Limiting the Potential Downside of Wholesale Electricity Competition

Frank A. Wolak
Director, Program on Energy and Sustainable Development (PESD)
and
Department of Economics
Stanford University
wolak@zia.stanford.edu
http://www.stanford.edu/~wolak
Chairman, Market Surveillance Committee
California ISO

Outline of Talk

- Electricity Market Design—What is it and why it is needed
  - Challenge of wholesale market design—Unilateral Market Power
  - Challenge of regulatory mechanism design—Productive Efficiency
- The Political Economy of Short-Term Bid-Based Markets
  - Wholesale electricity prices can be extremely volatile
    - Orders of magnitude greater volatility than other commodities or financial securities
  - Local market power and need for explicit regulatory intervention
  - Market design flaws can lead to substantial consumers harm in a very short period of time
  - Prohibitions on market power abuse do not always prevent significant consumer harm
- Mechanisms that can be used to limit potential harm
  - Fixed-price forward contracts for energy
  - Active demand-side involvement, transmission upgrades
  - Automatic Market Power Mitigation Procedures
    - Conduct and impact
    - Structural approaches

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Outline of Talk (2)

- The benefits and costs of short-term market interventions
- Two Approaches to Limiting to Exercise of Unilateral Market in Short-Term Markets
  - Cost-based short-term market
    - Costs versus benefits of cost-based short-term market
    - Sources of benefits of re-structuring and cost-based markets
    - Conclusion—Cost-based short-term market and 100% forward contracting are low-risk strategy for capturing significant fraction of benefits of wholesale competition
    - Particularly for markets with limited transmission capacity and asymmetric treatment of load and generation as in United States
  - Guardrails on competition approach to short-term markets
    - No short-term bid mitigation, except for local market power mitigation
    - Intervention in the form of cost-based market for one-year if difference between 12-month rolling average of actual price and competitive benchmark exceeds a critical value
- A Market Design to Realize the Major Sources of Benefits of Re-structuring

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Market Design Problem

- Technology of energy production and delivery given
  - How many units of each input is required to produce one unit of energy
  - How many units of electricity produced are delivered to final consumers
- Policymaker faces two challenges
  - How to cause producers to supply in a technically and allocatively efficient manner
    - Technically efficiency = produce the maximum amount of output for a given quantity of inputs—capital, labor, input energy, and materials
    - Allocative efficiency = produce output at least cost given input prices
  - How to cause producers to set the lowest possible retail price consistent with the long-term financial viability of the industry
- Suggested goal of market design process is to achieve
  - Least cost production and the lowest possible retail prices consistent with long-term financial viability of industry
  - Recognizing the initial conditions of industry

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Major Market Design Challenge

- **All market participants will choose their strategies to maximize their payoffs given rules set by market designer (including market power mitigation mechanisms)**
  - Firms do not produce in a technically or allocatively efficient manner or price to recover only production costs unless they have a financial incentive to do so
  - Mechanisms that provide strong incentives for least-cost production can provide strong incentives for prices that yield revenues far in excess of production costs
    - Market mechanisms with little competition between privately-owned firms can yield prices far in excess of average cost of production
  - Mechanisms that intervene in short-term market can create incentive for inefficient production and higher prices

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Design Challenge with Market Mechanisms
Unilateral Market Power

- Electricity supply industry extremely susceptible to the exercise of unilateral market power in the short-term market
  - Demand must equal supply at every instance of time at every location in the transmission network
  - All electricity must be delivered through transmission network
  - Non-storability of product
    - Demand varies throughout the day
  - Production subject to severe capacity constraints
  - How electricity is priced to final consumers makes real-time demand elasticity effectively equal to zero
- Implication--Firms can exercise enormous amounts of unilateral market power in a very short time
  - Ask California, UK, New Zealand, El Salvador

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What is Unilateral Market Power?

- Ability of a firm to
  - Increase the market price
  - Profit from this price increase
  - Both are necessary for firm to possess unilateral market power
- A firm exercising all available unilateral market power subject to the market rules is equivalent to
  - The firm maximizing profits, which is equivalent to
  - The firm's management serving its fiduciary responsibility to its shareholders
- The issue for regulatory oversight is not whether a firm possesses unilateral market power or exercises it
  - Management has duty to shareholders to exercise all available unilateral market as long as this does not violate law
- **Key issue—Does exercise of unilateral market power result in market outcomes that cause sufficient harm to consumers to justify cost of regulatory intervention**

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Market Design Challenge with Regulation
Productive Efficiency

- How to cause producers to supply electricity in technically and allocatively efficient manner
  - Technically efficiency = produce the maximum amount of output for a given quantity of inputs—capital, labor, input energy, and materials
  - Allocative efficiency = produce fixed amount of output at least cost given input prices
- Regulatory process must set prices to recover incurred production costs
  - Incurred production costs ≥ minimum production costs
- Incurred production costs can differ significantly from minimum production costs particularly over long-term
  - Regulatory process that only recovers incurred cost production costs can dull incentive for firm to invest in cost-reducing technology
  - Can also create incentive to invest in cost-increasing technologies

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Some Form of Regulation Necessary

- Choice is not de-regulation versus regulation, but how much and which industry segments to regulate
- Re-structuring is an alternative regulatory mechanism for attaining market designer's goals
  - Market designer faces choice between imperfectly competitive market and imperfect regulatory process at each stage of production process

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The Political Economy of Market Mechanisms

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Political Economy of Market Mechanisms

- Electricity prices are very politically visible
  - All voters purchase electricity
- In bid-based, short-term markets wholesale electricity prices can rise to levels vastly in excess of any measure of variable production costs of any generation unit operating
  - This can attract significant attention from political process

– Steadily increasing prices in Colombia over past 5 years

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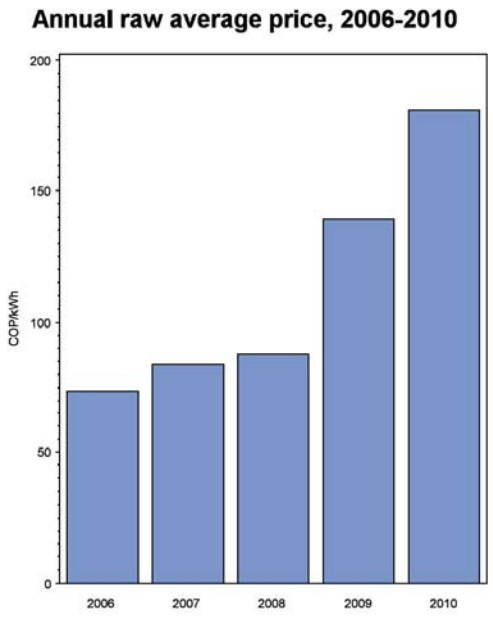

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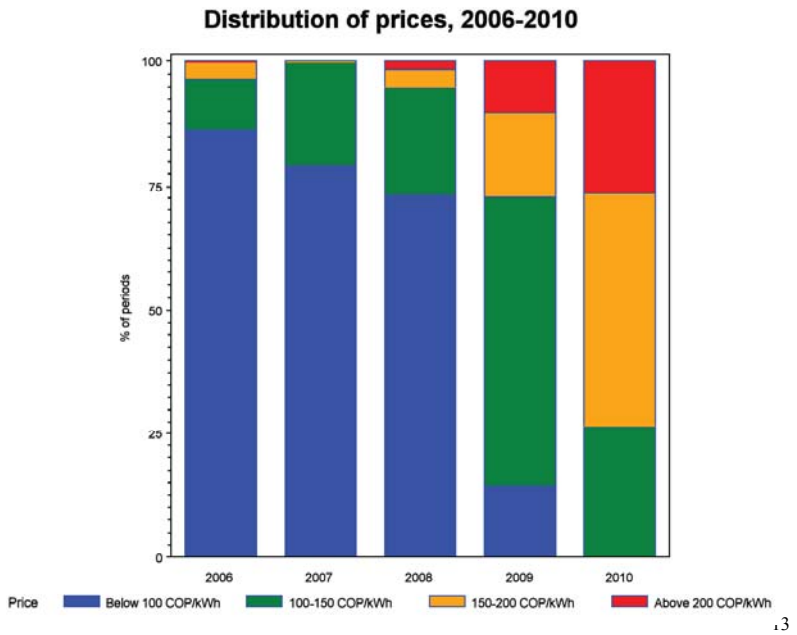

