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PROSUMAGER IMPACT ON ELECTRICITY LOAD PROFILES: A MODEL COMPARISON

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- Motivation
- Modeling approaches
 - Invert/FLEX
 - PRIMES-Prosumager
- Modeling assumptions
- Results
- Conclusion

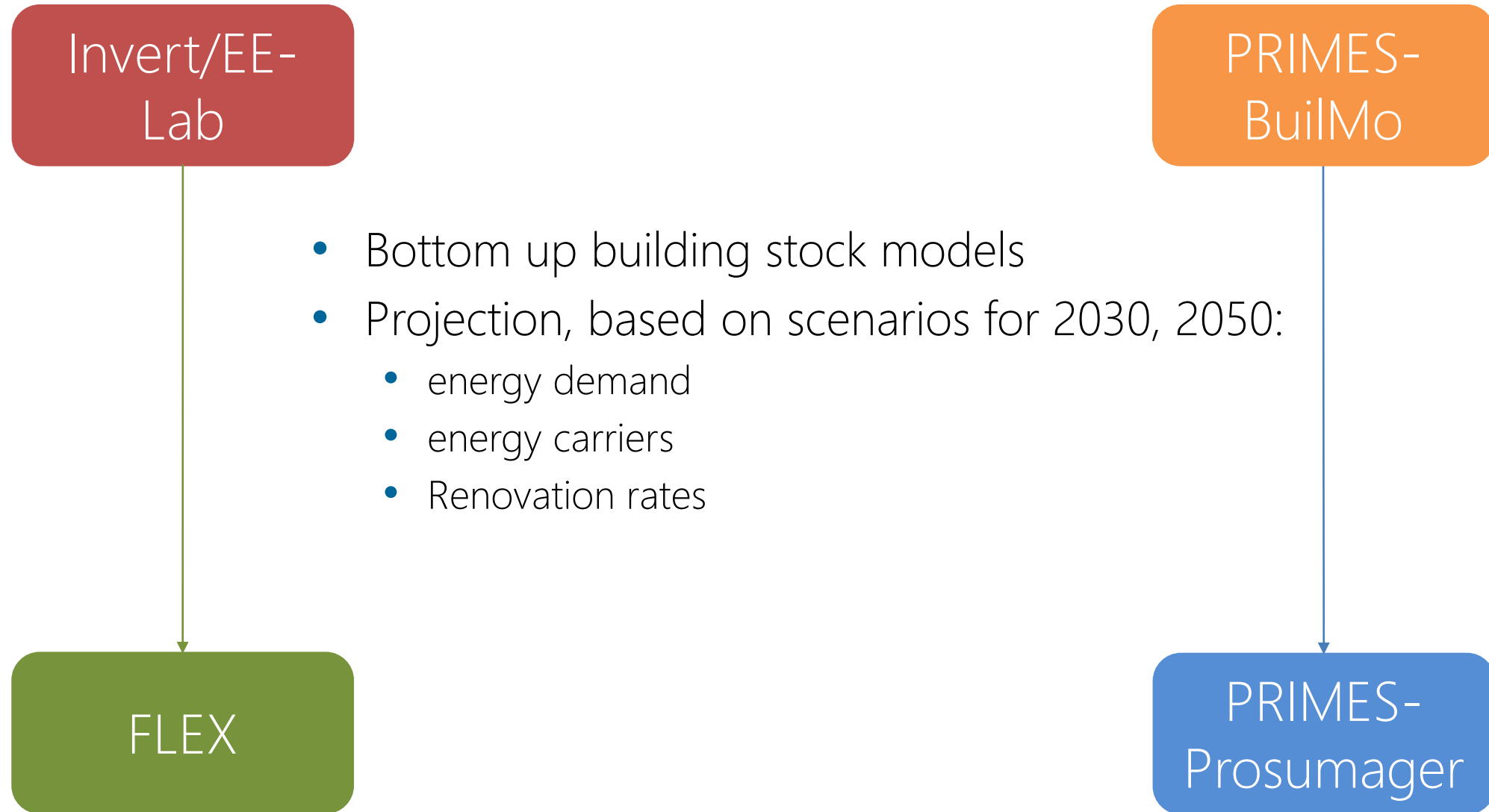
What role could prosumagers play in the energy transition through the provision of flexibility?

How do different approaches in modeling them affect the outcome?

- Prosumager – consumes, produces and manages electricity consumption
 - Minimizes costs
 - Electrified heating systems
 - Participates in the day ahead electricity market
 - Shifts demand



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Models

Invert/FLEX:

Invert projects building stock development until 2050 (monthly, yearly)



FLEX optimizes prosumer behavior on hourly resolution (8760)

Objective:

$$\min \text{Cost} = \sum_{t=1}^{8760} EP_t \times EC_{grid,t} - FiT \times ES_{pv2grid,t}$$

PRIMES-Prosumer:

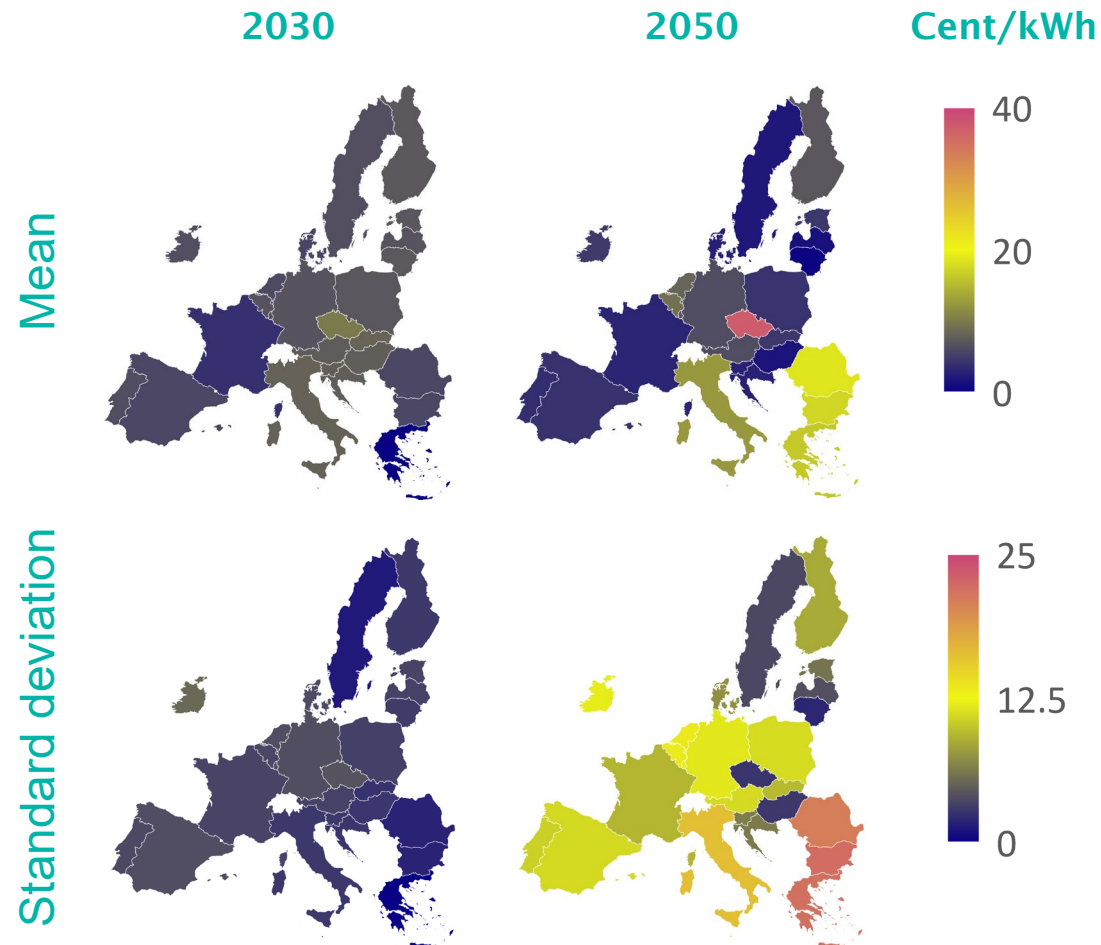
Simultaneous optimization projecting building stock and prosumer behavior until 2050 (typical days, hours)

Objective:

$$\min \sum_t c_t^{int} \cdot (C_t^{Ren} + C_t^{Eq,Cap} + C_t^{PV,Cap} + C_t^{BESS,Cap} + C_t^{Eq,OM} + C_t^{PV,OM} + C_t^{Fuel} + C_t^{ELC} + V_t^{EE}) + \Pi_t$$

Modeling assumptions - scenarios

Electricity price

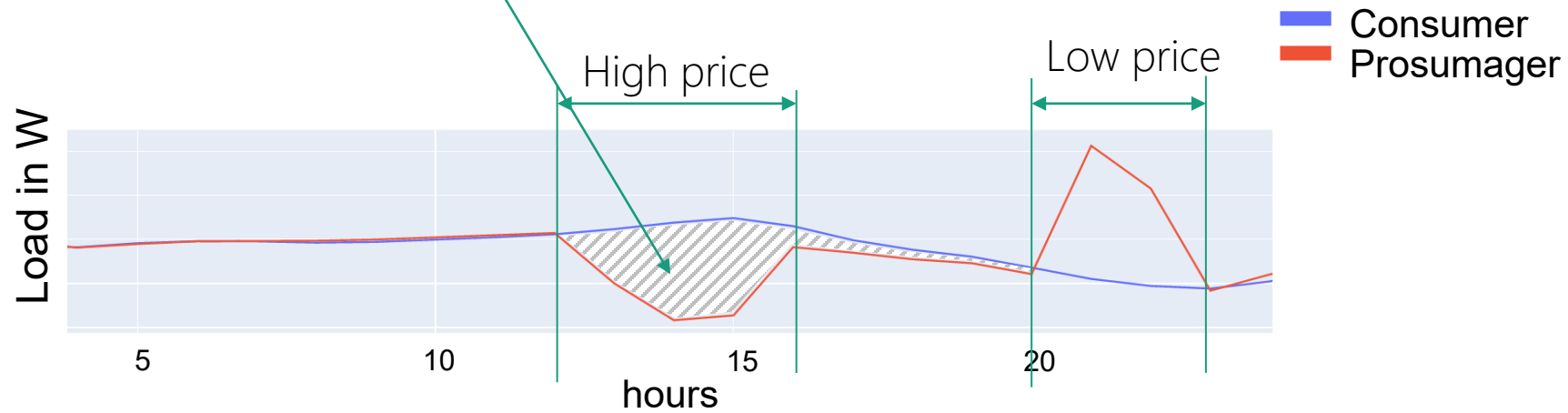


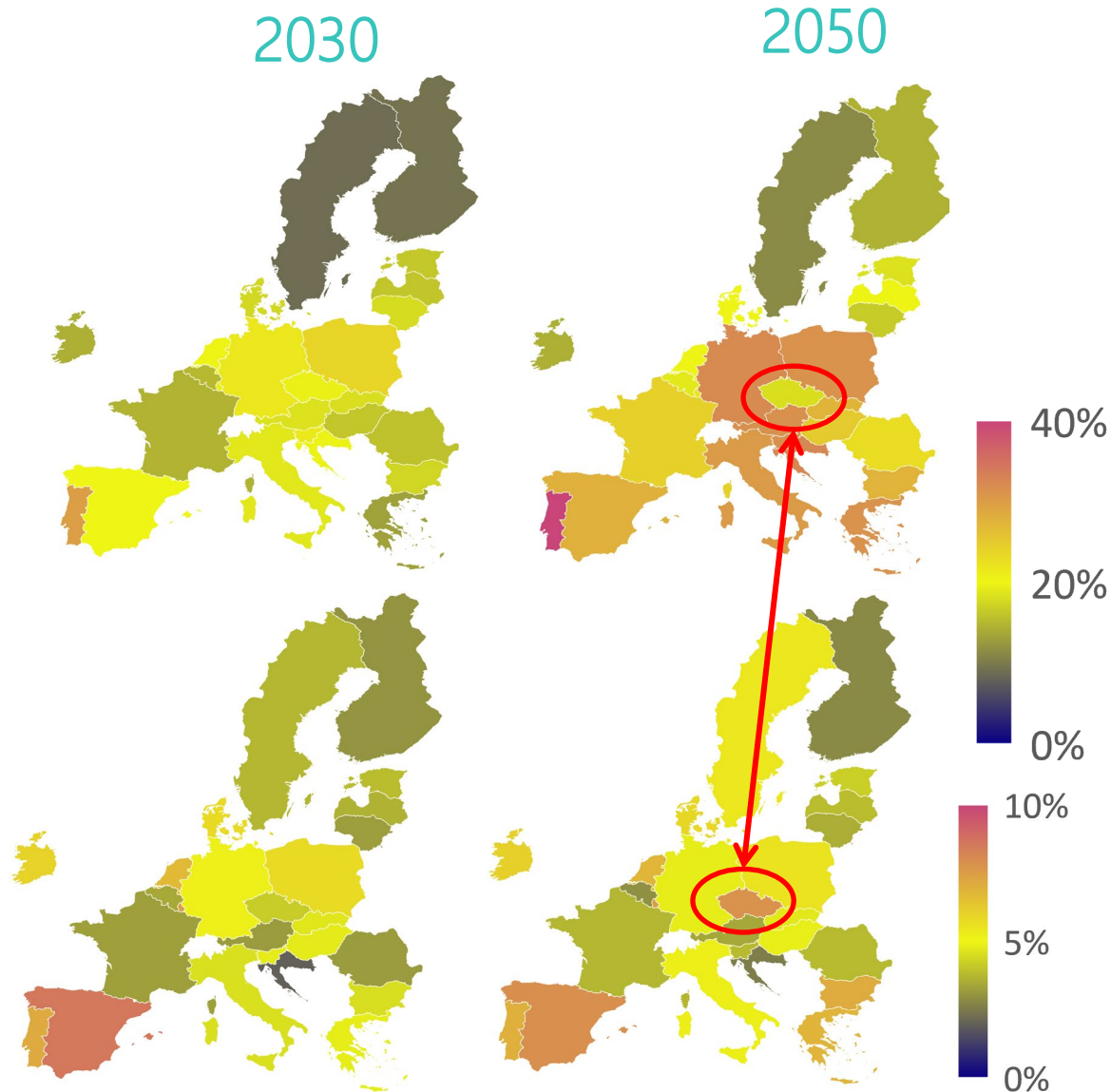
- Decarbonization until 2050
- No feed in tariff
- FLEX: future storage penetration is the same in all countries

Result Indicators

- Load shifting

$$P_{shifted} = \frac{\sum \int P_{consumer,t} - P_{prosumer,t} dt}{\sum \int P_{consumer,t} dt} \quad \text{if } P_{consumer,t} > P_{prosumer,t}$$





Major influence factors

- FLEX:
 - Volatility of price
 - Amount of installed storages
 - Thermal mass and heating system (direct electric \leftrightarrow heat pump)
 - PV installations
- PRIMES-Prosumager
 - Absolute electricity price
 - PV installations
 - Battery storage

Conclusion

- Potential for load shifting is high
- Two-stage approach (FLEX) in modeling prosumagers:
 - Good behavior/electricity demand representation
 - Bad/no impact on investment decisions
 - Volatility of electricity price has the highest impact
- optimization of investment and operation for prosumagers:
 - Good estimation of impact on investment behavior
 - Bad behavior/electricity consumption representation
 - Average electricity price has the highest impact
- Next steps:
 - Analyze prosumaging's impact on the distribution network and the overall electricity system

Thank you for your attention!

Philipp Mascherbauer