Improvement of model-based energy systems analysis through model comparison and speed-up

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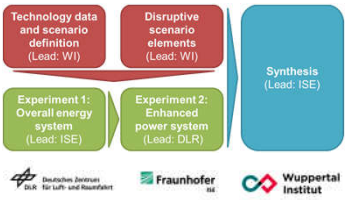
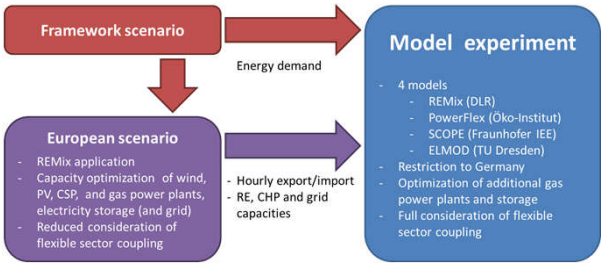
Model experiment on comparative modelling of Germany's electricity supply (*RegMex* project) [1]

Scope

- Definition of a standardized scenario framework
- Development of templates for increasing comparability of models and data
- Implementation of the model experiments and derivation of robust conclusions



Methodology



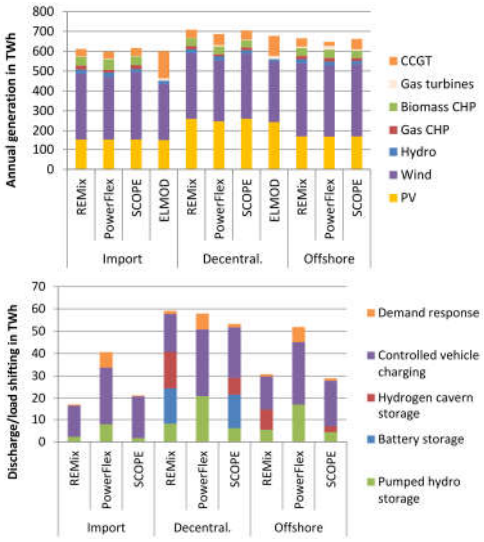
- Analysis of the demand for flexibility options and their operation
- Focus: Power sector with links to heat and transport
- Hourly optimization for Germany in 2050
- Comprehensive harmonization of model input data
- Evaluation of three scenarios differing in supply and grid structure
- Detailed elaboration of the model differences

Results

- Considered scenarios allow detailed evaluation of load balancing
- Robustness with regard to the aggregated use of controllable power plants and the sum of the other temporal load balancing
- High impact of cogeneration and electric vehicle modelling on operation
- Back-up demand overestimated without endogenous optimization
- Separate dimensioning of charging, discharging and storage unit advantageous

Conclusions and outlook

- Implementing a model experiment poses many challenges
- Identical parameterization reduces the differences in the results
- Deviations can be traced back relatively well to model differences
- Effects of individual differences cannot be quantified by approach
- Follow-up project with extended analysis to start soon

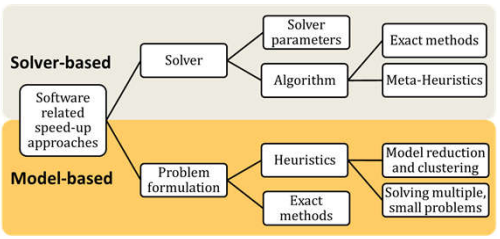


Comparison of annual power generation (above) and temporal balancing (below) in the three scenarios

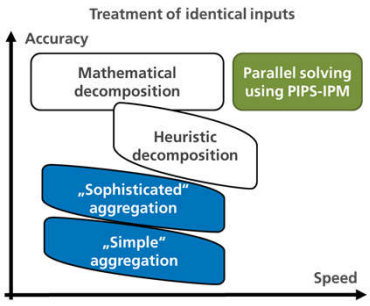
Methods to improve computing times in linear optimization energy system models (*BEAM-ME* project) [2]

Scope

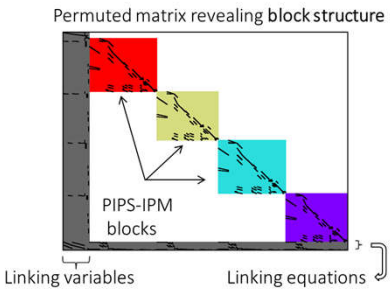
- Reduction of LP model solution time
- Evaluation of model-based and solver-based approaches
- Implementation of selected approaches into REMix
- Assessment of the transferability to six other models
- Publication of best-practice strategies



Results and ongoing work



- Most promising model-based strategies so far
  - "Smart treatment" of temporal scale
  - Heuristics that allow for parallelization
- Enhancement of the open-source LP solver PIPS-IPM
- Identification of relevant problem block structures
- Model application on high performance computers
- Systematic analysis of scaling and parallel speed-up



References:
[1] Lechtenböhmer, S., Palzer, A., Pregger, T., Gils, H.C., Sterchele, P., et al. „RegMex - Modellexperimente und -vergleiche zur Simulation von Wegen zu einer vollständig regenerativen Energieversorgung : Schlussbericht"
[2] www.beam-me-projekt.de

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Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag