

The California Electricity Market:

What a long strange trip it's been

Market Organization in California

- **ISO operates but does not own the grid**
 - Runs transmission market
 - Acquires ancillary services
 - Runs an 'imbalance' energy (spot) market
- **Power Exchange (PX) runs day ahead and hour ahead energy markets**
- **Other firms also run energy markets in parallel to the PX**
- **IOUs will become (mostly) Distribution Companies**
- **All customers can 'choose' a supplier**
 - But for now it really makes no difference

Transmission Pricing Models

- **Fixed cost pricing models (cost recovery)**
 - Contract path
 - Impacted MW mile
- **Marginal cost pricing models**
 - ‘Nodal’ models
 - » Schweppe, et al., Hogan
 - » New Zealand, PJM
 - ‘Path’ based models
 - » Chao and Peck
 - » California
- **No price pricing models**
 - » Decentralized (Wu and Varaiya)

Point: PoolCo and the Nodal Pricing Framework

- **Energy prices are set by ISO at various locations (nodes or zones)**
- **Transmission prices are implicitly defined as the difference between locational energy prices**
- **Price of power in one location equals**
 - System wide marginal generation costs**
 - + additional cost of congestion from injecting power at that location**
 - + additional marginal cost of losses from injecting power at that location**

Counter Point: a Decentralized Model

- **Goal is to avoid a poolco, minimize the economic decisions made by the ISO**
- **ISO must still enforce reliability standards and ration transmission where necessary**
- **Under full decentralization, ISO would randomly curtail proposed schedules and then allow firms to make deals to revise schedules**

End Point: Path Based Pricing

- **Adopted in California as a compromise between nodal and decentralized approaches**
- **Firms bid for use of transmission, rather than for the supply or consumption of energy**
- **Users pay uniform prices for transmission rather than uniform prices for energy**
 - **Nodal proponents argue that ISO is forced to ignore some inefficiencies in schedules**
 - **Decentralized proponents complain that they are forced to use a confusing process administered by the ISO**

Current California System

- **Firms submit energy schedules to the ISO**
 - There is a day-ahead iteration to this process
- **Schedules can include ‘adjustment’ bids for reducing supply or increasing demand in a zone**
 - SCs do not *have* to submit adjustment bids, but risk high prices if they do not
- **ISO adjust schedules using these bids in order to relieve congestion at least cost**
 - These adjustments must be ‘balanced’ - cannot swap adjustments across schedule coordinators
 - ISO can only adjust when schedules are infeasible, it must stop adjusting once feasibility is reached

Firm Transmission Rights

- **How to mesh FERC order 888 and nodal or path based pricing?**
- **Firms want cost certainty in transmission**
 - Some firms also do not want to submit adjustment bids
- **Financial vs. Physical Rights**
 - Concern over withholding of physical rights
- **How many rights should be issued?**
 - Market power concerns
 - Incentives to submit adjustment bids
 - What about loop flow?

Ancillary Service Markets in California

- **Very disaggregated**
 - Hourly markets for four services
 - Limited demand flexibility
- **Not enough suppliers**
 - Physical constraints
 - Geographic limits
- **Conflicting Incentives**
 - Asymmetric regulation of suppliers
 - RMR contract distortions