



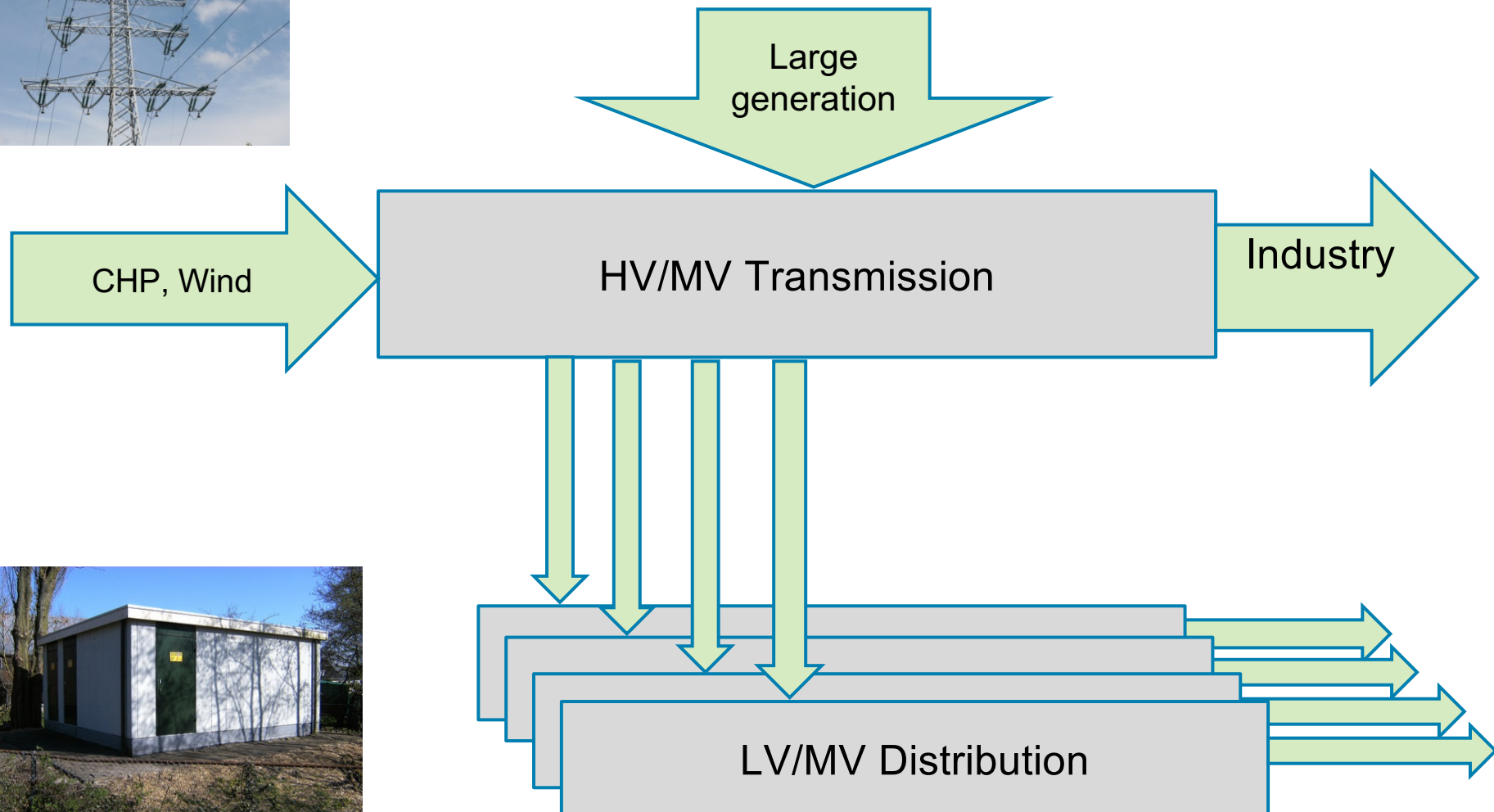
DSM Day IEA/DSM TASK-17: DG, DR and storage Flexibility: Dream or Reality

Matthias Stifter, AIT

René Kamphuis, TNO



Power flows in electricity grids (traditional)



Transition to new flows appearing

- New types of generation
- Electrification
- Simultaneous/ bidirectional
- Synergy electr./gas/heat/cold



Combined
heat/power, wind

Large
generators

HV/MV Transmission

Industry



EVs

Heatpumps, Air



μ (C)CHP

Solar cells

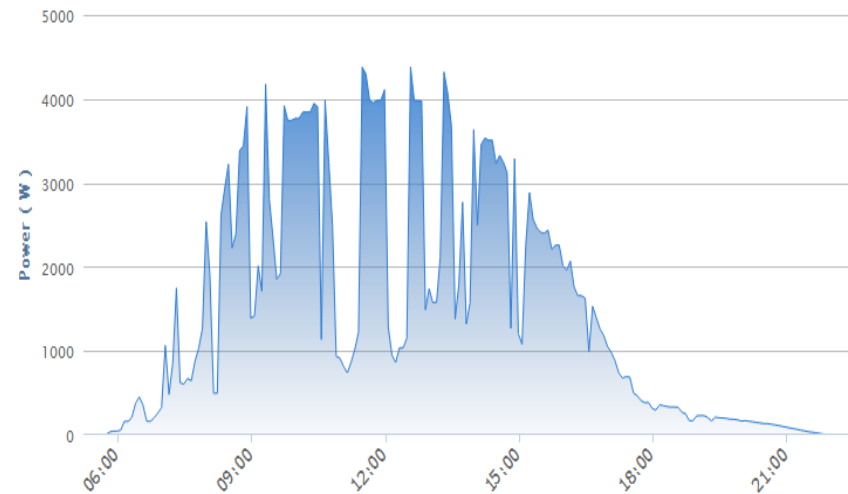


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iciency

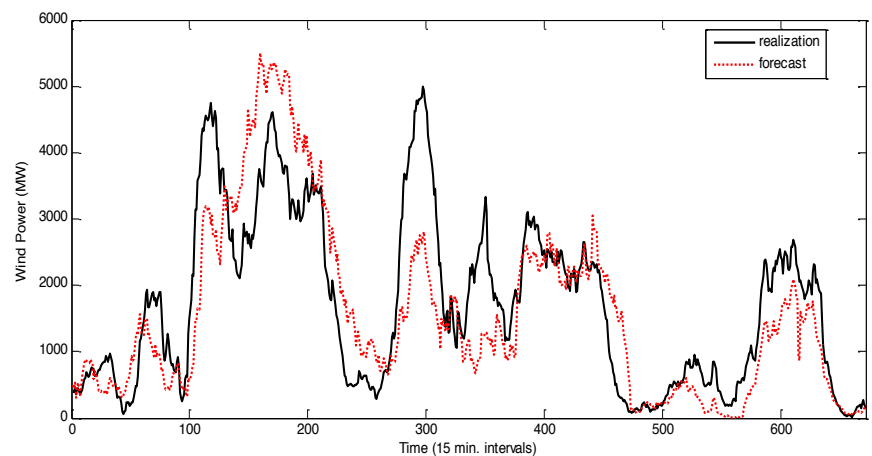


Increase of Volatility and need for Balancing

- PV generation on a cloudy day



- Wind generation and deviation from forecast

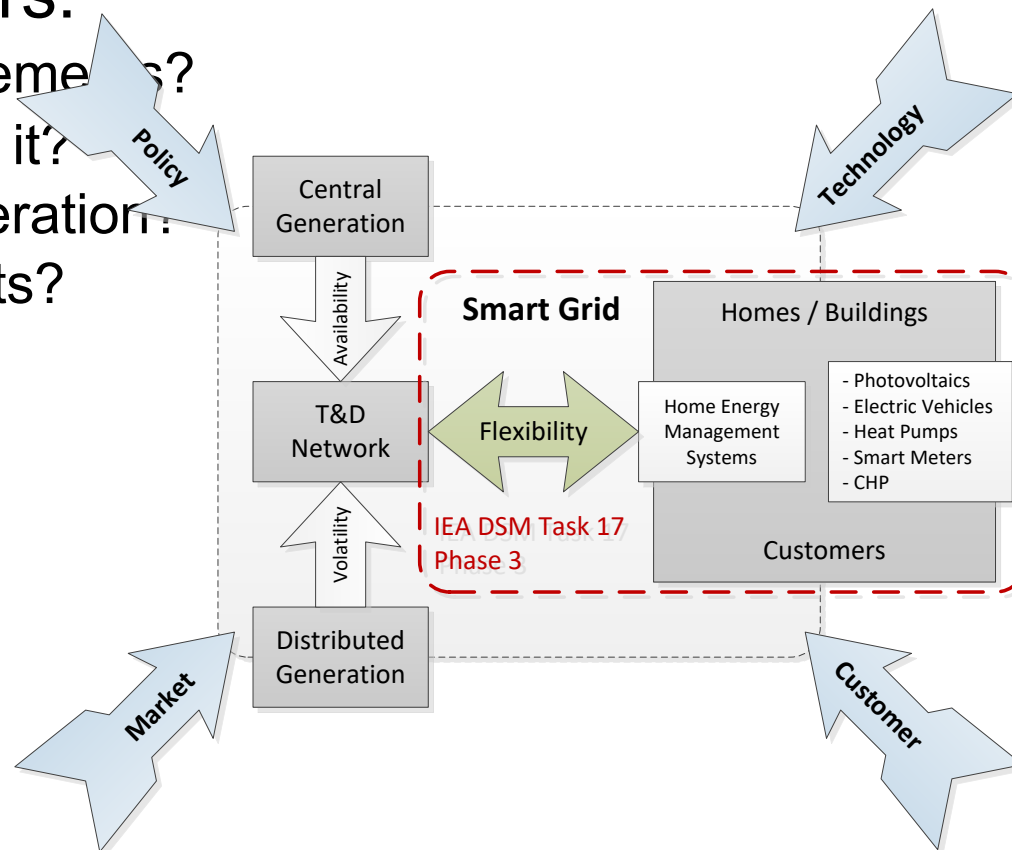


→ need for balancing

Overview: Systems view on enabling the Smart Grid

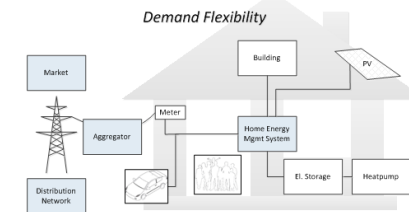
- Focus on the **enabling of flexibility in electricity production and consumption** and the impact of it on the stakeholders:

- What are the requirements?
- How do we manage it?
- How will it effect operation?
- What are the benefits?



Subtasks

- Subtask 10 - Role and potentials of flexible consumers
- Subtask 11 – Impact on Grid and Markets
- Subtask 12 - Sharing experiences / finding best p
- Subtask 13 – Conclusions and Recommendation

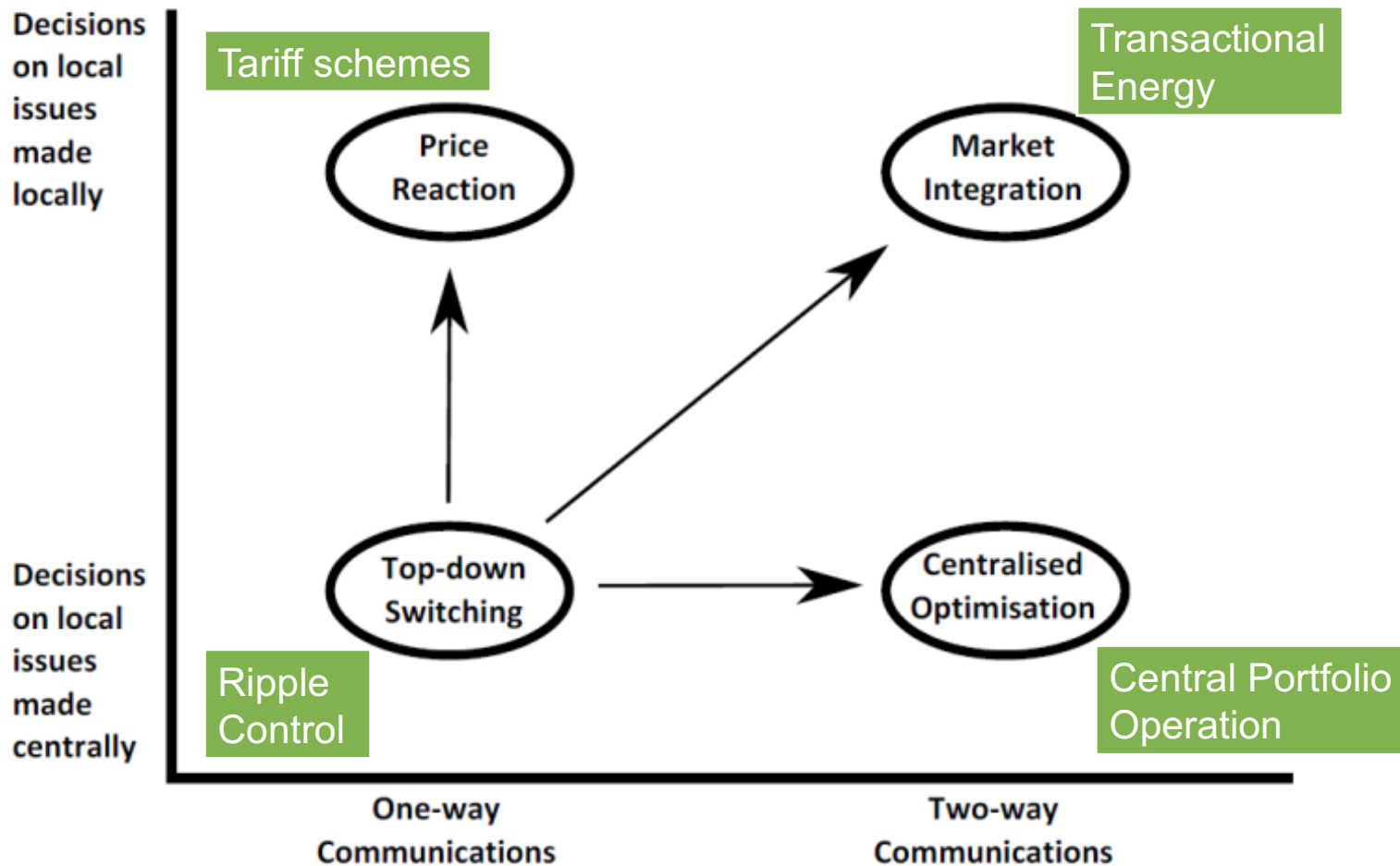


IEA DSM Task 17

*Roles and Potentials of
Flexible Consumers and Prosumers*
Distributed Demand Response in Households and Buildings

Matthias Stifter, René Kamphuis, Matthias Galus, Marijn Renting, Amoud Rijnveld, Roman Targosz, Steve Widjajanto, Lars Nordstrom, Daniel Brodén, Niclas Ehn, Tara Esteri, Stephen Galsworthy

