



Energy research Centre of the Netherlands

PowerMatching City

I.G. Kamphuis

*Presented at Energy Delta Convention, Invited lecture Sustainable Cities Session, 21-23
November 2010, Groningen, The Netherlands*

SmartGrids in action
Power Matching City

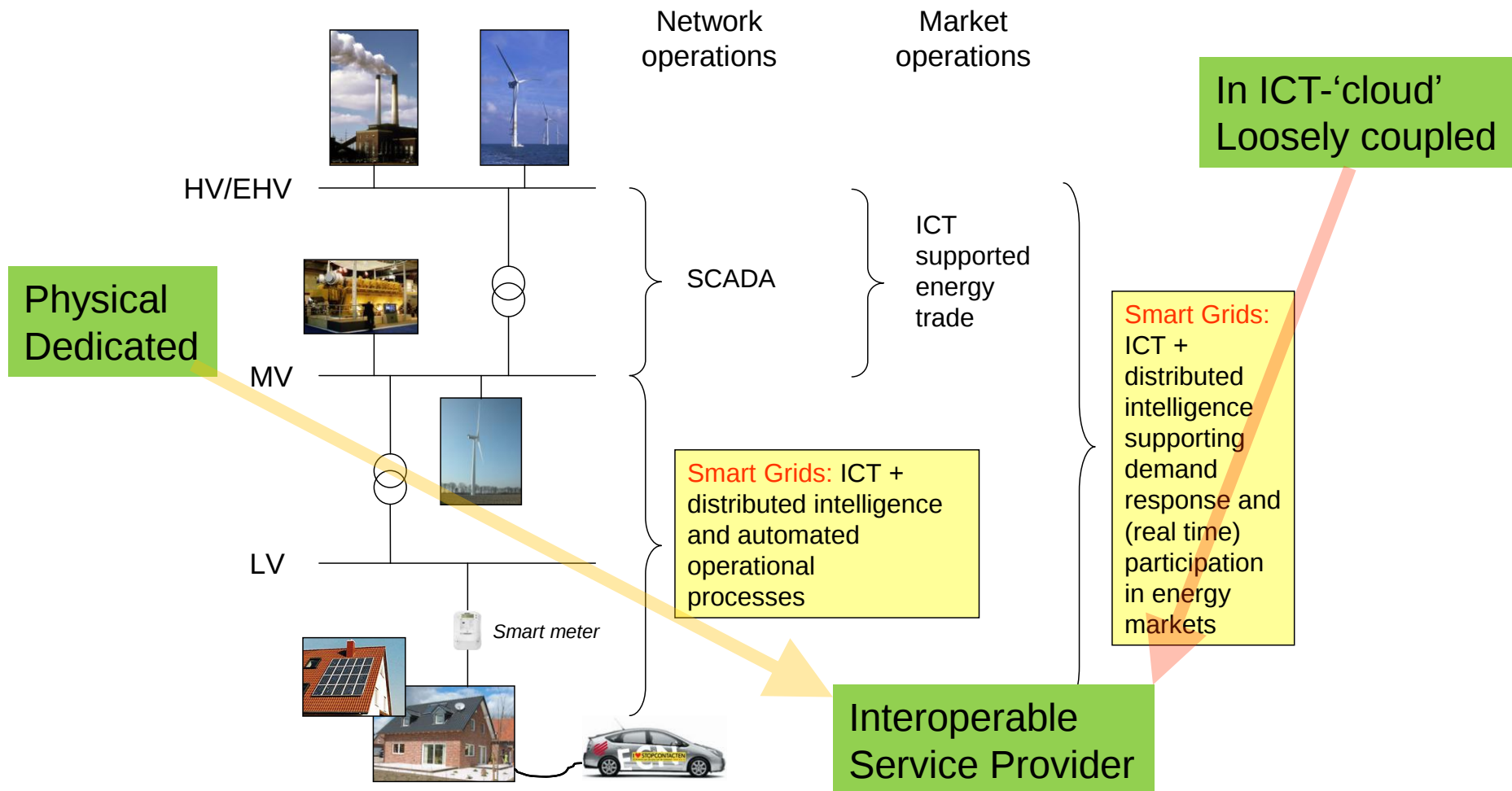
**René Kamphuis, ECN Efficiency and Infrastructure
Intelligent Energy Grids, Petten, the Netherlands
Energy Delta Convention, Groningen, 23-11-2010 2010**

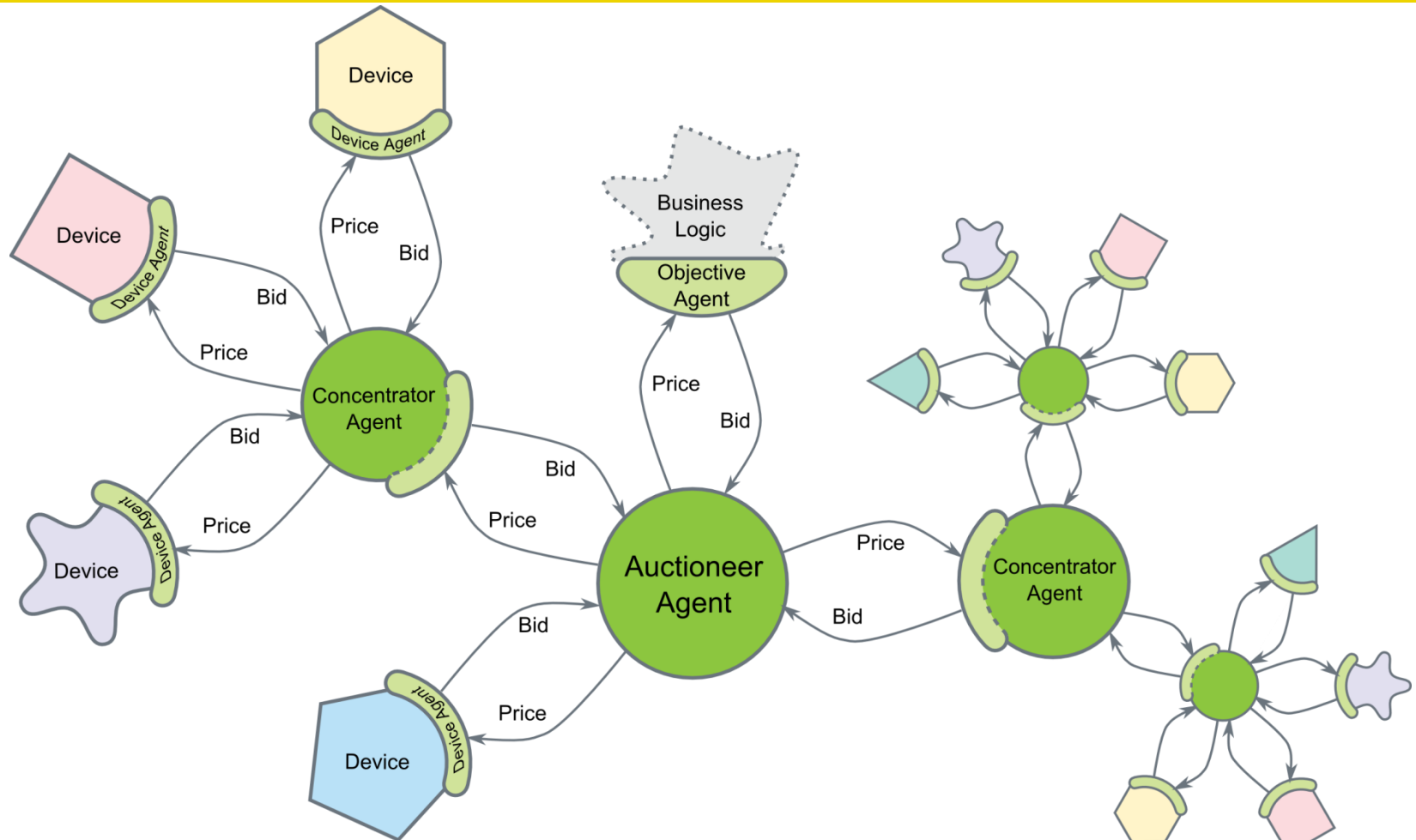


- Integral project EU 7th framework project (11 partners)
- PowerMatchingCity: SmartGrid in Hoogkerk
 - Embedding of DG-RES electricity (Wind and Solar)
 - What can fossil fuels and heat storage contribute in the form of flexibility
 - Demand response via μ -CHPs, heat pumps and consuming appliances
 - Role for electric vehicles
 - 25 heat pumps and μ -CHPs
- How to involve Information and communication technology ?
 - Monitoring; extended to lowest levels of distribution ?
 - Coordination; how are povernodes made aware of the rest of the system ?
- Use cases/ possible future grid functionality
- Some first results
- Conclusions



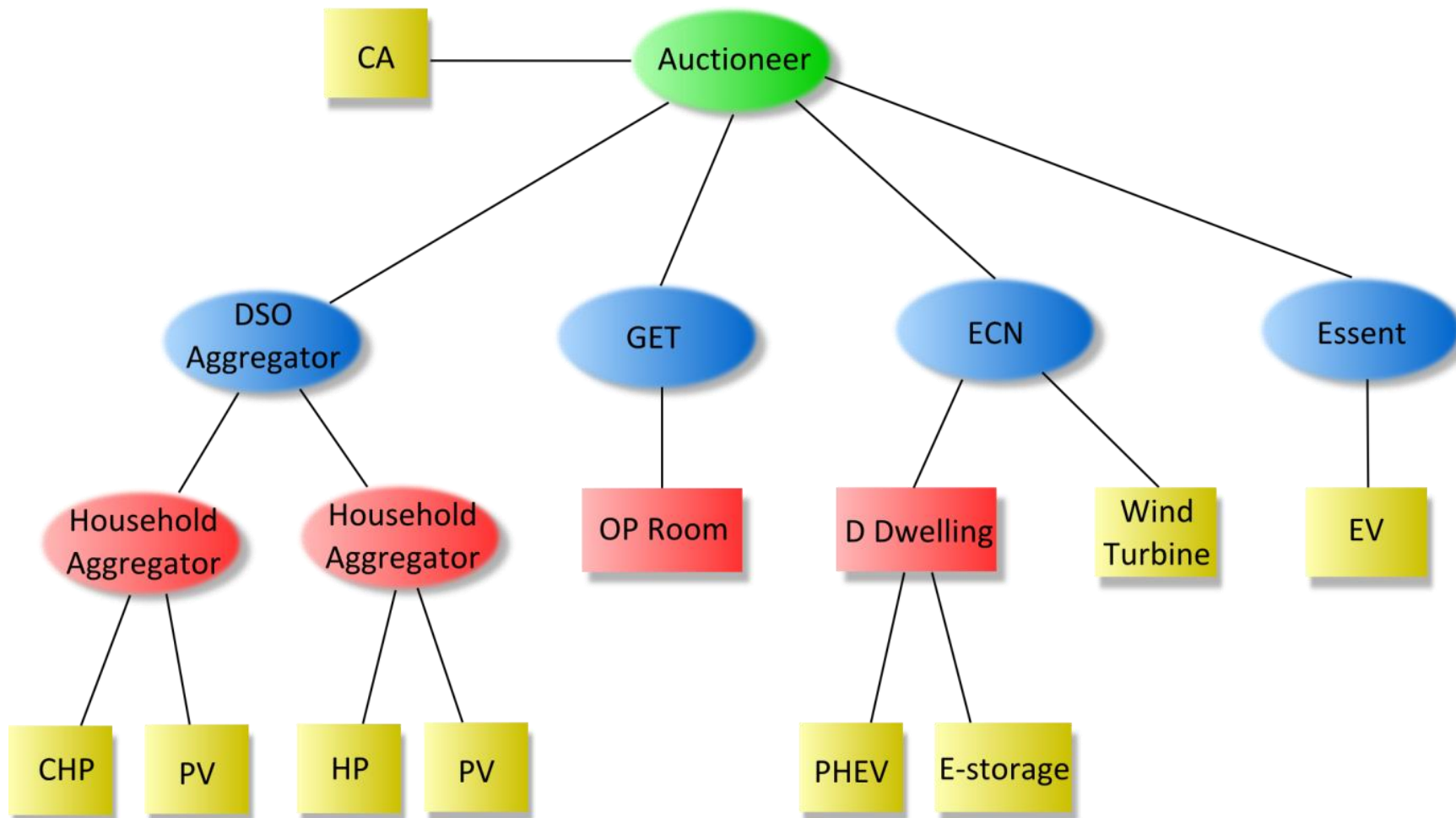
ICT Functions for market and network operations

