

The Electricity Market Model EMMA

Numerical partial-equilibrium model of the European interconnected power market



Objective: minimize system costs

- Capital costs
- Fuel and CO2 costs
- Fixed and variable O&M costs
- ... of power plants, storage, interconnectors

Decision variables

- Hourly dispatch
- Yearly investment
- ... of plants, storage, interco's

Constraints

- Energy balance
- Capacity constraints
- Volume constraints of storage
- Balancing reserve requirement
- CHP generation
- (No unit commitment, no load flow)

Resolution

- Temporal: hours
- Spatial: bidding areas (countries)
- Technologies: eleven plant types

Input data

- Wind, solar and load data of the same year
- Existing plant stack

Equilibrium

- Short-/mid-/long-term model (= dispatch / capacity expansion / greenfield)
- Equilibrium ("one year") rather than a transition path ("up to 2030")

Economic assumptions

- Price-inelastic demand
- No market power
- Carbon price

Implementation

- Linear program
- GAMS / cplex

Applications

- Four peer-reviewer articles
- Various consulting projects
- Copenhagen Economics

Open source