

Crossdisciplinary Modeling for the Design of Energy Supply Systems: TREES

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Motivation

- Current energy system models focus on technical and economic aspects
- Influence of social and regulatory aspects neglected
- Long lifetimes, degrees of freedom and uncertainties often hinder common system understanding
- Increased risk of project failure [1,2]
- Few sociotechnical models demonstrated for specific cases [3]

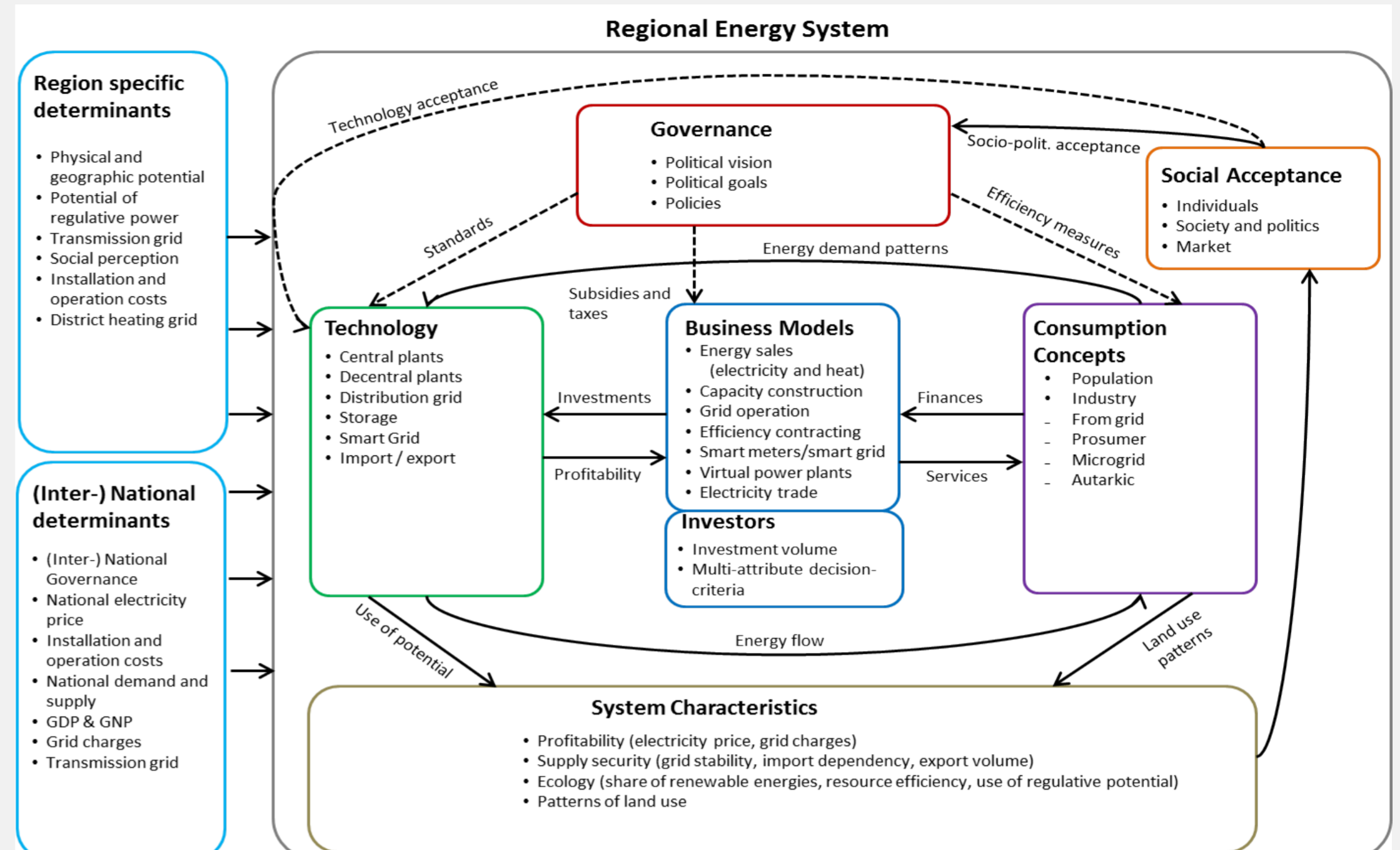


Figure 1. System variables and boundaries of the Transition of Regional Energy Systems model TREES.

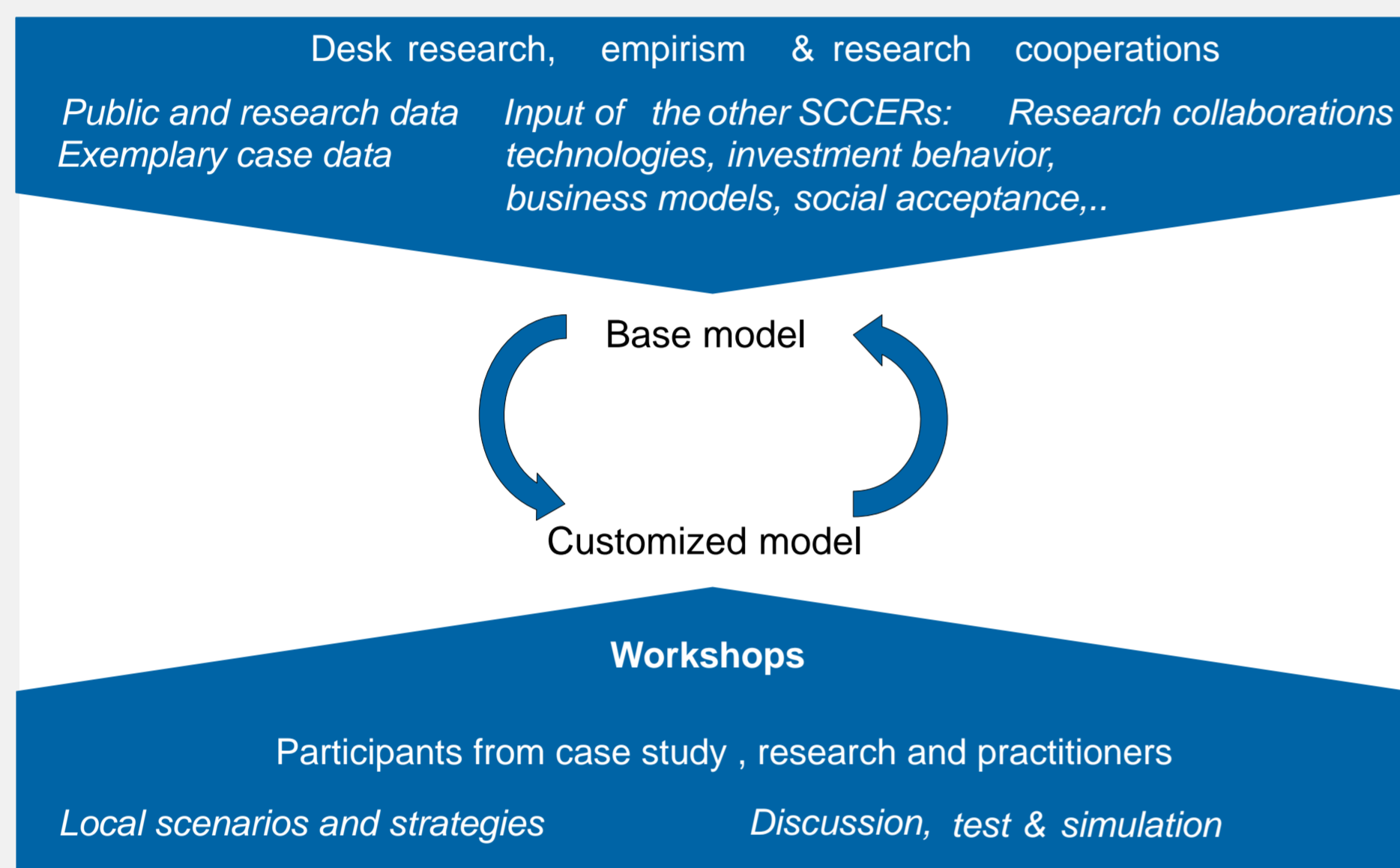
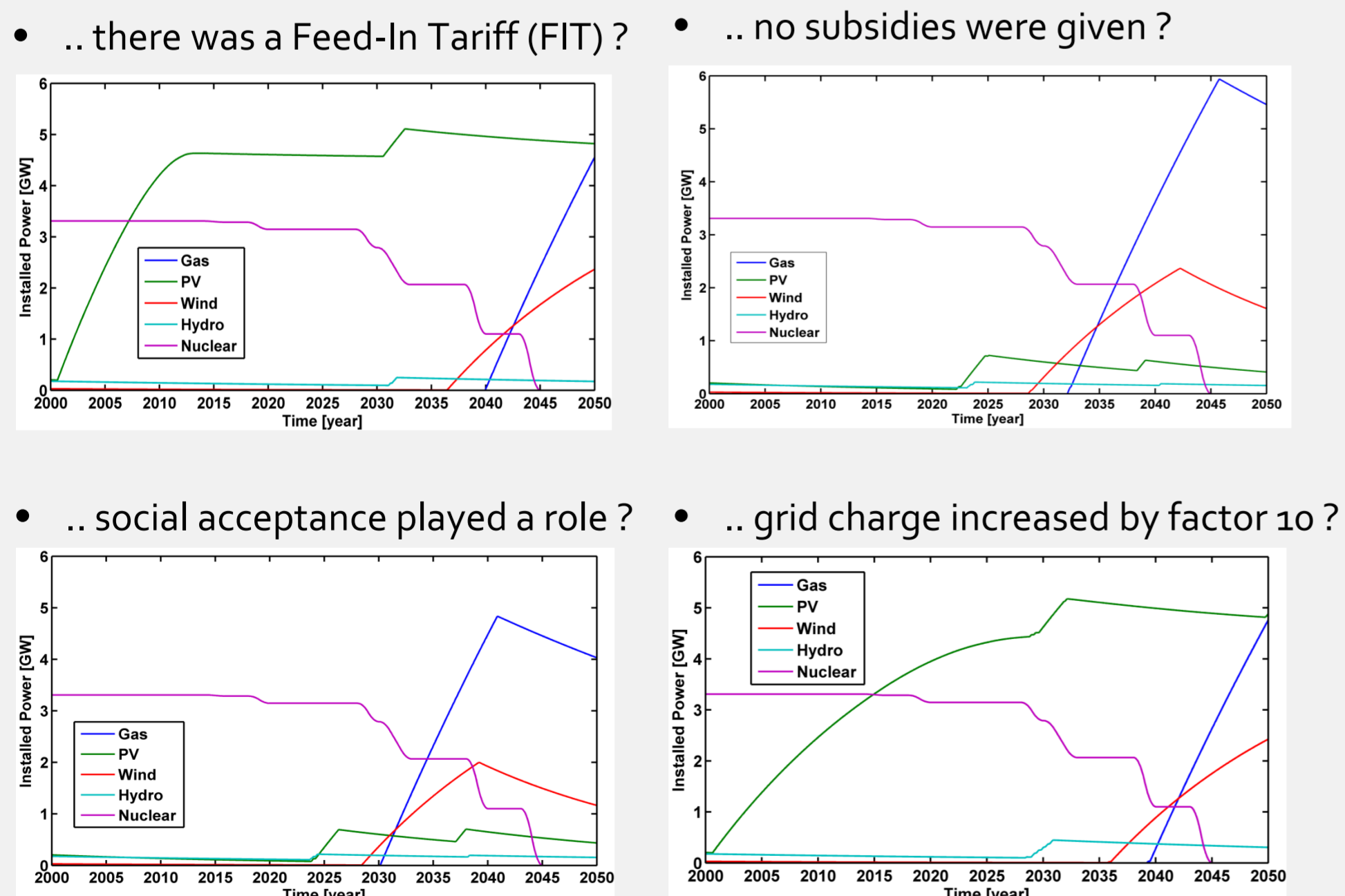


Figure 2. Participative customization process of TREES.

Examples: What, if...

- Four basic scenarios for the Swiss electricity system from 2000-2050
- Oppositions and delay effects reduce wind power by 28%, gas by 26%
- High grid charge effect similar to FIT



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Approach

- Crossdisciplinary energy system model
- System Dynamics simulation platform
- Base model: Data from research cooperations and public sources, interviews, own models
- Customization via participative workshops
- Involvement and coordination of relevant actors at an early stage of project

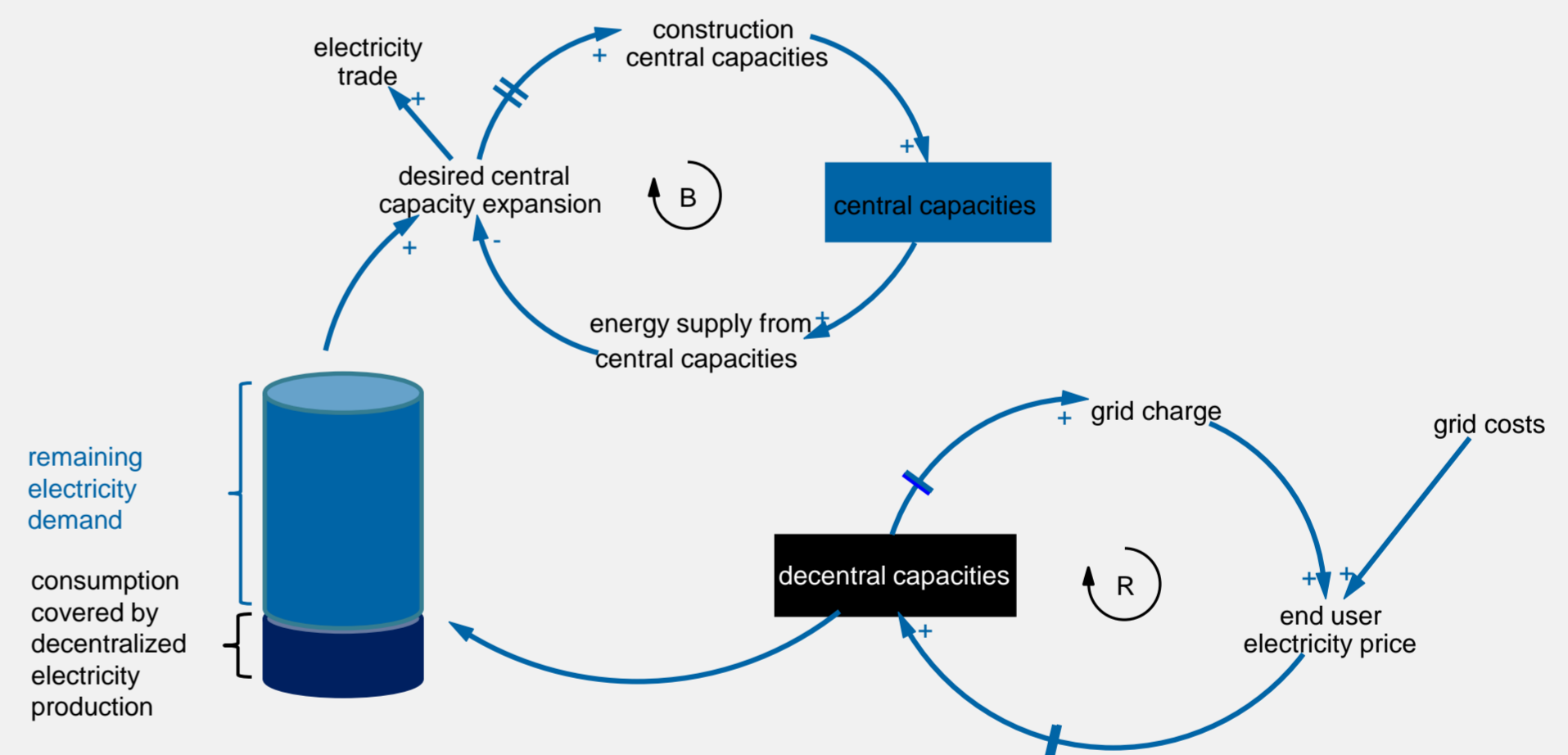


Figure 3. Exemplary model structure: Dynamic interactions of the decentralization of the energy system.

Discussion

- First crossdisciplinary modelling platform for the design of energy supply systems
- Delay effects and socio-economic factors relevant to project success
- First social models developed
- Further data and models required

References

- [1] Federal Office of Energy, Delays of projects for current production from renewable energies [German], Bern, Switzerland, Aug. 2013.
- [2] Huijts, N.M.A., Sustainable energy technology acceptance: A psychological perspective, PhD Thesis, Delft University of Technology, Netherlands, 2013.
- [3] Keith, D.R., Understanding spatiotemporal patterns of hybrid-electric vehicle adoption in the United States, working paper, MIT, Boston, USA, 2012.