Evolution of ICT Architecture for enabling Flexibility





Utilizing Flexibility - An application field for data analytics

Matthias Stifter, AIT

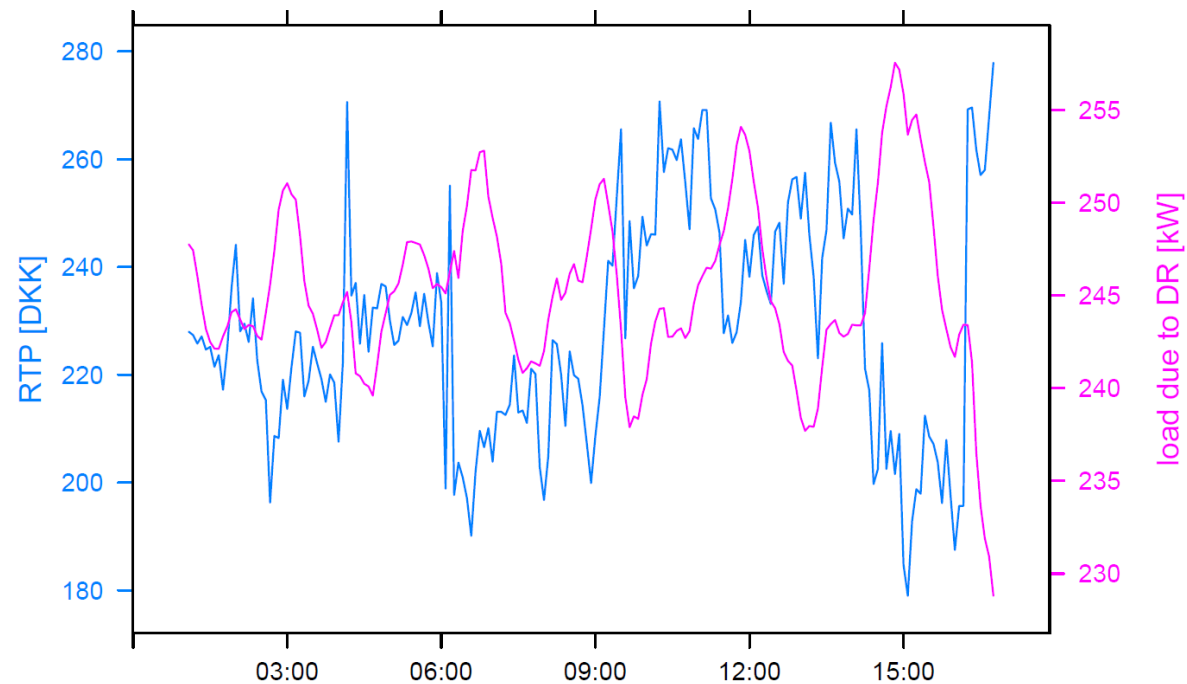
René Kamphuis, TNO



EcoGrid EU – Statistical data analysis of DR response

- Sample response

Although linear, not always the same reaction to the same price due to influence from the past

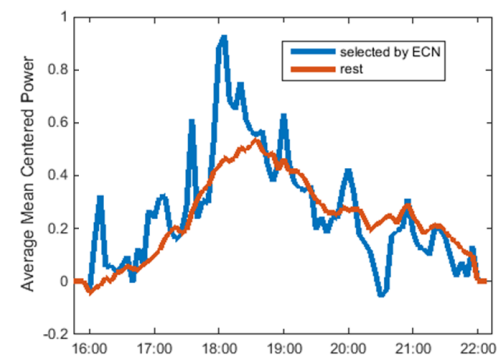
