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ENERGY RESEARCH

Strommarkttreffen Summer spikes vs Dunkelflaute: Which do batteries prefer?

21st March 2025

Battery operations are most profitable during the summer, when wholesale spreads are the highest

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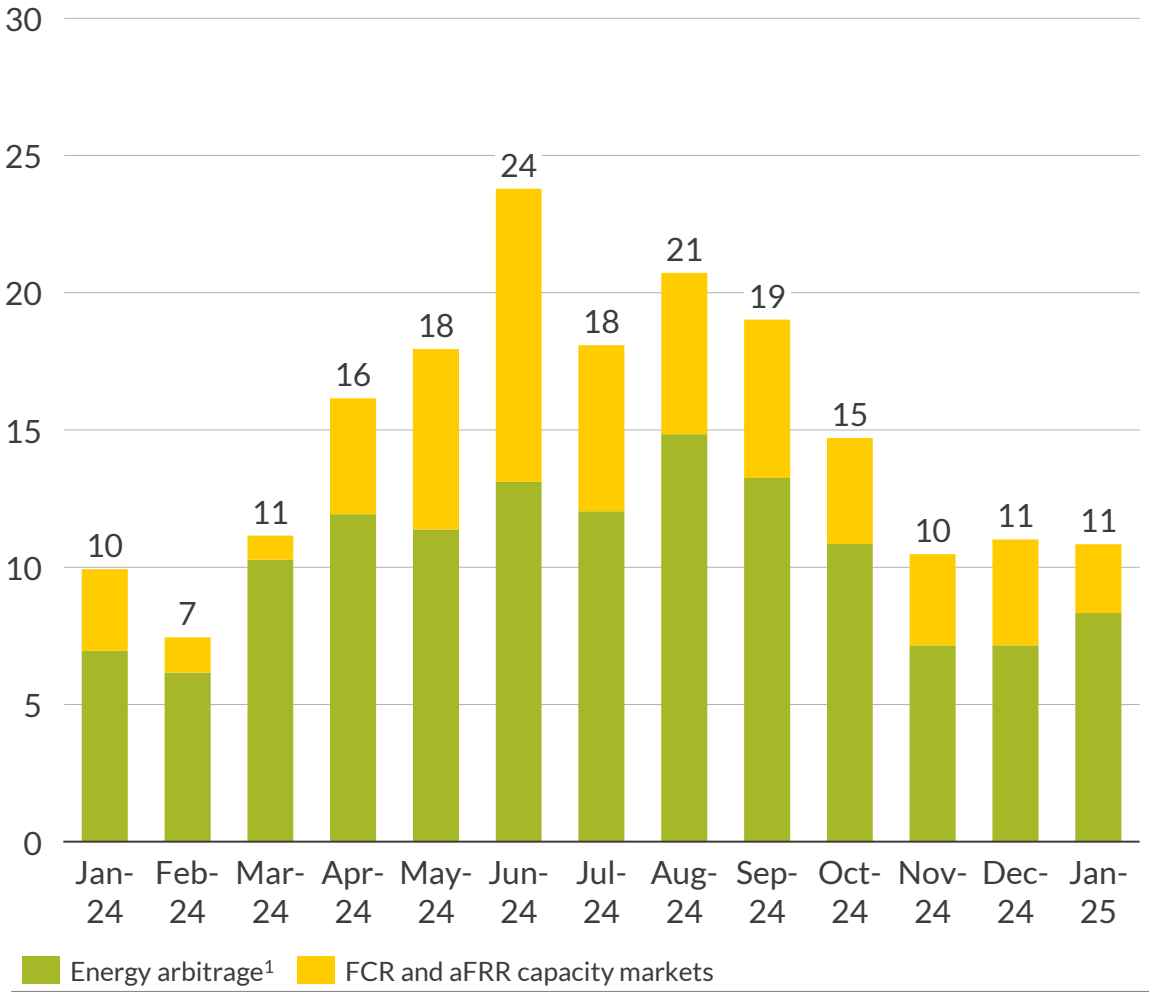
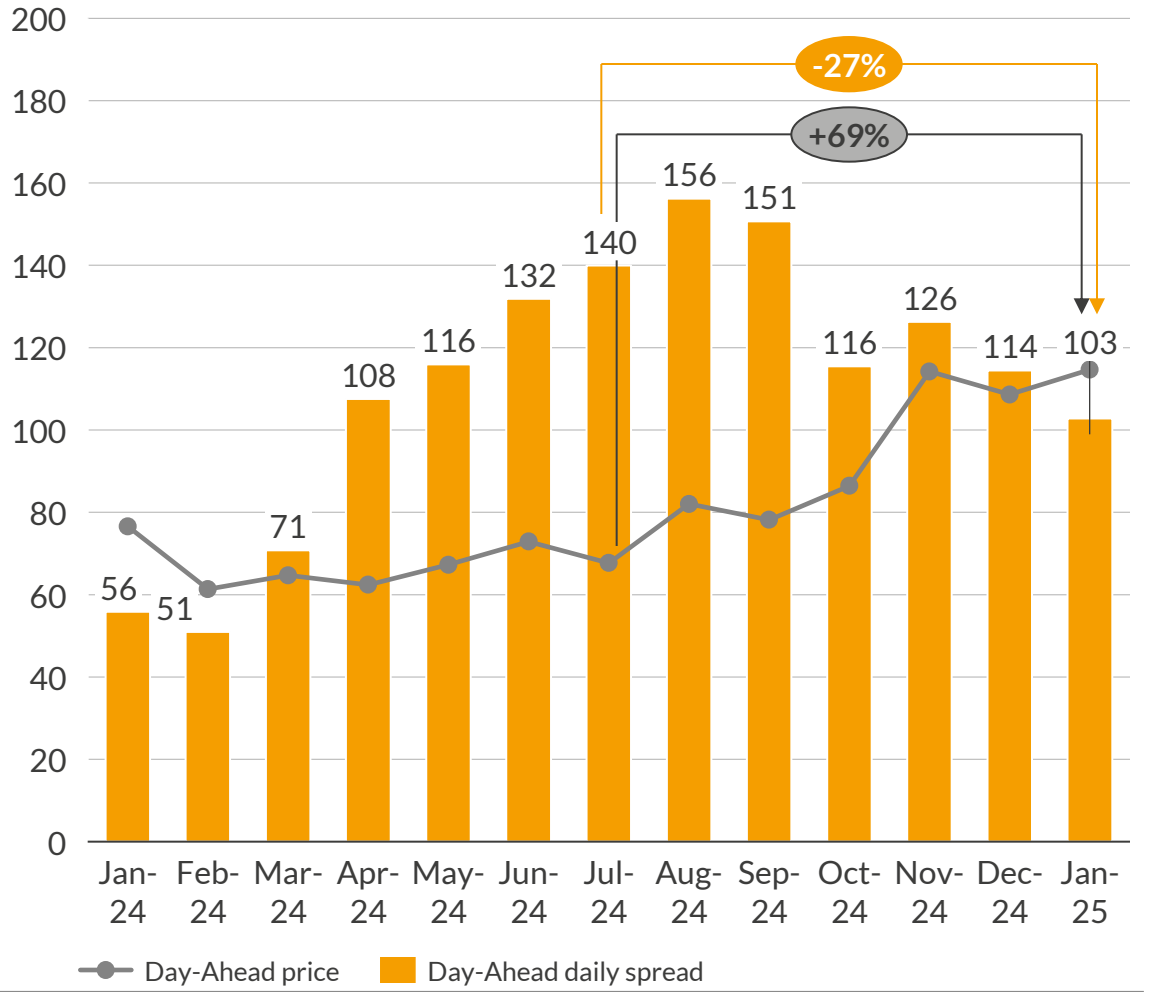
Total gross margins for a 2h battery system with 1.5 cycles, undegraded
€/kW, (nominal)



Monthly average Day-Ahead price and daily spread
€/MWh (nominal)



1) Energy arbitrage includes Day-Ahead, Intraday and aFRR energy trades.

Sources: Aurora Energy Research, ENTSO-E

During these Dunkelflaute events, price peaks on the Day-Ahead market can result in exceptionally high battery margins

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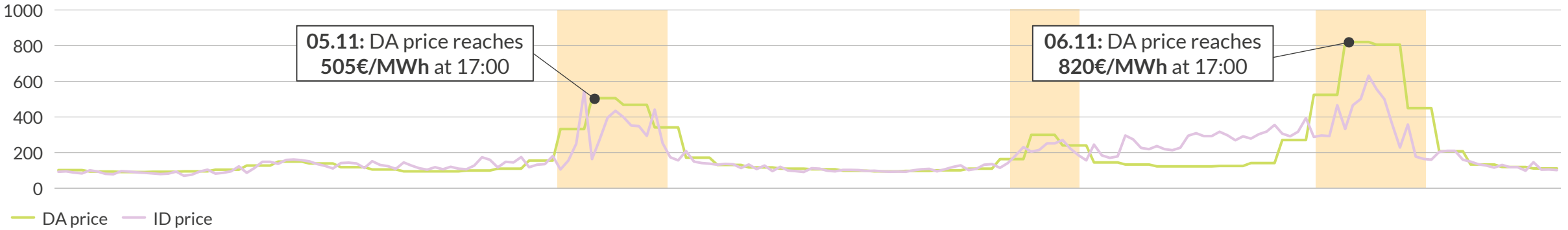
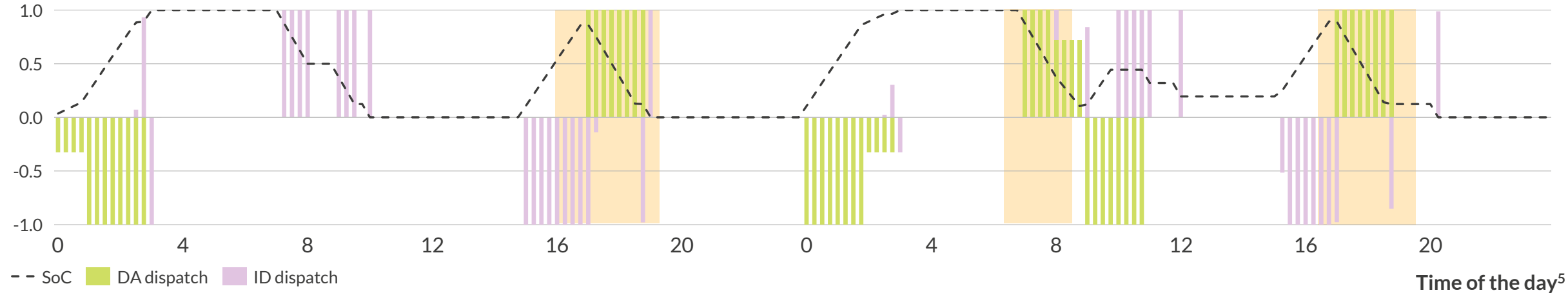
Power price - 5th to 6th of November 2024
€/MWh, (DA[1], ID[2])

Dunkelflaute



Battery dispatch[3] and SoC[4] for a 1MW, 2h battery active on the wholesale market - 5th to 6th of November 2024
MW, bar chart; SoC, dash line



The battery takes advantage of the price peaks and exports on the Day-Ahead market. On 05.11 and 06.11 respectively, the battery makes 641 and 1,412€/MW.

1) Day-Ahead. 2) Intraday. 3) Discharging/export actions are shown as positive, while charging/import actions are shown as negative. 4) State of Charge. 5) Time Zone used for the above charts is CET (Central European Time).

Source: Aurora Energy Research

Ancillary market prices tend to peak when solar generation is high and thermal plants not running, which decreases supply for these markets

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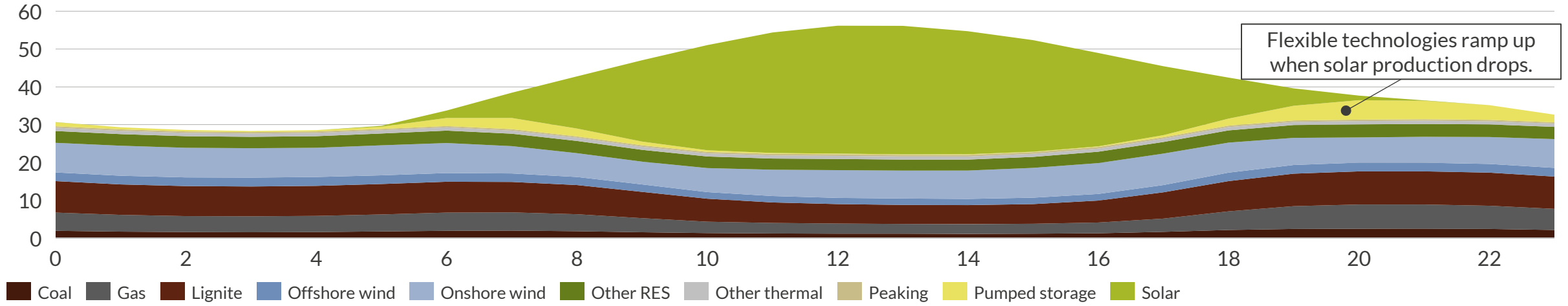
June – August 2024

Average hourly generation by technology group

GWh

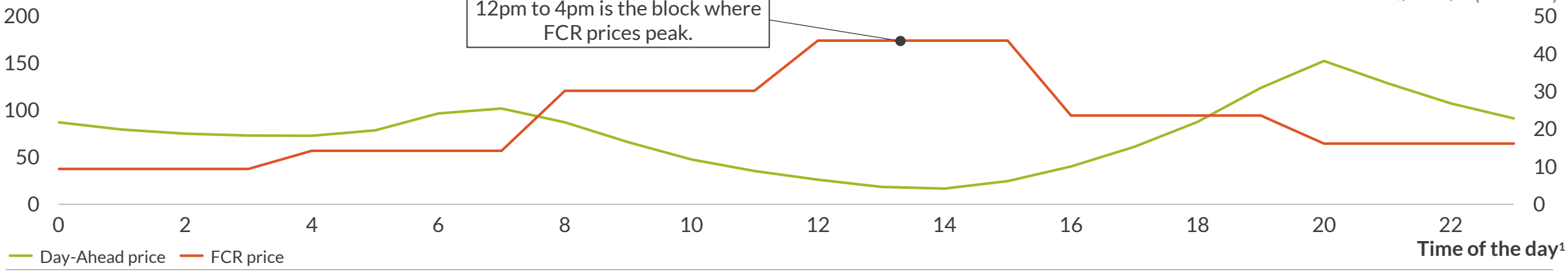


Average hourly Day-Ahead price

€/MWh (nominal)

Average hourly FCR price

€/MW/h (nominal)



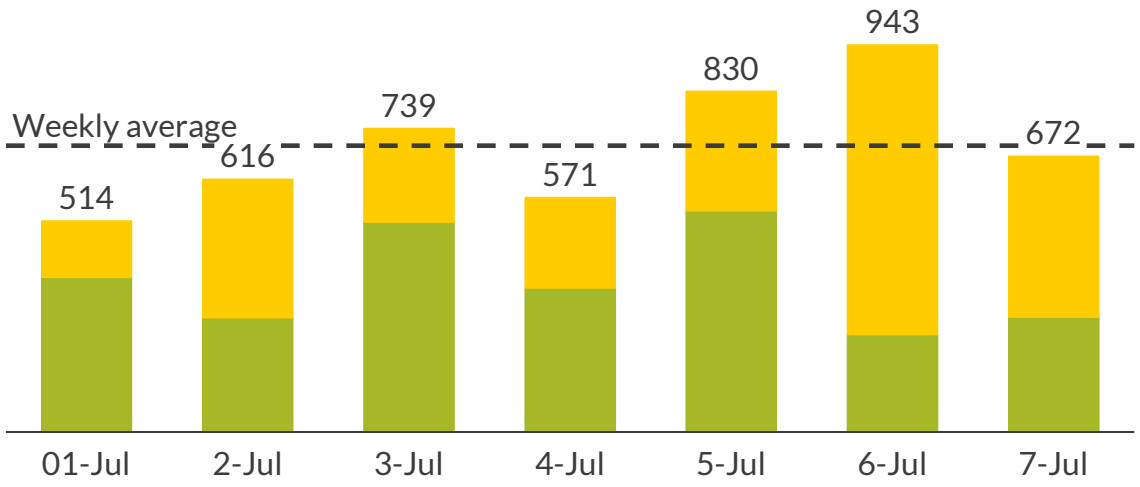
1) Time Zone used for the above charts is CEST (Central European Summer Time).

Source: ENTSO-E

Despite single Dunkelflaute events in winter, high daily market volatility makes the summer the most promising period for battery revenues

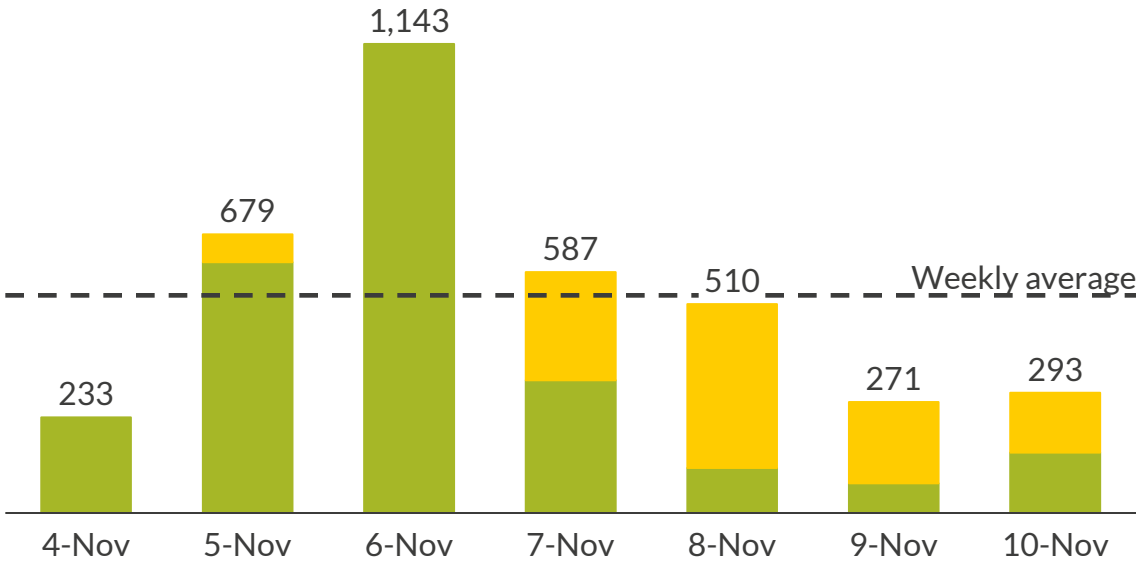
Total gross margins for a 2h battery system with 1.5 cycles, undegraded[1]
€/MW, (nominal)

1st to 7th July 2024



- Battery margins during the summer remain consistently high, as these are the months with the highest Day-Ahead spreads (140€/MWh in July 2024 vs. a yearly average of 111€/MWh).
- In July 2024, a battery made **584 €/MW/day** on average.

4th to 10th November 2024



- On the 6th of November, when the Day-Ahead reaches 820€/MWh at 5pm, the battery has exceptionally high margins of 1,143 €/MW. However, this day more than two times more profitable than the average day in that week.
- In November 2024, a battery made **349 €/MW/day** on average.

Energy arbitrage[2] FCR and aFRR capacity markets

1) The 2h battery is operating on the Day-Ahead, Intraday, FCR, aFRR capacity and aFRR energy markets. 2) Energy arbitrage includes Day-Ahead, Intraday and aFRR energy trades.

Source: Aurora Energy Research

Key take aways

1. Battery operations show strong seasonality in revenues, with June being the most profitable month in 2024 according to Aurora's Battery Benchmark.

2. Dunkelflaute events can lead to extraordinary revenues on single days during winter months. However, as these events are rare and general price volatility is low, the revenue potential of batteries during winter is limited.