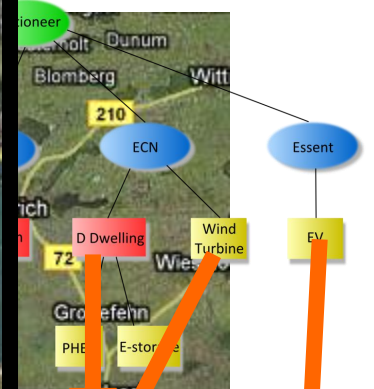




P•WERMATCHER
smartgrid technology

- Agent based
- Minimal message overhead
- Primary process/user in control



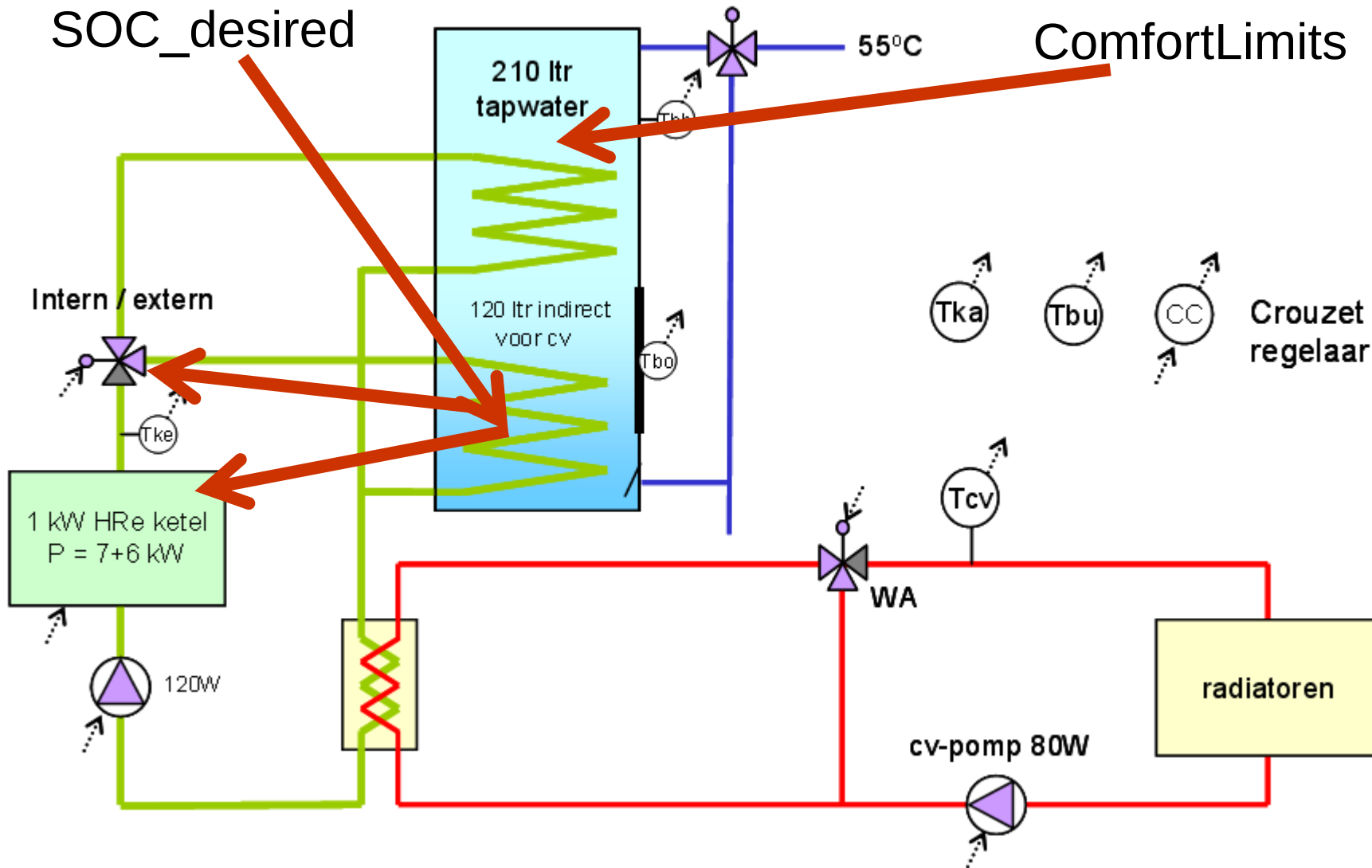


- Hot water storage for:
 - Heating system
 - Tap water
- Extra flexibility via electricity, gas operation modes
- Micro-CHP:
 - Usage of peak burner
- Hybrid Heat pump
 - High efficiency gas heater as peak support



SOC_desired

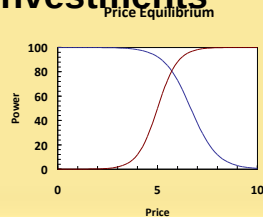
ComfortLimits



Business Cases

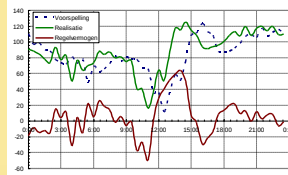
Cost Effective Use of Energy *Prosumer*

- **Maximize Economic Benefits of DER/RES asset investments**



Imbalance Reduction (VPP) *Program Responsible*

- **Reduce Own Imbalance**
- **Dispatch Control and Reserve Power**



Operational Cases

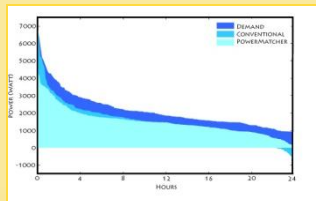
Monitor Own Household *Prosumer*

Provide feedback to customers

Monitor, Manage and Control System *Operator*

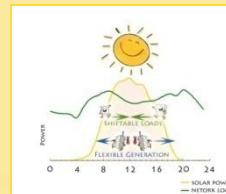
Improving asset utilization *Distribution System Operator*

- **Congestion Management**
- **Reduce investment in assets**



Valorization of Renewable Energy *Asset Owner*

- **Maximize revenues RES**
- **Improve RES embedding**

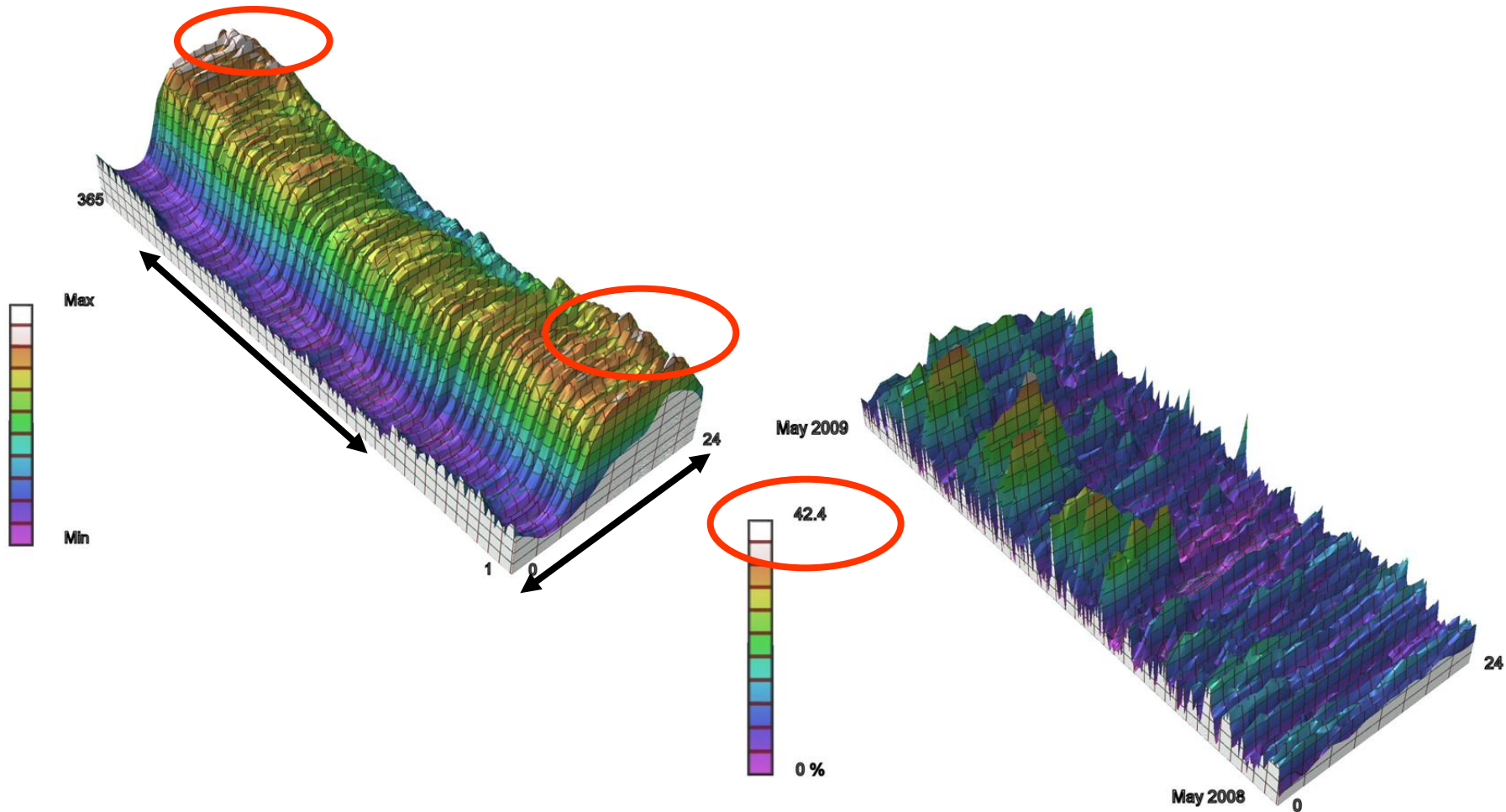


Collect and Analyze Data
Operator / Researcher
On-line or off-line analysis.

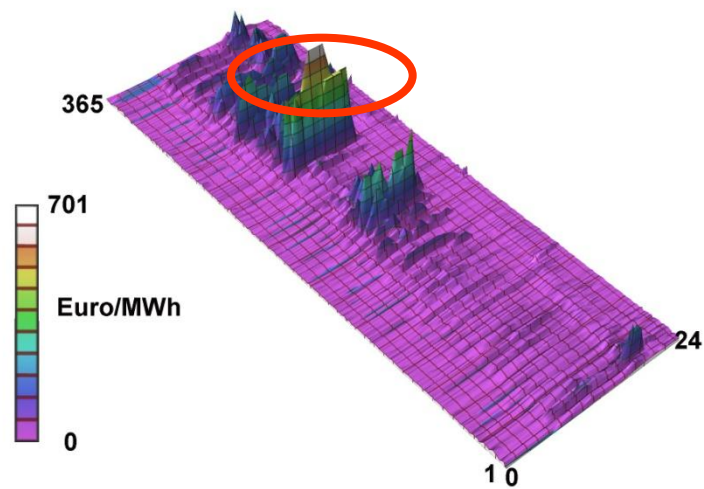
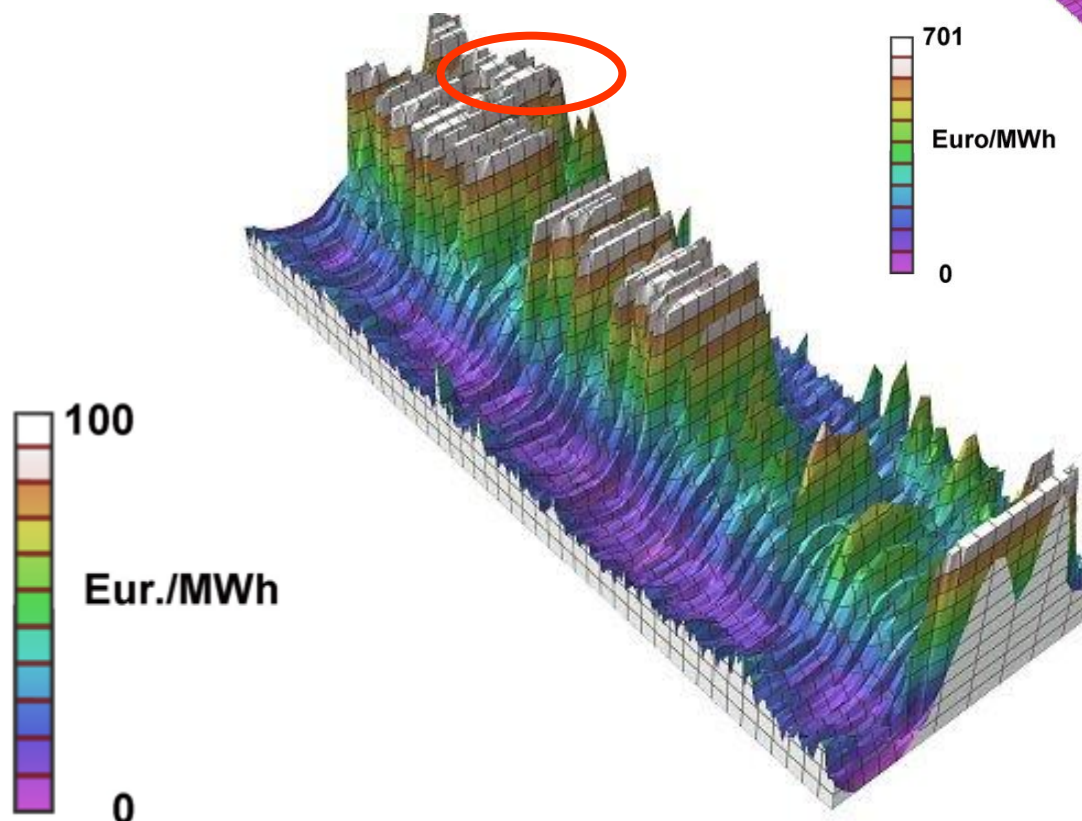
Use case / Operate cluster on electricity trade floor

