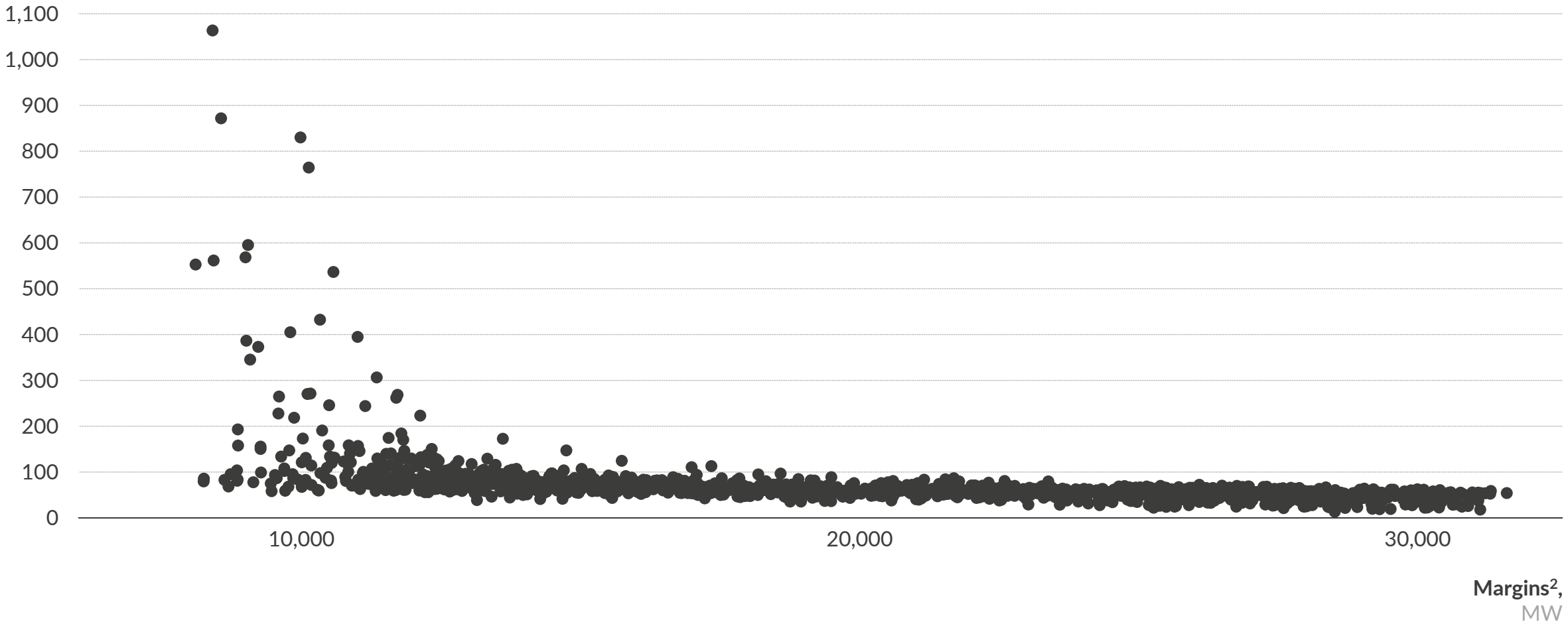
Historic fuel prices
Gas, Coal and Carbon daily prices



