Autonomous bidding on the day ahead electricity market

13 September Peter Goudswaard
AgroEnergy timeline

- Founded by Rabobank & LTO in 2001
- 100% subsidiary of Eneco in 2006
- First APX deal in 2010
- Intraday trade
- Introduction of BiedOptimaal in 2014
- Data driven Energy management
- Autonomous Greenhouse Challenge in 2018

Key dates:
- 2001: Founded by Rabobank & LTO
- 2006: First APX deal
- 2010: Intraday trade
- 2014: Introduction of BiedOptimaal
- 2018: Autonomous Greenhouse Challenge

Key features:
- Self service trading portal
- Data driven Energy management

Energy cooperative
Mostly family business; producing vegetables & flowers

Energy: ~30% of total costs

Decentral electricity production: 8% of total Dutch power generation

Digitalisation is still limited but growing
Introduction BiedOptimaal via
www.agro-energy.nl/slimme-energieoplossingen/biedoptimaal/
Growth management vs. energy management

Sales
Greenhouse climate
Crop growth

Weather
EPEX, TTF, Imbalance

Assets
CHP
Boiler
Buffer
Daily dilemma: day ahead bid

- Decide & bid

10:30u: Deadline bidding

Each asset/ each hour/ volumes/ bid price/ ask price
Forecasting energy demand

![Graph showing energy demand and CO2 levels with weather icons and crop climate symbols.]

- 0:00u: Forecasting
- 10:30u: Weather
- D+1: Crop climate
- 24:00u: D+2 t/m D+4
Forecasting energy prices
Forecasting buffer level
Asset optimisation

Optimization problem:
What volume
Make/ buy/ sell?
What price?

Bid advice
BiedOptimaal

Acquiring settings & measurements
→ Forecasting
→ Optimization

Process chain

EnergySpecialist

Quality checks

Bidding & confirmation

APXgroup

Asset control

Stuurbox & climate computer

7:00u: BiedOptimaal

10:30u: Deadline bidding

D+1
Results so far

- Including growers without Agro Energy contract
- ‘Auto pilot’ is used by >95% of users
- From management tool towards full service
- Winner of Dutch Data Science award 2017
Automation & human interaction

- Optimization beats human experience, but
- Full service only possible by automation together with monitoring by specialist
- Success of a forecasting model depends on acceptance by end user
- Great effort needed in adapting models and including preferences to satisfy users
Smart heat distribution in clusters
how to utilise your geothermal source maximal

BiedOptimaal Intraday
Every hour new bid at Intraday market;
optimal positions based on actual buffer levels

Autonomous Greenhouse challenge
Use AI to produce a cucumber crop remotely
(organised by Tencent & WUR)

http://www.autonomousgreenhouses.com/
Volg ons: