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# An Advanced Optimization-Based Bidding Method for District Heating Providers Considering Uncertainty and Block Bids

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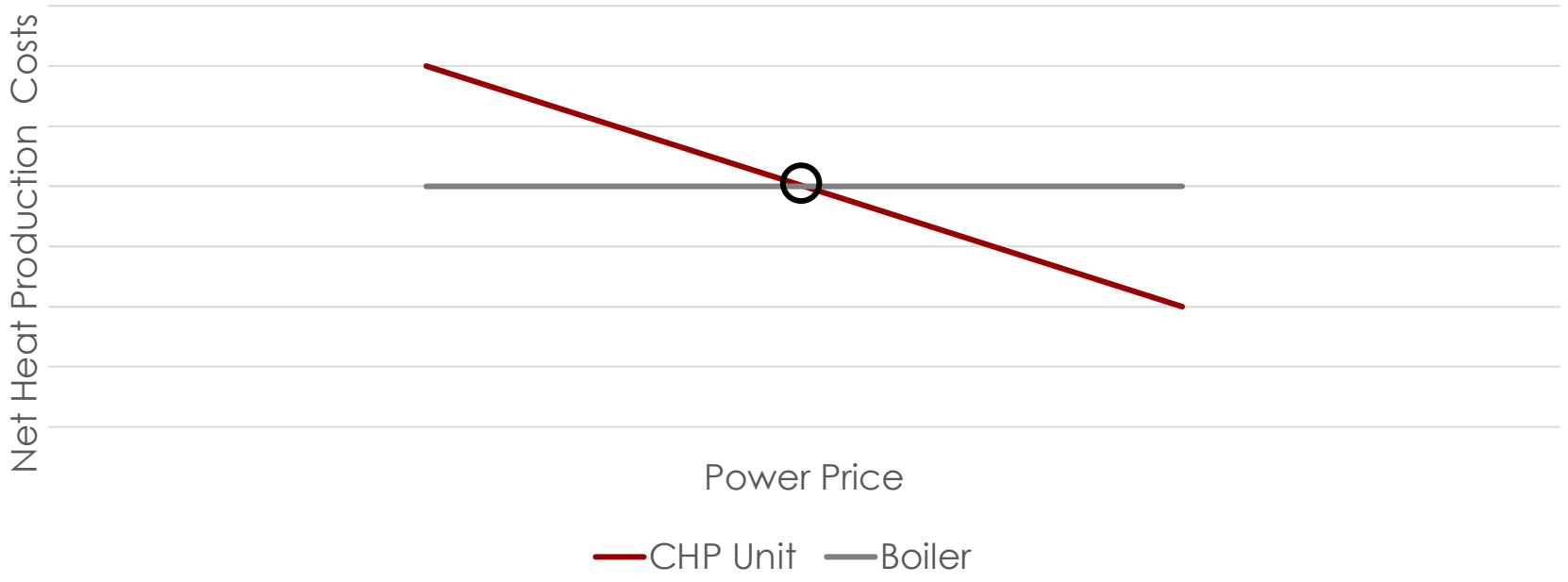
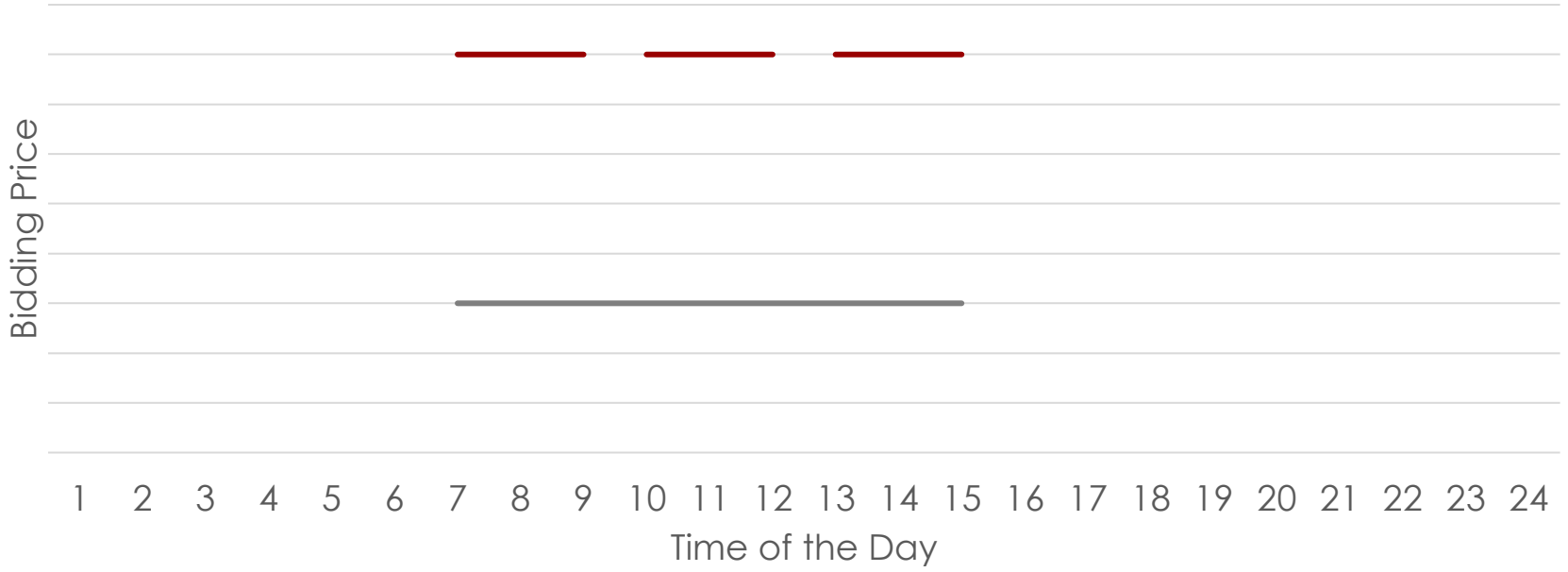
Based on Blanco et al. 2019 and Blanco et al. 2018

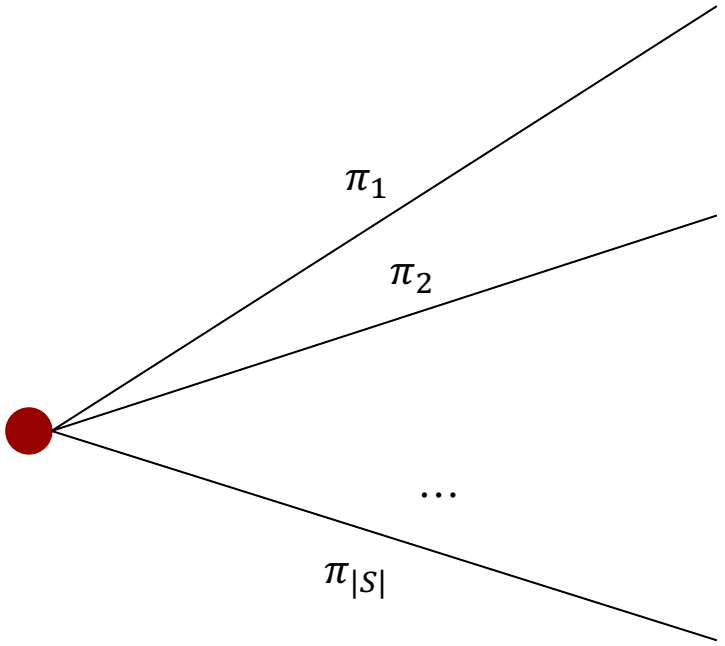
# The fuel switching power price provides a reasonable bidding price in the absence of startup costs.



