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# INTEGRATION OF DISTRIBUTED GENERATION AT THE REGIONAL ENERGY MARKET ETELLIGENCE

Die Integration verteilter Erzeuger am regionalen Energiemarktplatz  
eTelligence

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# AGENDA

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- The Integrative Market of the eTelligence Project
- Distributed Generation in eTelligence
- Day-ahead Trading at the eTelligence Market
- Economic analysis of the Field Test
- Conclusion

# eTelligence

## One of Six EENERGY Projects

The research project »eTelligence« is a winner of the technology competition »E-Energy« of the German Federal Ministry of Economics and Technology (BMWi).



- In the model region Cuxhaven
- Working group of more than 20 partners under the guidance of utility provider EWE AG Oldenburg





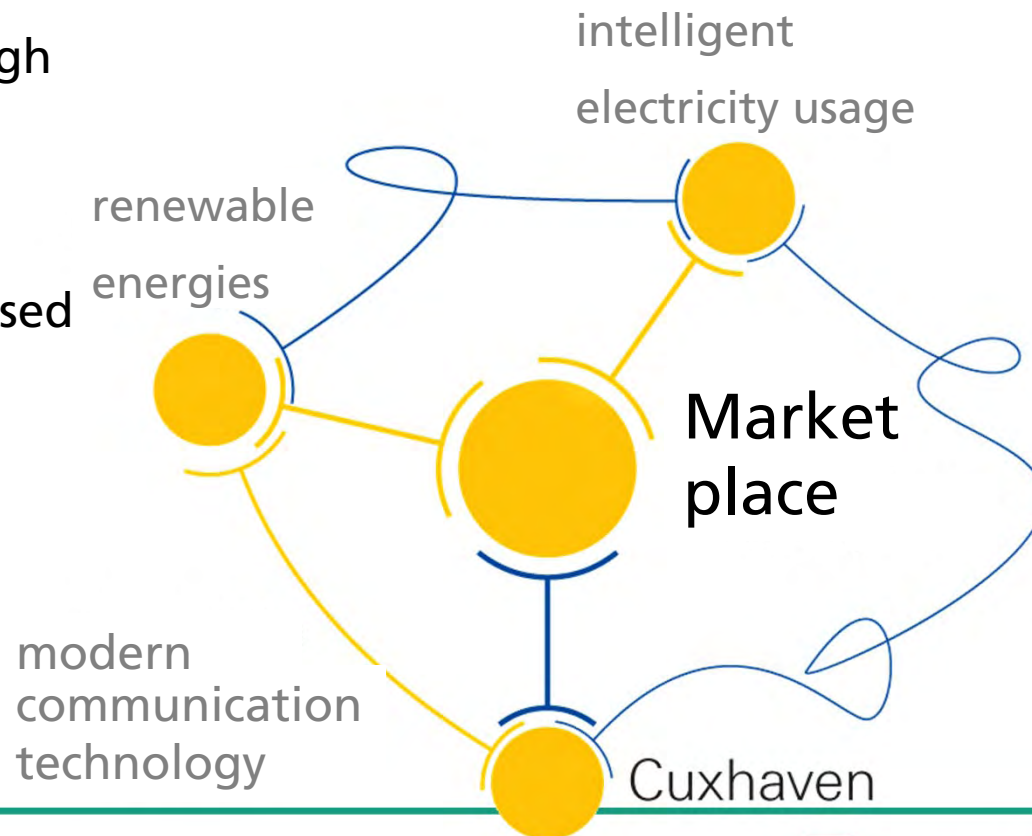
# Model Region



# eTelligence

## Focal Points

- Intelligent management (generators, grid, consumers)
- Connecting actors through a market place
- Connecting components through an ICT „nervous-system“ based on standards



# eTelligence

## Integrative Energy Market



- Pay as bid market
- Trading period: 10:00 – 11:00
- Guaranteed liquidity via market maker interconnecting to EEX
- Resolution: hour contracts
- Individual price and forecast risk
- Five days a week
- Products: real / active power



# Distributed Generation

## Three Participating CHP Units

CHP Installation Location	Electrical Power	Thermal Power	Fuel	Peak Boiler	Storage
Communal Swimming Pool	460 kW	716 kW	Natural Gas	1,200 kW	-
Sewage Treatment Center	1,052 kW	1,116 kW	Sewage & Natural Gas	1,750 kW	Gas & Thermal
Micro CHP in an Office Building	5.5 kW	14.5 kW	Natural Gas	60 kW	Thermal

