FRAUNHOFER INSTITUTE FOR SOLAR ENERGY SYSTEMS ISE

Electricity Spot-Prices and Production Data in Germany

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Fraunhofer Institute for Solar Energy Systems ISE

29.10.2013

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johannes.nikolaus.mayer@ise.fraunhofer.de

AGENDA

- General Spot-Price Analysis
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  - Analysis by month
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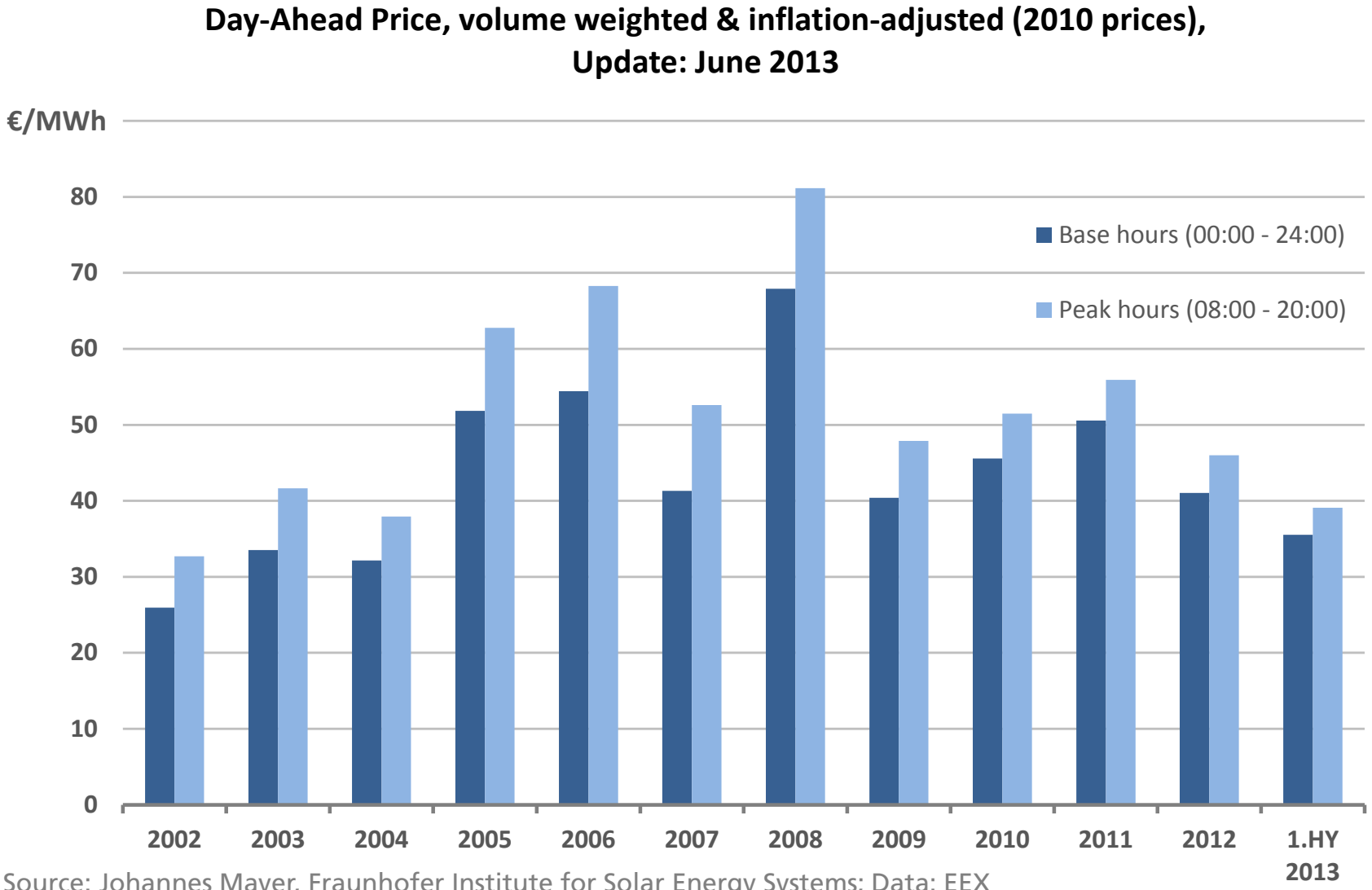
Historical Day-Ahead Base- and Peak-Prices



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

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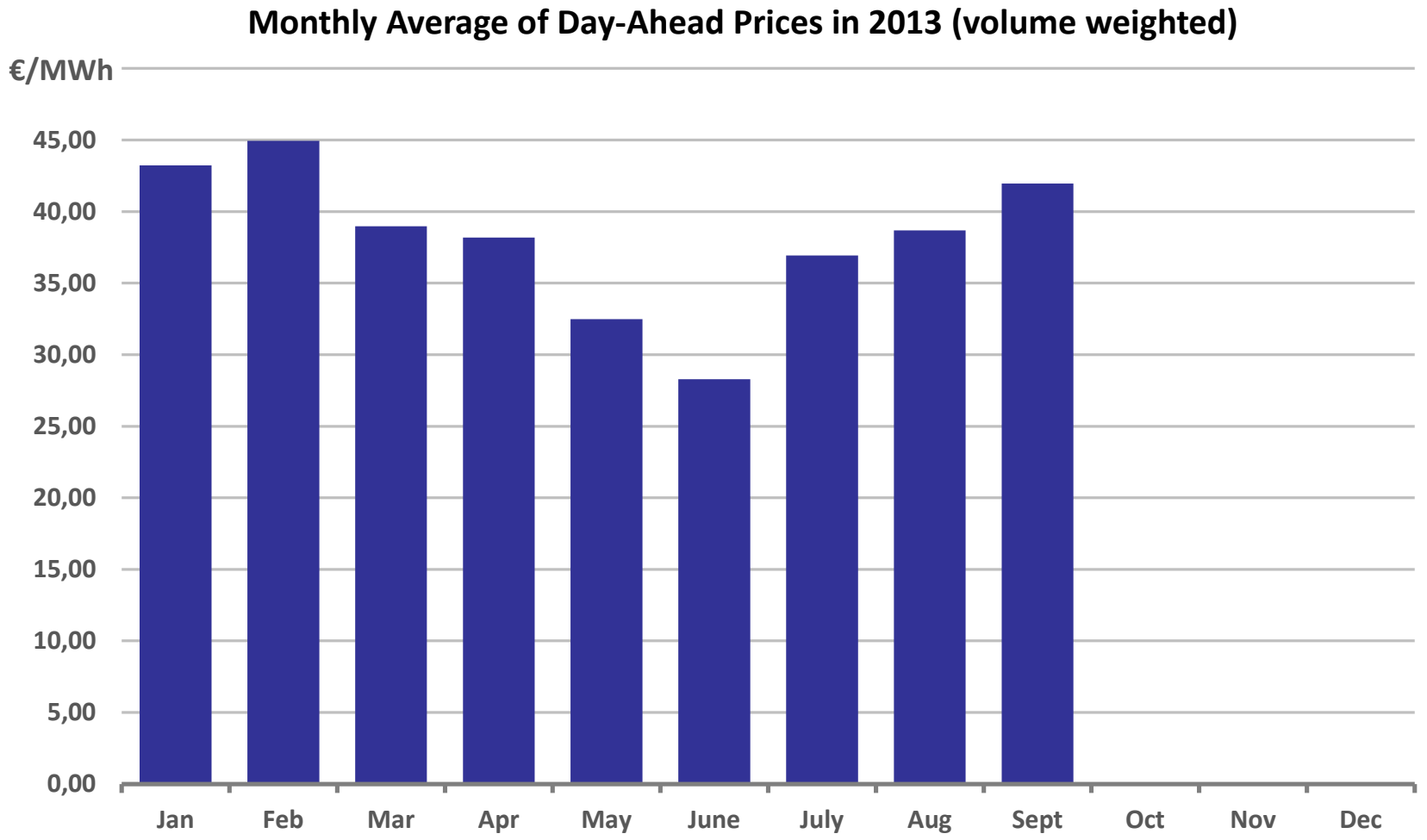
Monthly Average of Day-Ahead Prices in 2013



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

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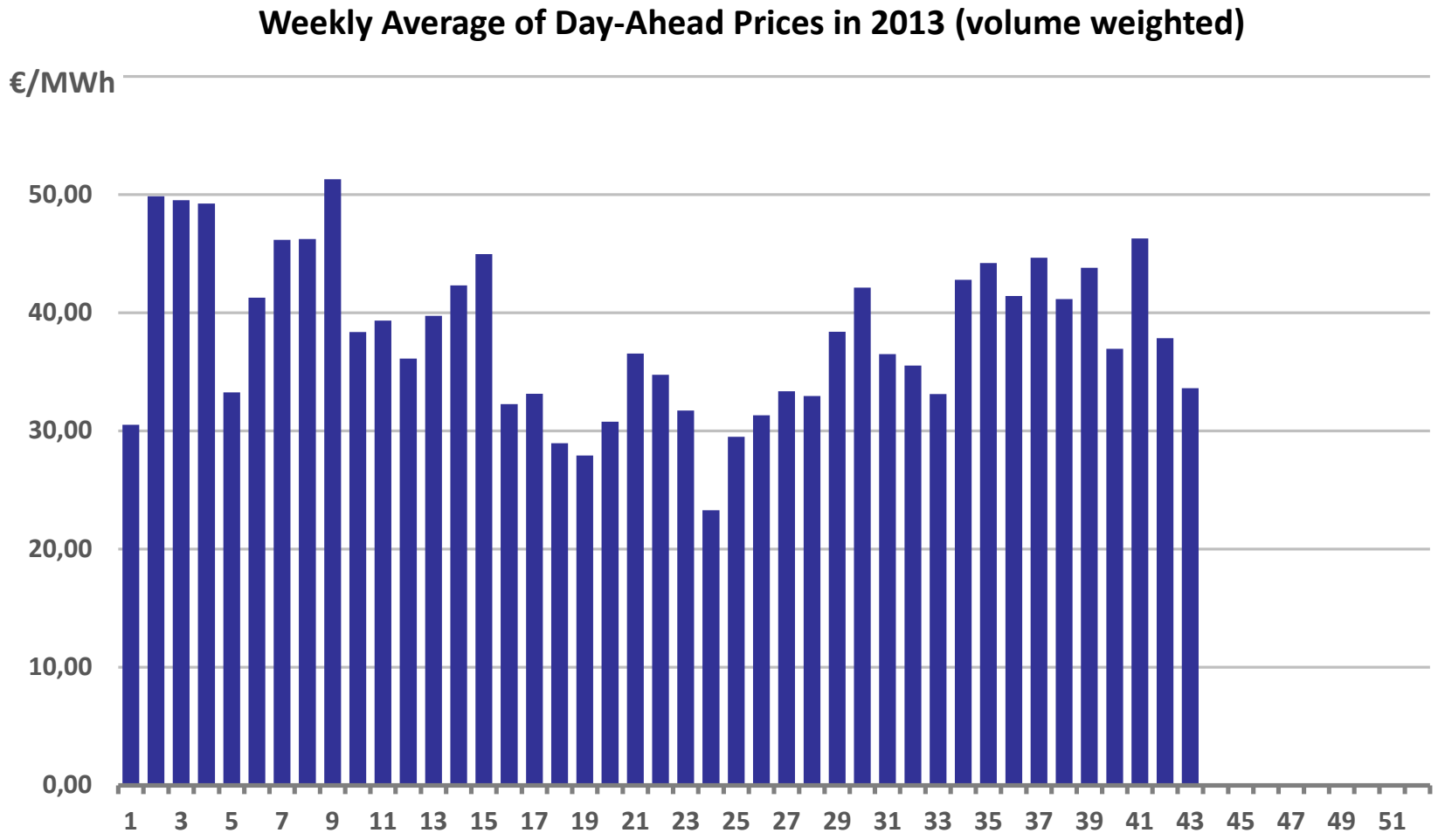
Weekly Average of Day-Ahead Prices in 2013



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

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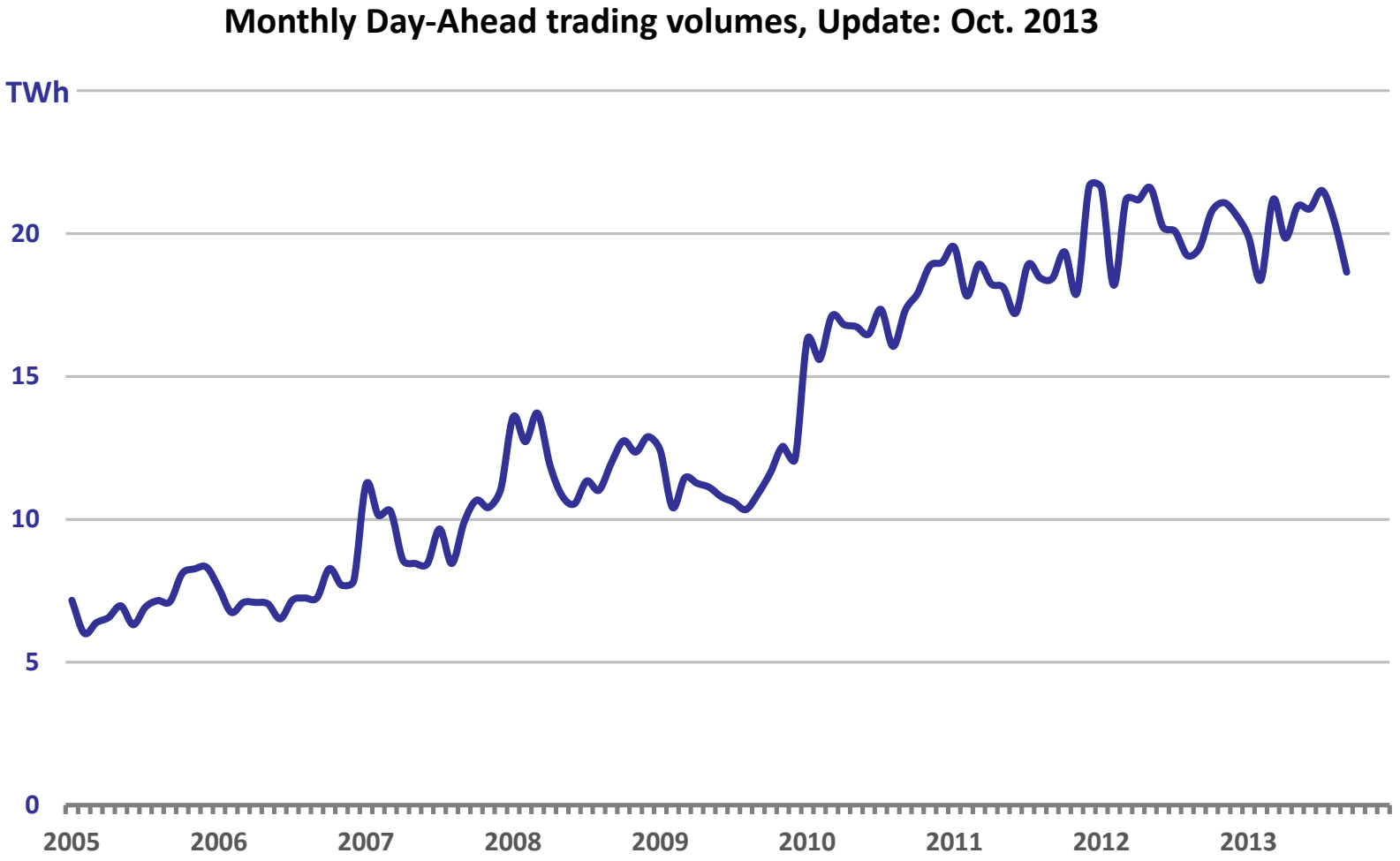
Monthly Trading Volume in the Day-Ahead Market



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

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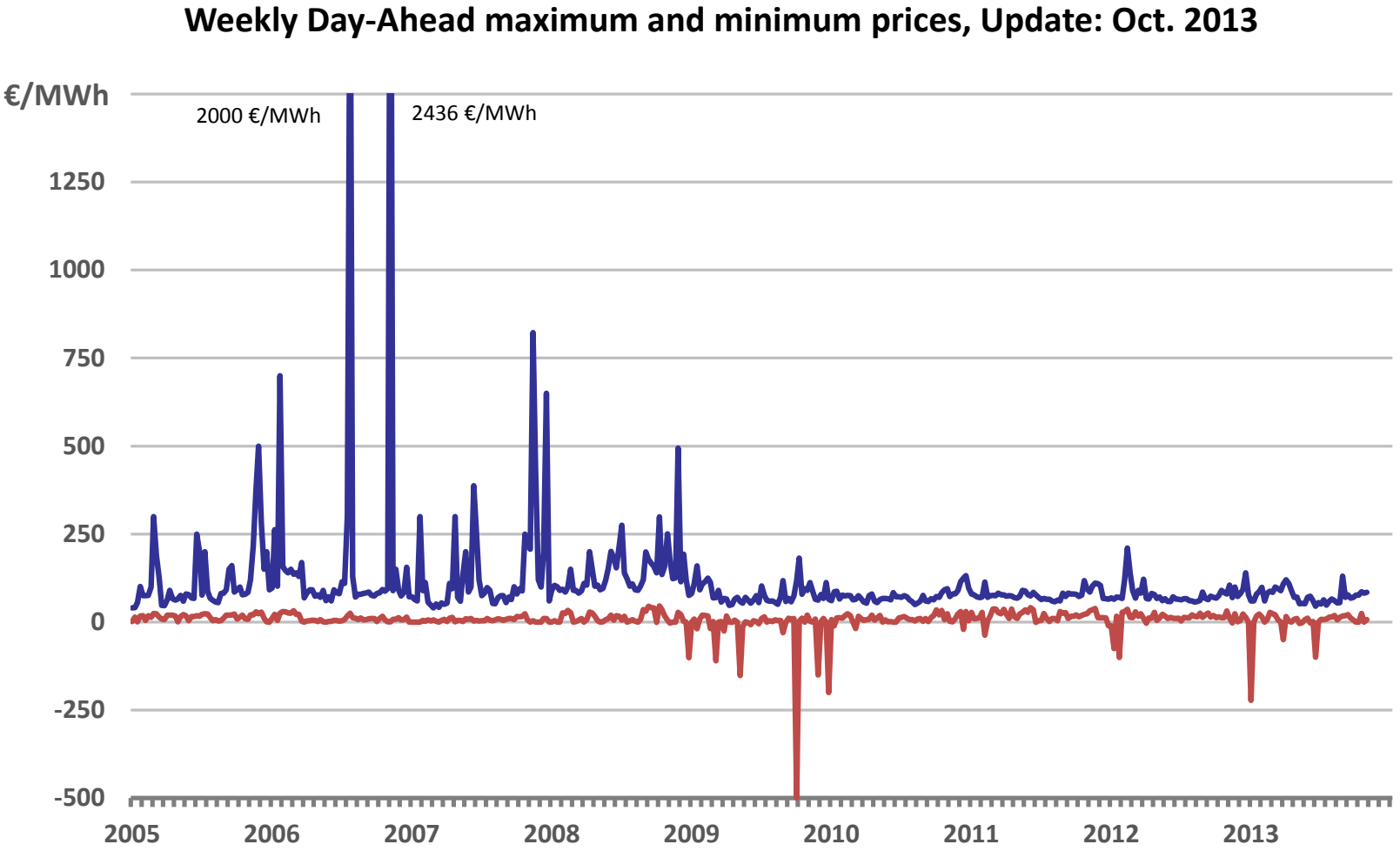
History of Price Extremes in the Day-Ahead Market



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

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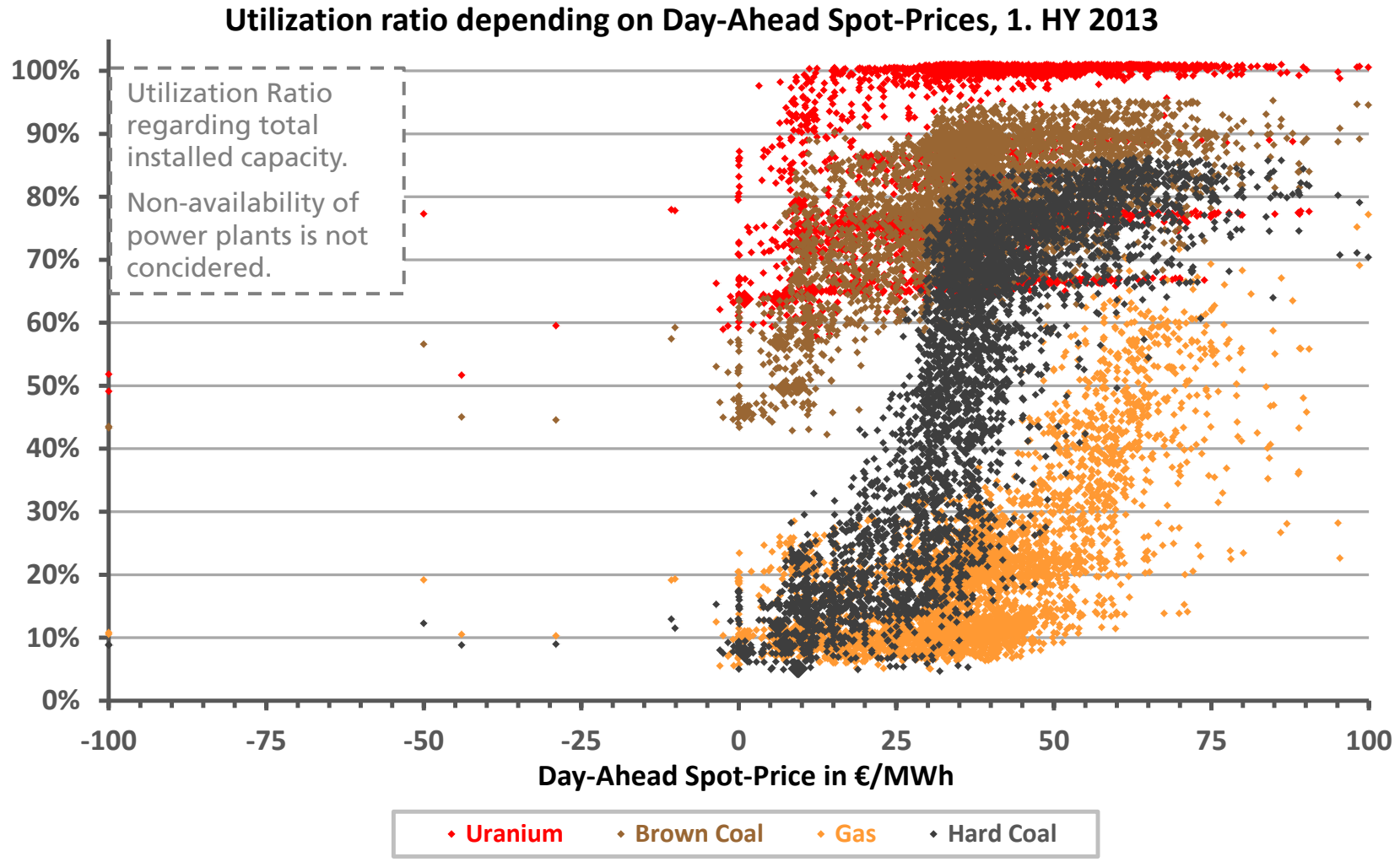
Plant System Utilization over Day-Ahead Prices



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

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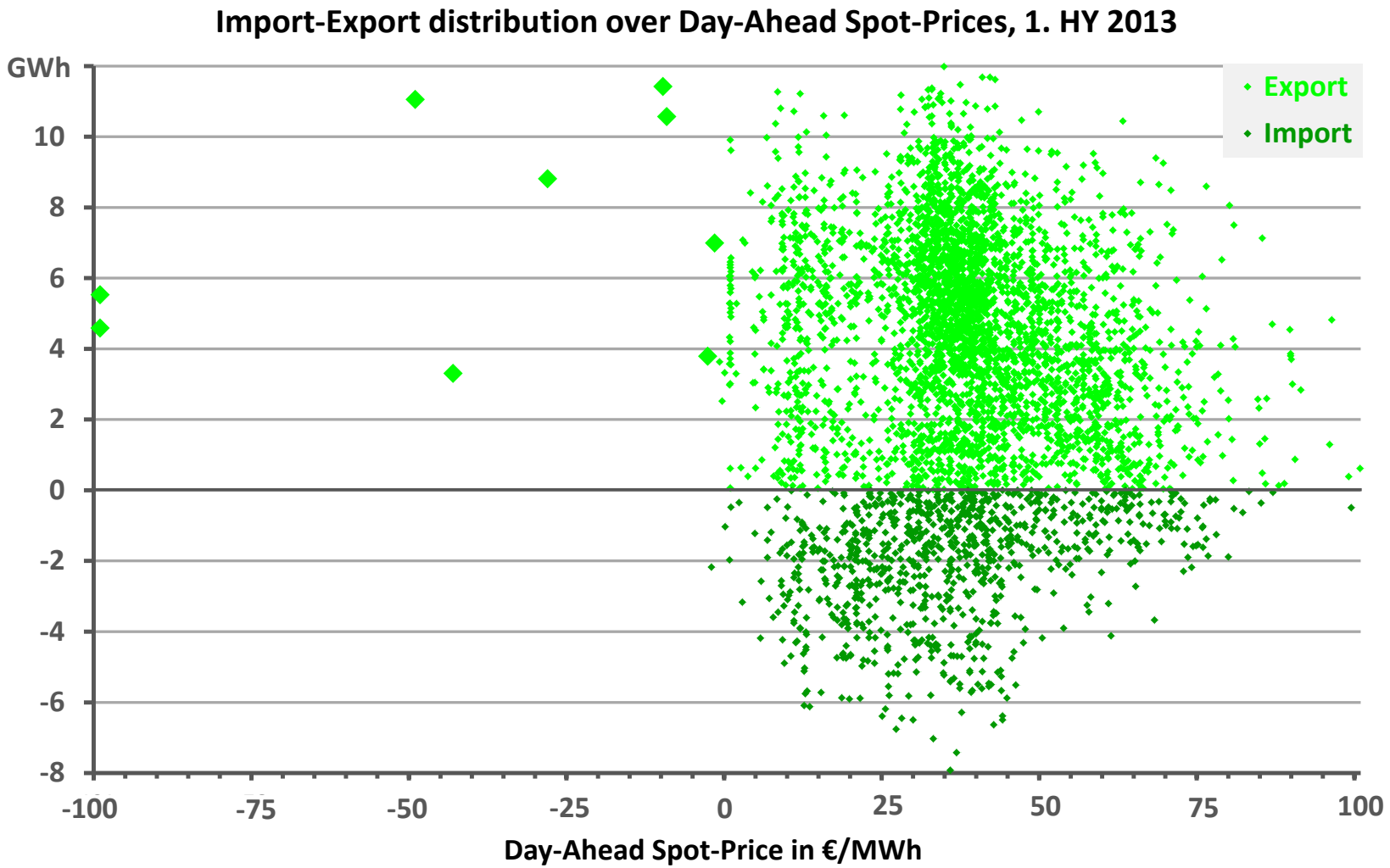
Import-Export distribution over Day-Ahead Prices



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

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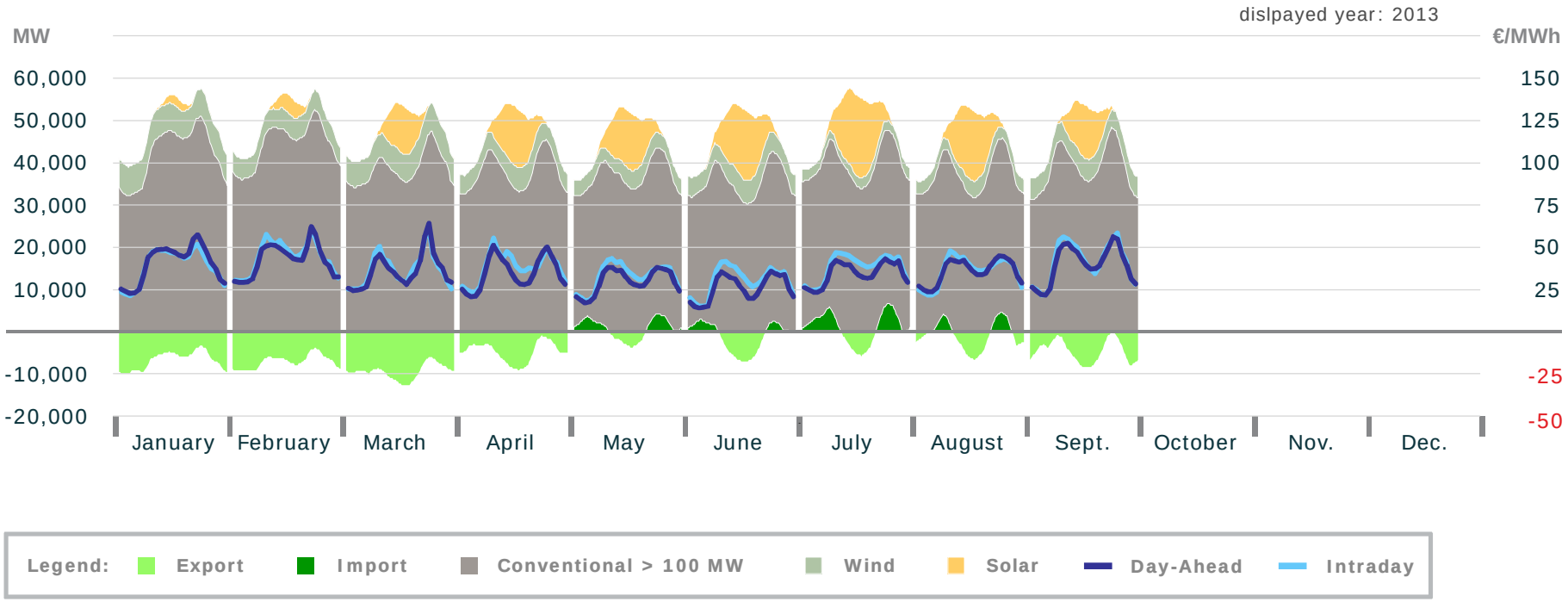
Electricity Production and Spot-Prices: Diurnal Courses



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

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

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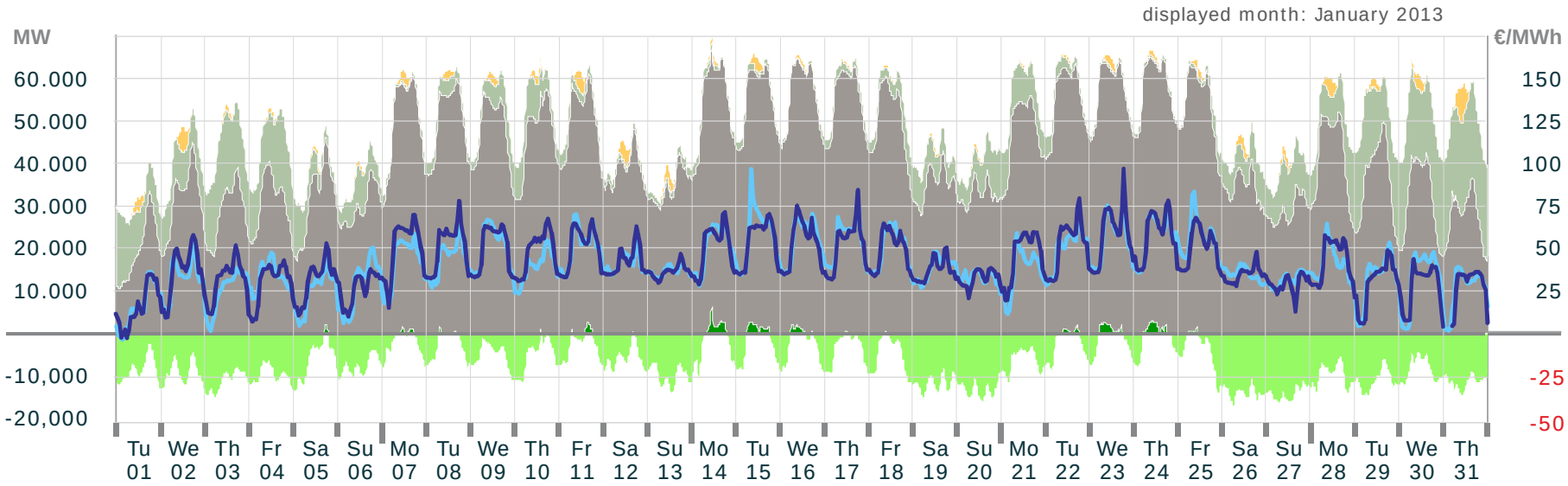
Electricity Production and Spot-Prices: January 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**43.24**	**- 0.10**	**98.50**	**19 884**
Intraday	**43.76**	**- 1.00**	**98.30**	**1 561**

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

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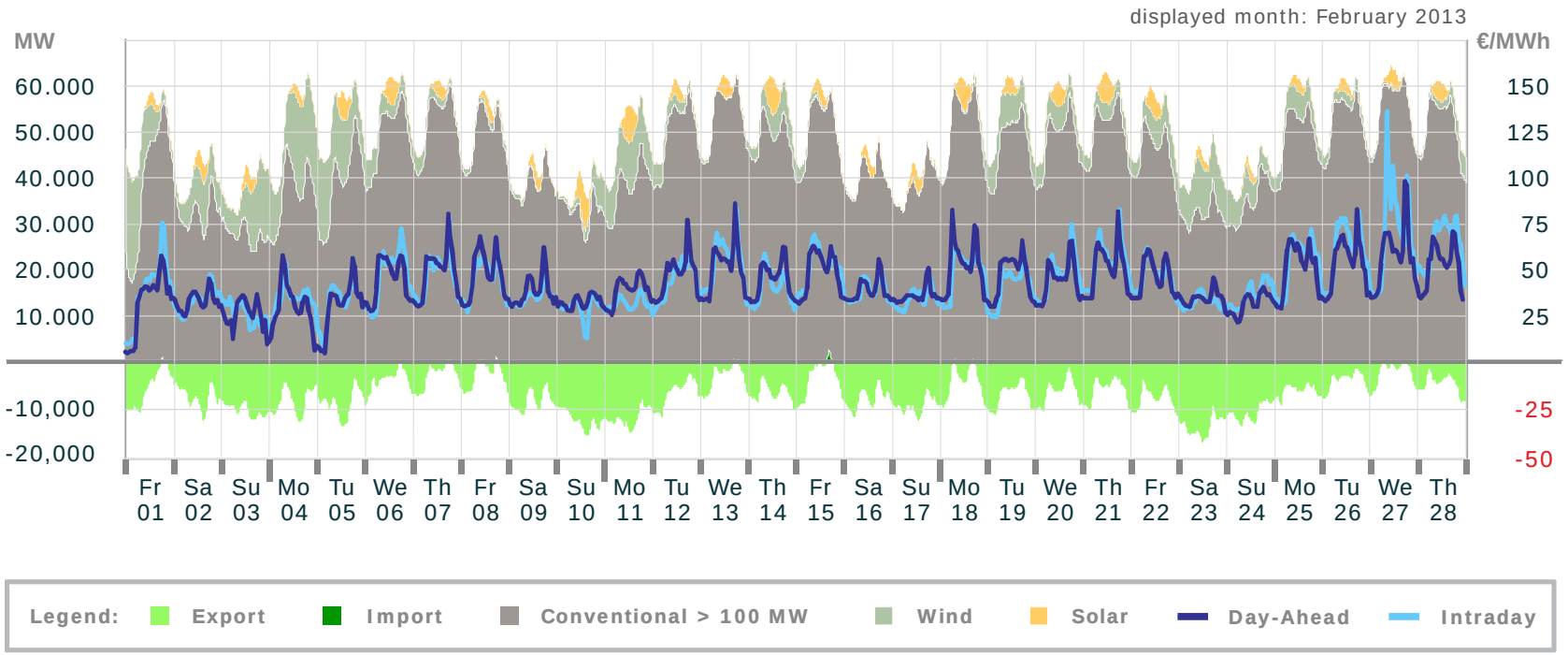
Electricity Production and Spot-Prices: February 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**44.95**	**7.30**	**99.90**	**18 377**
Intraday	**47.84**	**11.10**	**137.70**	**1 135**

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

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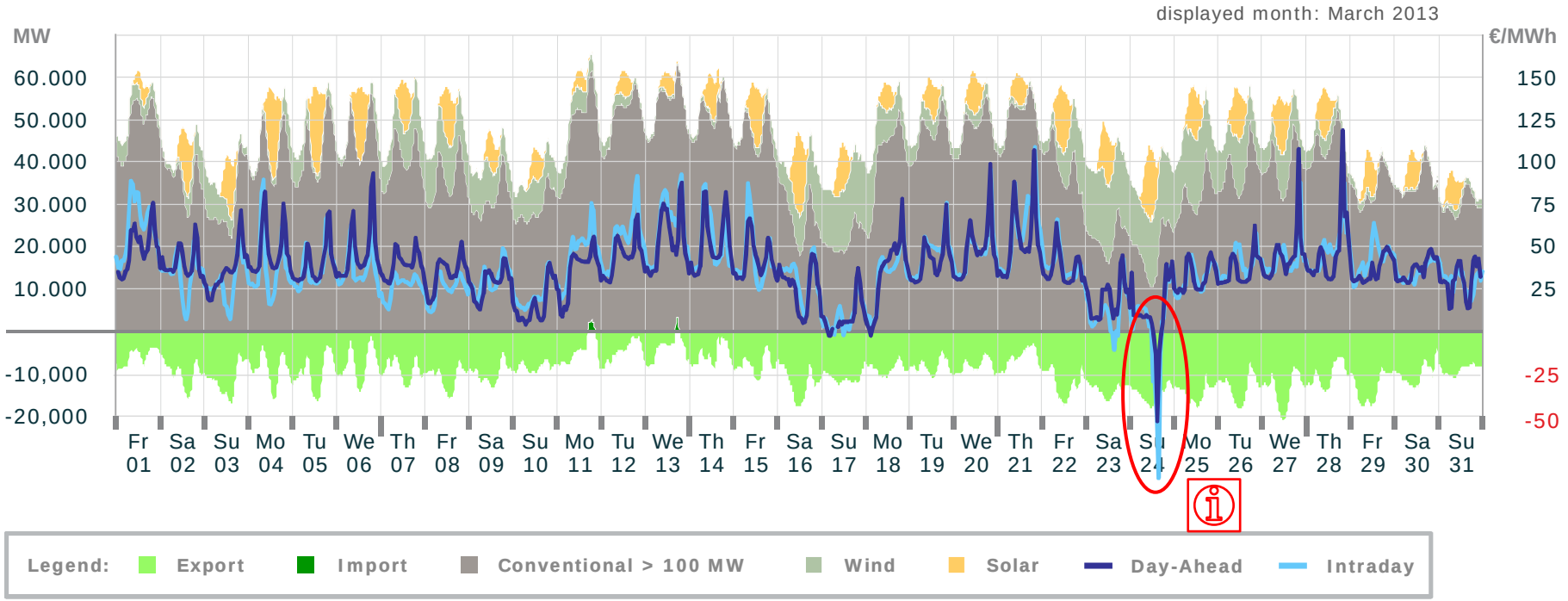
Electricity Production and Spot-Prices: March 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**38.97**	**- 50.00**	**120.20**	**21 190**
Intraday	**39.72**	**- 83.20**	**110.40**	**980**

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

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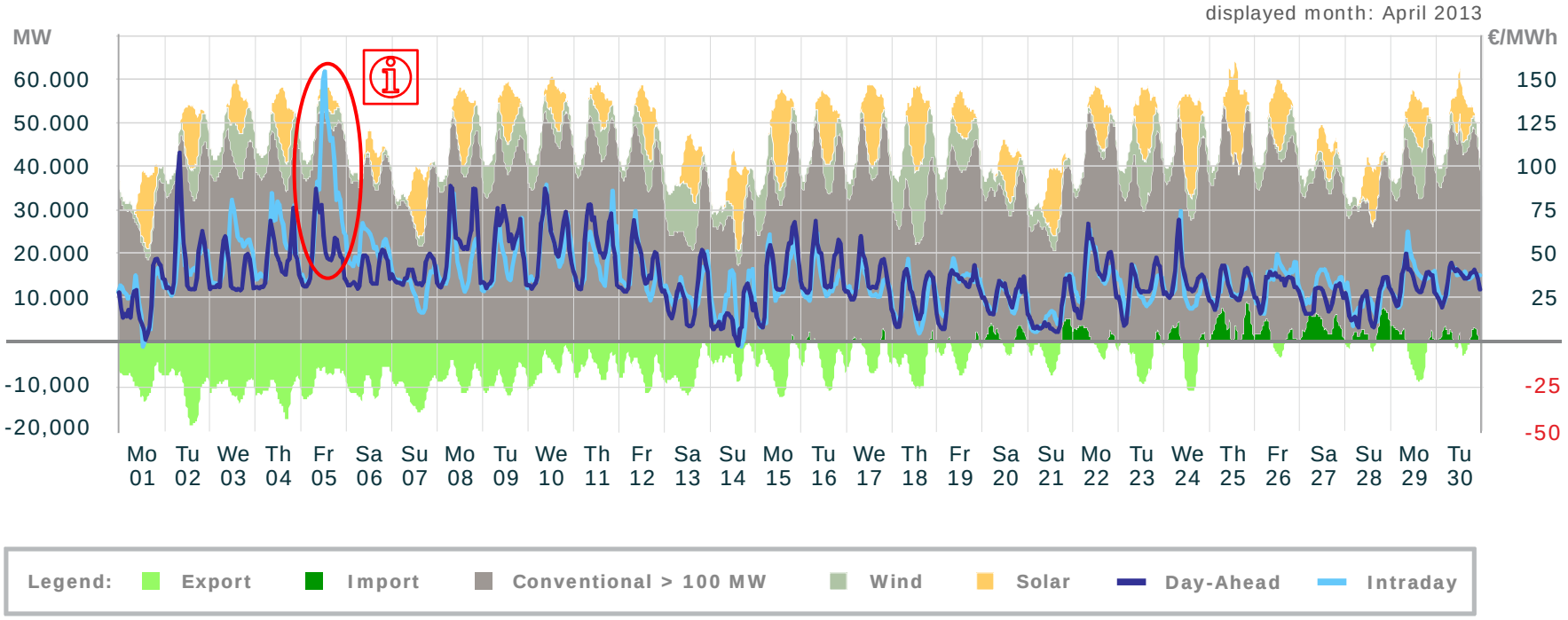
Electricity Production and Spot-Prices: April 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**38.18**	**0.00**	**109.40**	**19 839**
Intraday	**42.58**	**- 0.80**	**155.60**	**1 375**

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

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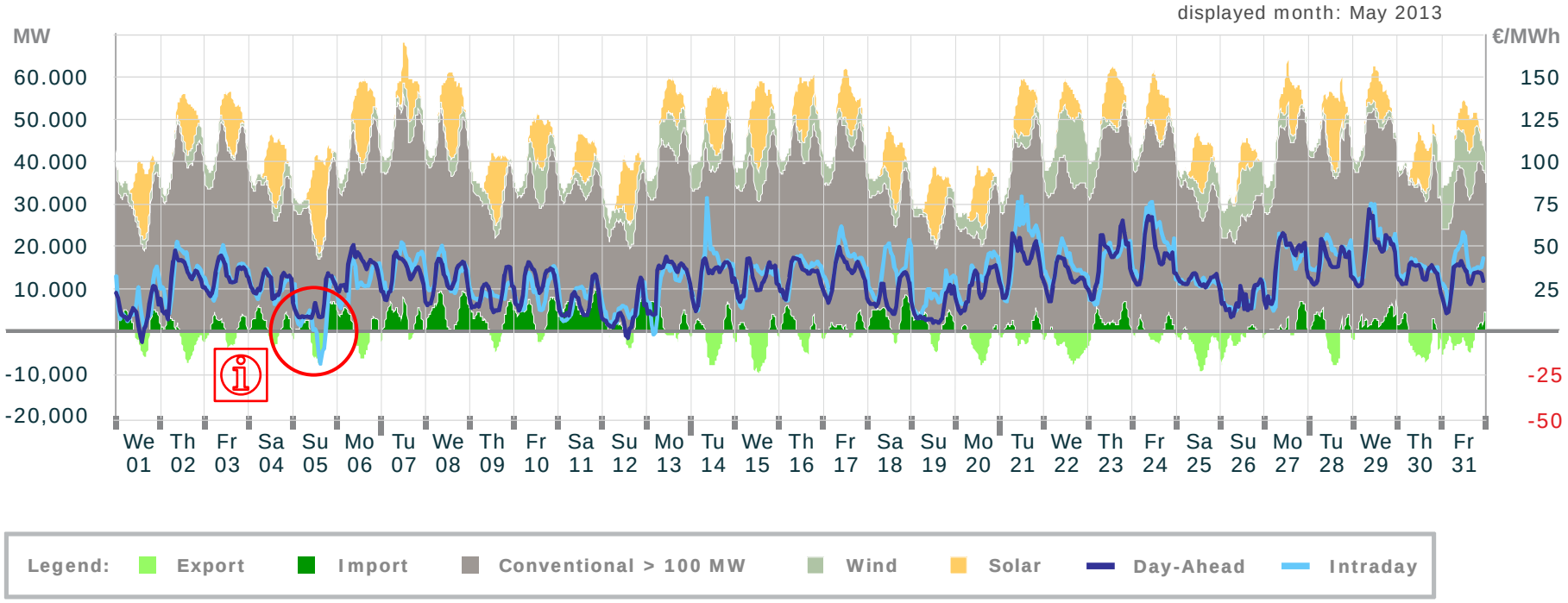
Electricity Production and Spot-Prices: May 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**32.47**	**- 3.60**	**73.90**	**20 953**
Intraday	**36.64**	**- 16.30**	**81.30**	**1 397**

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

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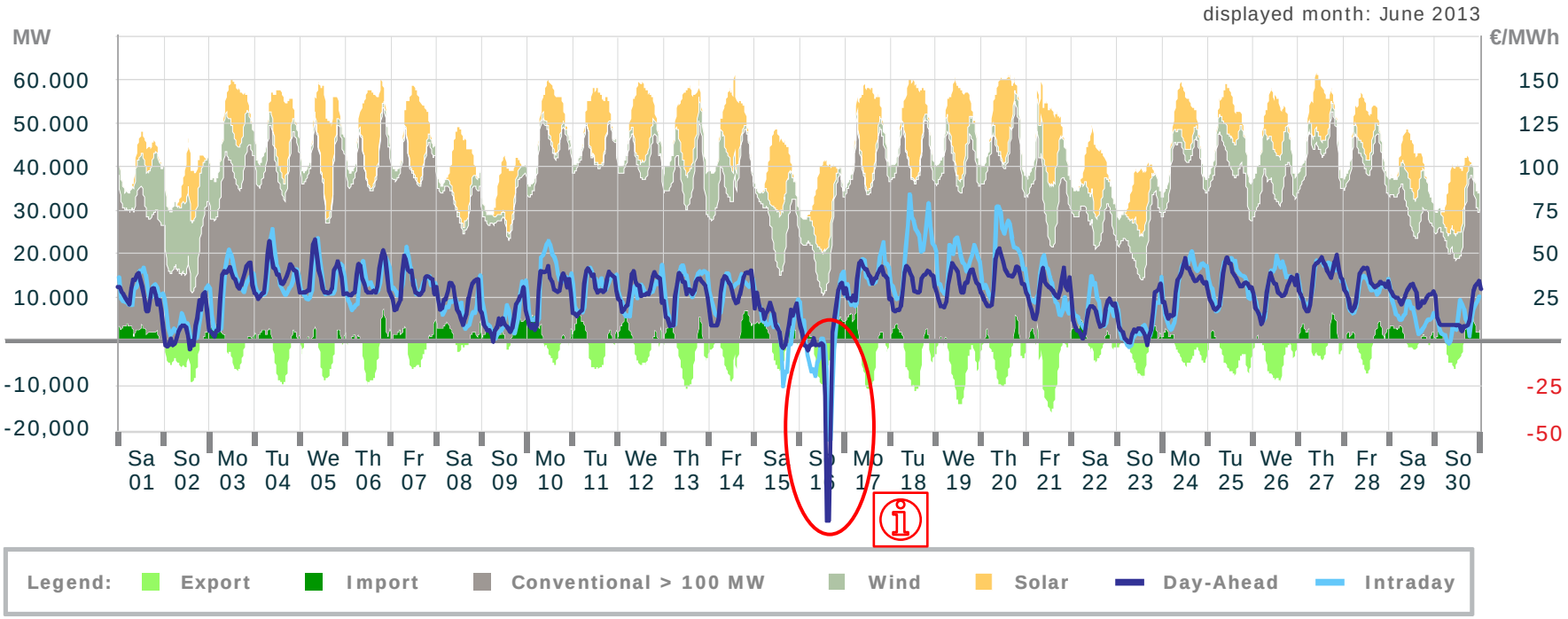
Electricity Production and Spot-Prices: June 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**28.28**	**- 100.00**	**60.00**	**20 864**
Intraday	**33.70**	**- 53.50**	**86.00**	**1 493**

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

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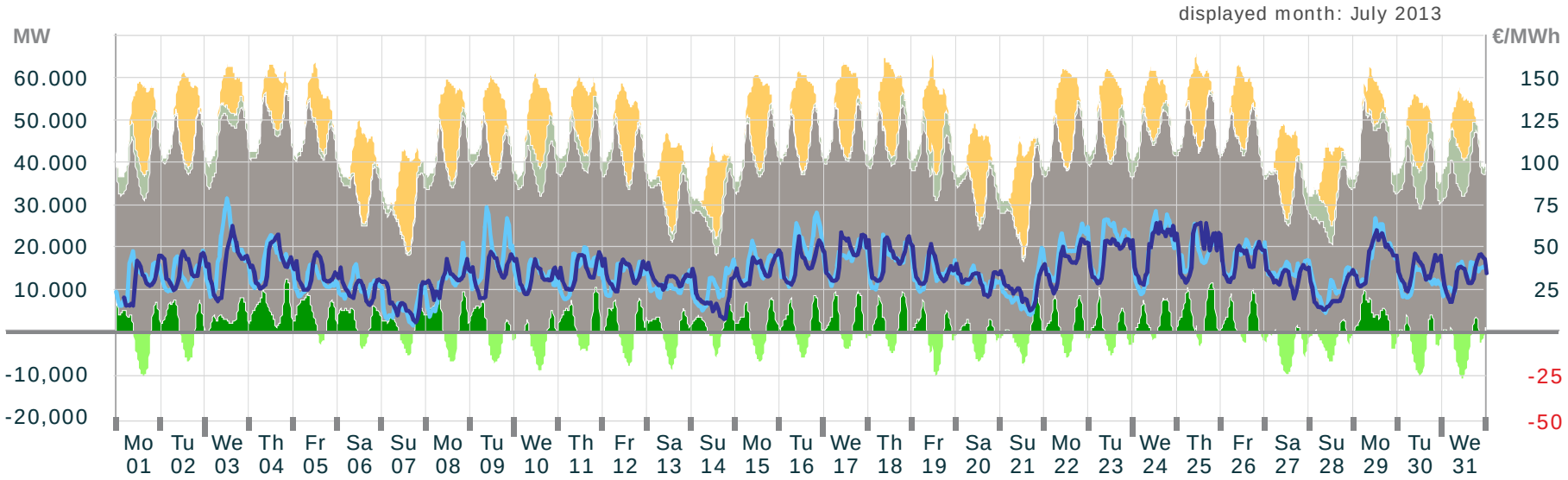
Electricity Production and Spot-Prices: July 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**36.92**	**7.00**	**65.30**	**21 504**
Intraday	**42.01**	**6.30**	**80.50**	**1 323**

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

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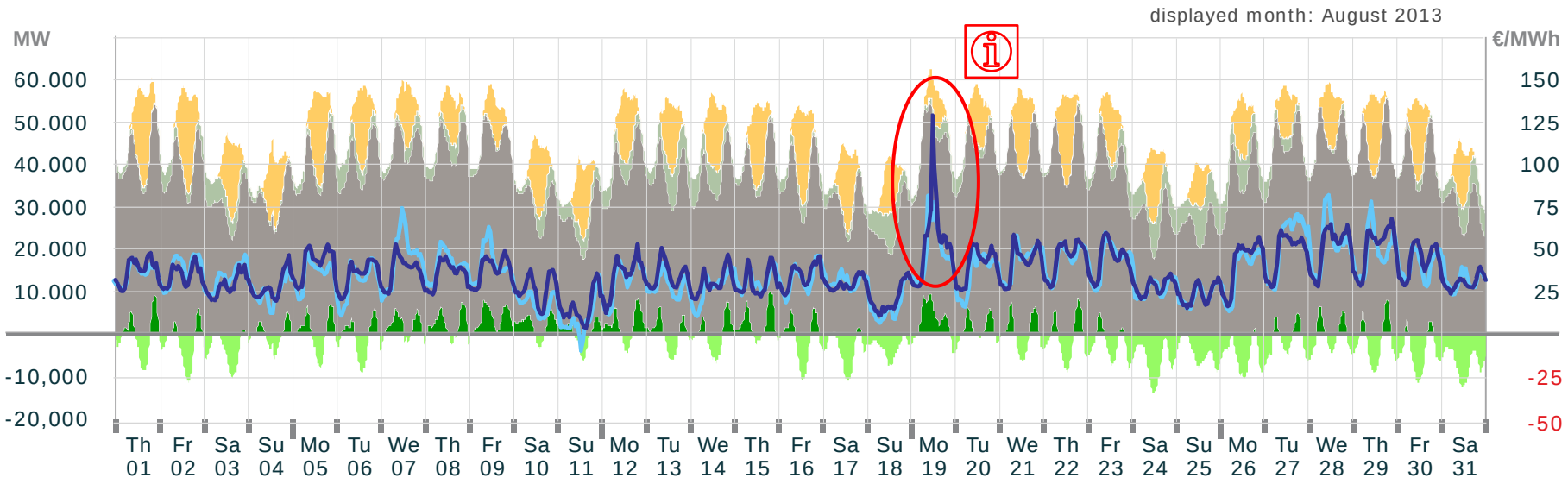
Electricity Production and Spot-Prices: August 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**38.69**	**6.00**	**130.30**	**20 429**
Intraday	**40.17**	**- 7.20**	**83.70**	**1 440**

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

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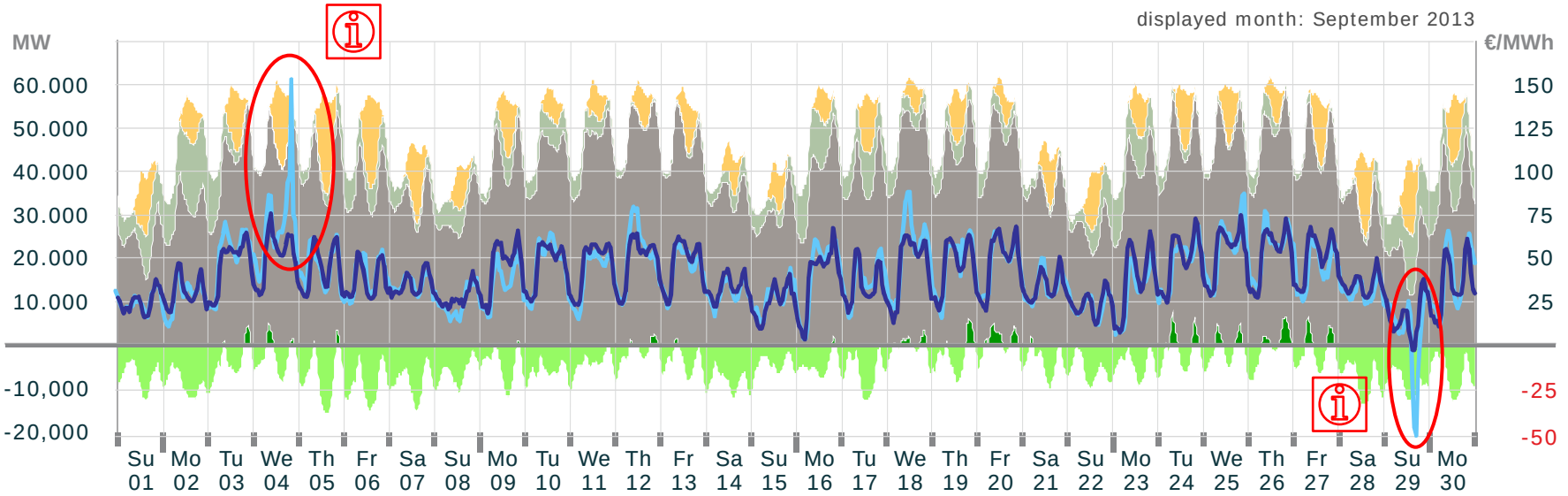
Electricity Production and Spot-Prices: September 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**41.96**	**- 0.10**	**77.70**	**18 649**
Intraday	**44.73**	**- 48.90**	**154.10**	**1 256**

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

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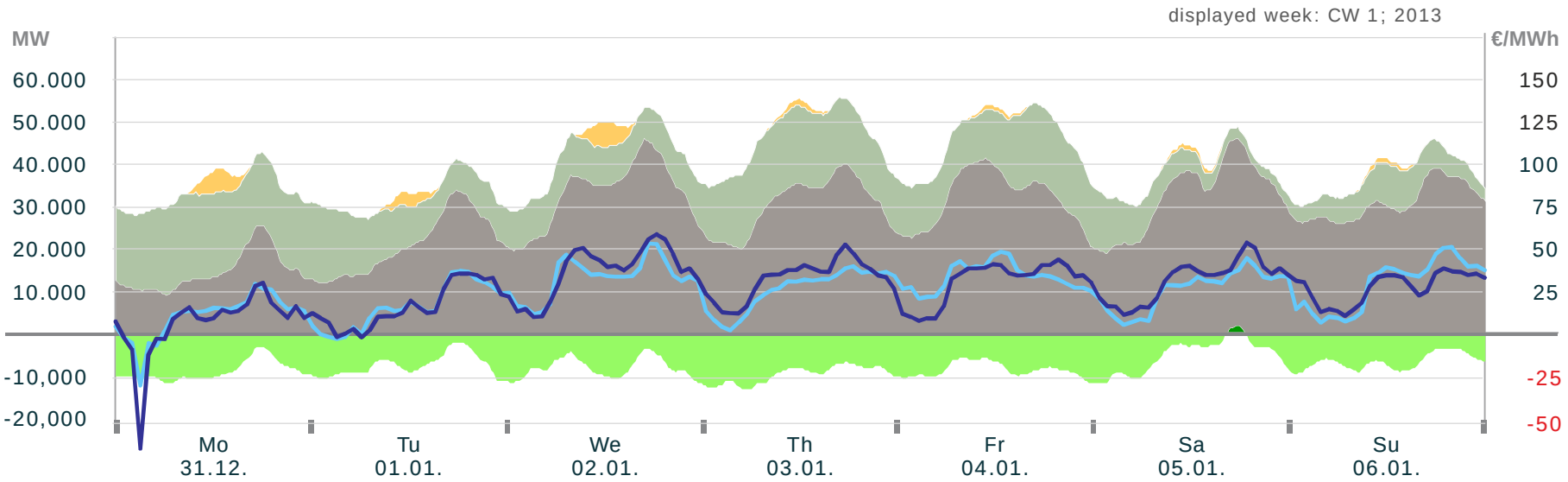
Electricity Production and Spot-Prices: CW 1 2013



€ / 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 Institute for Solar Energy Systems; Data: EEX, Entso-e

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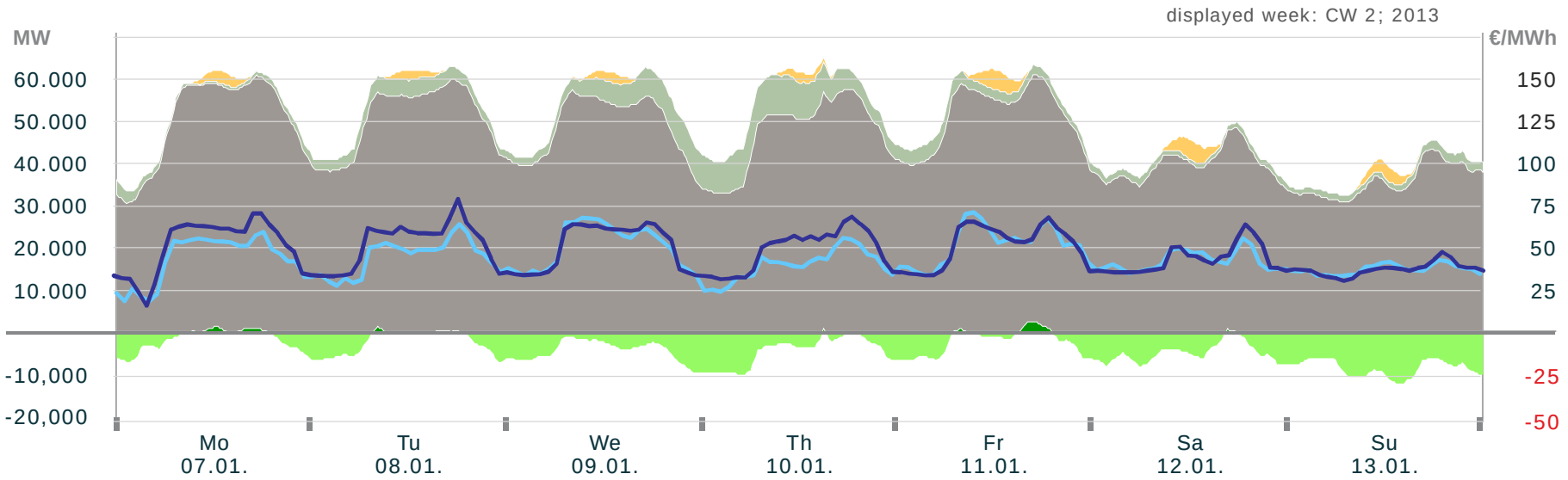
Electricity Production and Spot-Prices: CW 2 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**49.85**	**17.50**	**79.80**	**4 318**
Intraday	**49.67**	**20.10**	**72.00**	**339**

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

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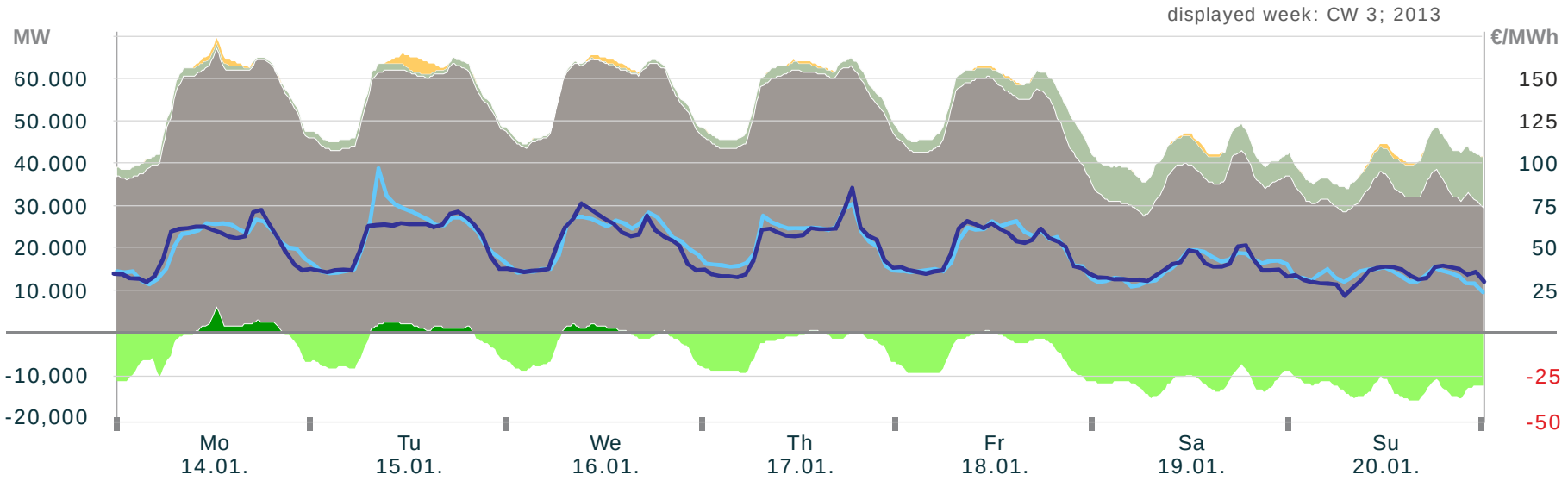
Electricity Production and Spot-Prices: CW 3 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**49.53**	**23.10**	**86.10**	**4 350**
Intraday	**54.73**	**25.70**	**98.30**	**340**

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

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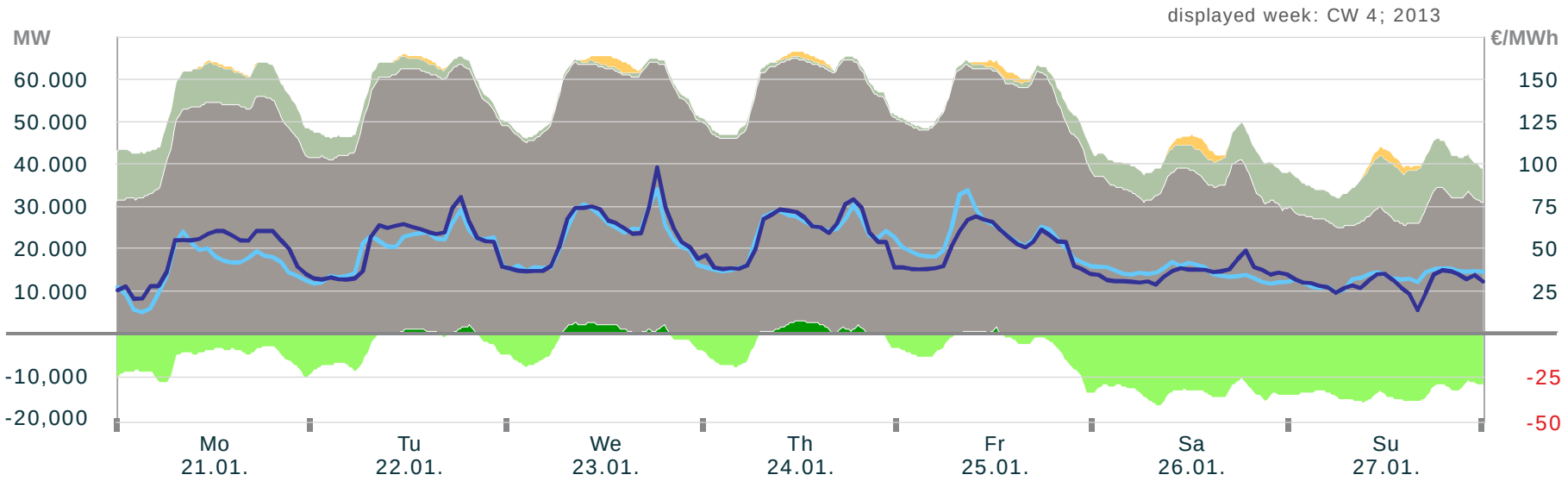
Electricity Production and Spot-Prices: CW 4 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**49.23**	**15.20**	**98.50**	**4 191**
Intraday	**49.65**	**14.00**	**85.80**	**197**

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

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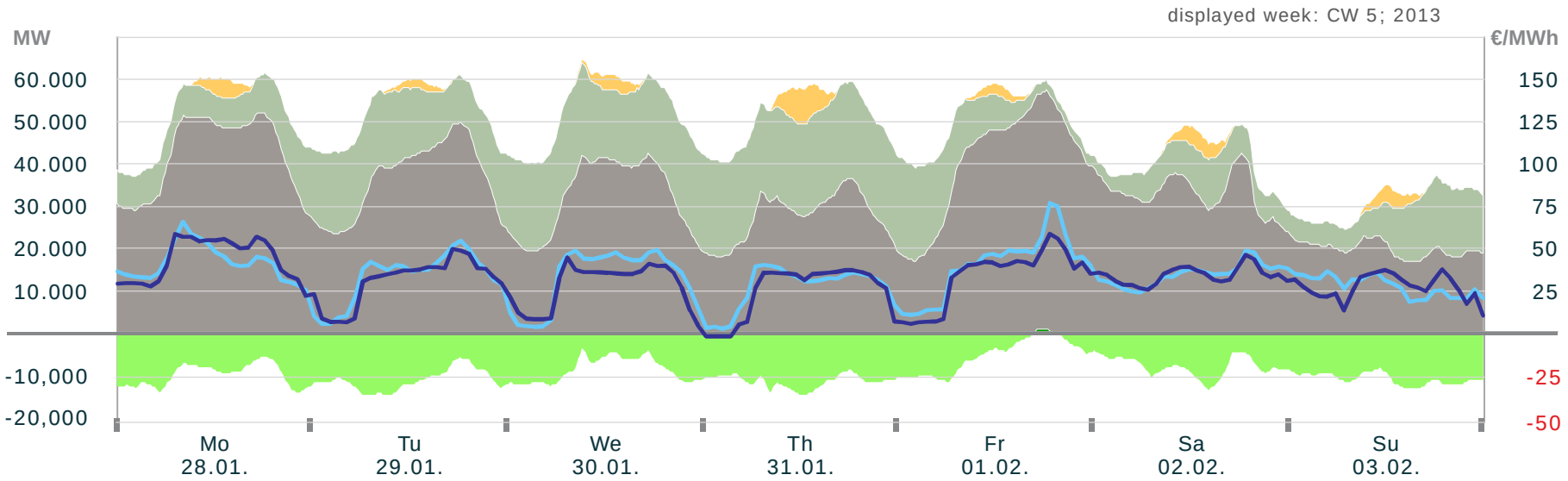
Electricity Production and Spot-Prices: CW 5 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**33.26**	**- 0.10**	**59.80**	**5 076**
Intraday	**37.71**	**4.20**	**77.60**	**261**

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

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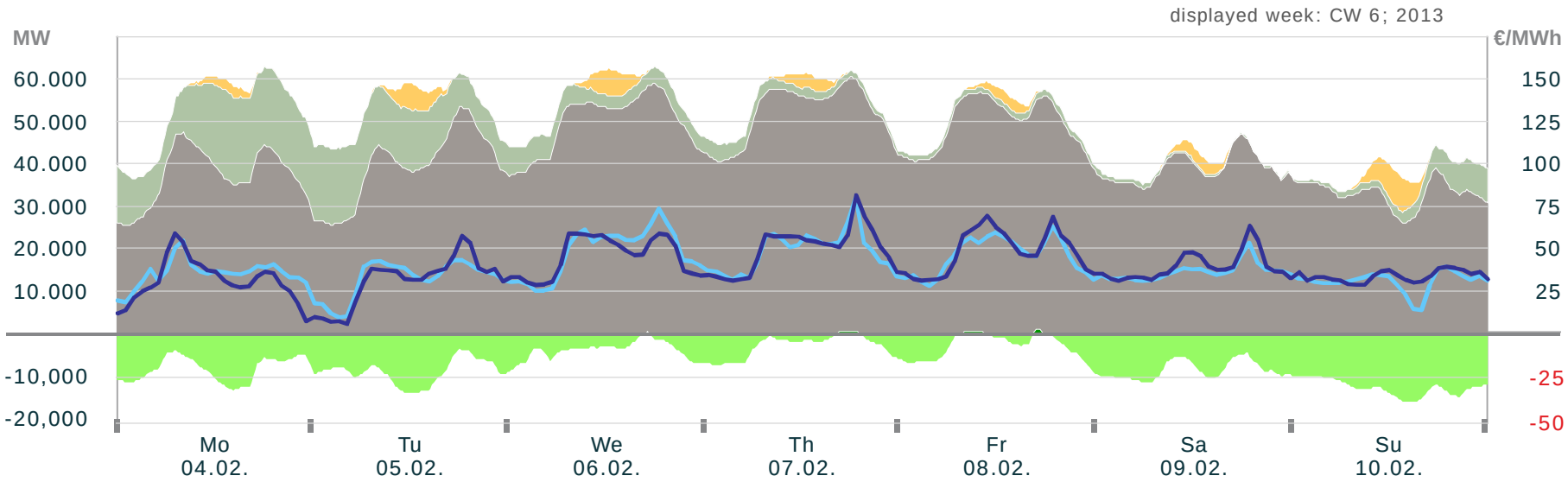
Electricity Production and Spot-Prices: CW 6 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**41.27**	**7.30**	**82.30**	**4 666**
Intraday	**42.12**	**11.10**	**80.60**	**233**

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

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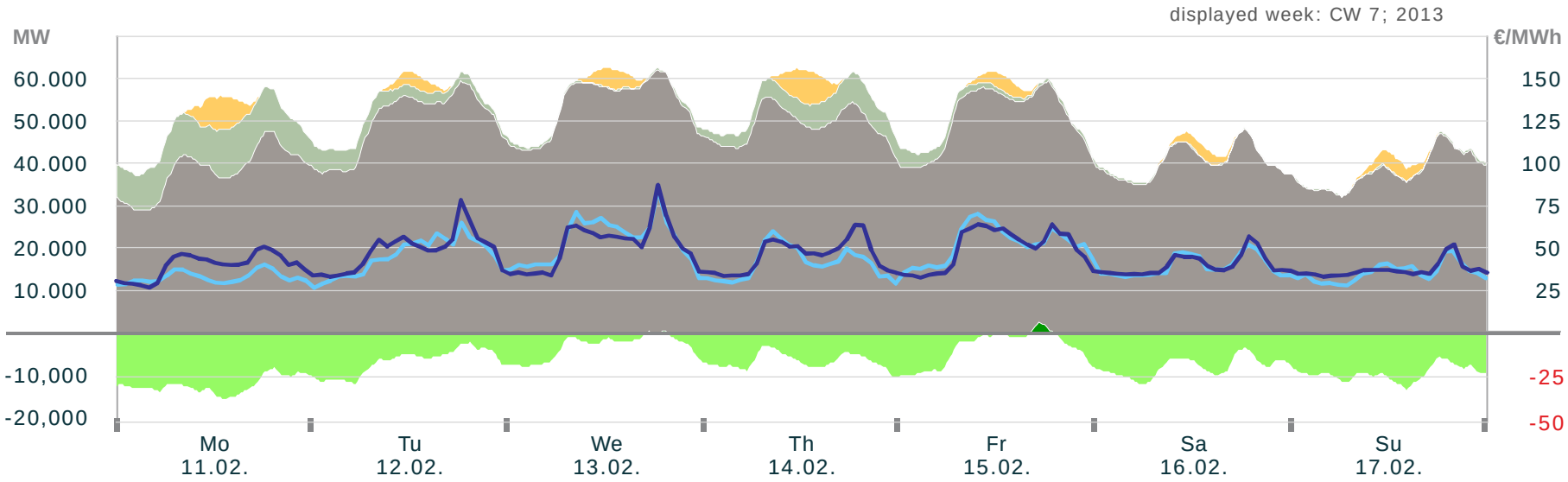
Electricity Production and Spot-Prices: CW 7 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**46.15**	**28.00**	**87.90**	**4 448**
Intraday	**45.41**	**28.00**	**85.40**	**298**

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

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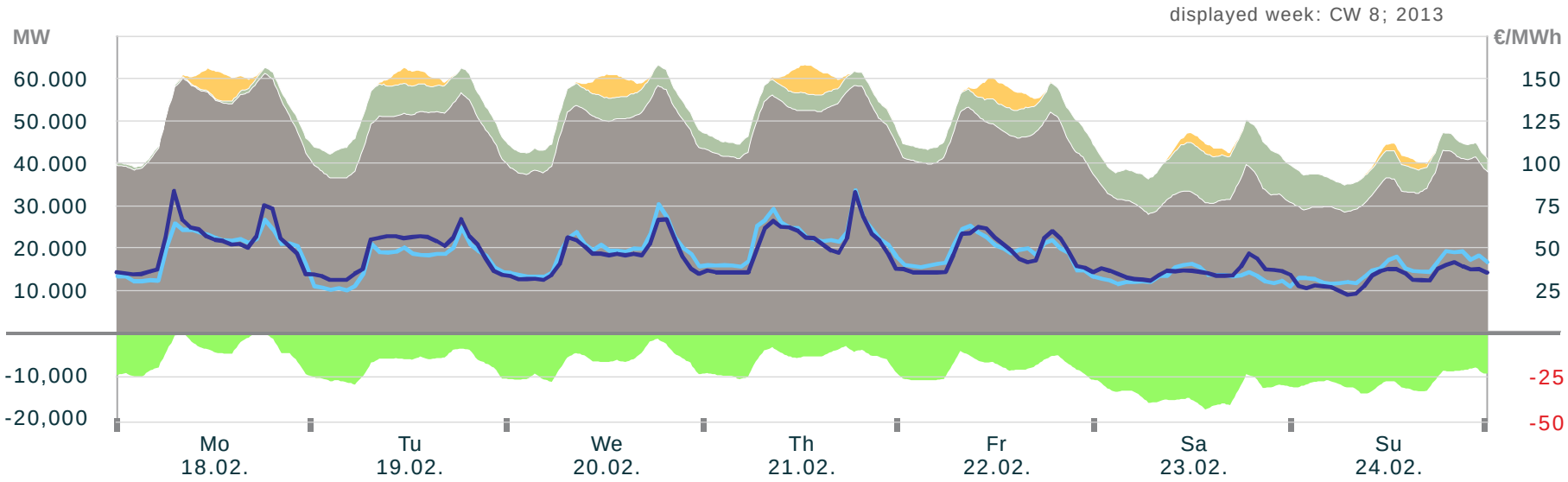
Electricity Production and Spot-Prices: CW 8 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**46.22**	**23.90**	**84.40**	**4 657**
Intraday	**47.18**	**26.50**	**84.80**	**349**

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

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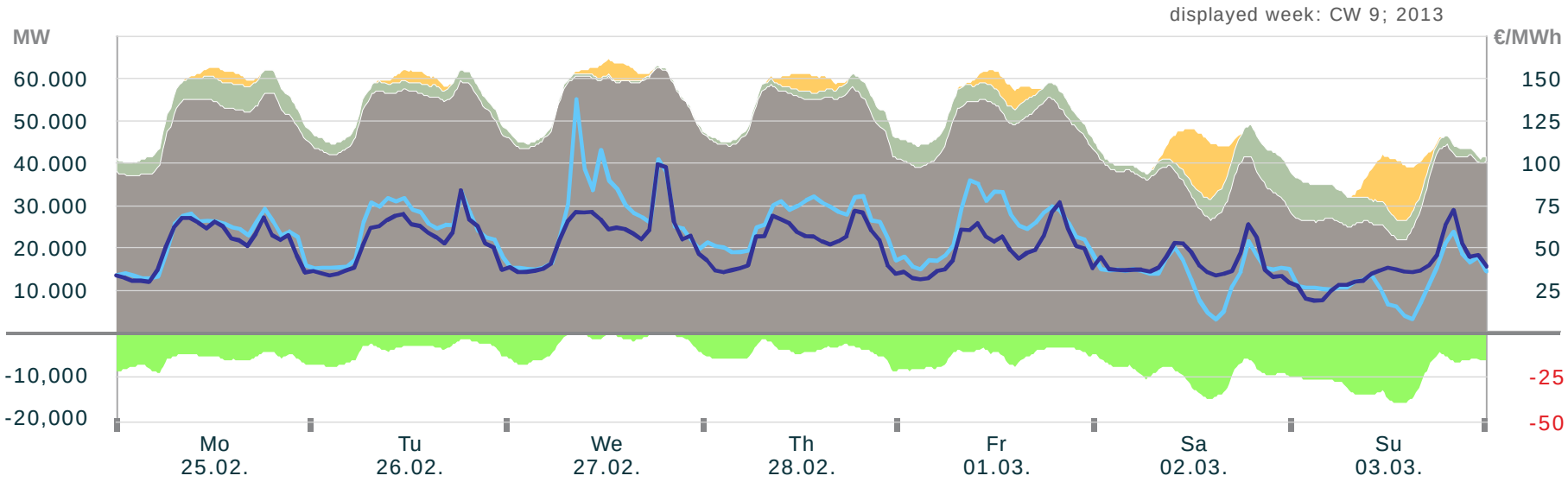
Electricity Production and Spot-Prices: CW 9 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**51.30**	**20.50**	**99.90**	**4 546**
Intraday	**56.76**	**9.60**	**137.70**	**203**

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

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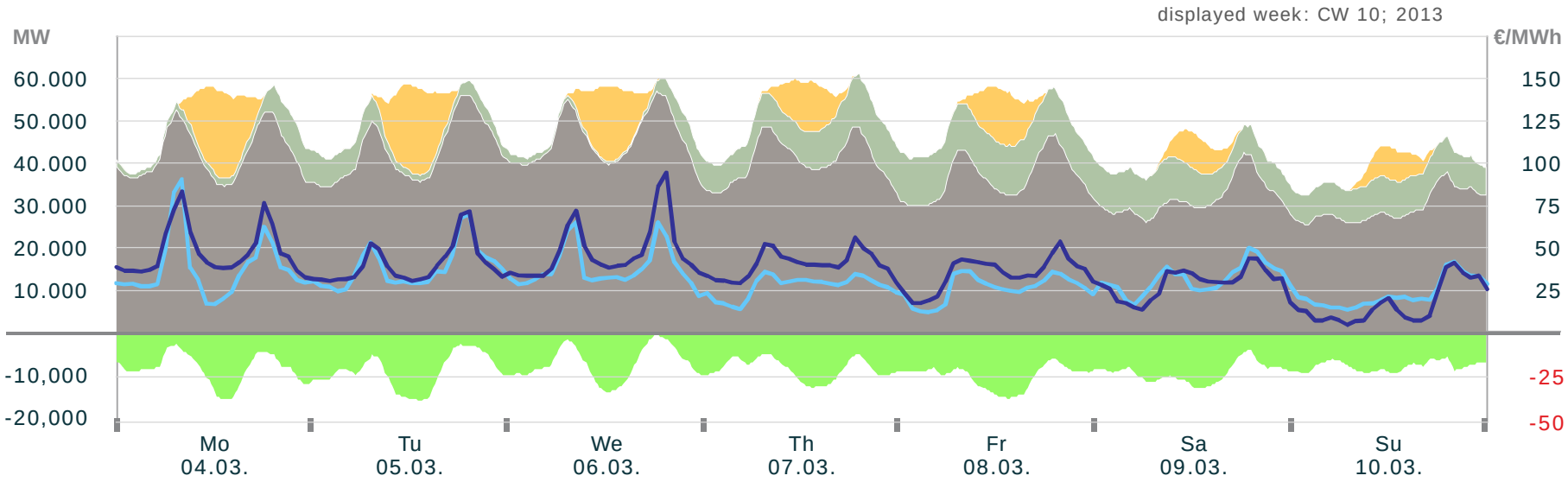
Electricity Production and Spot-Prices: CW 10 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**38.35**	**6.50**	**95.10**	**4 818**
Intraday	**32.31**	**13.90**	**91.30**	**247**

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

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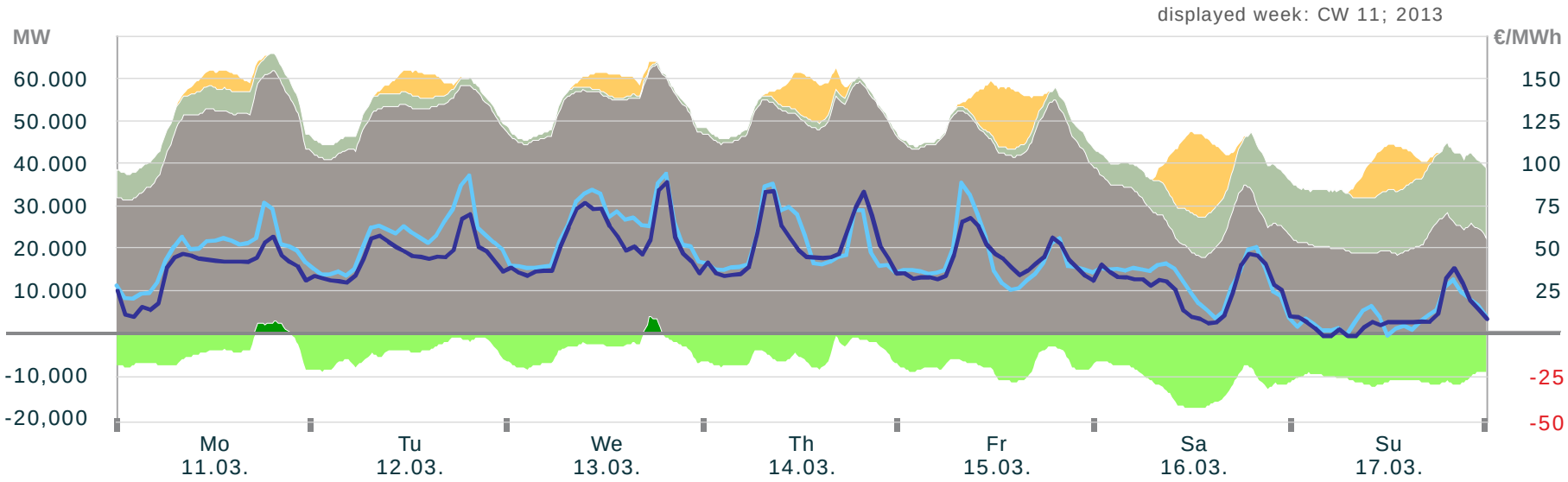
Electricity Production and Spot-Prices: CW 11 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**39.33**	**0.00**	**89.60**	**4 492**
Intraday	**45.38**	**0.30**	**94.50**	**219**

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

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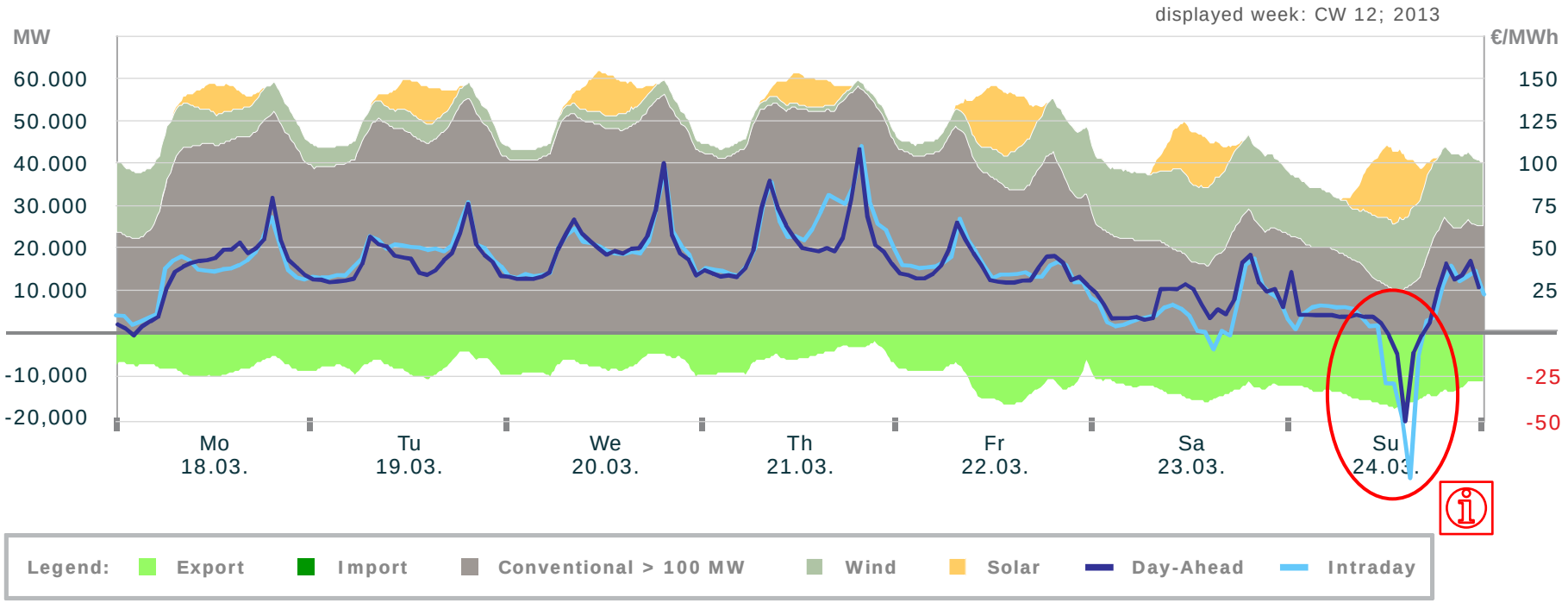
Electricity Production and Spot-Prices: CW 12 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**36.12**	**- 50.00**	**108.60**	**4 821**
Intraday	**36.33**	**- 83.20**	**110.40**	**177**

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

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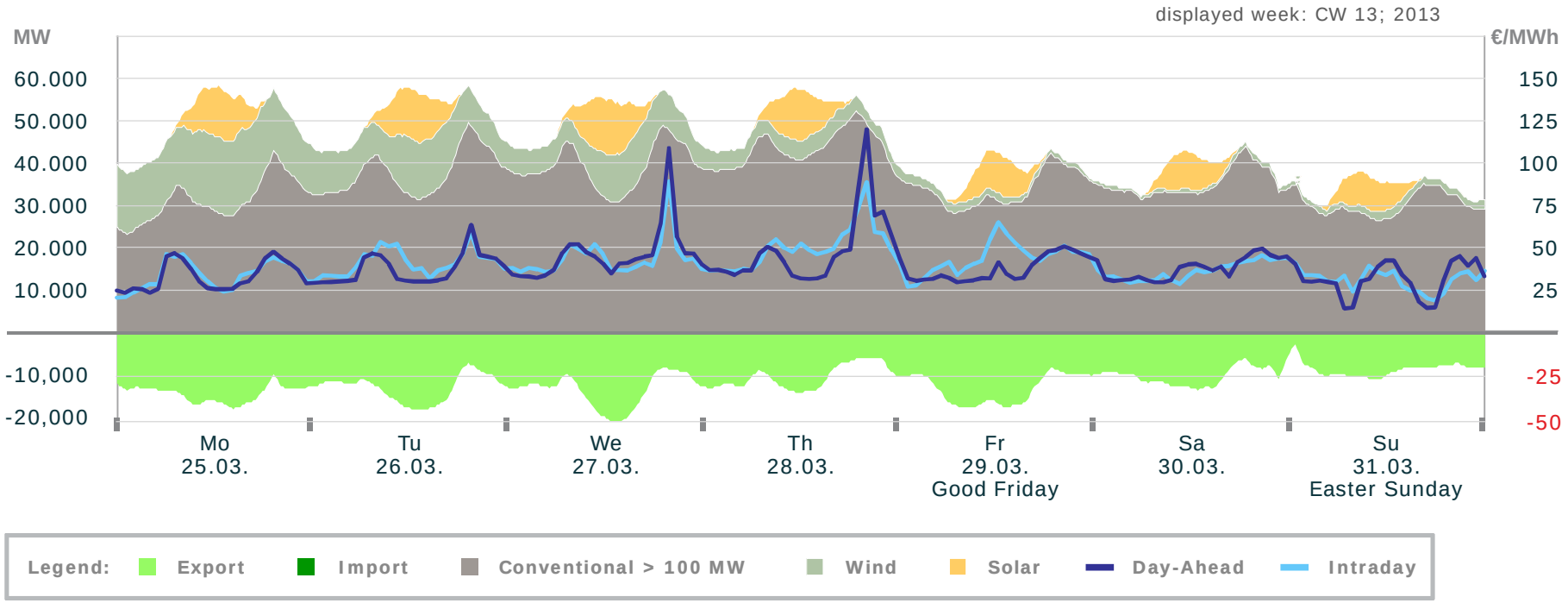
Electricity Production and Spot-Prices: CW 13 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**39.74**	**15.80**	**120.20**	**5 099**
Intraday	**44.41**	**20.50**	**89.80**	**264**

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

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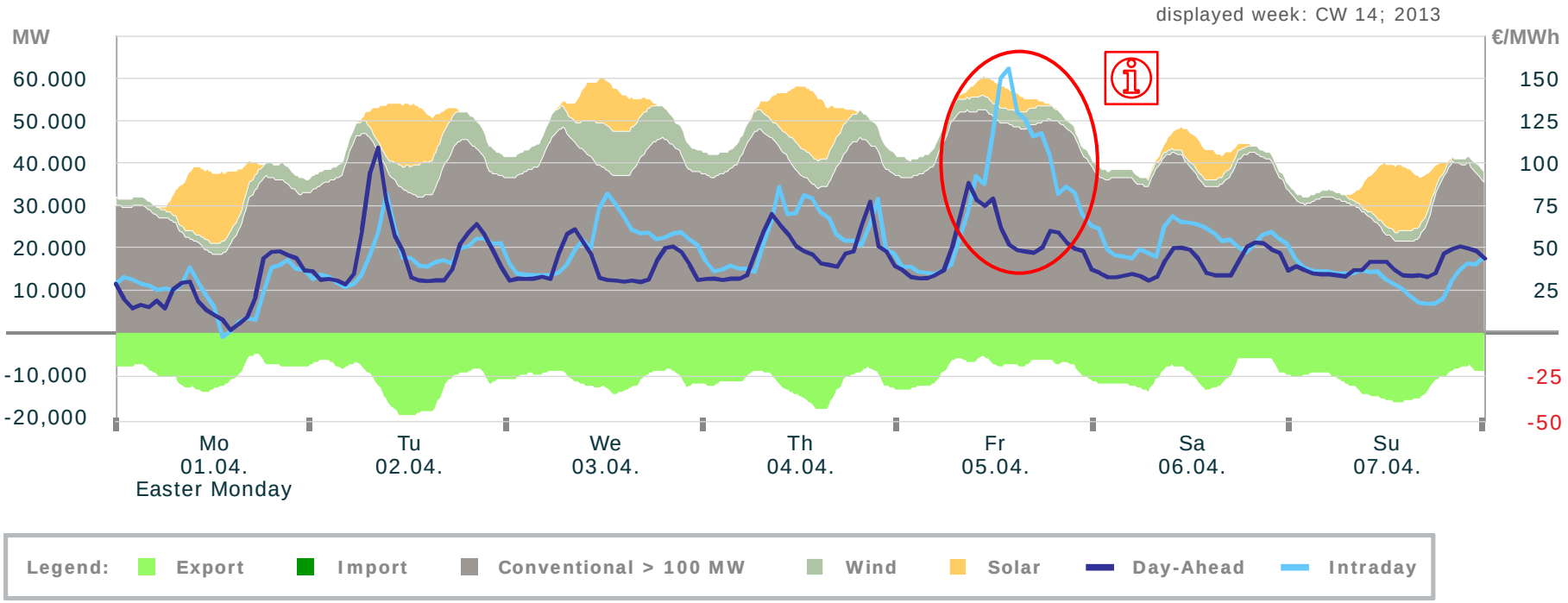
Electricity Production and Spot-Prices: CW 14 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**42.31**	**3.20**	**109.40**	**4 875**
Intraday	**62.40**	**- 0.80**	**155.60**	**216**

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

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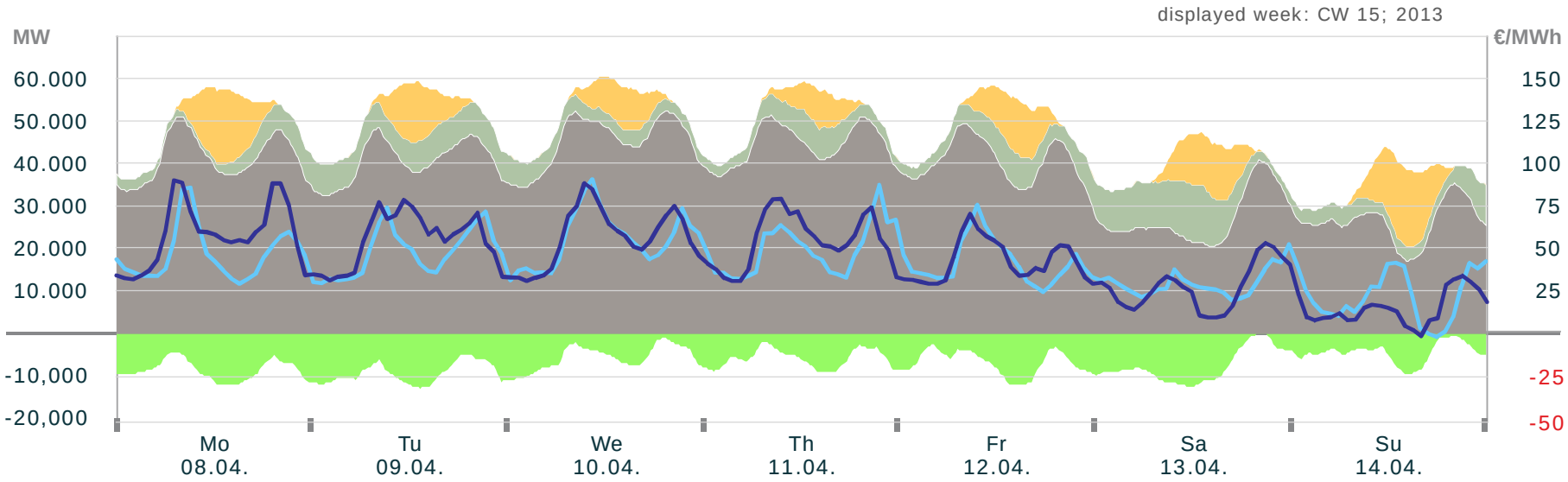
Electricity Production and Spot-Prices: CW 15 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**44.96**	**0.00**	**90.50**	**4 638**
Intraday	**42.46**	**- 0.70**	**91.20**	**180**

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

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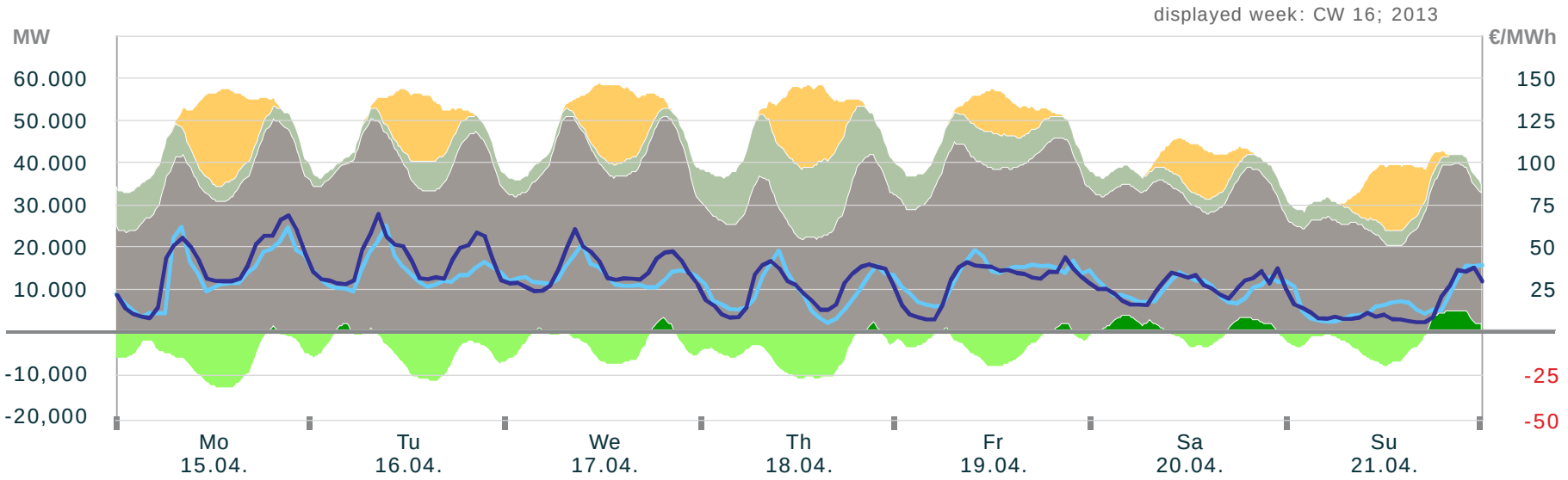
Electricity Production and Spot-Prices: CW 16 2013

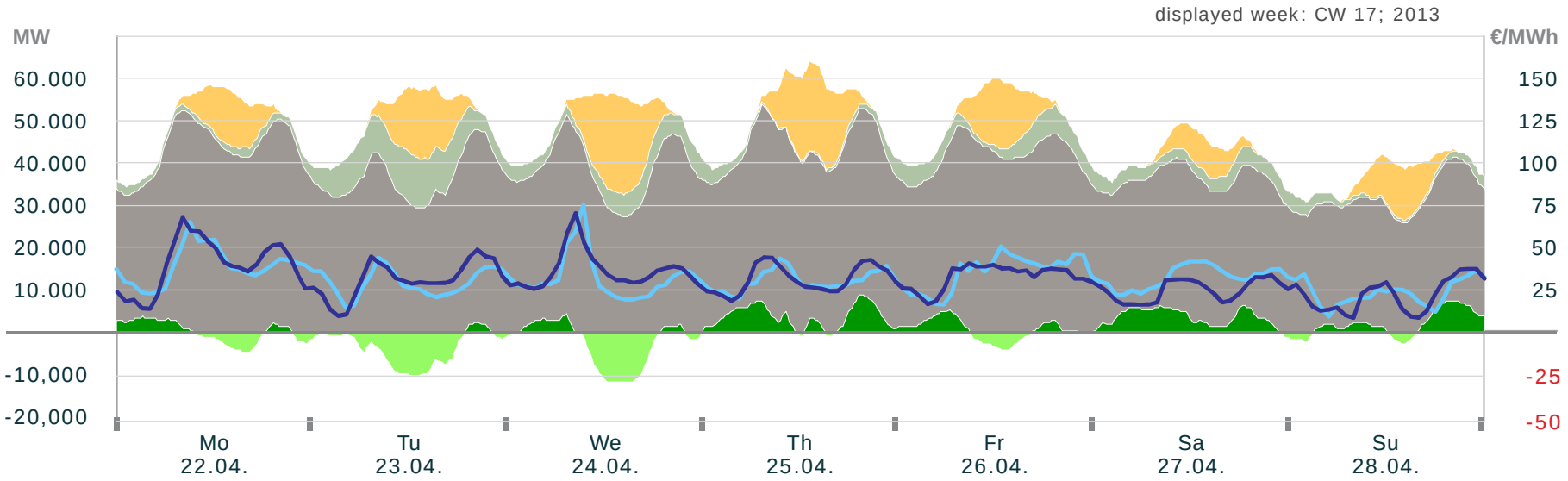


€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**32.25**	**7.60**	**70.70**	**4 634**
Intraday	**30.74**	**6.80**	**63.70**	**192**

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

Fraunhofer ISE

Electricity Production and Spot-Prices: CW 17 2013

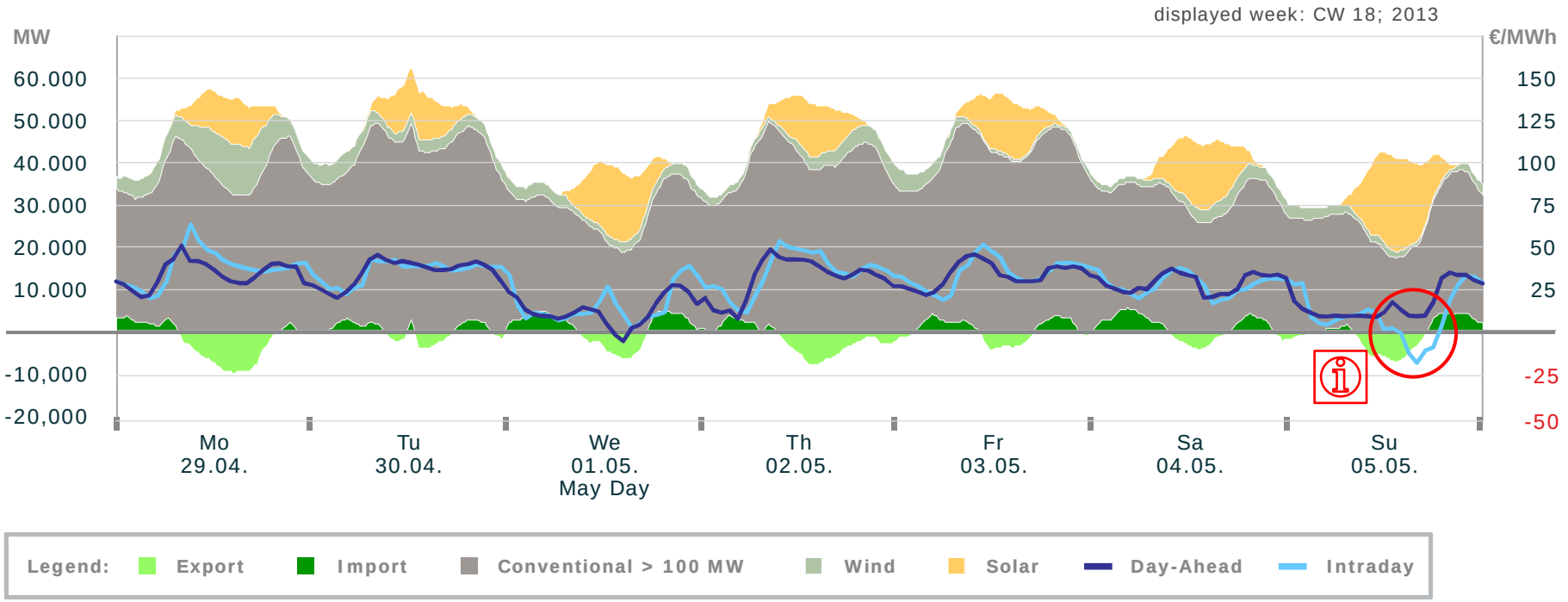


€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**33.13**	**10.10**	**71.20**	**4 392**
Intraday	**33.03**	**10.90**	**76.30**	**296**

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

Fraunhofer ISE

Electricity Production and Spot-Prices: CW 18 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**28.95**	**- 3.60**	**52.10**	**4 521**
Intraday	**29.90**	**- 16.30**	**64.60**	**320**

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

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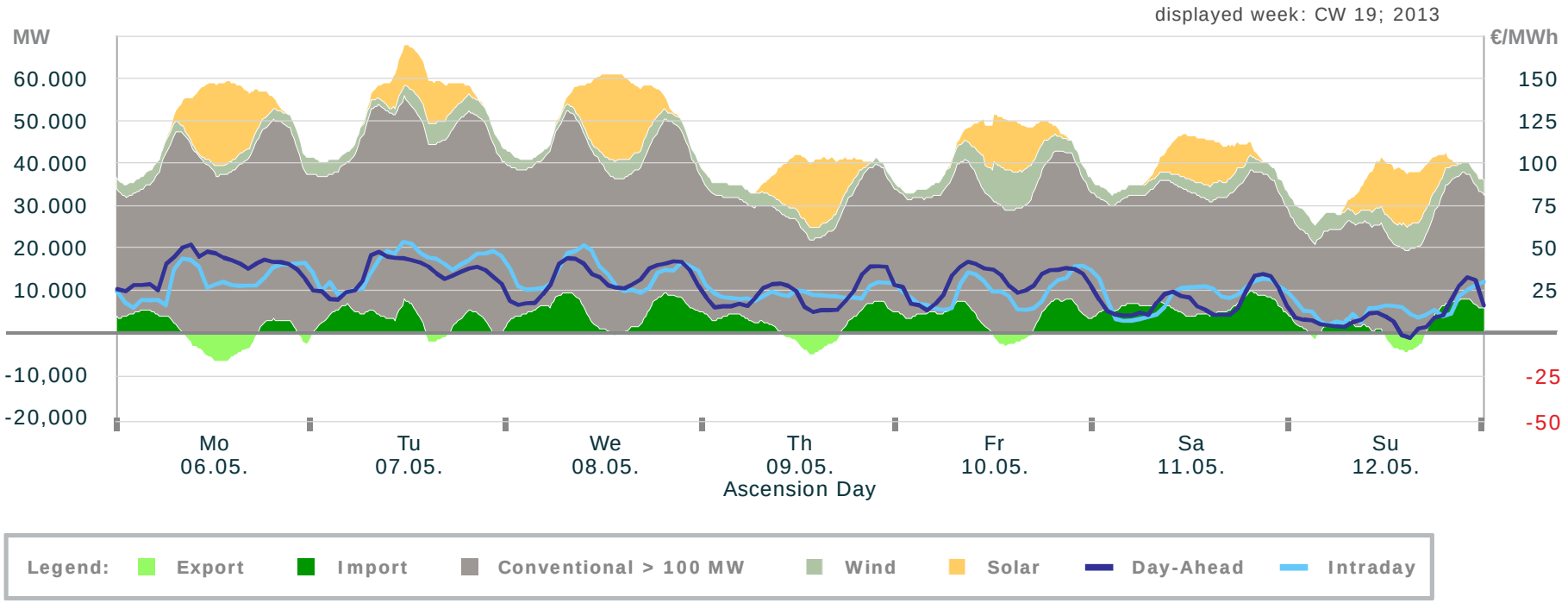
Electricity Production and Spot-Prices: CW 19 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**27.92**	**- 1.30**	**53.00**	**4 592**
Intraday	**28.82**	**6.30**	**54.60**	**301**

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

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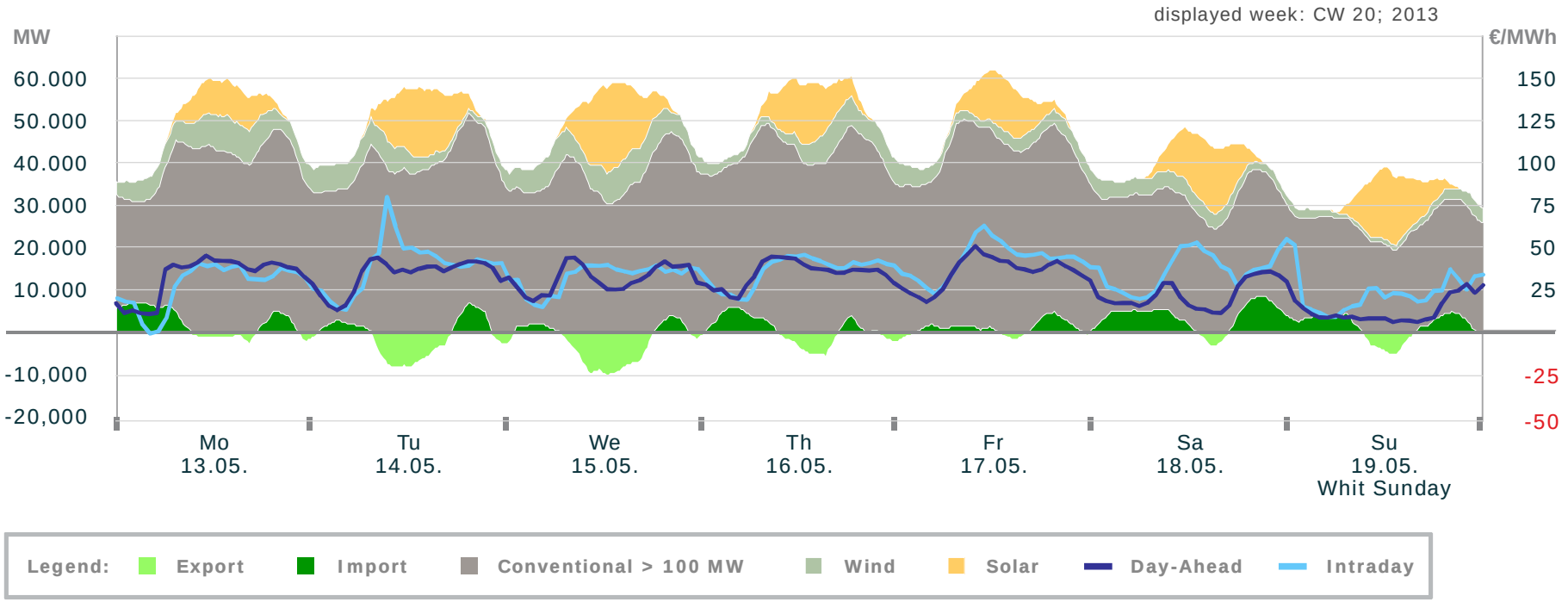
Electricity Production and Spot-Prices: CW 20 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**30.78**	**7.40**	**51.80**	**4 805**
Intraday	**37.74**	**0.80**	**80.50**	**335**

