Decentralized energy storage, electrical energy distribution

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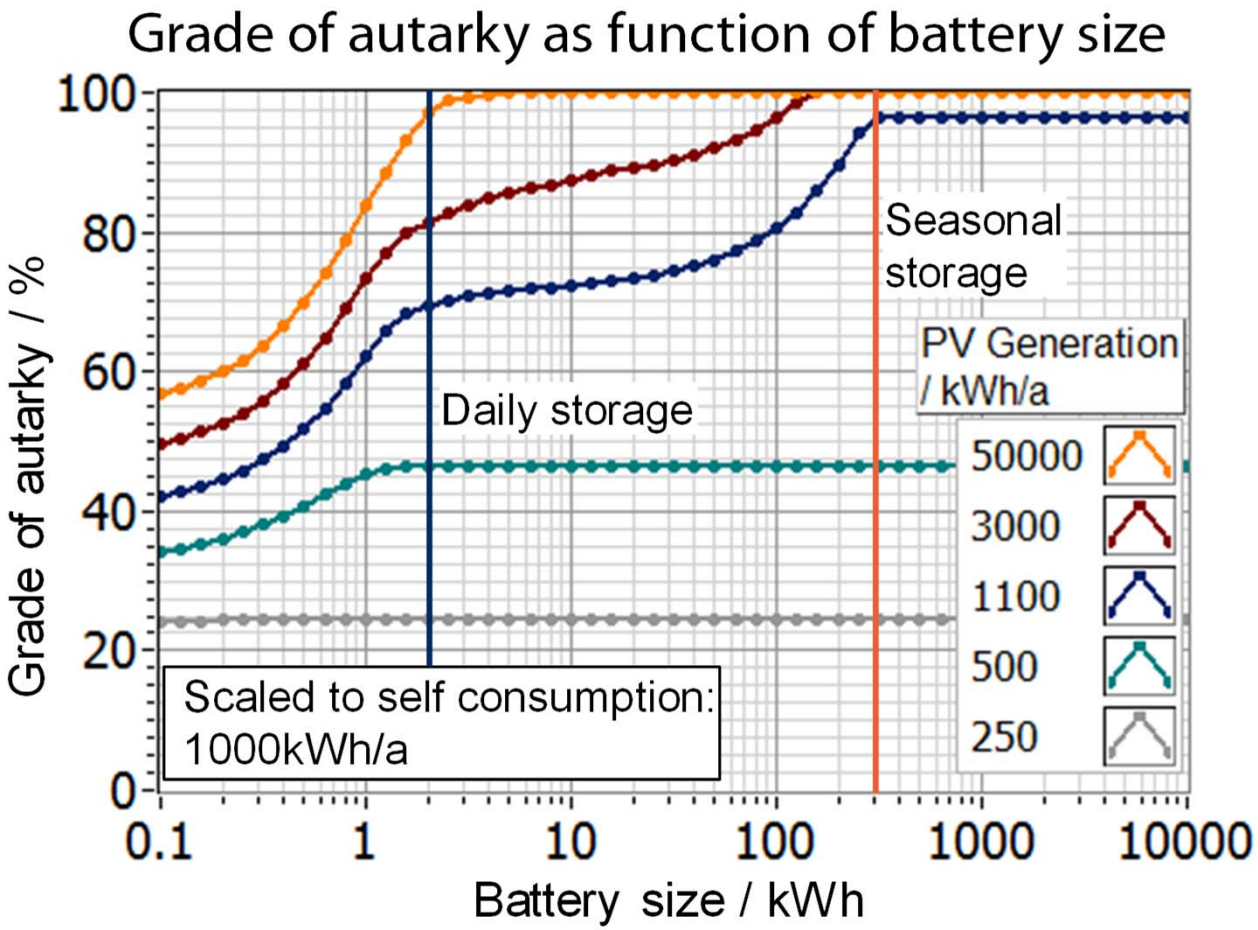
Topics

