The Integration of decentralized Storage in LV and MV Grids

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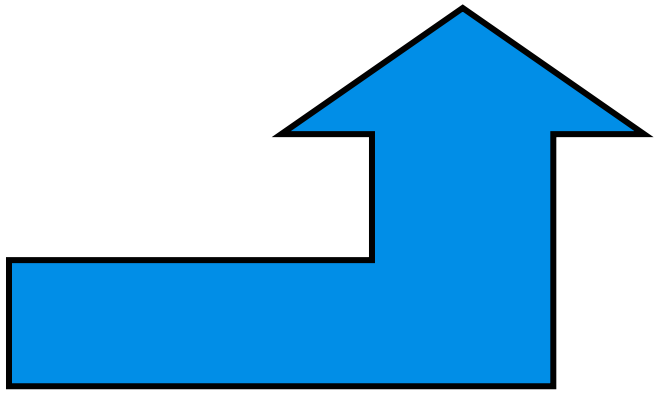
Motivation

- Natural Resources
- Climate Change
- CO2 Emissions
- Liberalization
- Economics
- Ecology
- Power Quality
- Security of Supply
- National Law

- Distributed Energy System
- Renewables
- Energy Management
- Storage



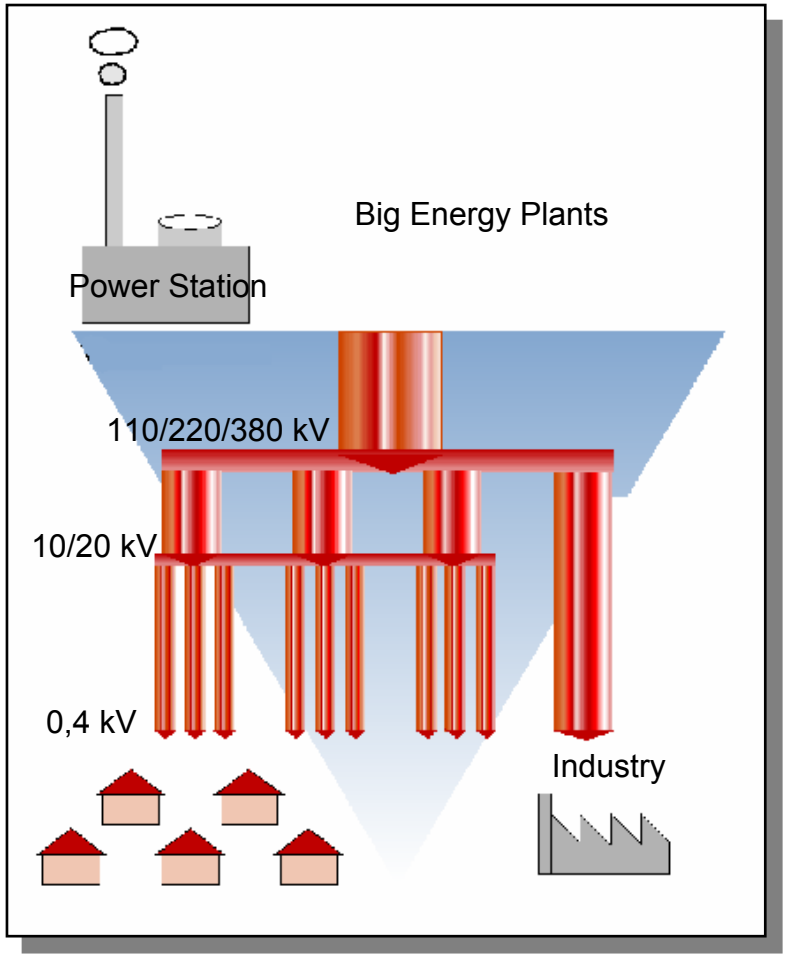
Change of System

Overview

- Part I – The Projects
  - EDISon
  - DISPOWER
  - Lessons learned
- Part II – The Boundary Conditions
  - Liberalization
  - Politics
  - Potential Barriers

EDISon

Infrastructure Today



Problems:

