- Use PowerTAC and integrate it with a domain-specific simulator
- Provide high usability (for “normal” human users)
- Create a mixed-initiative system

It will be evaluated on use cases for training, analysis, and design. Its architecture will comprise a platform development / simulator made up of PowerTAC and other frameworks, a learning user interface agent, a preference elicitation tool (for single user preferences, such as “one is on holiday and won’t need the energy and may thus provide it to its neighbor, who might need it for an EV”), and a scoping process. It would be useful in industry as training for traders, i. e., suppliers and aggregators, and as a micro-grid for energy cooperatives and local suppliers.

The open research questions are

- How to setup such an energy-cooperative?
  - how to align economic incentives?
  - how to setup a coordination scheme?
  - which communication mechanisms are needed?
- Is there a necessity for an infrastructure change, when we introduce energy cooperatives with agent-based control? (in terms of a “parallel network”)
- How to build up agent-based cooperative business models for service-oriented providers? (in relation to getting them started)
- How to design, develop, and apply a decision support tool?

4.4 Working Group 4: Resource Efficient Scheduling, Optimization, and Control

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Joint work of Christian Derksen, Ryszard Kowalczyk, Lars Mönch, Konstantina Valogianni, Eric van Heck, and Minjie Zhang

Utilizing resources efficiently requires different kinds of decisions to be made. These are shown in the Figures 2 and 3.

For agent-based distributed hierarchical decision making in future energy micro-grids, the group identified the following research questions:

1. How to balance supply-and-demand at different scales (e. g., planning vs. control)?
2. What are the decision making entities in different schemes? (e. g., local vs. global and makers vs. accountability)
3. What are the decision criteria? Global: cost/efficiency, QoS, $CO2$ . . . Local: min cost (energy, depreciation), satisfy needs (supply guarantee), . . .
4. How to align, via feedback and feed forward loops, capacity creation and utilization?
5. How to support/enable/facilitate the alignment (feedback and dynamic trade-offs/priorities) between the concerns of physical + economical + environmental + convenience/flexibility + regulatory . . . E.g., different objective functions and different constraints; minimum cost vs. maximum QoS; minimum cost + user flexibility as constraints

Decision Models

	Fully centralized	Mixed a	Mixed b	Fully decentralized
Decision	central	decentral	central	decentral
Objective function	central	decentral	central	decentral
Constraints	central	central	decentral	decent

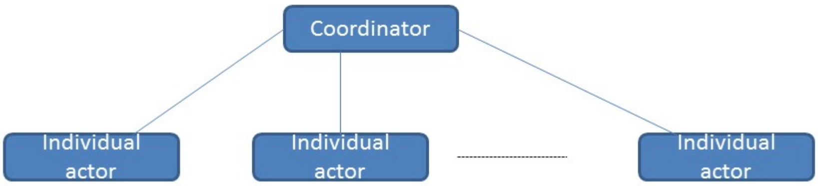

Figure 2 Decision models.

Type of Decisions

Actor	Regulators /policy makers	Suppliers	Network owners	Consumers
Capacity creation				
Capacity utilization				

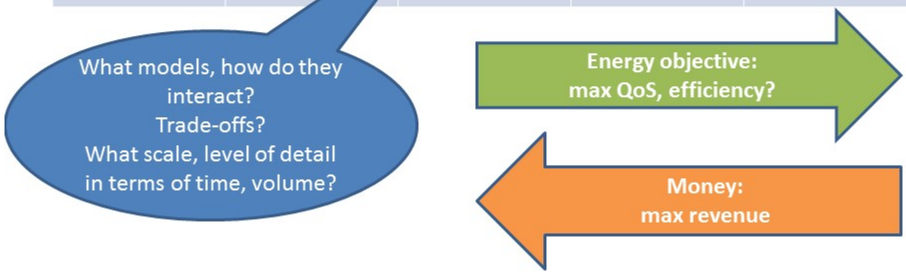

Figure 3 Type of decisions.