
FRAUNHOFER INSTITUTE FOR SOLAR ENERGY SYSTEMS ISE

Electricity Production and Spot-Prices in Germany 2014



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Energy Systems ISE

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www.ise.fraunhofer.de

We've started our new transparency website: www.energy-charts.de

Please have a look at our new transparency platform, where you can find interactive Charts on Power, Energy and Spot-Prices in Germany:

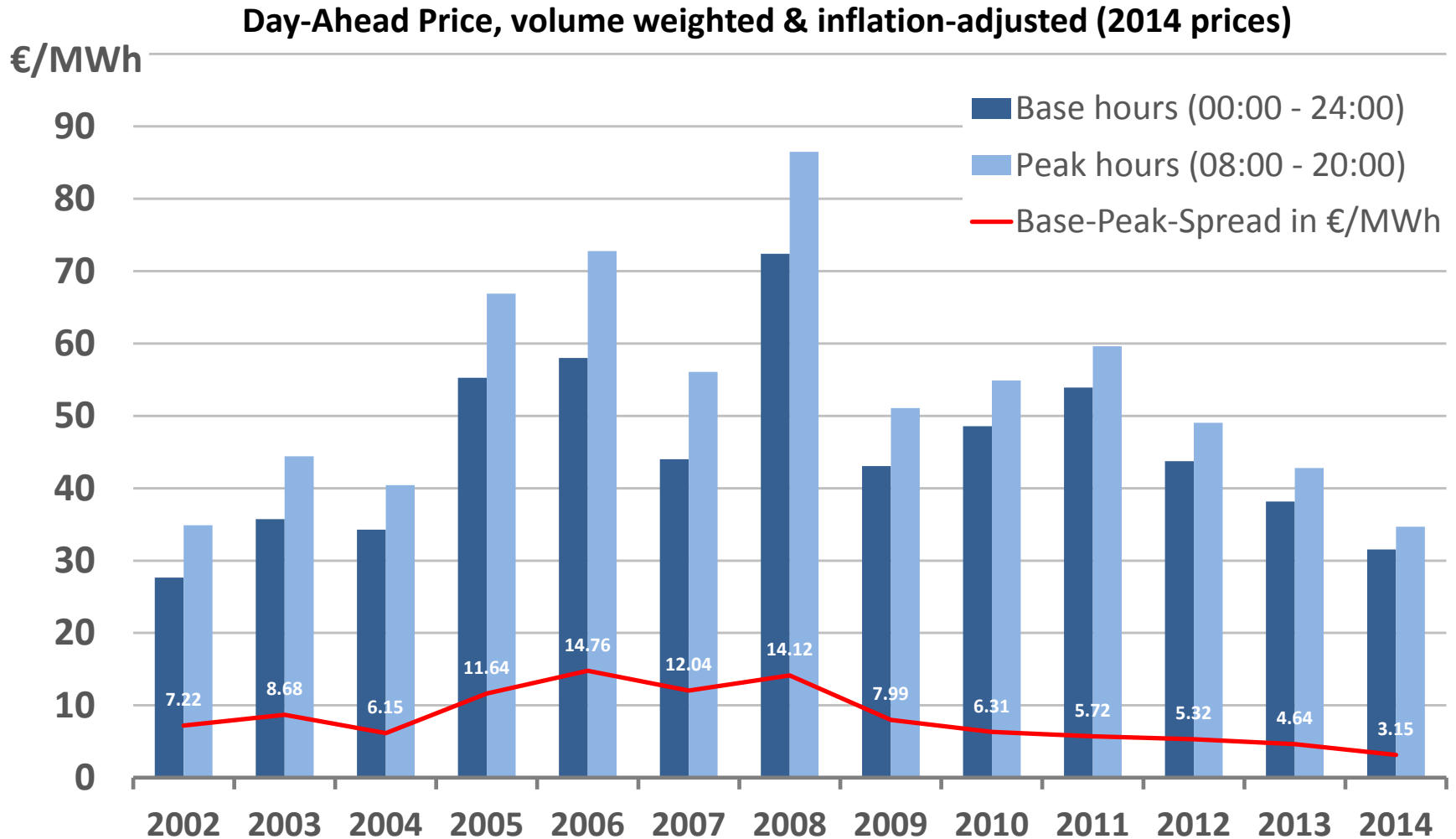
www.energy-charts.de

We consider this the next generation of the (static) graphs you can find in this slides and plan to constantly extend the content with new analysis and data.

AGENDA

- General Spot-Price Analysis
- Electricity Production and Spot-Prices
 - Analysis by month
 - Analysis by Week
- Analysis of Spot-Price Extremes
- General energy data
- Instructions
- Sources and Disclaimer

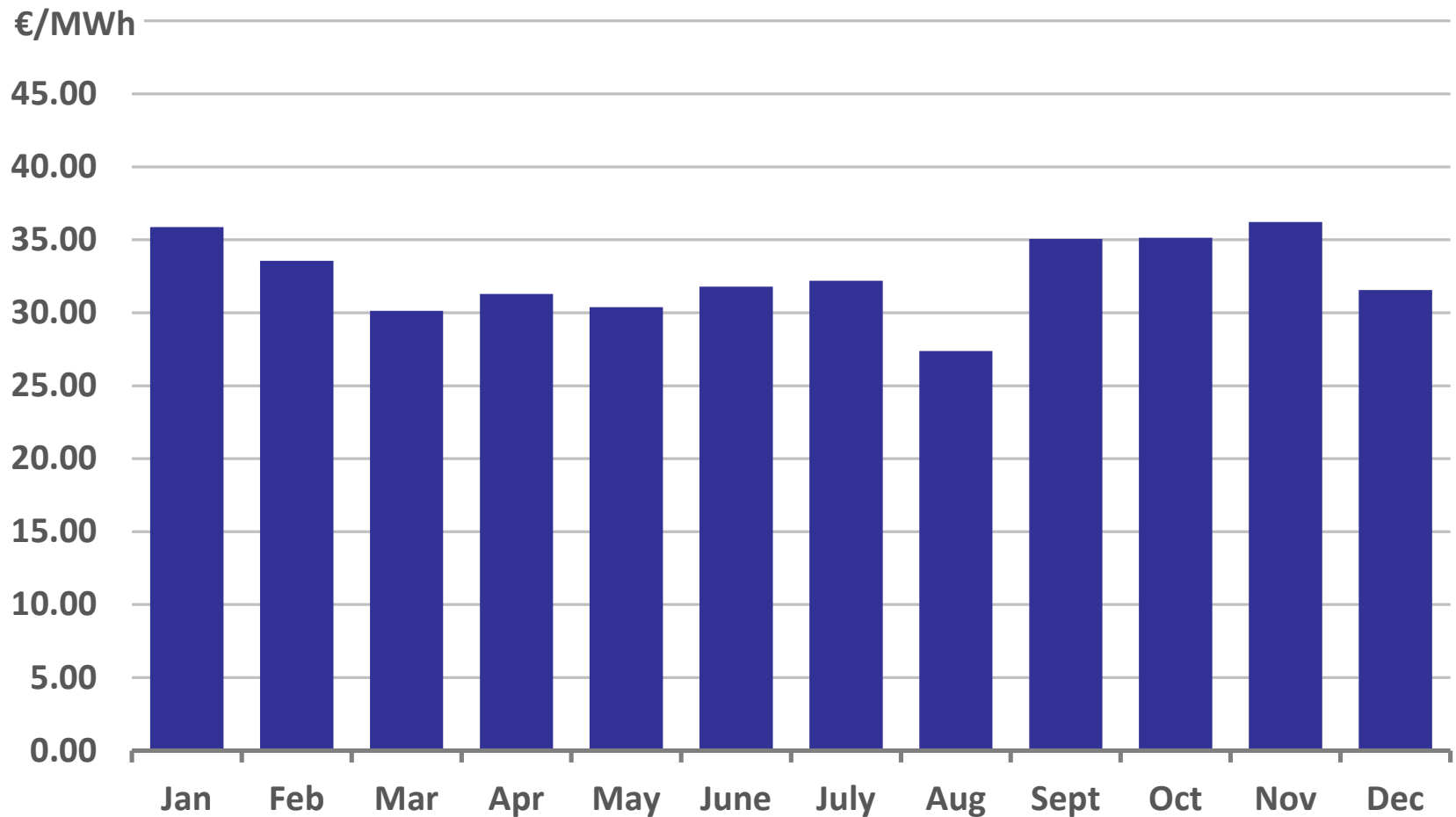
Historical Day-Ahead Base- and Peak-Prices



Monthly Average of Day-Ahead Prices in 2014



Monthly Average of Day-Ahead Prices in 2014 (volume weighted)

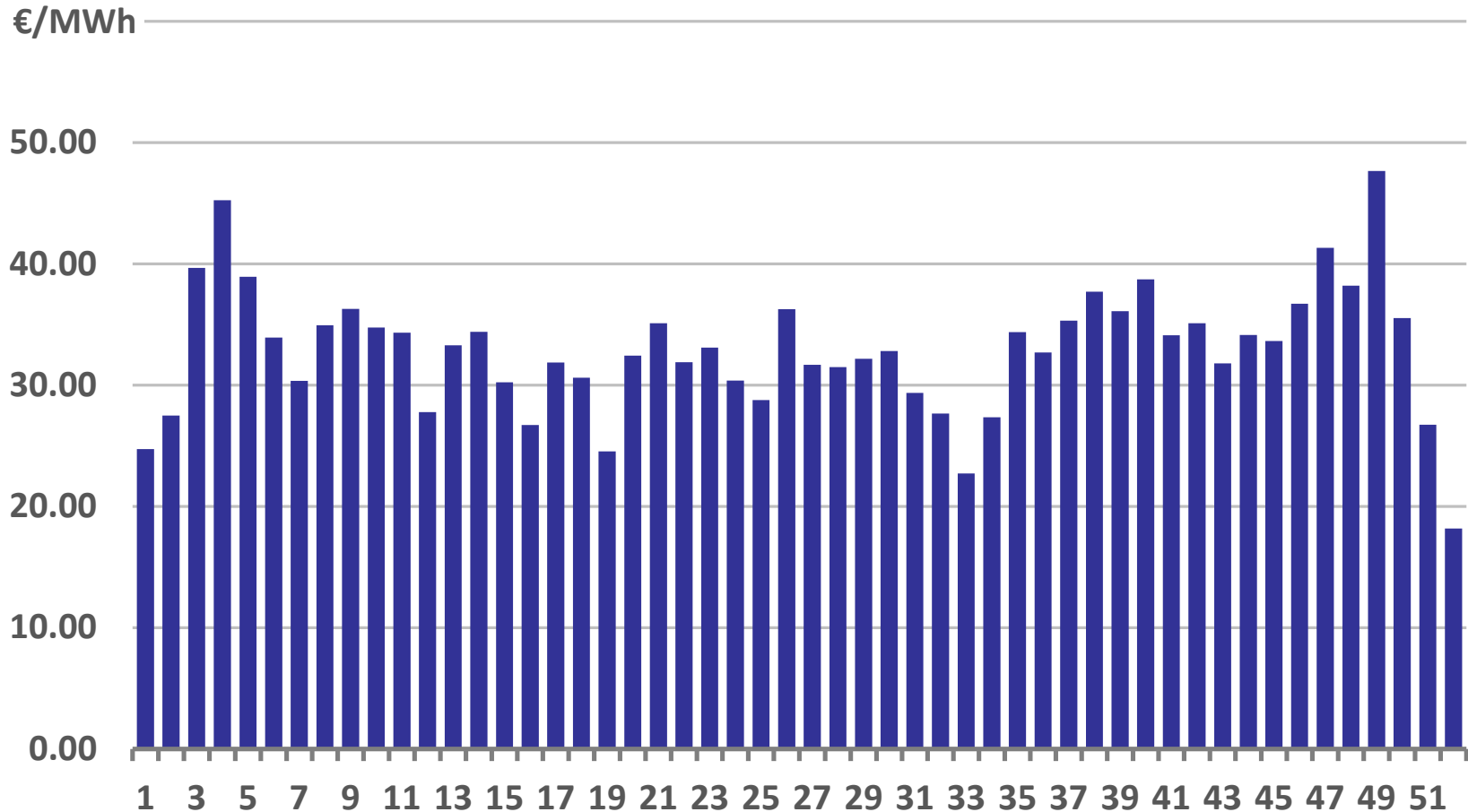


Source: Johannes Mayer, Fraunhofer ISE; Data: EPEX-SPOT / EEX

Weekly Average of Day-Ahead Prices in 2014



Weekly Average of Day-Ahead Prices in 2014 (volume weighted)



Source: Johannes Mayer, Fraunhofer ISE; Data: EPEX-SPOT / EEX

Monthly Trading Volume in the Day-Ahead Market



Monthly Day-Ahead trading volumes, Update: Dec. 2014

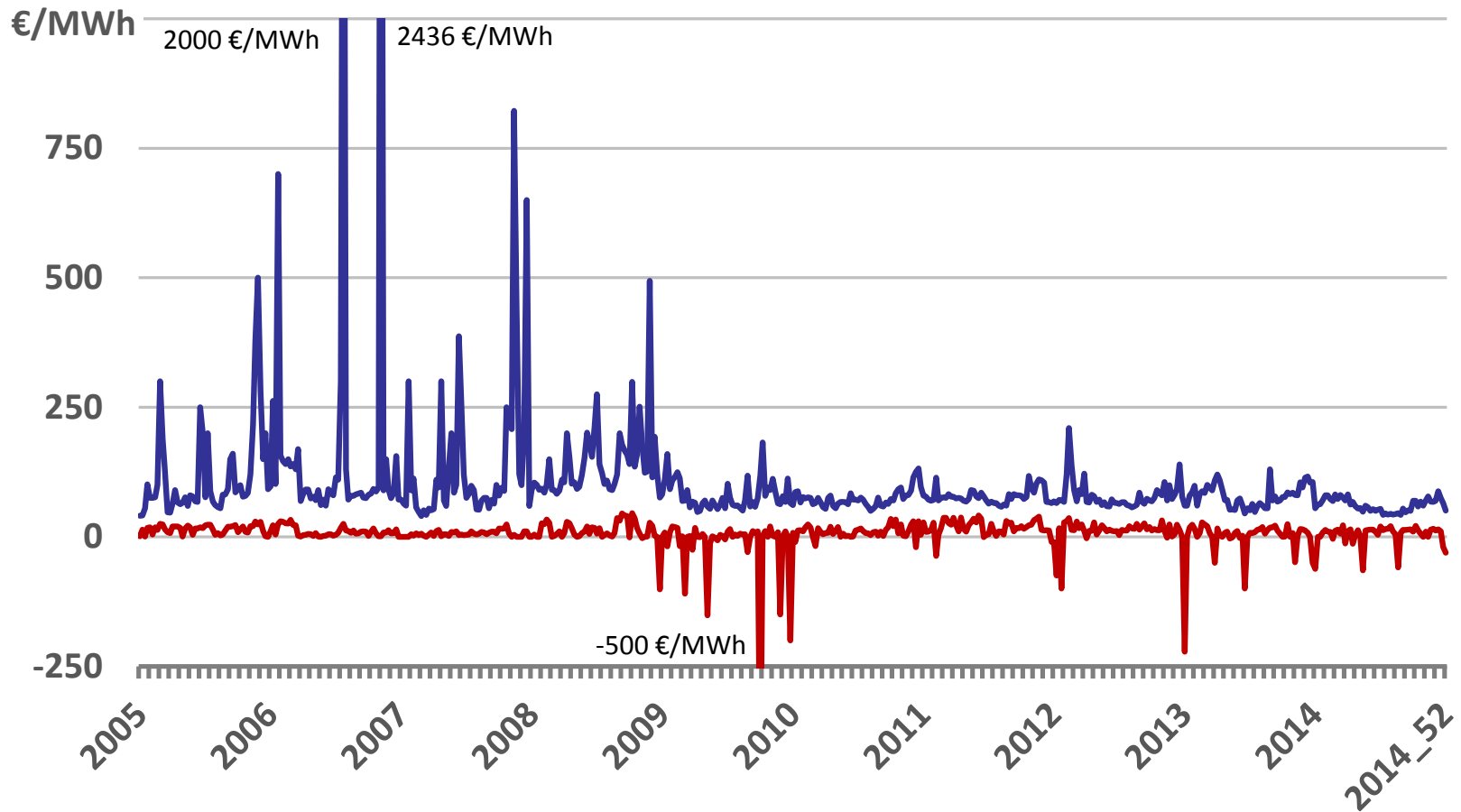


Source: Johannes Mayer, Fraunhofer ISE; Data: EPEX-SPOT / EEX

History of Price Extremes in the Day-Ahead Market



Weekly Day-Ahead maximum and minimum prices, Update: Dec. 2014

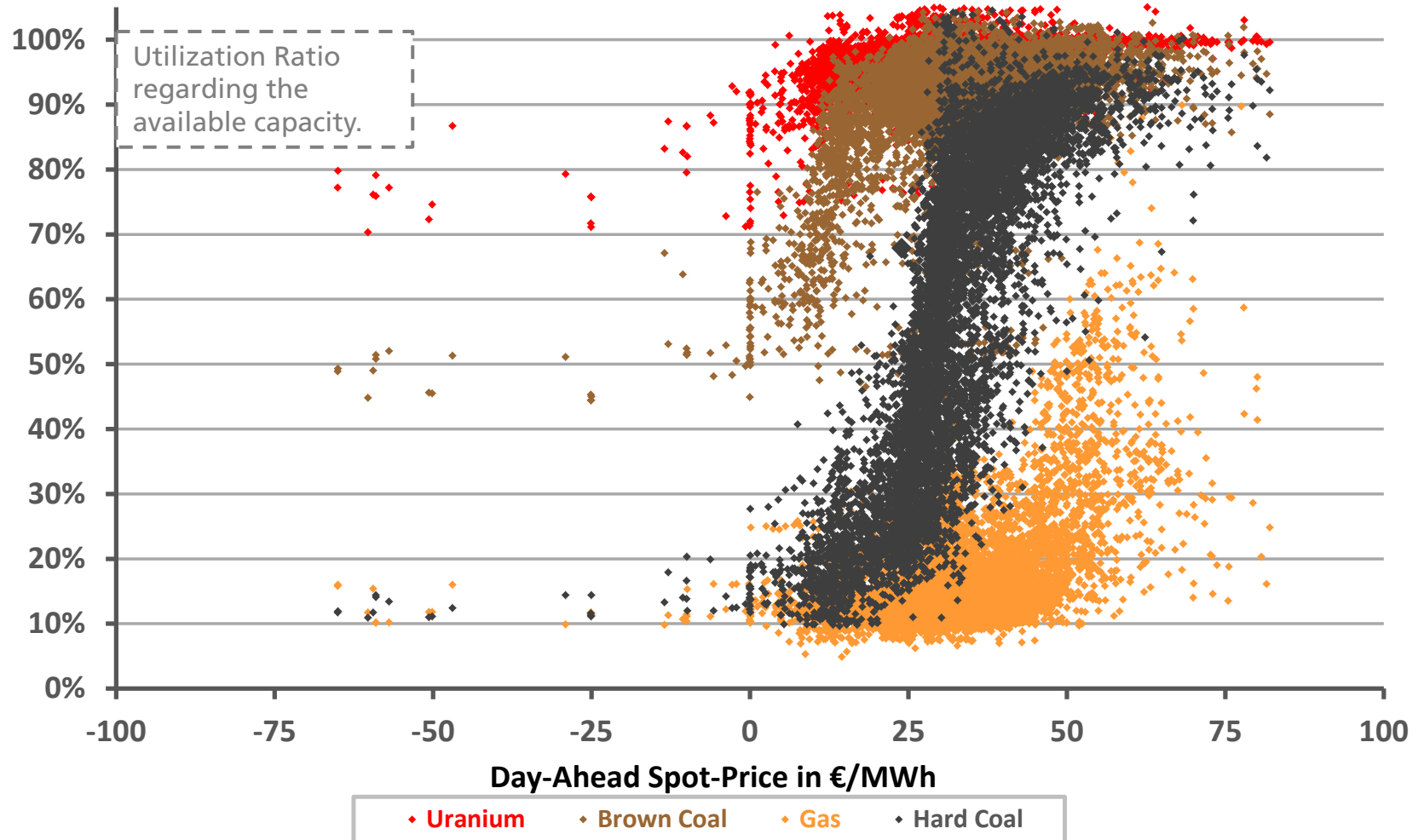


Source: Johannes Mayer, Fraunhofer ISE; Data: EPEX-SPOT / EEX

Plant System Utilization over Day-Ahead Prices

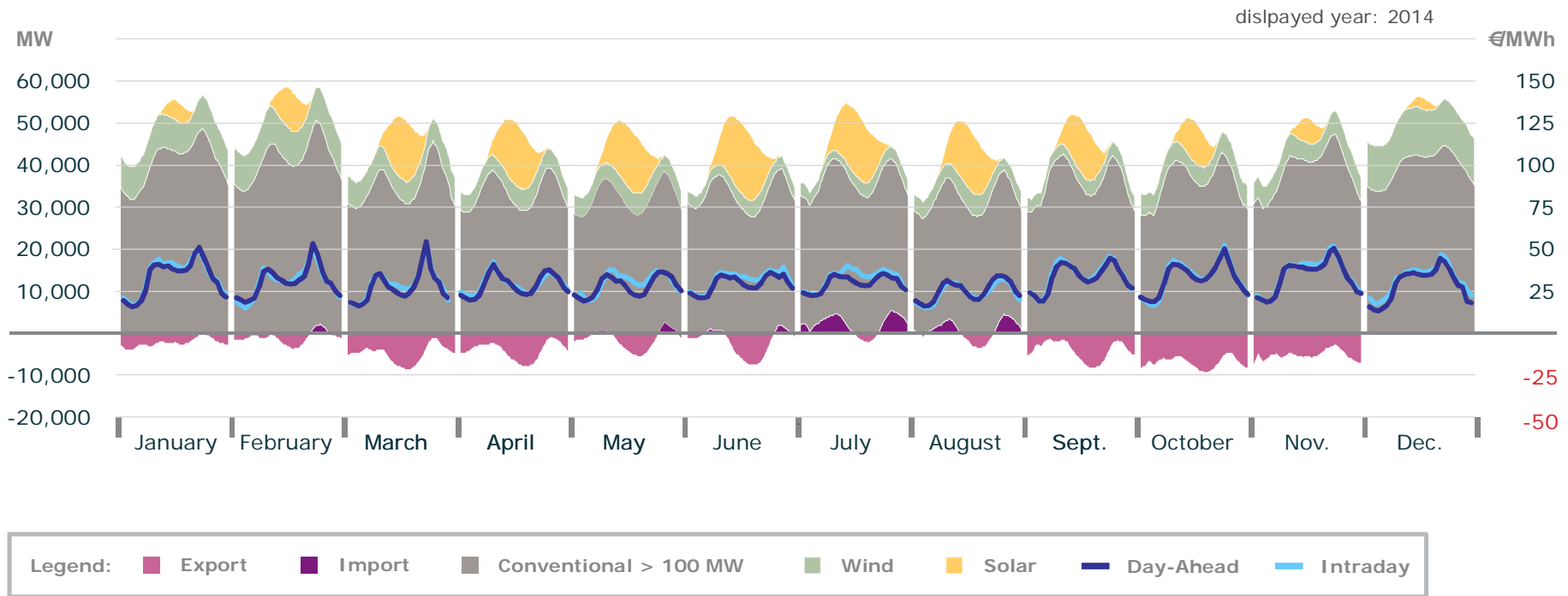


Utilization Ratio depending on Day-Ahead Spot-Prices (Update: Nov 2014)



Source: Johannes Mayer; Fraunhofer ISE; Data: EPEX-SPOT / EEX, Destatis

Electricity Production and Spot-Prices: Diurnal Courses



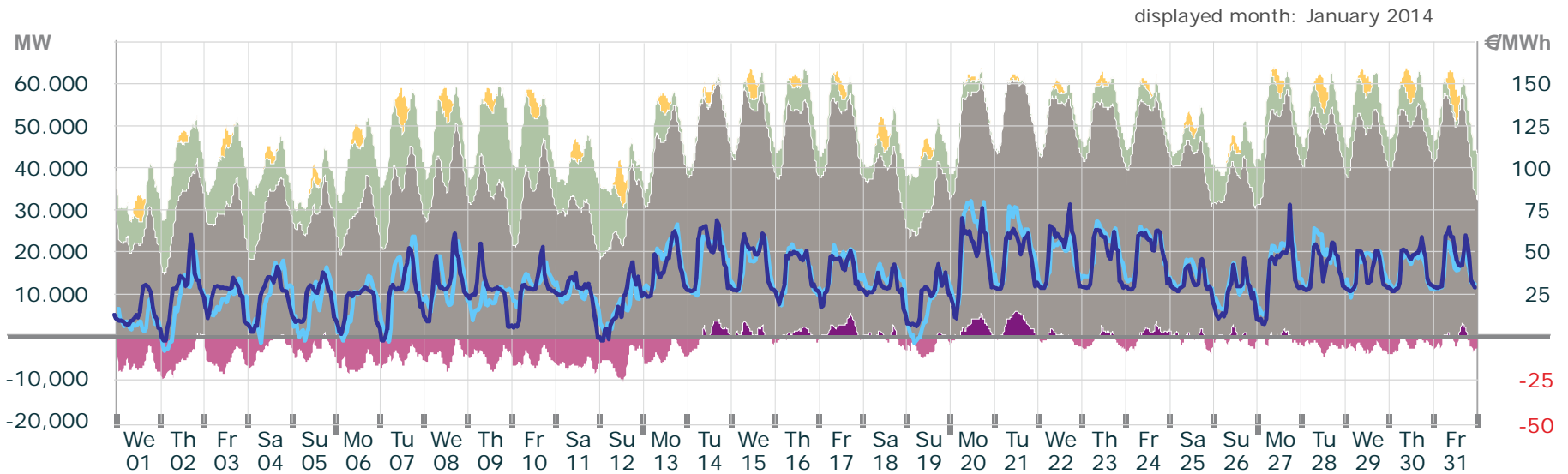
■ Diurnal courses of monthly production data and Spot-Prices (volume weighted)

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT / EEX, Entso-e

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Electricity Production and Spot-Prices: January 2014

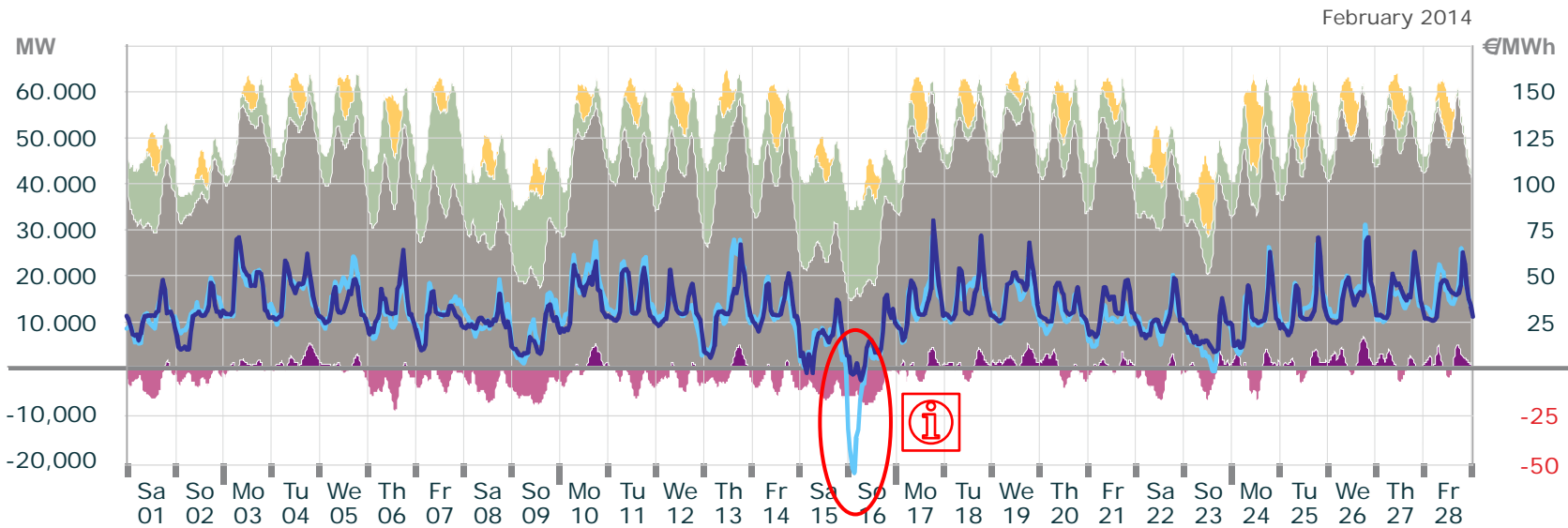


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 35.86 | 0.00 | 80.10 | 22 558 |
| Intraday | 39.38 | - 5.90 | 82.10 | 1 489 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: February 2014

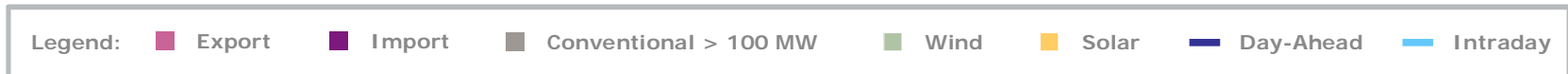
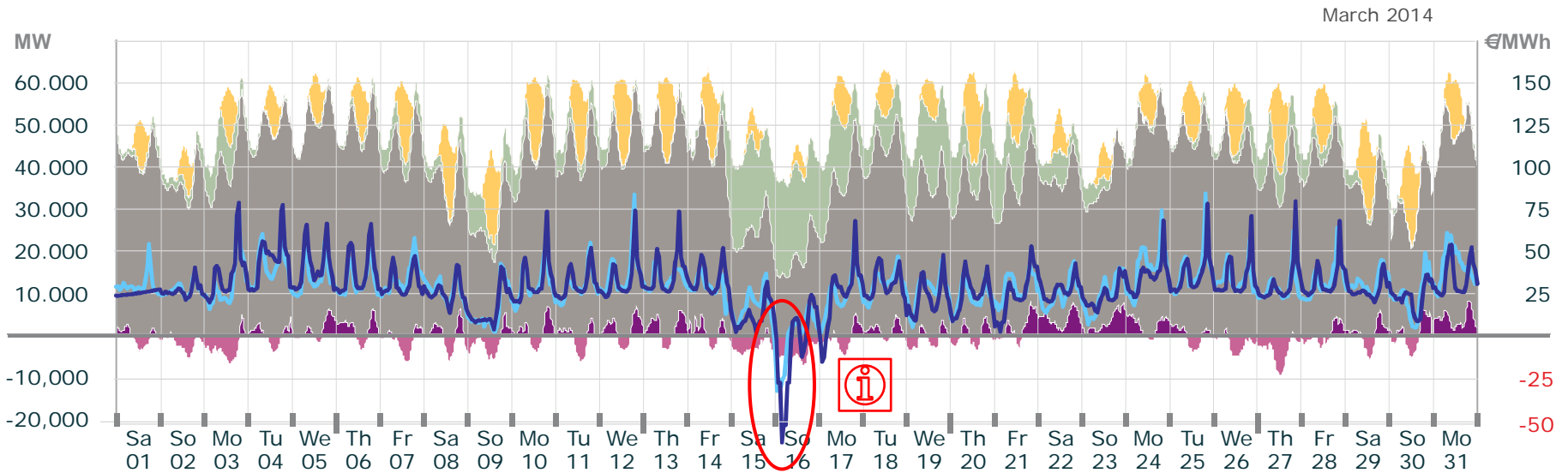


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|----------------|--------------|---------------|
| Day-Ahead | 33.57 | - 3.80 | 82.00 | 22 122 |
| Intraday | 34.86 | - 53.60 | 79.70 | 1 460 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

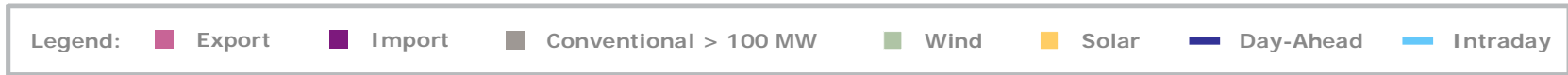
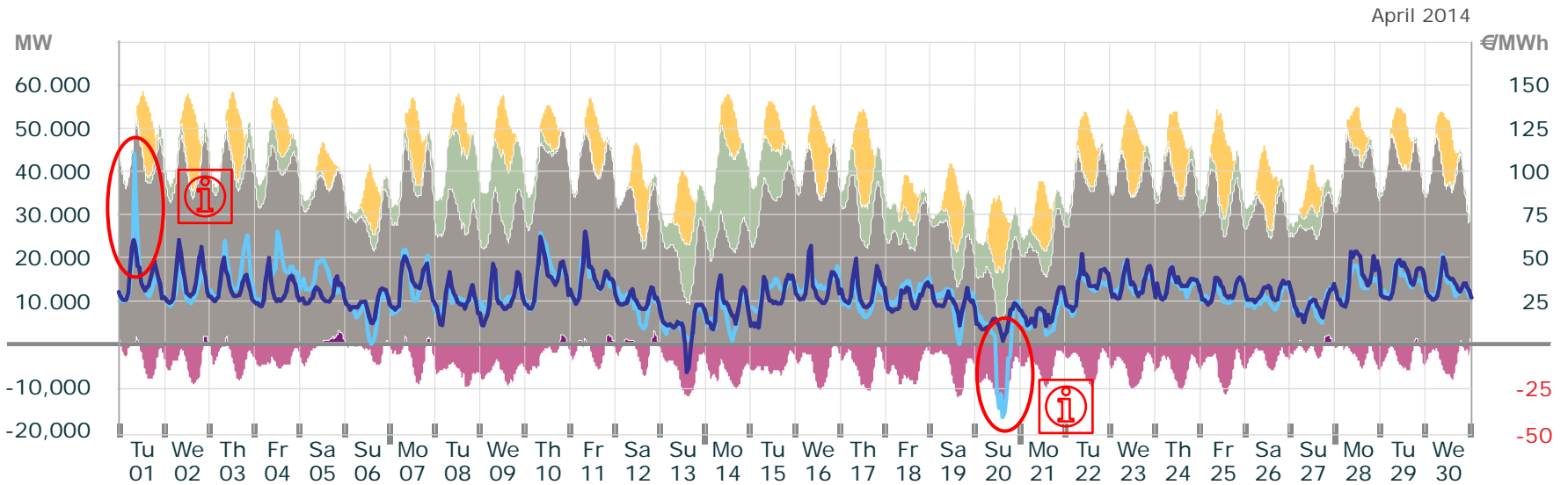
Electricity Production and Spot-Prices: March 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|----------------|--------------|---------------|
| Day-Ahead | 30.12 | - 60.30 | 81.50 | 23 592 |
| Intraday | 32.55 | - 29.50 | 86.30 | 1 565 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