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Local Market Power

- Hourly wholesale demand is virtually inelastic with respect to hourly wholesale price electricity prices
  - Little deployment of interval metering technology necessary to support active end-user participation in wholesale market
- Transmission network configuration, geographic distribution of wholesale electricity demand, concentration in local generation ownership, and production decisions of other generation units combine to create system conditions when a single firm may be only market participant able to meet a given local energy need
  - This firm is monopolist facing completely inelastic demand
  - No limit to price it can bid to supply this local energy need

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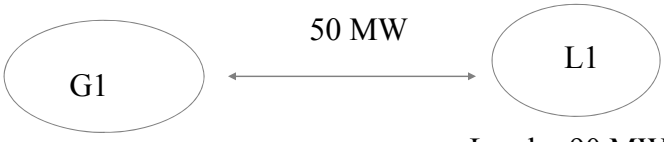
Local Market Power Problem

- Consider the following two-node example



Load = 0 MW
Generation = 100 MW
MC = $50/MWh

Load = 90 MW
Generation = 80 MW
MC = $80/MWh

No limit to what supplier at L1 can bid and be dispatched to provide 40 MWh of energy

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Local Market Power Problem

- Congestion management or locational-pricing scheme does not solve local market power problem
  - Given a geographic distribution of demand, configuration of transmission network, and production decisions of other units in this network, a firm is local monopolist for certain quantity of energy regardless of congestion management/locational pricing scheme
- Market operator must have the ability to mitigate the bids of firms that possess local market power
  - Explicit regulatory intervention needed to limit exercise of local market power
  - All US markets have local market power mitigation mechanisms
- Positive and negative reconciliation payment mechanism serves this role in Colombia
  - Mitigates local market power in upward and downward directions

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Design Flaws and Consumer Harm

- Enormous wealth transfers can occur in a very short period of time if there are design flaws in bid-based short-term markets
- In California, unilateral market power enabled by inadequate fixed-price forward contracting by large retailers led to approximately $5 billion of transfers from consumers to producers during last 6 months of 2000
- For similar reasons, significant wealth transfers and economic disruption occurred during winters of 2001 and 2003 in New Zealand
- In United Kingdom, significant wealth transfers from 1992-1996 led to New Electricity Trading Arrangements (NETA)
- In PJM market in US, large wealth transfers occurred during summer of 1999
- Virtually all bid-based short-term markets in industrialized and developed countries have experienced significant market performance problems
  - Markets with adequate regulatory safeguards have weathered storm best

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Penalizing Market Power Abuse May Not Prevent Consumer Harm

- All US markets have prohibitions on abuse of market power or market manipulation
- Whether a firm abuses market power depends on your perspective
  - Market power abuse as seen by one player is superior business acumen as seen by another (if firm is not otherwise violating market rules)
- Despite enormous wealth transfers in California no supplier was convicted of abuse of market power, market manipulation, or collusion
- Similar statements hold for New Zealand, UK, PJM and other markets around the world that have experienced periods of significant unilateral market power
- Conclusion—Prohibition against abuse of market power or market manipulation can, at best, prevent obvious egregious behavior
  - Massive wealth transfers can occur without this type of behavior
- The conclusion justifies an ex ante regulatory mechanisms to limit the exercise of unilateral market power

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Mechanisms to Limit the Extent of Market Power Exercised in Short-Term Market

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Mechanisms to Limit Market Power