Sources: Aurora Energy Research, Thomson Reuters

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

AURORA

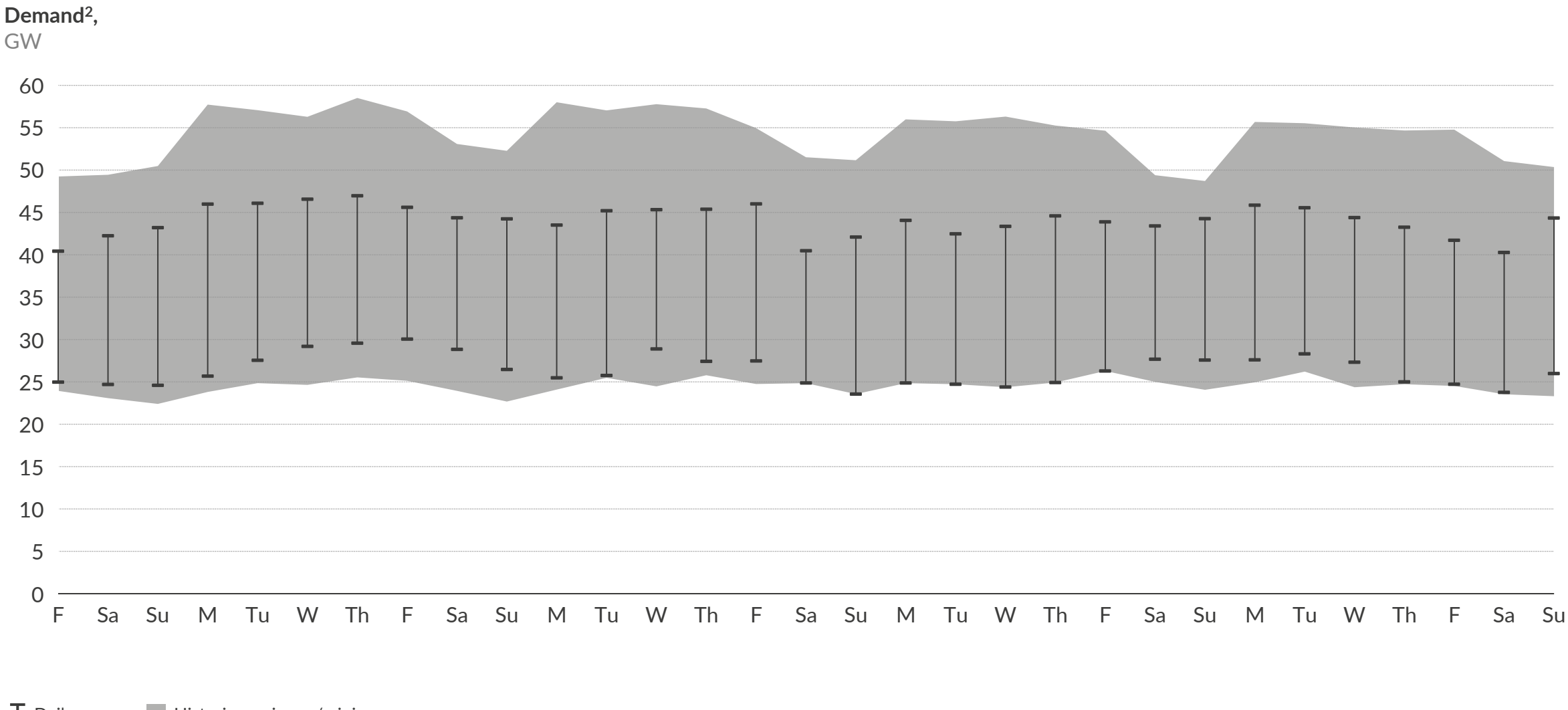


1) Half-hourly APX is the volume-weighted reference price over that half-hour interval, as provided by APX Power UK. 2) Margins are calculated as the difference between MEL and Demand for each half-hour period. Demand data presented here is Initial Transmission System Demand Out-Turn, and does not include embedded demand. MEL is calculated as the sum of all transmission BM units reporting MEL values in each half-hour. Where a BMU gives multiple values in a half-hour, only the least is taken.

Sources: Elexon, National Grid, Thomson Reuters, Aurora Energy Research

Daily January max and min demand

Relative to historic January max and min demand since 2010[1]

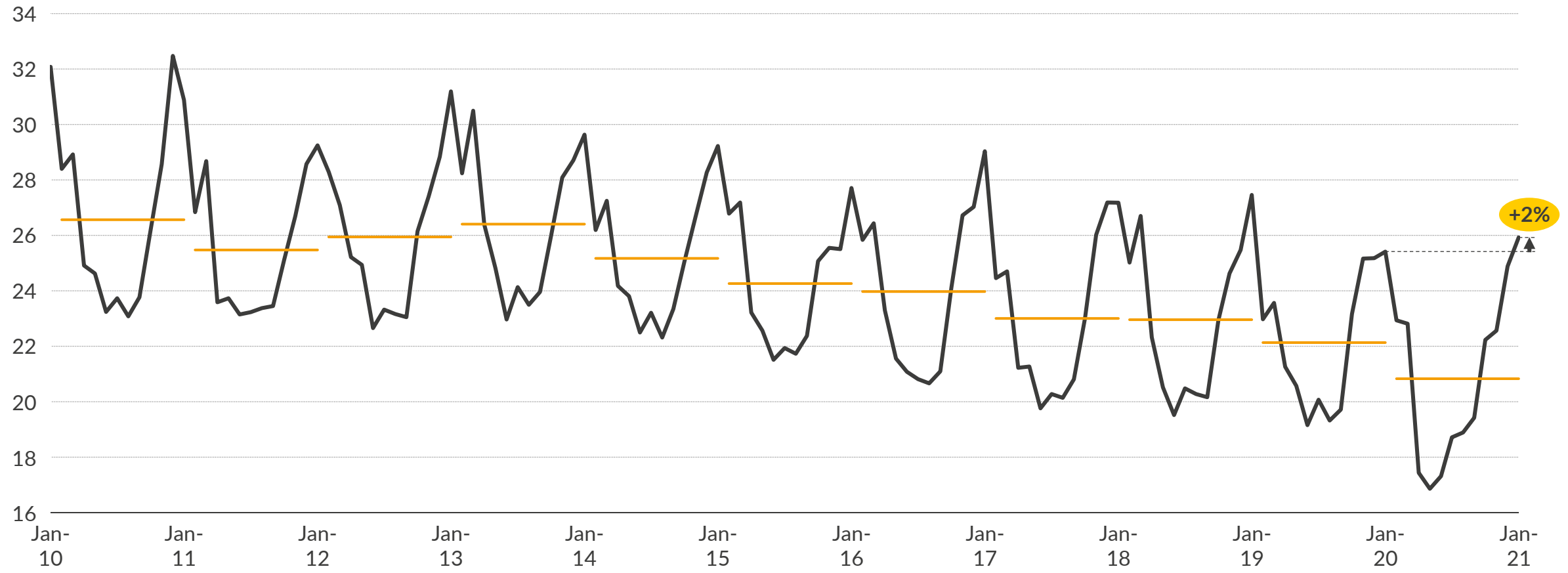


1) Data from previous years is matched to the nearest weekday within the current month, to maintain the weekly demand pattern. 2) Demand data presented here is Initial Transmission System Demand Out-Turn, and does not include embedded demand.

Sources: National Grid, Aurora Energy Research

Monthly historical demand on the transmission system

Total demand[1],
TWh



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.