- Flexibility
- Permissions
- Power Quality
- 3rd World Countries

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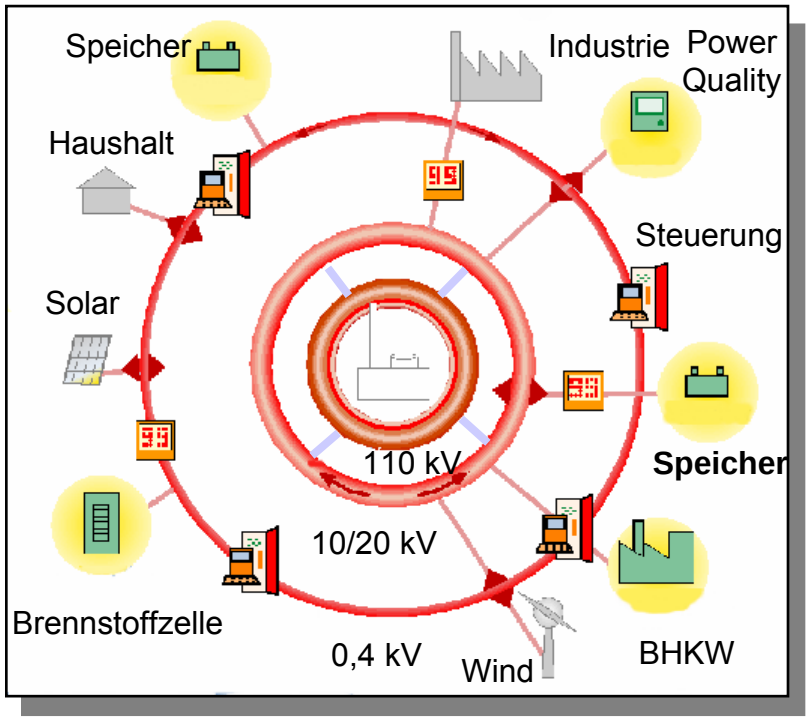
EDISon

Infrastructure of the Future



- Distributed Generation
- Bidirectional Power Flow
- Reduction of Losses
- Security of Supply

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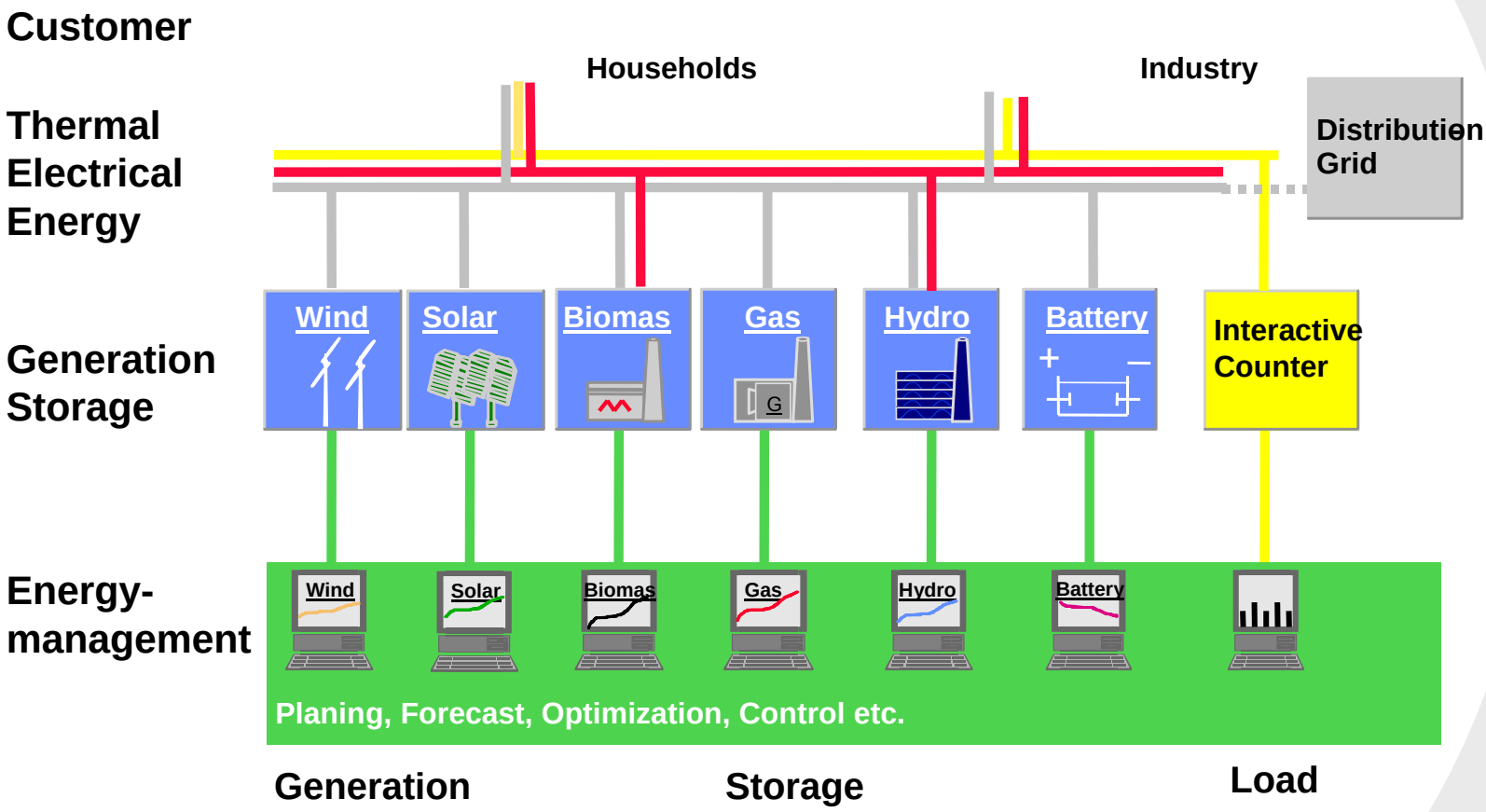
EDISon