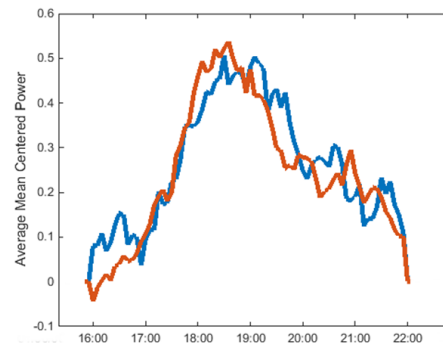


EcoGrid EU – sample reactions

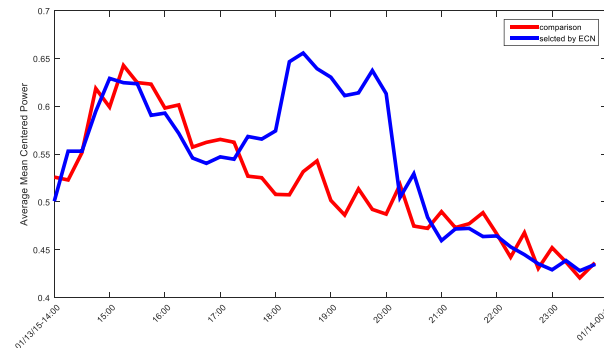
- Sample response on extreme price signals for manual group and reference group

- High price:

selected consumers only



- Low price



EcoGrid EU – Hourly Results

No comparison feasible because of

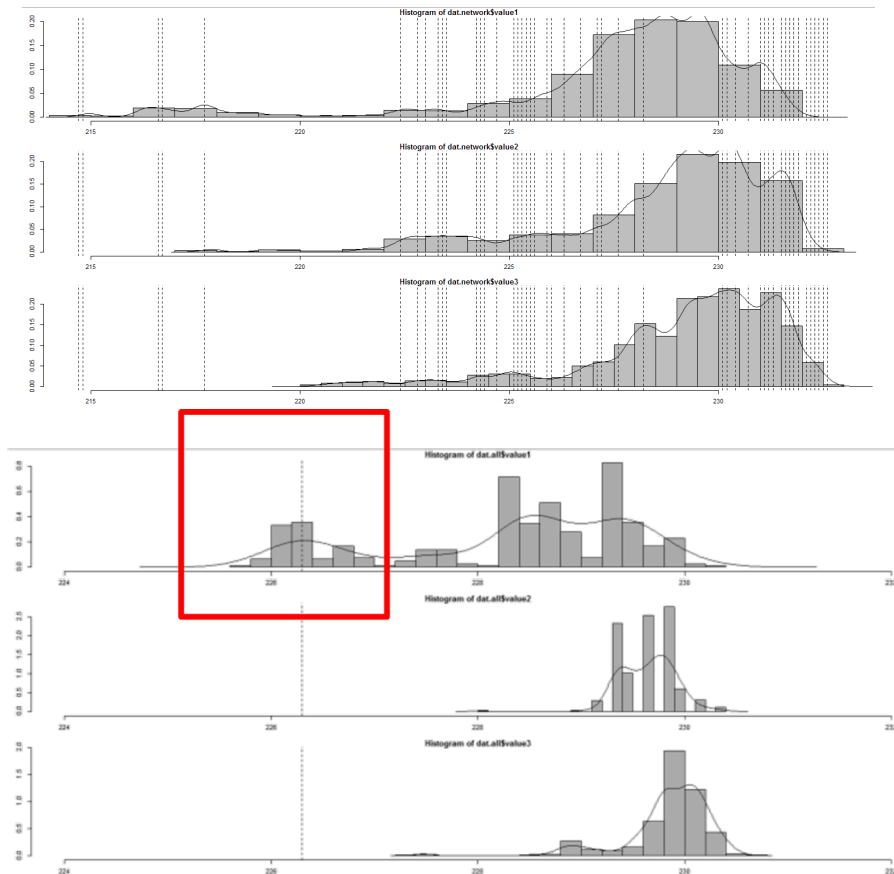
- Group composition
- Degree of automation (simply blocking heat sources vs. home automation)