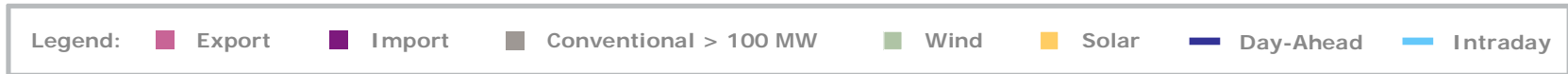
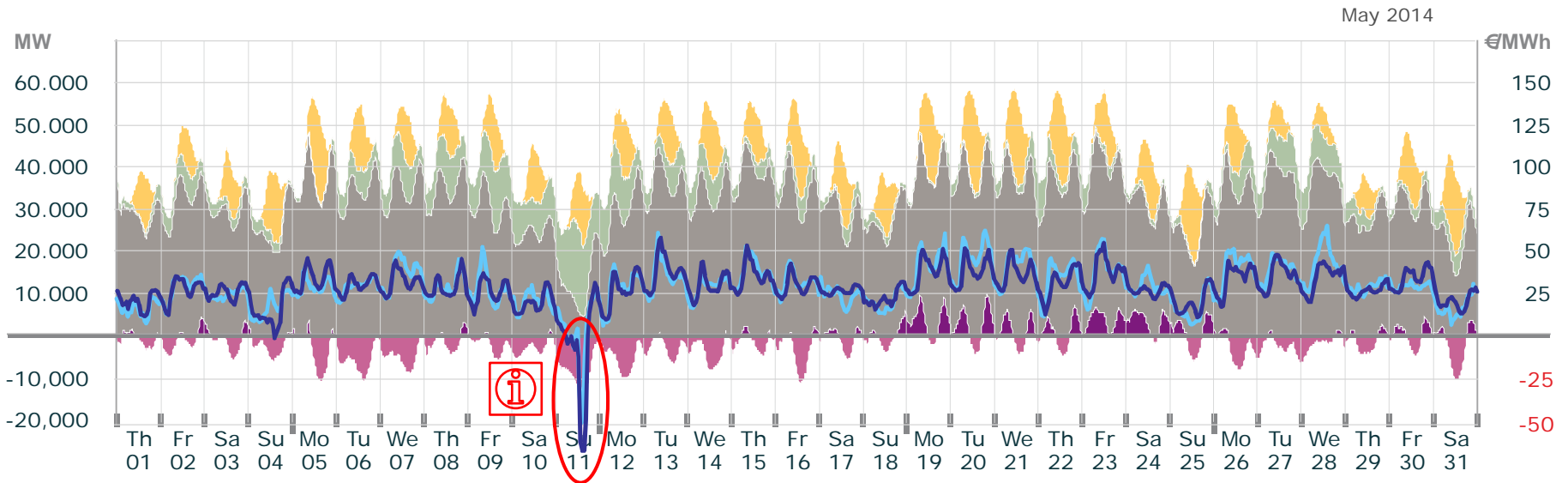
Electricity Production and Spot-Prices: April 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|---------------|---------------|
| Day-Ahead | 31.29 | -13.50 | 67.10 | 20 351 |
| Intraday | 31.72 | -39.20 | 111.60 | 1 683 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

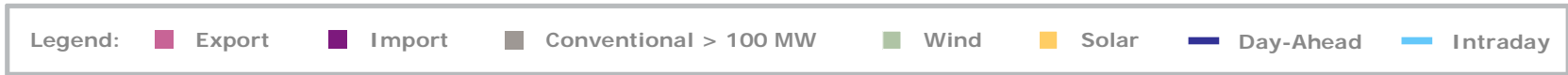
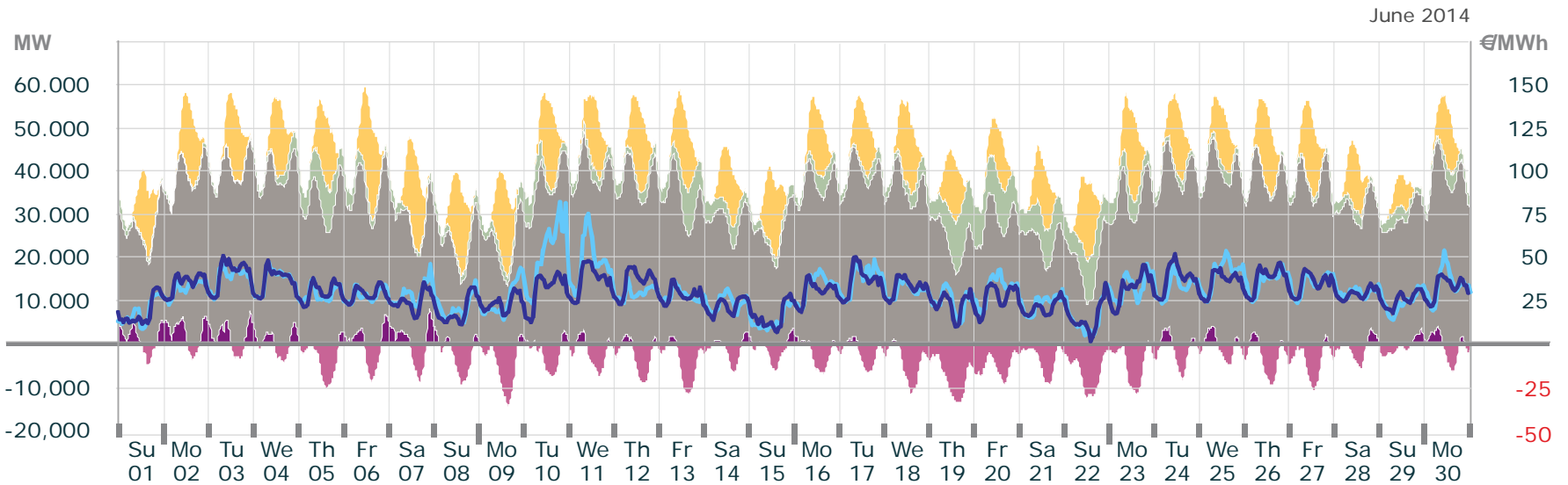
Electricity Production and Spot-Prices: May 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 30.38 | -65.00 | 60.10 | 21 366 |
| Intraday | 33.99 | -48.20 | 67.40 | 1 750 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

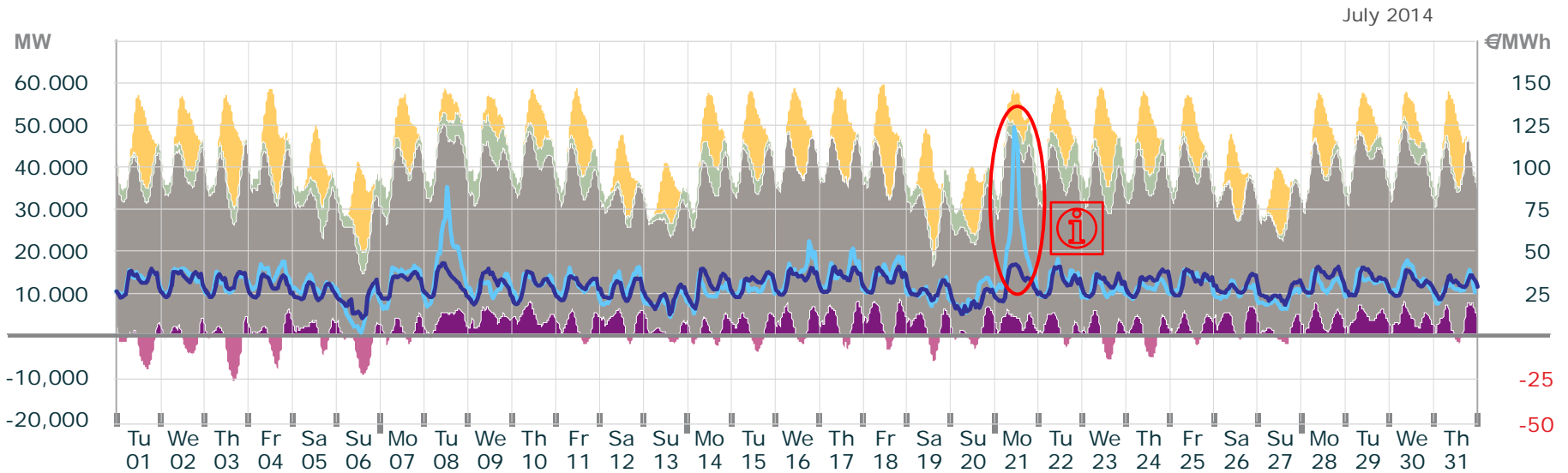
Electricity Production and Spot-Prices: June 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|-------------|--------------|---------------|
| Day-Ahead | 31.79 | 4.00 | 54.10 | 20 500 |
| Intraday | 34.99 | 7.00 | 84.00 | 1 576 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: July 2014

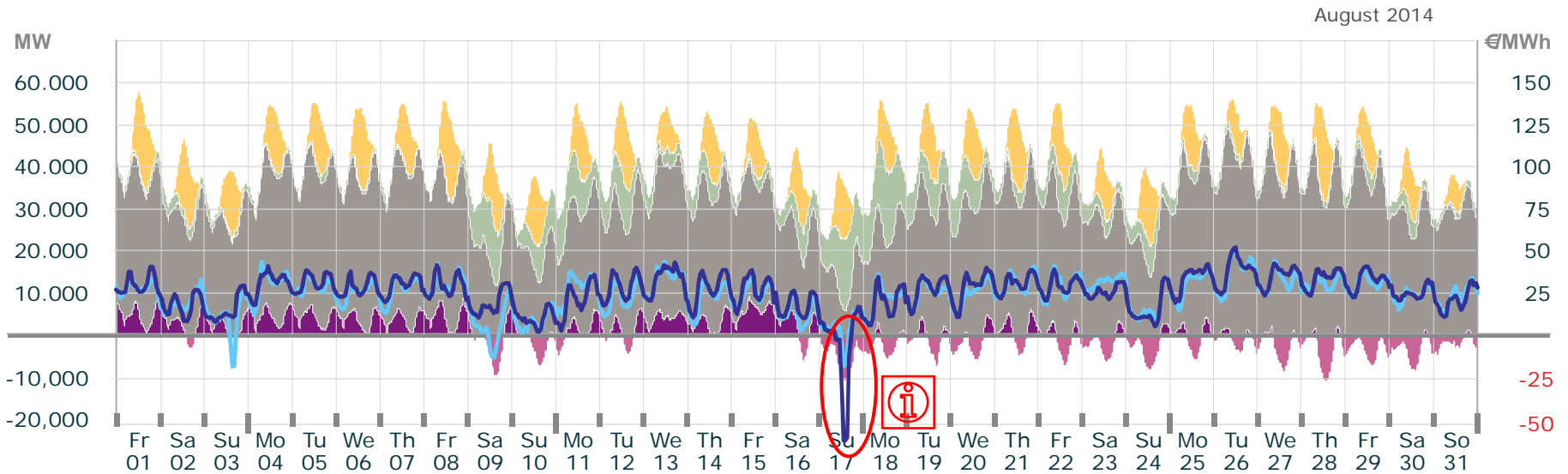


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|---------------|---------------|
| Day-Ahead | 32.18 | 12.80 | 45.10 | 20 704 |
| Intraday | 36.17 | 4.30 | 125.10 | 1 786 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: August 2014

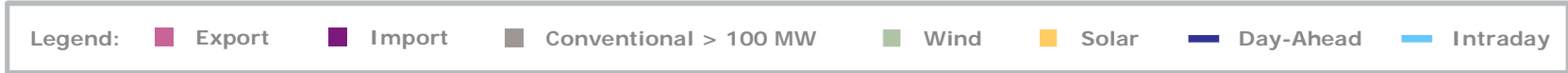
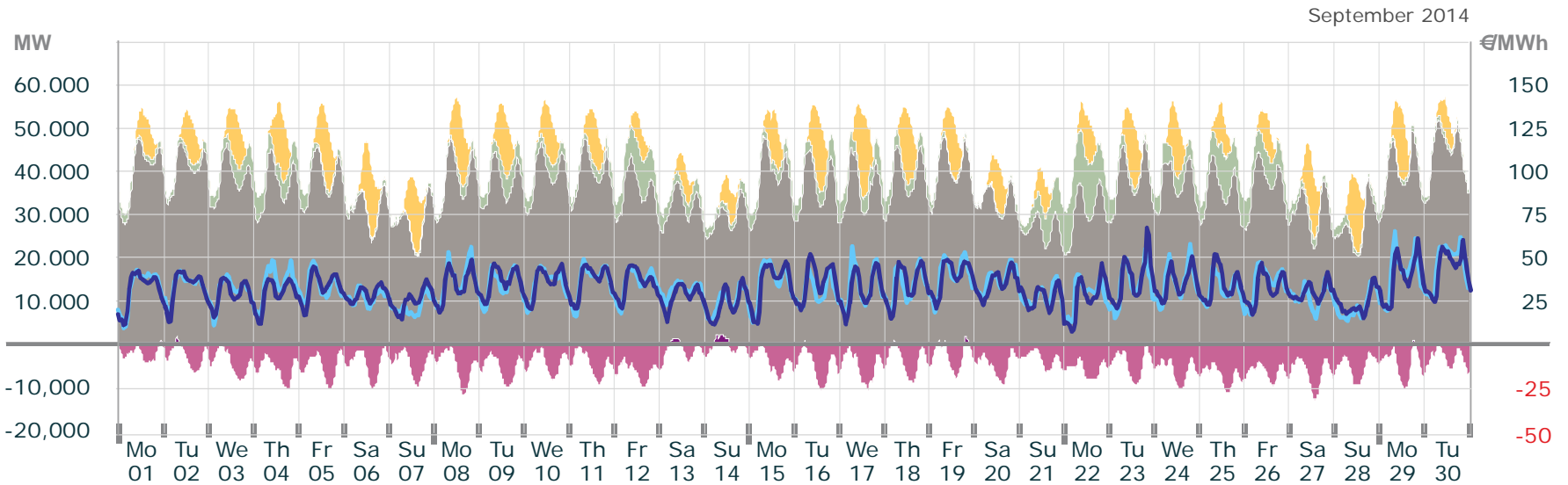


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 27.39 | -59.00 | 54.30 | 20 500 |
| Intraday | 26.72 | -15.80 | 52.00 | 1 802 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

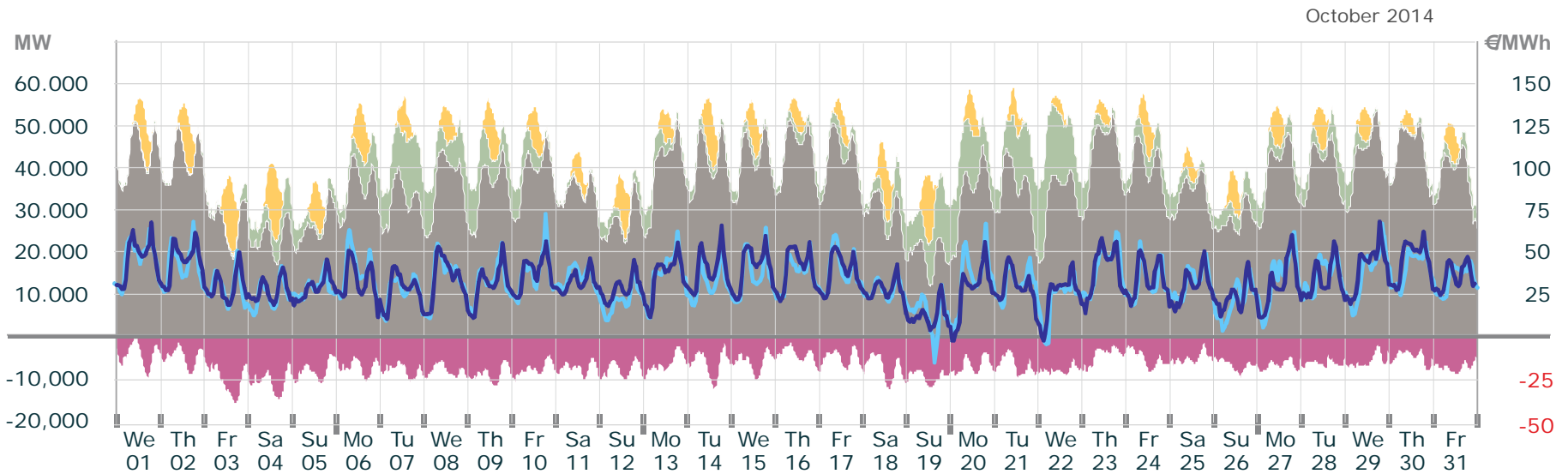
Electricity Production and Spot-Prices: September 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 35.14 | 9.80 | 69.30 | 20 270 |
| Intraday | 37.03 | 11.70 | 67.30 | 1 752 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: October 2014

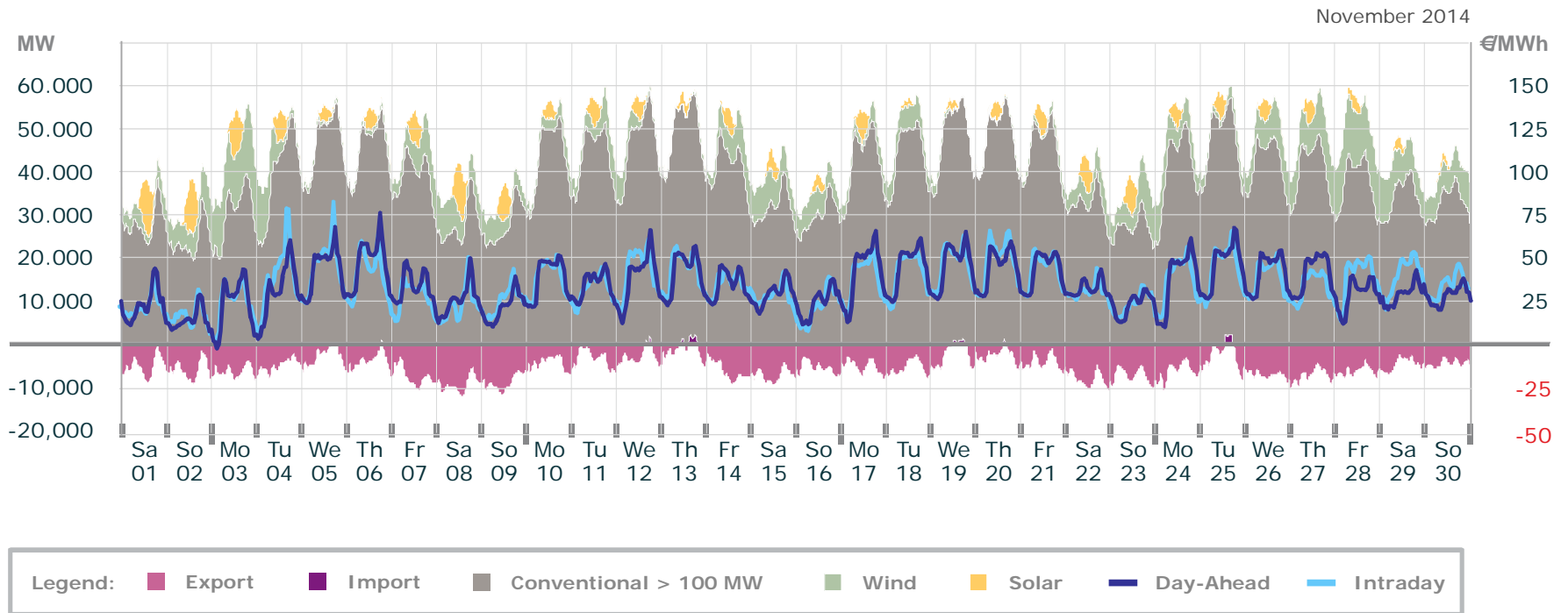


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 35.13 | 0.10 | 70.00 | 22 764 |
| Intraday | 37.40 | -12.90 | 74.60 | 1 708 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

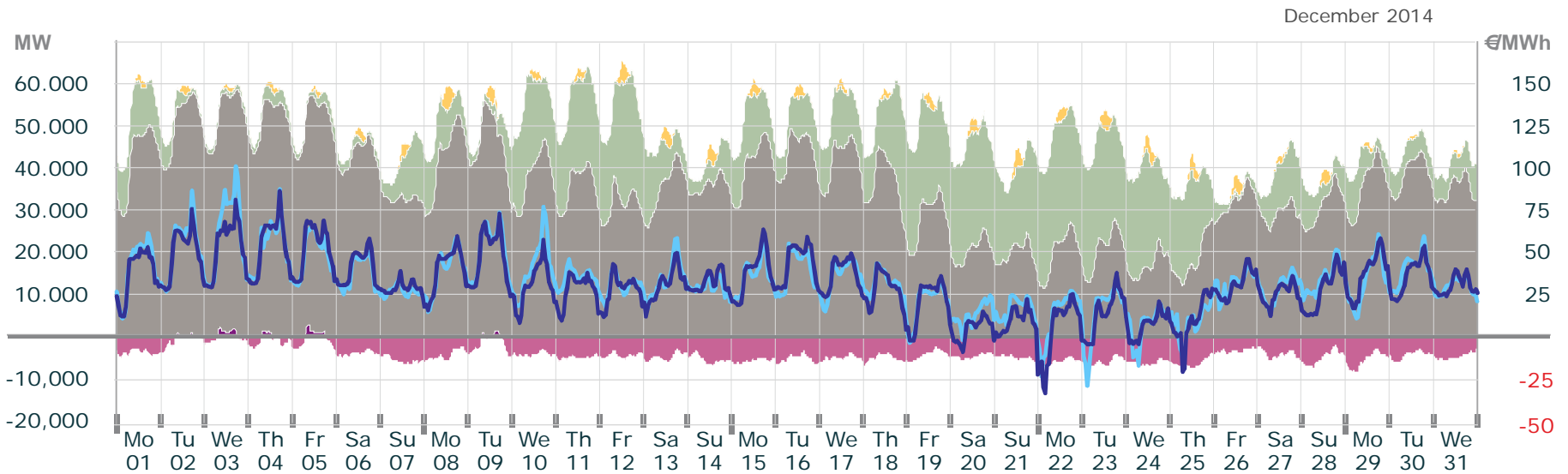
Electricity Production and Spot-Prices: November 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|-------------|--------------|---------------|
| Day-Ahead | 36.22 | 0.10 | 77.90 | 22 178 |
| Intraday | 39.92 | 3.90 | 83.90 | 1 816 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: December 2014



Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

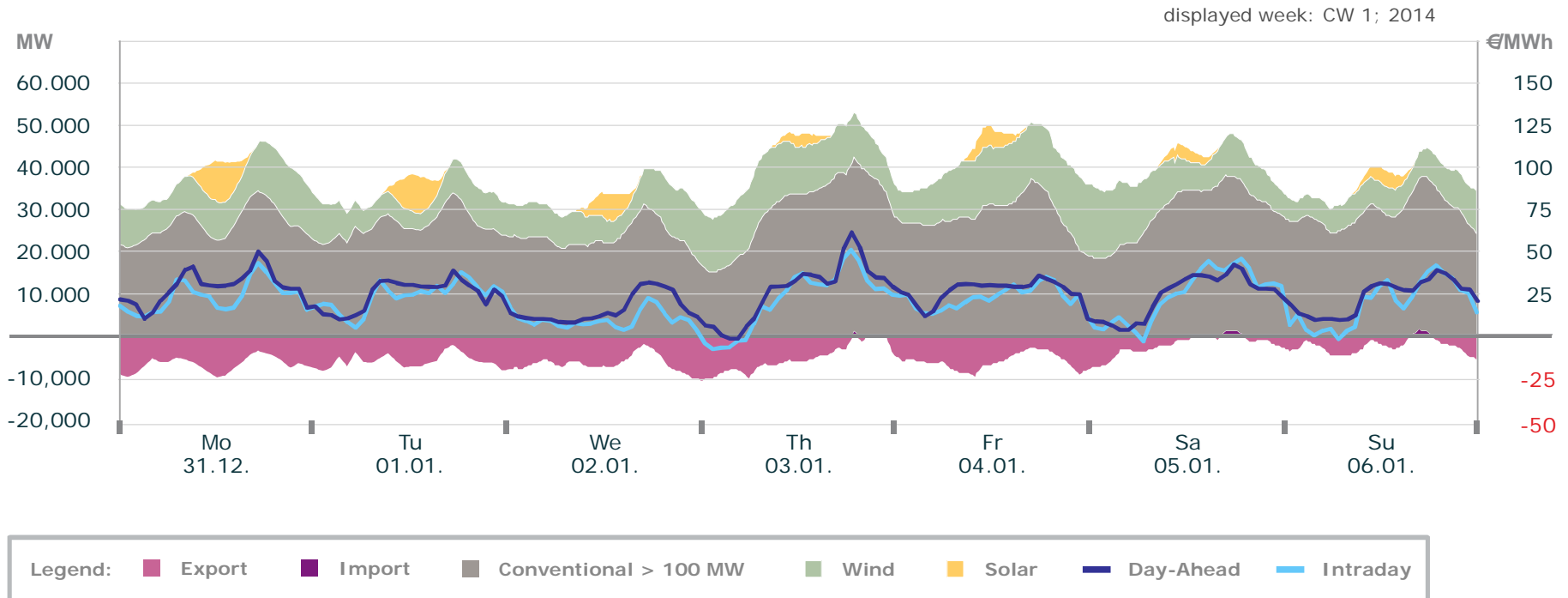
| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|---------------|---------------|
| Day-Ahead | 31.57 | -30.90 | 88.00 | 25 410 |
| Intraday | 36.28 | -26.50 | 102.50 | 2 229 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

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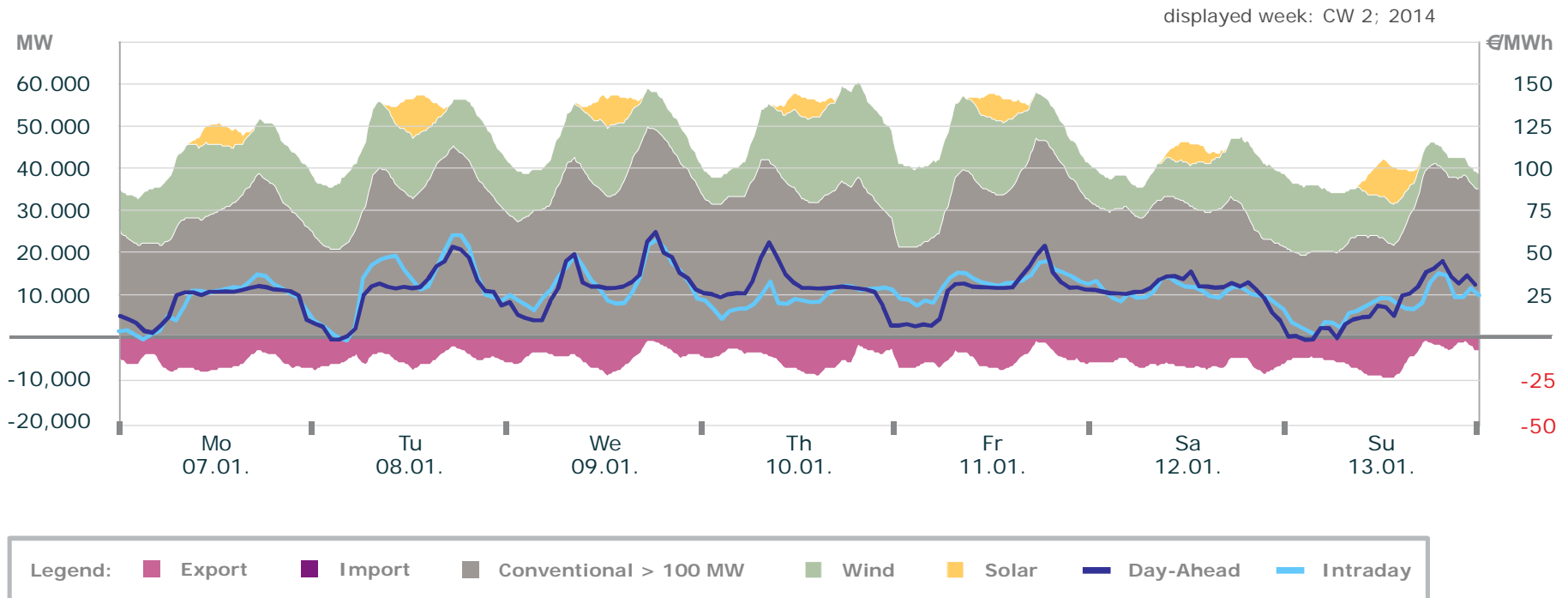
Electricity Production and Spot-Prices: CW 1 2013



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|----------------|--------------|---------------|
| Day-Ahead | 29.40 | - 64.90 | 59.90 | 3 969 |
| Intraday | 28.70 | - 28.10 | 54.50 | 538 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

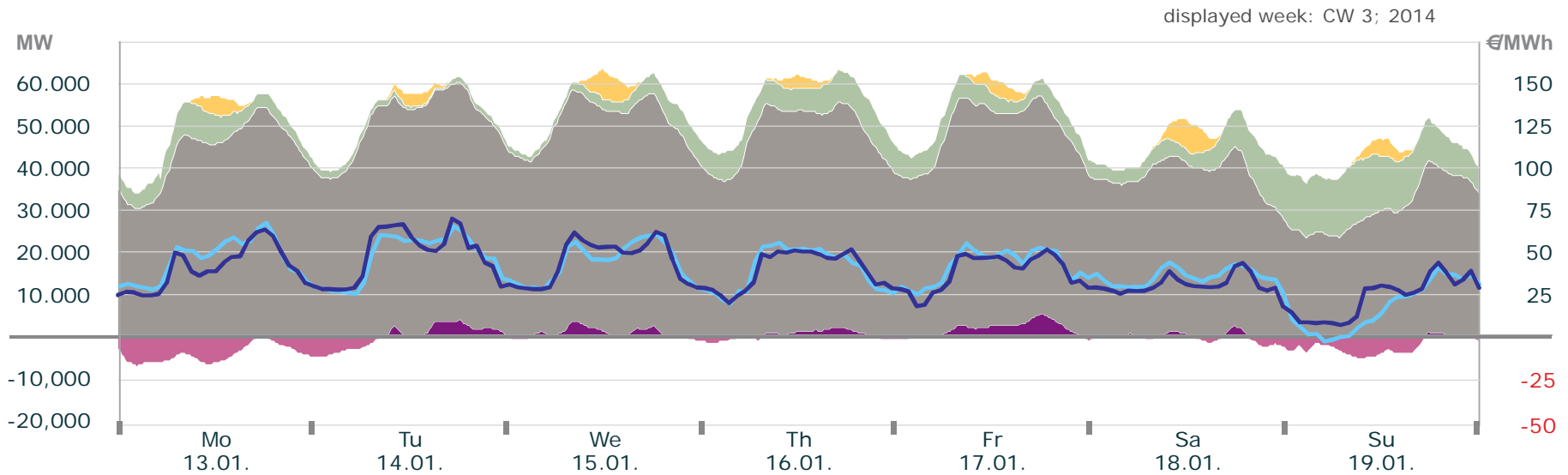
Electricity Production and Spot-Prices: CW 2 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 27.50 | 0.00 | 63.00 | 5 637 |
| Intraday | 29.53 | - 0.50 | 61.20 | 401 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: CW 3 2014

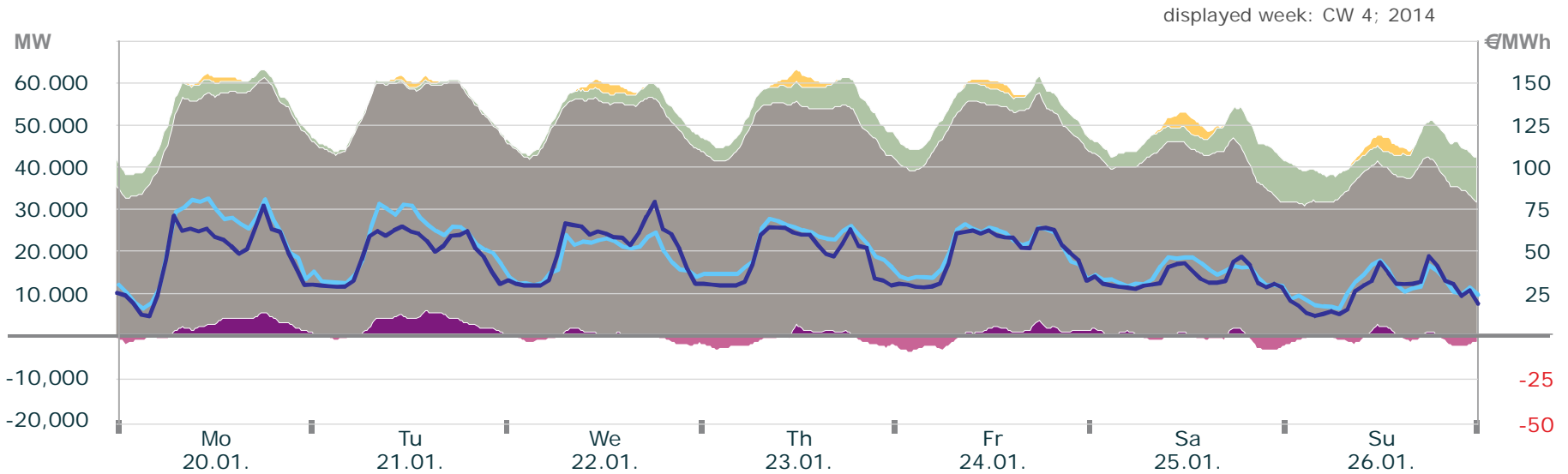


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 39.66 | 8.50 | 70.70 | 4 811 |
| Intraday | 42.95 | - 1.20 | 68.30 | 296 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: CW 4 2014

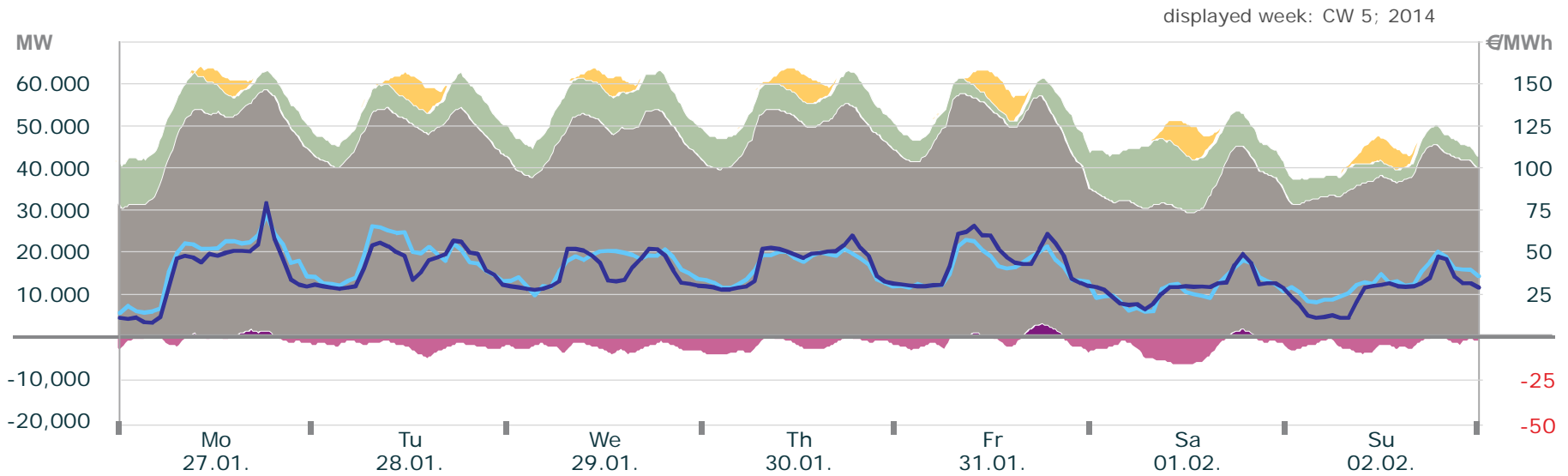


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 45.25 | 13.10 | 80.10 | 4 699 |
| Intraday | 54.57 | 17.40 | 82.10 | 320 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: CW 5 2014

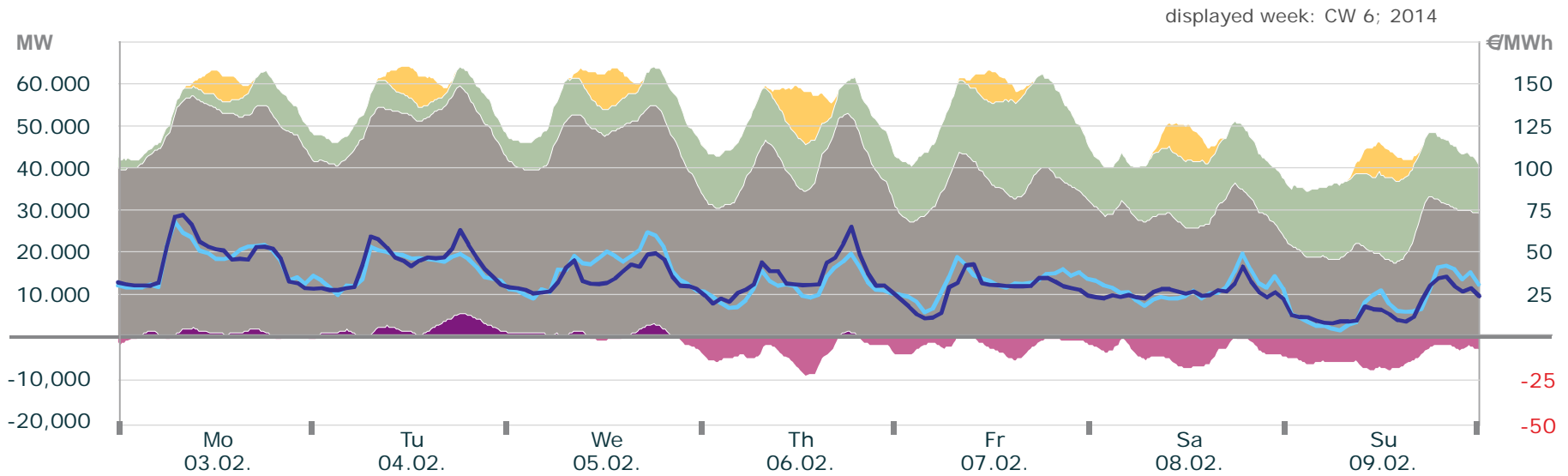


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 38.93 | 9.80 | 79.90 | 5 197 |
| Intraday | 43.56 | 15.10 | 72.90 | 313 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: CW 6 2014

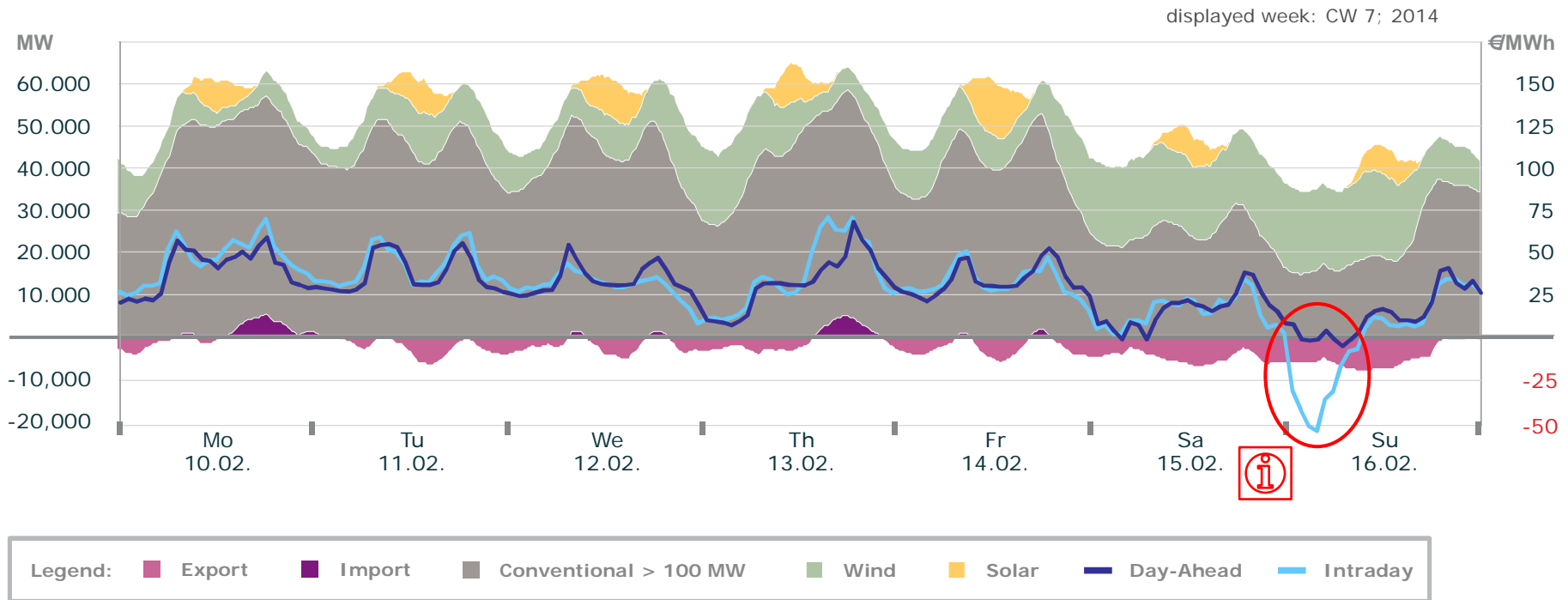


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|-------------|--------------|---------------|
| Day-Ahead | 33.90 | 9.40 | 72.90 | 5 775 |
| Intraday | 36.96 | 5.20 | 69.10 | 376 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

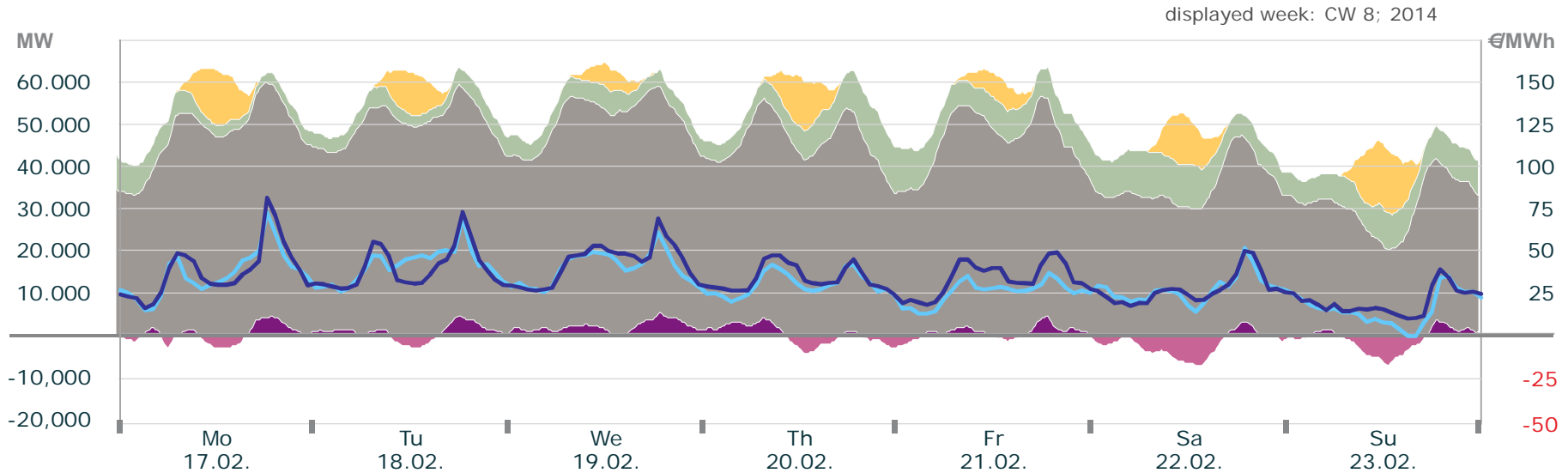
Electricity Production and Spot-Prices: CW 7 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|----------------|--------------|---------------|
| Day-Ahead | 30.35 | - 3.80 | 68.90 | 5 830 |
| Intraday | 32.54 | - 53.60 | 71.60 | 429 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: CW 8 2014

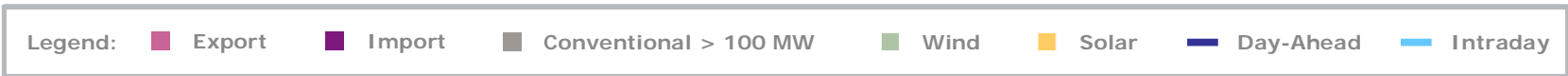
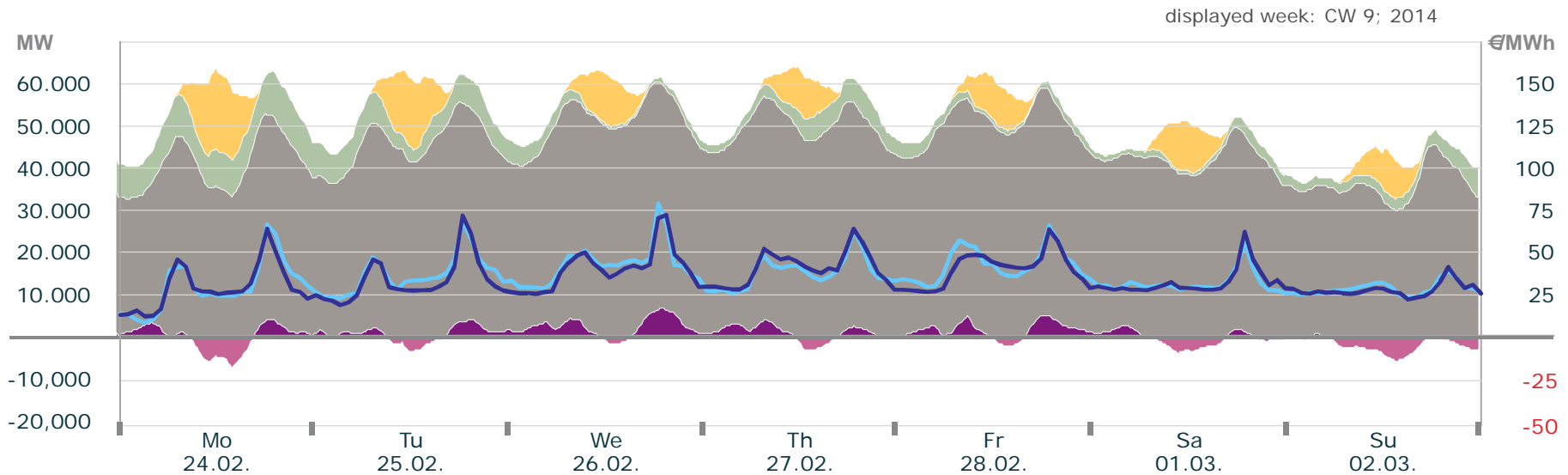


Legend: Export Import Conventional > 100 MW Wind Solar Day-Ahead Intraday

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 34.94 | 11.30 | 82.00 | 5 382 |
| Intraday | 32.67 | 1.00 | 73.50 | 349 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

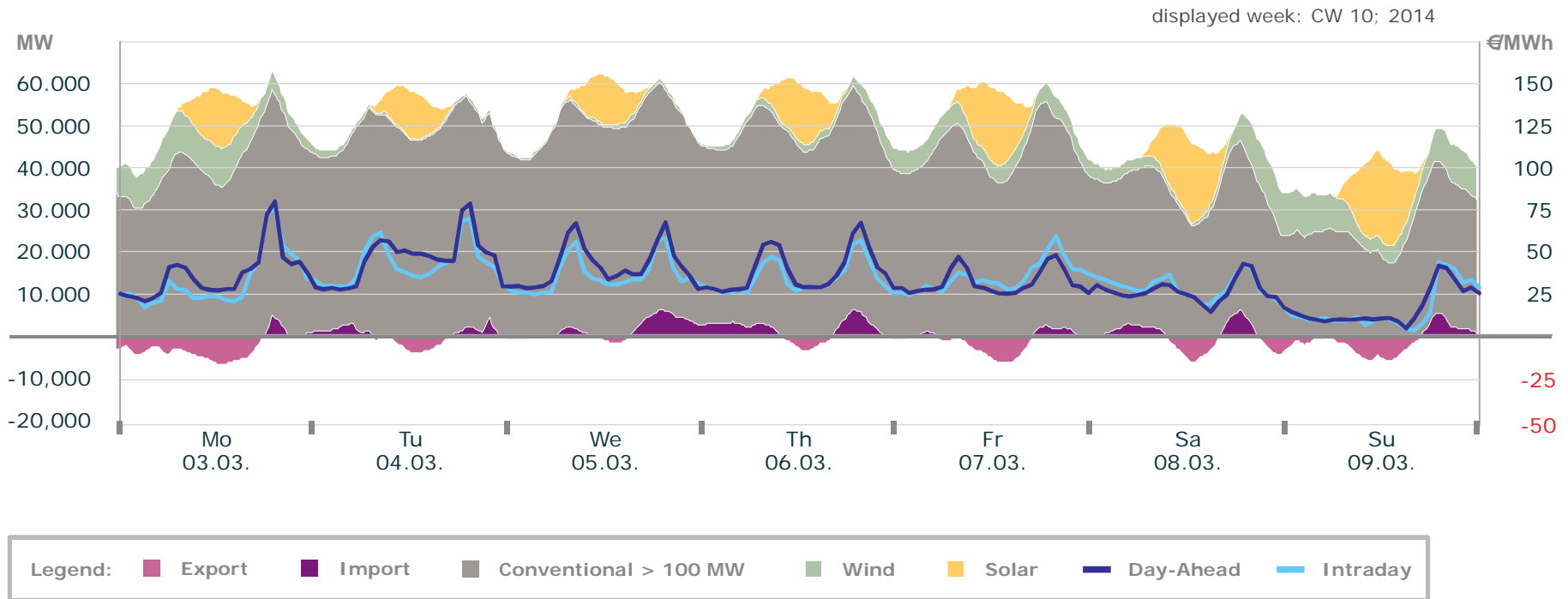
Electricity Production and Spot-Prices: CW 9 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 36.27 | 13.70 | 73.00 | 4 994 |
| Intraday | 38.21 | 10.10 | 79.70 | 295 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

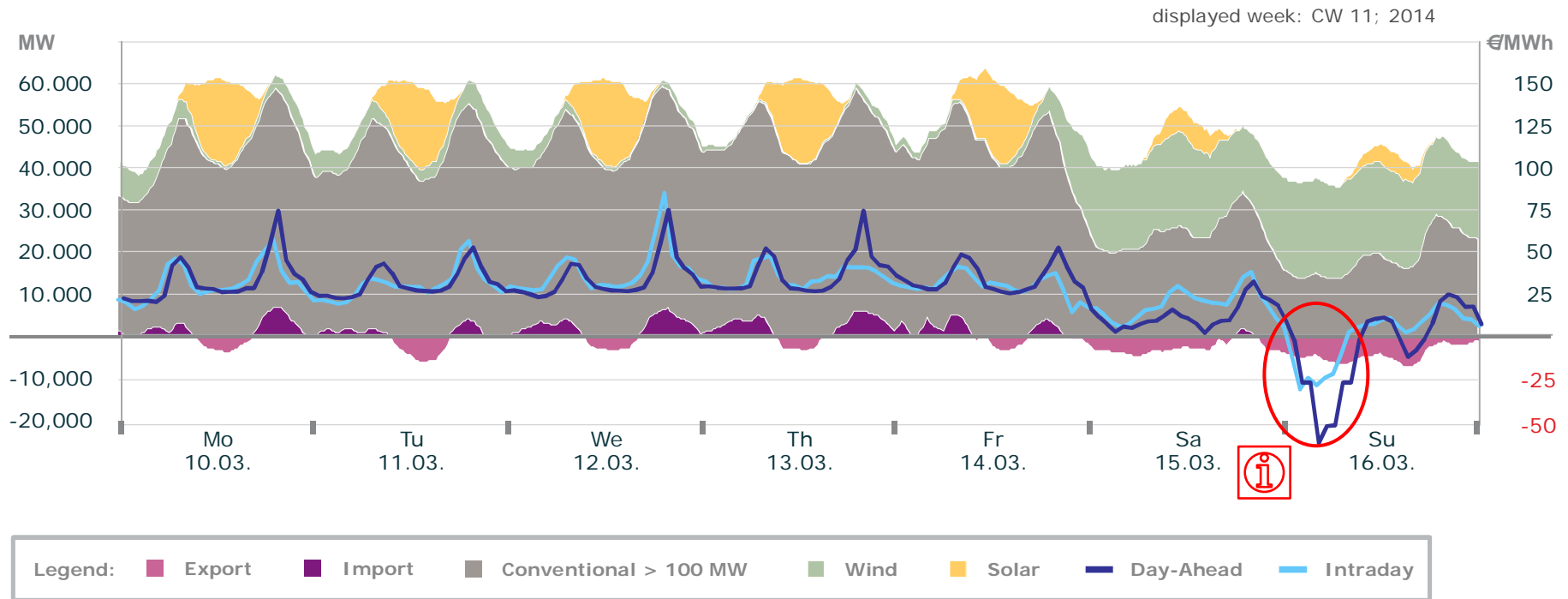
Electricity Production and Spot-Prices: CW 10 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|-------------|--------------|---------------|
| Day-Ahead | 34.74 | 6.20 | 80.70 | 5 158 |
| Intraday | 34.92 | 5.10 | 77.20 | 330 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

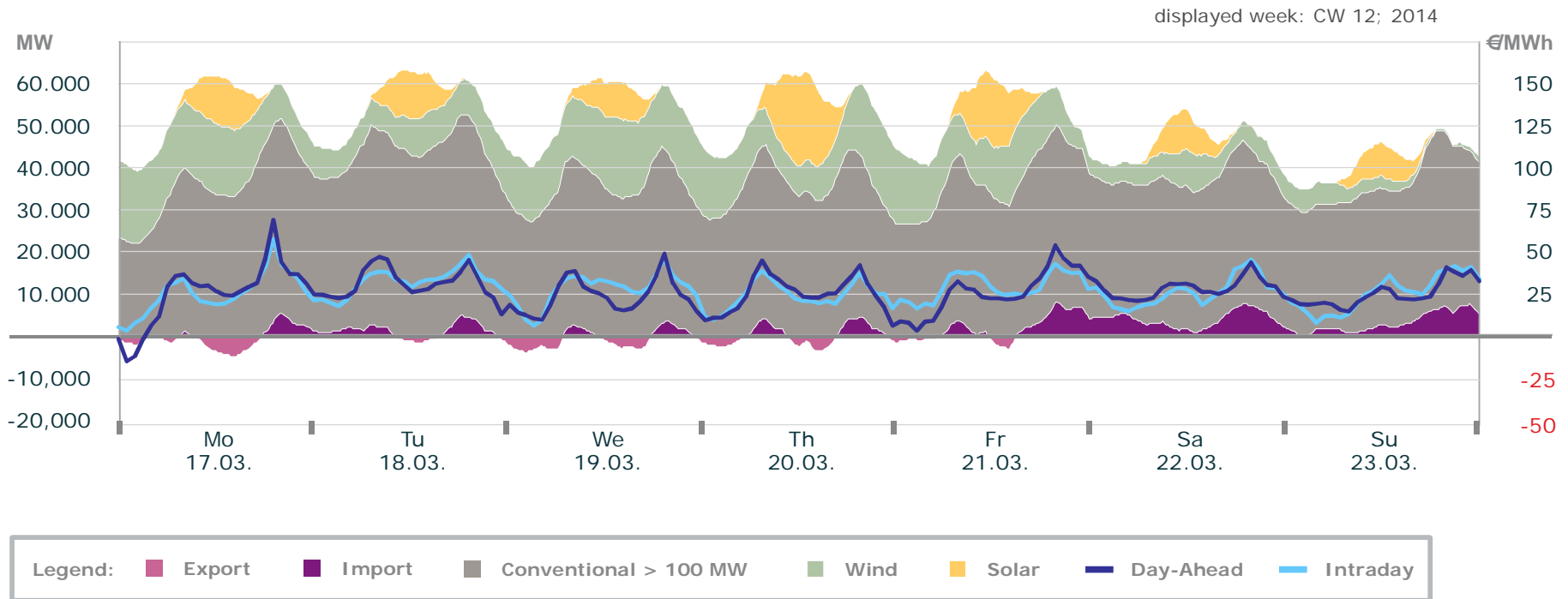
Electricity Production and Spot-Prices: CW 11 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|----------------|--------------|---------------|
| Day-Ahead | 24.85 | - 60.30 | 76.00 | 5 467 |
| Intraday | 26.07 | -29.50 | 85.70 | 353 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

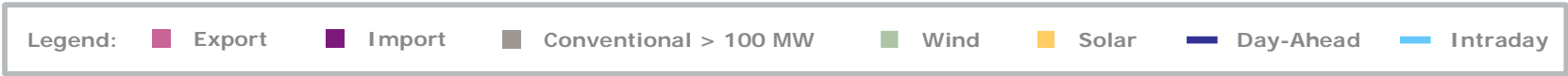
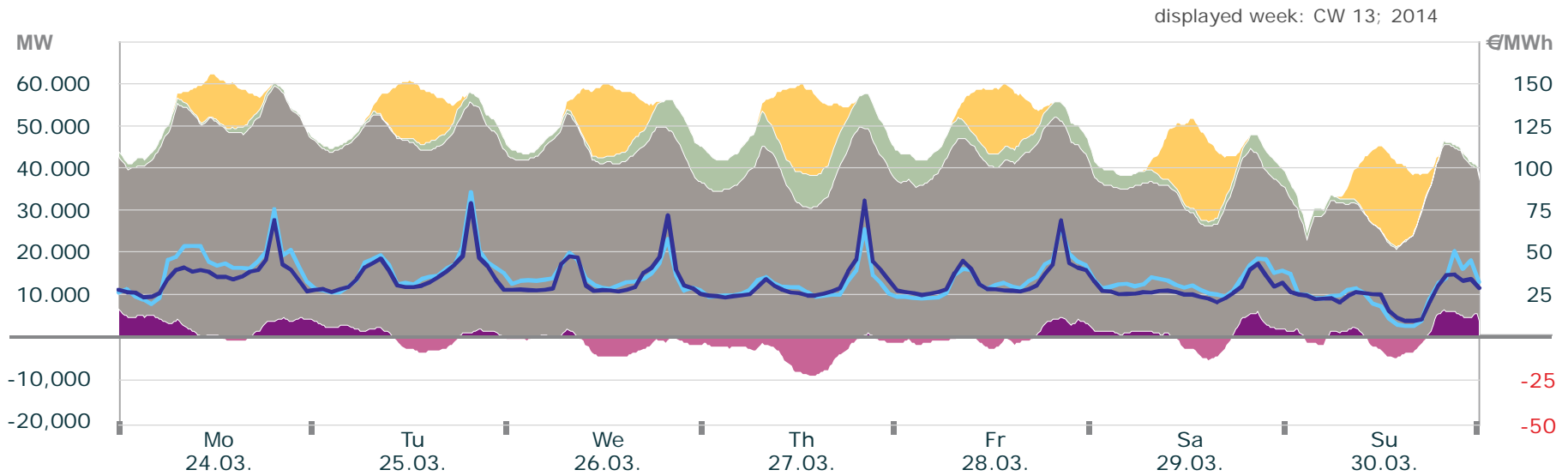
Electricity Production and Spot-Prices: CW 12 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|----------------|--------------|---------------|
| Day-Ahead | 27.77 | - 12.90 | 69.90 | 5 797 |
| Intraday | 30.07 | 4.80 | 58.50 | 450 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

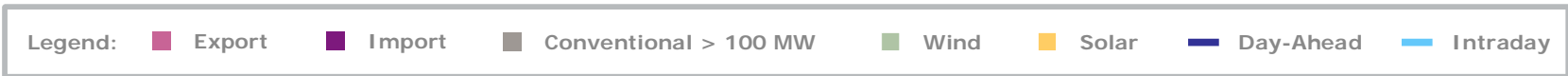
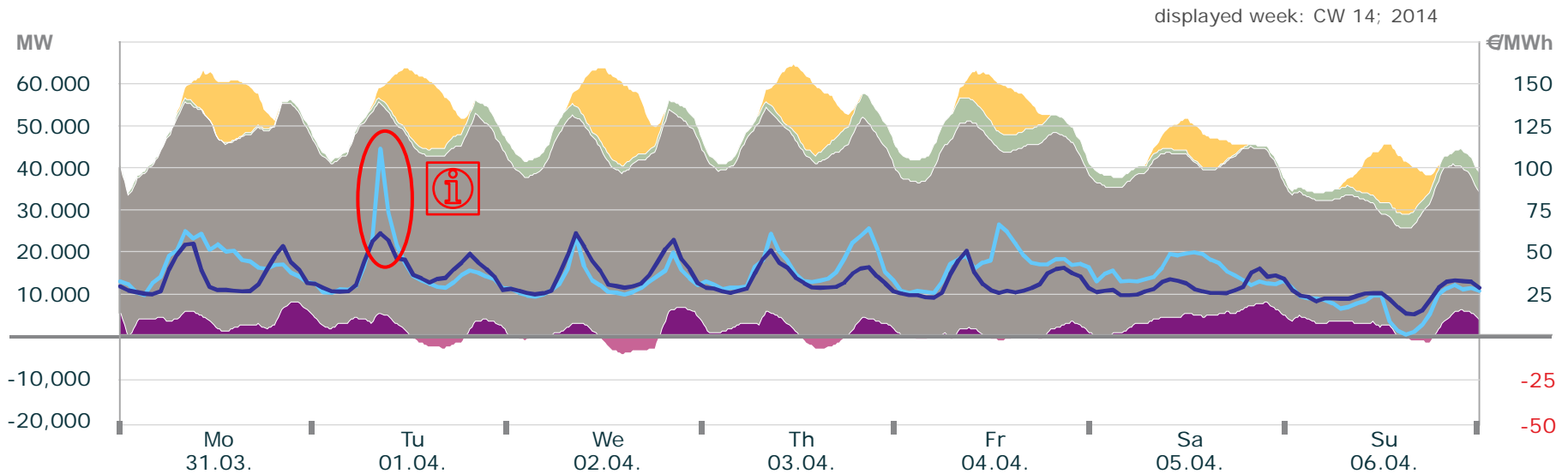
Electricity Production and Spot-Prices: CW 13 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 33.28 | 11.20 | 81.50 | 5 161 |
| Intraday | 37.29 | 7.70 | 86.30 | 296 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

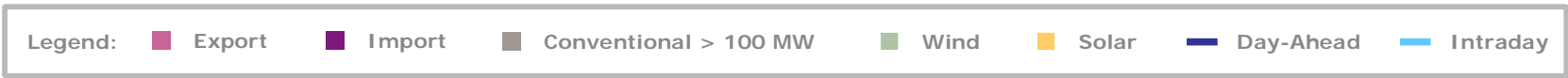
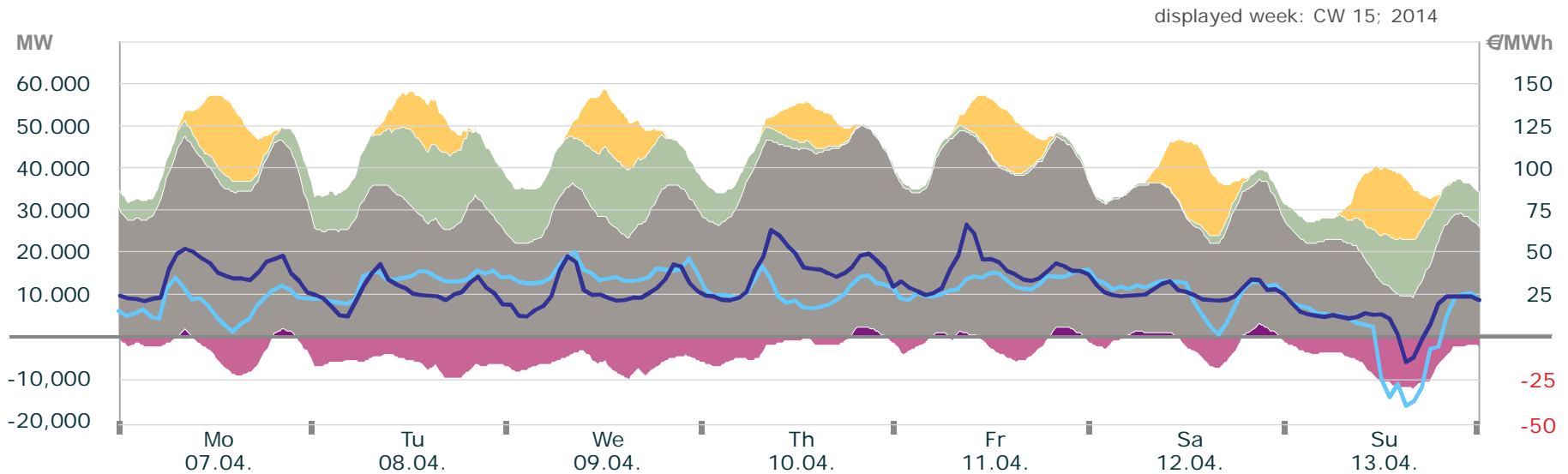
Electricity Production and Spot-Prices: CW 14 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|---------------|---------------|
| Day-Ahead | 34.39 | 14.60 | 62.20 | 4 591 |
| Intraday | 42.41 | 2.70 | 111.60 | 450 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