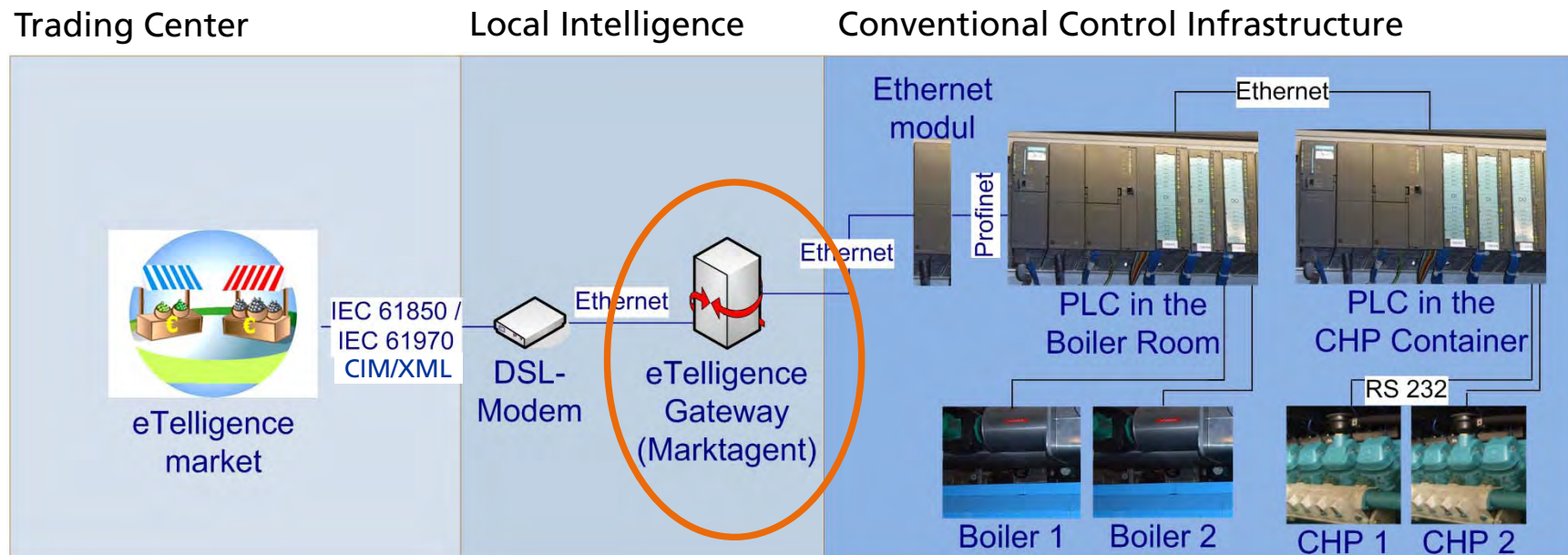


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# Distributed Generation

## Flow of Smart Grid Data - Communication

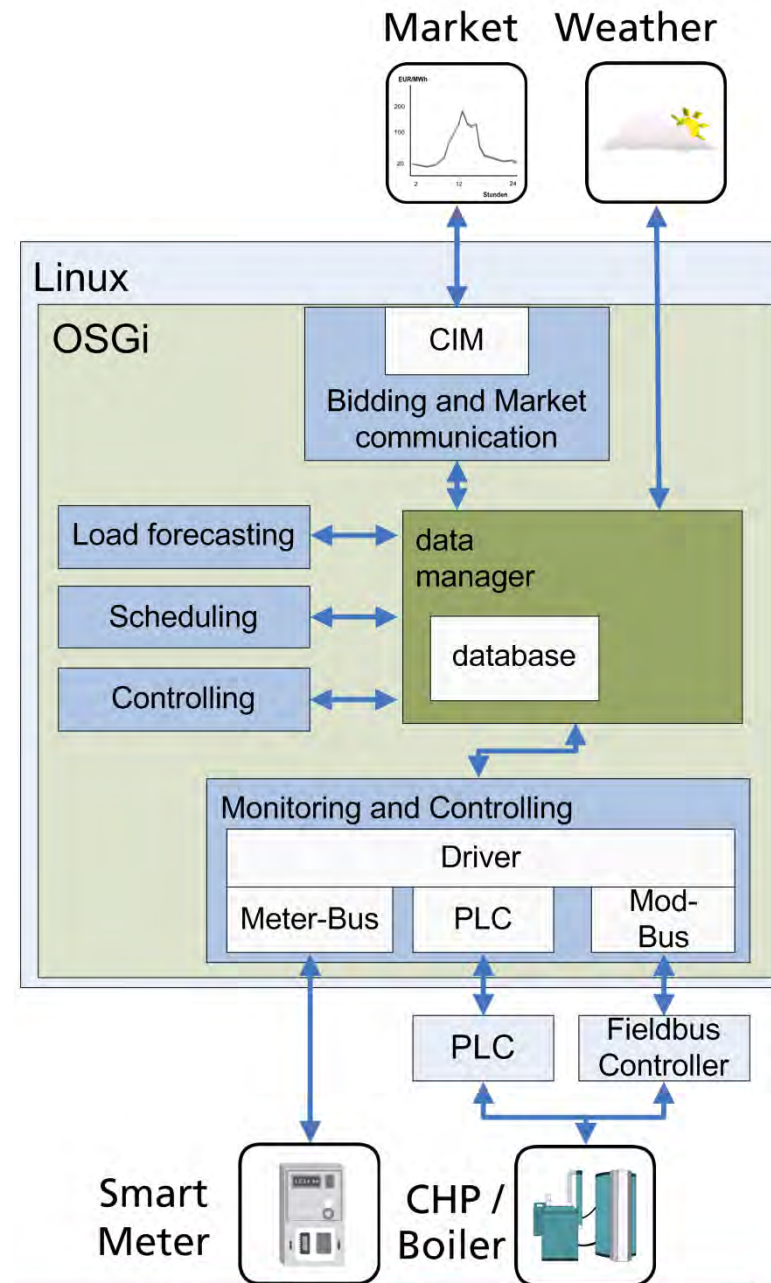




# Distributed Generation eTelligence Gateway

## Fully automated processing

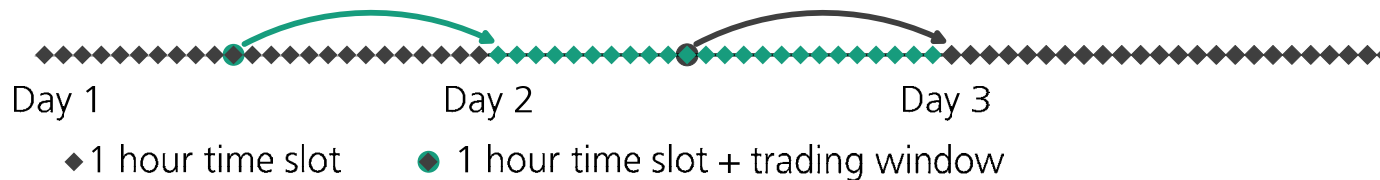
- Prediction of th. load based on
  - External weather forecast
  - Local historical measured data
- Day-ahead scheduling based on
  - Market prices
  - Predicted thermal load
- Marketing of hour contracts
- Physical operation based on the sold schedule



