

Energy management in an integrated residential area

Presented By: Thomas Walter, Easy Smart Grid GmbH

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LEC in Allensbach/Lake Constance (D) Objective: To Minimize Carbon Footprint



- 8 houses with 22 apartments (plus exist building, bottom left)
- High insulation standard (KfW 40)
- 14 PV plants (~80 kWp)
- 12 heat pumps
- 1 CHP
- Garage with up to 24 EV chargers
- Batteries optional (KfW 40+)
- Flexible household appliances (washing machines, dish-washers, dryers, fridges, freezers)
- ➔ Challenge: coordinate ~100 actors



Challenge: Coordination of LEC participants Key Options and their Properties

Coordination method	Small quarter: 100 actors	Small city: 10.000 actors
Central optimizer (MILP solver)	Conceivable but requires full appliance control	Impossible (complexity of computation)
Peer to peer trading	Up to 5.000 relations/contracts to be negotiated/maintained	Up to 500.000.000 relations/ contracts
Cascaded EMS Home/Quarter/City	Possible but synergies in quarter will hardly be exploited	Possible but synergies in quarter/city hardly exploited
Dynamic local tariff (components)	Synergies in quarter fully used, cascading down to home possible	Synergies in quarter and city fully used (cascading)





SoLAR: Shift Heat pump and CHP operation to match Demand and Supply









Project SoLAR: Increased Self-Consumption Creates €€ Added Value for LEC









Dynamic Tariffs bring Substantial Benefits They can be derived Locally and in Real Time



- ✓ All flexibility can be used as "virtual batteries": any number, any power, any duration, any availability
- Huge potential of low-cost "virtual battery" storage as heating and mobility sectors are de-carbonized
- ✓ Simple contracts without bidding or penalties
- Low bandwidth, unidirectional broadcast is simple to implement and also ensures data privacy
- ✓ Increase resilience against failures and attacks
- ✓ Prices derived by fair and transparent mechanism







Dynamic Energy Tariffs Made Simple by Real Time tracking of Local Balance Price



Balance Indicator (BI) for energy price is derived from power balance (coupled) or frequency (isolated LEC) Note: Price derivation and reaction method is protected by European and US Patents for Easy Smart Grid GmbH



Thank you for your interest!

Project page: https://solarlago.de/solar-allensbach/

Presenter: Thomas Walter, Easy Smart Grid GmbH, thomas.walter@easysg.de