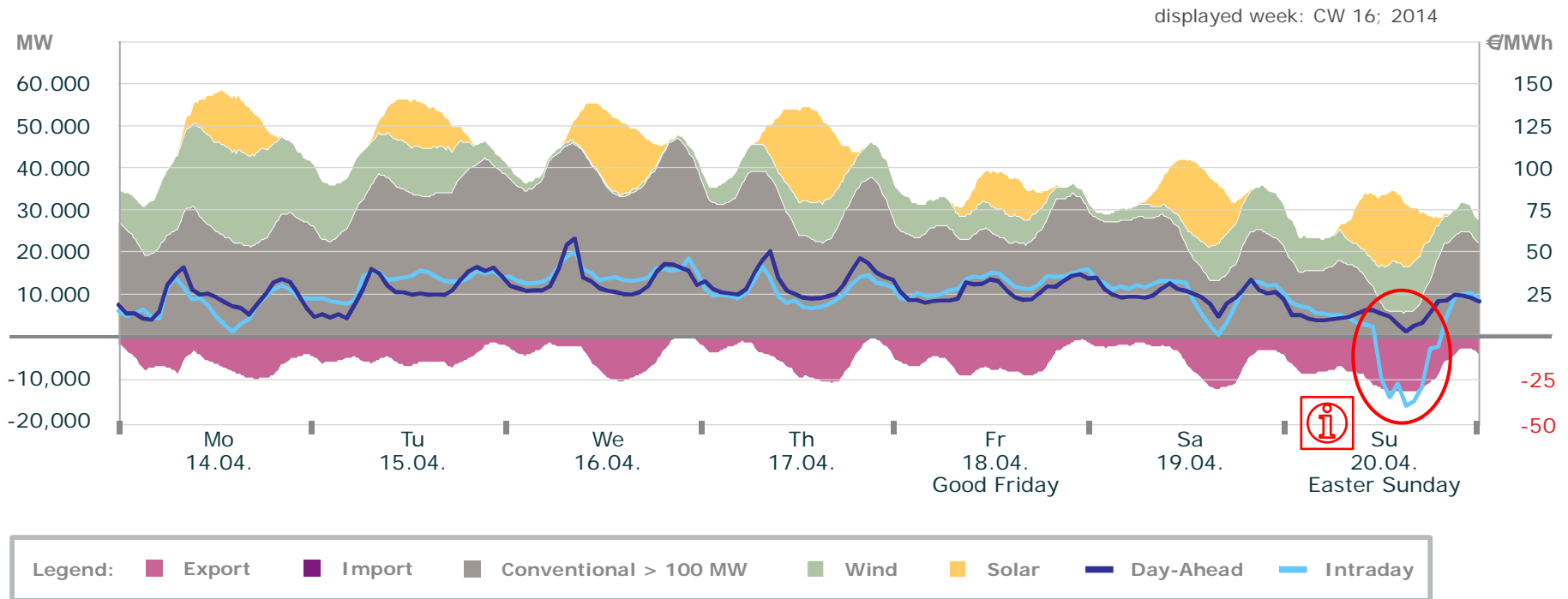
Electricity Production and Spot-Prices: CW 15 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 30.23 | -13.50 | 67.10 | 4 858 |
| Intraday | 30.86 | 5.30 | 66.10 | 356 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

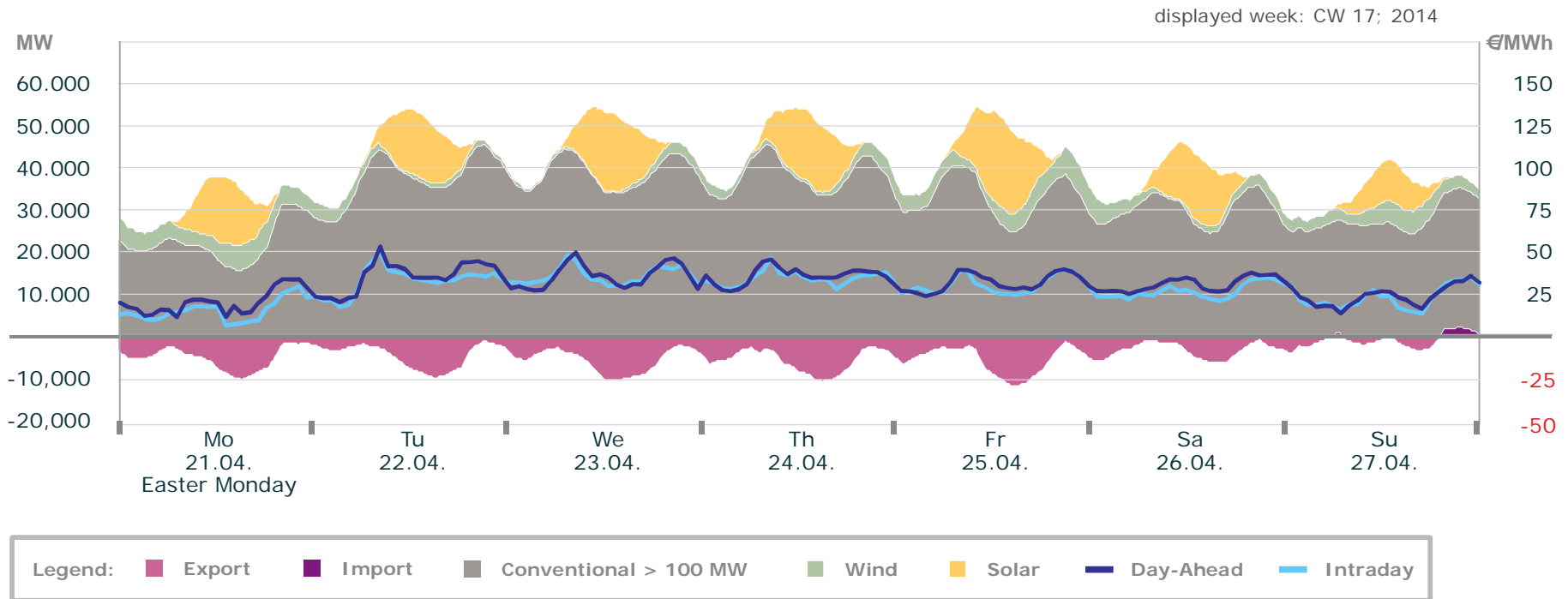
Electricity Production and Spot-Prices: CW 16 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 26.70 | 4.50 | 58.90 | 5 163 |
| Intraday | 24.58 | -39.20 | 51.10 | 468 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

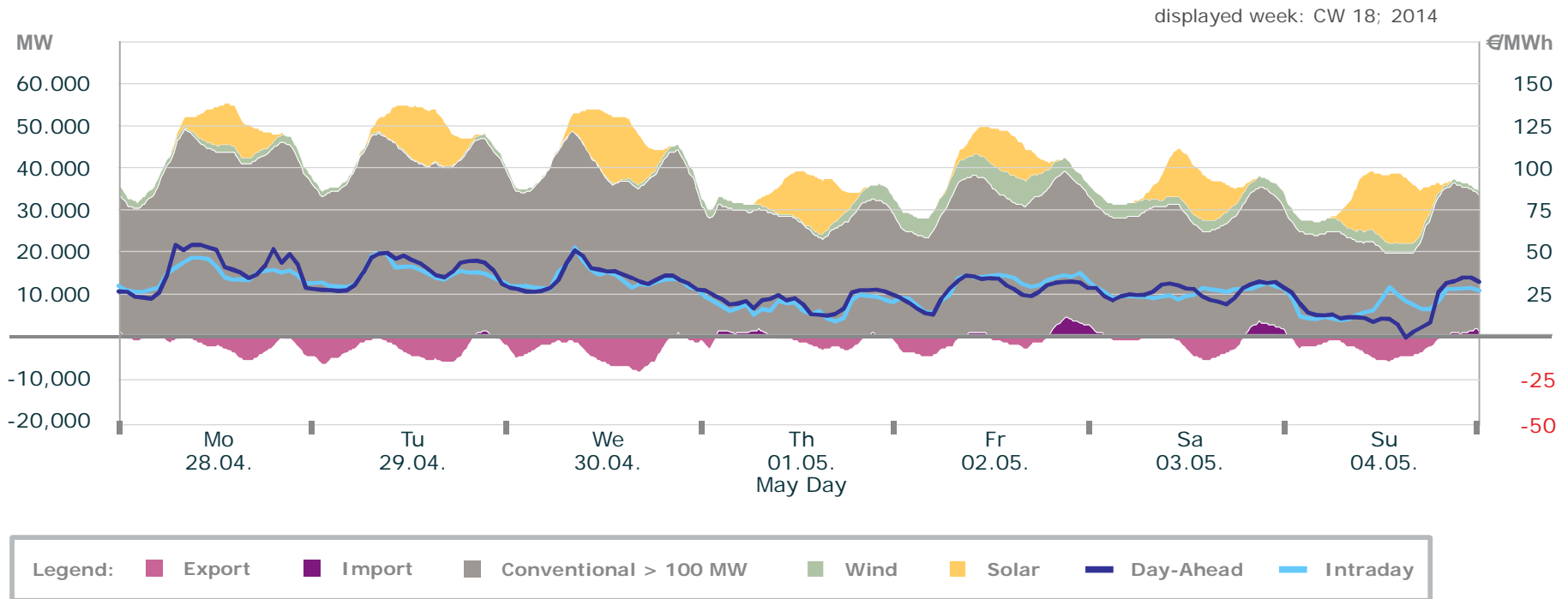
Electricity Production and Spot-Prices: CW 17 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 31.86 | 12.80 | 54.20 | 4 640 |
| Intraday | 29.58 | 7.90 | 51.20 | 337 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

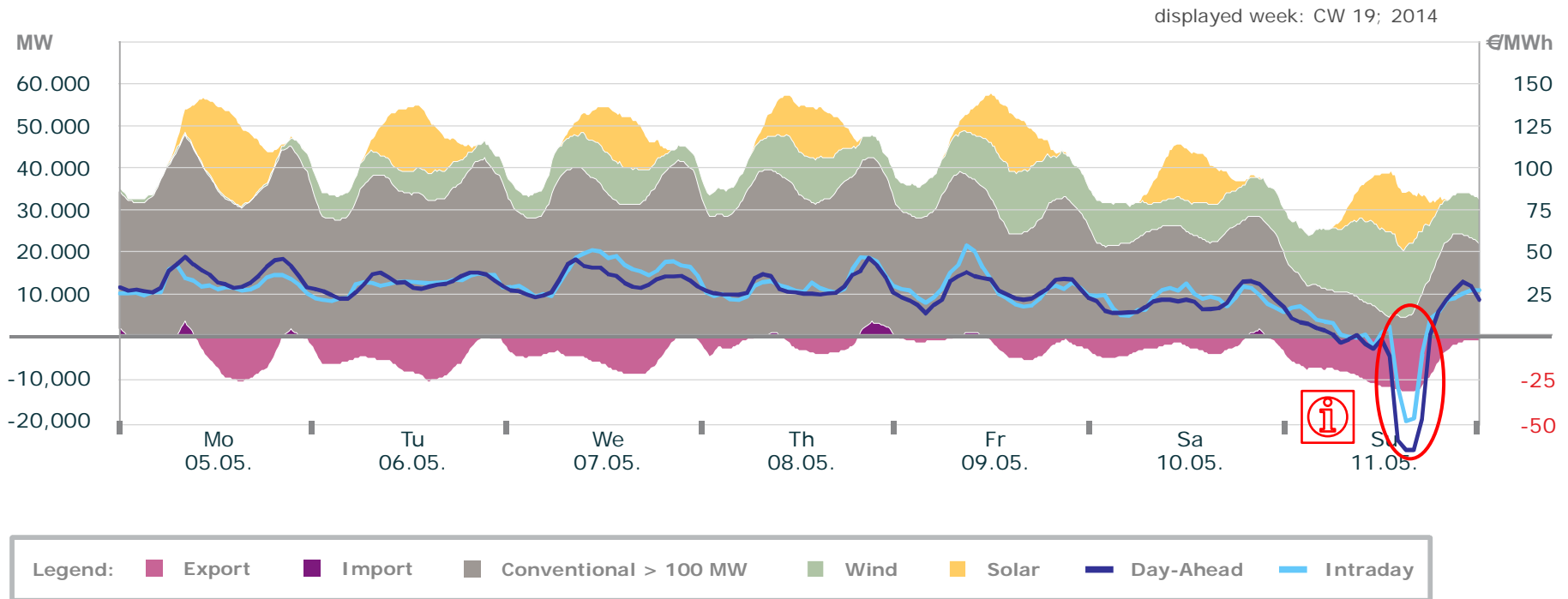
Electricity Production and Spot-Prices: CW 18 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 30.60 | 1.20 | 55.60 | 4 404 |
| Intraday | 30.89 | 10.20 | 53.70 | 351 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

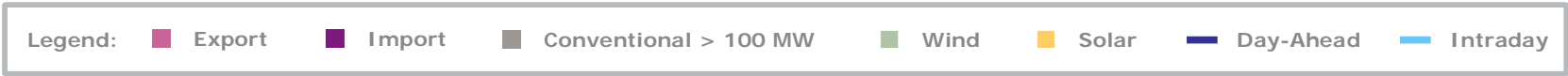
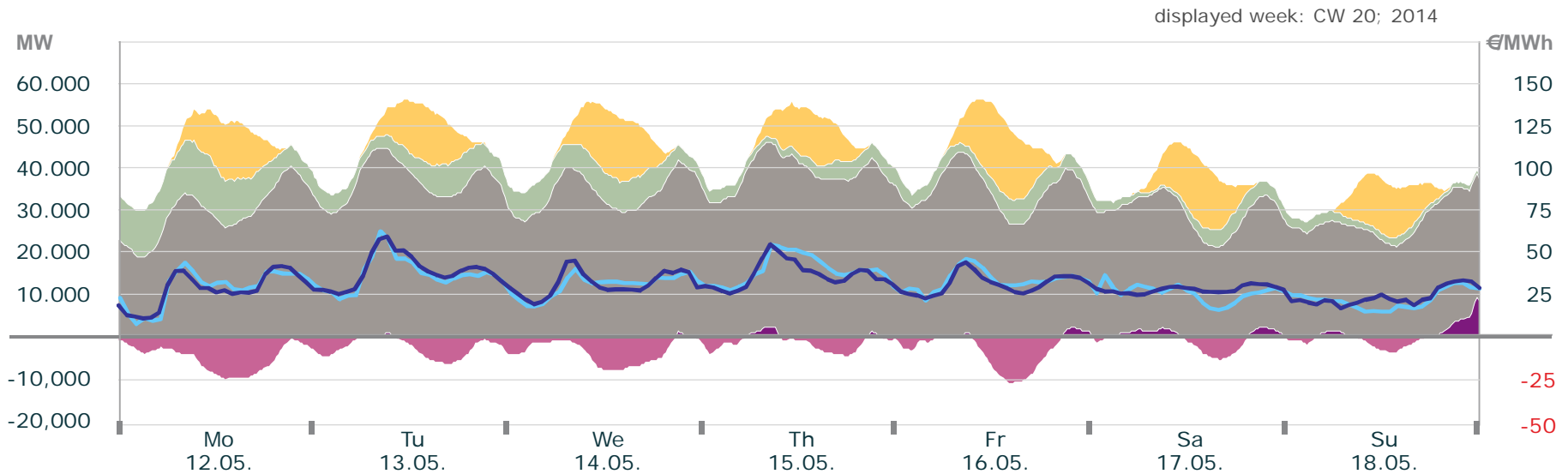
Electricity Production and Spot-Prices: CW 19 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 24.54 | -65.00 | 48.10 | 5 100 |
| Intraday | 27.92 | -48.20 | 54.90 | 391 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

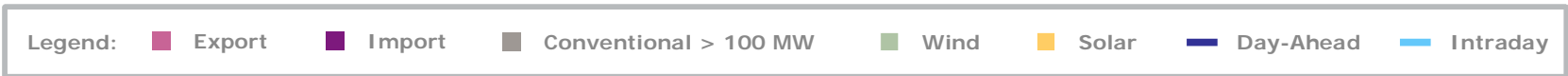
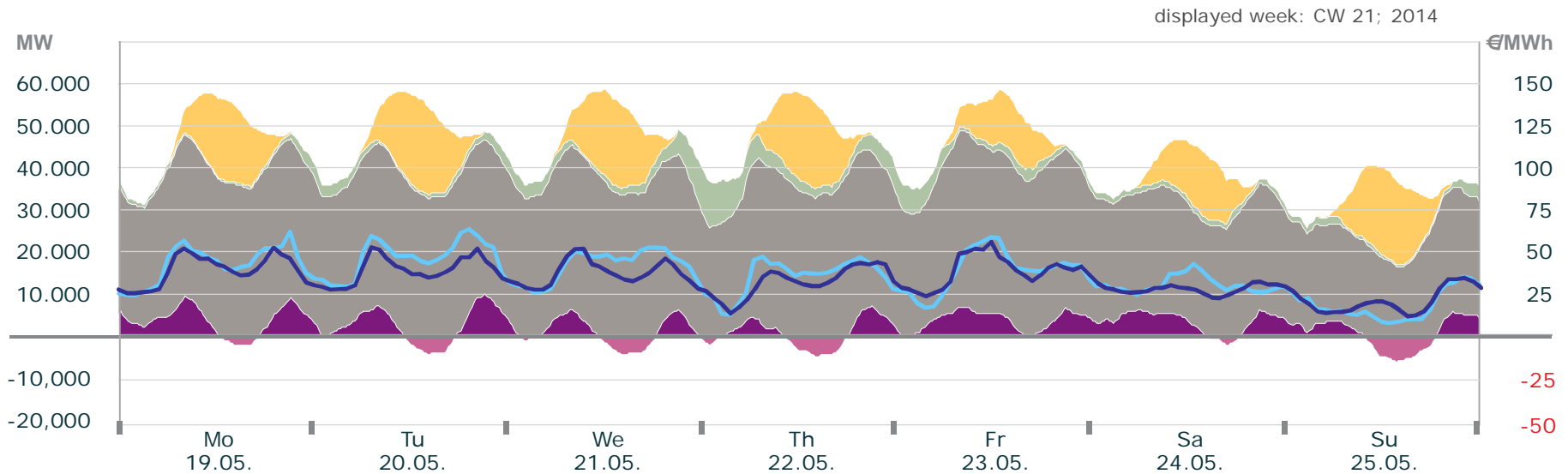
Electricity Production and Spot-Prices: CW 20 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 32.43 | 12.10 | 60.10 | 4 726 |
| Intraday | 33.06 | 8.90 | 63.20 | 409 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

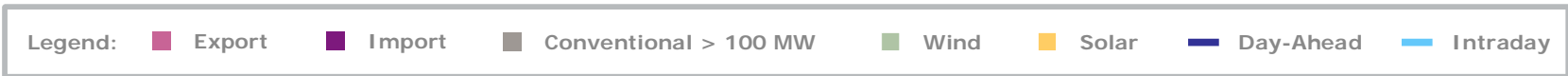
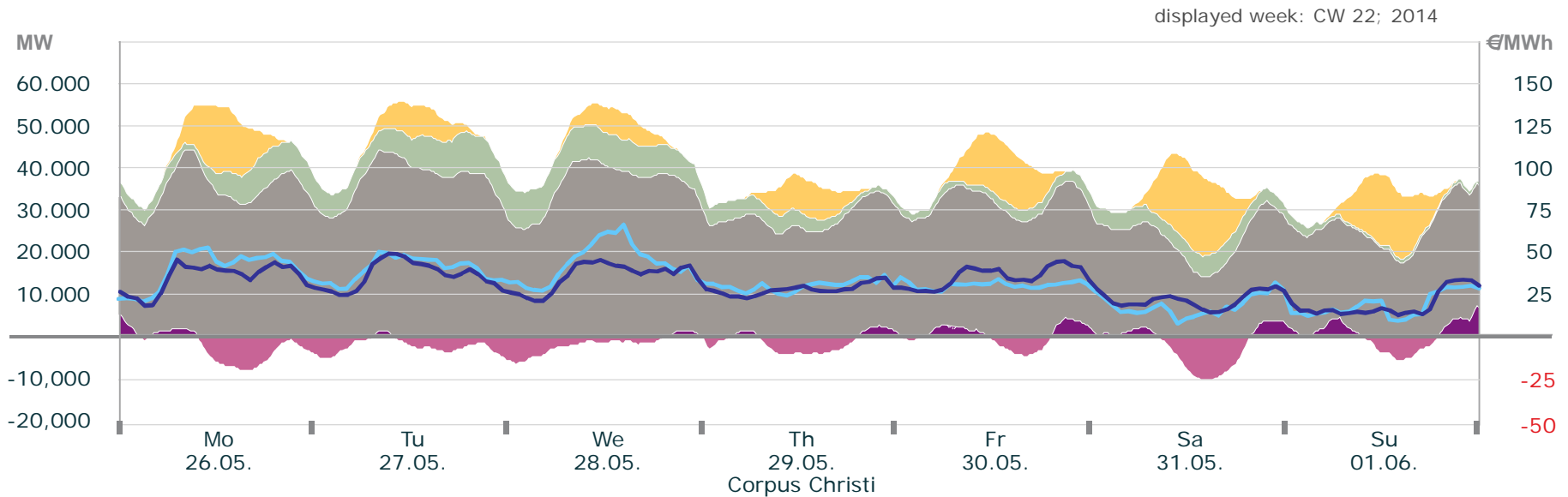
Electricity Production and Spot-Prices: CW 21 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 35.11 | 13.40 | 57.00 | 4 881 |
| Intraday | 41.06 | 9.50 | 64.60 | 409 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

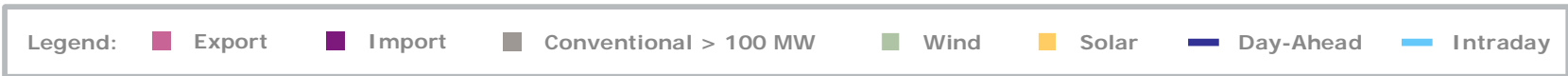
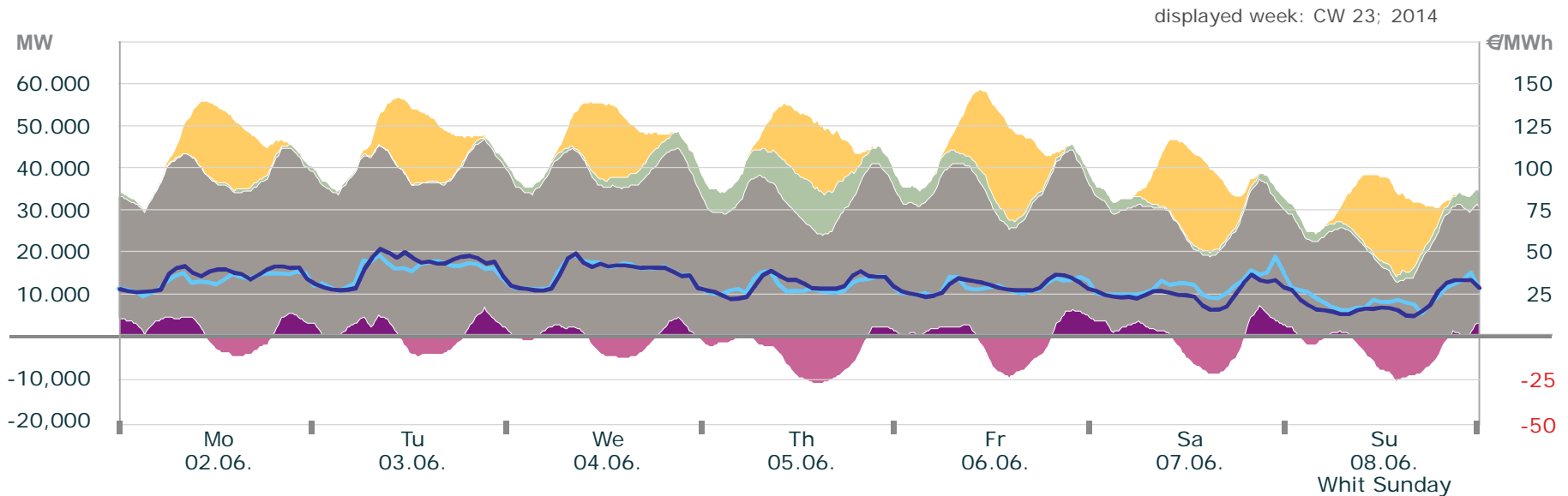
Electricity Production and Spot-Prices: CW 22 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 31.87 | 14.00 | 50.00 | 4 699 |
| Intraday | 36.25 | 9.40 | 67.40 | 379 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

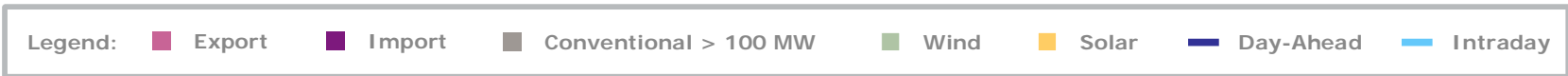
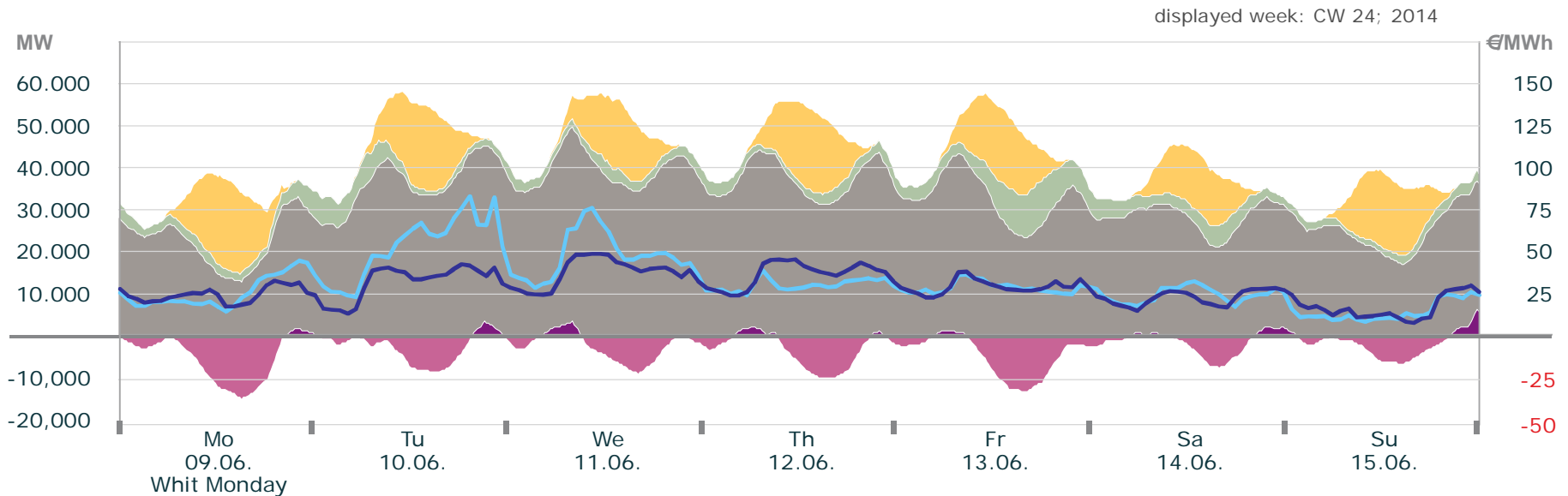
Electricity Production and Spot-Prices: CW 23 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 33.09 | 13.70 | 53.10 | 4 556 |
| Intraday | 33.51 | 14.90 | 49.50 | 308 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

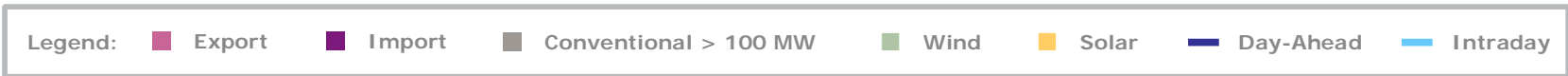
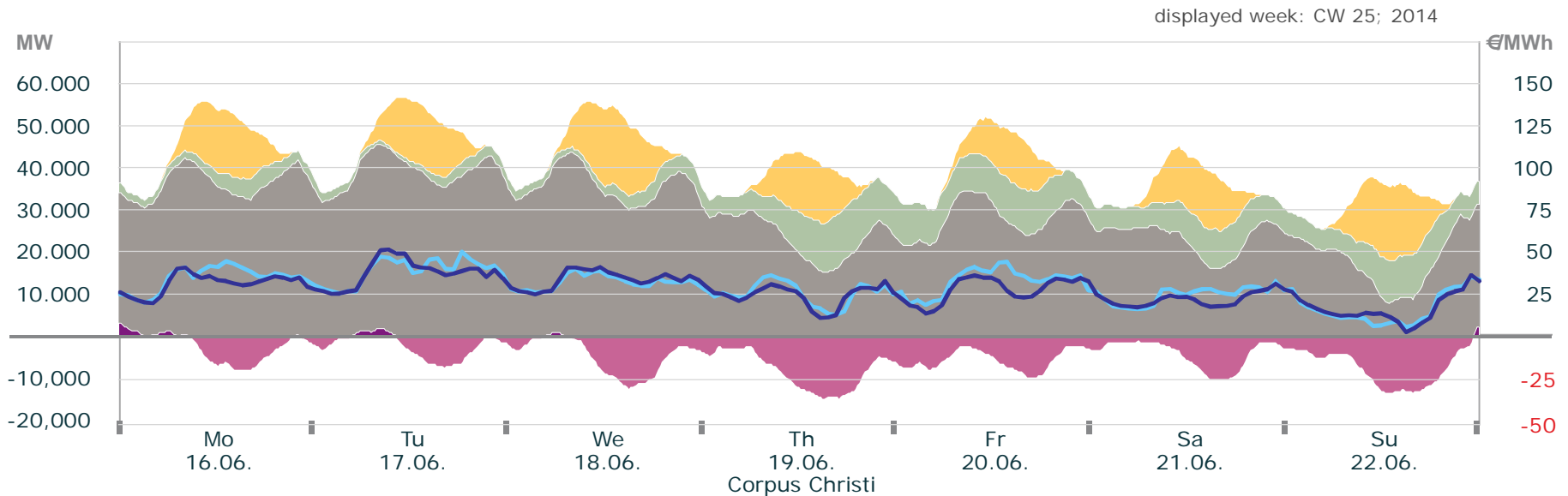
Electricity Production and Spot-Prices: CW 24 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 30.37 | 9.30 | 49.90 | 4 976 |
| Intraday | 37.74 | 10.30 | 84.00 | 397 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

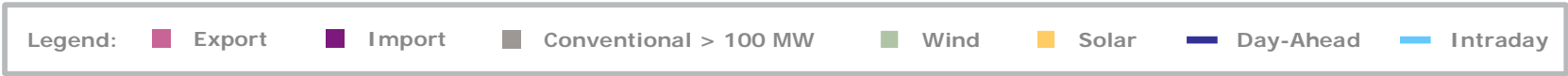
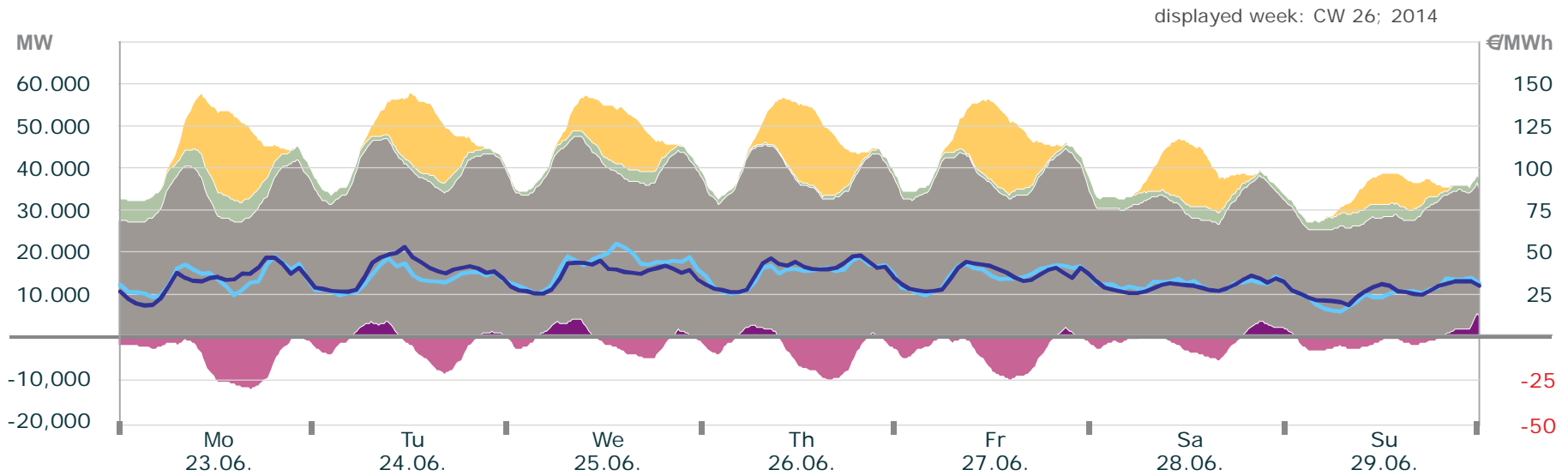
Electricity Production and Spot-Prices: CW 25 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|-------------|--------------|---------------|
| Day-Ahead | 28.77 | 4.00 | 52.40 | 4 980 |
| Intraday | 32.61 | 7.00 | 51.10 | 398 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