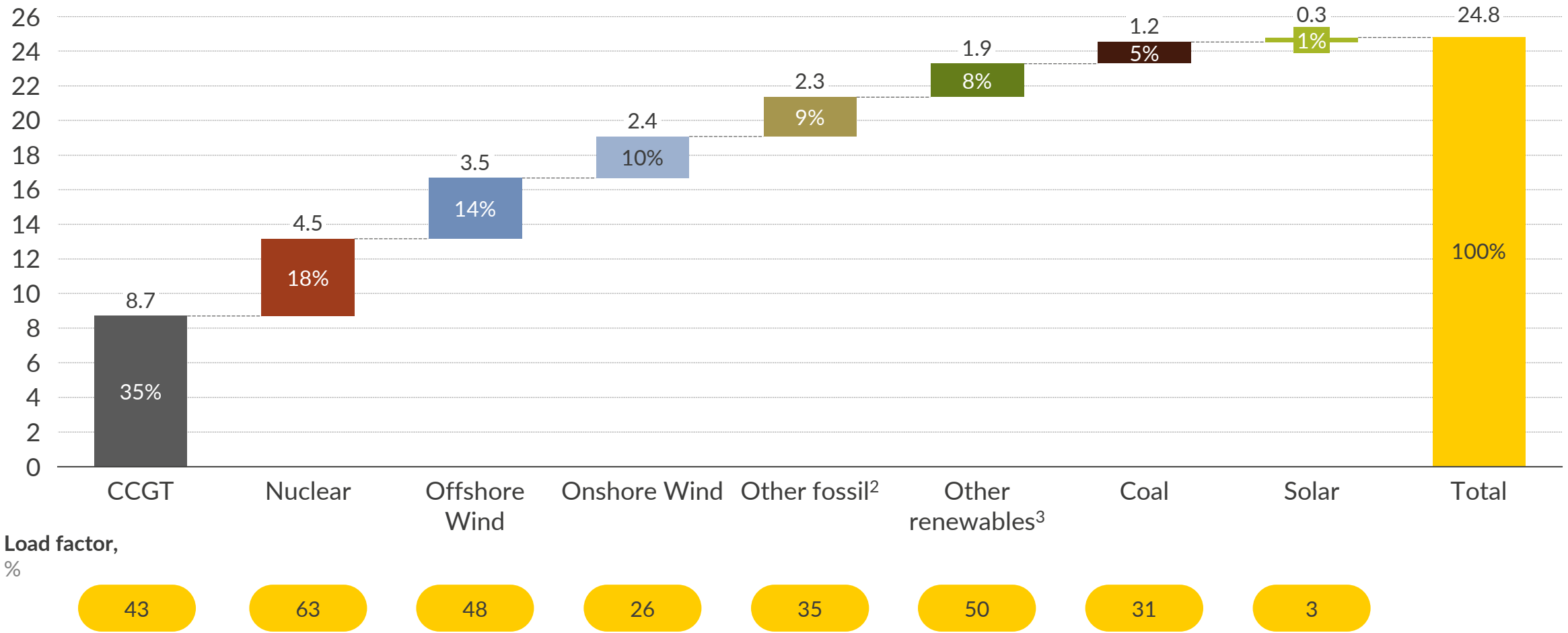
Sources: National Grid, Aurora Energy Research

Monthly fuel mix breakdown

AURORA

Output[1]

TWh



Load factor,

%

CCGT	Nuclear	Offshore Wind	Onshore Wind	Other fossil[2]	Other renewables[3]	Coal	Solar
43	63	48	26	35	50	31	3

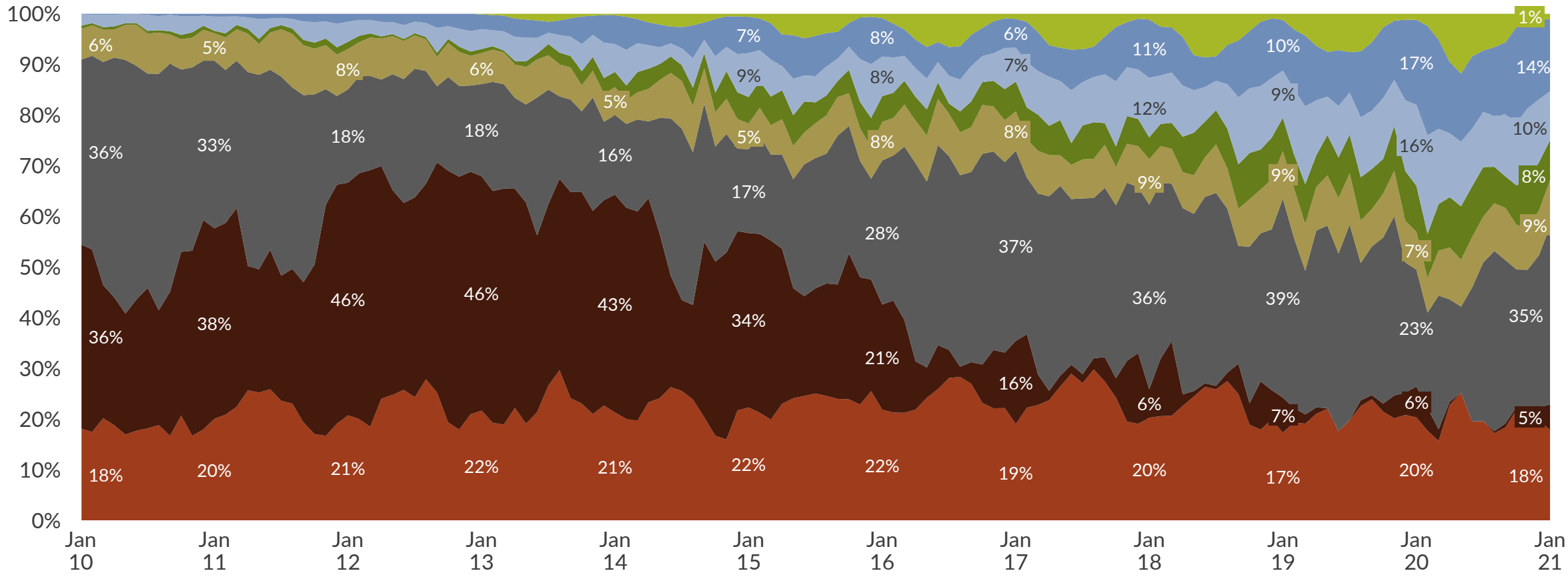
1) Includes outputs from generators registered as BM Units as well as embedded wind and solar PV assets. All numbers are rounded to 0.1 TWh which means that subtotals may not sum to total value. 2) Other fossil includes oil, CHP-CCGT and OCGT. 3) Other renewables includes biomass and hydro.