- Fixed-price long-term contracts between suppliers and retailers
- Active involvement of final demand in wholesale market
- Transmission upgrade to facilitate competition
- Bid cap on short-term market
  - Maximum bid that any supplier can submit
  - All US ISOs have a bids caps on energy and ancillary services
    - Currently $1000/MWh in east and $250/MWh in California
- Automatic Market power Mitigation Mechanisms
  - Automatic intervention mechanism to mitigate bids of suppliers that demonstrate ability to exercise unilateral market power
- Cost-based short-term market
  - Dispatch and system operation takes place using estimated variable costs of generation units
- Guardrails on bid-based market with no automatic mitigation mechanism, except to control local market power
  - Annual deviations from competitive benchmark pricing

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Forward Contracts and Spot Market Power

- Extent of final output covered by fixed-price forward contracts limits incentives for suppliers to exercise market power in short-term market
  - Wolak (2000) "An Empirical Analysis of the Impact of Hedge Contracts on Bidding Behavior in a Competitive Electricity Market" (on web-site)
- No incentive to raise spot price until produce at least forward contract quantity
  - Incentive to reduce price if sell less than fixed-price forward market quantity in short-term market
- In virtually all markets around the world, a very small amount of energy is sold at the short-term market price because of high levels fixed-price forward contracting
- With high levels of coverage of final demand with fixed-price forward contracts, consumers are protected from periods of high wholesale prices

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Forward Contracts and Spot Market Power

- Forward contracts must be signed far enough in advance of delivery to obtain contestable market price
  - Must allow new entrants to compete with existing suppliers to provide long-term contract
    - Emphasizes importance of streamlined generation siting process
  - New Combined Cycle Gas Turbine (CCGT) can compete at 2-year delivery horizon in forward contract market
- Signing forward contracts 3-months, 6-months or even one-year in advance of delivery may not provide any short-term market power mitigation benefits of fixed-price forward contracts
  - May simply pay for expected market power in short-term market on installment plan in forward contract price
  - Short-term prices will subsequently reflect less unilateral market power, but consumers must still pay higher forward contract price

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Forward Contracts that Pay for Market Power on Installment Plan—California Winter 2001

During Winter of 2001 market participants expected future short-term prices for electricity in California

- June 01 to June 02 = $250/MWh
- June 02 to June 03 = $150/MWh
- June 03 to future = $40/MWh

Suppose State of California wishes to buy a 10-year contract with 1/20 of energy in first year, 1/10 in second year, and 17/20 of energy in years 3 to 10.

- What price will generator charge?
- Generator requires a price of at least $61.50 =(250*1/20+150*1/10+40*17/20) to agree to contract

Note: Above numbers based on actual forward prices of power in winter 2001 and actual pattern of energy purchased in contracts.

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Automatic Mechanisms to Mitigate Market Power in Short-Term Market

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Automatic Ex Ante Market Power Mitigation

- All US markets have form of ex ante automatic mitigation procedure (AMP) for local market power
  - History of US industry led to transmission network poorly suited to wholesale market regime
  - Few have system-wide market power mitigation mechanisms
- All AMP procedures follow three-step process
  - Determine system conditions when supplier is worthy of mitigation
  - Mitigate offer of supplier to some reference level
  - Determine payment to mitigated and unmitigated suppliers
- Two classes of AMP procedures
  - Conduct and impact
    - NY-ISO, ISO-NE
  - Market Structure-Based
    - CAISO, PJM, ERCOT

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Automatic Ex Ante Market Power Mitigation

- Likely reason that automatic mitigation procedures exist only in United States
- Federal Power Act requires that wholesale electricity prices be "just and reasonable"
  - Legally, prices that do not reflect the exercise of unilateral market power are just and reasonable
  - Federal Energy Regulatory Commission (FERC) has determined that if a supplier's offers have been subject to an automatic mitigation procedure then by definition they do not reflect the exercise of unilateral market power
    - Recall that profit-maximizing suppliers exercise all available unilateral market power, even those subject to an automatic mitigation procedure

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Conduct and Impact Mitigation

- Conduct and Impact approach first defines a reference price for supplier based on either
  - Regulated variable cost of unit, or
  - Accepted price offers from unit during "competitive conditions"
- Conduct test
  - If supplier offers price in excess of this reference price by some preset limit, for example $100/MWh or 100% of the reference level, this supplier violates the *conduct* test
- Impact test
  - If this supplier's offer moves the market price by some amount, for example $50/MWh, then supplier is said to violate the *impact* test
- A supplier's offer will be mitigated to its reference level if it violates the conduct and impact tests

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Conduct and Impact Mitigation

- C&I mechanisms have been applied both system wide and locally
  - Local thresholds are usually tighter
- Downside of Conduct and Impact approach is that supplier can exercise all of the unilateral market power it is able to if it does not violate conduct or impact threshold
  - If offer price does not exceed reference level by $100/MWh, then conduct test is not violated
  - If all suppliers offer in at high price then supplier that violates conduct test is unlikely to be mitigated because it does not violate impact test
    - Does not protect against coordinated actions (collusive behavior) to raise prices above competitive levels

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Conduct and Impact Problems

- Conduct and Impact approach limits extremely high prices, but may cause average prices to increase
  - Particularly if accepted offers during competitive conditions is used to set reference level, which seems inevitable for hydro-dominated system such as Colombia
  - CREG proposal relies on a version of this approach for hydro units
- AMPs change the way suppliers exercise unilateral market power
  - Example--Reference price creep
    - Accepted low-priced bids can reduce reference level for conduct test, which makes it costly for a supplier to bid low during "competitive conditions"
    - Suppliers recognize that bidding low limits ability to bid high during periods when they can raise prices
- Conclusion--Likely that Conduct and Impact AMP leads to reduced price volatility but higher average prices
  - Lower prices in peak periods of day and higher prices in off-peak periods
  - Many more off-peak hours of day than peak hours of the day

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Market Structure-Based

- Mitigation occurs when structural conditions arise that provide opportunity for supplier to exercise substantial unilateral market power
  - Supplier does not have to exercise market power to be mitigated
  - Mechanism assumes that if supplier has ability to exercise market power, it will do so
    - Suppliers will serve their fiduciary responsibility to their shareholders
  - One measure of extreme ability to exercise market power is if supplier is pivotal

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Market Structure-Based Mitigation

- PJM approach uses 3-jointly pivotal supplier test
  - If 3-suppliers are jointly pivotal, some of their output is needed to resolve a transmission constraint, and all three suppliers are mitigated
  - Offer prices are reset to reference level
    - Reference level based on PJM-verified variable cost of production + 10% adder
      - Variable cost = Heat rate*fuel cost + variable O&M
  - Dispatch and market price set using mitigated offers and all other offers

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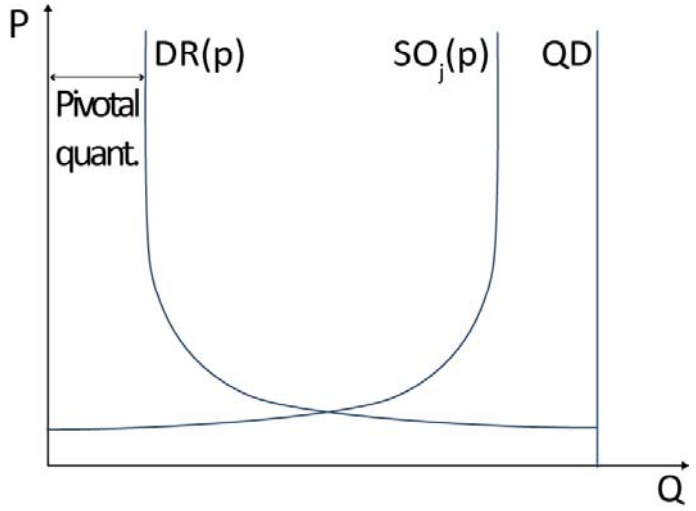
Three Jointly Pivotal Suppliers

(DR(p) = Residual Demand of Three Largest Firms)