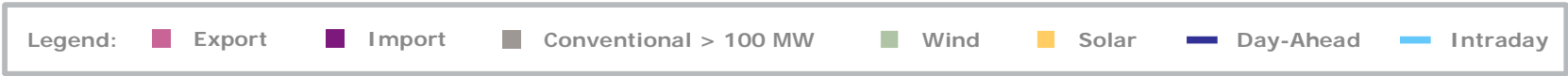
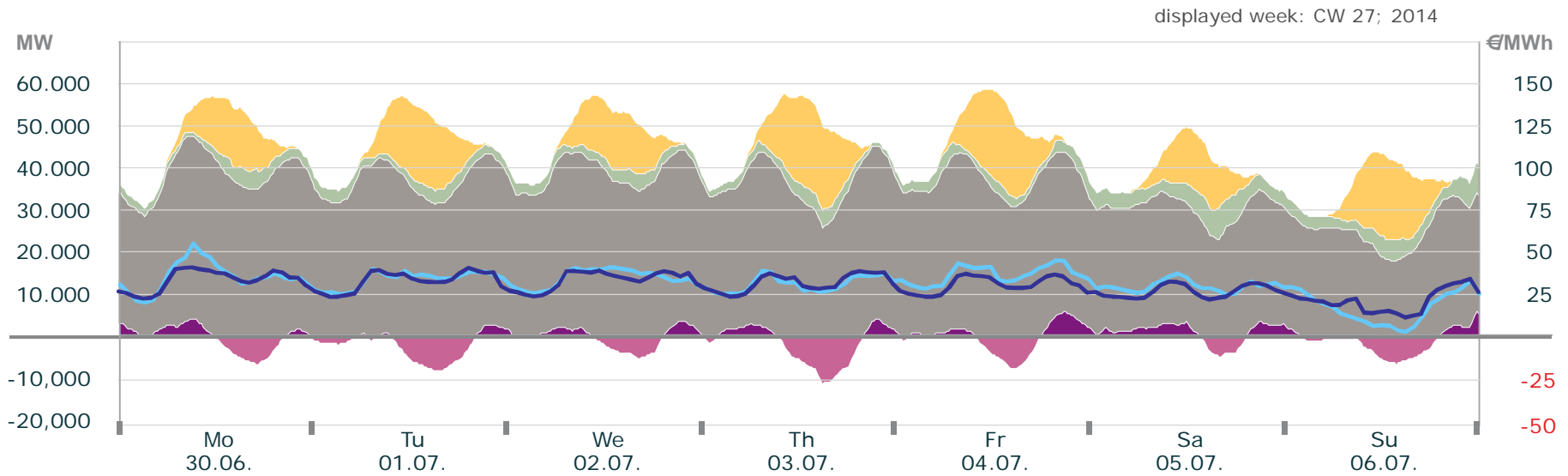
Electricity Production and Spot-Prices: CW 26 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 36.25 | 19.90 | 54.10 | 4 740 |
| Intraday | 36.88 | 16.30 | 55.90 | 355 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

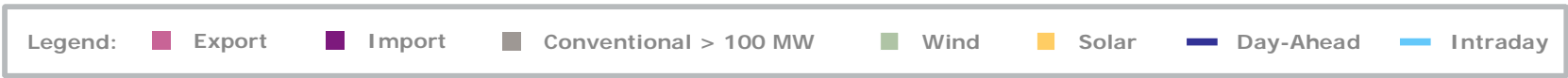
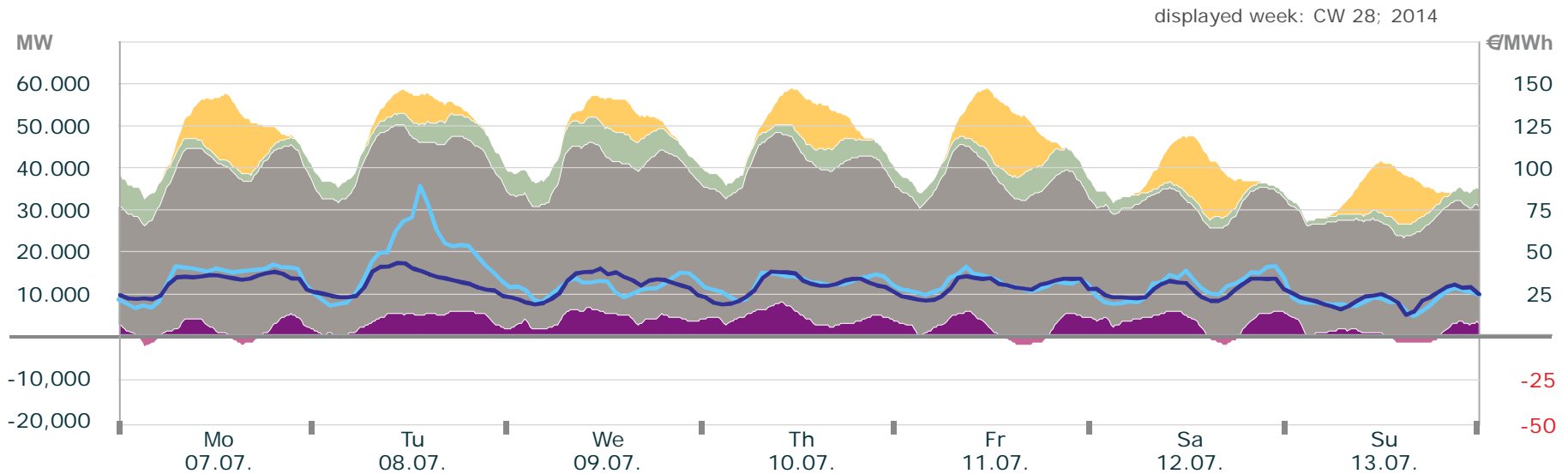
Electricity Production and Spot-Prices: CW 27 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 31.68 | 12.80 | 42.30 | 4 760 |
| Intraday | 33.65 | 4.30 | 56.10 | 419 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

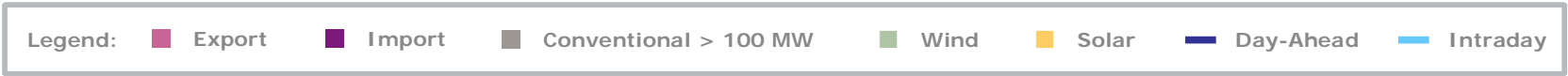
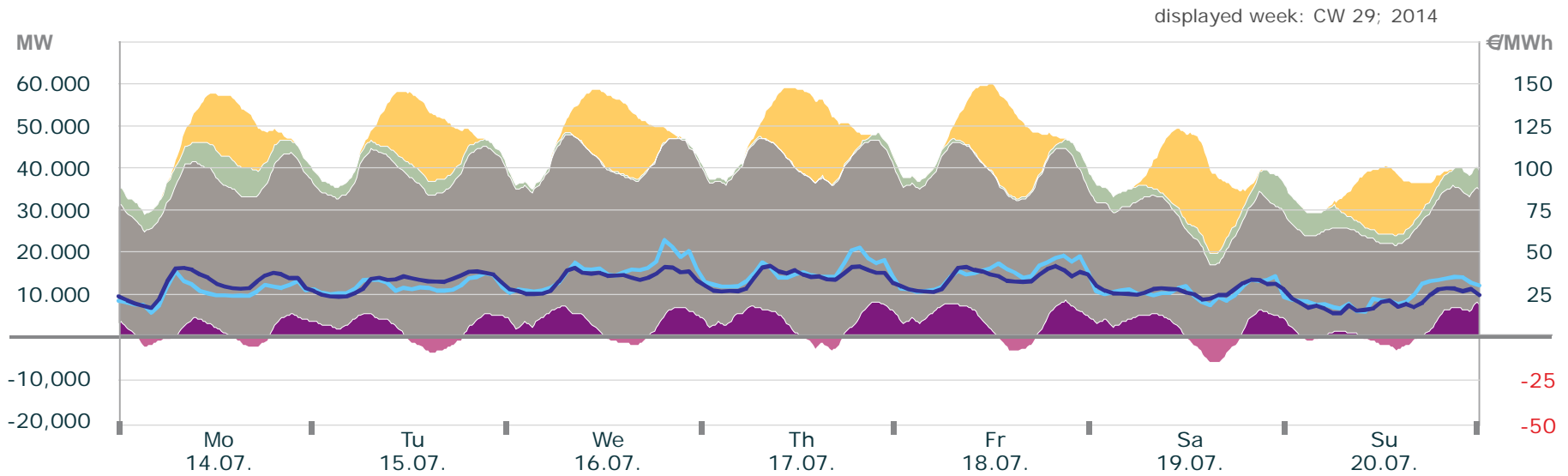
Electricity Production and Spot-Prices: CW 28 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 31.48 | 15.00 | 45.10 | 4 579 |
| Intraday | 37.17 | 13.50 | 89.90 | 446 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

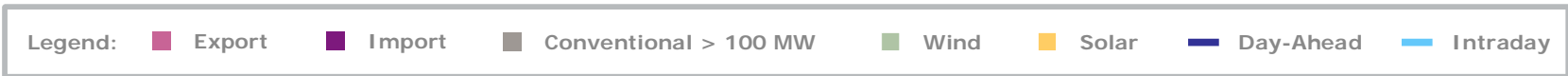
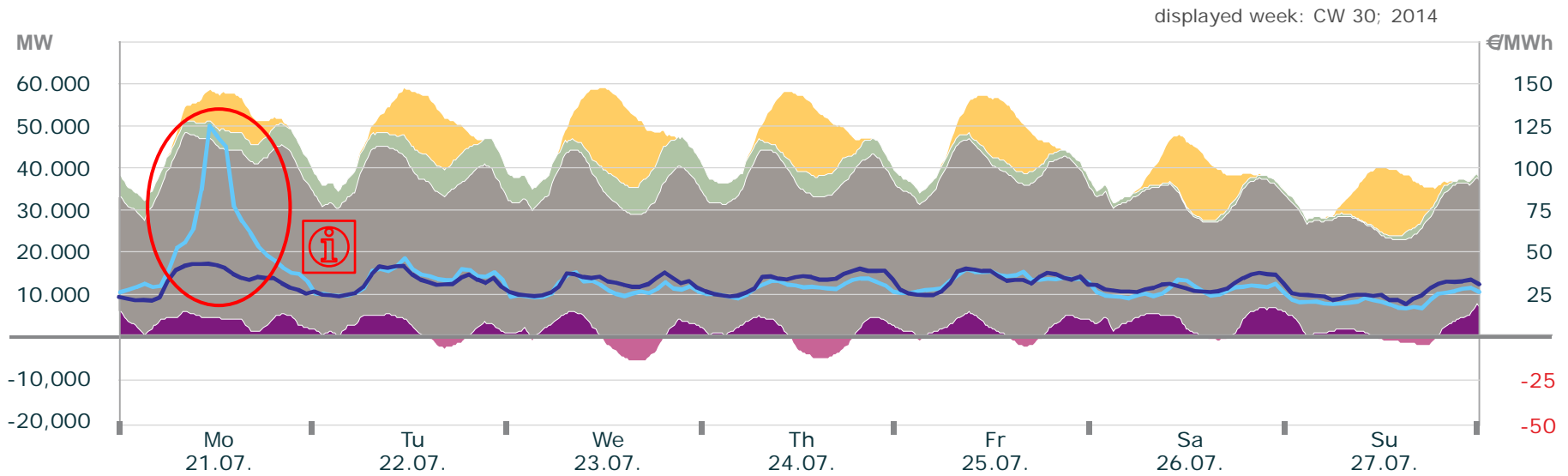
Electricity Production and Spot-Prices: CW 29 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 32.18 | 15.30 | 43.00 | 4 882 |
| Intraday | 34.02 | 15.60 | 58.10 | 362 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

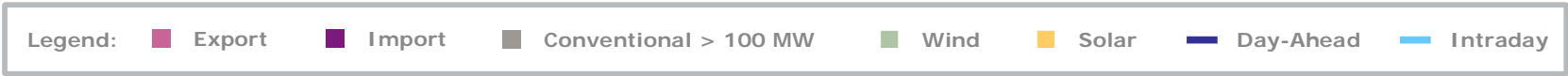
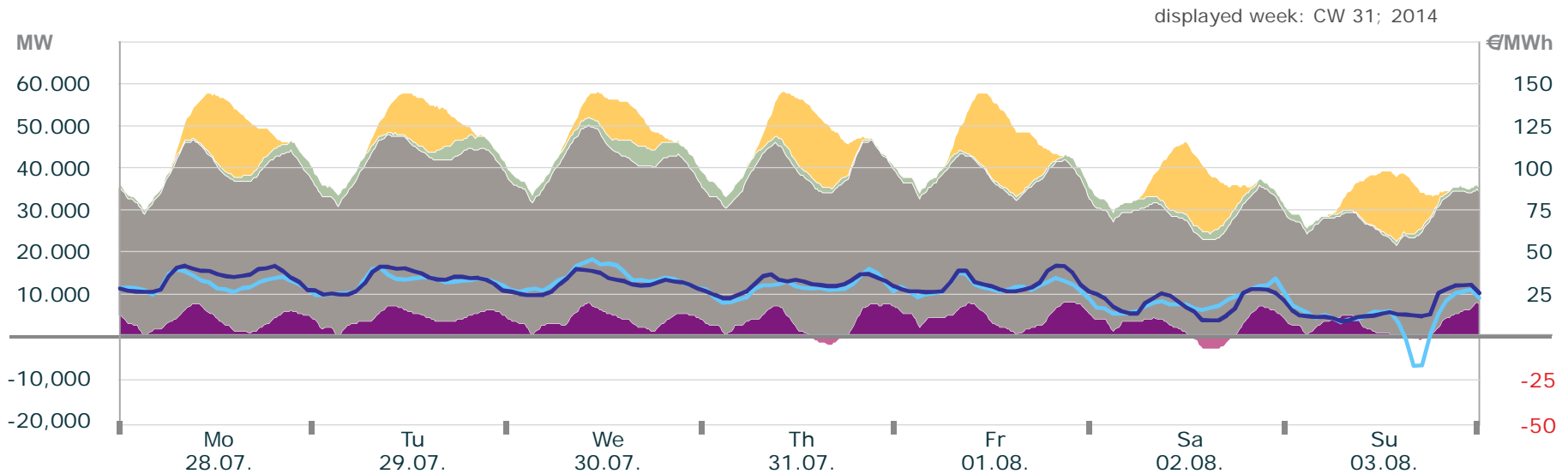
Electricity Production and Spot-Prices: CW 30 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|---------------|---------------|
| Day-Ahead | 32.81 | 20.60 | 44.30 | 4 674 |
| Intraday | 40.83 | 18.10 | 125.10 | 427 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

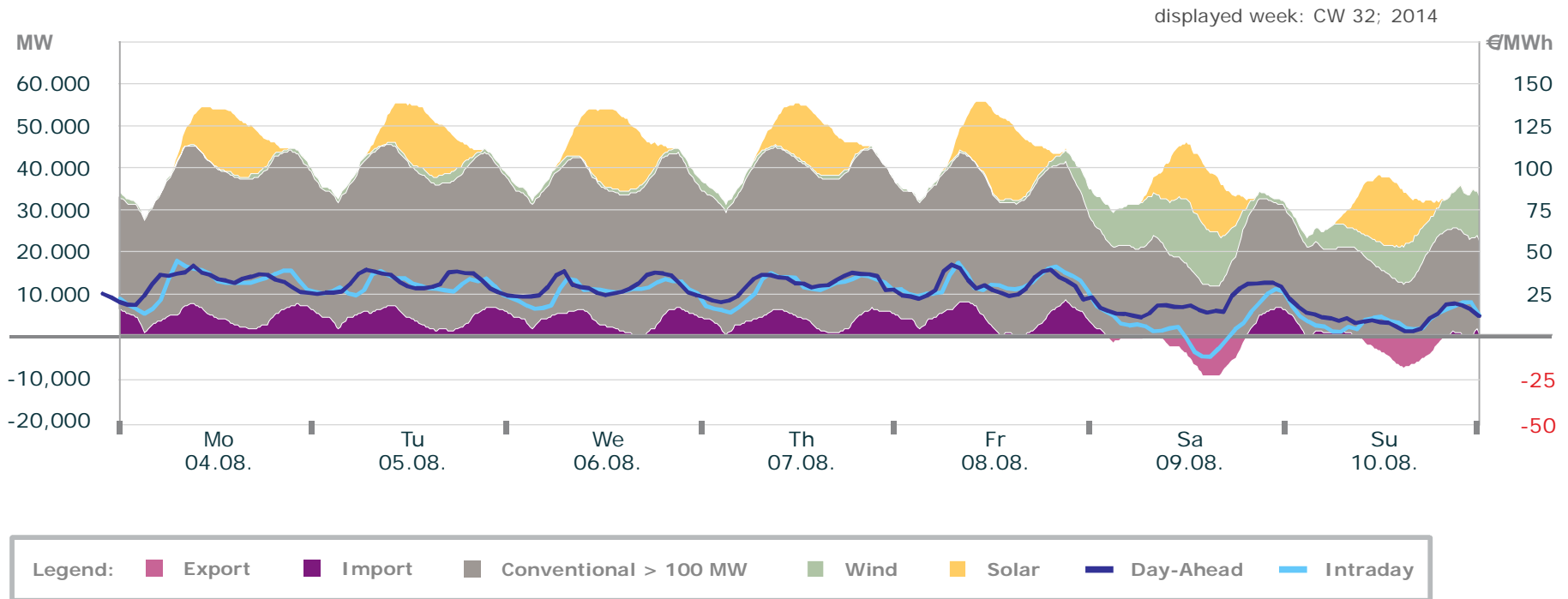
Electricity Production and Spot-Prices: CW 31 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 29.35 | 10.60 | 43.00 | 4 419 |
| Intraday | 28.39 | -15.80 | 46.80 | 362 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

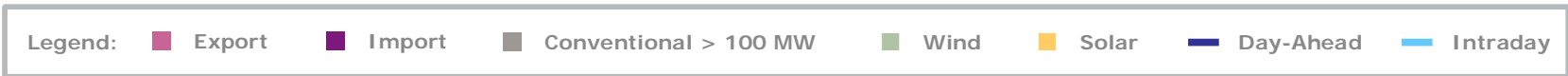
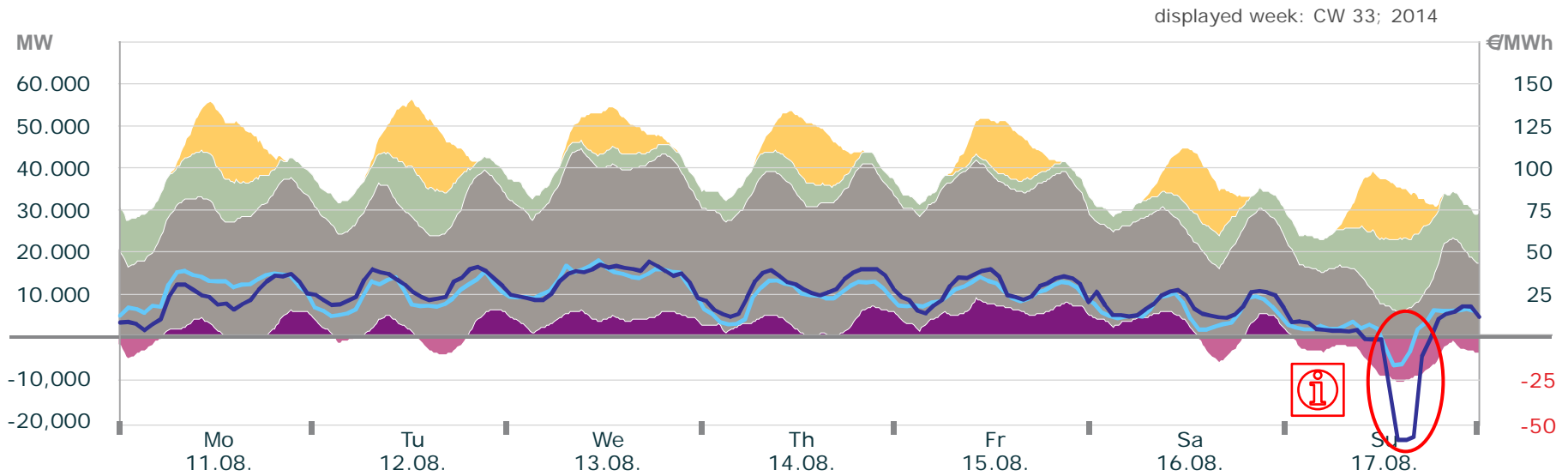
Electricity Production and Spot-Prices: CW 32 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 27.65 | 4.90 | 44.00 | 4 387 |
| Intraday | 23.21 | -10.40 | 45.90 | 431 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

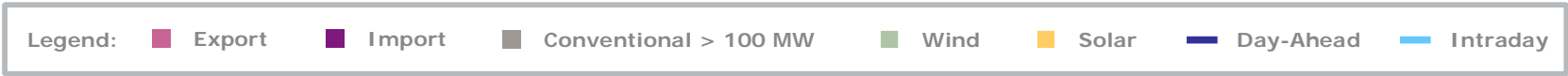
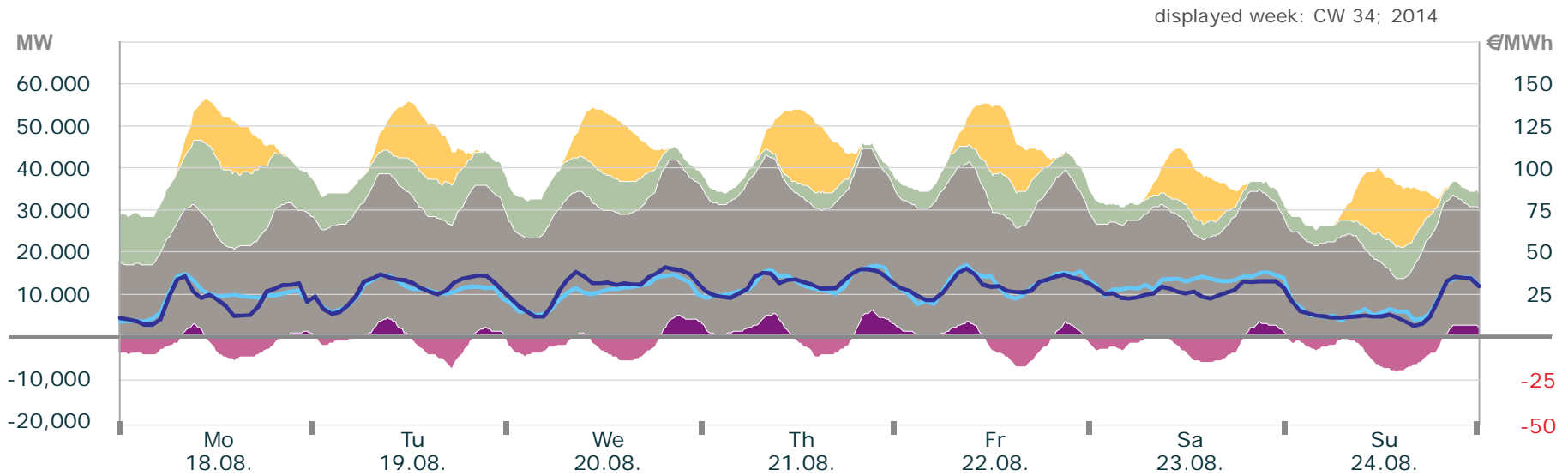
Electricity Production and Spot-Prices: CW 33 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 22.70 | -59.00 | 45.50 | 5 118 |
| Intraday | 24.79 | -15.20 | 46.20 | 459 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

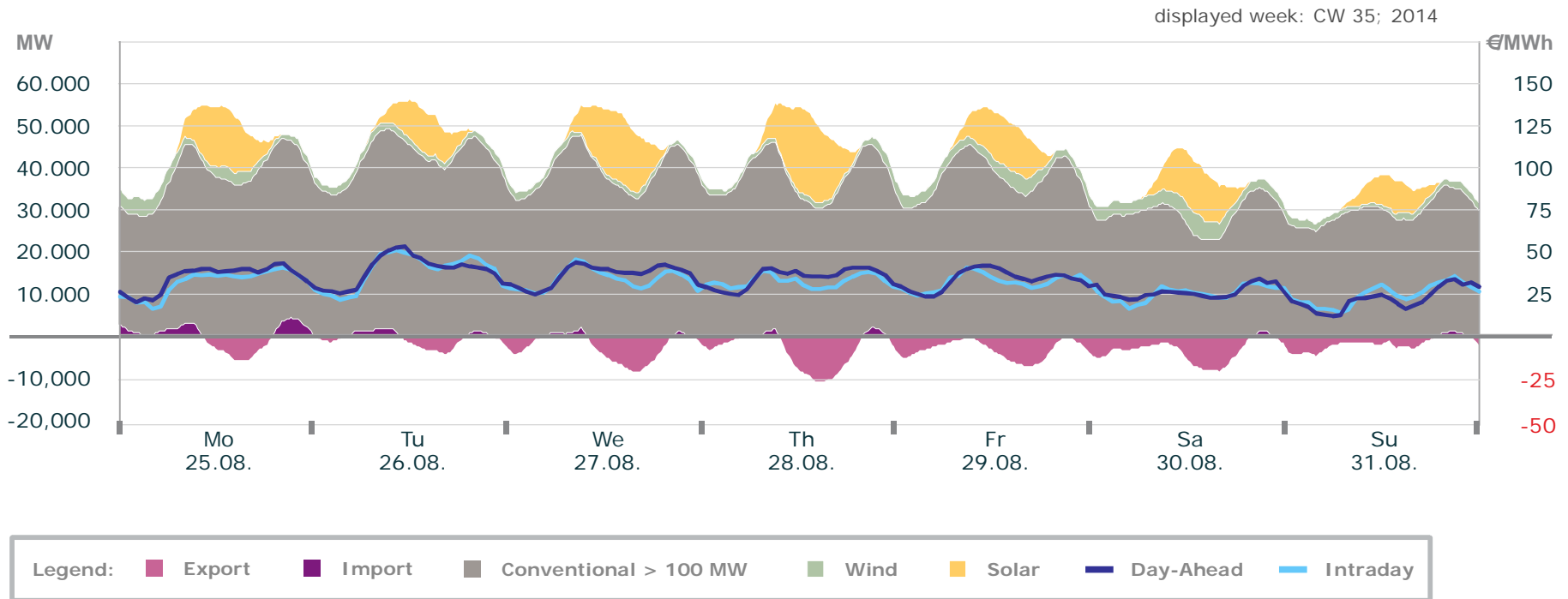
Electricity Production and Spot-Prices: CW 34 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 27.35 | 7.90 | 42.30 | 5 111 |
| Intraday | 29.22 | 10.20 | 43.50 | 404 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

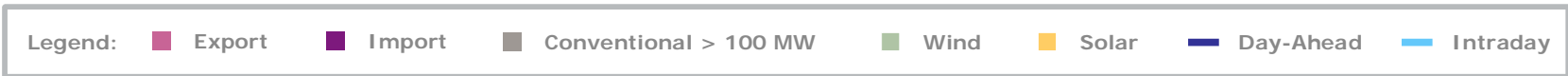
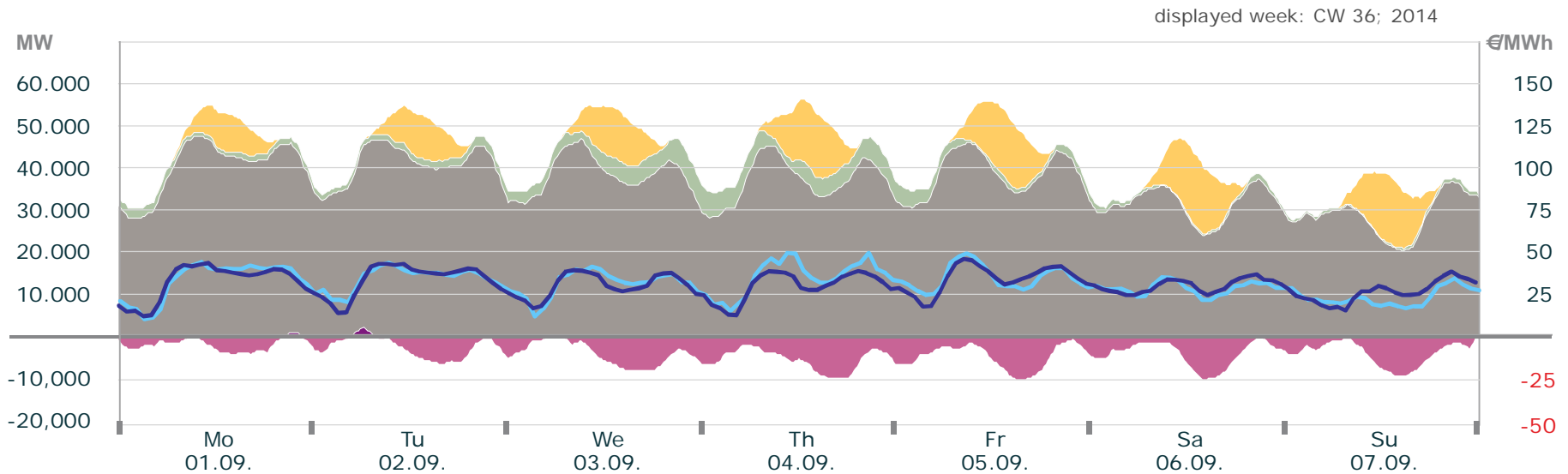
Electricity Production and Spot-Prices: CW 35 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 34.37 | 13.50 | 54.30 | 4 449 |
| Intraday | 33.42 | 15.20 | 52.00 | 355 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

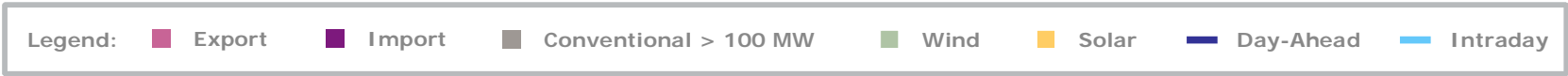
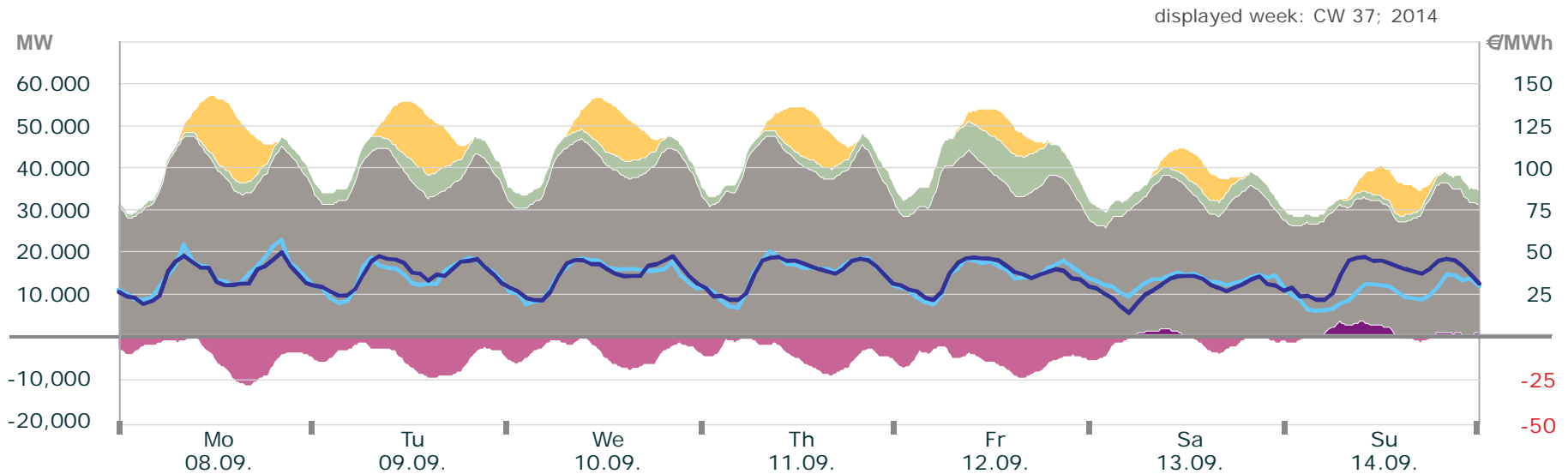
Electricity Production and Spot-Prices: CW 36 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 32.69 | 13.50 | 47.00 | 4 497 |
| Intraday | 33.51 | 11.70 | 50.60 | 353 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