Sources: Elexon, Sheffield Solar, National Grid, Aurora Energy Research

Historical fuel mix breakdown

AURORA

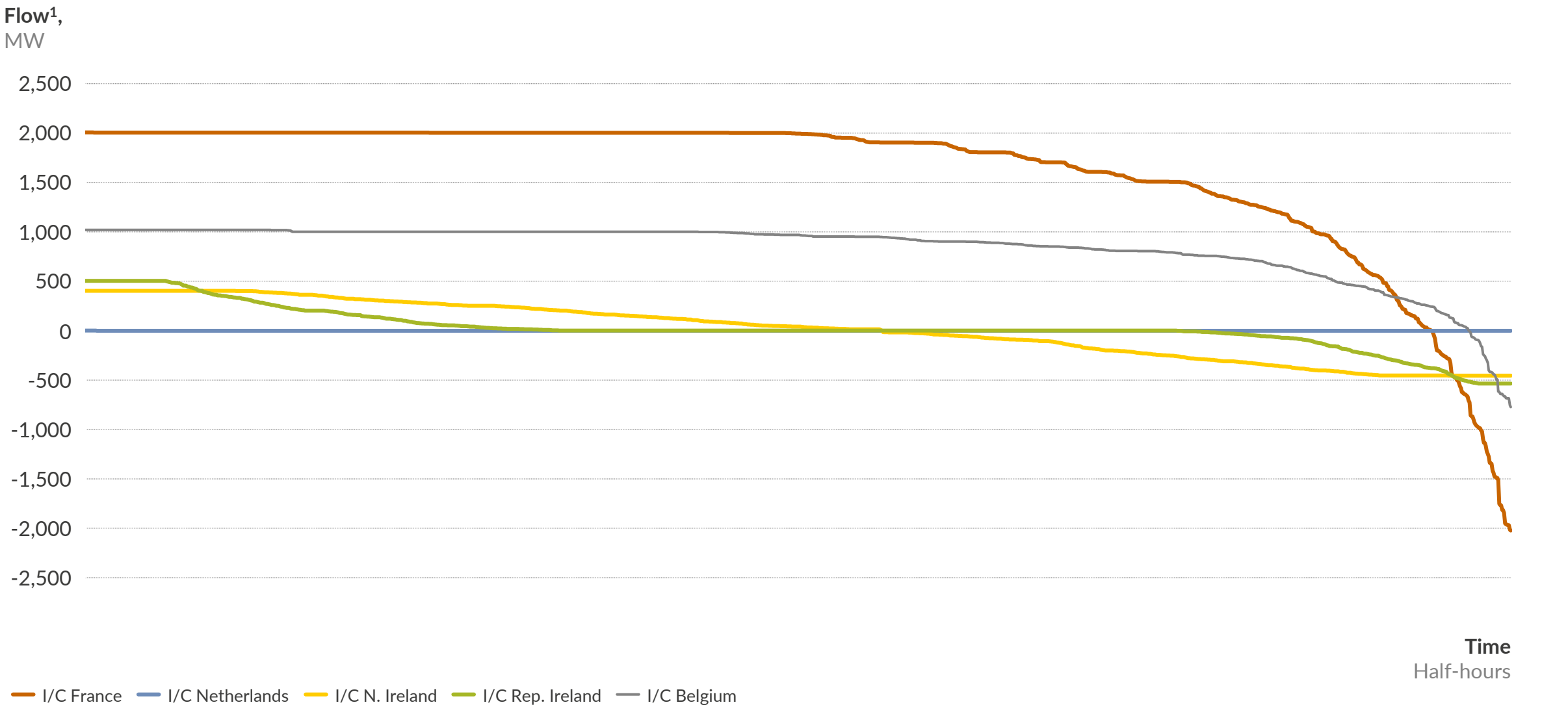
Output[1]
% of total



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.

Sources: Elexon, Sheffield Solar, National Grid, Aurora Energy Research

Monthly interconnector flow duration curve
Flow in each half-hour for GB interconnectors

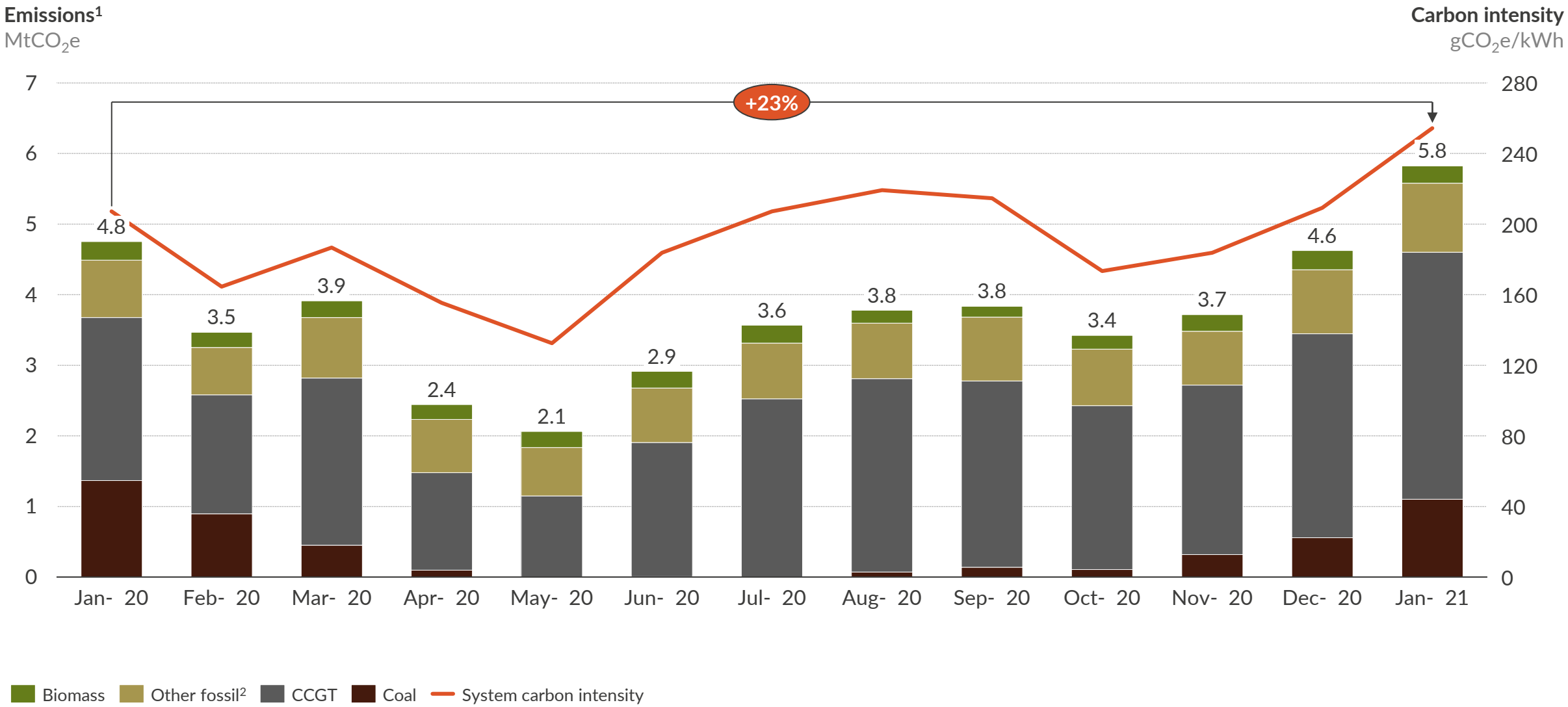


1) Positive flow is imports into GB, negative flow is exports.

Sources: Elexon, National Grid, Aurora Energy Research

Monthly emissions by technology

AURORA



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.

Sources: Elexon, Ofgem, Aurora Energy Research

Agenda

AURORA

I. System performance

II. Company performance (available to subscribers only)

III. Plant performance

Agenda

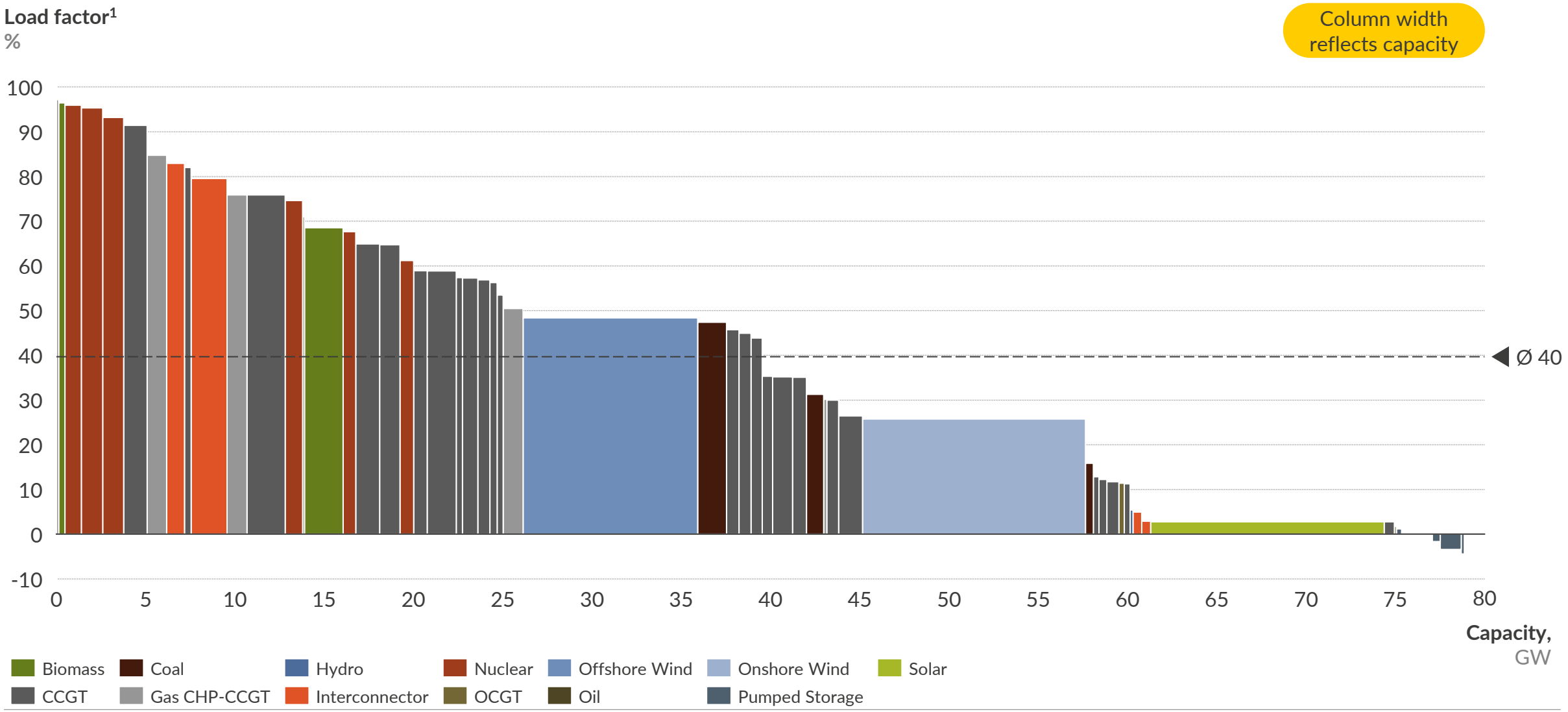
AURORA

I. System performance

II. Company performance (available to subscribers only)

III. Plant performance

Plant utilisation – load factors by plant



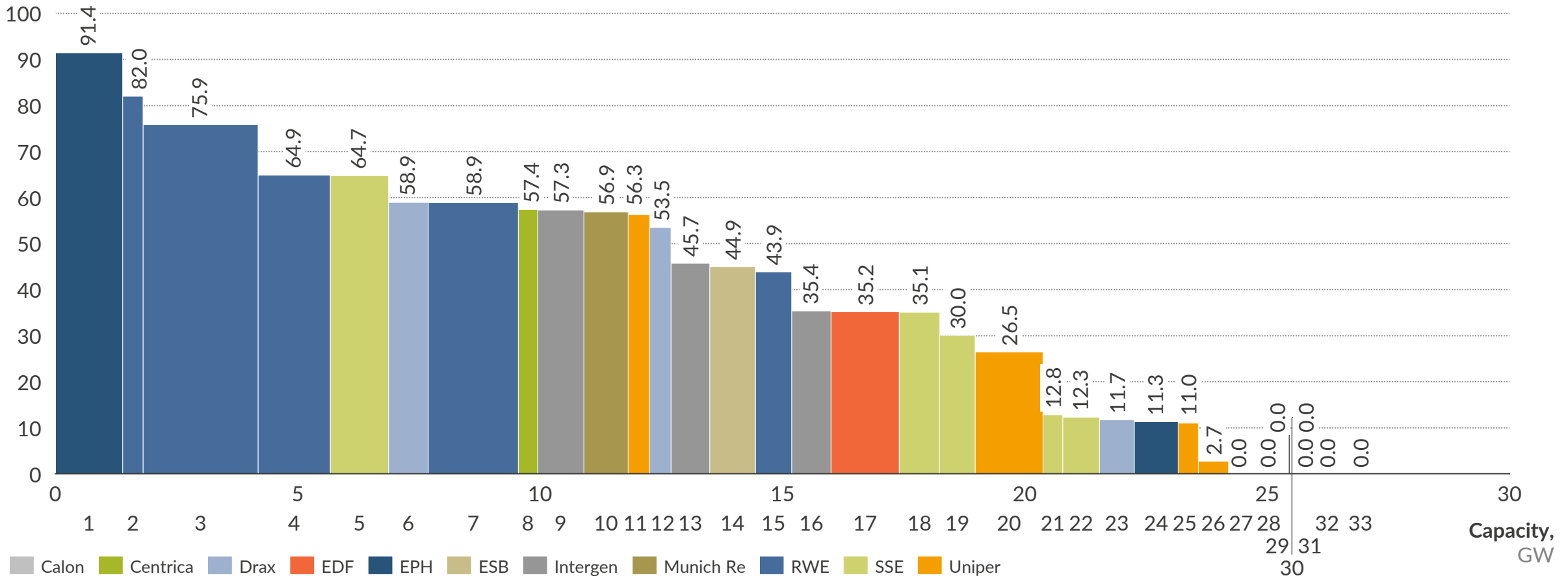
1) Represents 60 plants with highest capacity according to the Balancing Mechanism (BM) database, as well as aggregated data for wind and solar. Capacity of each plant represents the sum of capacities of all its generators that have been active at least once in the last three months. Please refer to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

