



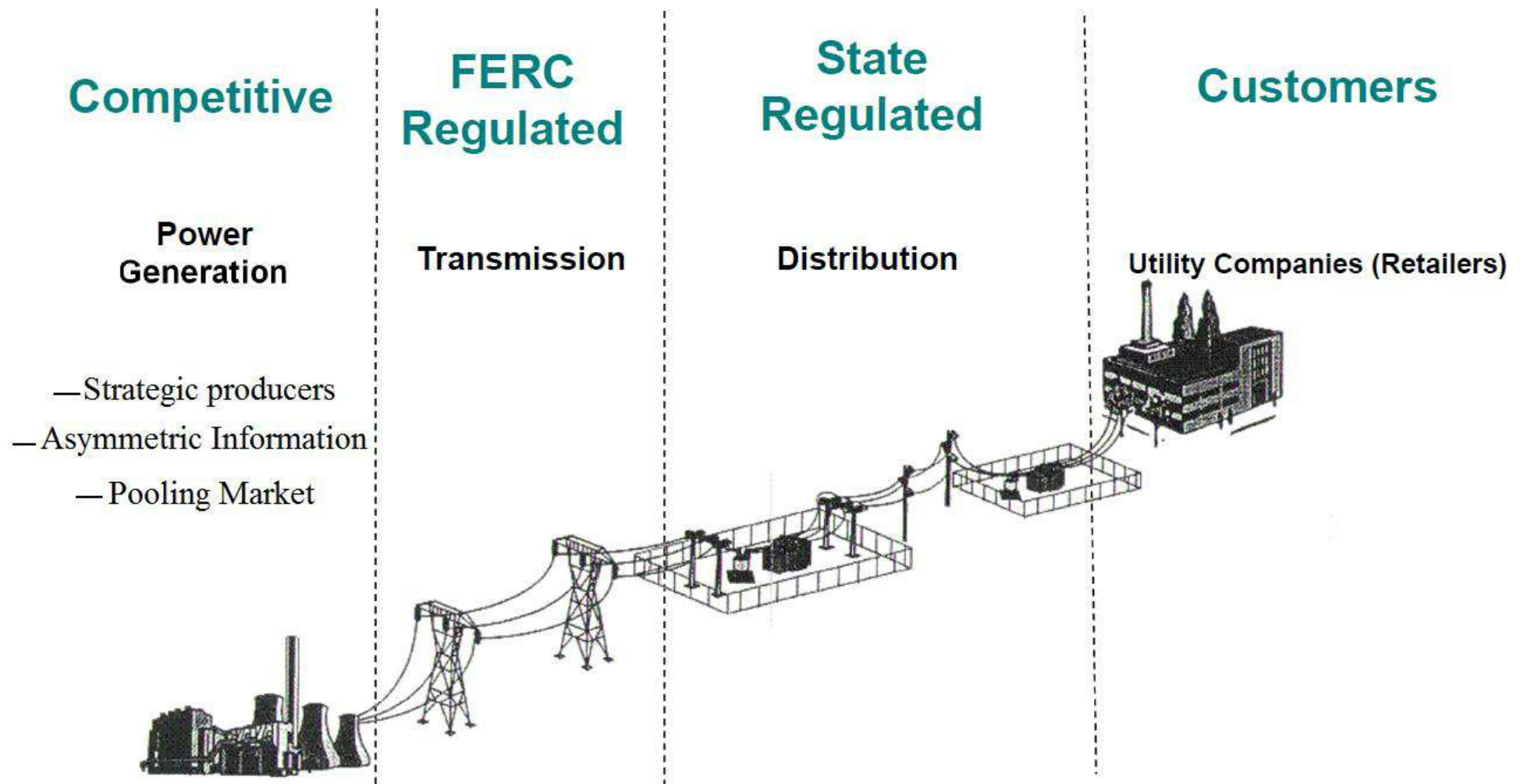
Electricity Pooling Markets with Strategic Producers Possessing Asymmetric Information: Inelastic Demand

Mohammad Rasouli and Demosthenis Teneketzis

University of Michigan



Power Industry Structure



Inelastic Demand



[Borenstein,2002] The fundamental problem with electricity markets is that the demand is almost completely insensitive to price fluctuations

- A firm with even a small percentage of the market could exercise extreme market power when demand is high.
- This is the main reason for the California ISO/PX 2000 market failure.

Contribution

We design a market mechanism for electricity pooling markets with inelastic demand that

- implements the social welfare correspondence in Nash equilibrium,
- individually rational,
- budget balanced.

In this market mechanism

- every producer bids one price and one production quantity,
- the outcome at NE is price efficient.

Mechanism for Inelastic Demand

Producers' bids Every producer bids one price, p_i , and one production quantity \hat{e}_i .

Allocations Every producer is allocated a production amount, e_i , and a subsidy to receive, t_i .

$$t_i = t_{i,1} + t_{i,2}$$

- $t_{i,1}$ paid by the demand to producer i for his production.
- $t_{i,2}$ collected by ISO from producers to align individual incentives with social welfare.

Mechanism for Inelastic Demand (Cont.)

$$\begin{aligned}e_i &= \hat{e}_i \\t_{i,1} &= p_{i+1} e_i \\t_{i,2} &= -(p_i - p_{i+1})^2 - 2p_i \zeta^2 \\ \zeta &= \left| D - \sum_{i \in I} e_i \right|\end{aligned}$$

- $t_{i,1}$: price independent of producer i 's message to make producers price-taker
- $t_{i,2}$
 - $-(p_i - p_{i+1})^2$ to propose the same price per unit of electricity energy.
 - $-p_i^2 \zeta^2$ to collectively meet the optimal demand at the proposed price

Reflection

What if the demand is elastic?

Thanks. Questions?