The aim: 100% usage of renewable energy

- Decentralized power generation
- Future grid structure
- Future grid control
- Efficiency

Decentralized power generation

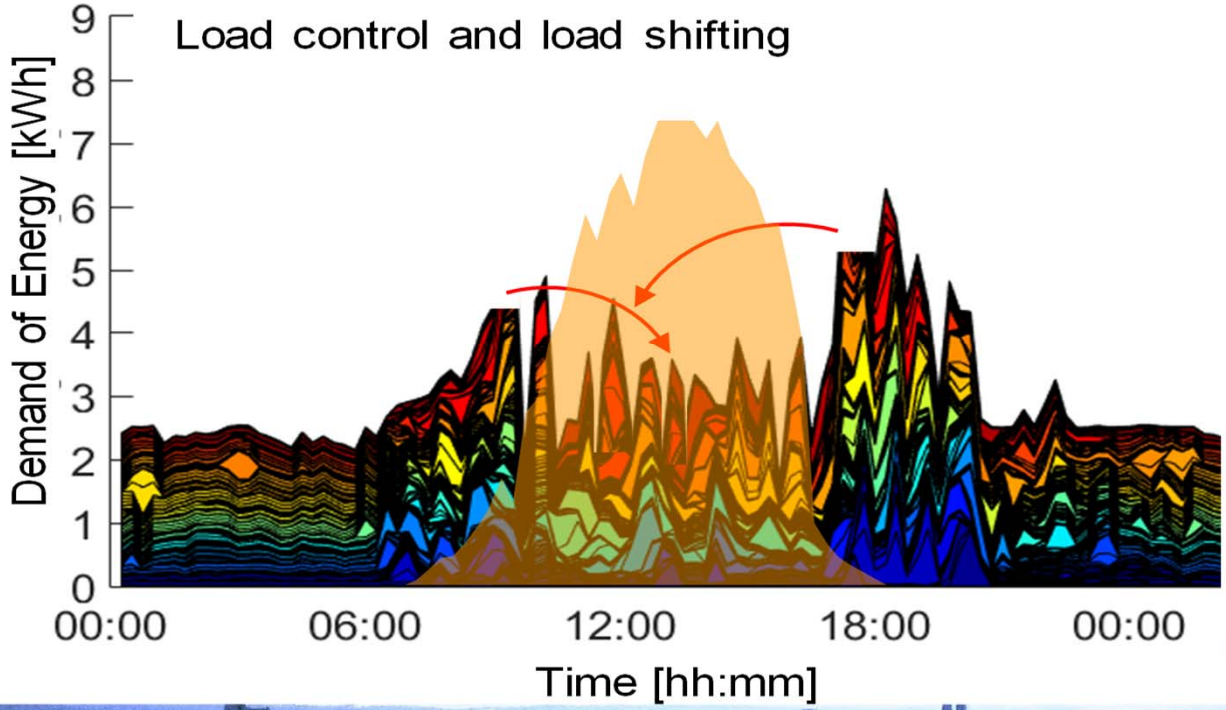
Batteries and Photovoltaics



- Daily storage only dependent on consumption: ~2 kWh battery for 1000 kWh/a annual consumption
- Full autarky only with
  - Seasonal storage or
  - Oversized PV system

Decentralized power generation

Photovoltaics and Diesel generators

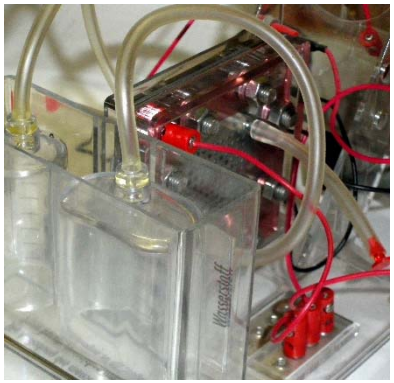


Simulation tool:

- Matlab-Simulink
- PV-Profiles
- Load Profiles
- Battery use
- Parametric variation
- Operation strategies
- Database (in work)

Decentralized power generation

Coupling of energy sectors



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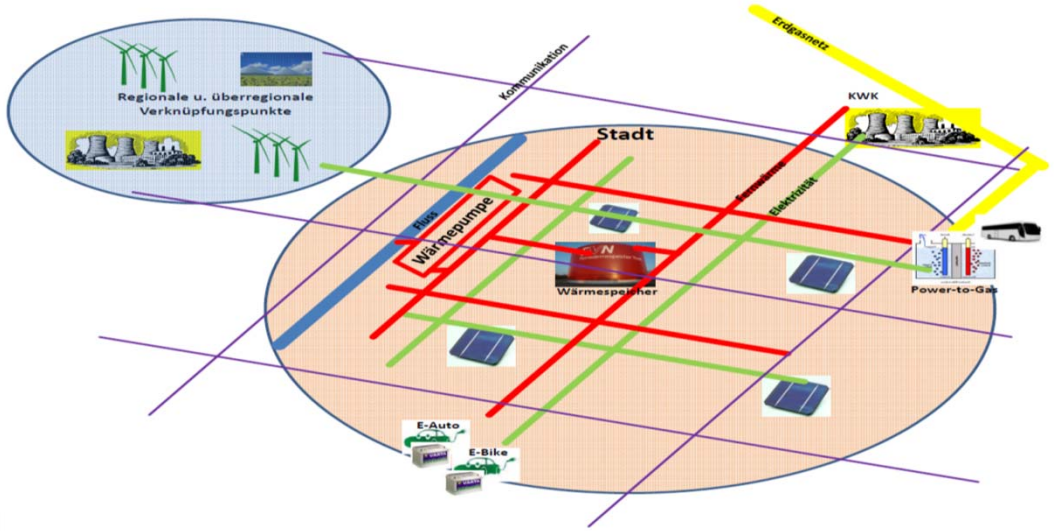
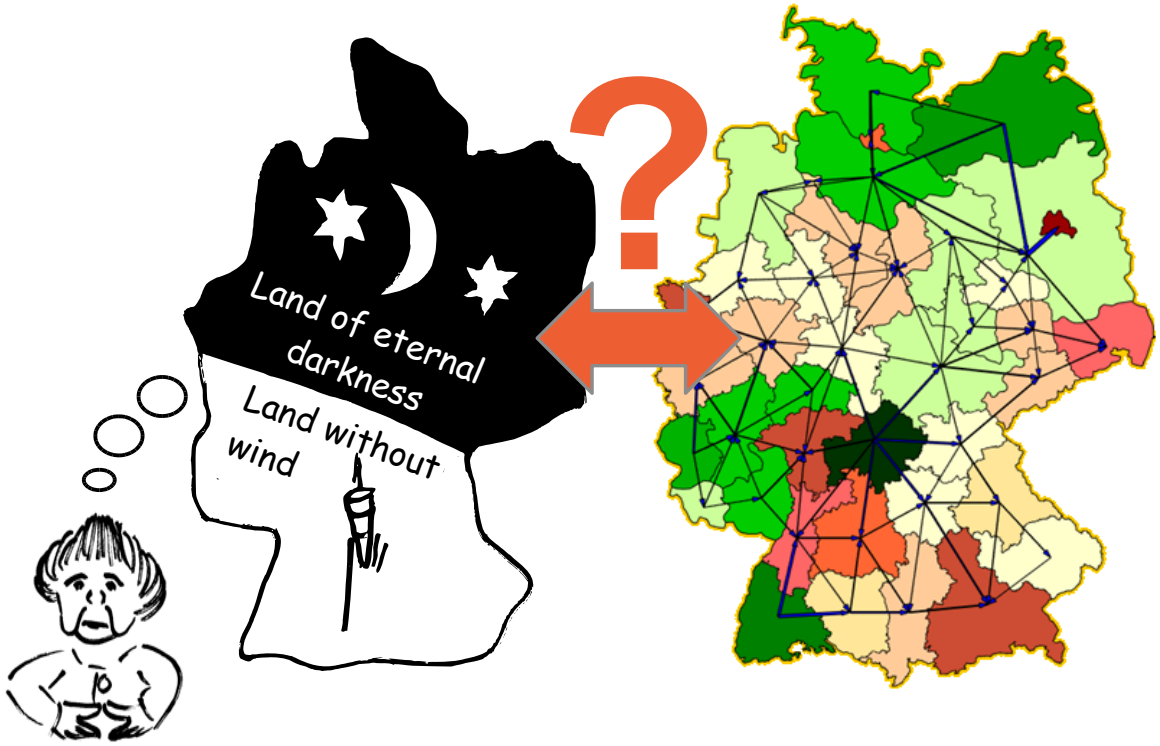


- Which size is reasonable?
- Which grid level is optimal?
- Considering financial and social aspects
- Use and development of open source media

Future grid structure

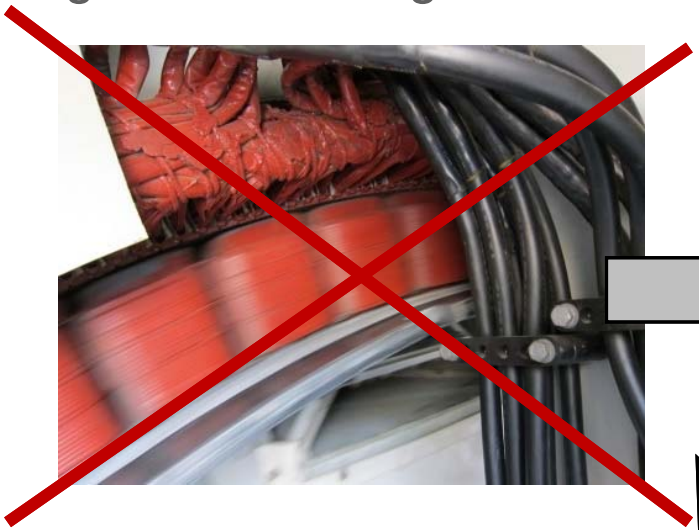


Celluar power grid:

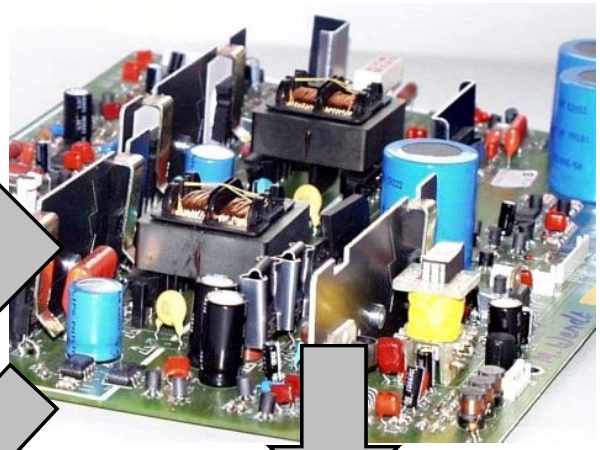
- Regionalized grid structure
- Decentralized power generation
- Calculation tool with regional data in 15 min resolution:
  - Generation and demand
  - Power flow

Future grid control

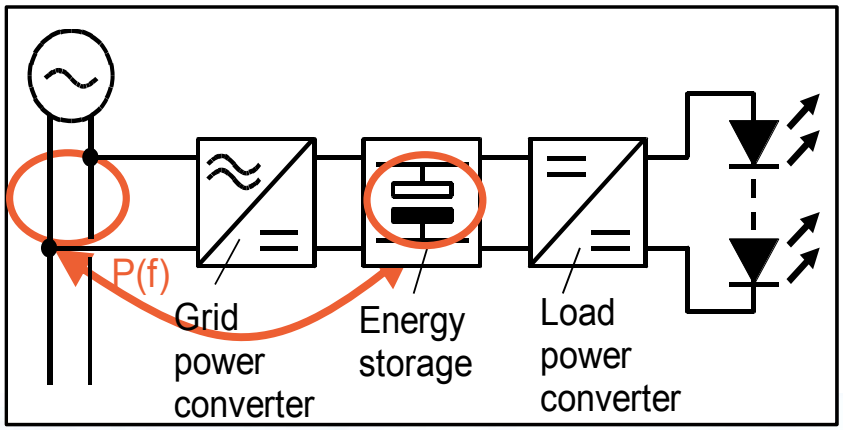
No longer real rotating masses



Feed in with power electronics



Virtual inertia with power supplies

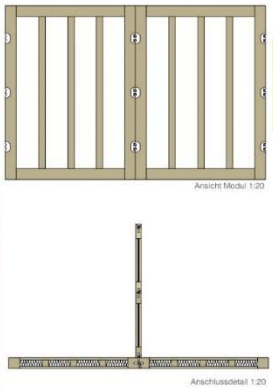


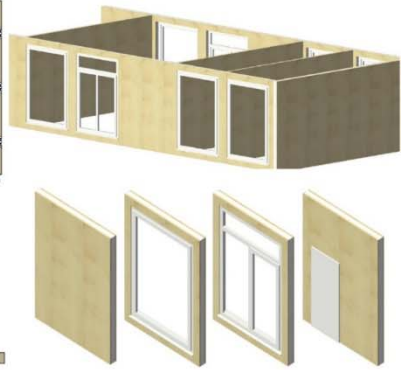
Primary Control with batteries

Efficiency: Sustainable living

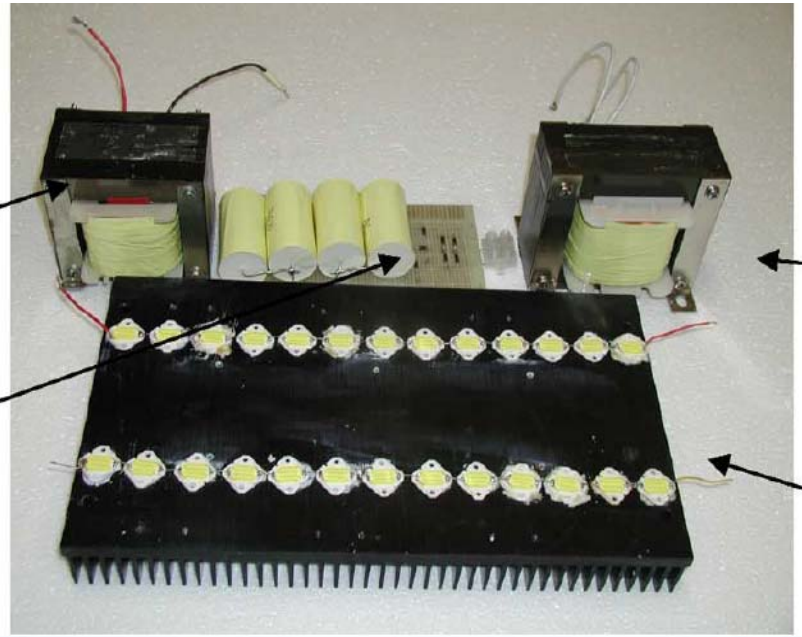
dreRaum – Project

- *Aim*:
  Re-Use of existing building infrastructure with sustainable materials:
  - Old industrial hall
- Interdisciplinar students project
- Involved faculties
  - Electric engineering
  - Mechanical engineering
  - Architecture
  - Business
  - Social science





Efficiency: LED lighting



- Own experience with LED drivers at Research Philips
- „Overseas Superviser“ in LED-Project with Hong-Kong-University
- *Besides others:* Very resilient passive LED driver for street lighting

⇨ No lightning damage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