Sources: Aurora Energy Research, Elexon, BEIS

CCGT plant utilisation – by plant

Full load hours[1]
% of total for the period

Column width reflects capacity



Plant Names: 1. South Humber Bank, 2. Great Yarmouth, 3. Pembroke, 4. Didcot B, 5. Peterhead, 6. Damhead Creek, 7. Staythorpe, 8. Kings Lynn, 9. Spalding, 10. Marchwood, 11. Cottam Dvpt Centre, 12. Shoreham, 13. Coryton, 14. Carrington, 15. Little Barford, 16. Rocksavage, 17. West Burton B, 18. Seabank 1, 19. Medway, 20. Connahs Quay, 21. Seabank 2, 22. Keadby, 23. Rye House, 24. Langage, 25. Enfield Energy, 26. Killingholme 2, 27. Corby, 28. Sutton Bridge, 29. Killingholme 1, 30. Glanford Brigg, 31. Peterborough, 32. Severn, 33. Baglan Bay.

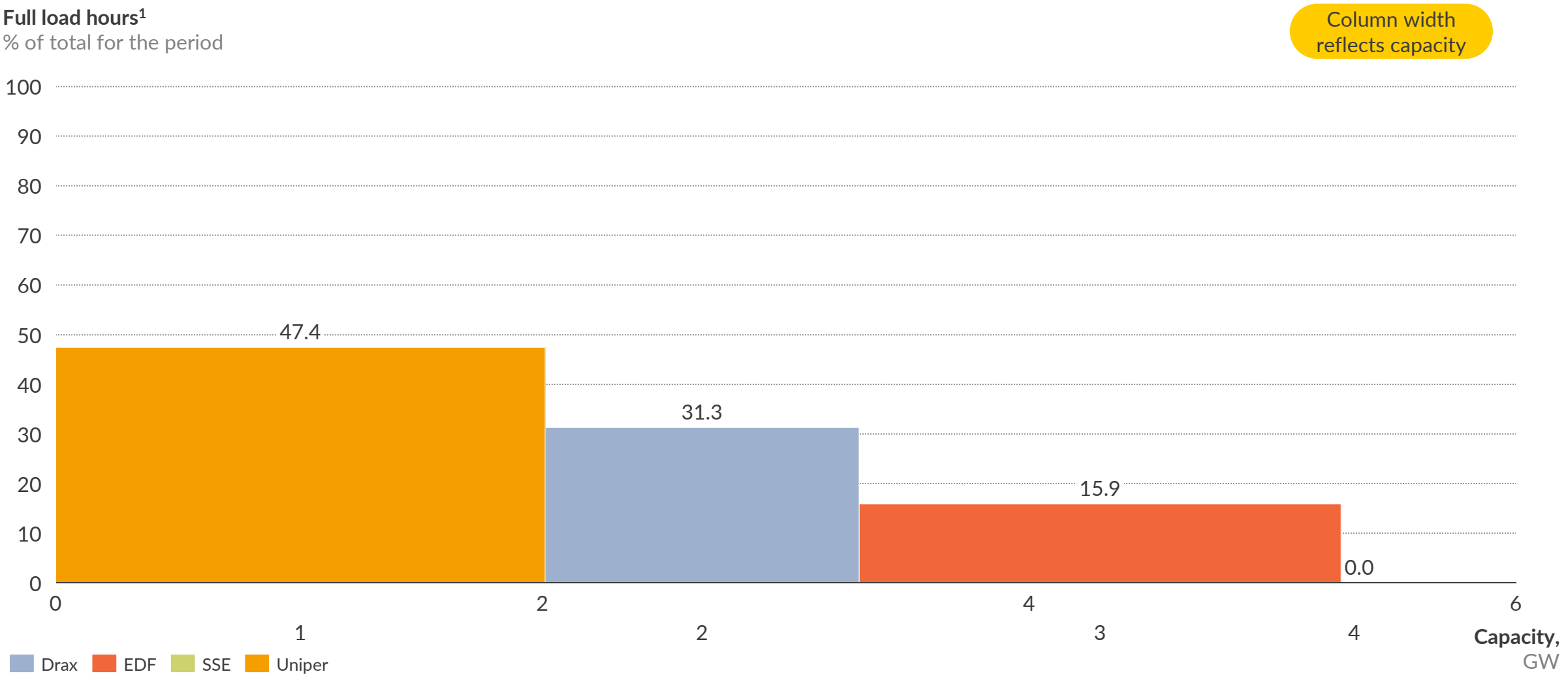
1) Includes all CCGT plants of the presented companies that report to the Balancing Mechanism

Sources: Aurora Energy Research, Elexon

Coal plant utilisation – by plant

AURORA

Full load hours[1]
% of total for the period



Plant Names: 1. Ratcliffe, 2. Drax Coal, 3. West Burton, 4. Uskmouth, 5. Fiddlers Ferry.