# Day-ahead Trading

## Trading Design

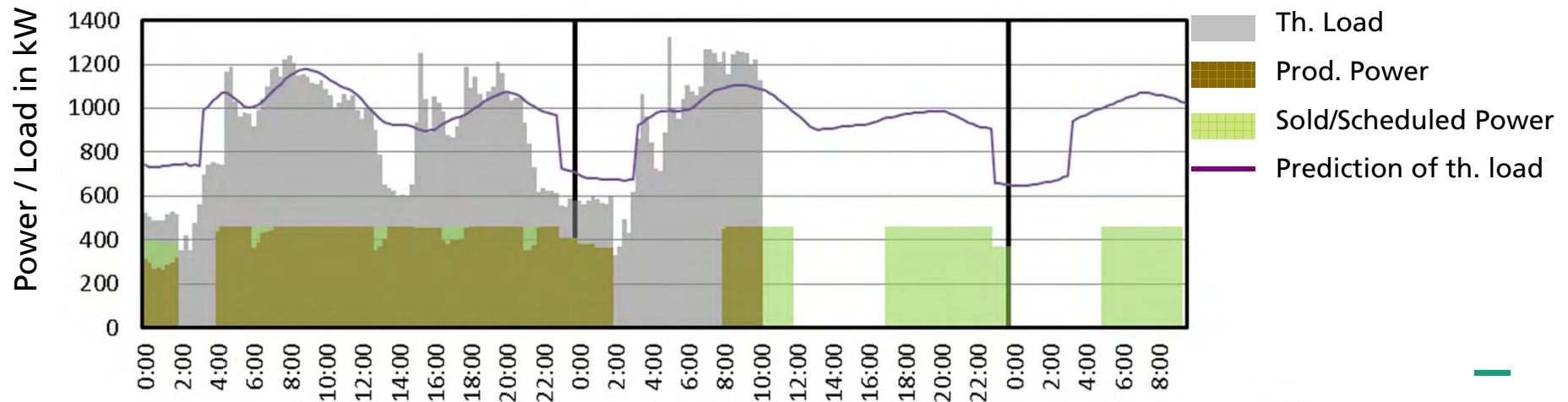
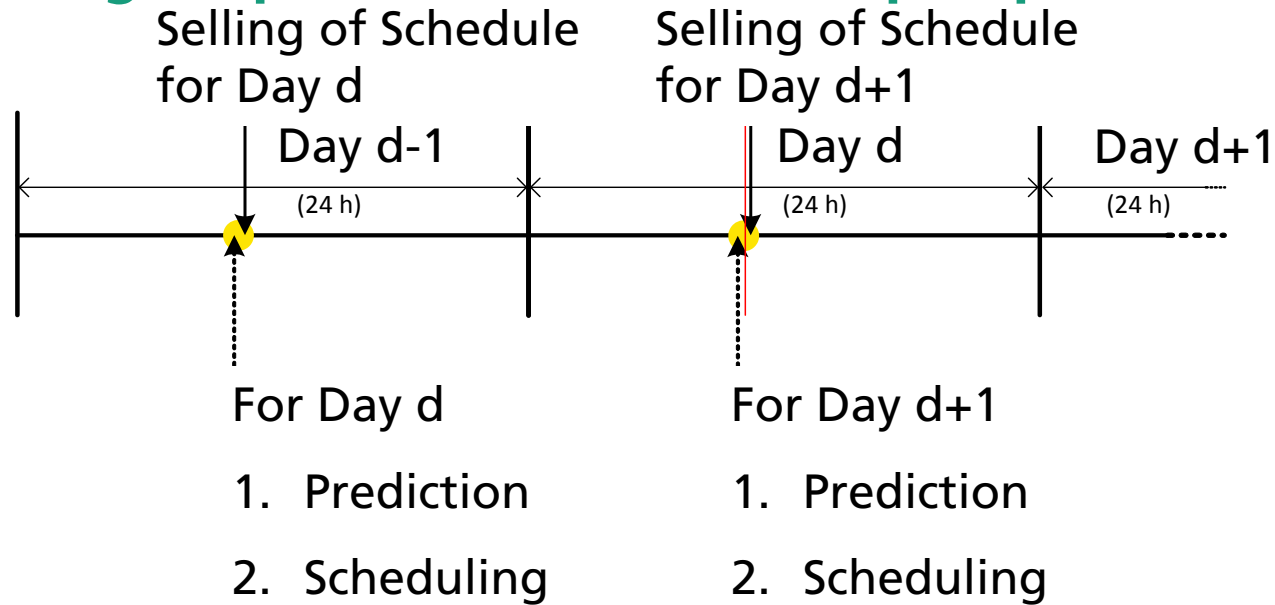
### Day-ahead Trading



- Trading Period: 10:00 – 11:00
- Five days a Week → 24 h (Mon.-Thu.) / 72 h (Fri.)
- Products: Real / Active Power
- Resolution: Hour Contracts
- Pay as Bid Market
- Price and Forecast Risk
- Guaranteed Liquidity by a Market Maker

