Optimization of combined heat and power plants
Contents

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  • Optimization of heat delivery to greenhouses in ‘B3Hoek’
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Overview activities Uniper in NL

- Power plants
  - Leiden: 83 MW CCGT
  - The Hague: 112 MW CCGT
  - Rotterdam: 210 MW CCGT, 50 MW GT
  - Maasvlakte: 2.120 MW coal, 70 MW GT
- Electricity sales (under E.ON name)
- Heat production in Leiden, The Hague and Rotterdam area
- Our role: management and operation of optimization models
Market outlook
Commodity prices

Fuel price (euro/MWh thermal)

Fuel
- coal
- gas

Commodity prices

CO2 price (euro/Ton)

2005 2010 2015 2020
Forward electricity prices
Gas production under pressure
Dutch merit order

Figure 10: Dutch merit order and residual load distribution in 2014.
Source: TenneT, ENTSO-E, EEX, IAEW
German merit order

Figure 9: German merit order and residual load distribution in 2014. Source: ENSO-E, EEX, Bundesnetzagentur, IAEW

Figure 10: Dutch merit order and residual load distribution in 2014. Source: TenneT, ENSO-E, EEX, IAEW
Optimization of heat delivery to greenhouses in ‘B3Hoek’
Greenhouses ≈ 50k household eq

Rotterdam/Capelle ≈ 30k household eq

Rotterdam ≈ 60k household eq
Production – week in February
Production – week in February

[Line graphs showing energy production/delivery for Alt 0 and Alt 1.]

- Alt 0: Graph showing energy production/delivery with various colors representing different names.
- Alt 1: Graph showing energy production/delivery with various colors representing different names.

Names:
- AVR
- B-ROC
- B-ROT
- B-Tuinders
- Boszoom
- Geo-Tuinders geo
- LON
- ROC1
- ROC2
- ROC3
- RoCa - B3hoek
- Storage
- WKK-Tuinders WKK

Source: uniper
Production – week in April
Future steps

- Create price communication platform
- Test price responsiveness greenhouses on small group
Heat roundabout ‘Zuid-Holland’
Market operation

- Goal: first open access district heating network
- Requires:
  - Grid operator
  - Market operator
  - Rules and regulations
- Challenge: How to bid in connected electricity-heat market?
Power to heat - Electric boiler
Electricity prices 2015

2015-01-21

2015-04-05

2015-04-23

2015-05-16

2015-06-21

2015-06-26

2015-07-19

2015-07-21

2015-10-24
Imbalance prices 2015
Imbalance price detail

2015-05-16

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uniper
Imbalance price detail

2015-05-16

electricity price (euro/MWh)

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0 100 200

-100
Imbalance price detail
Imbalance price detail
Conclusion & Discussion

- Large CO2 reduction potential in district heat
- Current market conditions not easy
- Many interesting optimization challenges!