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

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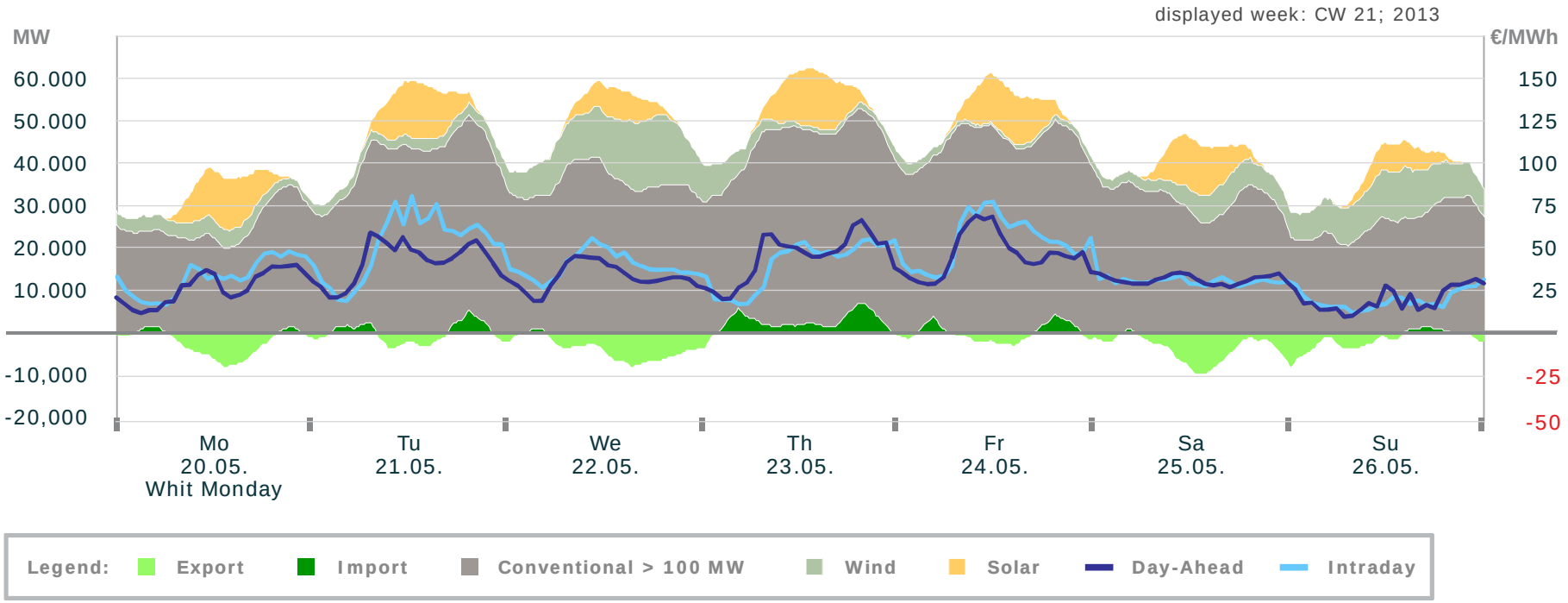
Electricity Production and Spot-Prices: CW 21 2013

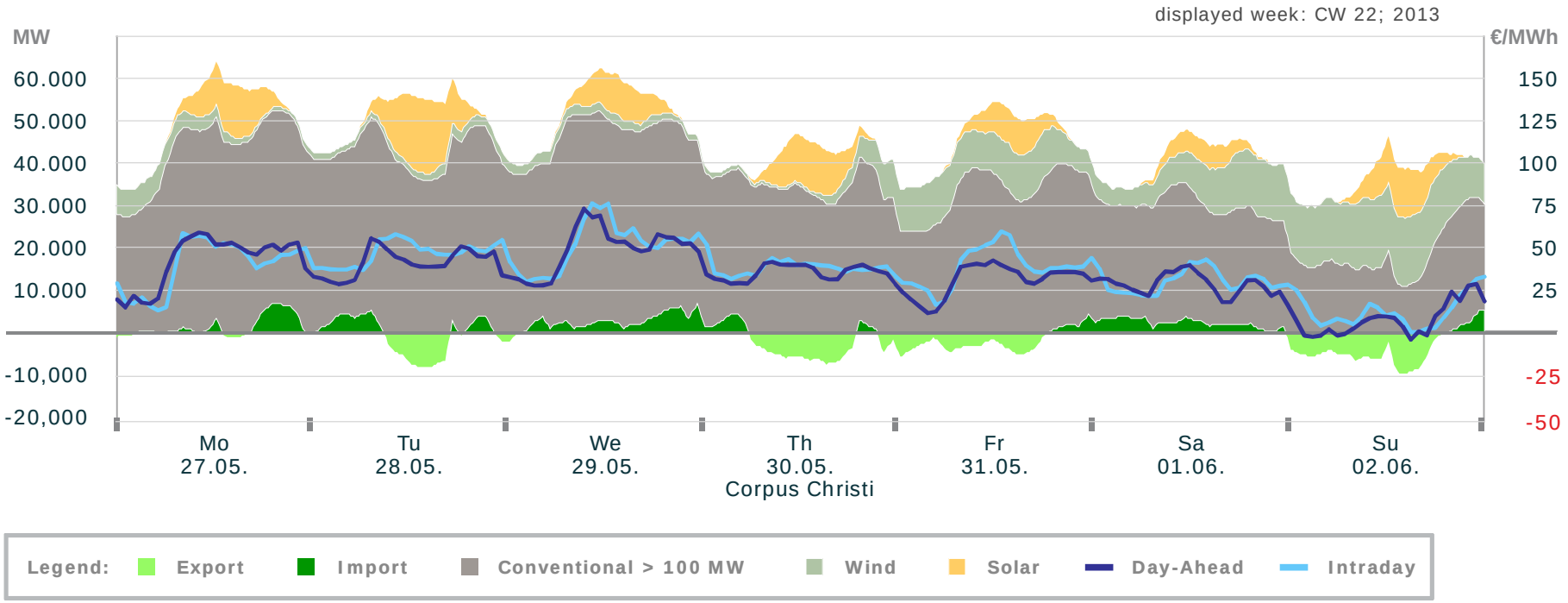


€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**36.54**	**10.90**	**70.00**	**4 954**
Intraday	**43.23**	**13.20**	**81.30**	**313**

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

Fraunhofer ISE

Electricity Production and Spot-Prices: CW 22 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**34.75**	**- 2.50**	**73.90**	**4 783**
Intraday	**39.45**	**1.80**	**77.10**	**349**

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

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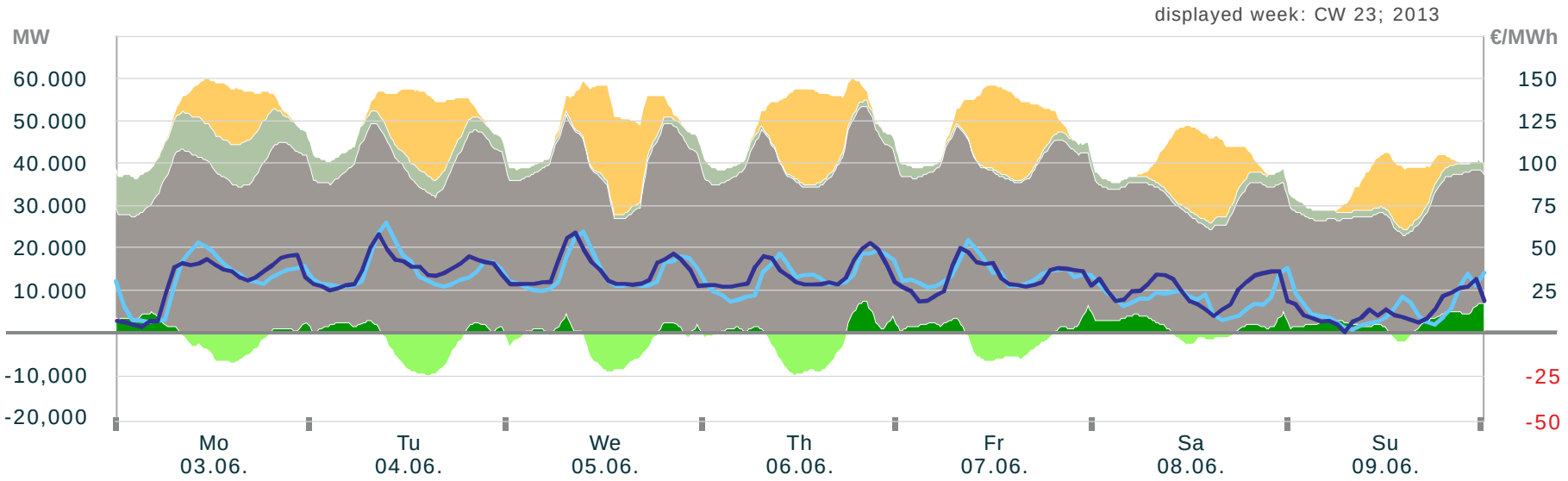
Electricity Production and Spot-Prices: CW 23 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**31.71**	**1.90**	**60.00**	**4 826**
Intraday	**32.67**	**4.00**	**66.20**	**295**

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

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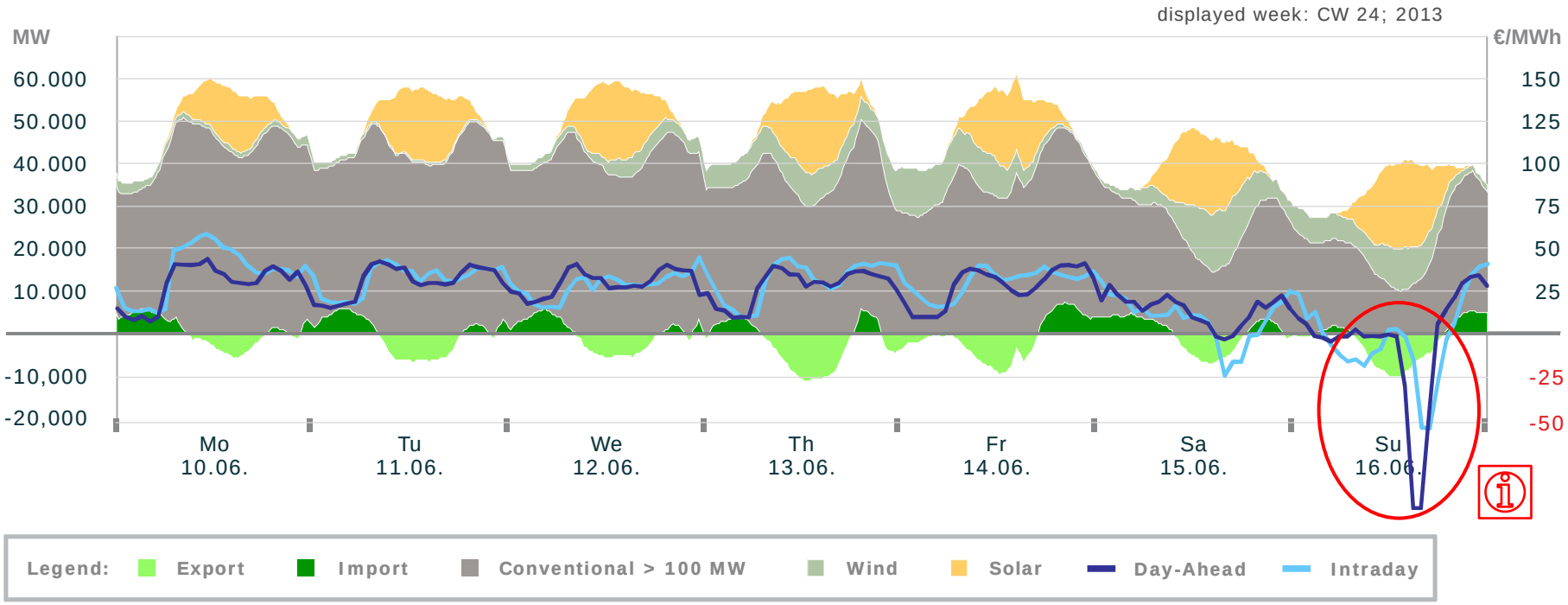
Electricity Production and Spot-Prices: CW 24 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**23.28**	**- 100.00**	**45.00**	**4 783**
Intraday	**26.95**	**- 53.50**	**59.50**	**288**

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

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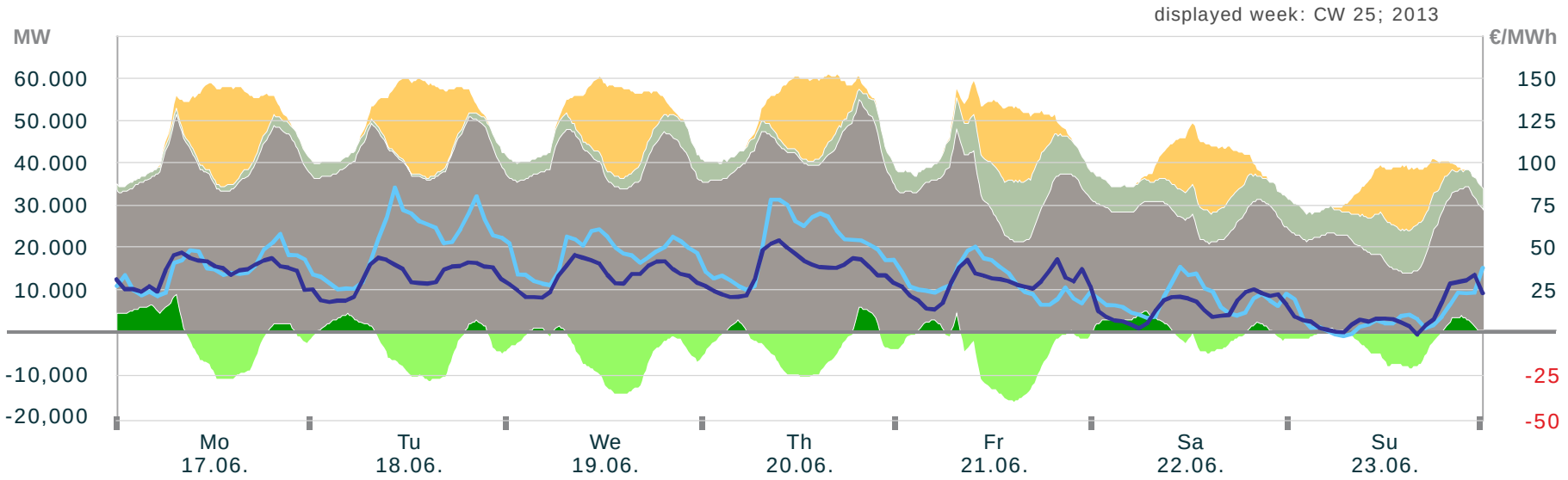
Electricity Production and Spot-Prices: CW 25 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**29.50**	**0.00**	**55.10**	**5 017**
Intraday	**43.66**	**- 0.80**	**86.00**	**390**

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

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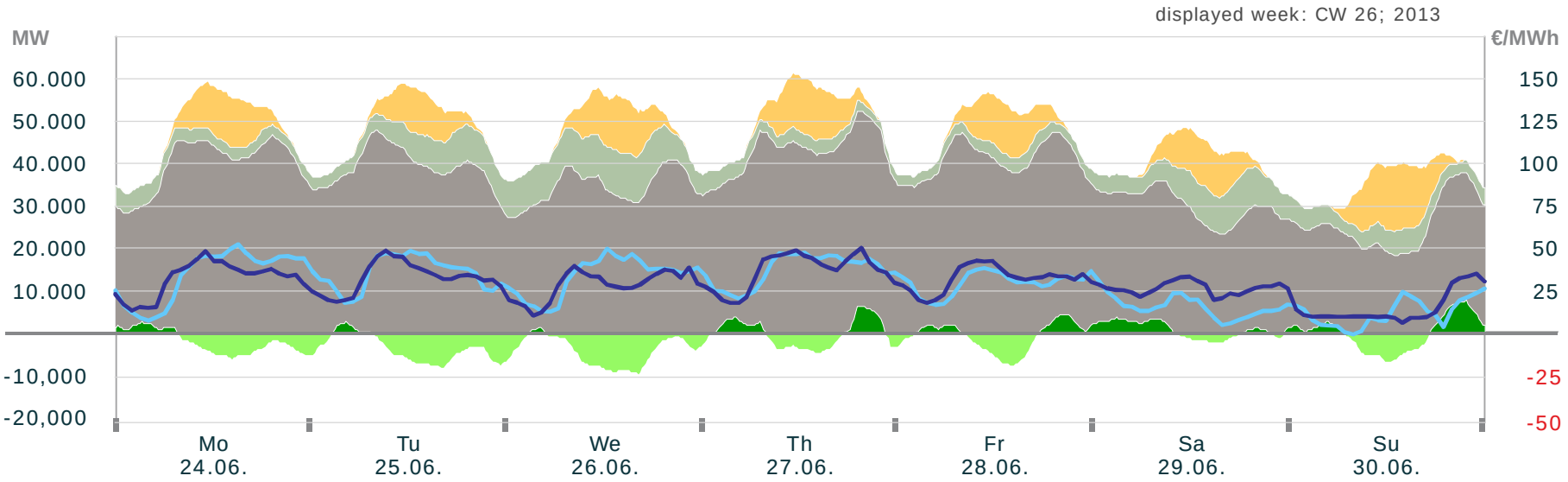
Electricity Production and Spot-Prices: CW 26 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**31.31**	**7.90**	**51.40**	**4 837**
Intraday	**32.12**	**1.20**	**53.50**	**395**

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

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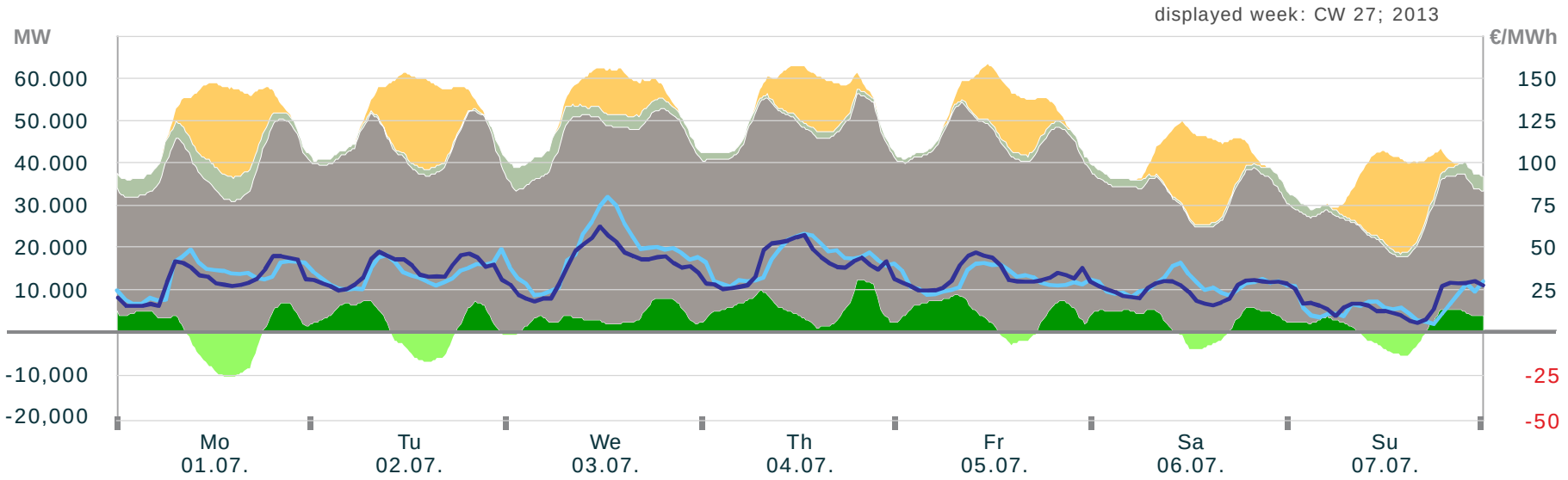
Electricity Production and Spot-Prices: CW 27 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**33.34**	**7.00**	**63.20**	**4 865**
Intraday	**39.69**	**6.30**	**80.50**	**261**

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

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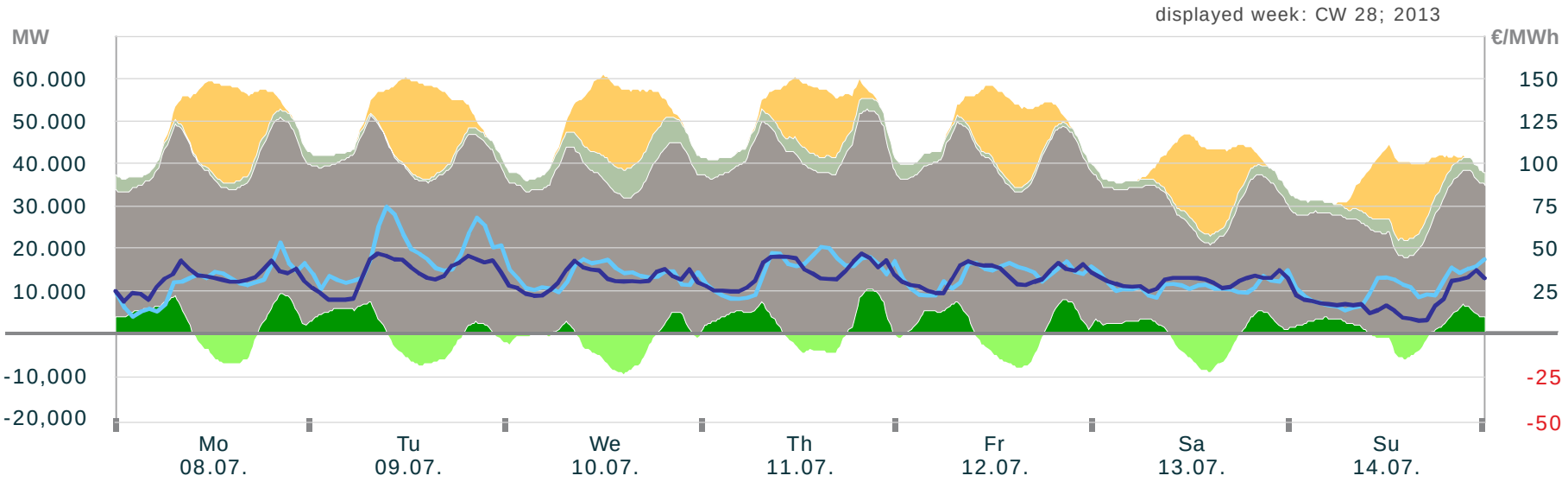
Electricity Production and Spot-Prices: CW 28 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**32.93**	**9.00**	**48.00**	**4 759**
Intraday	**38.58**	**11.40**	**75.40**	**293**

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

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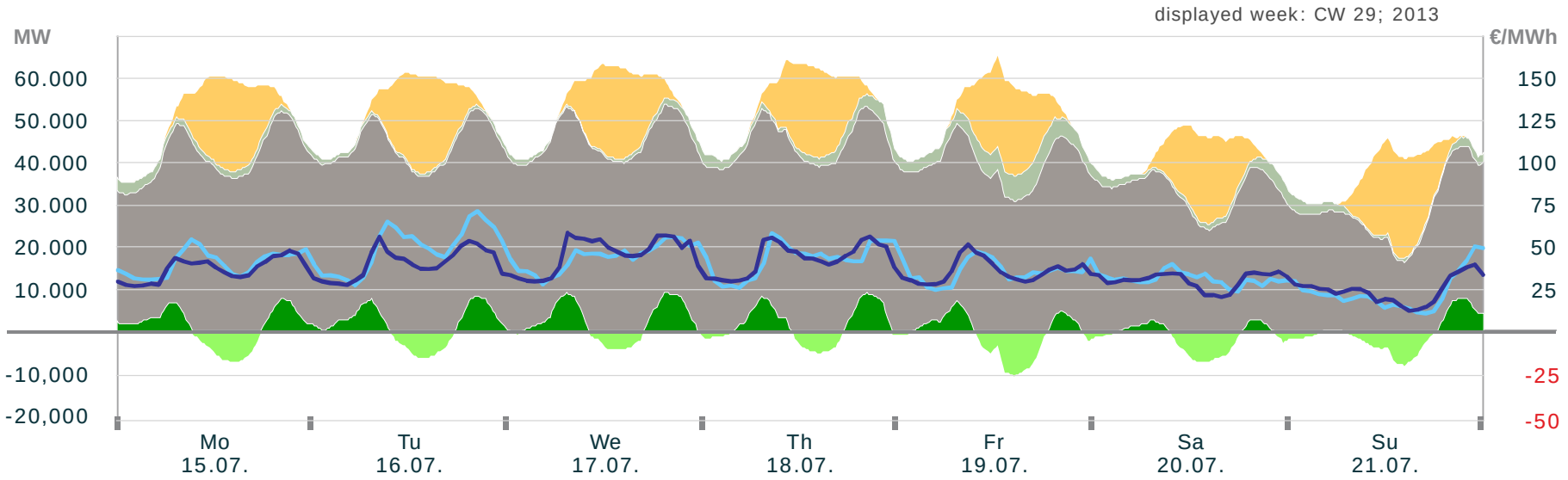
Electricity Production and Spot-Prices: CW 29 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**38.38**	**13.90**	**59.50**	**4 938**
Intraday	**42.14**	**12.50**	**72.20**	**258**

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

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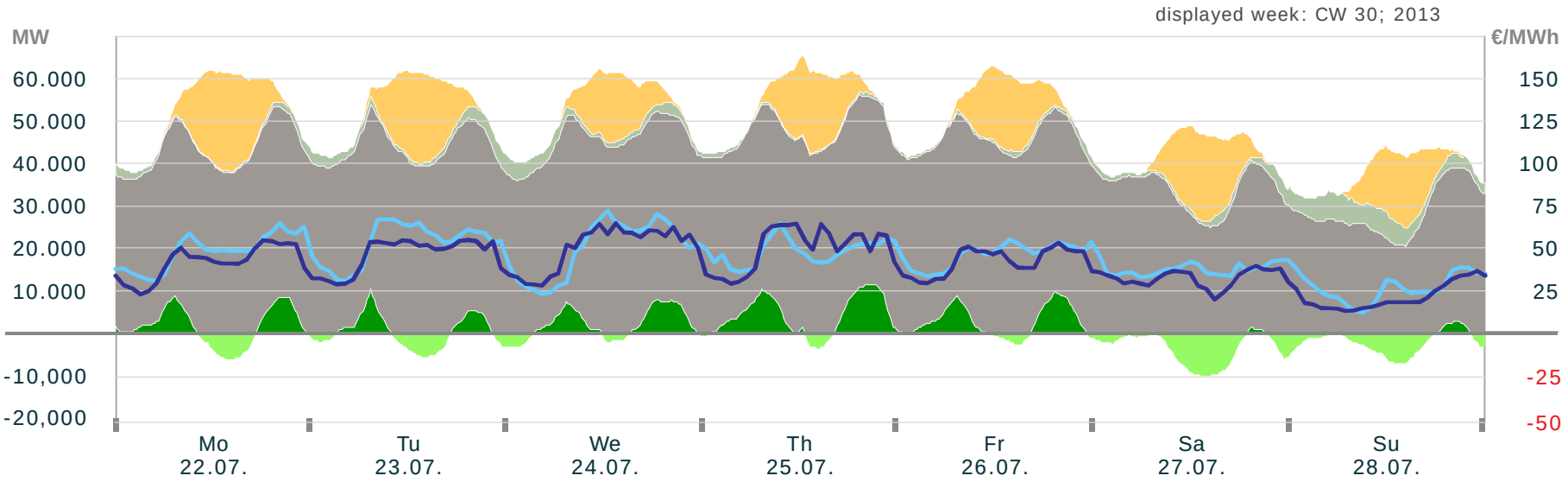
Electricity Production and Spot-Prices: CW 30 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**42.12**	**14.30**	**65.30**	**4 787**
Intraday	**47.51**	**13.70**	**73.10**	**341**

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

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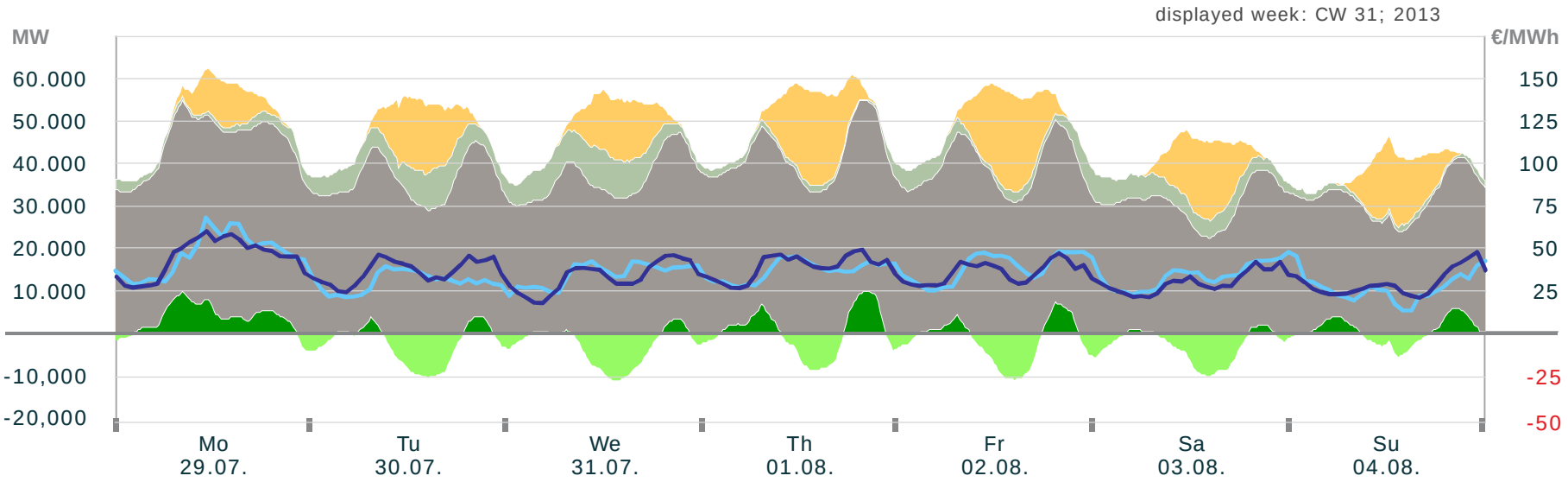
Electricity Production and Spot-Prices: CW 31 2013

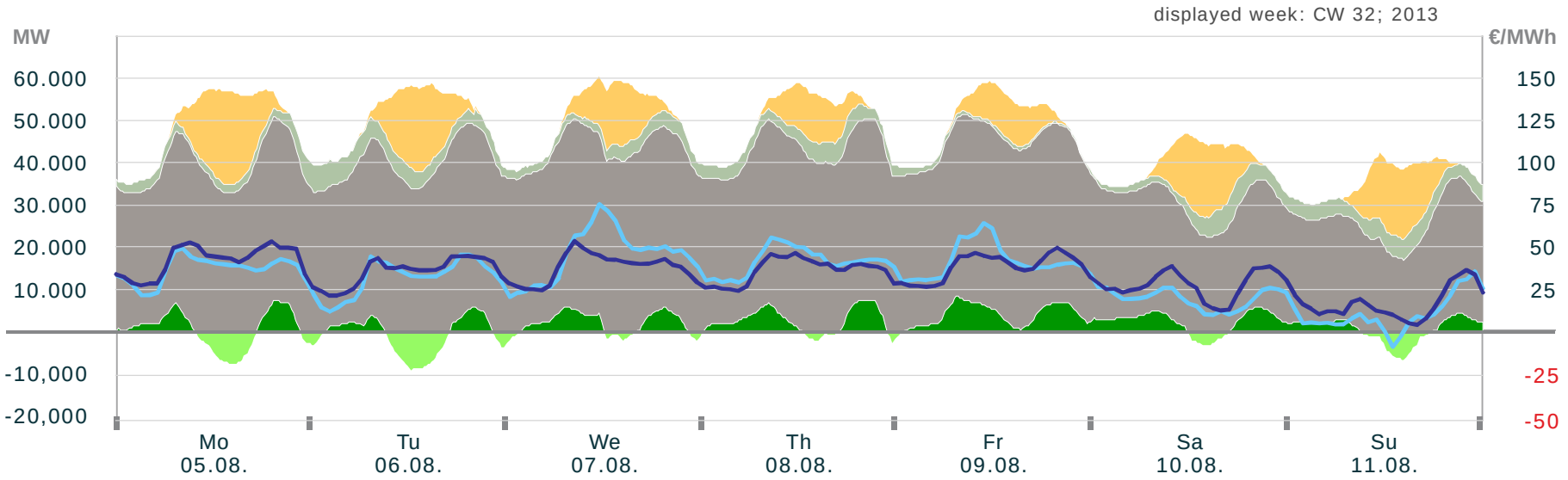


€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**36.48**	**18.90**	**60.70**	**4 872**
Intraday	**38.18**	**14.80**	**68.90**	**349**

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

Fraunhofer ISE

Electricity Production and Spot-Prices: CW 32 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**35.53**	**6.00**	**54.90**	**4 513**
Intraday	**25.95**	**- 7.24**	**76.20**	**359**

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

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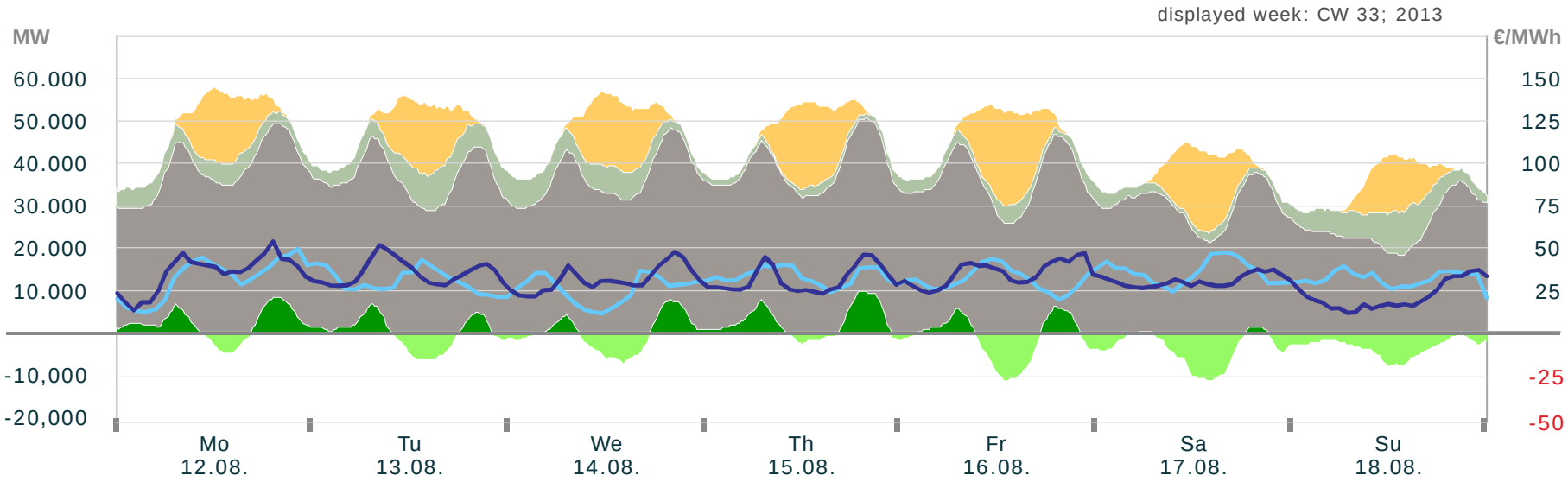
Electricity Production and Spot-Prices: CW 33 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**33.10**	**13.50**	**55.00**	**4 686**
Intraday	**33.29**	**13.10**	**50.62**	**283**

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

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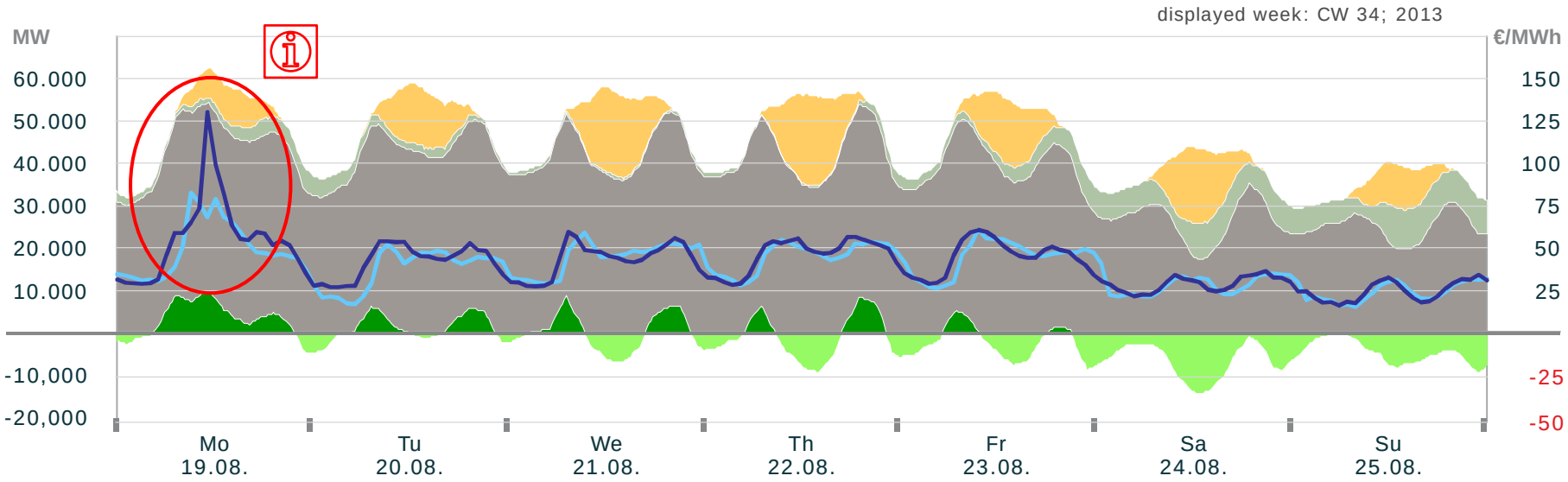
Electricity Production and Spot-Prices: CW 34 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**42.78**	**17.70**	**130.30**	**4 503**
Intraday	**43.29**	**17.00**	**83.40**	**340**

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

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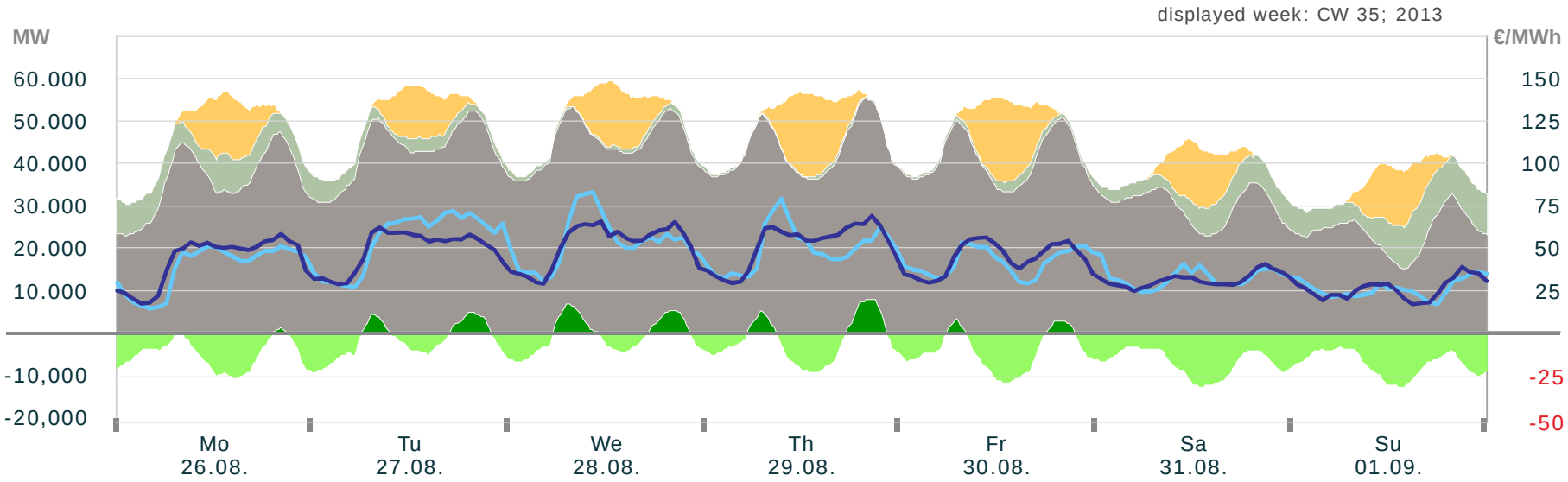
Electricity Production and Spot-Prices: CW 35 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**44.21**	**18.50**	**70.00**	**4 663**
Intraday	**47.61**	**16.00**	**83.70**	**319**

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

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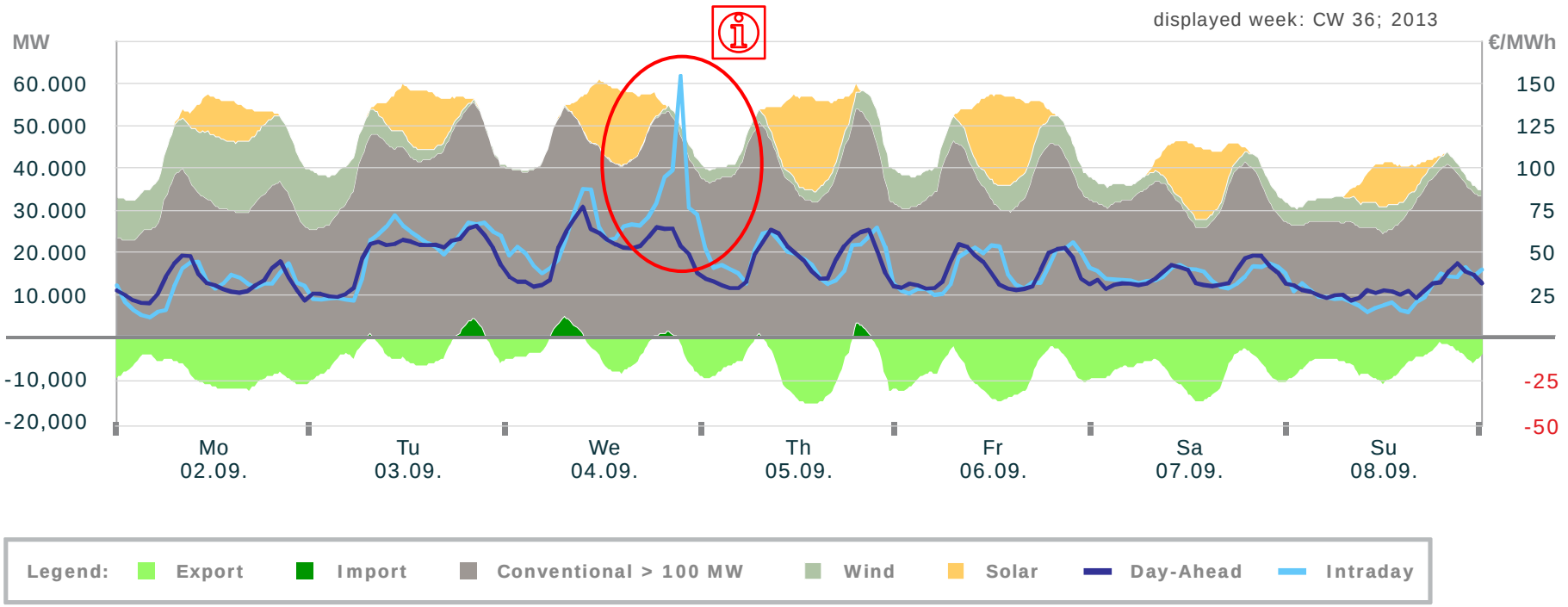
Electricity Production and Spot-Prices: CW 36 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**41.41**	**21.50**	**77.70**	**4 580**
Intraday	**46.47**	**13.20**	**154.10**	**281**

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

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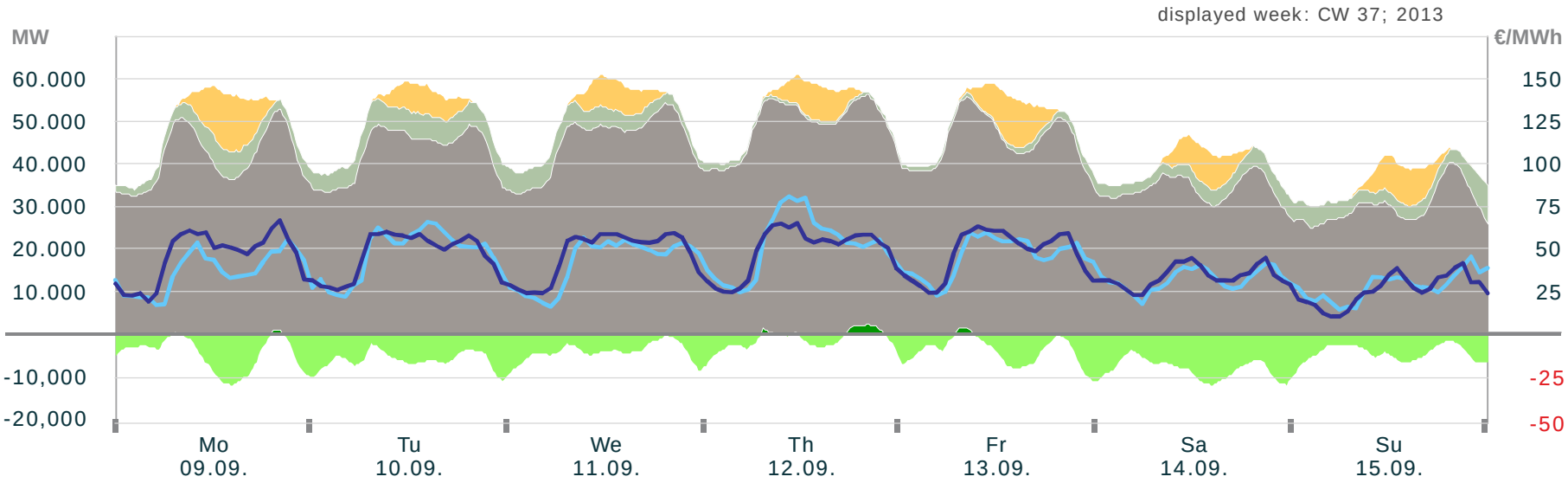
Electricity Production and Spot-Prices: CW 37 2013



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

€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**44.64**	**12.10**	**67.90**	**4 016**
Intraday	**45.67**	**15.80**	**81.50**	**313**

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

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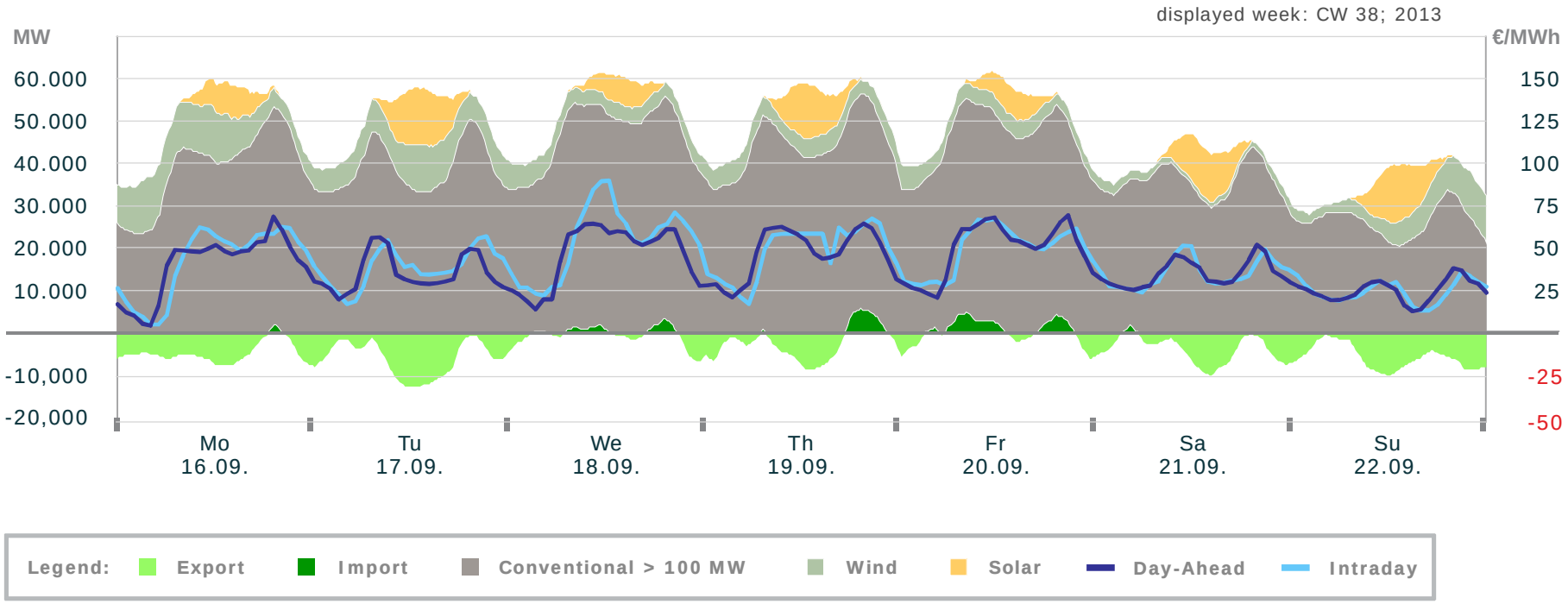
Electricity Production and Spot-Prices: CW 38 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**41.15**	**5.80**	**70.20**	**4 318**
Intraday	**45.63**	**6.30**	**90.10**	**276**

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

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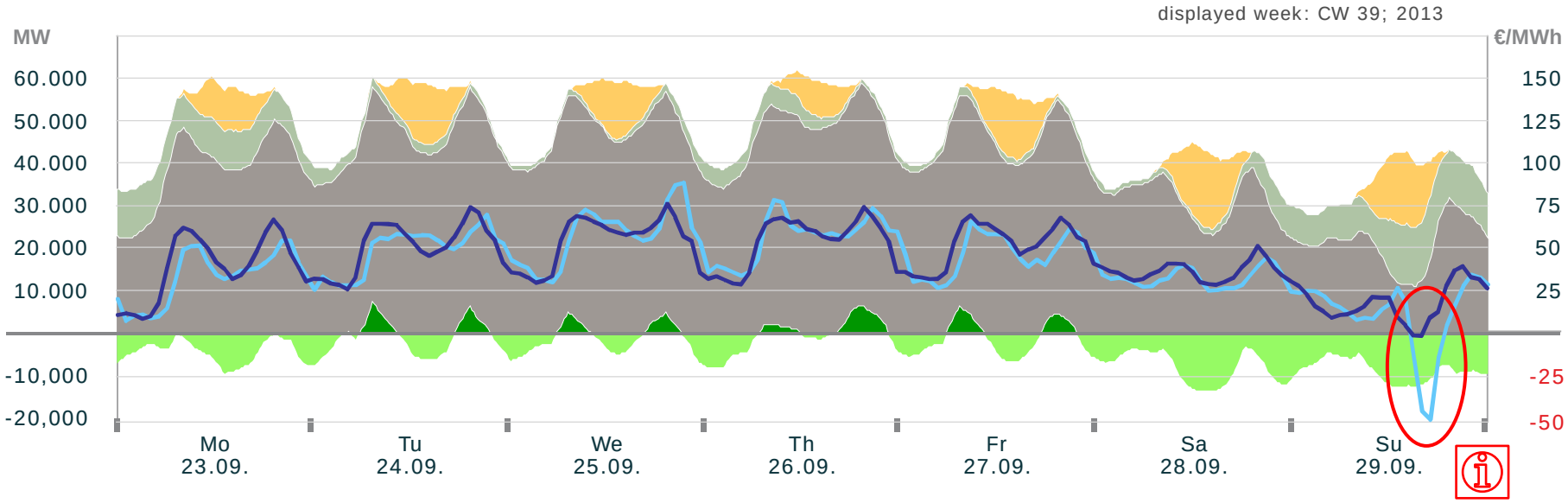
Electricity Production and Spot-Prices: CW 39 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**43.79**	**- 0.10**	**76.70**	**4 403**
Intraday	**43.76**	**- 48.90**	**89.00**	**307**

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

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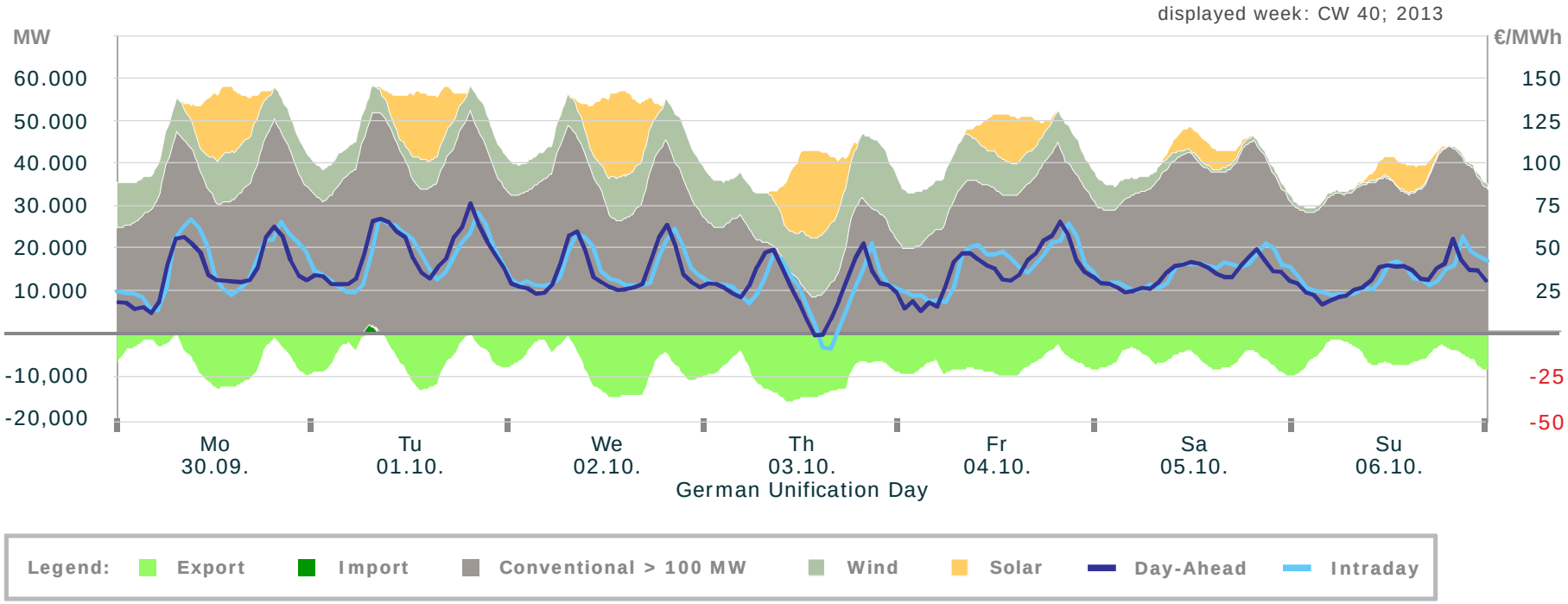
Electricity Production and Spot-Prices: CW 40 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**36.93**	**0.20**	**76.90**	**4 805**
Intraday	**37.74**	**- 7.60**	**71.70**	**269**