DEMS



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EDISon
Storage and Grid Economics

- MV : Not feasible
  - Some MWh of Storage needed
  - PQ and even Grid-Extension is more economic
- LV : Could be feasible
  - ≥ 100 kWh Capacity
  - Available
  - Safe
  - Small
  - Mobile
  - Robust

Storage Systems
Technology

- 2 Systems
  - Lead-Acid 880 Ah
  - Gel Battery 1.100 Ah
- Container of Steel
  - 7,0 * 2,45 * 2,95 m
  - ca. 15 to.
- 100 kW, 1 h / 60 kW, 2 h

EXIDE

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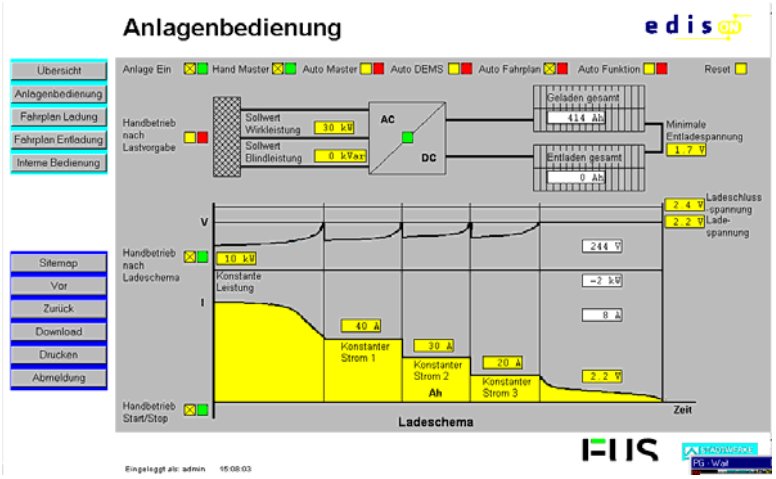
Storage Systems
Operation

- Local
  - Manually charge / discharge
  - Manual active and reactive power
- GSM
  - Schedule
  - Conservation Charge
    - 5 Step-Charging
      - Power
      - 3*Current
      - Voltage
  - Manually charge / discharge
- DEMS



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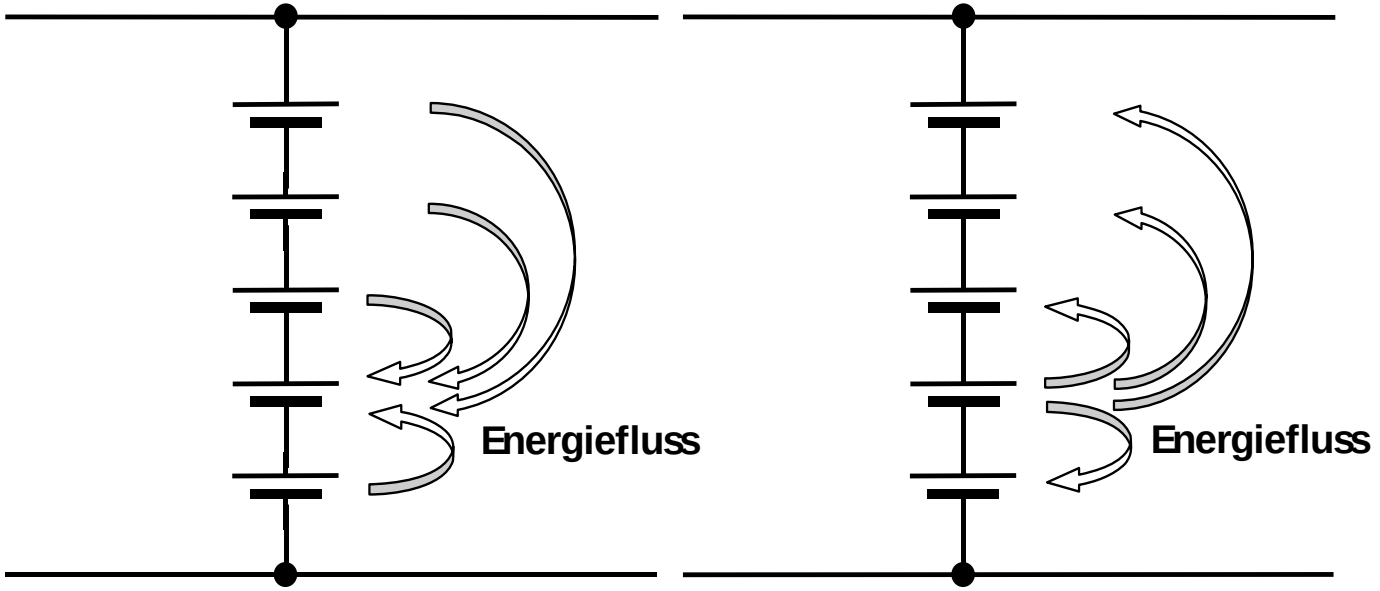
Storage System

