DISTRIBUTED AUTONOMOUS CONTROL SYSTEMS FOR DECENTRALIZED ENERGY MARKETS

Yong Ding <ding@teco.edu>
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*
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

![Diagram of decentralized power markets](image-url)
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