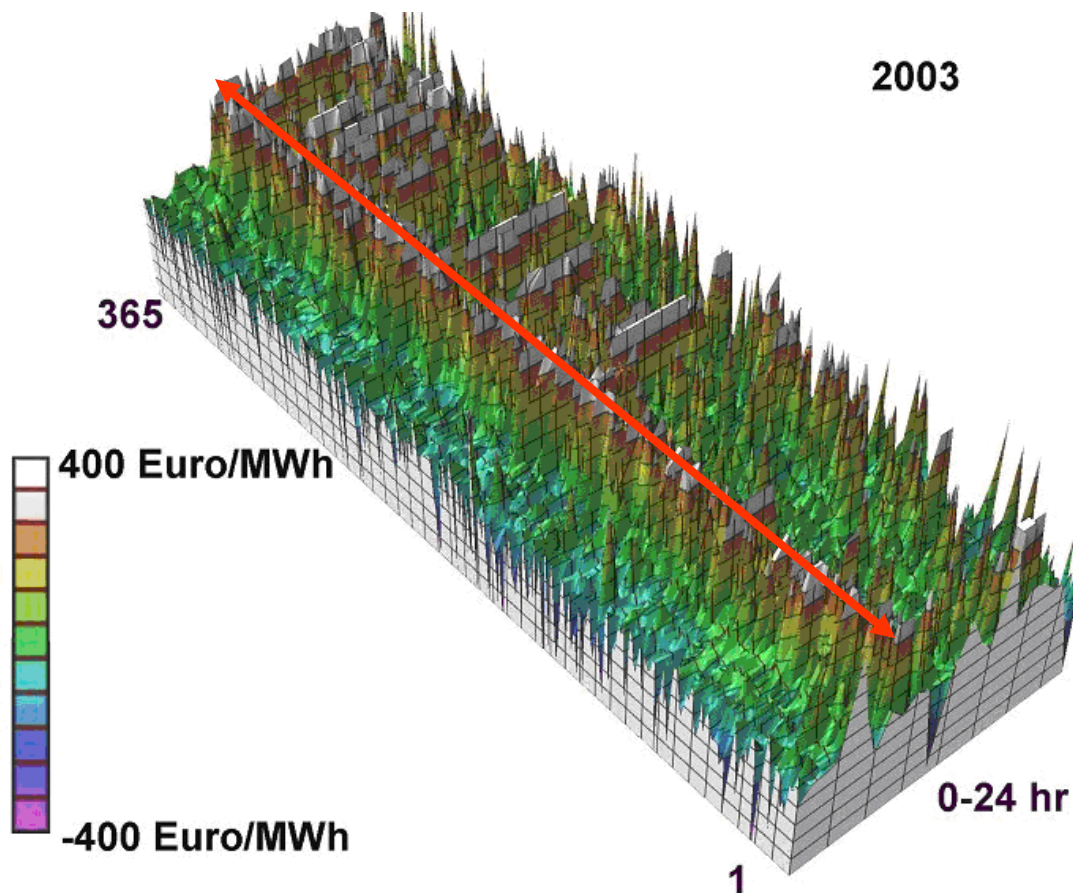
- Commercial-VPP
 - Now in the Netherlands already for horticultural CHP
 - Day-ahead, intra-day
 - Imbalance market
 - Reduce or direct imbalance in portfolio
 - Dispatch and support of conventional power within PTE within portfolio; compensate for ramp-up/ramp-down large generators
 - Take part in spinning reserve requirement for large generators

Illustration by 3D-price profiles



Netherlands electricity market 1 hour blocks: electricity price



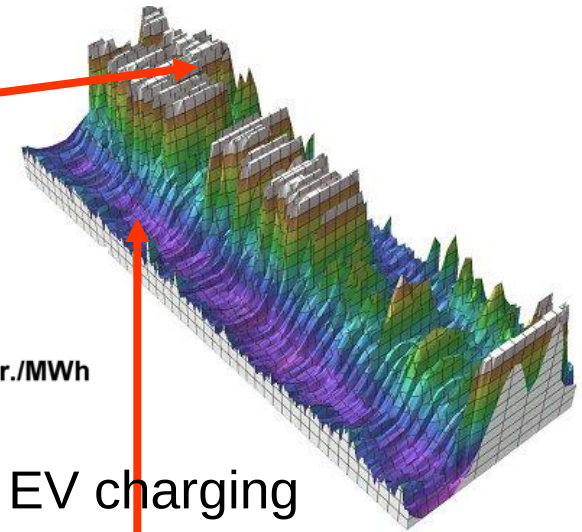
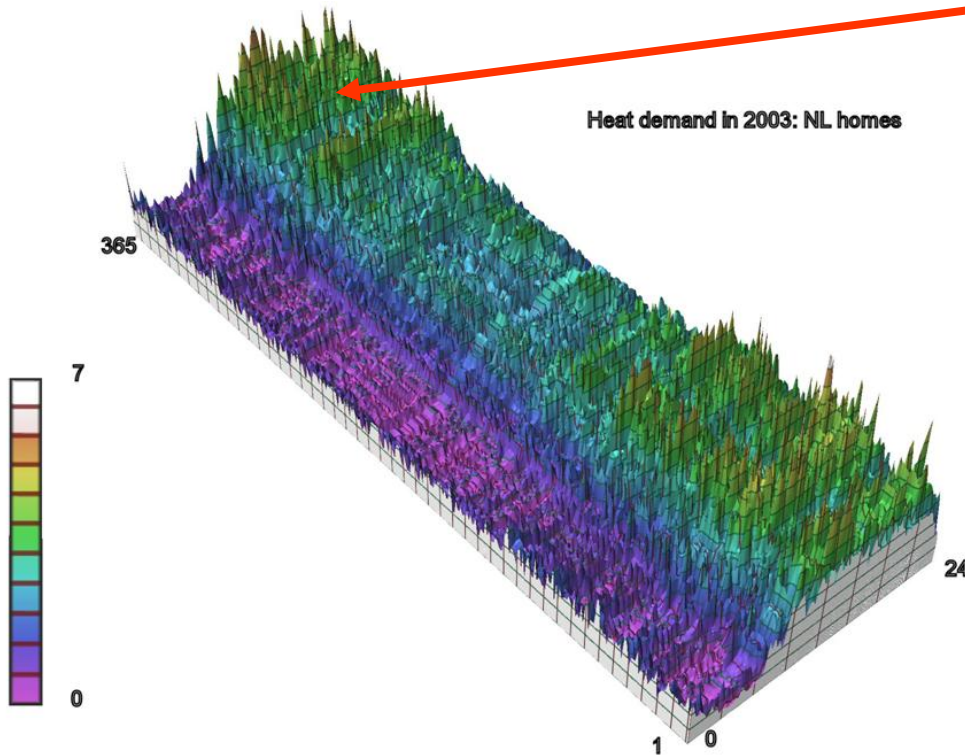


2003

Ramp-up at 8:30

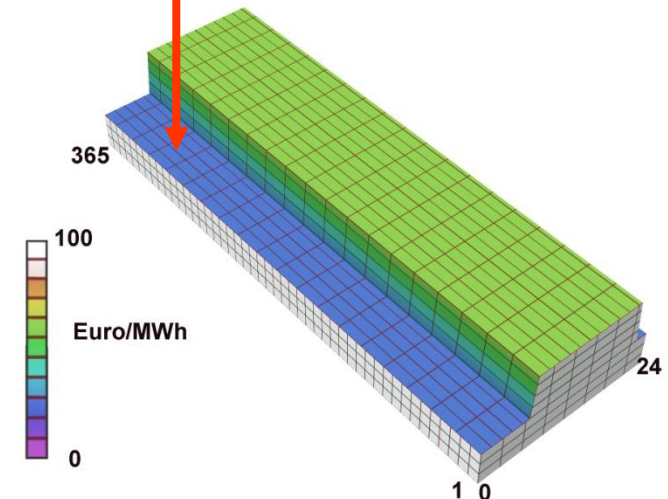
Home Heating

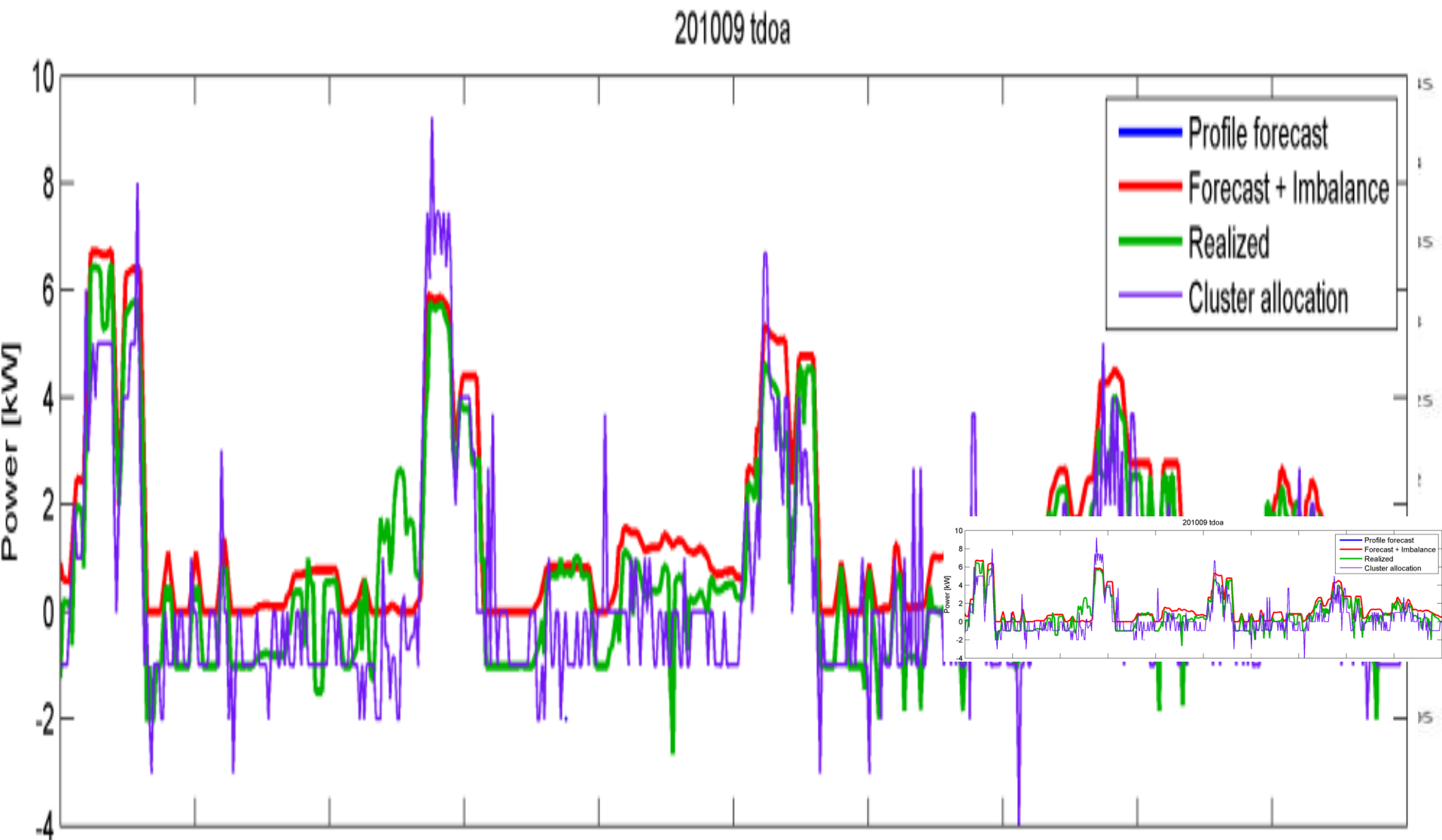
Heat demand in 2003: NL homes

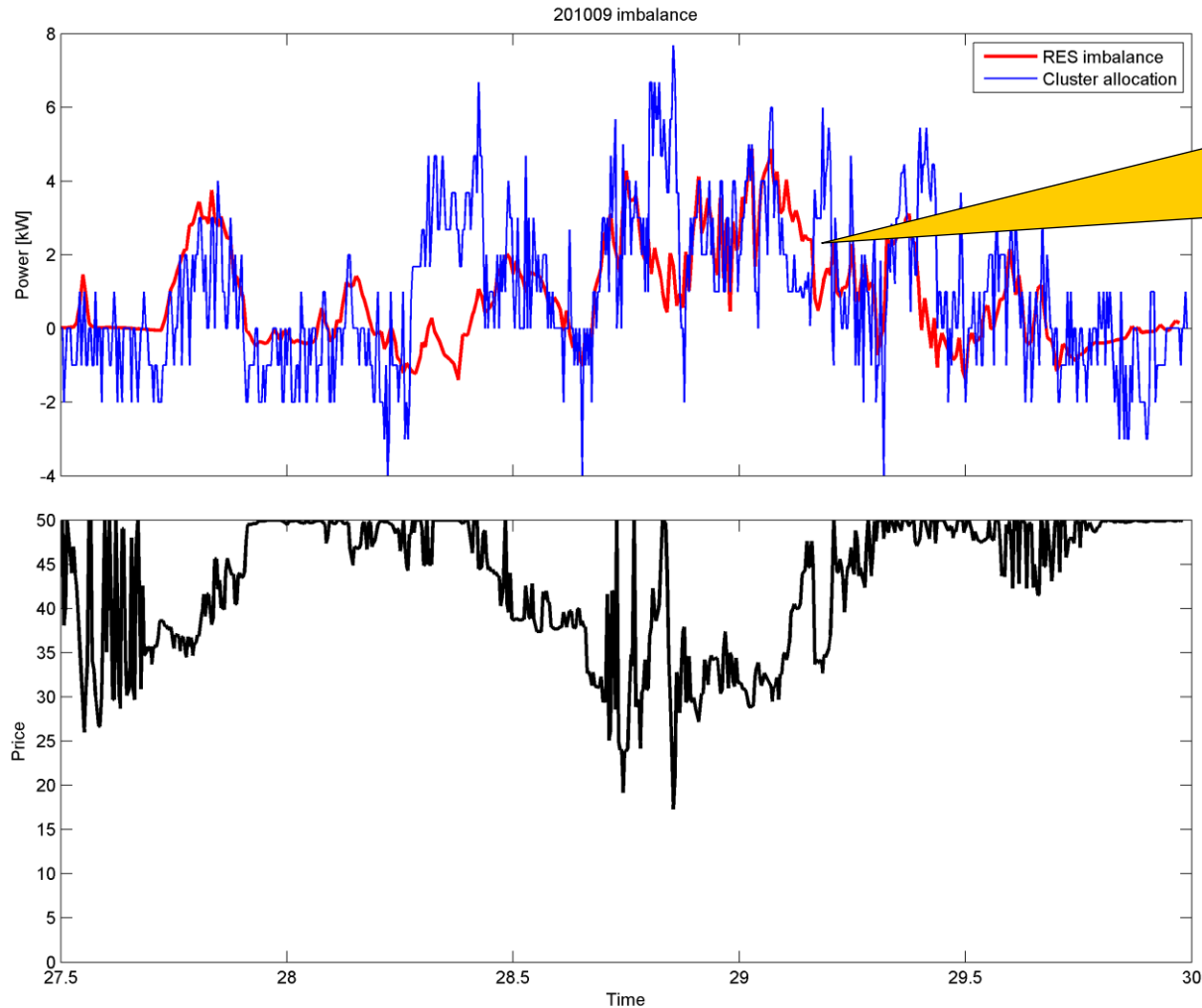


EV charging

Consumer-tariff







Wind
imbalance
pattern is
compensated
if possible

- Fine-grained metering scheme
 - Intelligent meter at every node; gas and heat
- User WEB-portal
 - Cluster Prices
 - Experience platform
 - Participative design
- New 'Pricing Model' for users; participation fee is attributed as an incentive
 - Market part
 - Contribution to congestion management; 'grid friendliness'
- Socio-economic research-interventions on perception of the new technology and usability

Experiment now delivers ‘real-world’ clues on

- Value of heat/electricity storage in DG-RES context
- Flexibility of a VPP-cluster as an asset on short-timeframe electricity markets
- Behind-the-meter optimization
- ICT connection possibilities to other operational modes (critical, emergency)
- User perception and retribution schemes



See
www.integraleu.com
www.powermatchingcity.nl