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

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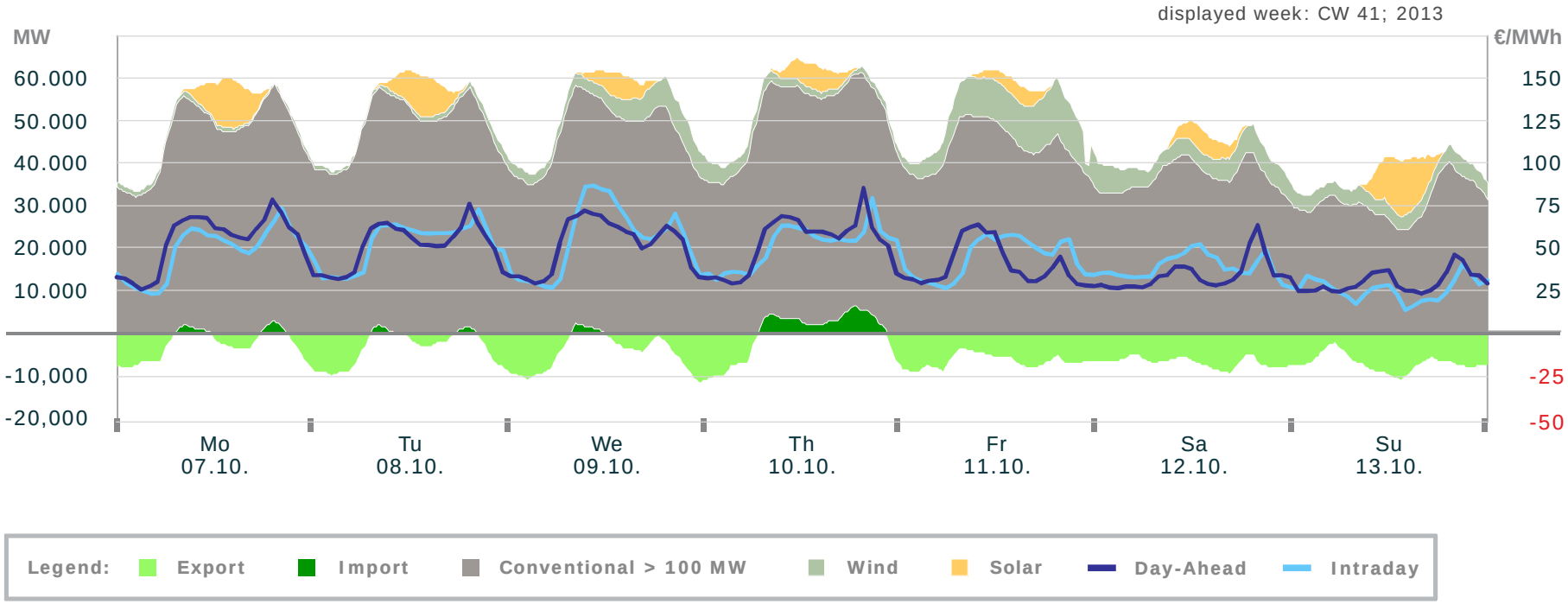
Electricity Production and Spot-Prices: CW 41 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**46.28**	**24.40**	**85.80**	**4 655**
Intraday	**49.03**	**15.40**	**87.60**	**375**

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

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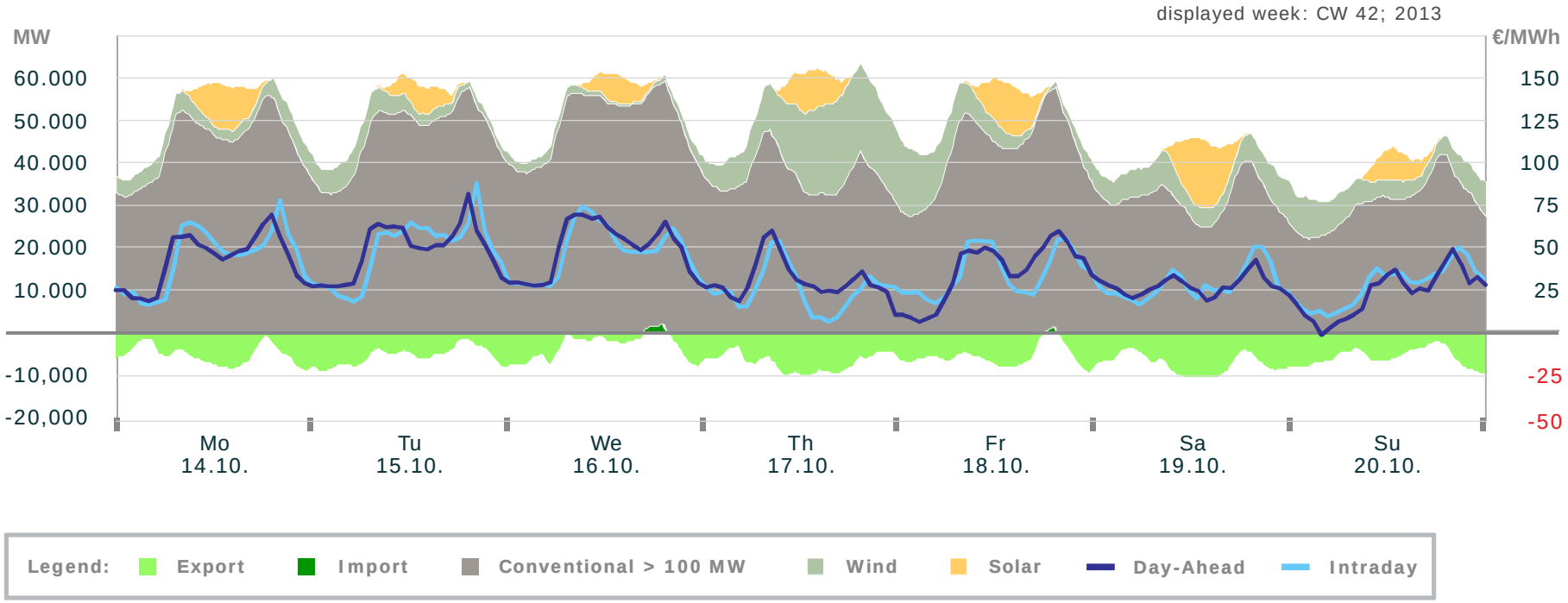
Electricity Production and Spot-Prices: CW 42 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**37.85**	**0.00**	**82.20**	**4 678**
Intraday	**39.14**	**8.20**	**88.90**	**283**

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

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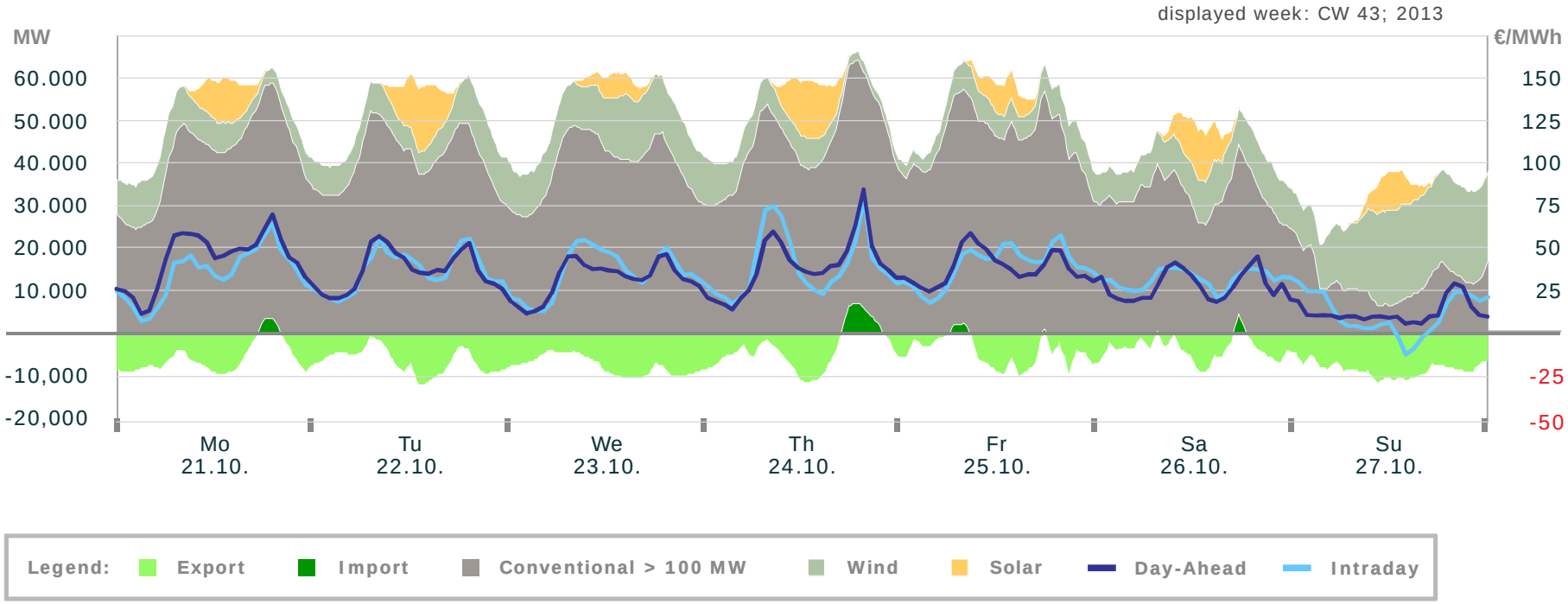
Electricity Production and Spot-Prices: CW 43 2013



€ / MWh	Period Mean	Period Min	Period Max	Trading / GWh
Day-Ahead	**33.61**	**7.00**	**84.90**	**5 037**
Intraday	**33.31**	**- 11.20**	**79.00**	**340**

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

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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 coventional 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 Spot-Prices on 24.03.2013

- The following table provides detailed data about the negative price period in calendar week 12 on the Spot-market:

€/MWh	11:00 – 12:00	12:00 – 13:00	13:00 – 14:00	14:00 – 15:00	15:00 – 16:00
Day-Ahead	**7.20**	**- 0.10**	**- 10.07**	**- 50.00**	**- 10.01**
Trade Vol (€)	**274 611**	**- 4 021**	**- 417 428**	**- 1 875 620**	**- 349 957**
Intraday	**- 27.90**	**- 28.10**	**- 48.40**	**- 83.20**	**- 13.10**
Trade Vol (€)	**- 57 452**	**- 76 567**	**- 151 356**	**- 246 705**	**- 22 773**

- The cumulated trade volume with negative prices was about **2.6 Mio. €** in the Day-Ahead market and **0.55 Mio. €** in the Intraday market.
- The Day-Ahead trade volume with positive prices was **174 Mio. €** in calendar week 12 and **2 511 Mio. €** in the first quarter 2013.

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

Back to month chart Back to week chart

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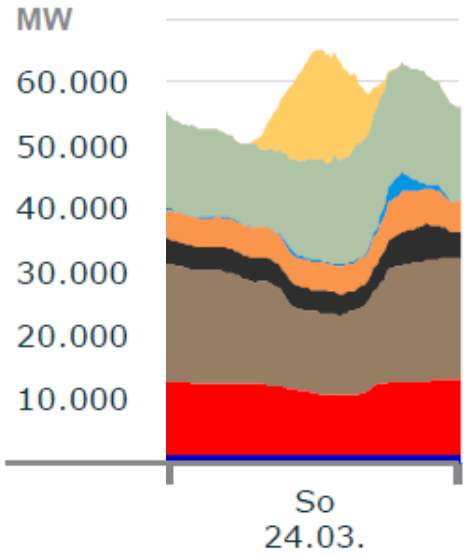
Analysis of the Negative Spot-Prices on 24.03.2013

- Solar and wind produced more than 30 GW of power around noon.
- The actual load was up to 10 GW lower than projected the day before, resulting in oversupply.
- The actual production from solar and wind combined was up to 5 GW higher than it was projected the day before (see following slide).
- Utilization ratio of power plants (14:00 – 15:00):



24.03. | 14:00-15:00	RoR	Uran	BC	HC	Gas	PSt	Wind	Solar
Production	1,2 GW	9,3 GW	12,0 GW	3,1 GW	4,7 GW	0,3 GW	16,6 GW	14,1 GW
Plant Utilization*	32,4 %	77,3 %	56,6 %	12,3 %	19,2 %	2,8 %	54,9 %	42,4 %

*compared to total installed capacity

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

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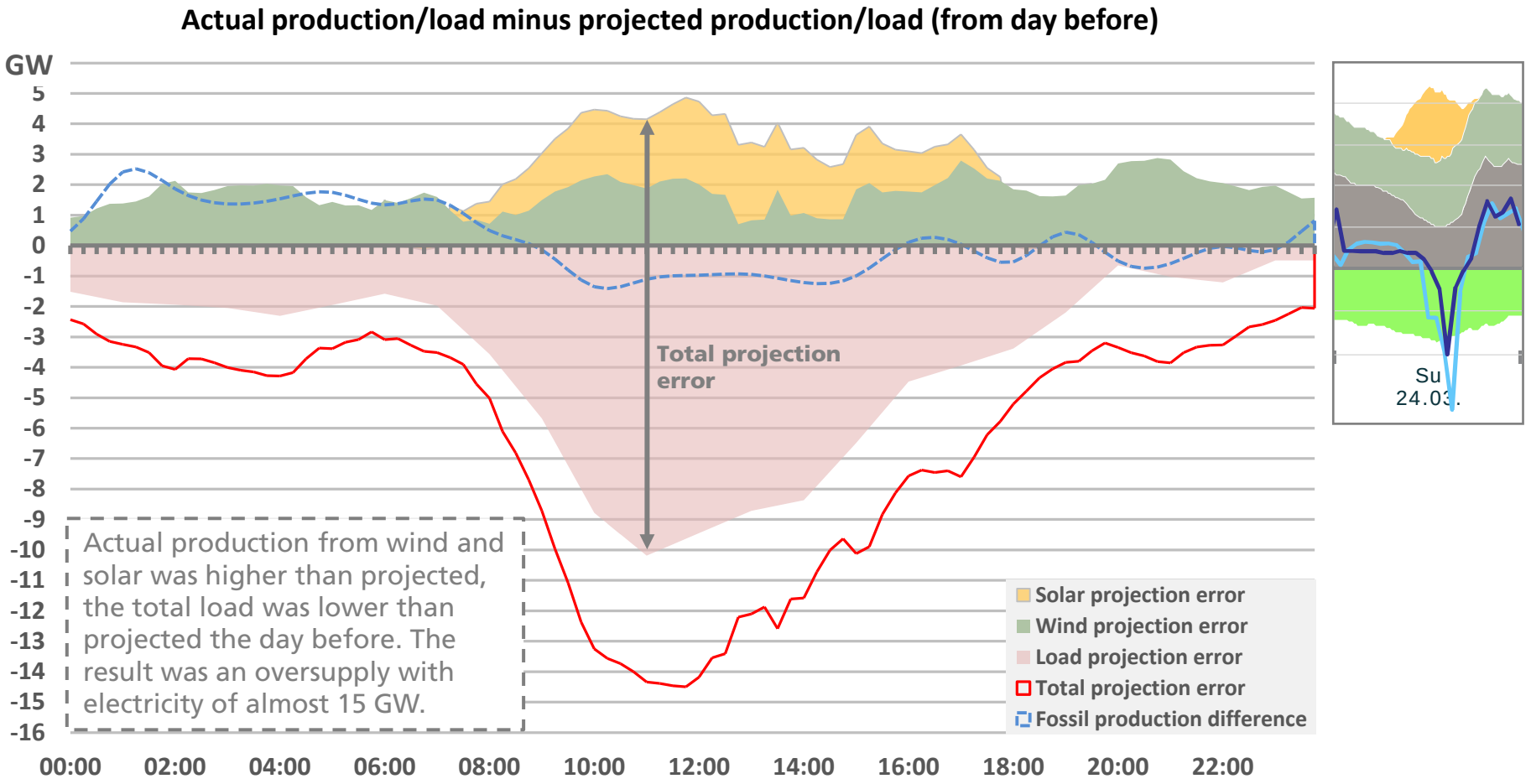
Fraunhofer ISE

Analysis of the Negative Spot-Prices on 24.03.2013



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

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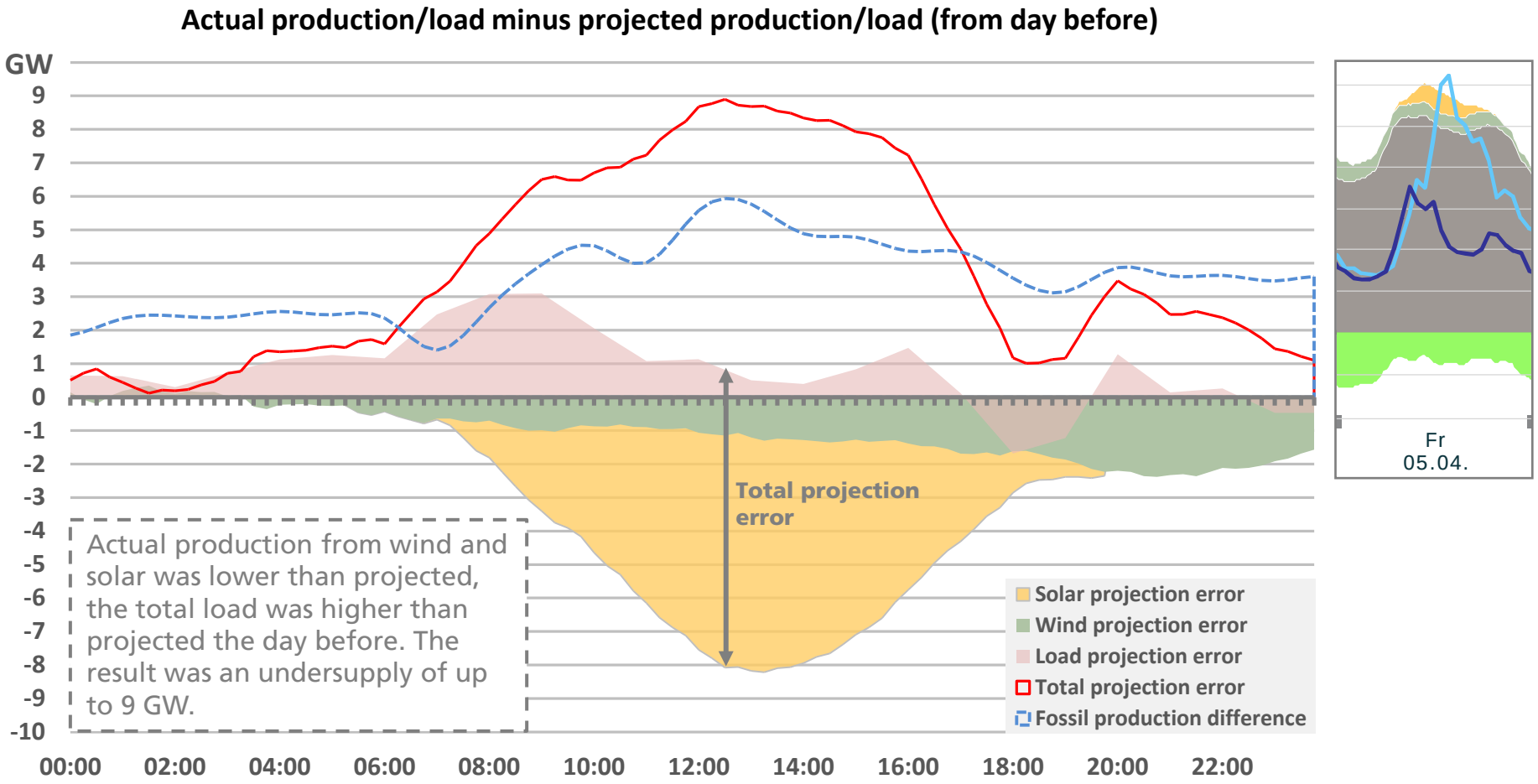
Fraunhofer ISE

Analysis of the Spot-Price Difference on 05.04.2013



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

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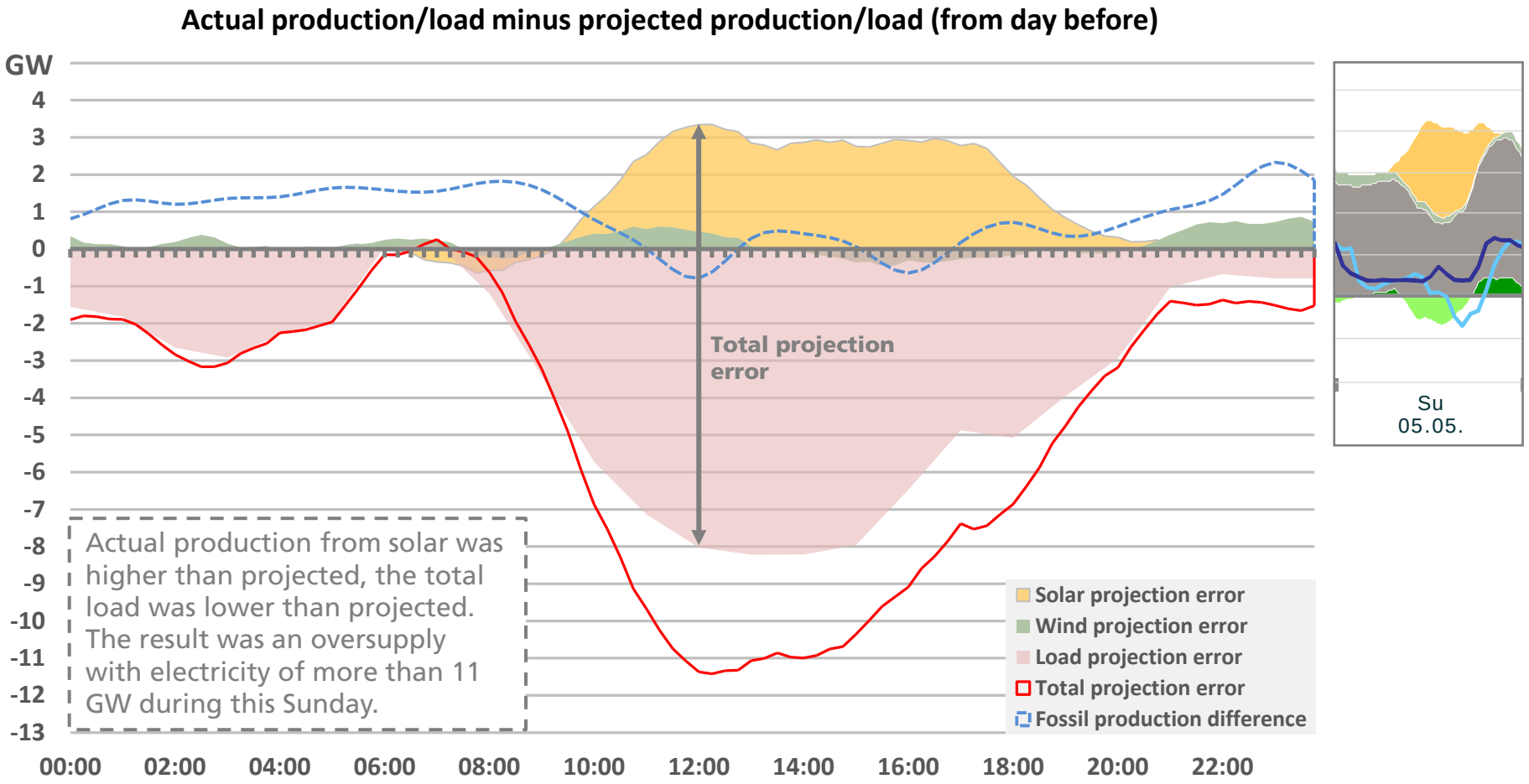
Fraunhofer ISE

Analysis of the Negative Intraday-Prices on 05.05.2013



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

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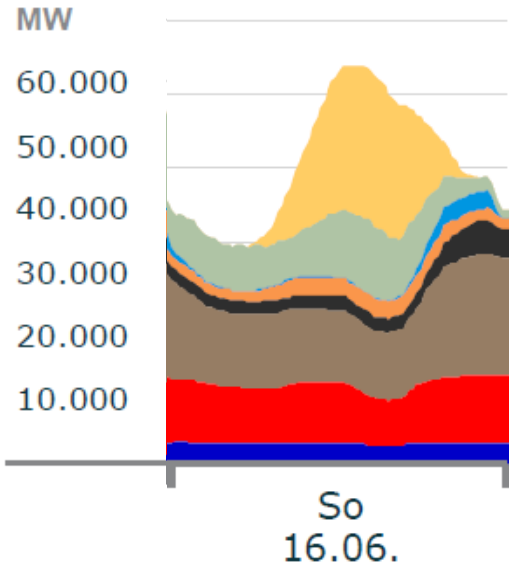
Fraunhofer ISE

Analysis of the Negative Spot-Prices on 16.06.2013

- Solar and wind produced app 29 GW of power between 2 and 3 pm during this Sunday.
- The total grid load was about 45 GW at this time.
- Conventional baseload power plants (Uranium, Brown Coal) were not able to reduce their production below 40% of the installed capacity.



- Utilization ratio of power plants (14:00 – 15:00):

16.06. | 14:00-15:00	RoR	Uran	BC	HC	Gas	PSt	Wind	Solar
Production	2,0 GW	6,3 GW	9,1 GW	2,2 GW	2,6 GW	0,1 GW	8,8 GW	20,1 GW
Plant Utilization*	53,8 %	51,8 %	43,3 %	8,9 %	10,8 %	1,0 %	29,1 %	60,2 %

*compared to total installed capacity

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

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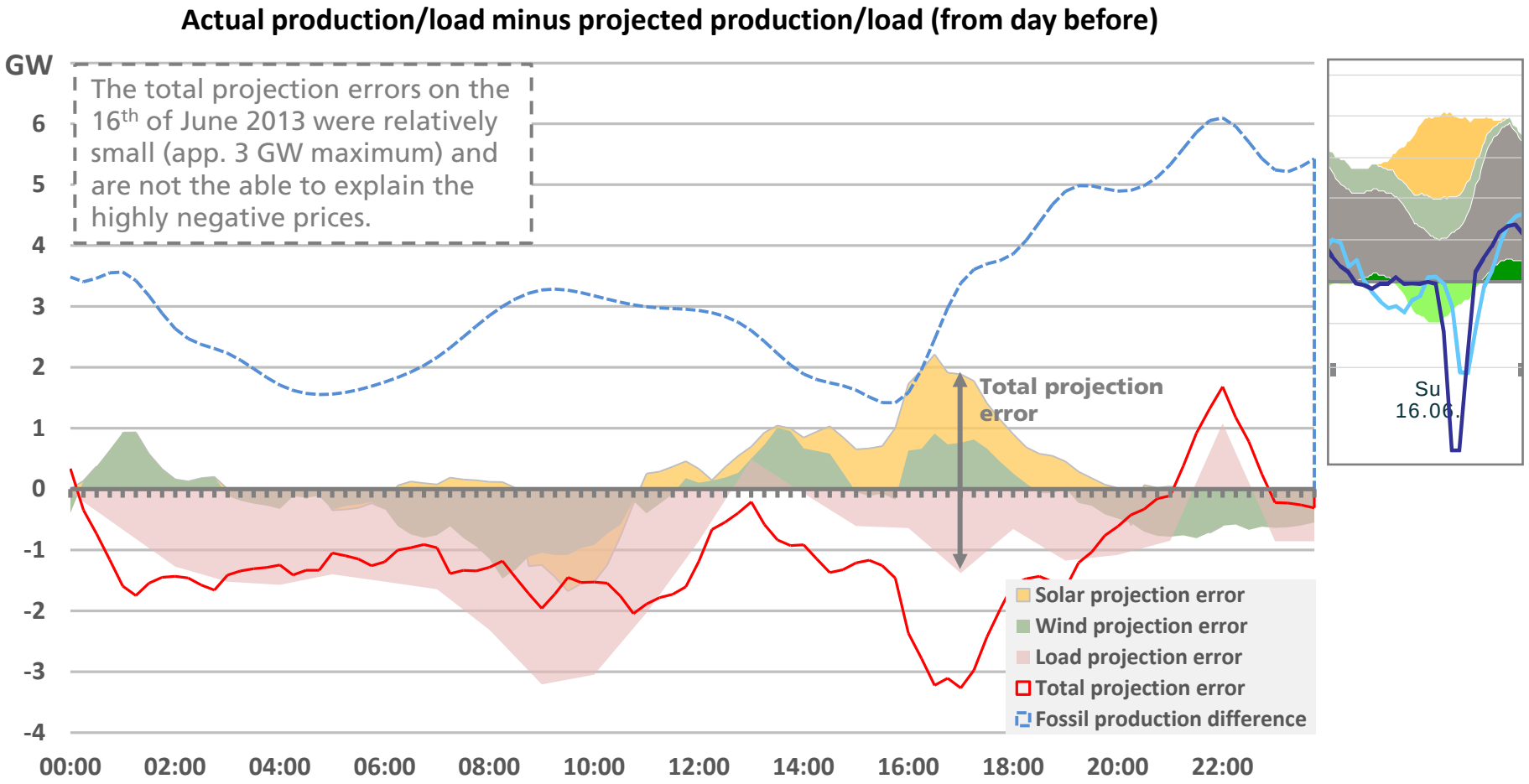
Fraunhofer ISE

Analysis of the Negative Spot-Prices on 16.06.2013



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

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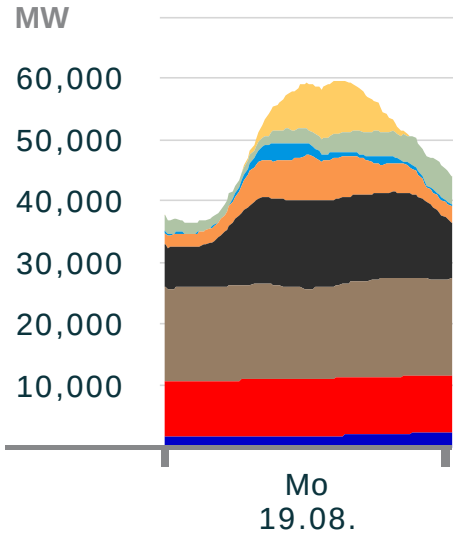
Fraunhofer ISE

Analysis of the Day-Ahead Price on 19.08.2013

- The Day-Ahead Spot-Price reached 130 €/MWh between 11am and noon.
- Solar and wind produced app 9 GW of power during this time.
- The total grid load was about 70 GW.
- Projection errors don't explain Day-Ahead Price.