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Market Structure Mitigation

- CAISO uses competitive path approach
  - ISO pre-classifies transmission paths as competitive and non-competitive
- 3-step process
  - Day-ahead locational marginal pricing market is run with all non-competitive paths set to have infinite capacity
  - Day-ahead market operated with all transmission paths set at actual capacity
  - If a generation unit's schedule is increased between competitive constraints and all-constraints run, then its offer is mitigated to reference level

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Market Structure Mitigation

- Reference level in CAISO is verified variable costs plus a 10 percent adder
- Third step of process re-runs all constraints model with mitigated offers and all other offers to compute day-ahead schedules and prices
- Potential difficulty with market structure-based approach
  - What is appropriate market structure that causes mitigation
- Less of a problem if reference level is above variable cost, which is price offer of a supplier with no ability to exercise unilateral market power

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Leveraging Market Power Mitigation Mechanisms

- Computing market prices with a combination of mitigated offers and market-based bids can enhance ability of suppliers that own a portfolio of units to exercise unilateral market power
- Bushnell and Wolak (1999) "Regulation and the Leverage of Local Market Power in the California Electricity Market" (on web-site)
  - Suppliers that owned several generation units used local market power mitigation mechanism to enhance their ability to exercise unilateral market power
- Suppliers take actions to ensure high mitigated bids set market prices
- Suppliers take actions to ensure that units do not fail conduct or impact tests

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Market Power Mitigation

- Implication—No market power mitigation mechanism can achieve perfectly competitive market outcome or least cost supply of energy
  - Would imply existence of perfect regulatory process
  - There is a cost to mitigation
- Conclusion--Design market power mechanism to intervene when benefits from mitigation are likely to exceed costs
- Local market power mitigation seems to be an instance when this is case
  - Address incentive problems with reconciliation payment mechanism
- System-wide market power mitigation seems less likely to be an instance when this is the case

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Cost-Based Market and Guardrails to Competition Market Power Mitigation

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Bid-Based versus Cost-Based Dispatch

- In bid-based market suppliers submit their willingness to supply energy
  - Price is highest bid necessary to meet demand
- In cost-based market suppliers submit heat rates and other information about variable costs to system/market operator
  - Price is highest variable cost necessary to meet demand
- Under both regimes suppliers receive market price and loads pay the market price for deviations from their forward contract positions
- System/market operator creates opportunity cost of water for hydro units in cost-based market to manage water
  - Opportunity cost of water is hydro supplier's "variable cost"

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Cost-Based Markets in LACs

- Several Latin American Countries (LACs) have a long history with electricity supply industry re-structuring using cost-based short-term market
  - Chile has had a wholesale market since mid-1980s
    - Almost 300% increase in capacity since 1990, all privately financed
  - Argentina has had a wholesale market since early 1990s
  - Brazil, Peru, Panama, and Guatemala also have significant experience with cost-based short-term markets
  - Colombia, El Salvador only LACs with bid-based short-term markets
- Experience of Chile is generally thought to be a success, as is the experience of Argentina
  - Cost-based markets in LACs have had success at attracting new investment
    - LACs focus on what is needed to attract new investment—active forward market
  - Unclear if bid-based short-term market, such as those operated in US, have benefited consumers, relative to cost-based short-term market
    - Risky market design given limited transmission capacity in US
      - Many opportunities for suppliers to exercise unilateral market power
      - Limited upside for consumers in terms of potential for lower prices

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Bid-Based versus Cost-Based Dispatch

- Virtually impossible to limit unilateral market power in bid-based spot market during vast majority of hours of the year
  - All bid-based short-term market have experienced instances of significant unilateral market power
    - California, PJM, New England, New York, New Zealand, UK, Australia
- Net benefits of bid-based spot markets limited because of market power problems
  - Particularly in markets with limited transmission capacity and asymmetric treatment of load and generation such as those in the US
- Few markets operate pure bid-based short-term market because of local market power problems
  - Many market power mitigation measures in place in short-term market, particularly in US,
  - Reduce potential benefits of bid-based short-term markets

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Cost-Based Intervention in Bid-Based Market

- Bid-based short-term markets in US have significant and growing regulatory component
  - Open question—Does this bid mitigation yield the best of both worlds (regulation and market) or worst of both worlds?
- These market power mitigation mechanisms result in a very inefficient form of cost-based dispatch despite being called bid-based dispatch
  - Combines cost-based bids plus ad hoc adders with market bids to determine market-clearing prices paid to all market participants
- Conclusion—Explicit cost-based dispatch may be superior to hybrid bid-based dispatch

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Bid-Based versus Cost-Based Dispatch

- ISO needs to operate system in real-time
  - Cost-based market allows this to happen
- Bids in short-term market often differ substantially from variable cost
  - A supplier that possesses unilateral market power finds it expected profit-maximizing to bid in excess of variable cost
  - See papers on web-site on expected profit-maximizing bidding in wholesale electricity markets
- A supplier facing substantial competition will find it unilaterally profit-maximizing to submit a bid equal to its variable cost
- Cost-based dispatch will be very close to bid-based dispatch if all suppliers face substantial competition
- Conclusion--Little advantage to bid-based short-term market unless all suppliers face substantial competition vast majority of hours of the year

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Bid-Based versus Cost-Based Dispatch

- Benefits of explicit cost-based short-term market
- Reduces barriers to entry
  - Provides more certainty on imbalance charges loads and generators will be liable for relative to their forward positions
    - No need forecast bids of competitors to predict short-term prices
  - Easier to forecast future spot energy prices
  - Reduces cost of new investment, forward contracting costs
  - Makes it easier to sell standardized forward contracts for energy
- Reduce risk of expropriation of investment by government-owned suppliers
  - Particularly problematic in system with significant government-owned hydro-electric capacity
  - For political reasons government-owned entities may bid to lower prices when system conditions call for higher prices
    - This can discourage private investment in needed fossil-fuel units

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Cost-Based Dispatch Market

- Costs of cost-based dispatch
  - Increase incentive to put fixed costs into variable costs
  - Limited incentive to reduce input fuel purchase costs
  - Limited incentive for suppliers to invest to reduce production costs
  - Incentives for inefficient dispatch
    - Withhold lower cost units to allow high cost units to set market price
- All of these incentives will impact market prices only if a supplier faces insufficient competition
  - Supplier possesses unilateral market power
  - Unilateral market power is more potentially harmful in bid-based market

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Cost-Based Dispatch Market

- Countervailing benefits of cost-based market
  - Limit number of ways suppliers can exercise market power
    - Can only bid higher if can "cost justify" higher bid
  - Limit amount and sophistication of technology needed to operate wholesale market
  - Reduce volatility of wholesale prices and congestion prices
    - Requires little demand-side involvement in market
    - Can still operate market with limited transmission upgrades
    - Both of which limit ability of suppliers to exercise market power in bid-based market
- Summary Trade-offs
  - Potential for increased incurred cost of real-time system operation
  - Limit risk of enormous market power in short-term market and reduce uncertainty associated with future spot prices

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Pre-Condition for Cost-Based Market

- Mandated forward contracting levels for retailers enforced by regulator
  - Specify minimum hedging requirements at various time horizons to delivery, for example
    - 95% coverage 1-year in advance of delivery
    - 90% coverage 2-years in advance of delivery
    - 85% coverage 3-years in advance of delivery
- Desired contracting levels can be achieved through financial incentives to retailers
  - For example, allow pass-through of higher wholesale price the farther in advance power is purchased
- Mandated contracting needed because of cost-based short-term dispatch limits incentive of retailers to hedge short-term price risk

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Pre-Condition for Cost-Based Market

- Stranded contracts for retailer possible only if aggregate load forecast is too high
  - Retailer that loses customers can sell excess contracts to retailer that gains customers for a profit or loss
  - On average retailer should not make or lose money from these sales or purchases of contracts
- Note the very little energy will be sold a short-term price under this scheme
  - Prices determined by willing buyers and willing sellers in forward markets
- Cost-based dispatch market should only clear imbalances relative to forward market positions
  - Net zero energy market on average
- Market mechanisms used to set price for supply of products where is adequate competition
  - Forward market obligations to provide energy