Groups	Increasing RTP [%]		Decreasing RTP [%]		Increasing DA [%]		Decreasing DA [%]	
	Best	Average	Best	Average	Best	Average	Best	Average
Semi-automated heat pumps (1A)	-20,5%	-1,5%	20,5%	1,5%	-10,9%	-0,5%	12,9%	0,5%
Semi-automated electric heating (1B)	-12,1%	-0,7%	9,4%	0,7%	-4,8%	-0,4%	5,1%	0,4%
Semi-automated heating with aggregation (1C)	-6,1%	-0,3%	6,4%	0,3%	-5,3%	-0,6%	5,2%	0,5%
Fully automated electric heating (2)	-41,7%	-1,9%	27,6%	1,9%	-23,4%	-1,6%	23,1%	1,6%
Manual	-2,6%	-0,2%	2,7%	0,2%	-12,5%	-0,5%	10,5%	0,5%

Data Exploration on impact of DR signal

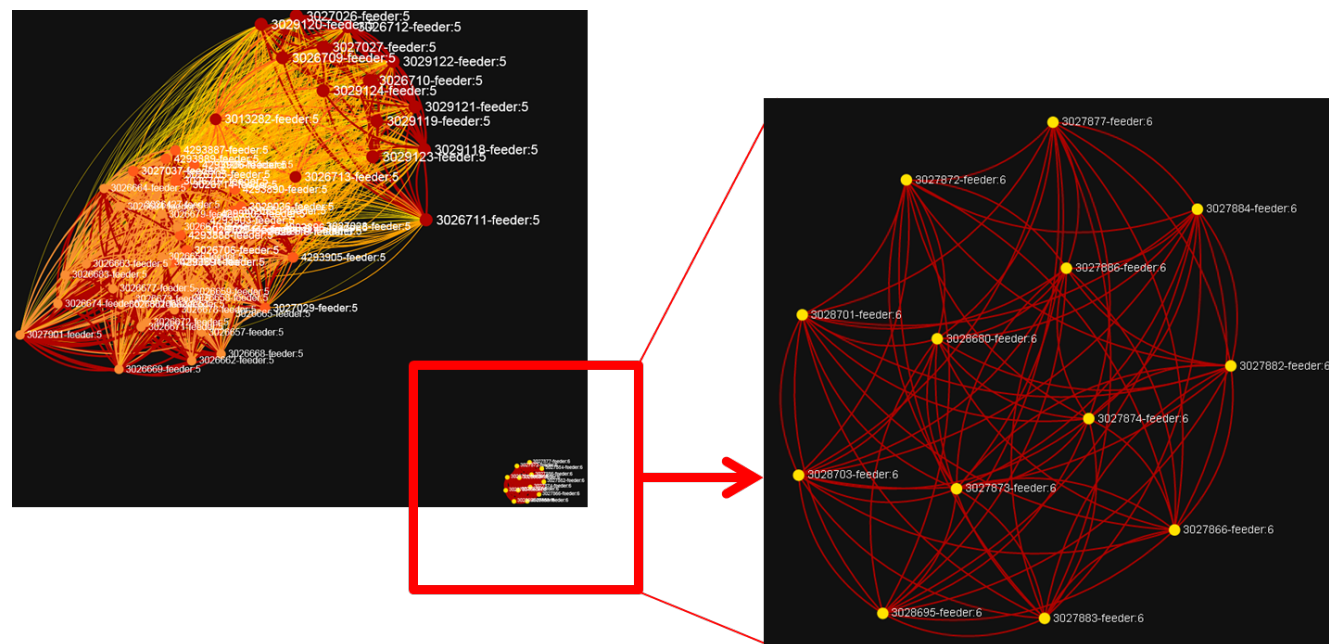
Data analysis of smart meter data to identify impact on network from DR signal