1) Includes all coal plants of the presented companies that report to the Balancing Mechanism

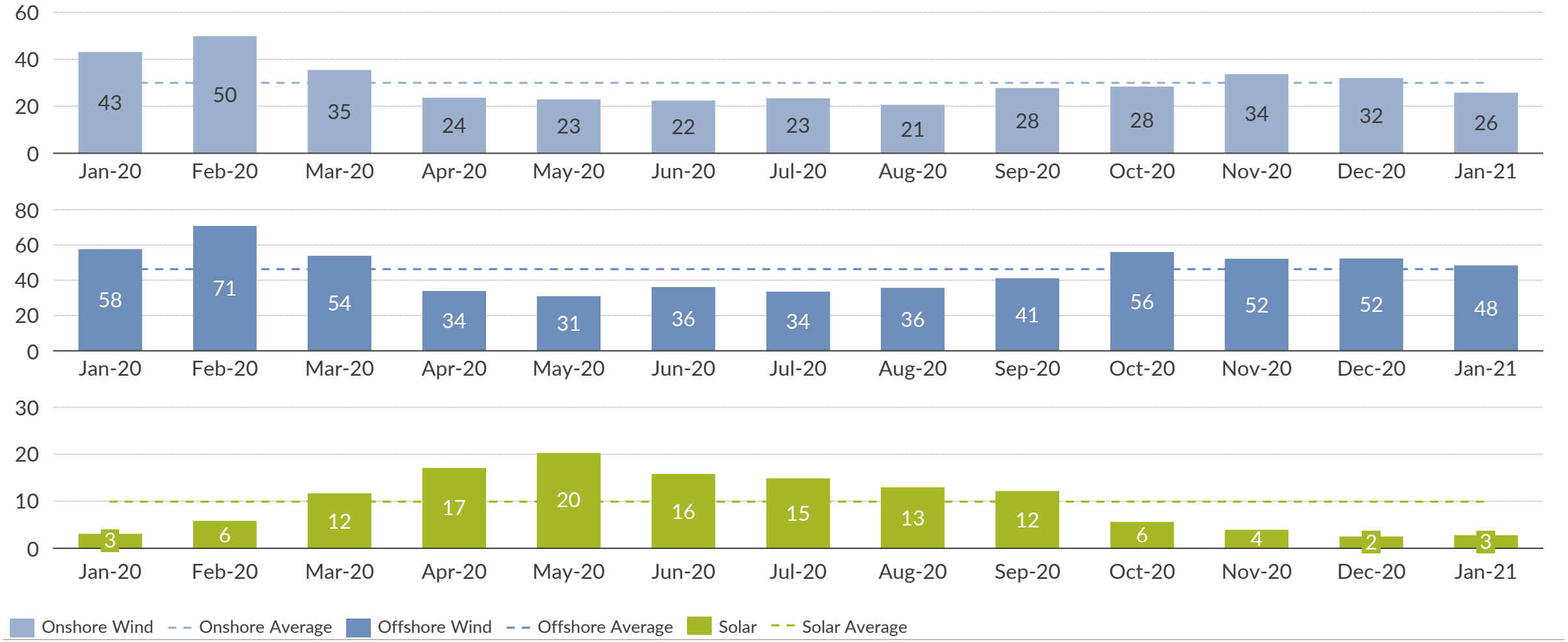
Sources: Aurora Energy Research, Elexon

Monthly load factors by technology

AURORA

Average load factor[1]

%



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

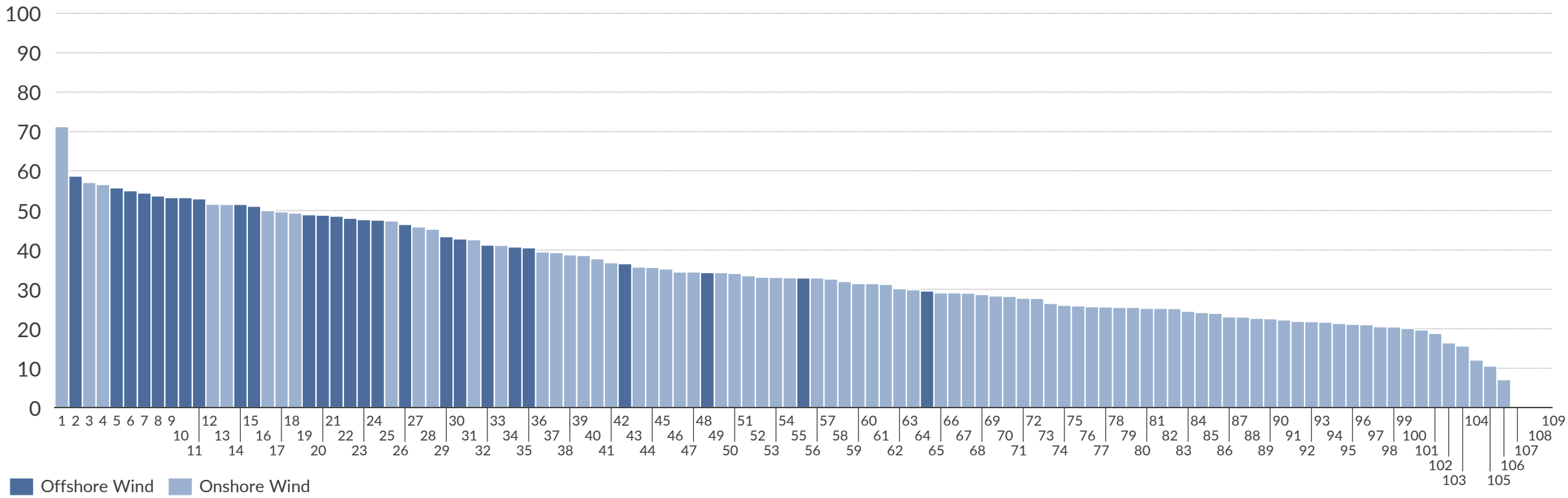
Sources: Aurora Energy Research, Elexon, Crown Estate

Wind farm utilisation – load factor by wind farm

AURORA

Load factor[1]