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Guardrails for Competitive Market

- Compare 12-month rolling average of actual prices to 12-month rolling average of competitive benchmark prices
  - Take rolling average of hourly market prices over entire 12-month period and compare this to average hourly competitive benchmark price over same 12-month period
  - If difference in P(actual) and P(benchmark) exceeds some critical value then automatic regulatory intervention occurs to protect consumers
- Requires less hour-to-hour regulatory intervention by ISO
  - Can set high bid cap or price cap and therefore allow hourly price signals
- Consumers protected from excessive market power
  - Recommended level--$5/MWh difference between 12-month average P(actual) - P(benchmark)
  - This would have not triggered regulatory intervention until June of 2000 in California

Guardrails for Competitive Market

- Recommended intervention if index is exceeded
  - All market participants will be dispatched according to cost-based market and be paid the resulting market-clearing price for the following year
  - Any unit earning insufficient revenues to cover total costs under this scheme must cost-justify its annual cost shortfall to regulator
  - Payment scheme must be sufficiently unattractive to generation unit owners so that they do all they can to avoid triggering its imposition
- This scheme creates a self-regulating market
  - Generators want to work to fix market rather continue to exercise unilateral market power
  - Prevents a California market meltdown yet still provides hourly price signals needed to
    - Simulate development of price-responsive demand
    - Provide incentives for load-serving entities to hedge spot price risk
  - Goal of setting this compensation scheme is to provide strong incentives for generators to avoid implementing it

Guardrails for Competitive Market

- Supplier with a substantial ability and incentive to exercise unilateral market power has a strong incentive to take actions to reduce this incentive
  - To prevent exceeding difference between rolling average of actual and competitive benchmark prices suppler would sign fixed-price forward contract that commits it to more aggressive behavior in short-term market
  - Recall that supplier with large fixed-price forward contract obligations relative to expected output, has limited to incentive to exercise unilateral market power
- Mechanism limits need for short-term market intervention, yet protects consumers against the harmful exercise of market power, (unilateral or collusive)
- All firms have a common interest in preventing competitive benchmark pricing threshold from being exceeded by actual prices

Sources of Benefits of Re-structuring

- General conclusion—Operating cost saving bid-based versus cost-based market short-term are likely to be small
- Investment decisions in former vertically integrated regime were based on regulatory and political factors
  - Other goals besides least-cost supply of energy
  - Problem particularly acute for government-owned entities
  - Enormous cost over-runs in vertically-integrated regime
    - Many examples from 1970s and 1980s in US
- Market test for new generation investment provides strong incentive for least-cost technology to be selected
  - Forward market necessary to finance new investments
- Conclusion—Significant cost saving possible from market test applied to new generation investments

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Fostering Forward Market

- Cost-based short-term market focuses on development of active forward market for electricity
- Credible forward market will attract private investment in new generation
- Mistake of many industrialized countries is an over-emphasis on the design of the short-term market
  - In US, state versus federal separation between retail and wholesale market regulation necessitates Federal Energy Regulatory Commission's (FERC) focus on short-term market design
    - State regulator has jurisdiction over long-term procurement of retailers
- Cost-based dispatch market may have some inefficiencies (relative to bid-based short-term market) in short-term operation but focuses on capturing major source of benefits of re-structuring
  - Least-cost investment in new generation facilities
  - Protects against economically and politically harmful market outcomes

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Conclusions

- Short-term mitigation for local market power
  - Continue to refine and improve positive and negative reconciliation payment mechanisms
- Protect against harm to consumers with guardrails to competitive market
  - No short-term system-wide market power mitigation
- Focus on realizing major source of benefits of re-structuring
  - Creating forward market far in advance of delivery to foster least cost new investments in generation capacity
  - Limit exposure of consumers to short-term prices, which limits incentives for suppliers to exercise market power in short-term market

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For background and
related papers see
http://www.stanford.edu/~wolak

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