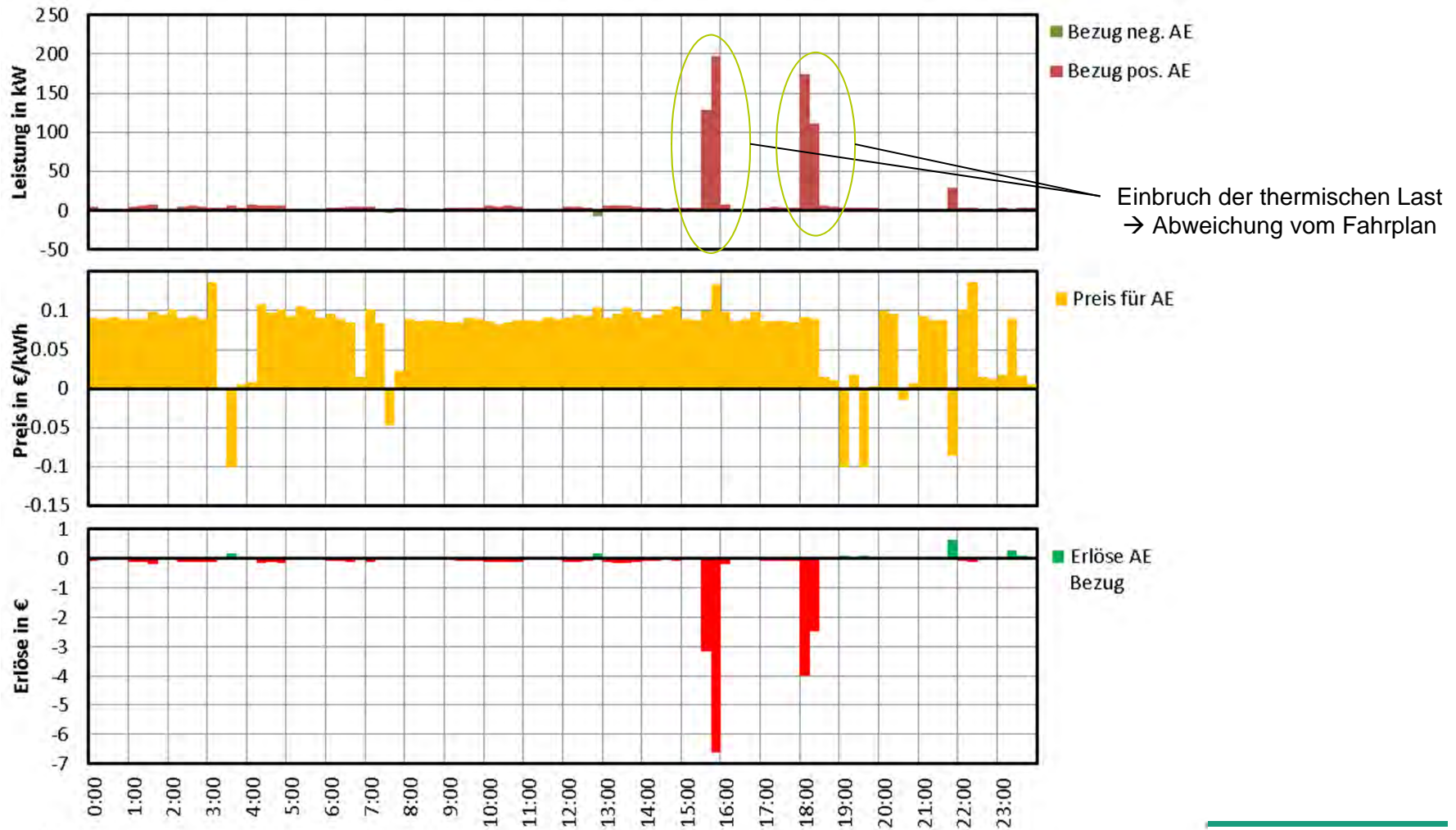
# Day-ahead Trading

## Trading Sequence from the CHP perspective