%



Plant Names: 1. Pauls Hill, 2. Dudgeon, 3. Whiteside Hill, 4. Aikengall 2, 5. Westermost Rough, 6. Hywind Scotland, 7. Galloper, 8. Humber, 9. London Array, 10. East Anglia One, 11. Race Bank, 12. Gordonstown, 13. Dorenell, 14. Sheringham Shoals, 15. Greater Gabbard, 16. Sanquhar Community, 17. Crystal Rig, 18. Fallago Rig, 19. Lincs, 20. Hornsea 1 , 21. Walney Extension, 22. Burbo Extension, 23. Rampion, 24. Beatrice, 25. Brockloch Rig 2, 26. West of Duddon Sands, 27. Blackcraig, 28. Cour, 29. Thanet, 30. Walney, 31. Carraig Gheal, 32. Gwynt y Mor, 33. Pen y Cymoedd, 34. Gunfleet Sands, 35. Burbo Bank, 36. Auchrobert, 37. Corriegarth, 38. Assel Valley, 39. Coire Na Cloiche, 40. Kilbraur, 41. Millennium, 42. Aberdeen, 43. Kilgallioch, 44. Galawhistle, 45. Baillie, 46. A Chruach, 47. Mid Hill, 48. Ormonde, 49. Beinneun, 50. Glen App, 51. Afton, 52. Hill of Glaschyle, 53. Andershaw, 54. Rothes Extension, 55. Barrow, 56. Minsca, 57. Stronelairg, 58. Camster, 59. Dunmaglass, 60. Bad a Cheo, 61. Dalswinton, 62. Beinn An Tuirc , 63. An Suidhe, 64. Robin Rigg, 65. Freasdail, 66. Strathy North, 67. Clyde, 68. Farr, 69. Glens of Foudland, 70. Tullymurdoch, 71. Toddleburn, 72. Burn of Whilk, 73. Goole Fields, 74. Dersalloch, 75. Ewe Hill, 76. Berry Burn, 77. Kype Muir, 78. Glenchamber, 79. Braes of Doune, 80. Gordonbush, 81. Harburnhead, 82. Clashindarroch, 83. Minnygap, 84. Beinn Tharsuinn, 85. Tullo, 86. Hill of Towie, 87. Arecleoch, 88. Bhlaraidh, 89. Edinbane, 90. Hare Hill Extension, 91. Tullo Extension, 92. Embedded Wind, 93. Mark Hill, 94. Corriemoillie, 95. Lochluichart, 96. Dun Law Extension, 97. Middle Muir, 98. Harestanes, 99. Griffin, 100. Craig, 101. Whitelee, 102. Clachan Flats, 103. Hadyard Hill, 104. Moy, 105. Airies, 106. Black Law, 107. Kincardine, 108. Brownieleys, 109. Keith Hill.

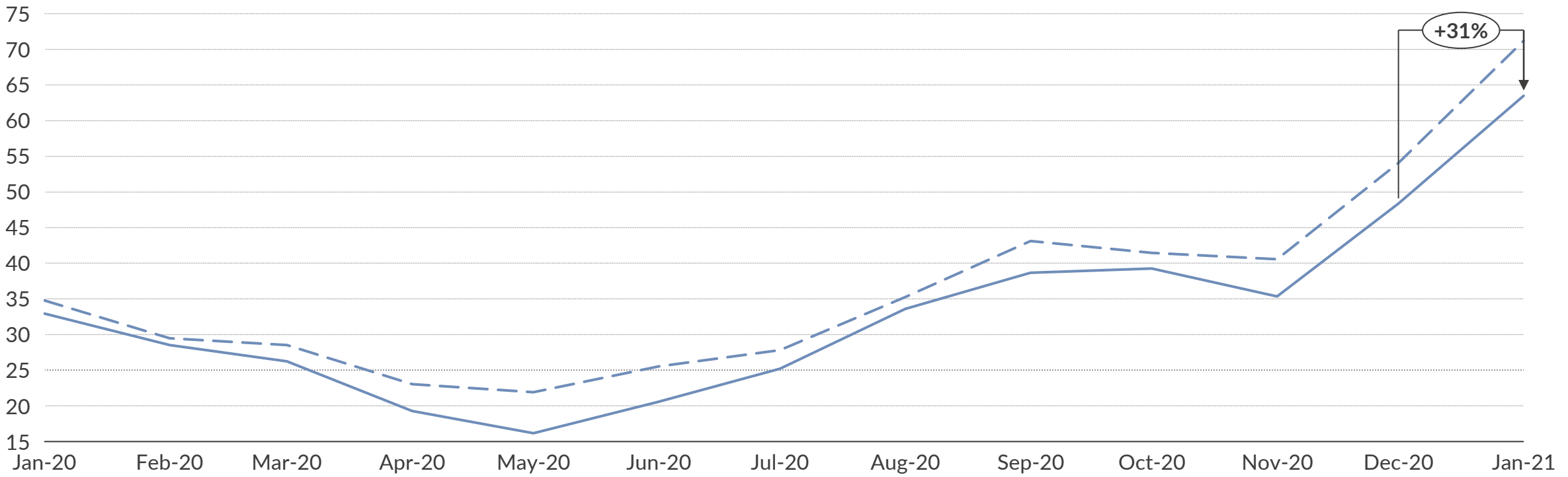
1) Represents UK wind farms reporting Balancing Mechanism Unit data. Figures presented reflect Final Physical Notification (FPN) expectations reported to the grid, which are not always representative of actual production

Sources: Aurora Energy Research, Elexon, Crown Estate

Wind capture price versus baseload price

AURORA

Price
£/MWh



Wind load factors
%

	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21
Baseload[1]	43	50	35	24	23	22	23	21	28	28	34	32	26
Wind Capture[2]	58	71	54	34	31	36	34	36	41	56	52	52	48

1) Baseload price is the average monthly APX price; 2) Wind capture price is the load-weighted monthly average APX price across all wind Balancing Mechanism plants for all half-hourly periods

Sources: Aurora Energy Research, Elexon, Thomson Reuters

Appendix

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 APX 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 APX 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 APX 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.

Source: Aurora Energy Research

Disclaimer and Copyright

AURORA

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