- Voltages for 3 phases
 - all snapshots/measurements of one network:
- one snapshot/measurement:



Data Exploration on impact of DR signal

- Detection of isolated events
 - Same event connecting meters for all snapshots
 - Event = strong asymmetry between voltages
 - Visualisation with *Collaborative Filtering* und *Affinity Graph*



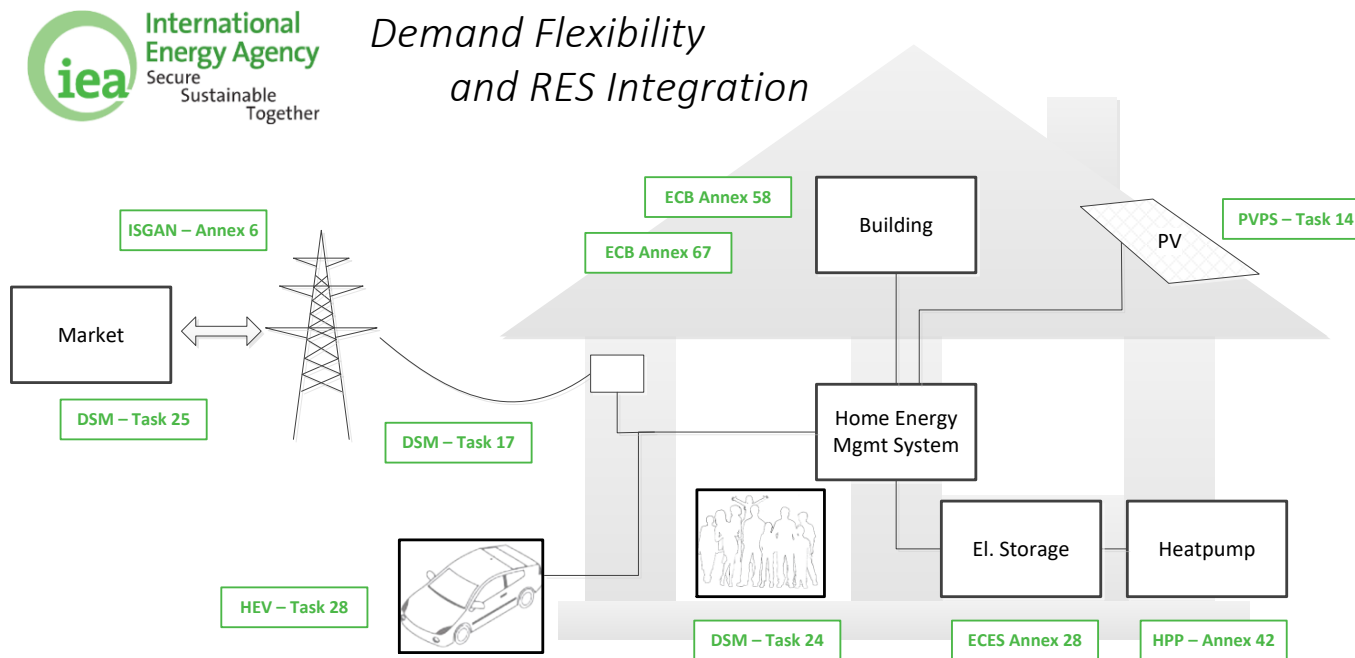
Data Exploration on impact of DR signal

- Interactive visualisation of user defined events z.B.: sums und singlephase active/reactive power with respect to unsymmetry
 - Most frequent event is slight asymmetry
 - Low single phase voltage independent from reactive power situation



Symposium and Expert Meeting @ Smart Grids Week

- Workshop Linz, Austria May 9th 2016 – Smart Grids Week
 - IEA-DSM Flexibility symposium:
<http://www.smartgridsweek.com/workshops.html>



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