3. In summer, high solar generation leads to significant daily spreads on wholesale markets and attractive FCR and aFRR prices, making it the hot season for battery revenues.

Source: Aurora Energy Research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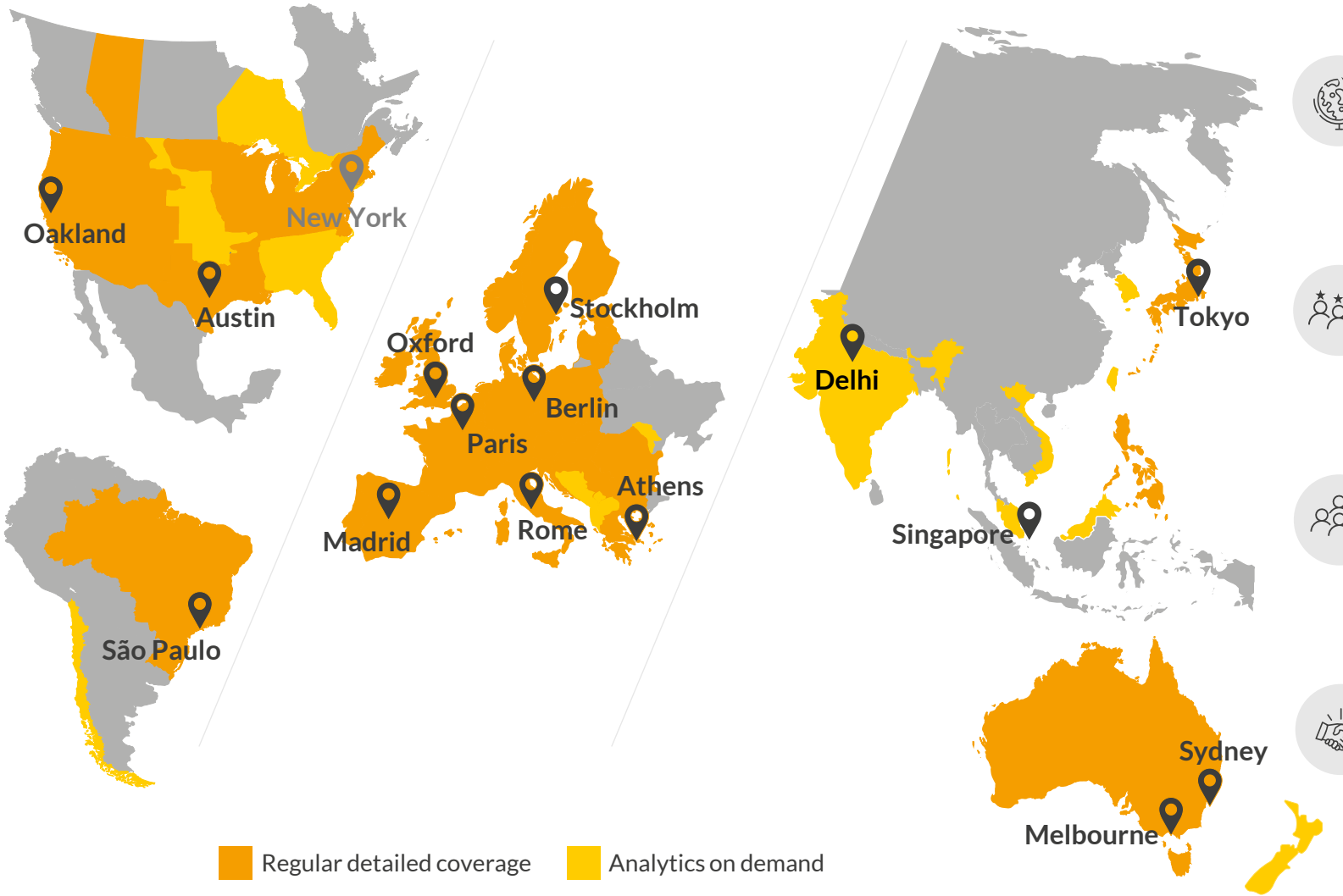

15 offices
and New York coming soon

900
market experts

850+
subscribing companies

150+
transactions supported in 2023

Source: Aurora Energy Research