

Assessing the Economic Benefits of Transmission Additions

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Overview

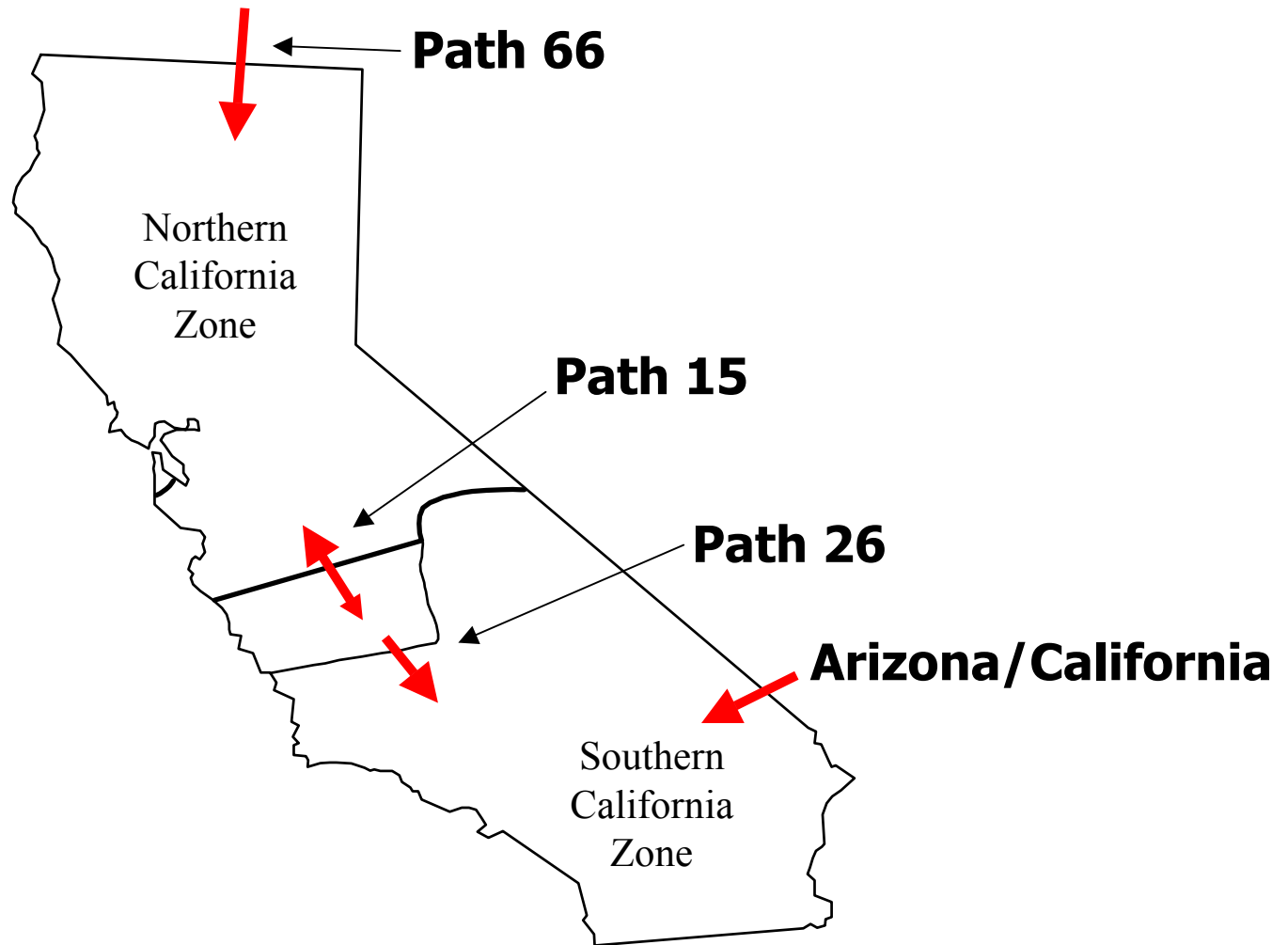
- Congestion – Without this, there is no need for new “economic” transmission
- Market and ISO response to mitigating congestion
- Types of economic benefits resulting from mitigating congestion
- Assessing the economic benefits of mitigating congestion with transmission



What Is Congestion ?

- More want to use lines than available capacity
- California ISO constrains use based on technical and contractual limits
- Transmission system is not overloaded

Where Major Congestion Occurs





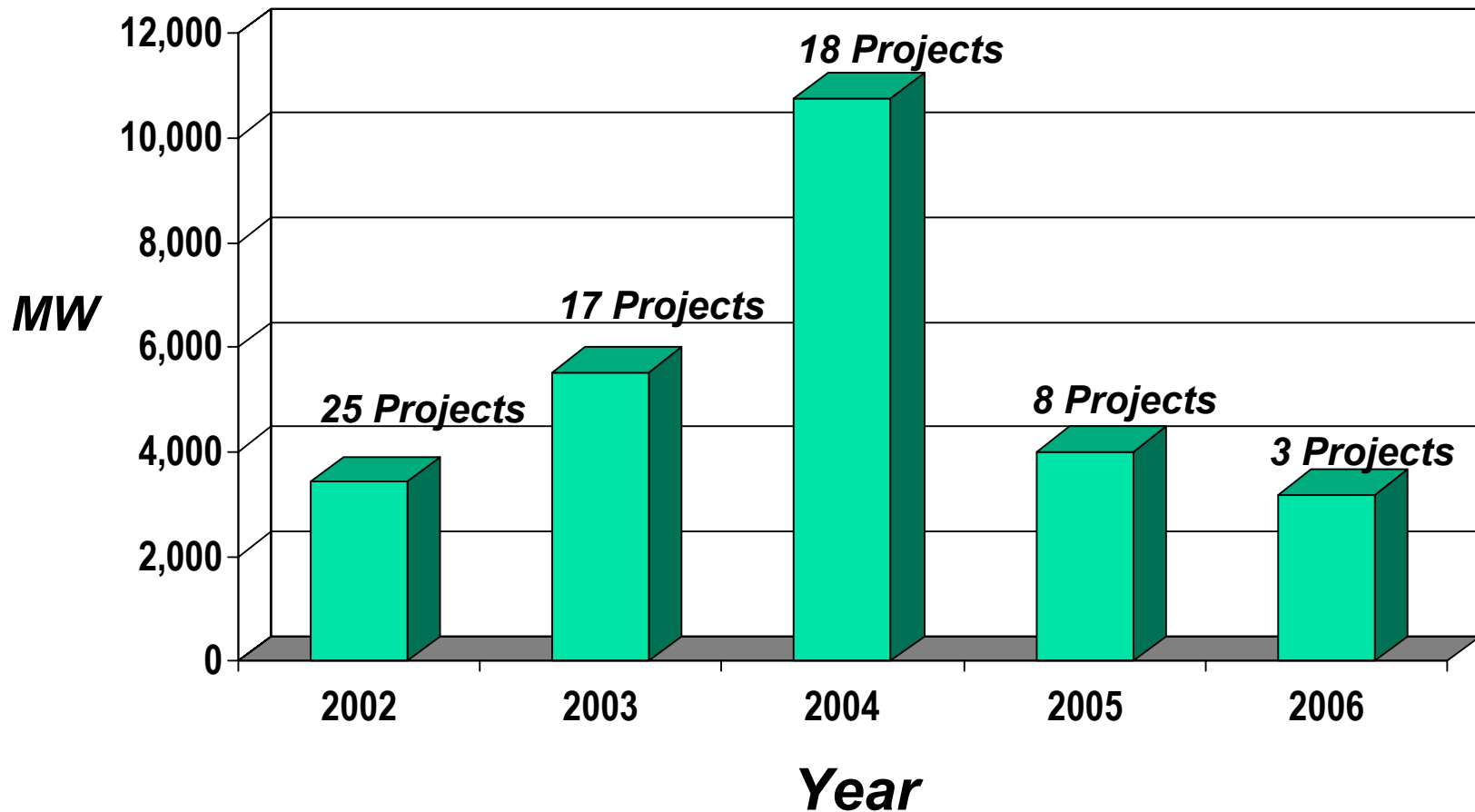
Original Gospel -

Market Will Build Transmission

- Market response to **Transmission** need has been poor
 - Some talk but no action yet
 - Third parties building for regulated rate of return – not the original concept of market lines
- Market response to **Generation** need has been phenomenal



Proposed New Generation





Reasons for Poor Market Response to Transmission Need

- No incentive
 - Receive Transmission Rights but they may be worthless
 - Competitors may benefit from upgrades without cost
- Project development may not be under their control
- Siting process is very difficult, uncertain, and lengthy





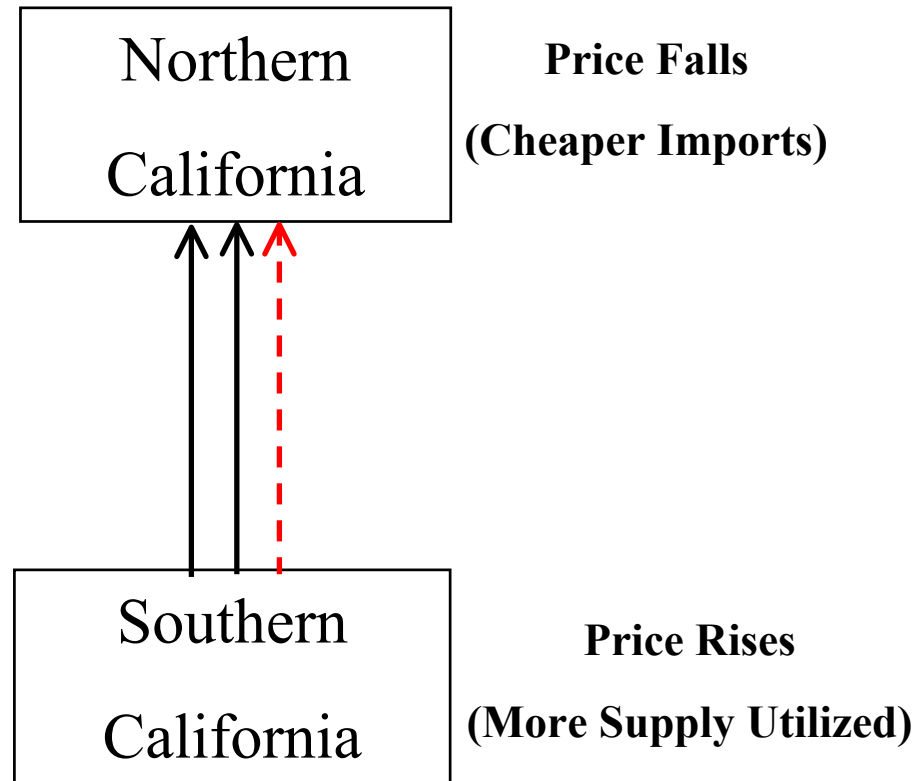
ISO or RTO Role

- ISO provides a means for the market to develop transmission projects
- If the market does not respond, then the ISO can respond
- The challenge is determining when the ISO should respond





Transmission Investment Lowers Overall Prices but Is It Worth the Cost?





How Do We Decide When to Add Transmission

- Consumer benefits from reducing congestion
 - Lower prices through access to lower cost resources
 - Lower prices through lower monopoly rents
- How do we measure benefits?
 - Should benefits to producers be included or just the benefit to consumers?

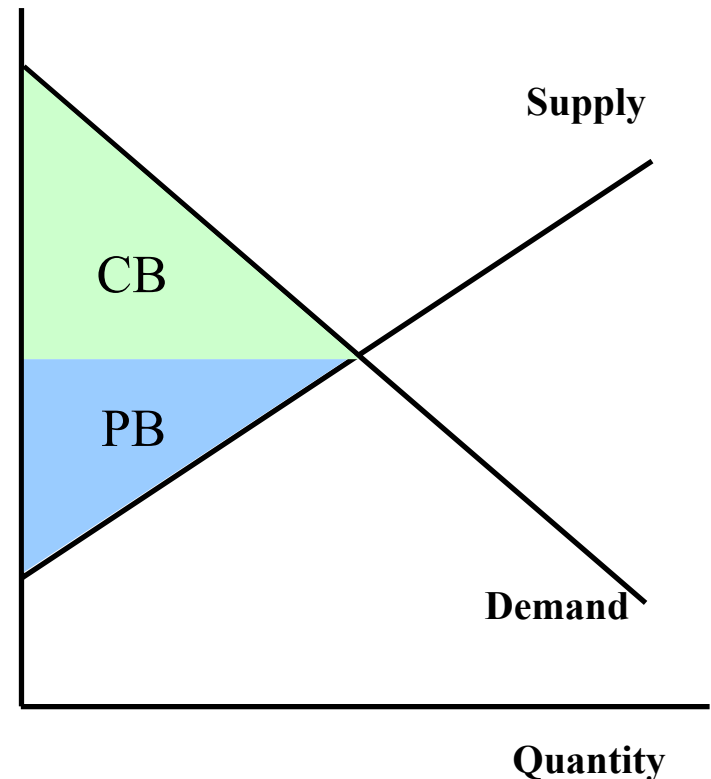


Supply-Demand Curve

Producer and Consumer Benefits

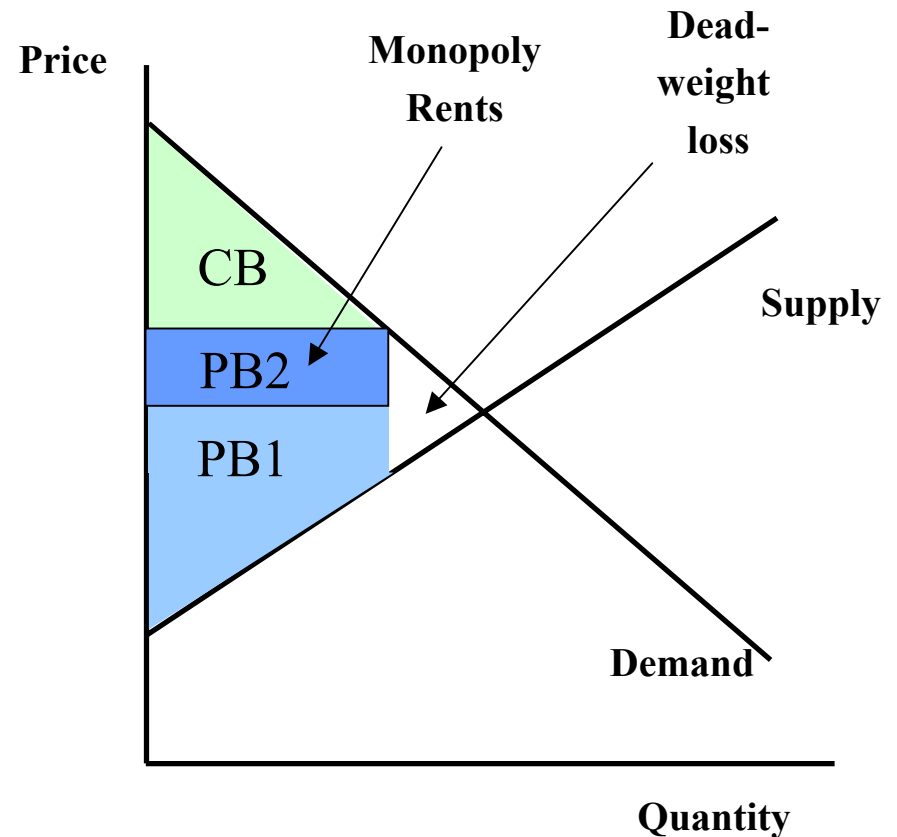
- **Consumer Benefit (CB) is the difference between willingness to pay, and payment, over all output.**
- **Producer Benefit (PB) is the difference between the total payment received and the total cost of production.**
- **Total benefit (TB) = CB + PB**

Price



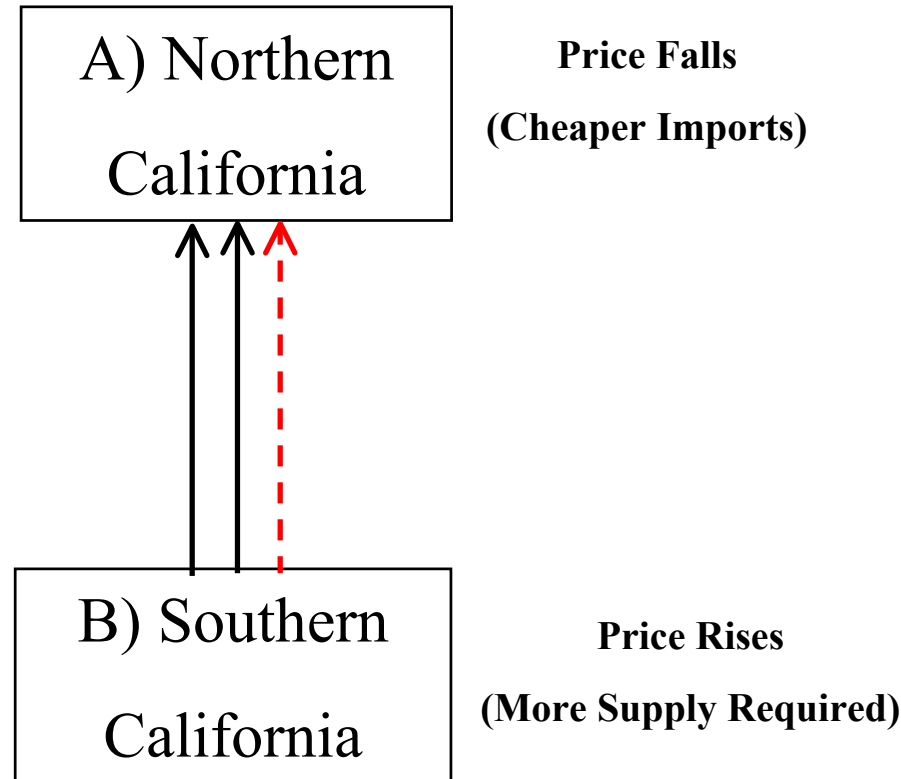
Effect of Producer Charging Monopoly Rents

- **Consumer Benefit (CB) is reduced.**
- **Producer Benefit (PB) is increased**
- **Total Benefit is reduced by Dead-weight loss**

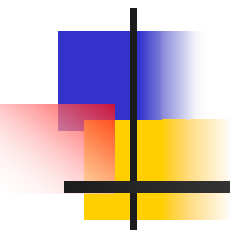


Benefits from Transmission Investment

- Consumer benefit increases in A but decreases in B
- Producer benefit increases in B but decreases in A
- Total GROSS benefit should not be less than it was before the investment.
- Subtract cost of new line to assess total NET benefit.
- But -- What will the prices be?



How can we predict what market prices will be before and after a transmission addition?



First --- We need to understand markets



The New Planning Vernacular

- **Rent Dissipation** - Investing today to enjoy monopoly rents tomorrow
- **Nash Equilibrium** - The point where no individual Player can improve their position by changing their bid
- **Kaldor-Hicks Criterion** - Project is supportable if the winners can theoretically compensate the losers.
- **Strategy Space, Game Theory, Ready Reconers, Exogenous, Endogenous, Contract Cover, Dead-Weight Losses, Real Options Analysis,**



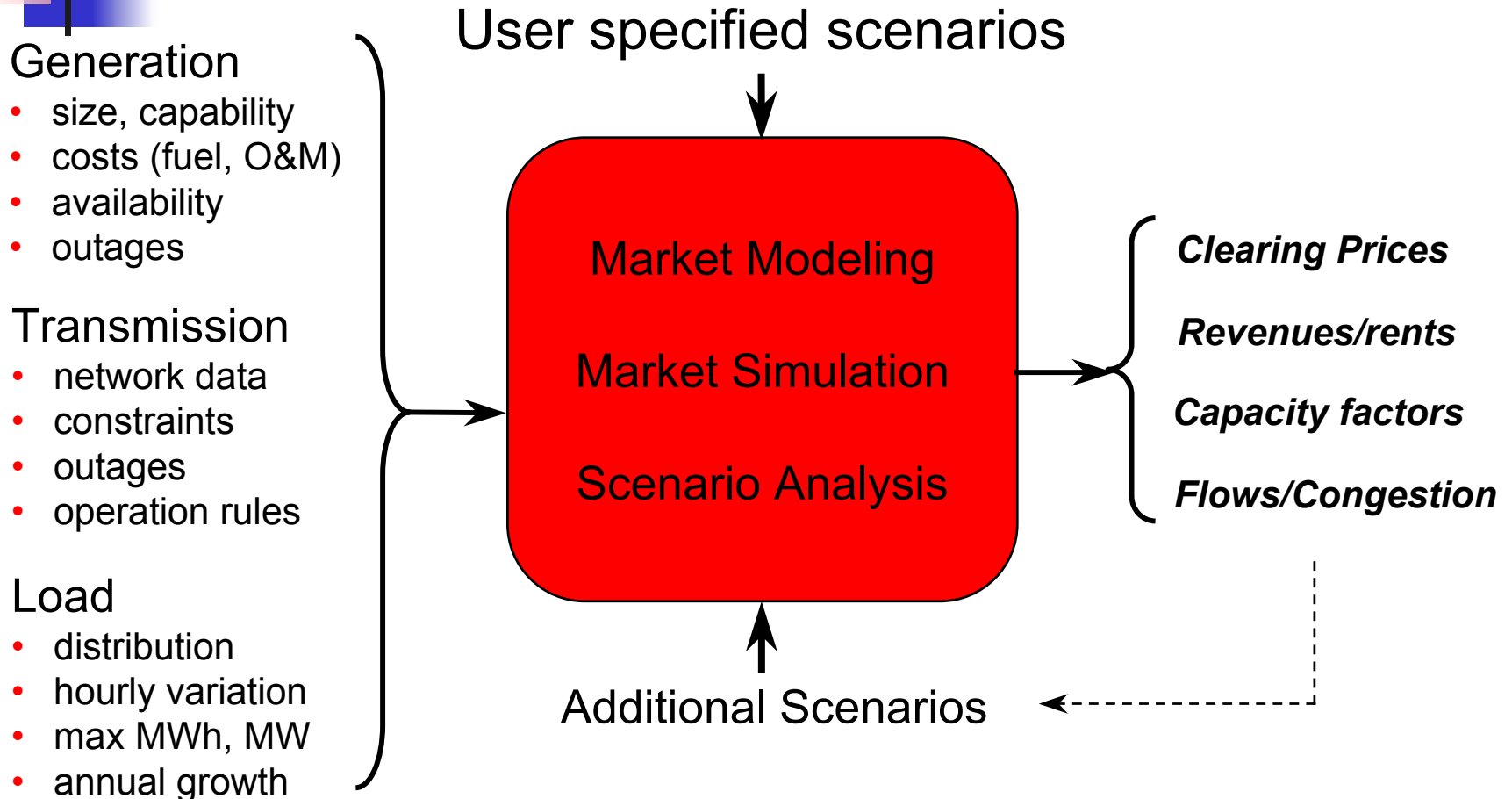


Plan to Use Two Methods for Forecasting Wholesale Prices

- **Method 1** - Use historic bid data to predict future bid behavior
- **Method 2** - Estimate bid curves using an iterative model where a participant's bids are based on conjectures about other participants' bids
- The two methods compliment each other



Power Market simulation overview



*Goal: To predict the **economic** and **physical** performance of large power networks*





Summary

- Uneconomic congestion that is not being mitigated by market response will be mitigated by the ISO or RTO
- The California ISO is developing a methodology to determine when to build transmission to mitigate congestion
- Predicting market behavior is a new and substantial challenge
- More info available at: www.caiso.com/thegrid/planning/



Questions?