T-CHEQ – Load Balancing



Stützung von schwacher Zelle bei Entladung

Entlastung von schwacher Zelle bei Ladung

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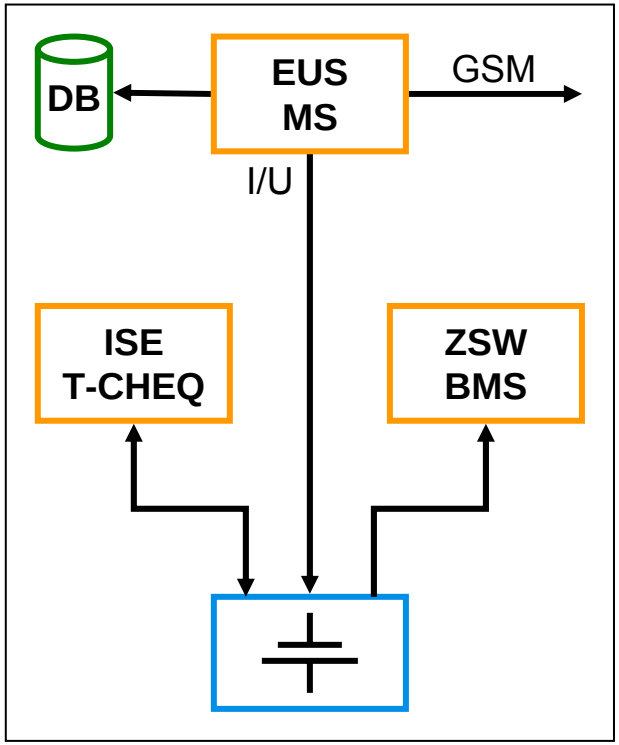
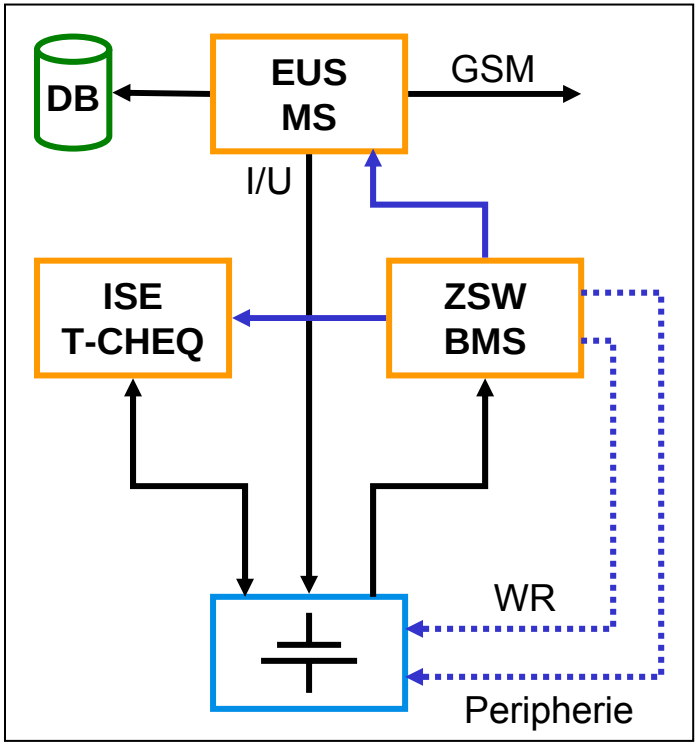
Storage System

Configuration

Actual Configuration



Potential Configuration



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Storage Systems
Lessons Learned

Pros:

- Operation
- Grid Support
  - Peak shaving
  - Stabilization

Cons:

- Economics
  - Actual not feasible
  - Not competitive compared to Grid-Solutions
- Mobility
  - Robustness
  - Weight
  - Size