# Balancing Energy

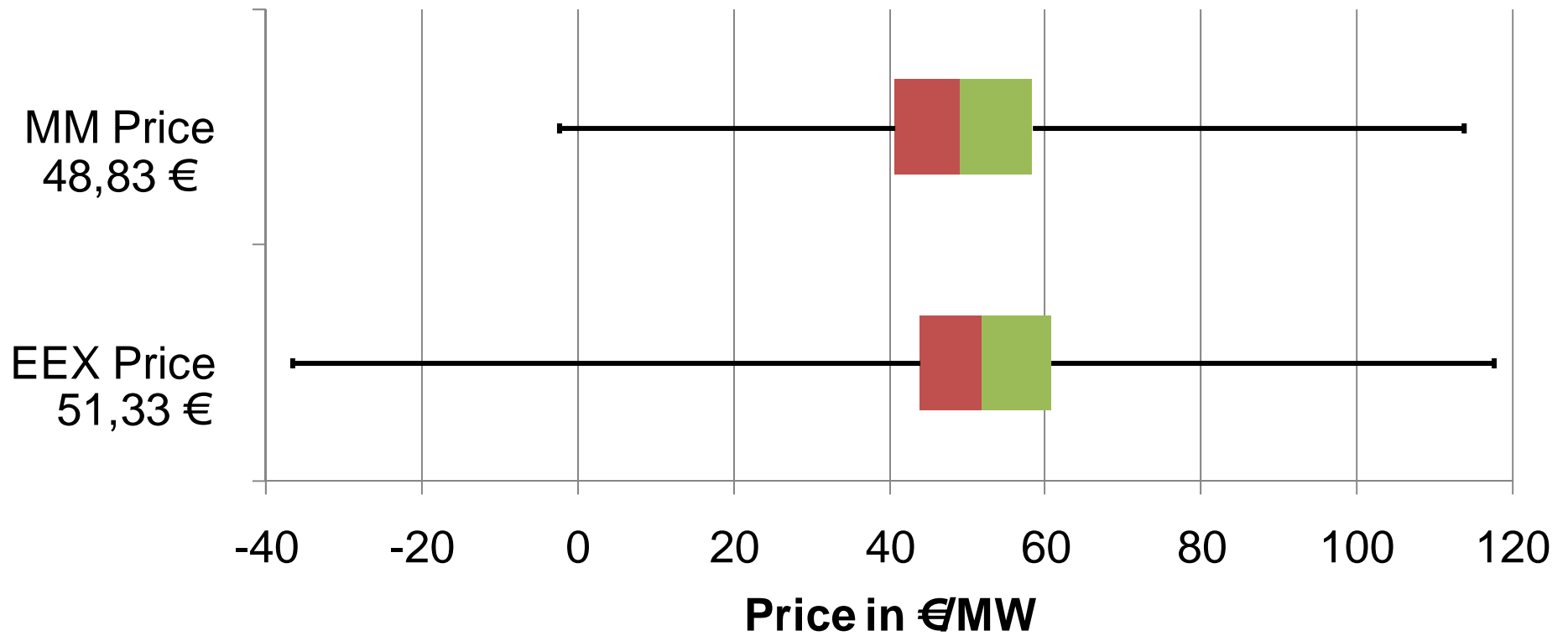
## Ausgleichsenergie





# Economic analysis