- Utilization ratio of power plants (11:00 – 12:00):

19.08. | 11:00-12:00	RoR	Uran	BC	HC	Gas	PSt	Wind	Solar
Production	1,7 GW	9,1 GW	14,6 GW	13,8 GW	8,6 GW	1,9 GW	1,7 GW	7,3 GW
Plant Utilization*	43,9 %	76,0 %	69,7 %	56,5 %	39,0 %	20,6 %	5,5 %	21,0 %

*compared to total installed capacity

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

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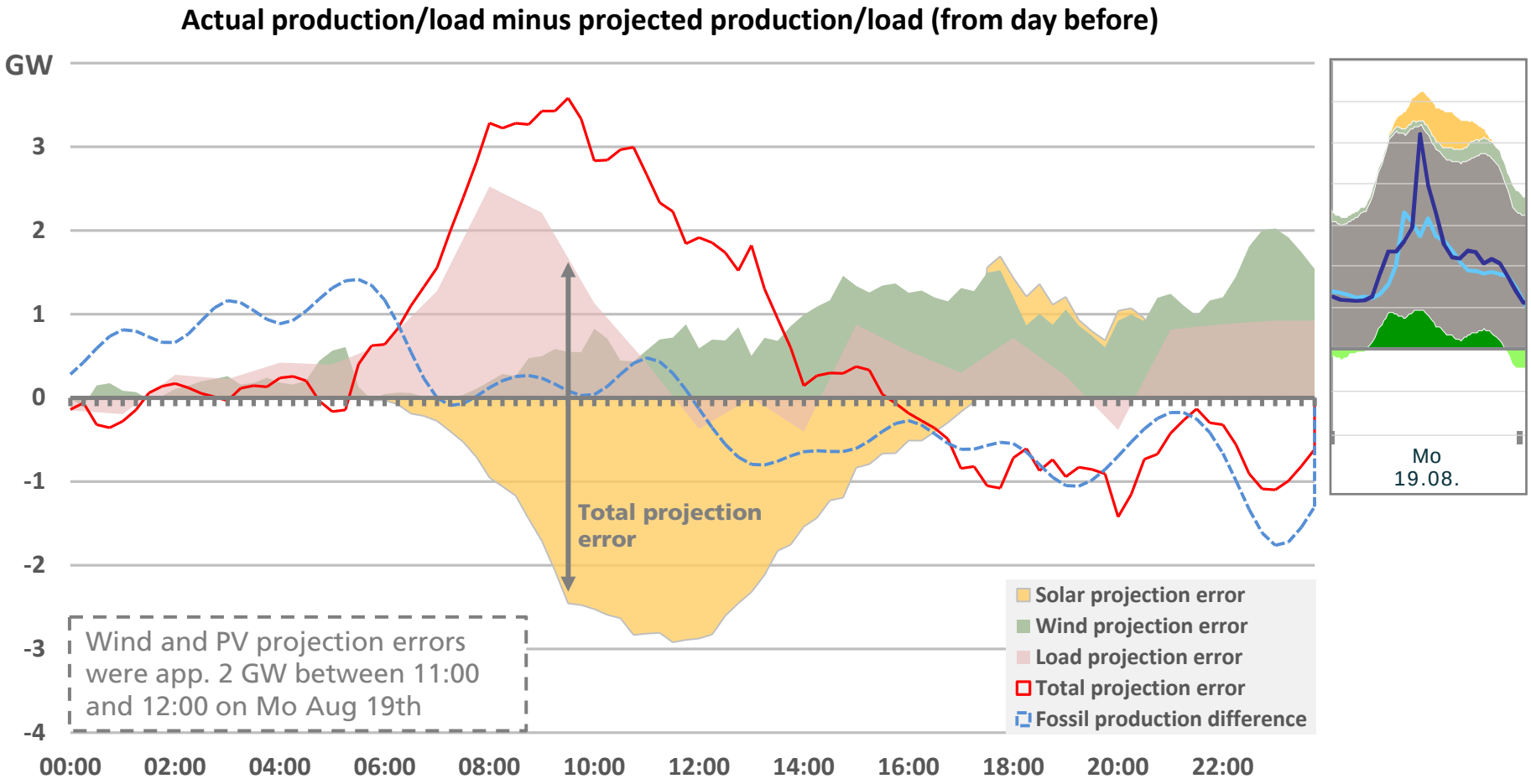
Fraunhofer ISE

Analysis of the Day-Ahead Price on 19.08.2013



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

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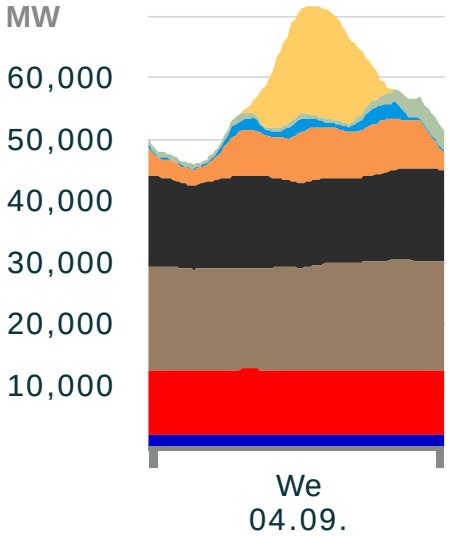
Fraunhofer ISE

Analysis of the Intraday Price on 04.09.2013

- The Intraday Spot-Price reached 154 €/MWh between 9pm and 10pm.
- Wind produced 2,7 GW during this time.
- The total grid load was about 61 GW.
- Projection errors don't explain Intraday Price.



- Utilization ratio of power plants (21:00 – 22:00):

04.09. | 21:00-22:00	RoR	Uran	BC	HC	Gas	PSt	Wind	Solar
Production	1,9 GW	10,4 GW	17,6 GW	14,4 GW	9,2 GW	0,4 GW	2,7 GW	0 GW
Plant Utilization*	48,6 %	86,5 %	84,0 %	58,9 %	41,7 %	4,8 %	8,8 %	0 %

*compared to total installed capacity

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

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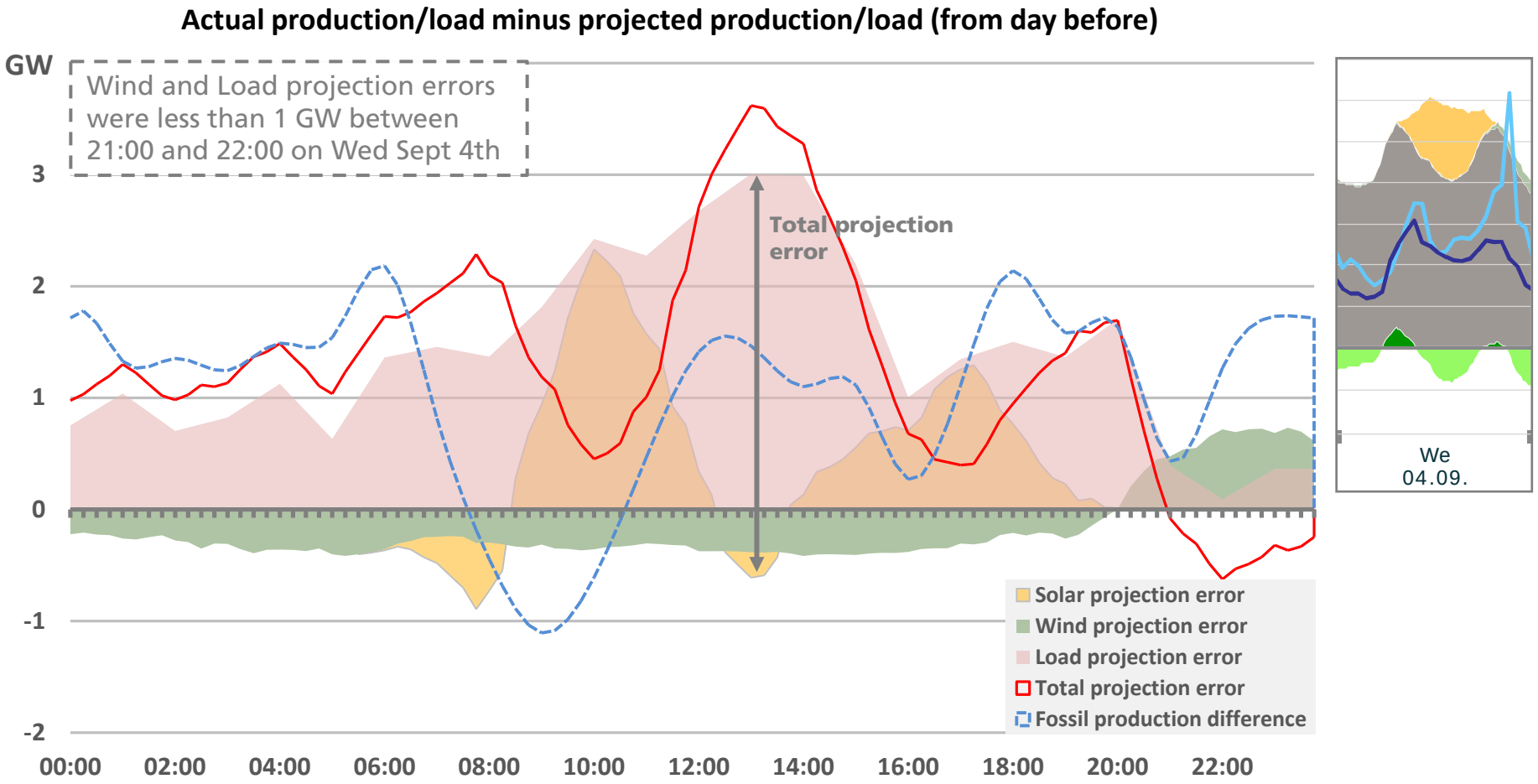
Fraunhofer ISE

Analysis of the Intraday Price on 04.09.2013



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

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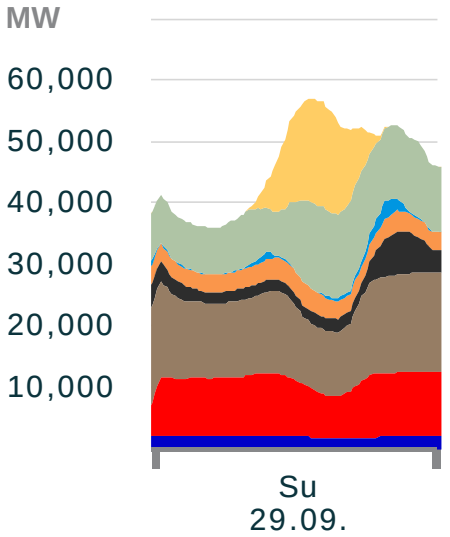
Fraunhofer ISE

Analysis of the Intraday Price on 29.09.2013

- Negative Intraday Spot-Prices occured between 2 and 6pm, reaching – 48.9 €/MWh (16:00 – 17:00)
- Wind and PV produced app. 25 GW during this time
- The total grid load was about 54 GW
- The total projection error was about 3 GW during this time



- Utilization ratio of power plants (16:00 – 17:00):

29.09. | 16:00-17:00	RoR	Uran	BC	HC	Gas	PSt	Wind	Solar
Production	1,8 GW	8,4 GW	12,6 GW	2,0 GW	3,2 GW	0,8 GW	14,6 GW	8,7 GW
Plant Utilization*	46,0 %	69,2 %	60,3 %	8,2 %	14,3 %	8,6 %	48,0 %	25,2 %

*compared to total installed capacity

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

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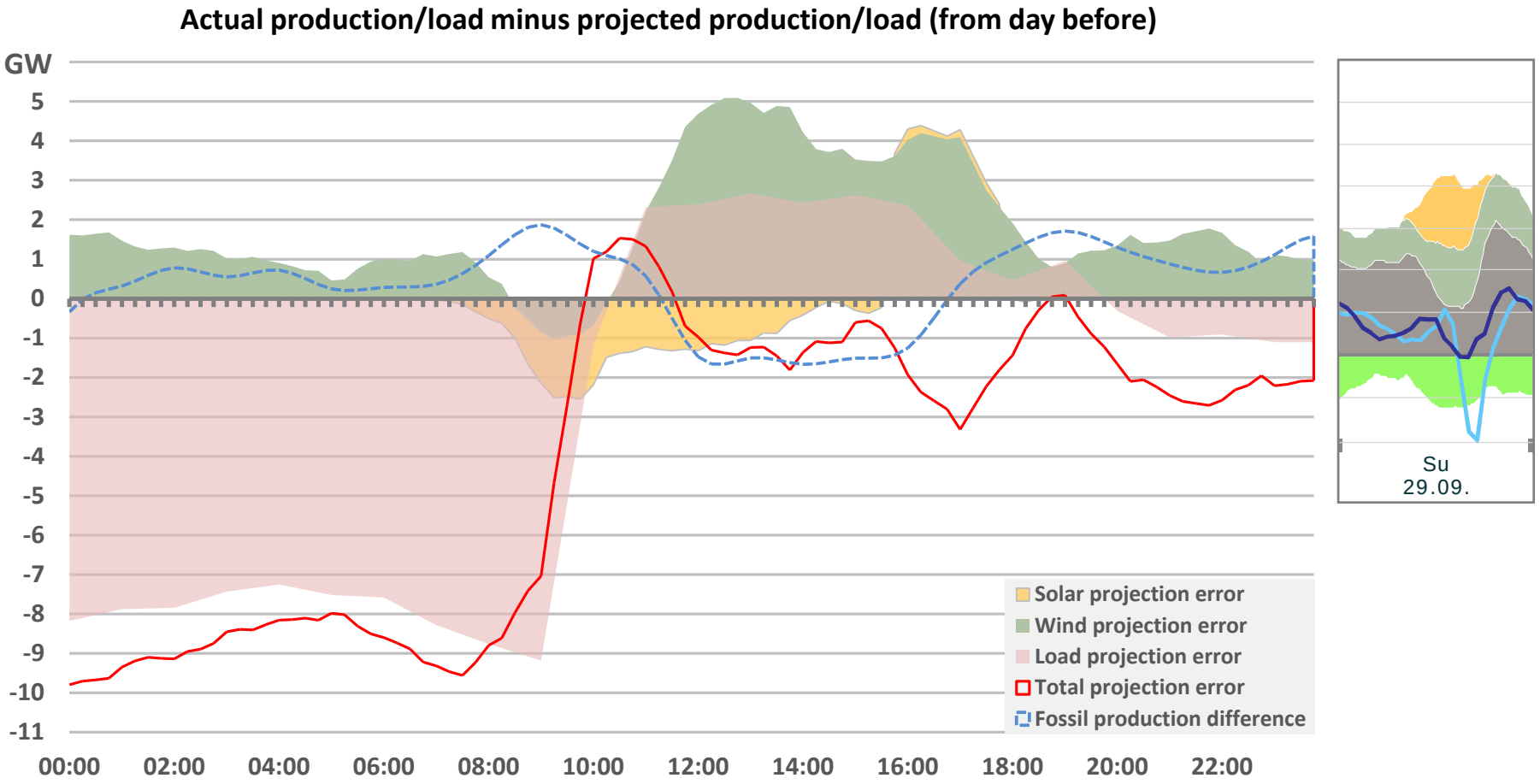
Analysis of the Intraday Price on 29.09.2013



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

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- General Spot-Price Analysis
- Electricity Production and Spot-Prices
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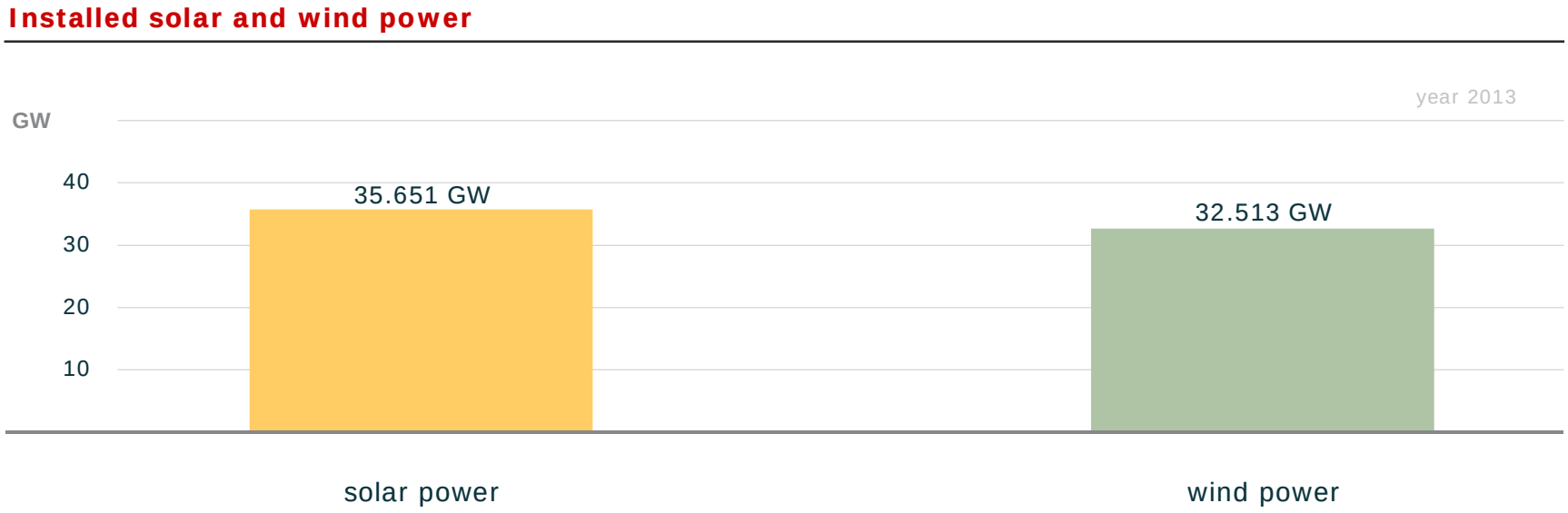
- General energy data
- Instructions
- Sources and Disclaimer

Installed solar and wind power, 16.10.2013



Source: Bruno Burger, Fraunhofer ISE, Data: Bundesnetzagentur

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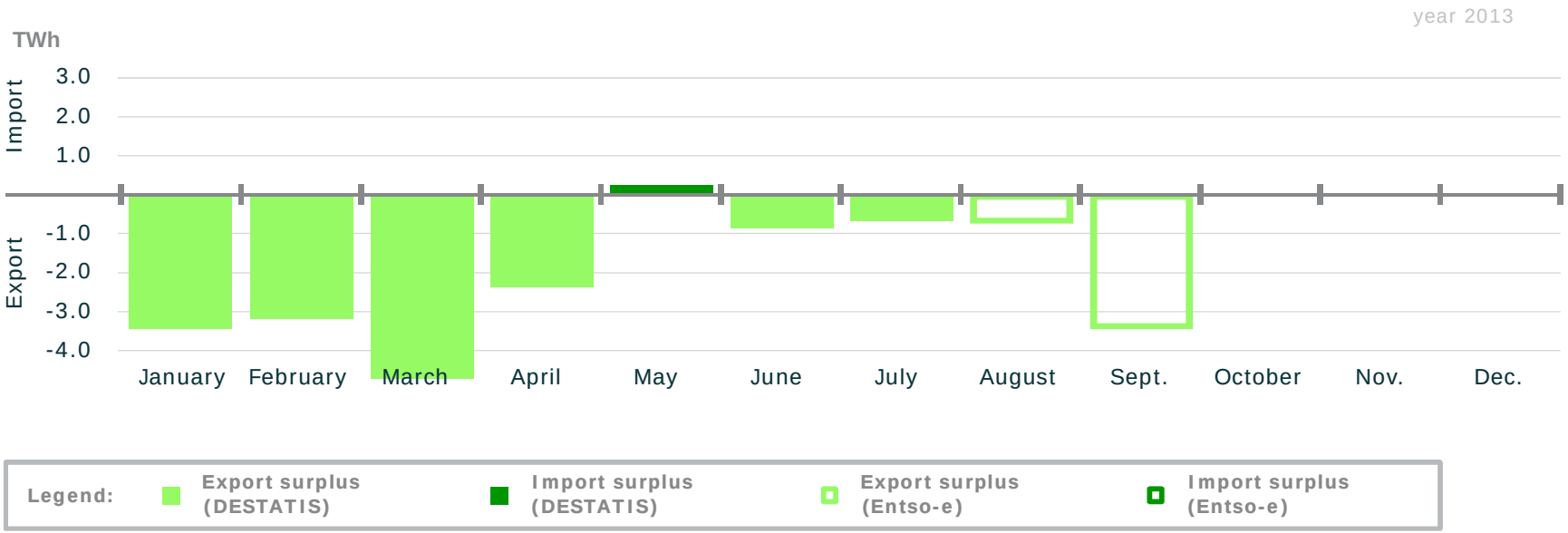
Electricity Import-Export-Balance

Electricity Export and Import Balance



Source: Bruno Burger, Fraunhofer ISE, Data: BMWi Energiedaten (-2011); DESTATIS (2012); Entso-e (2013, skaliert)

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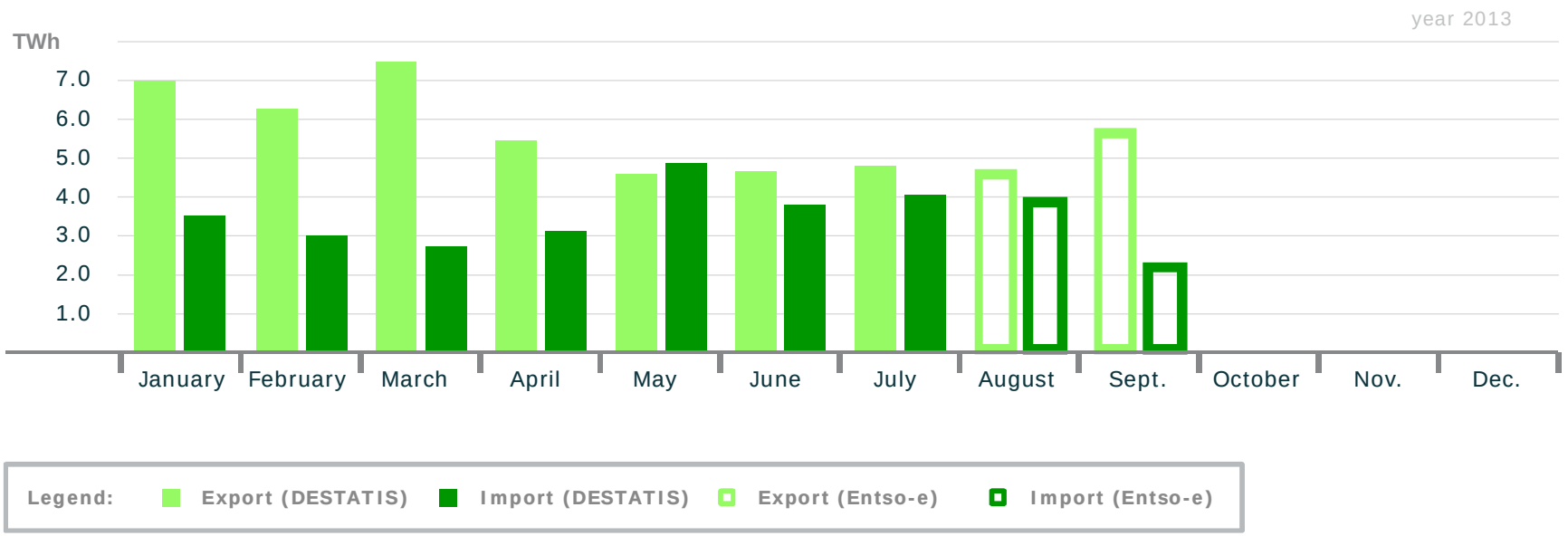
Electricity Import-Export-Balance

Electricity Export and Import



Source: Bruno Burger, Fraunhofer ISE, Data: BMWi Energiedaten (-2011); DESTATIS (2012); Entso-e (2013, skaliert)

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Instructions

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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

- 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
johannes.nikolaus.mayer@ise.fraunhofer.de

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Sources

- Production Data: http://www.transparency.eex.com/de/
- Electricity Spot Prices: http://www.eex.com/de/Downloads
- Import-Export Data: http://www.entsoe.eu/
- Load Data: http://www.entsoe.eu/
- Monthly Production Data: https://www.destatis.de
- Total Installed Capacity by Source: http://www.bundesnetzagentur.de

Interested in Detailed Electricity Production Time Series?

We also publish slides with detailed time series on the electricity production by source (run-of-river, nuclear, brown coal, hard coal, gas, solar, wind, ...). The slides also show further analysis on the electricity import-export balance, supplement of PV and wind production, intraday production profiles etc.

2013:

http://www.ise.fraunhofer.de/en/downloads-englisch/pdf-files-englisch/news/electricity-production-from-solar-and-wind-in-germany-in-2013.pdf

2012:

http://www.ise.fraunhofer.de/en/downloads-englisch/pdf-files-englisch/news/electricity-production-from-solar-and-wind-in-germany-in-2012.pdf

2011:

http://www.ise.fraunhofer.de/en/downloads-englisch/pdf-files-englisch/news/electricity-production-from-solar-and-wind-in-germany-in-2011.pdf

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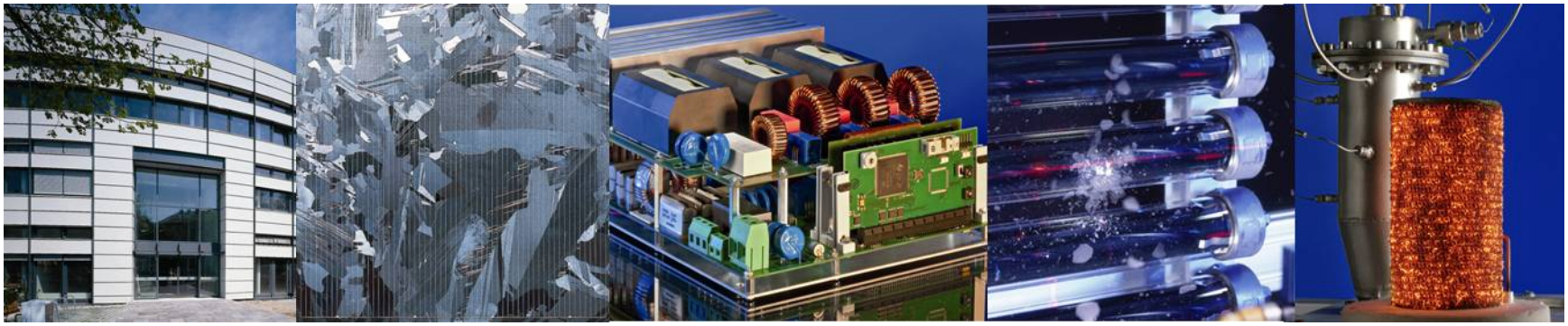
Thank-you for your attention!



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