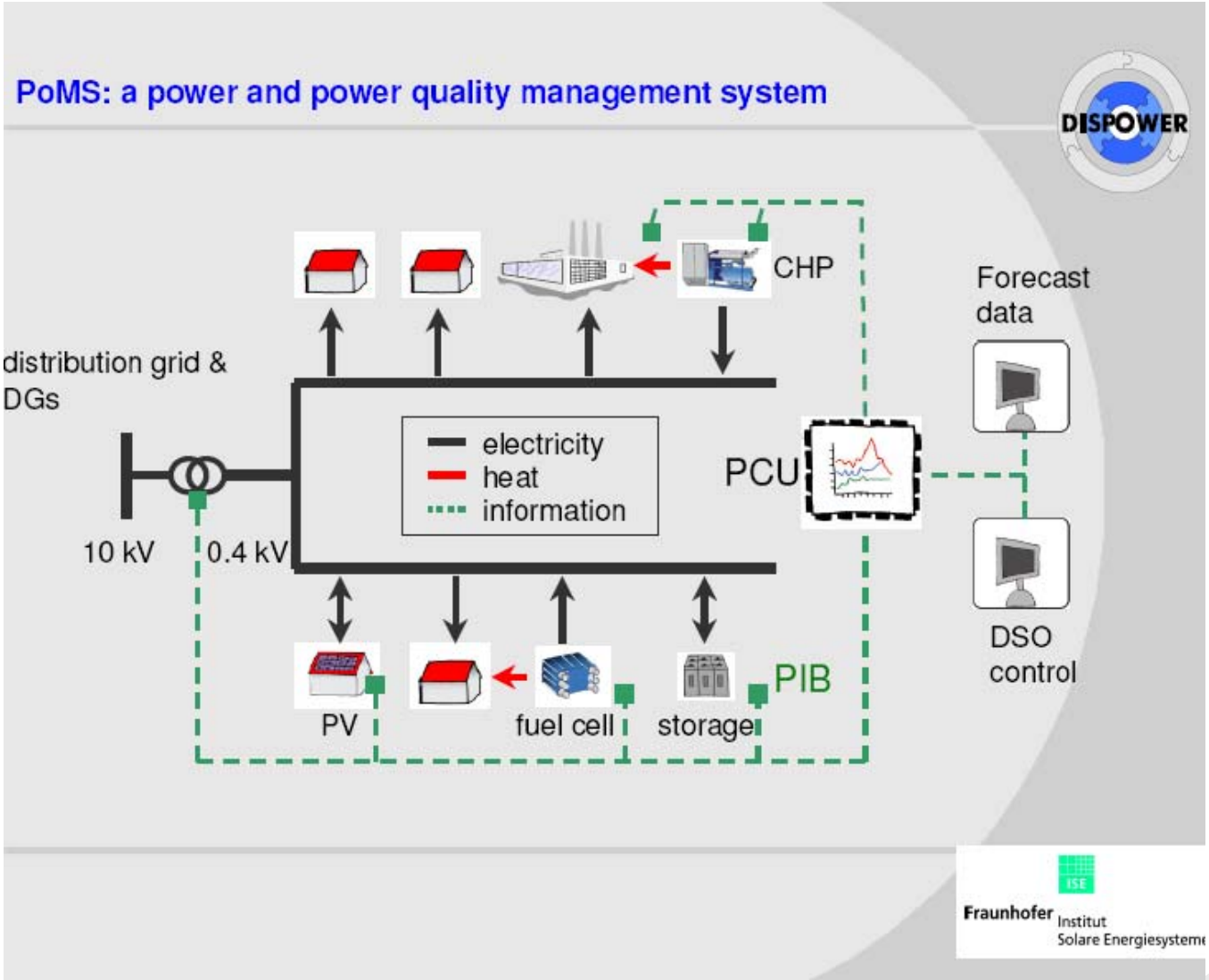
Problems in Supply
Power Quality

- Local / Short term
  - Construction
  - Events
- Global
  - Peaks in the Grid
  - Interruptions
- DER
  - Structural Change of the Distribution System

→ **Need for Storage Technologies**

DISPOWER

Energy Management



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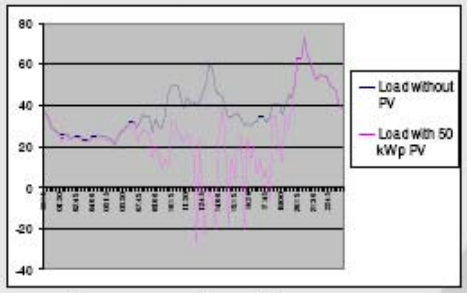
DISPOWER
Pilot Plant MVV

Pilot Installation Stutensee

Classification:

- Residential area; ring structure
- Possible impact of PV, CHP, battery on PQ
- Options for power management by PoMS

29 kWp PV-System



In co-operation with
Heinz Maier Architekten, Stutensee

MVV Energie

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DER
Alternatives

Energy-Management:

- DSM
  - Thermal Storage Capacity
    - Air-Conditioning, CHP, Heat Pumps, ..., Micro-Storage

PQ-Management:

- Short Term Load Rising
  - Fly Wheels, Super-Cap, ...

Boundary Conditions
The Nature of the Grid

- Facts about the Grid
  - 40-50 years lifetime
    - Not a flexible System
    - Adoption is possible with Guidelines
  - It is not a Copperplate
    - Topology is the Limitation
  - Existence determines the Costs
    - Less Usage is not increasing Costs
    - “Last existing socializing System”
  - It is not a Storage System
    - Infrastructure for a Real Time Balancing System

Boundary Conditions
Liberalization

- Focus on Business Economics
  - Mechanistic not holistic View
  - External Costs are neglected
- Transparency
  - Unbundling
    - DSO, IPP, Generation, Trade, Distribution, Transport
- WHO ?
  - Is able, is allowed, … , can do the Job of managing these Energy System

Boundary Conditions
Politics

- No Renewable Energy Storage Law
  - EEG, KWKModG
  - Storage is a useful but expensive Technology
- Mechanistic viewpoint of Politics
  - Parallel, independent, ideological Laws
  - Pushing Generation not Supply
  - No political Concept for Energy of the Future
  - Generation of Two Energy Markets
- National Economics
  - Even Today Storage can be competitive

We have to look at the

complete
Energy
Supply
System

technical, economical, ecological, social, holistic

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