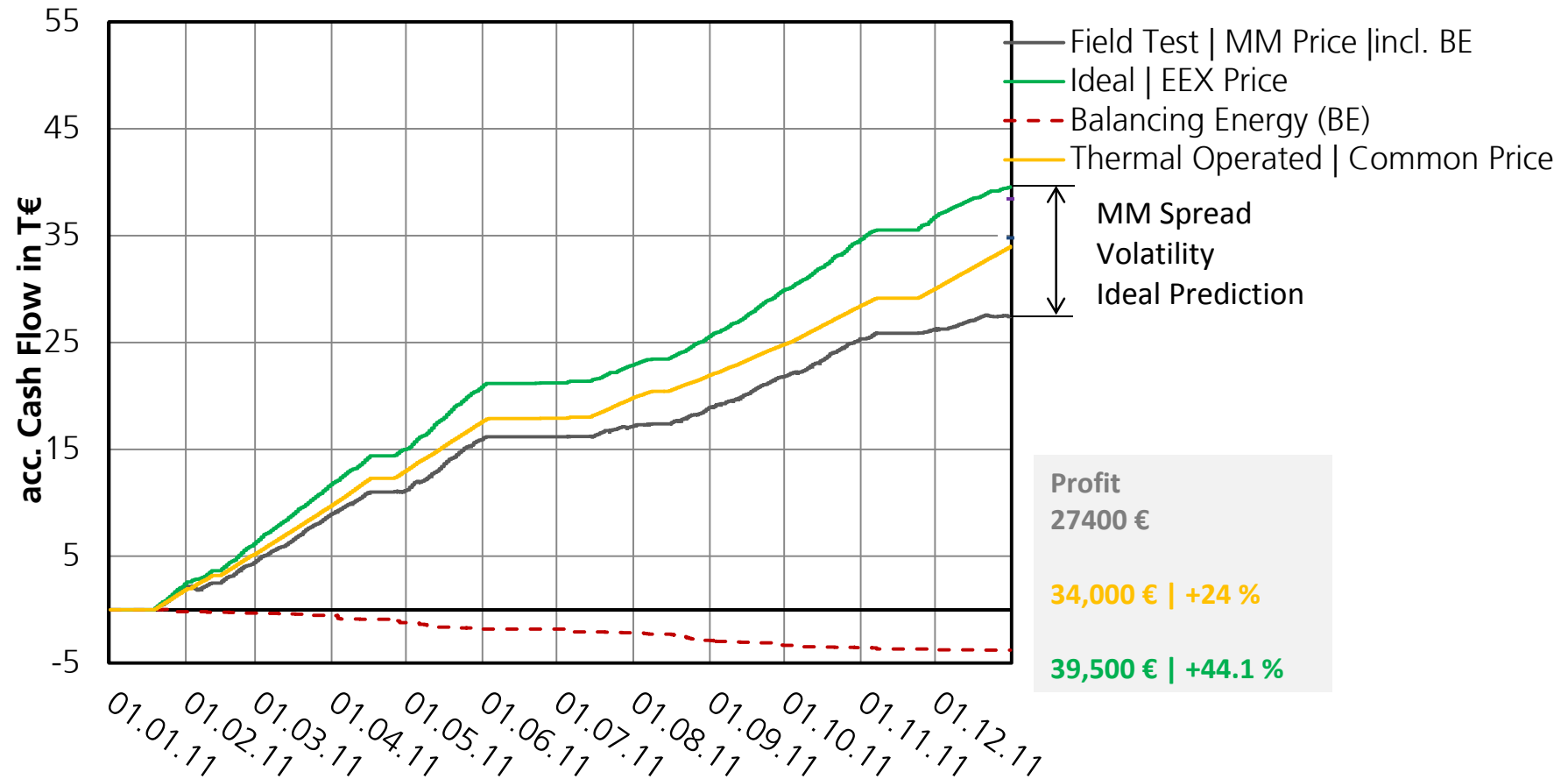
## Price analysis



MM Price is 5.1 % below EEX-Price and less volatile.

