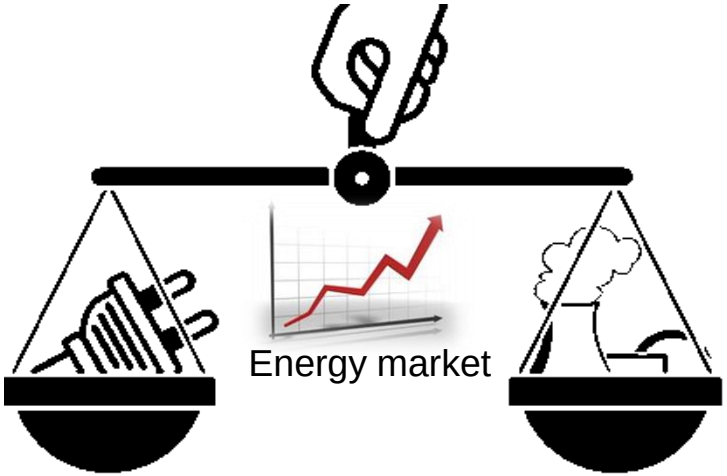
Yong Ding <ding@teco.edu>

DISTRIBUTED AUTONOMOUS CONTROL SYSTEMS FOR DECENTRALIZED ENERGY MARKETS

Motivation

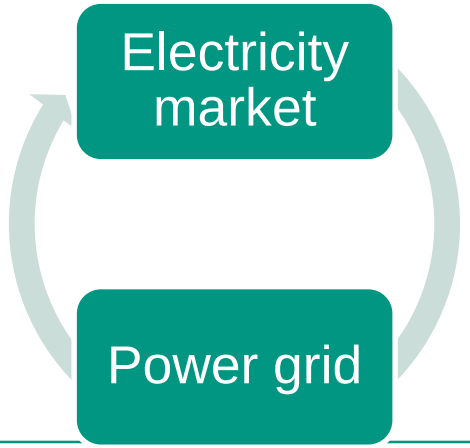
- ***Key task*** of the energy market
  - A continuous balance between production & consumption



- Focus on: ***electricity market***
  - Electricity storage inefficient
  - Demand price-insensitive

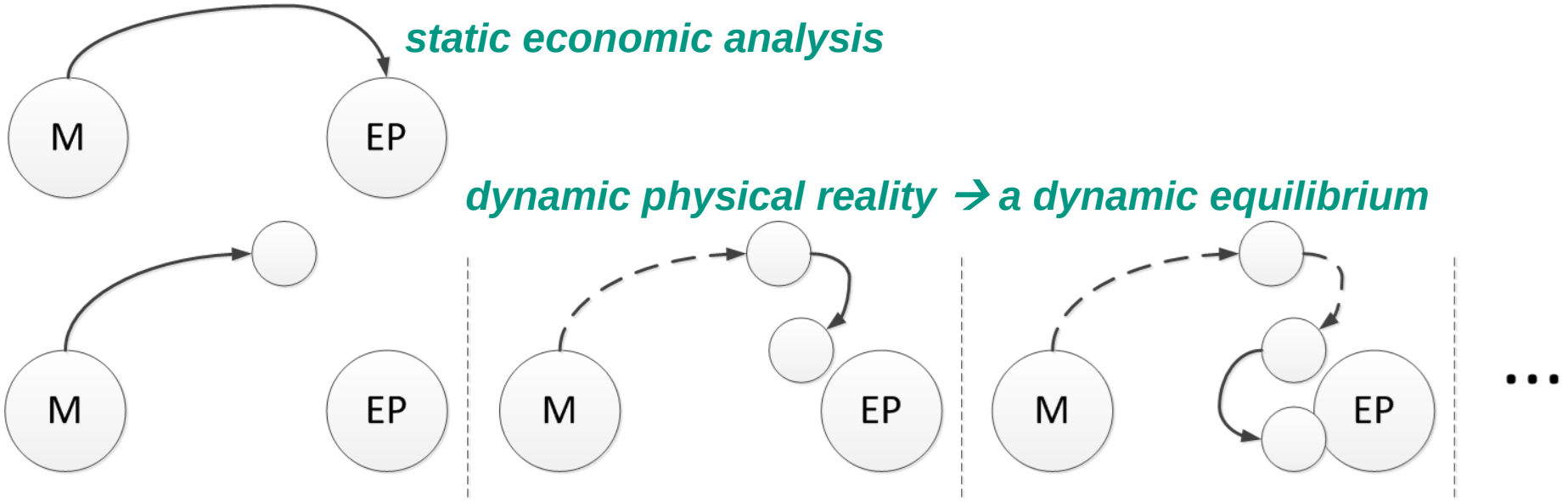
⇨ ***high volatility & increase on short notice***

- Need ***new market model*** to capture ***future grid***



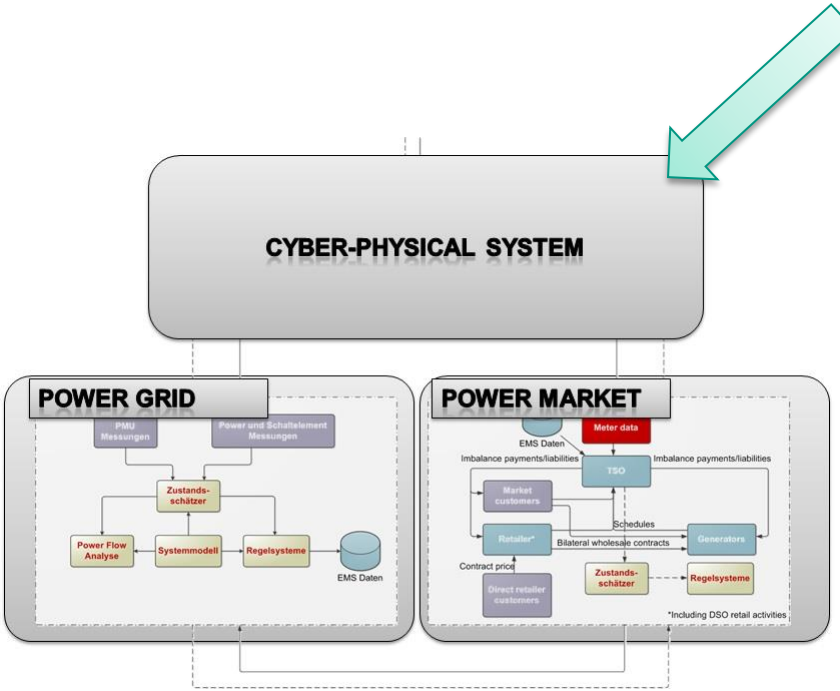
Research project

- There is a need for ***a dynamic equilibrium***



- **Control theory** as the approach
  - for the feedback modeling to explore the market behavior & dynamics
  - for the interaction modeling between the ***Market*** and the ***Grid***

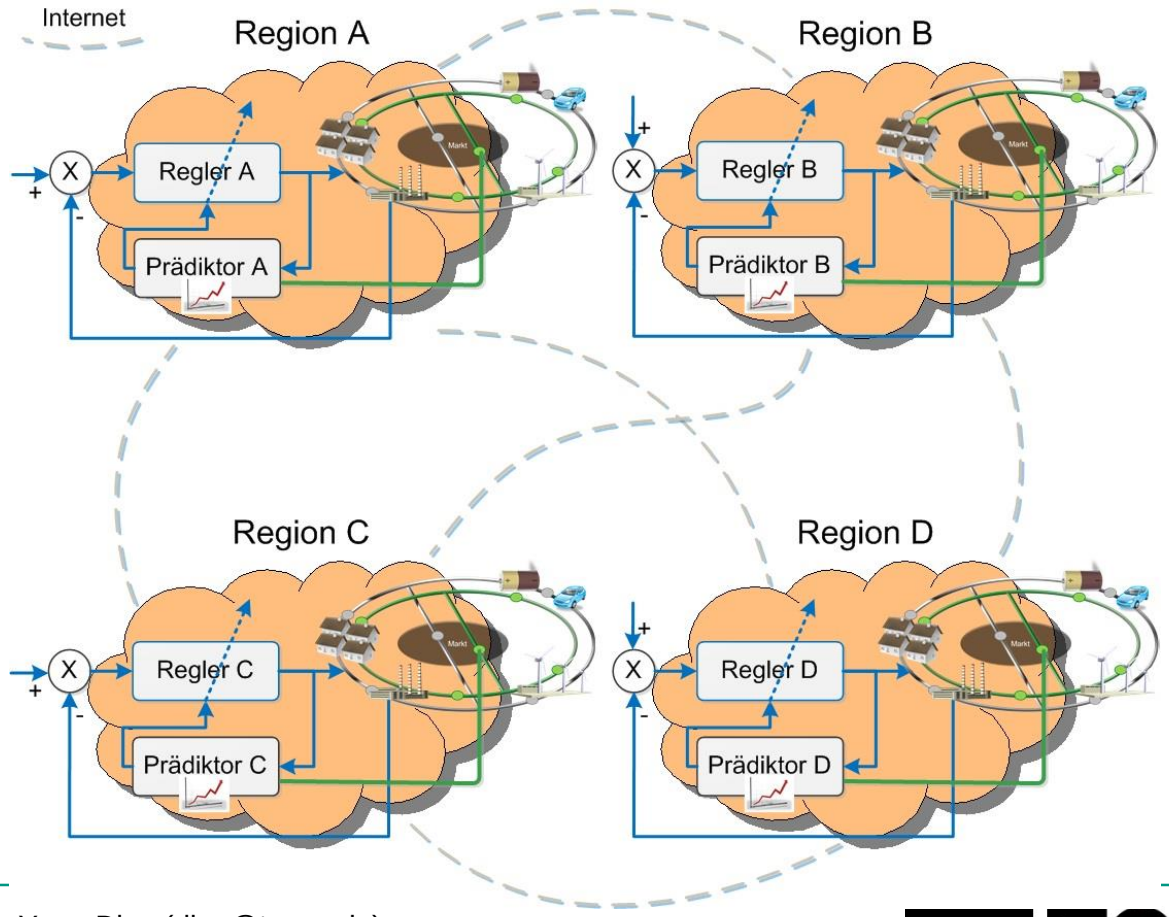
Problem statement



- ***State space*** between power grid and power market
  - ***options of power generating units***
  - ***transmission limitations***
  - ***power demand in the market***
- A control loop approach for future power market
  - to enable a ***market-driven load distribution*** in power grid
  - to enable a ***grid-driven load forecast*** in power market

A global view

- ***Decentralized power markets***
  - Local and global decision making



Expected results

- ***Mixed market and grid simulator***

- Comparison of different system alternatives
- ***Fairer*** retail prices and ***stable*** & ***predictable*** operating costs without full knowledge
- ***Proof-of-Concept*** for industrial integrable system