# Startup costs and block bids lead to a combinatorial problem.



# Mathematical formulation: cost minimization in a stochastic mixed-integer program under uncertain power prices.



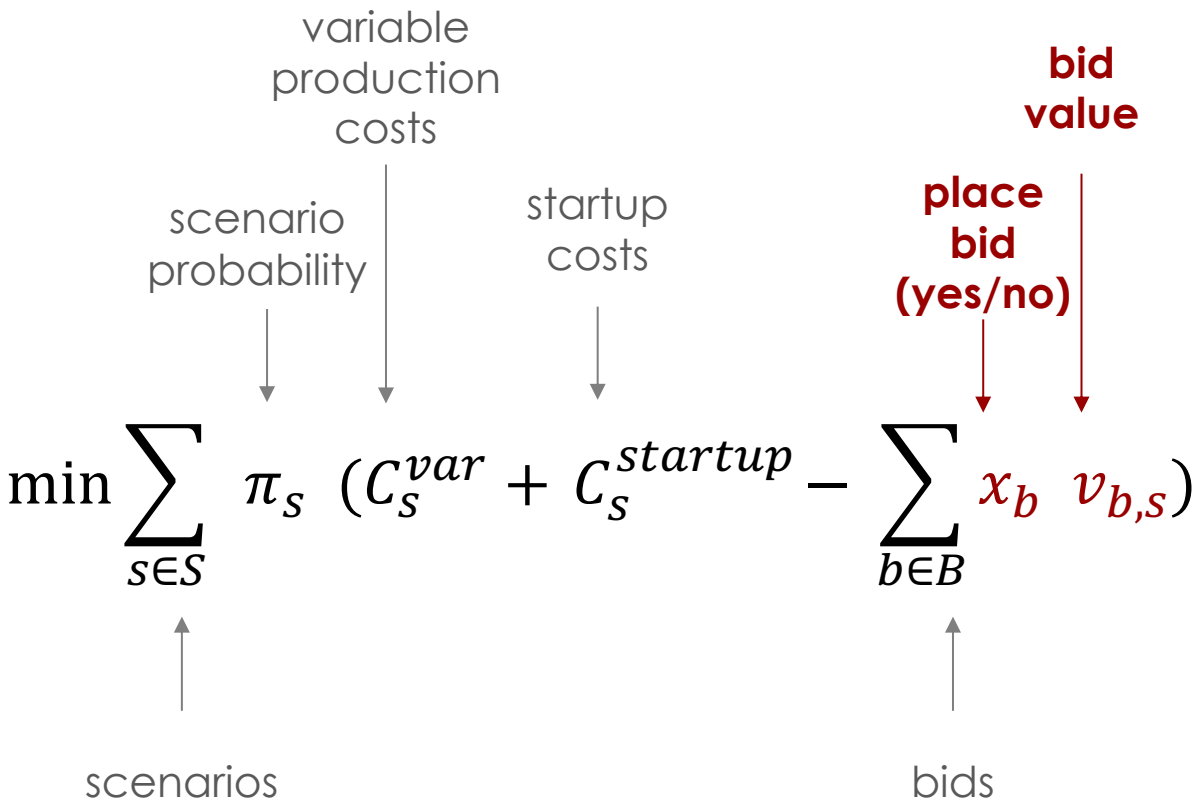

Noon, day 1:

Place day-ahead bids

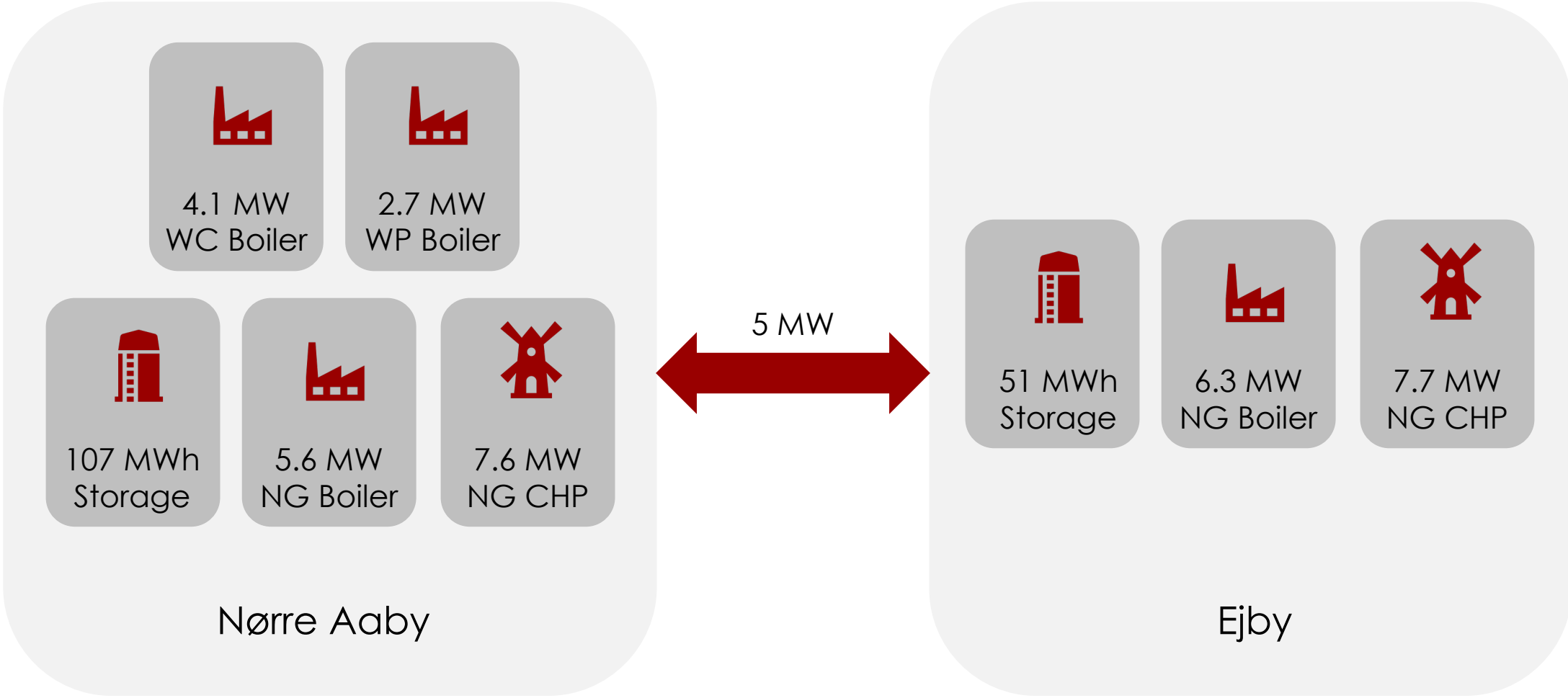
Midnight, day 2:

Dispatch depending on power delivery obligations

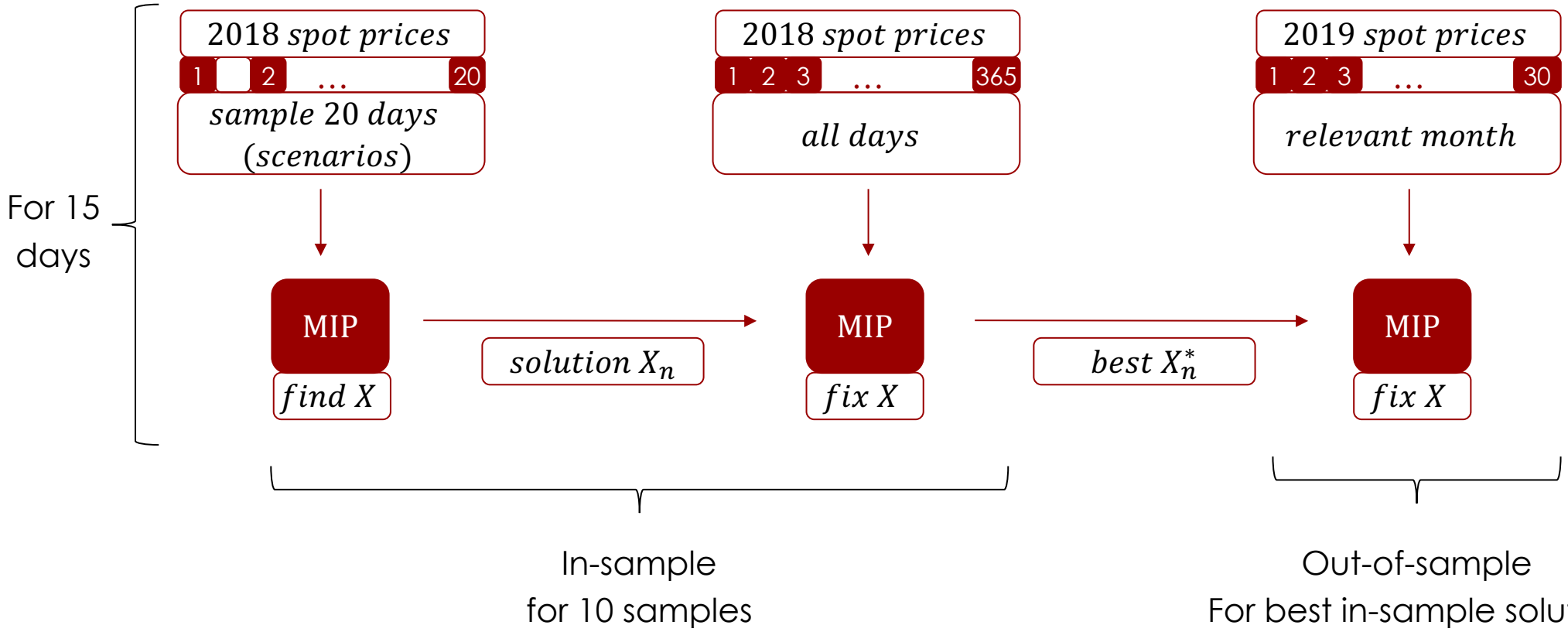
# Mathematical formulation: cost minimization in a stochastic mixed-integer program under uncertain power prices.



# Case Study: Middelfart Fjernvarme



# Solutions are generated for 2018 spot prices and evaluated on the first week of April, July and December 2019.



# Preliminary results suggest senseful bidding behavior, which we aim to make more aggressive in the future.

| | hours bid | accepted in-solution | accepted out-of-sample | bidding price [DKK/MWh] |
|---|---|---|---|---|
| April | 20 | 35% | 17% | 353.9 |
| July | 19.6 | 32% | 6% | 378.9 |
| December | 19.8 | 55% | 35% | 294.0 |
| Mean | 19.8 | 41% | 19% | 342.3 |

*average number of hours for which a bid is placed*

*number of in-sample scenarios, in which bid is accepted divided by total number of in-sample scenarios*

*number of out-of-sample evaluations, in which bid is accepted divided by total number of out-of-sample evaluations*

*average bidding price, weighted by bid length in hours*

# Future work includes the integration of additional technologies and markets and alternative solution methods for bigger networks.

More Technologies

e.g. heat pumps and solar thermal

More Markets

e.g. balancing markets

More Testing

Networks of higher complexity and alternative solution methods