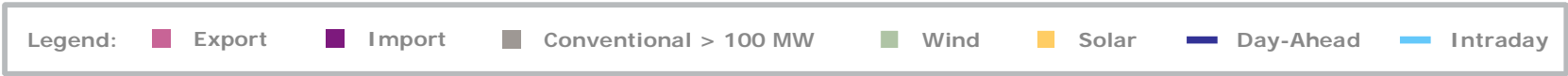
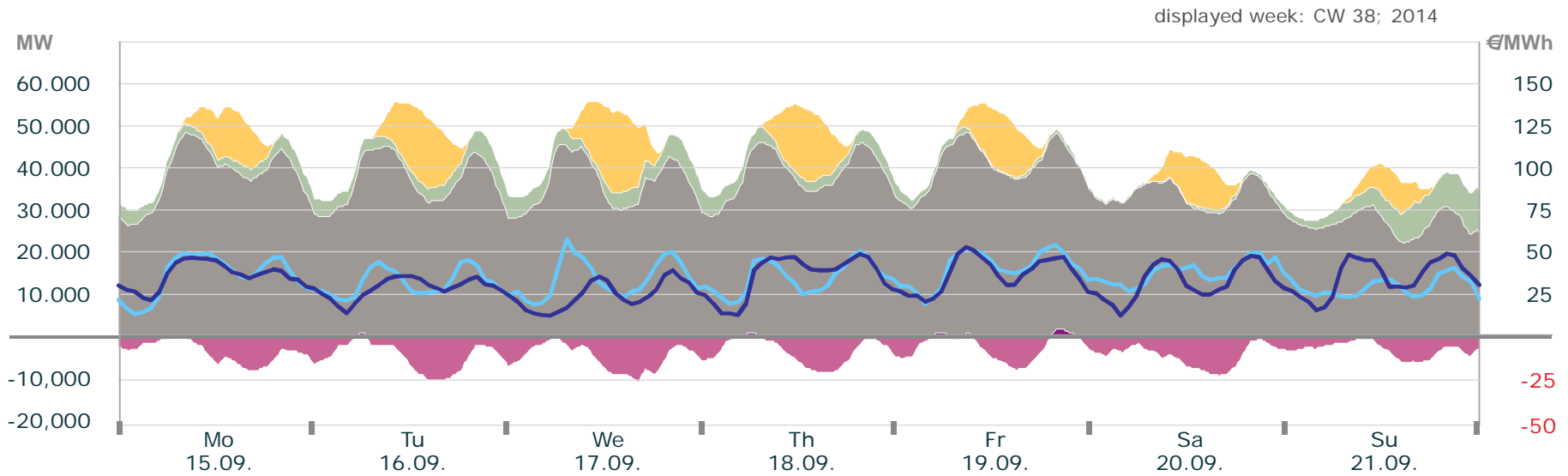
Electricity Production and Spot-Prices: CW 37 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 37.04 | 15.30 | 51.00 | 4 589 |
| Intraday | 37.34 | 16.70 | 58.30 | 421 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

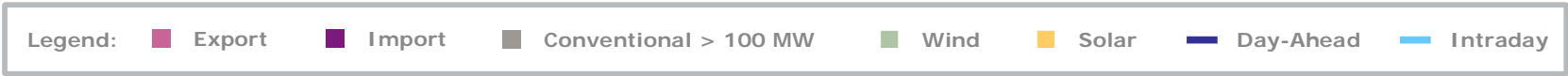
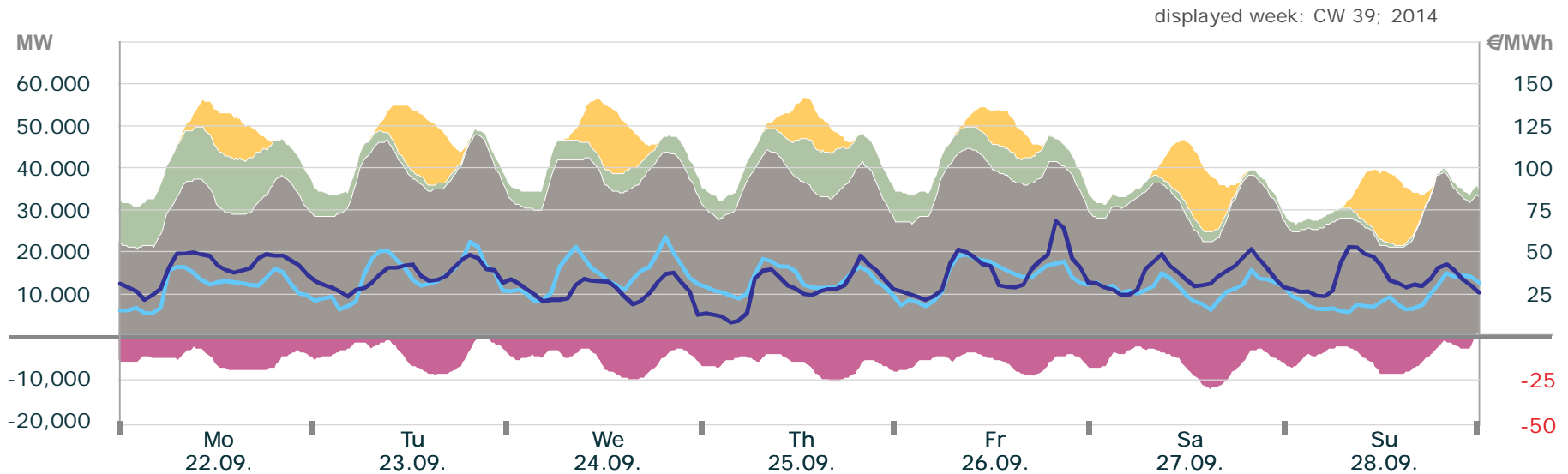
Electricity Production and Spot-Prices: CW 38 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 34.56 | 13.80 | 54.10 | 4 721 |
| Intraday | 37.67 | 14.80 | 58.70 | 401 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

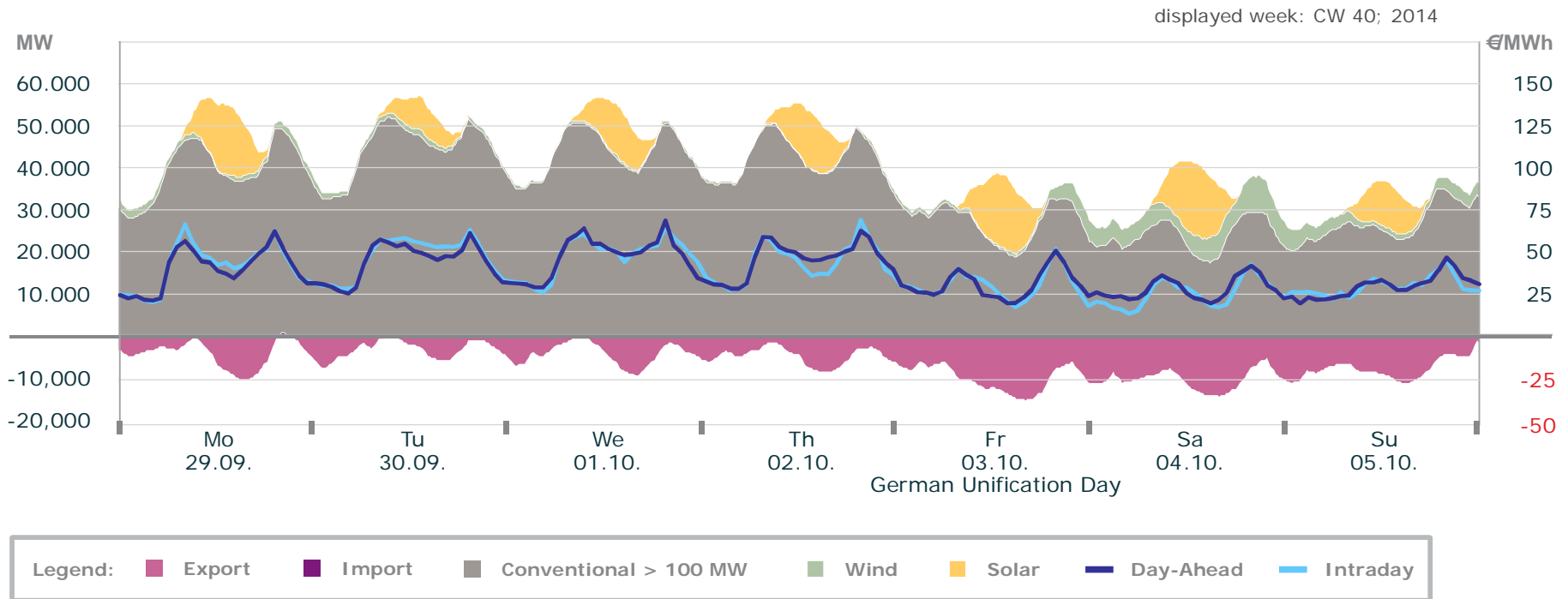
Electricity Production and Spot-Prices: CW 39 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 36.09 | 9.80 | 69.30 | 5 129 |
| Intraday | 35.01 | 15.30 | 60.00 | 447 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

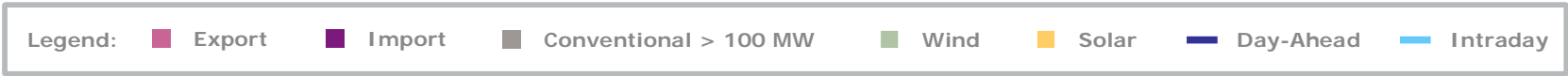
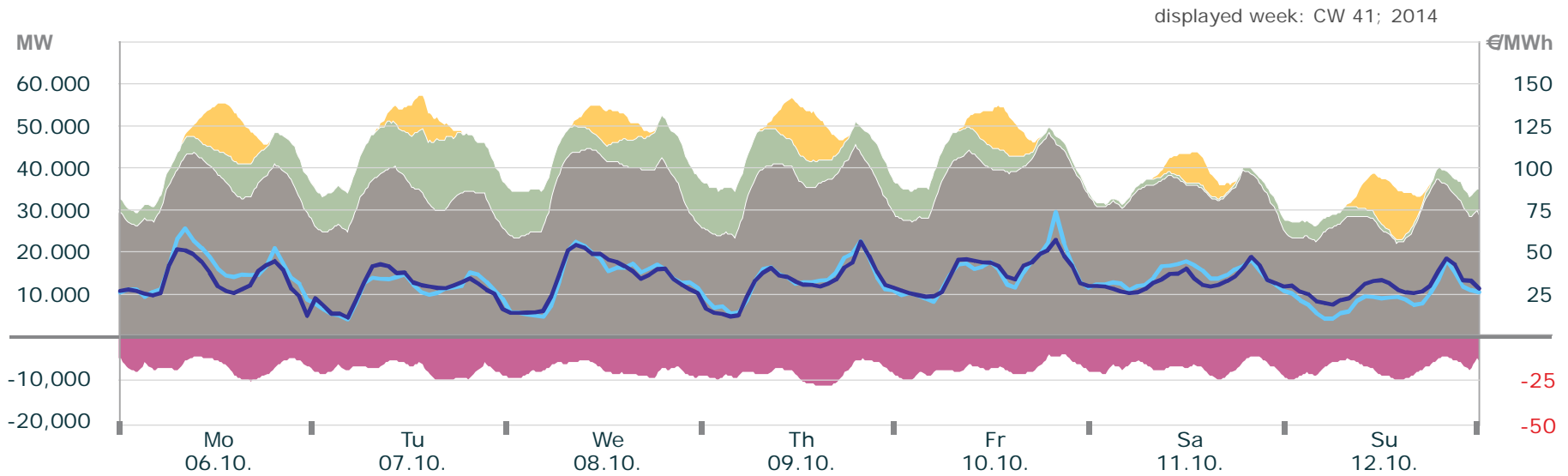
Electricity Production and Spot-Prices: CW 40 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 38.77 | 20.90 | 69.50 | 5 039 |
| Intraday | 43.76 | 14.90 | 69.80 | 381 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

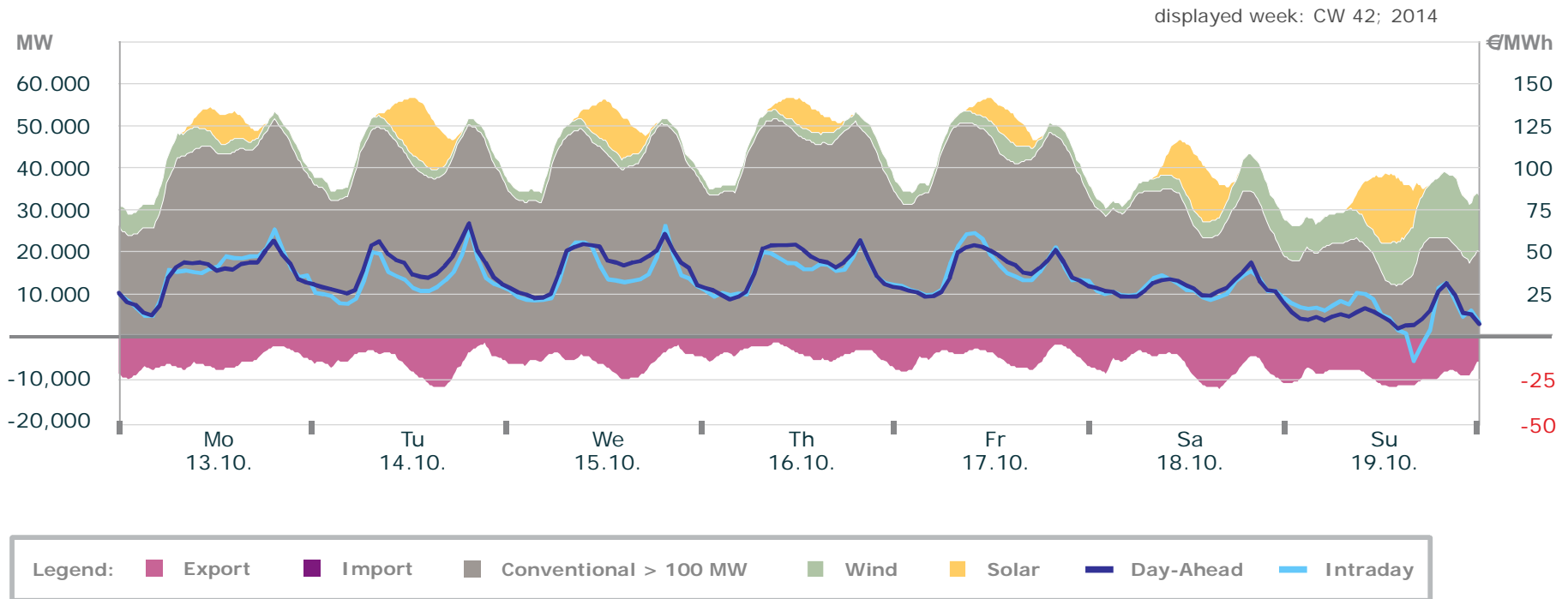
Electricity Production and Spot-Prices: CW 41 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 34.10 | 12.80 | 58.40 | 5 155 |
| Intraday | 35.80 | 11.70 | 74.60 | 387 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

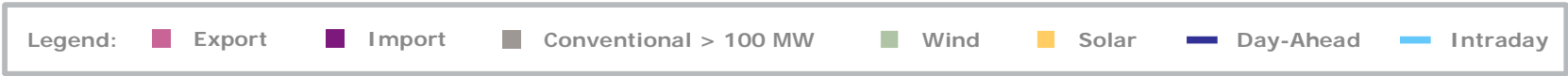
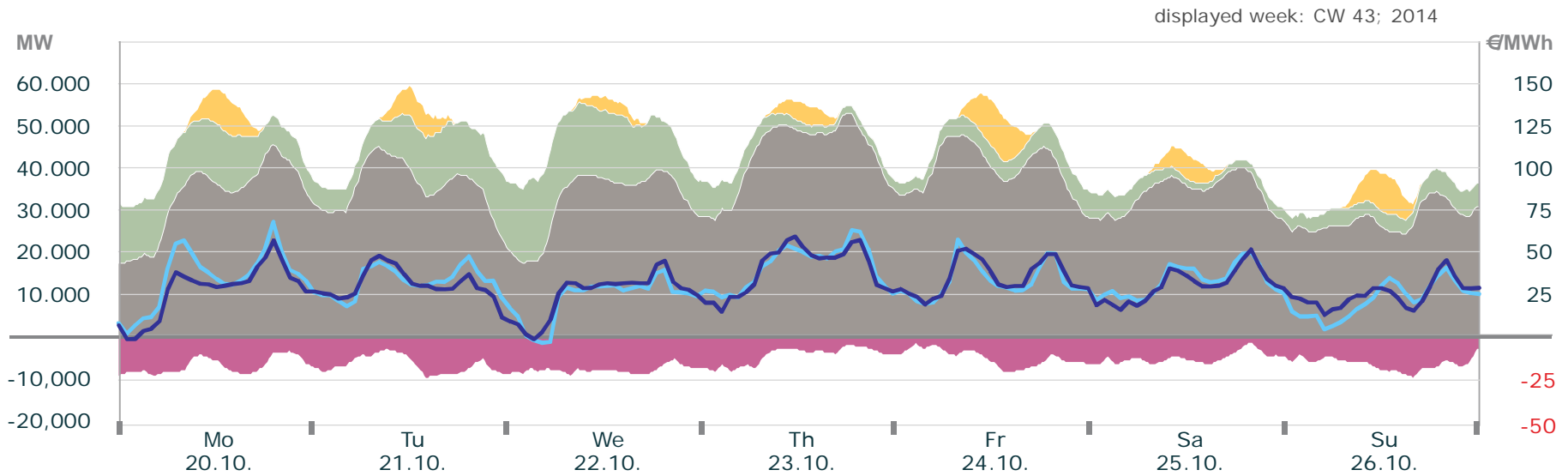
Electricity Production and Spot-Prices: CW 42 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 35.09 | 6.20 | 67.80 | 4 920 |
| Intraday | 35.35 | -12.90 | 66.40 | 382 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

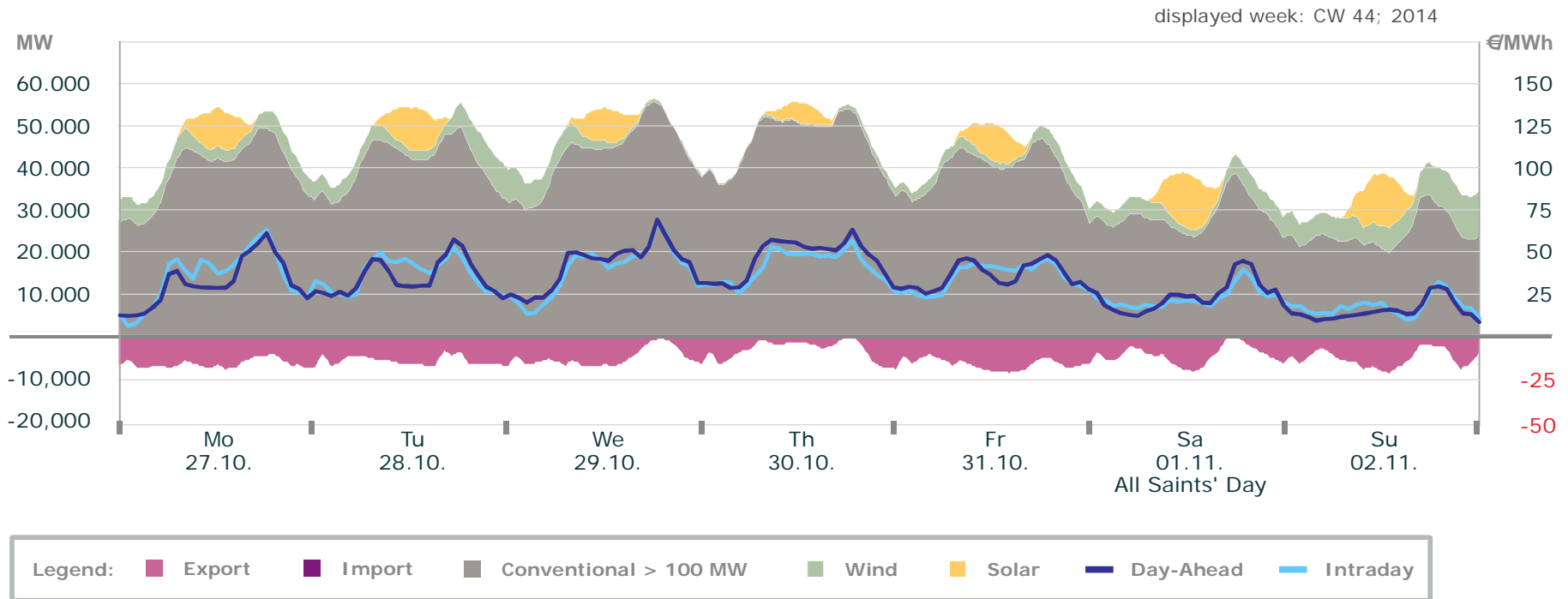
Electricity Production and Spot-Prices: CW 43 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 31.78 | 0.10 | 60.30 | 5 240 |
| Intraday | 35.43 | -2.00 | 68.80 | 373 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

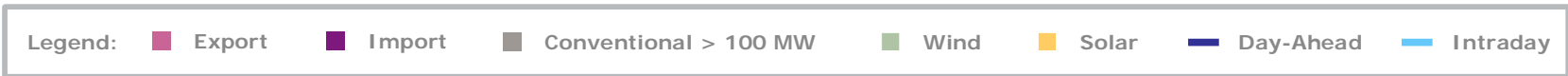
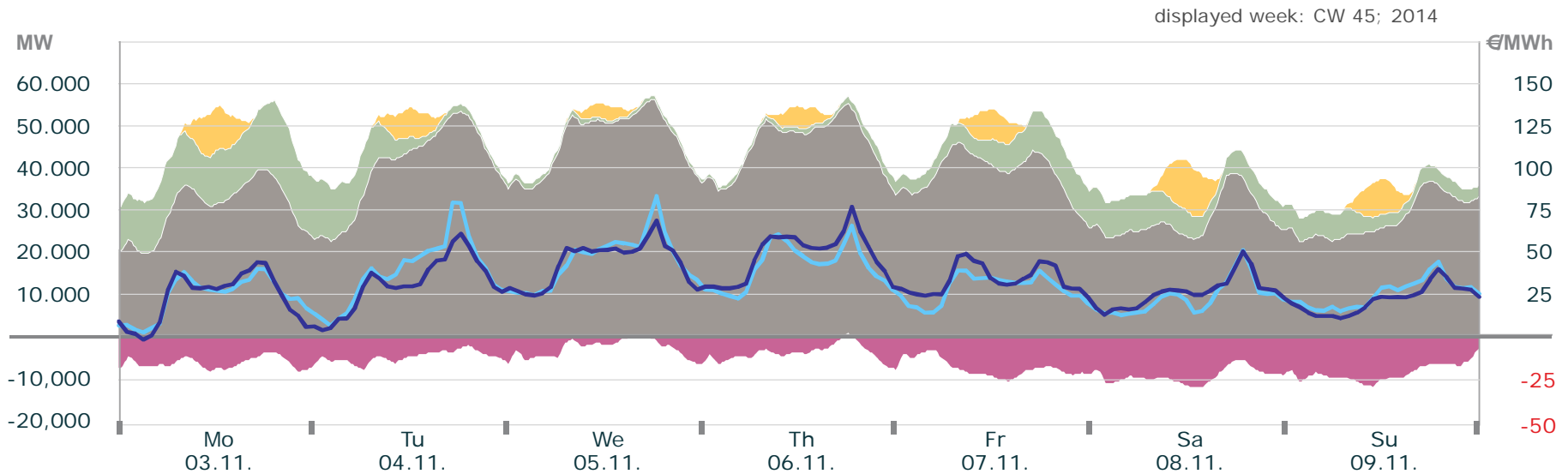
Electricity Production and Spot-Prices: CW 44 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 34.12 | 10.00 | 70.00 | 5 317 |
| Intraday | 37.62 | 7.70 | 68.80 | 410 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

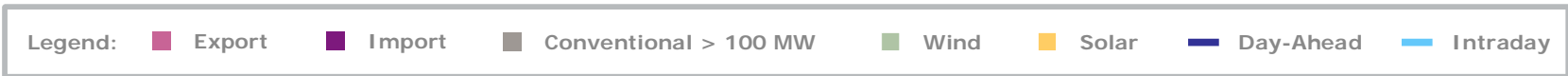
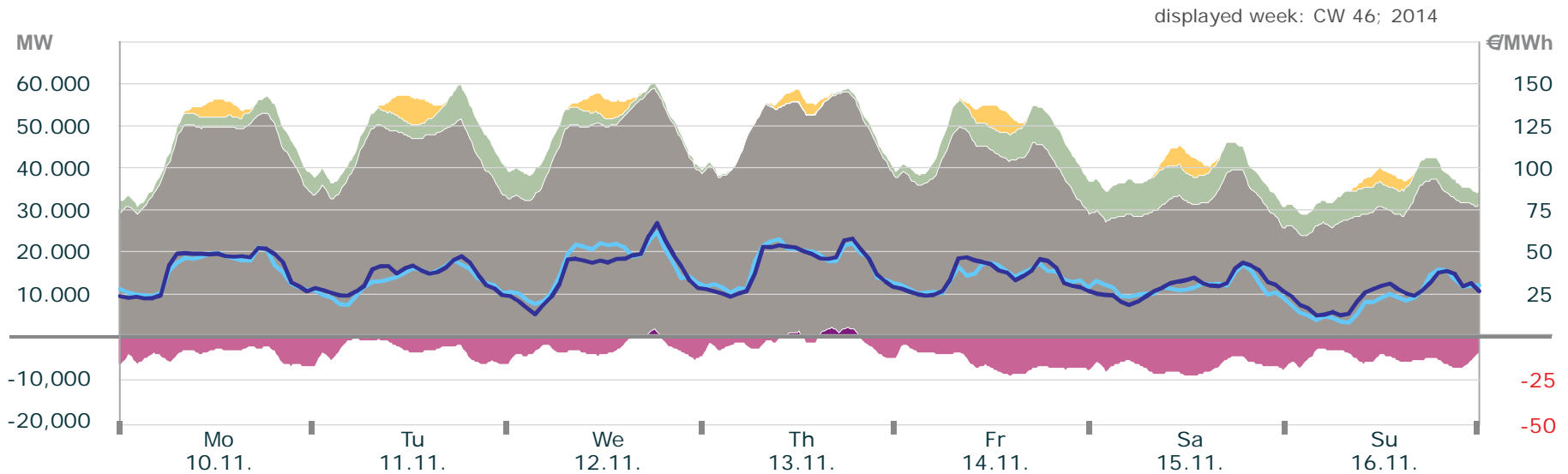
Electricity Production and Spot-Prices: CW 45 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|-------------|--------------|---------------|
| Day-Ahead | 33.64 | 0.10 | 77.90 | 5 370 |
| Intraday | 38.00 | 3.90 | 83.90 | 470 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

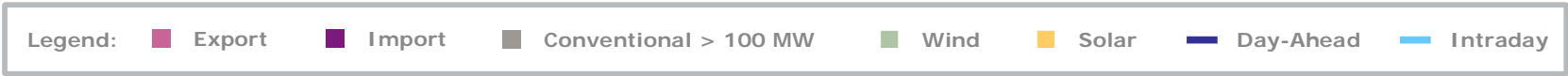
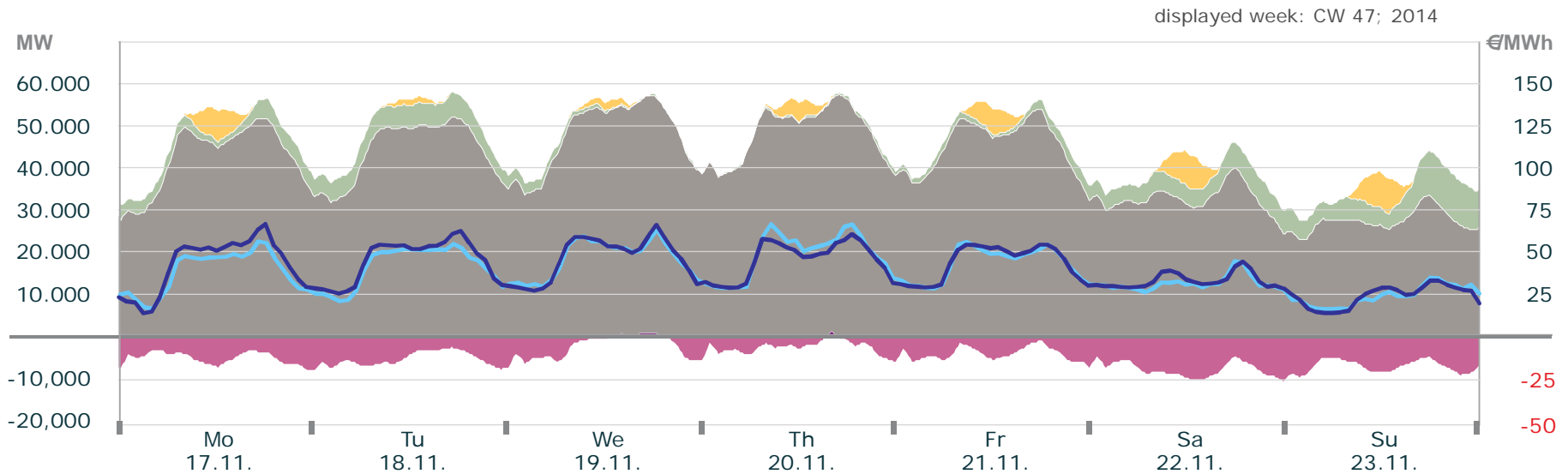
Electricity Production and Spot-Prices: CW 46 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 36.71 | 13.90 | 68.10 | 5 129 |
| Intraday | 39.23 | 9.70 | 62.60 | 353 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

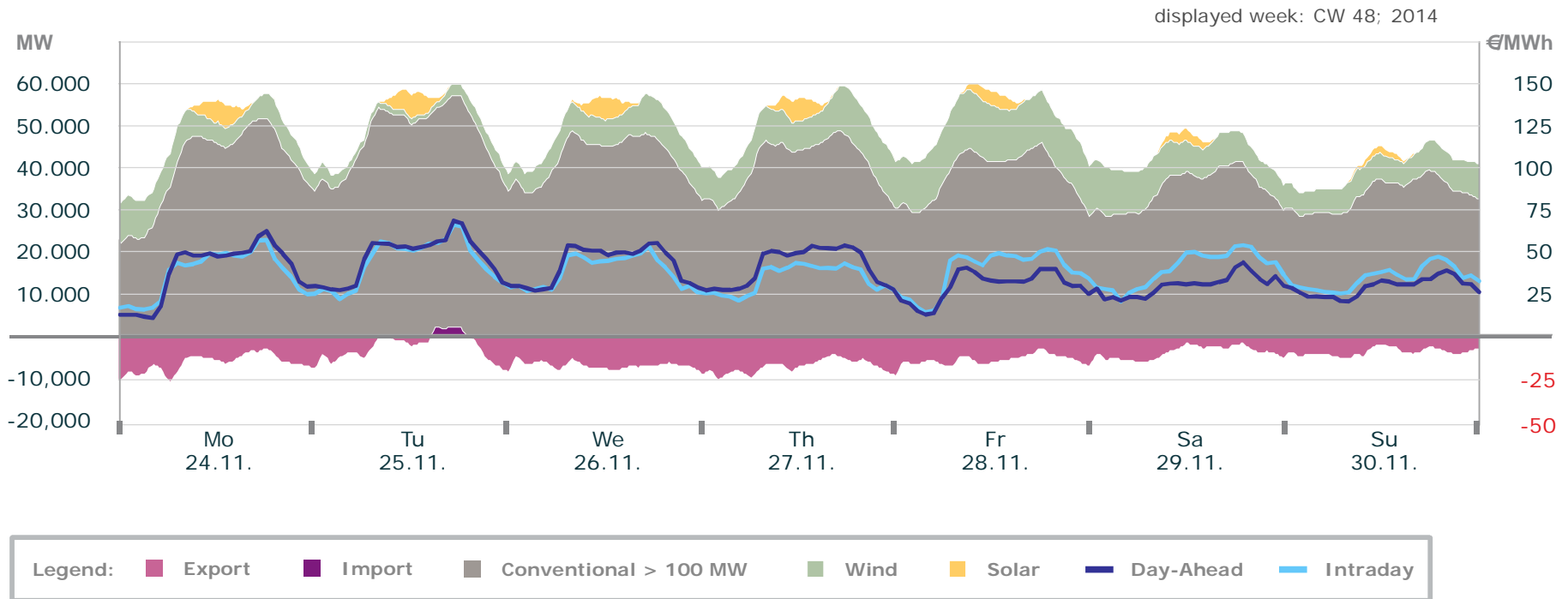
Electricity Production and Spot-Prices: CW 47 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 41.32 | 15.20 | 67.50 | 4 884 |
| Intraday | 43.53 | 17.50 | 67.40 | 397 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

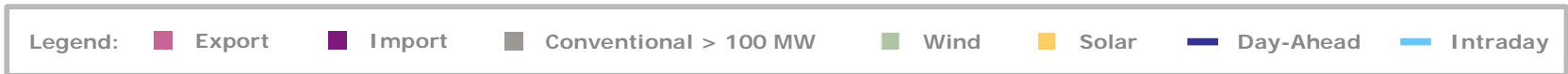
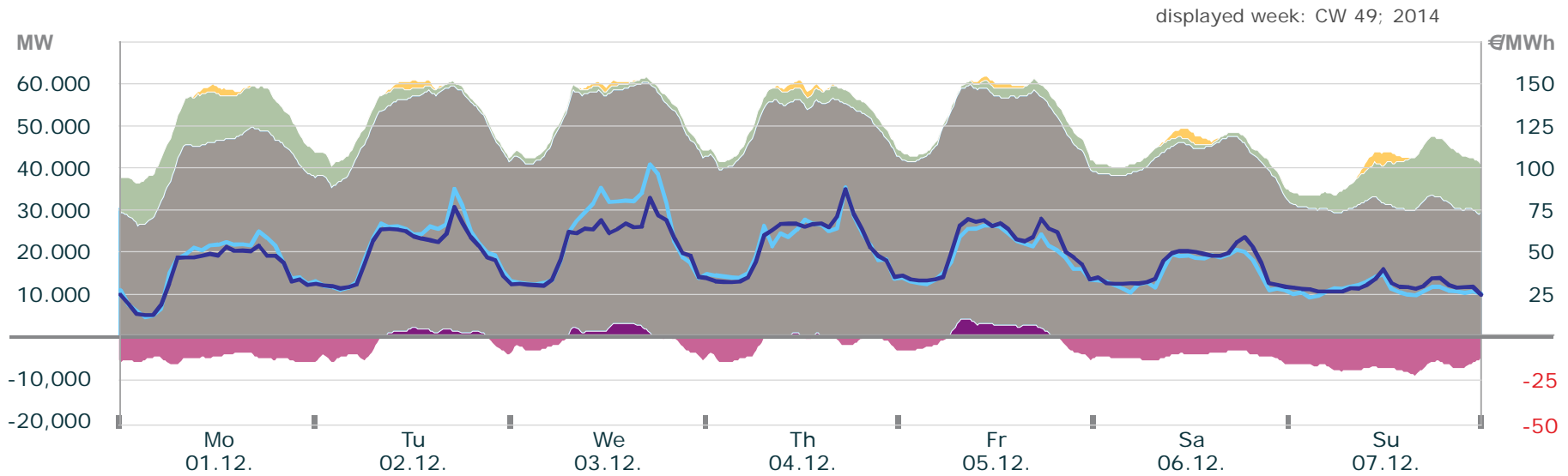
Electricity Production and Spot-Prices: CW 48 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 38.20 | 12.30 | 69.40 | 5 242 |
| Intraday | 42.59 | 15.60 | 67.20 | 503 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

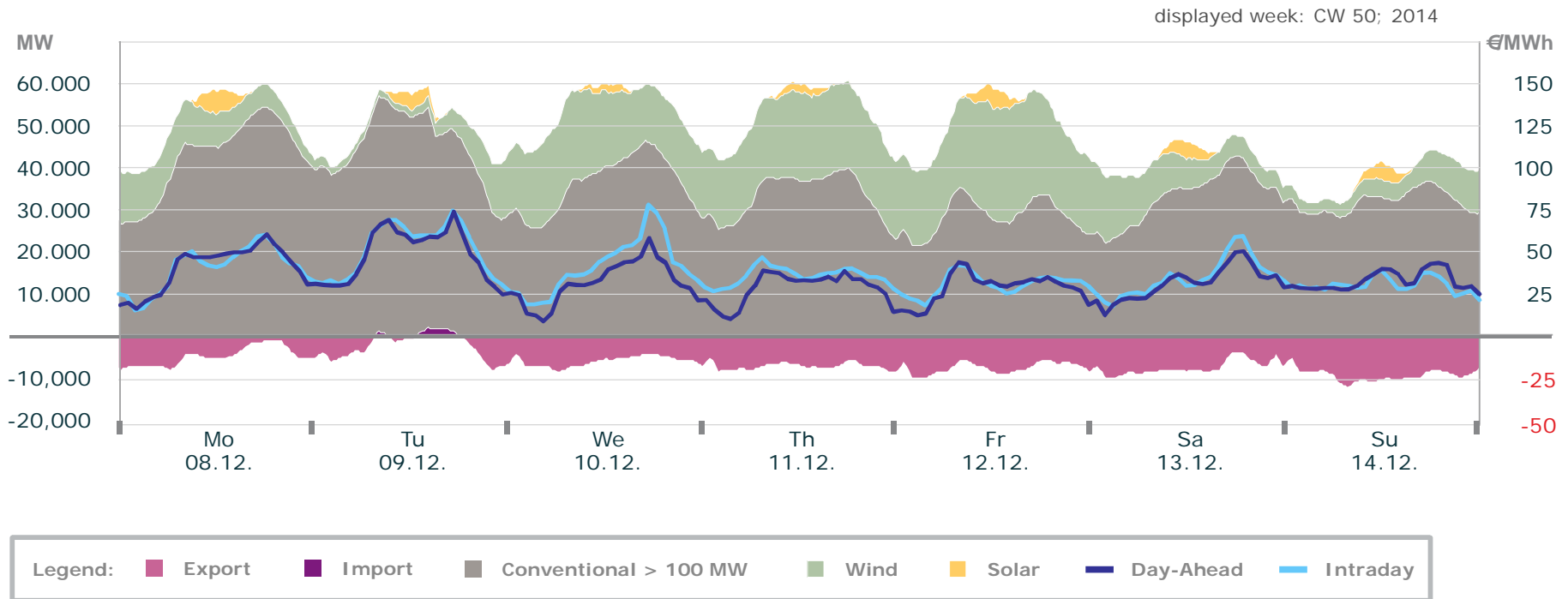
Electricity Production and Spot-Prices: CW 49 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|---------------|---------------|
| Day-Ahead | 47.65 | 14.30 | 88.00 | 4 928 |
| Intraday | 53.44 | 13.10 | 102.50 | 418 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

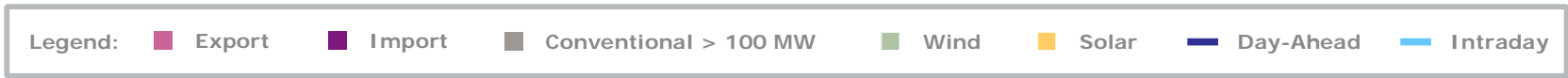
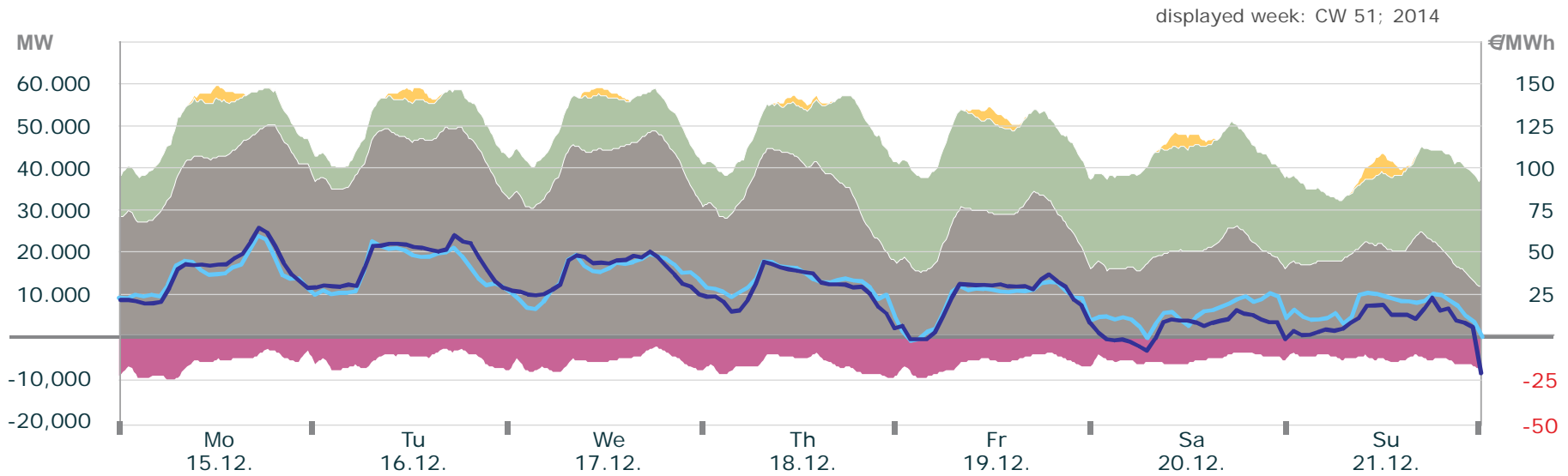
Electricity Production and Spot-Prices: CW 50 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|--------------|--------------|---------------|
| Day-Ahead | 35.52 | 10.40 | 74.70 | 5 714 |
| Intraday | 41.58 | 16.90 | 78.70 | 539 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

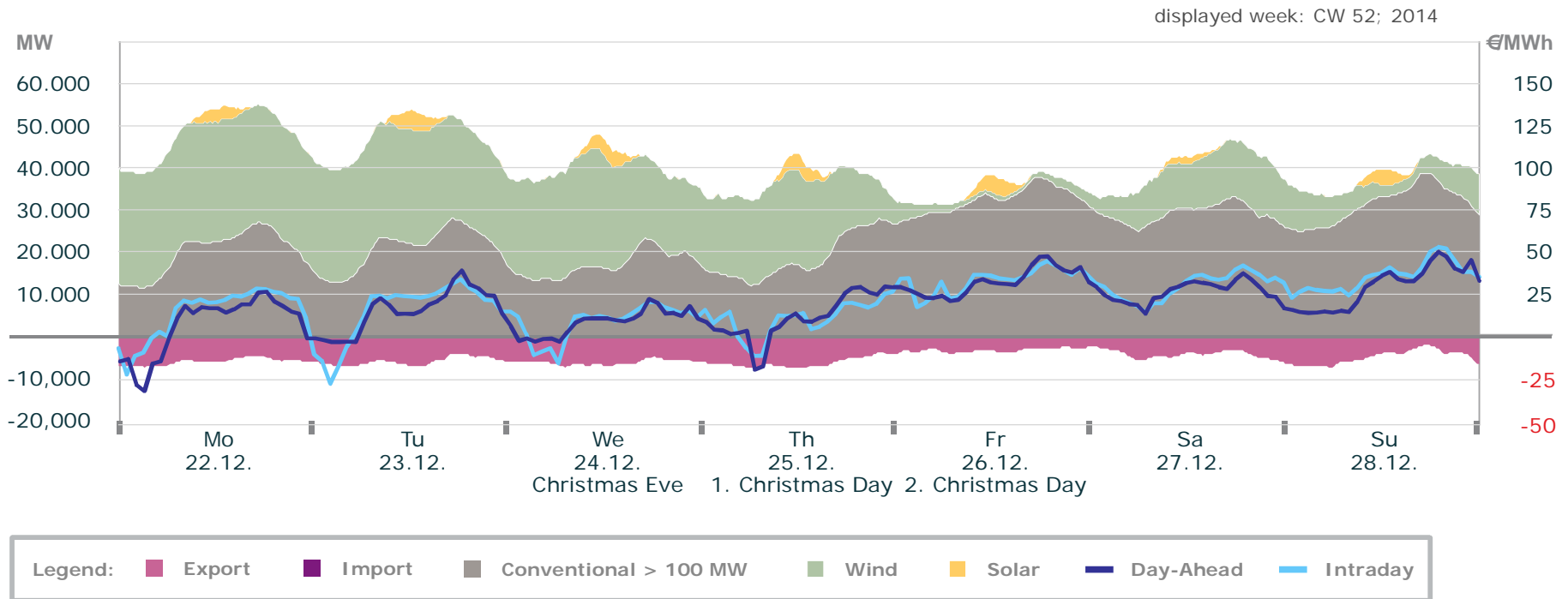
Electricity Production and Spot-Prices: CW 51 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 26.73 | -19.90 | 65.30 | 6 215 |
| Intraday | 30.78 | -1.30 | 60.40 | 495 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

Electricity Production and Spot-Prices: CW 52 2014



| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|--------------|---------------|--------------|---------------|
| Day-Ahead | 18.17 | -30.90 | 50.70 | 6 259 |
| Intraday | 23.18 | -26.50 | 53.60 | 581 |

Source: Johannes Mayer, Bruno Burger, Fraunhofer ISE; Data: EPEX-SPOT, EEX, Entso-e

AGENDA

- General Spot-Price Analysis
- Electricity Production and Spot-Prices
 - Analysis by month
 - Analysis by Week
- Analysis of Spot-Prices Extremes
- General energy data
- Instructions
- Sources and Disclaimer

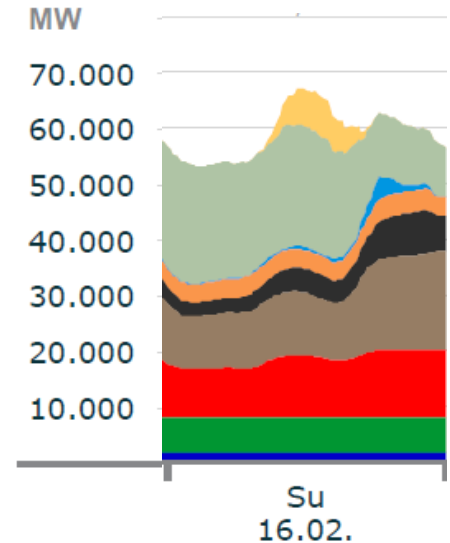
Analysis of Spot-Price Extremes



- On the following slides we try to give explanations for extreme price events based on public available data:
 - forecast versus actual production of solar and wind
 - load projection errors
 - total load in the grid
 - utilization ratio and total power output of conventional power plants
- There are also effects like strategic bidding and certain technical constraints (grid-stability, must-run generation, etc.) that are not transparently available.

Analysis of the negative Intraday prices on 16.02.2014

- In the night from Saturday to Sunday nine hours of negative Intraday prices occurred between 0:00 and 08:00 am, reaching a minimum of – 53.6 €/MWh.
- The production from wind power was app 2 GW higher than projected the day before during the negative price peaking (see following slide).
- Utilization ratio of power plants (03:00 – 04:00):



| 03:00-04:00 | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|--------|-----|--------|--------|--------|--------|-----|---------|-------|
| Production | 1,7 GW | - | 8.7 GW | 9.8 GW | 2.5 GW | 3.4 GW | - | 21.0 GW | 0 GW |
| Plant Utilization* | - | - | 71.7 % | 50.7 % | 12.7 % | 11.9 % | - | - | - |

*compared to available capacity

Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

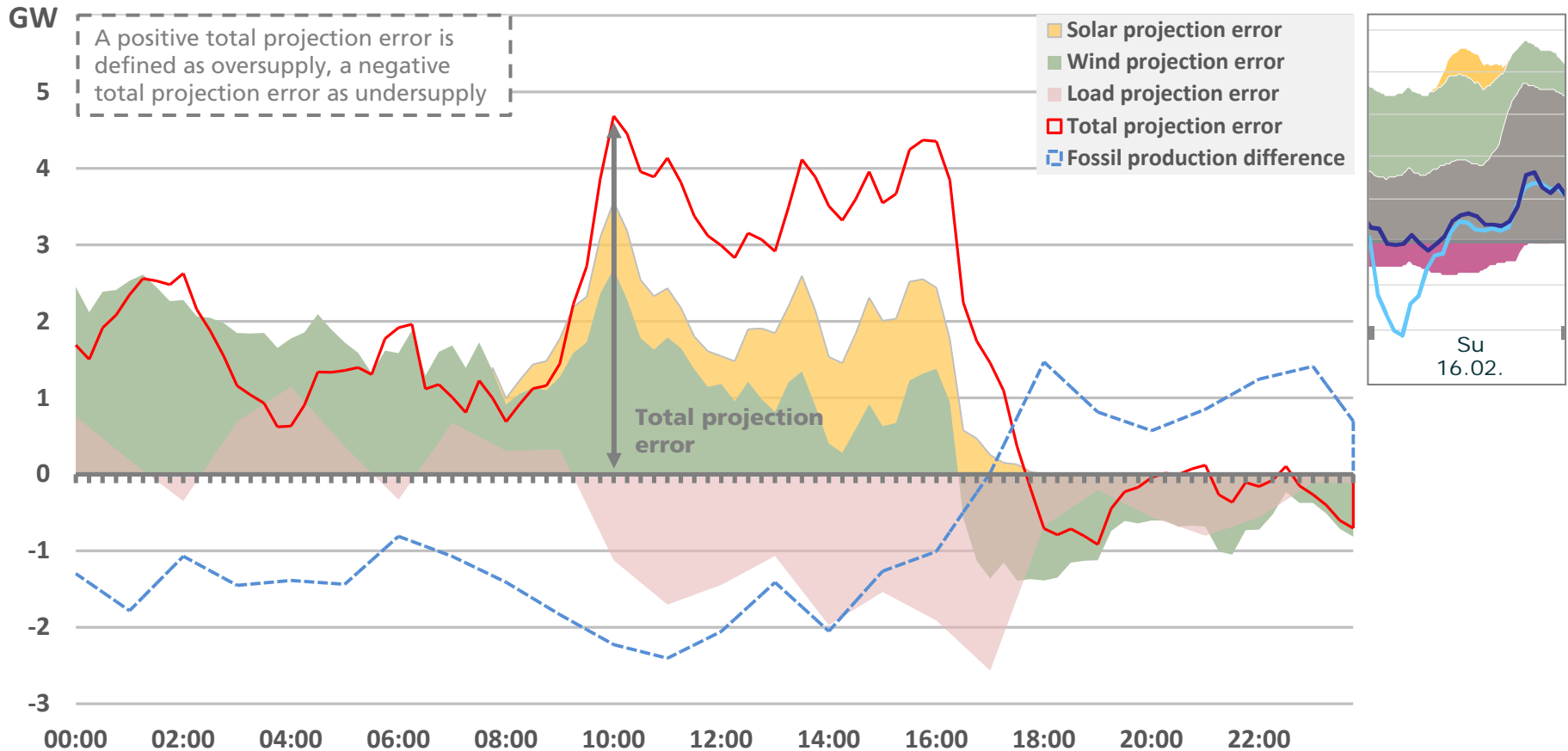
[Back to month chart](#) 

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Analysis of the negative Intraday prices on 16.02.2014



Actual production/load minus projected production/load (from day before)



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX, Entso-E

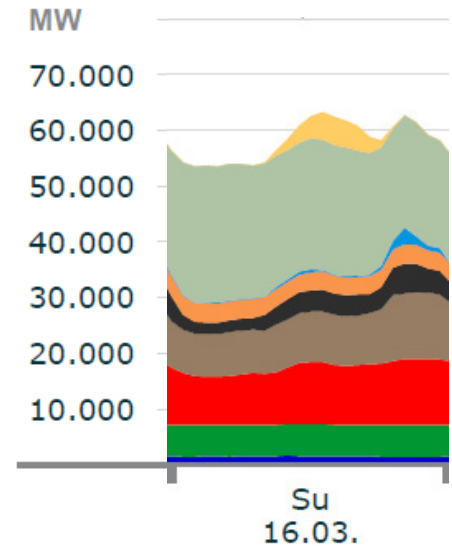
[Back to month chart](#)

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Analysis of the negative Intraday prices on 16.03.2014



- In the night from Saturday to Sunday nine hours of negative prices occurred between 0:00 and 08:00 am, reaching a minimum of – 60.3 €/MWh.
- The production from wind power was app 3 GW higher than projected the day before during the negative price peaking (see following slide).
- Utilization ratio of power plants (03:00 – 04:00):



| 03:00-04:00 | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|--------|-----|--------|--------|--------|--------|-----|---------|-------|
| Production | 1.4 GW | - | 8.5 GW | 7.8 GW | 2.0 GW | 3.3 GW | - | 24.5 GW | 0 GW |
| Plant Utilization* | - | - | 70.3 % | 44.8 % | 10.9 % | 11.7 % | - | - | - |

*compared to available capacity

Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

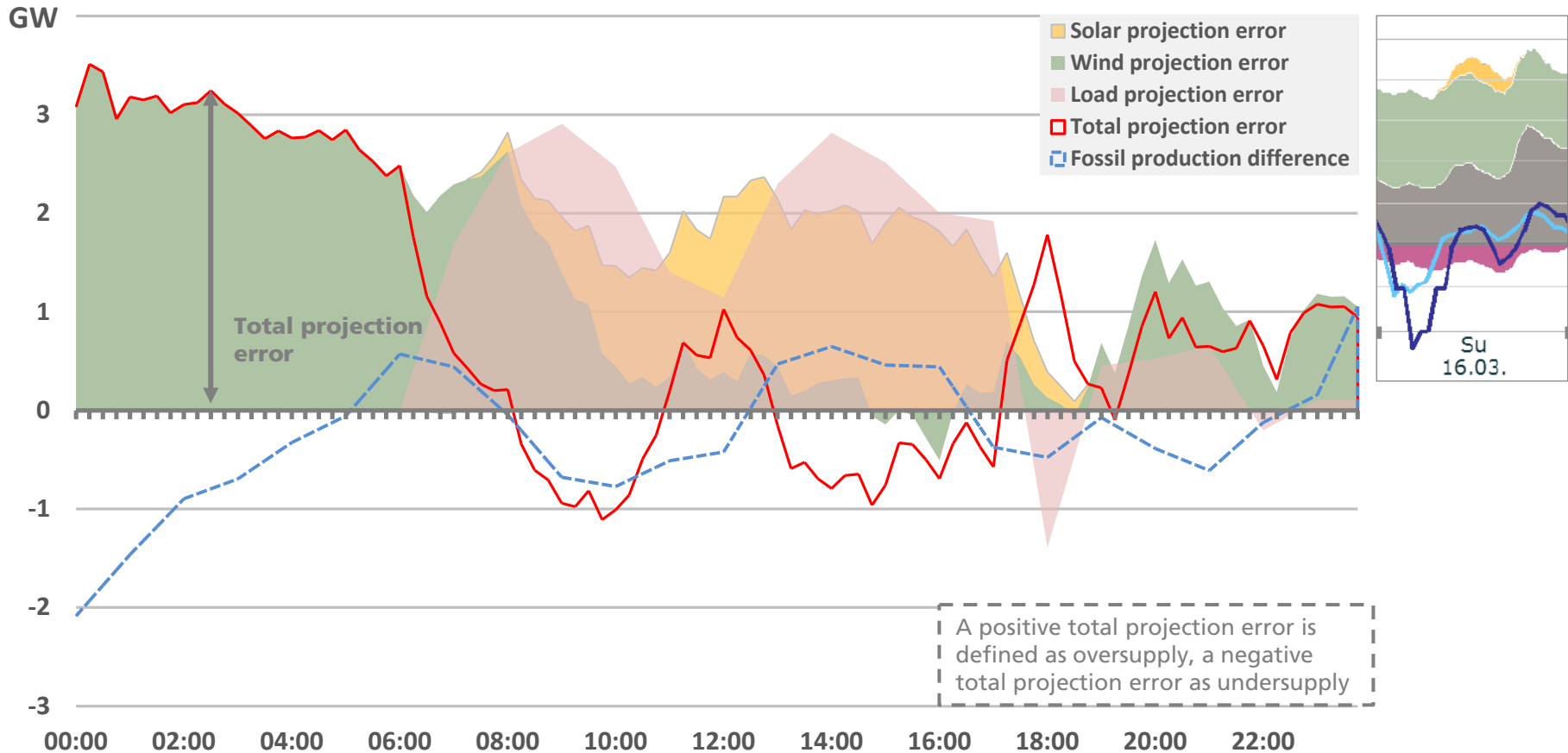
[Back to month chart](#)

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Analysis of the negative Intraday prices on 16.03.2014



Actual production/load minus projected production/load (from day before)



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX, Entso-E

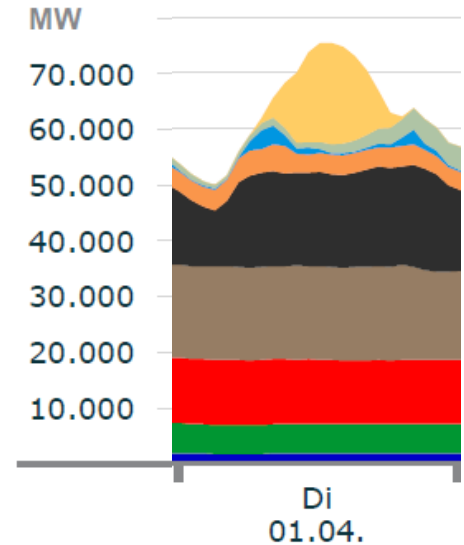
Back to month chart

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Analysis of the high Intraday prices on 01.04.2014



- In the morning of April 1st the Intraday price reached a 111.6 €/MWh peak between 8 and 9 am. The Day-Ahead price for the same hour, traded the day before, was 62.2 €/MWh.
- The main projection errors during that day resulted from a miss-projection of the load. Actual load was app 4 GW lower higher than projected resulting in an oversupply of electricity.



- Utilization ratio of power plants (08:00 – 09:00):

| 08:00-09:00 | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|--------|-----|---------|---------|---------|--------|-----|--------|--------|
| Production | 1.5 GW | - | 11.6 GW | 16.7 GW | 16.1 GW | 4.6 GW | - | 1.3 GW | 3.6 GW |
| Plant Utilization* | - | - | 99.4 % | 92.5 % | 84.1 % | 19.4 % | - | - | - |

*compared to available capacity

Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

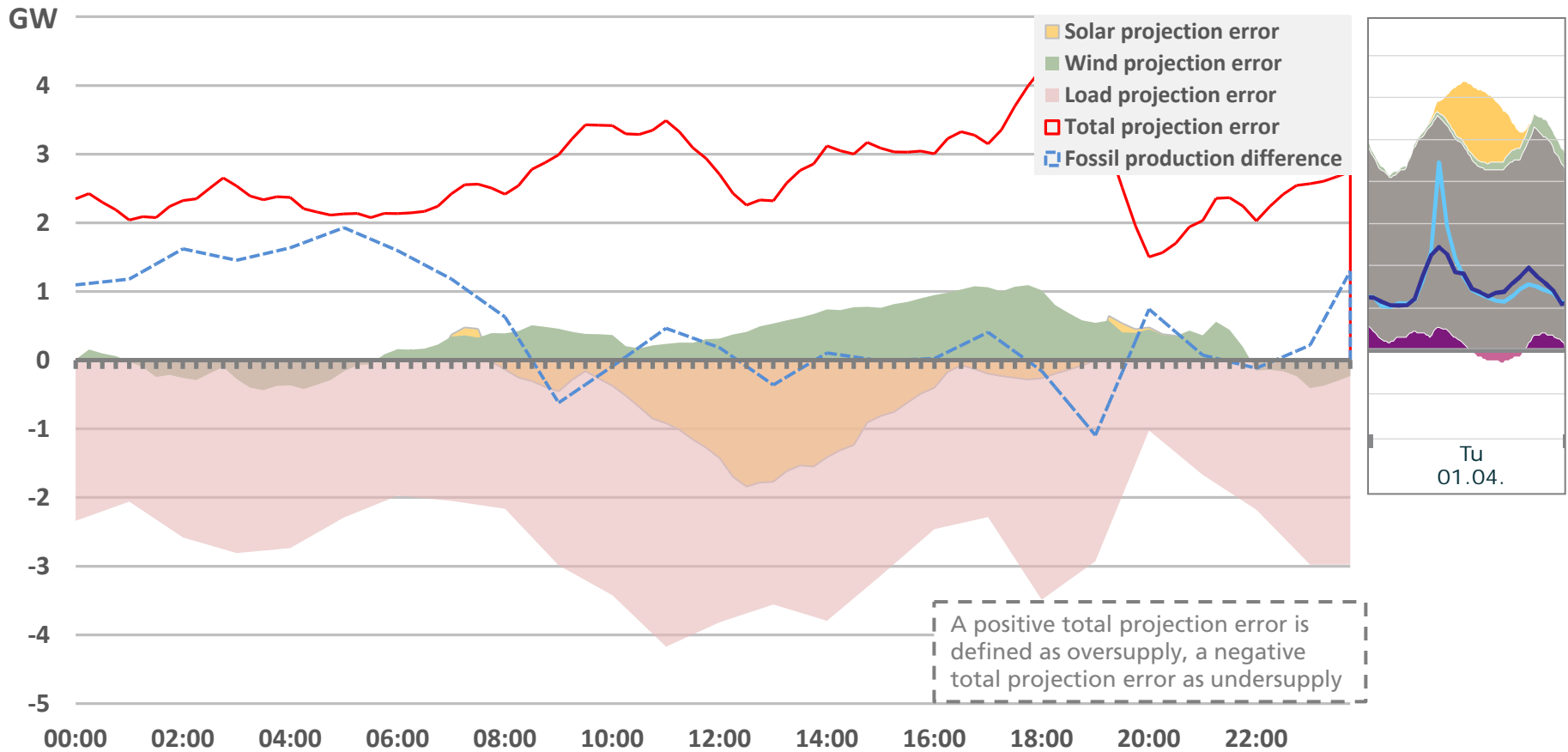
[Back to month chart](#)

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Analysis of the high Intraday prices on 01.04.2014



Actual production/load minus projected production/load (from day before)



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX, Entso-E

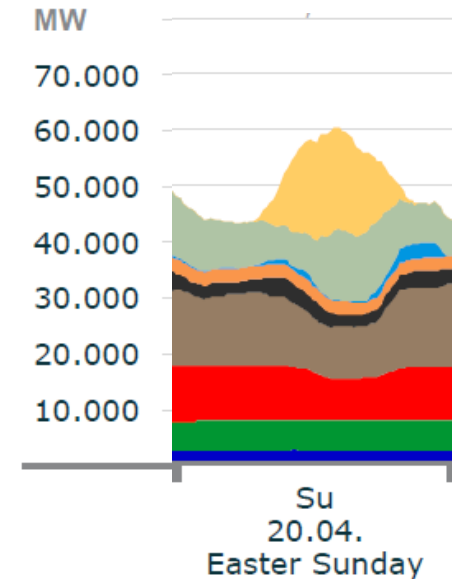
[Back to month chart](#)

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Analysis of the negative Intraday prices on 20.04.2014



- On Easter Sunday April 20th Intraday prices were negative during the day between 11:00 and 18:00, reaching -39.18 €/MWh between 2 and 3 pm. Day-Ahead prices for the same hour were positive.
- PV and wind production combined were about 4 GW higher than projected, the actual load was up to 4 GW lower than projected. The combined projection error was over 7 GW between 1 and 2 pm, explaining the negative intraday prices.
- Utilization ratio of power plants (14:00 – 15:00):



| 14:00-15:00 | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|--------|-----|--------|--------|--------|--------|-----|---------|---------|
| Production | 1.5 GW | - | 7.7 GW | 9.2 GW | 2.3 GW | 2.1 GW | - | 12.5 GW | 17.5 GW |
| Plant Utilization* | - | - | 75.0 % | 59.6 % | 13.1 % | 8.6 % | - | - | - |

*compared to available capacity

Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

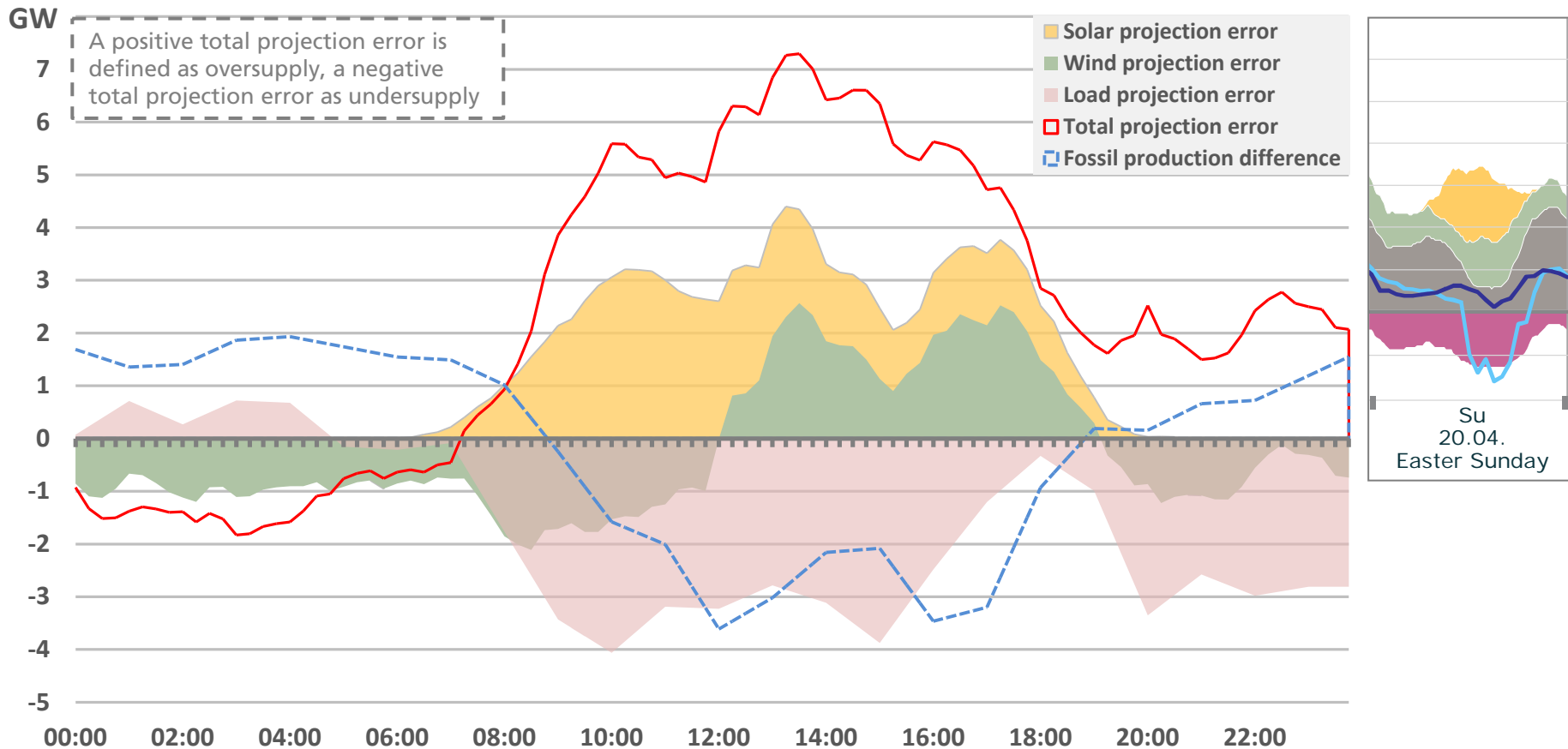
[Back to month chart](#)

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Analysis of the negative Intraday prices on 20.04.2014



Actual production/load minus projected production/load (from day before)



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX, Entso-E

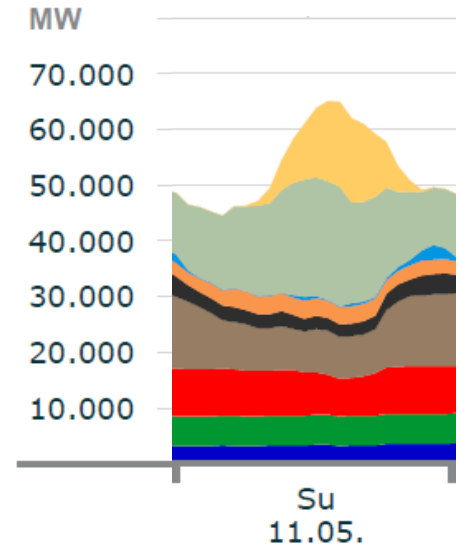
[Back to month chart](#)

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Analysis of the negative Spot prices on 11.05.2014



- On Sunday May 11 spot market prices were negative during the day between 06:00 and 16:00. The minimum prices were -65.03 €/MWh (Day-Ahead) and -48.19 €/MWh (Intraday) between 2 and 3 pm.
- Projection errors were relatively low during that day (see following slide) reaching app -1.5 GW during 2 and 3pm, mainly due to an overestimate of wind production.
- Utilization ratio of power plants (14:00 – 15:00):



| 14:00-15:00 | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|--------|-----|--------|--------|--------|--------|-----|---------|---------|
| Production | 1.9 GW | - | 6.8 GW | 7.5 GW | 2.1 GW | 2.8 GW | - | 18.2 GW | 15.0 GW |
| Plant Utilization* | - | - | 77.2 % | 48.9 % | 11.7 % | 15.8 % | - | - | - |

*compared to available capacity

Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

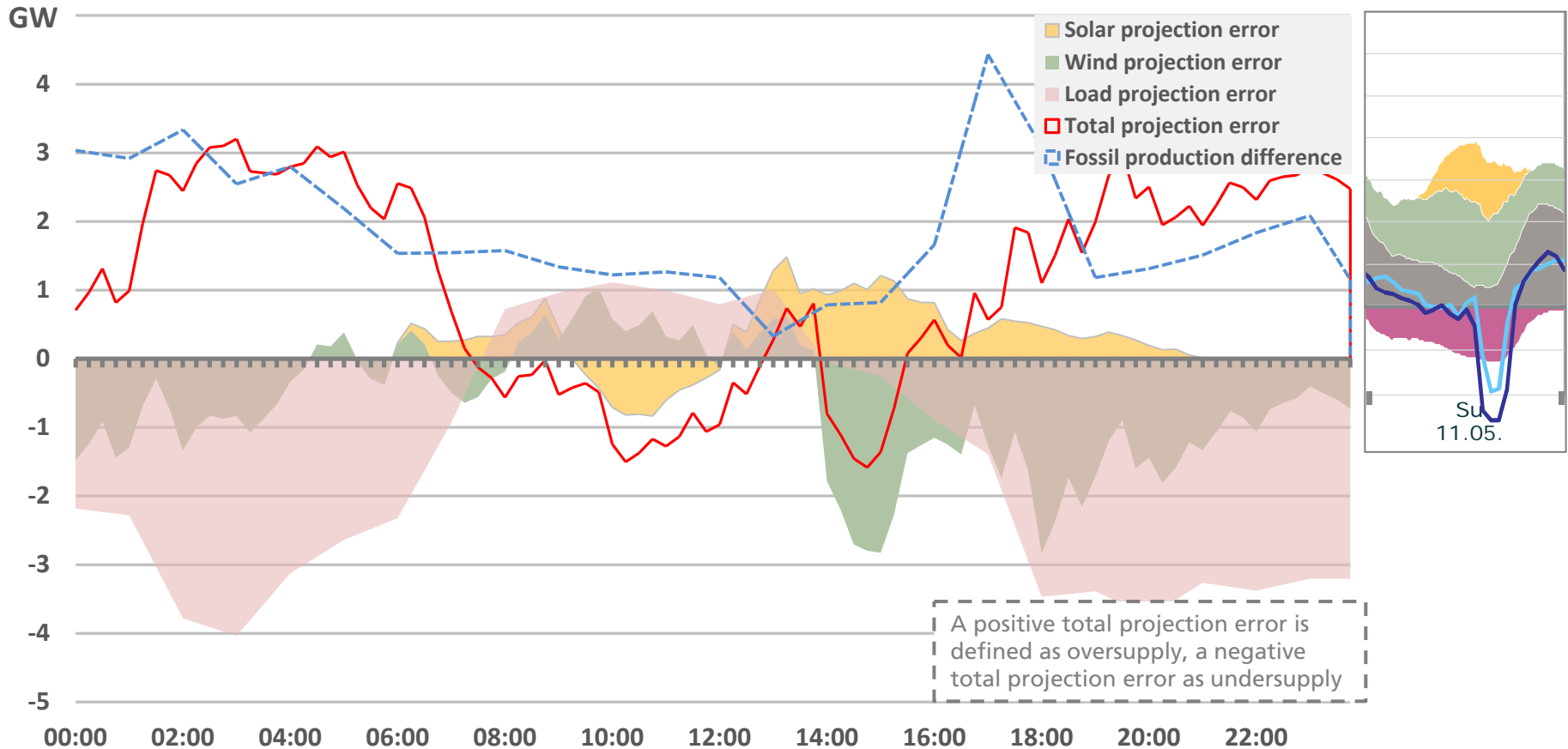
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Analysis of the negative Spot prices on 11.05.2014



Actual production/load minus projected production/load (from day before)



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX, Entso-E

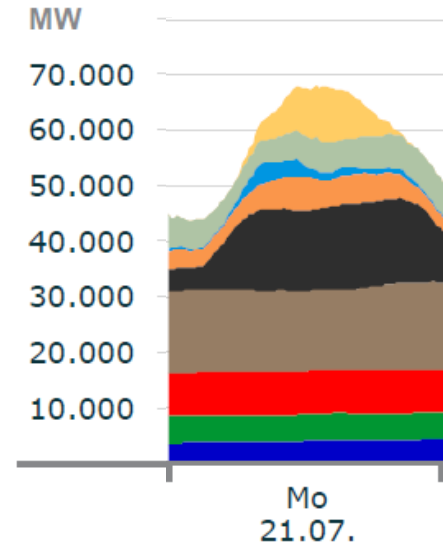
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Analysis of the high Intraday prices on 21.07.2014



- On Monday July 21st the Intraday price reached a 125.12 €/MWh peak between 11 am and noon. The Day-Ahead price for the same hour, traded the day before, was 44.29 €/MWh.
- The effect can be explained by the projection errors during that day: Wind and PV produced up to 6 GW less than projected, the load was up to 4 GW higher. In the hour before noon, the total projection resulted in 6 GW undersupply.
- Utilization ratio of power plants (11:00 – 12:00):



| 11:00-12:00 | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|--------|-----|--------|---------|---------|--------|-----|--------|--------|
| Production | 2.4 GW | - | 7.7 GW | 14.9 GW | 13.3 GW | 5.7 GW | - | 4.4 GW | 8.3 GW |
| Plant Utilization* | - | - | 98.8 % | 86.6 % | 88.0 % | 28.3 % | - | - | - |

*compared to available capacity

Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

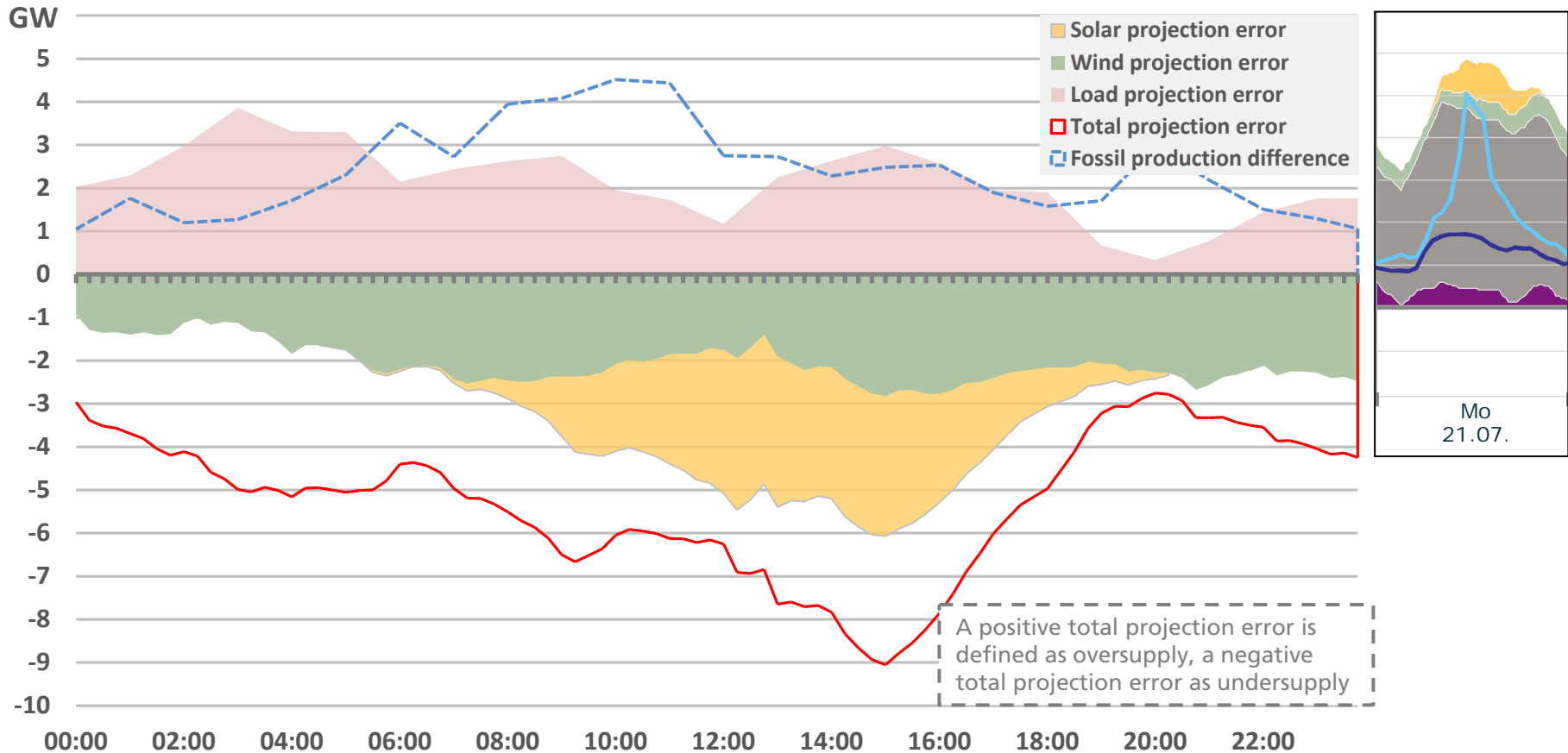
[Back to month chart](#)

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Analysis of the high Intraday prices on 21.07.2014



Actual production/load minus projected production/load (from day before)



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX, Entso-E

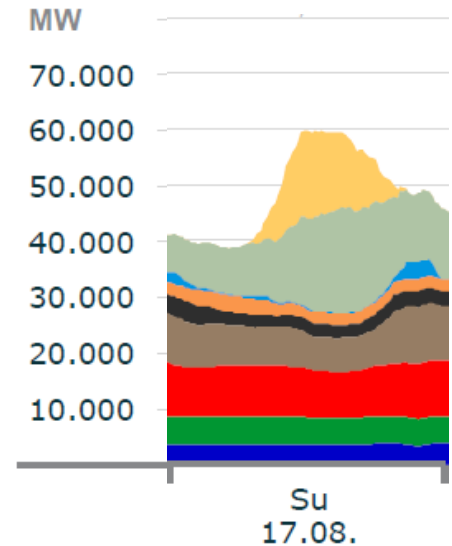
[Back to month chart](#)

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Analysis of the negative Spot prices on 17.08.2014



- On the afternoon of Sunday 17th in August, Spot prices were negative for several hours reaching a minimum of -59.01 €/MWh (Day-Ahead) and -15.21 €/MWh (Intraday) between 1 and 2 pm.
- Projection errors cumulated to about -2 GW during that time (mainly due to a load projection error).



- Utilization ratio of power plants (13:00 – 14:00):

| 13:00-14:00 | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|--------|-----|--------|--------|--------|--------|-----|---------|---------|
| Production | 3.1 GW | - | 8.3 GW | 6.2 GW | 2.3 GW | 1.6 GW | - | 17.6 GW | 14.4 GW |
| Plant Utilization* | - | - | 79.1 % | 50.8 % | 14.4 % | 10.1 % | - | - | - |

*compared to available capacity

Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX

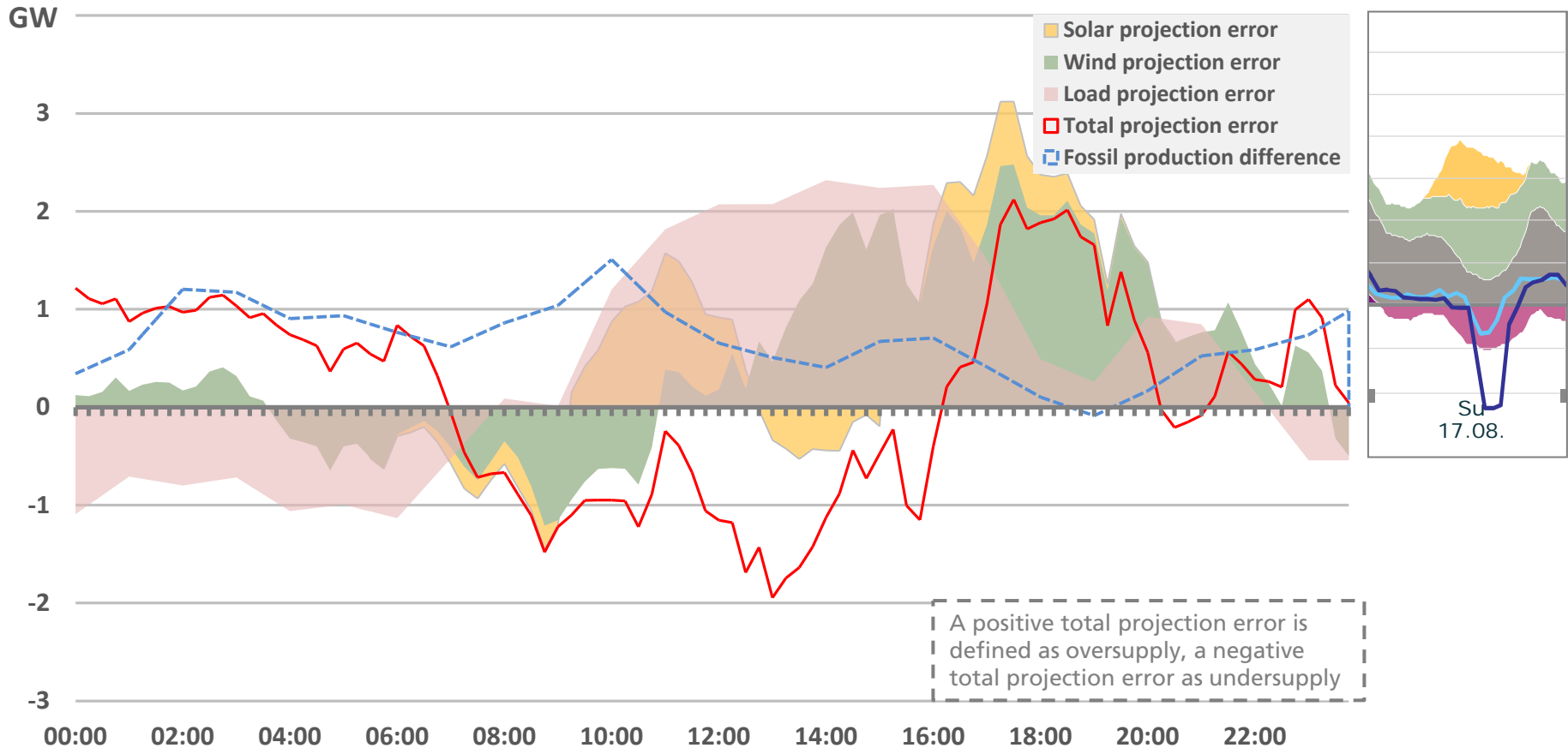
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Analysis of the negative Spot prices on 17.08.2014



Actual production/load minus projected production/load (from day before)



Source: Johannes Mayer, Fraunhofer Institute for Solar Energy Systems; Data: EEX, Entso-E

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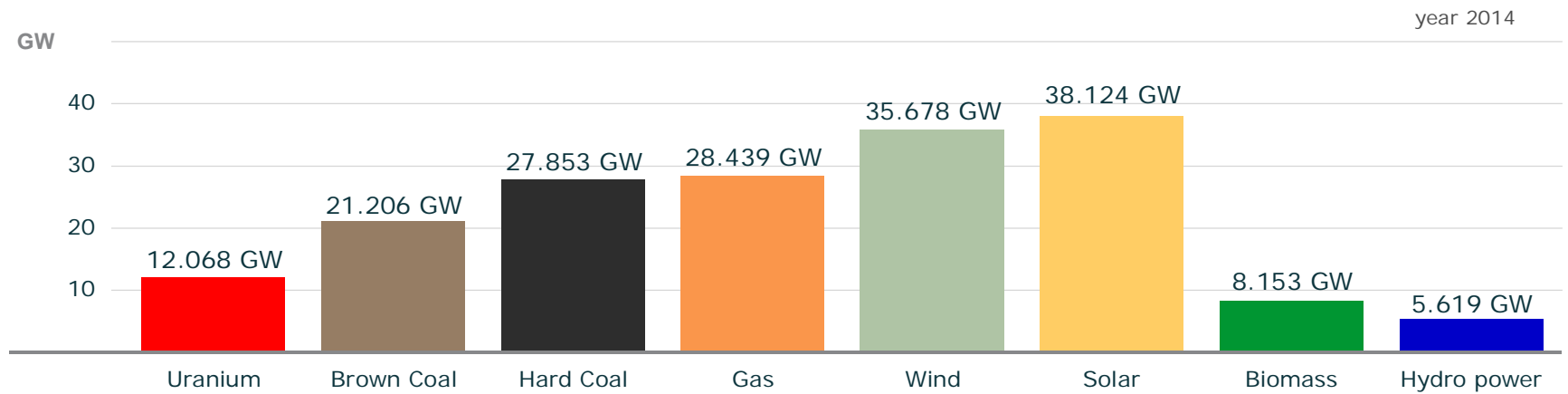
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Installed power in November 2014



Net installed capacity rating

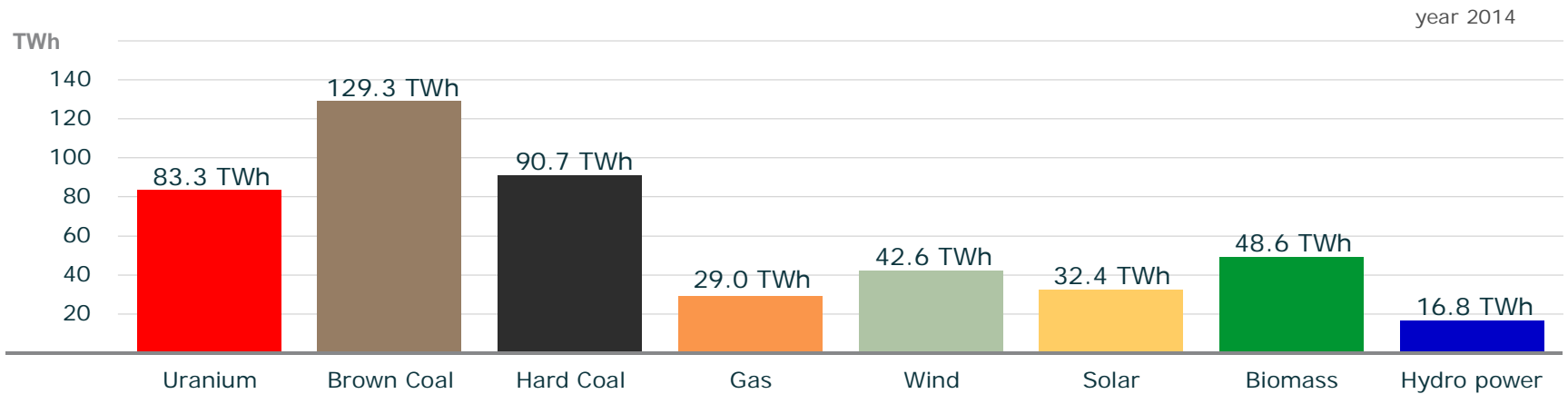


Source: Bruno Burger, Fraunhofer ISE, Data: Bundesnetzagentur

Total Electricity Production by Source in 2014



Electricity production: first eleven months 2014

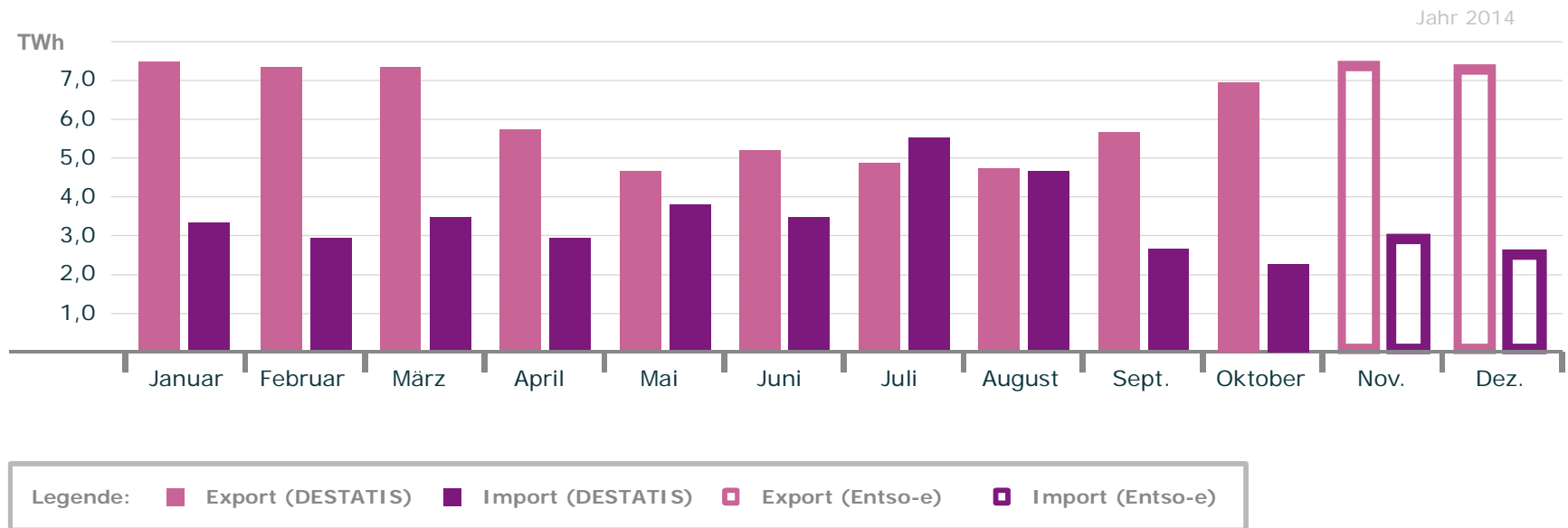


Source: Bruno Burger, Fraunhofer ISE, Data: Bundesnetzagentur

Electricity Import-Export-Balance



Strom Export und Import

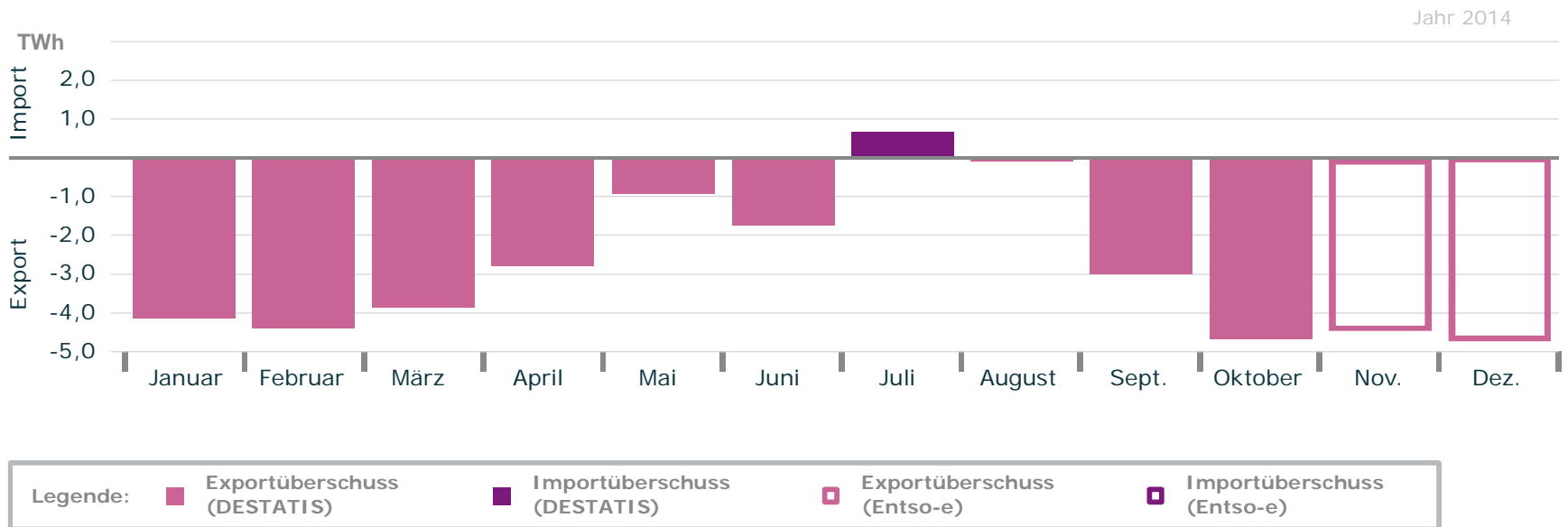


Source: Bruno Burger, Fraunhofer ISE, Data: BMWi Energiedaten; DESTATIS; Entso-e

Electricity Import-Export-Balance



Strom Export und Import Saldo

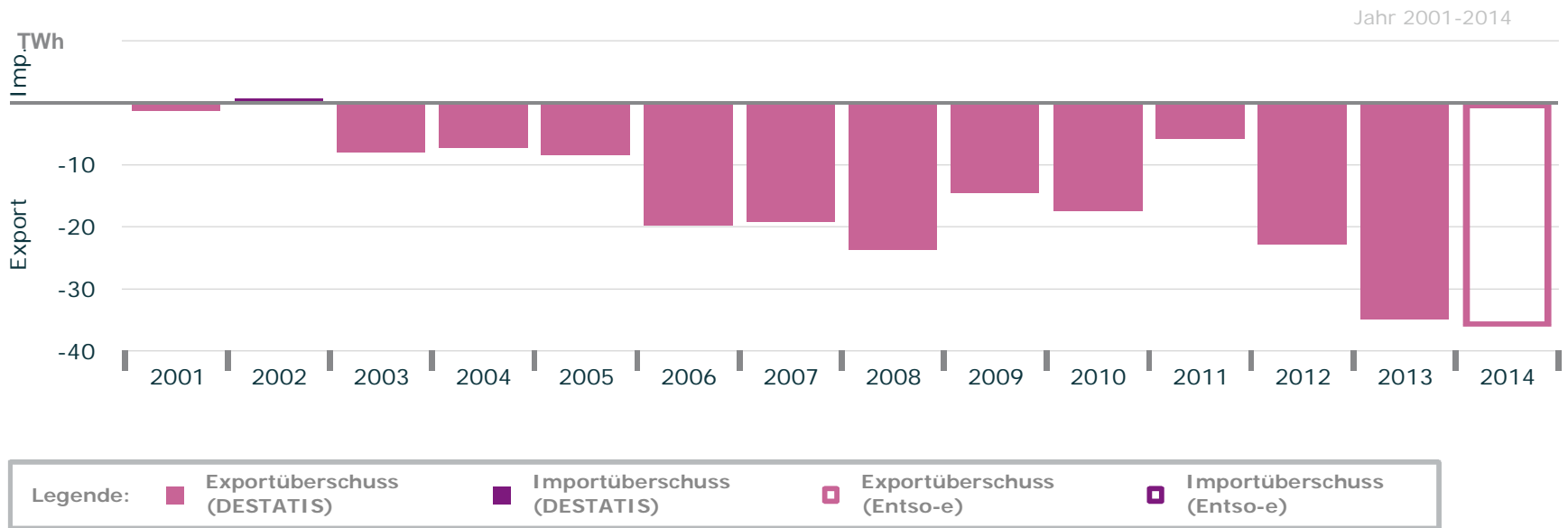


Source: Bruno Burger, Fraunhofer ISE, Data: BMWi Energiedaten; DESTATIS; Entso-e

Electricity Import-Export-Balance



Strom Export und Import Saldo



Source: Bruno Burger, Fraunhofer ISE, Data: BMWi Energiedaten; DESTATIS; Entso-e

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- The presentation is designed to provide an overview of the German electricity market by visualization of important market parameters (electricity production from conventional and renewable sources, import-export data and electricity spot market prices).
- Basis: Legal obligation for utility companies to publish production and consumption data since 2003 (European regulation EG 1228/2003)

Instructions



- The production time series of conventional power sources in this presentation refer to the net production of power plants greater 100 MW. Self consumption of the power plants and transfer losses are not included. Hence the total sum of conventional production differs from the gross electricity production listed by other sources (i.e. dSTATIS).

- The period mean value is calculated as volume weighted average for **Day-Ahead-Spot-Prices** and **Intraday-Spot-Prices**.

| €/ MWh | Period Mean | Period Min | Period Max | Trading / GWh |
|------------------|-------------|------------|------------|---------------|
| Day-Ahead | | | | |
| Intraday | | | | |
| | | | | |

Instructions



- The abbreviations in the table below represent the following energy sources:

English:

Legend: ■ Hydro ■ Biomass ■ Uranium ■ Brown Coal ■ Hard Coal ■ Gas ■ Pumped Storage ■ Wind ■ Solar

German:

Legende: ■ Wasserkraft ■ Biomasse ■ Kernenergie ■ Braunkohle ■ Steinkohle ■ Gas ■ Pumpspeicher ■ Wind ■ Solar

| | Hydro | Bio | Uran | BC | HC | Gas | PSt | Wind | Solar |
|--------------------|-------|-----|------|----|----|-----|-----|------|-------|
| Production | | | | | | | | | |
| Plant Utilization* | | | | | | | | | |



- We are working hard on constantly improving the quality and significance of the information given in this presentation.
- Therefore we look forward to your critical comments and ideas for further analysis.

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Johannes Mayer

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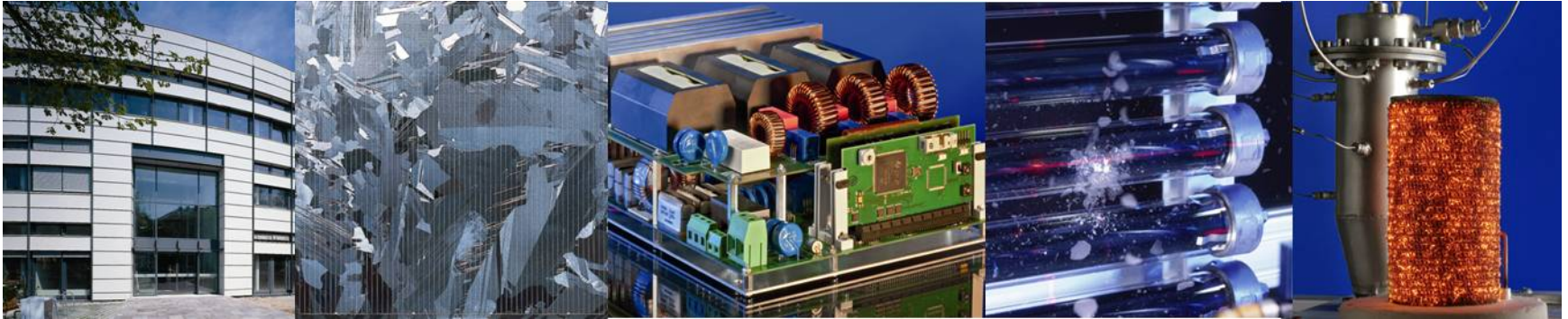
- Production Data: <http://www.transparency.eex.com/de/>
- Electricity Spot Prices: <http://www.epexspot.com/de/>
<http://www.eex.com/de/>
- Import-Export Data: <http://www.entsoe.net/> <http://www.entsoe.eu/>
- Load Data: <http://www.entsoe.net/>

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Thank-you for your attention!



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