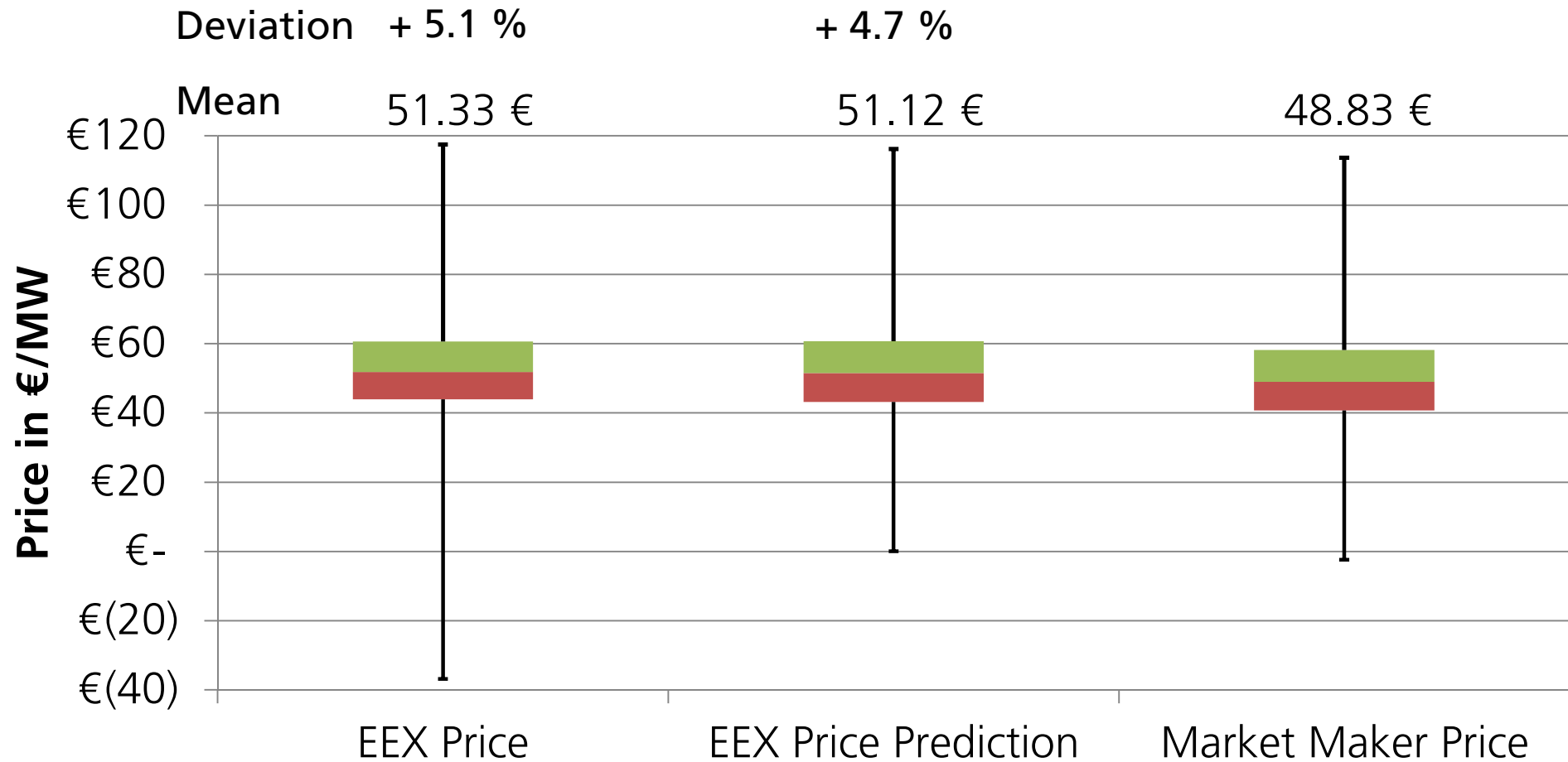
# Economic analysis

## Accumulated Cash Flow



→ Positive result even without a thermal storage!

# Price Analysis



MM Price is 5.1 % below EEX-Price and less volatile

# Conclusion

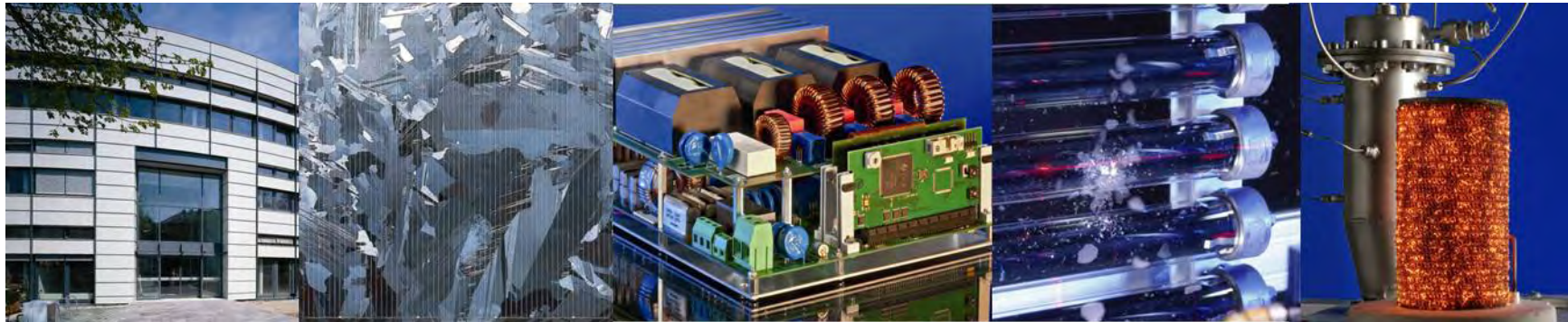
- **Despite increased risk** (esp. scheduling / prediction) the market integration potentially increases feasibility of small CHP units.
- **Despite the lack of a thermal storage**, the field test plant at the swimming pool realized an increased marginal income as compared to the risk free operation under a (fixed) feed-in tariff.
- But **low transaction costs** (margin of the market maker) is crucial.
- Need for scheduling **increases** the **complexity substantially**.

Step by Step Market Integration:

- Implementation of a **voluntary dynamic tariff** next to nowadays fixed feed-in tariff for small CHP.
- Comparable systemic value as market integration but
  - decreased transaction cost
  - decreased prediction risk on an individual basis.



# Thank you for your Attention!



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