



Webinar

Pricing Options for an Energy Imbalance Market in the Western Interconnection

State-Provincial Steering Committee

October 18, 2011

Presentation Outline



- *Welcome and Introduction*
 - Larry Chaset, SPSC consultant
- *Market Clearing Price v. Pay-as-Bid Pricing*
 - Susan F. Tierney, Analysis Group
- *Implementing a WECC-Wide Imbalance Market: Lessons from California ISO Real-Time Market*
 - Frank A. Wolak, PESD and Stanford University
- *Response*
 - Commissioner Jason A. Marks, New Mexico Public Regulation Commission

Pricing in a Western Energy Imbalance Market: Market Clearing Price versus Pay-As-Bid Pricing

Western Interstate Energy Board –
Webinar – October 18, 2011

Susan F. Tierney, Ph.D.

Goals for a Centralized Western Energy Imbalance Market

1. What: Lower overall cost of power production

- **More efficient dispatch of existing generating resources -**
 - More efficient balancing service
 - More efficient use of existing transmission
 - More efficient provision of ramping services

2. How: Security-constrained, least-cost dispatch

- **Dispatch of plants with the lowest cost of production ahead of plants with higher cost to produce power.**

Questions as to EIM design:

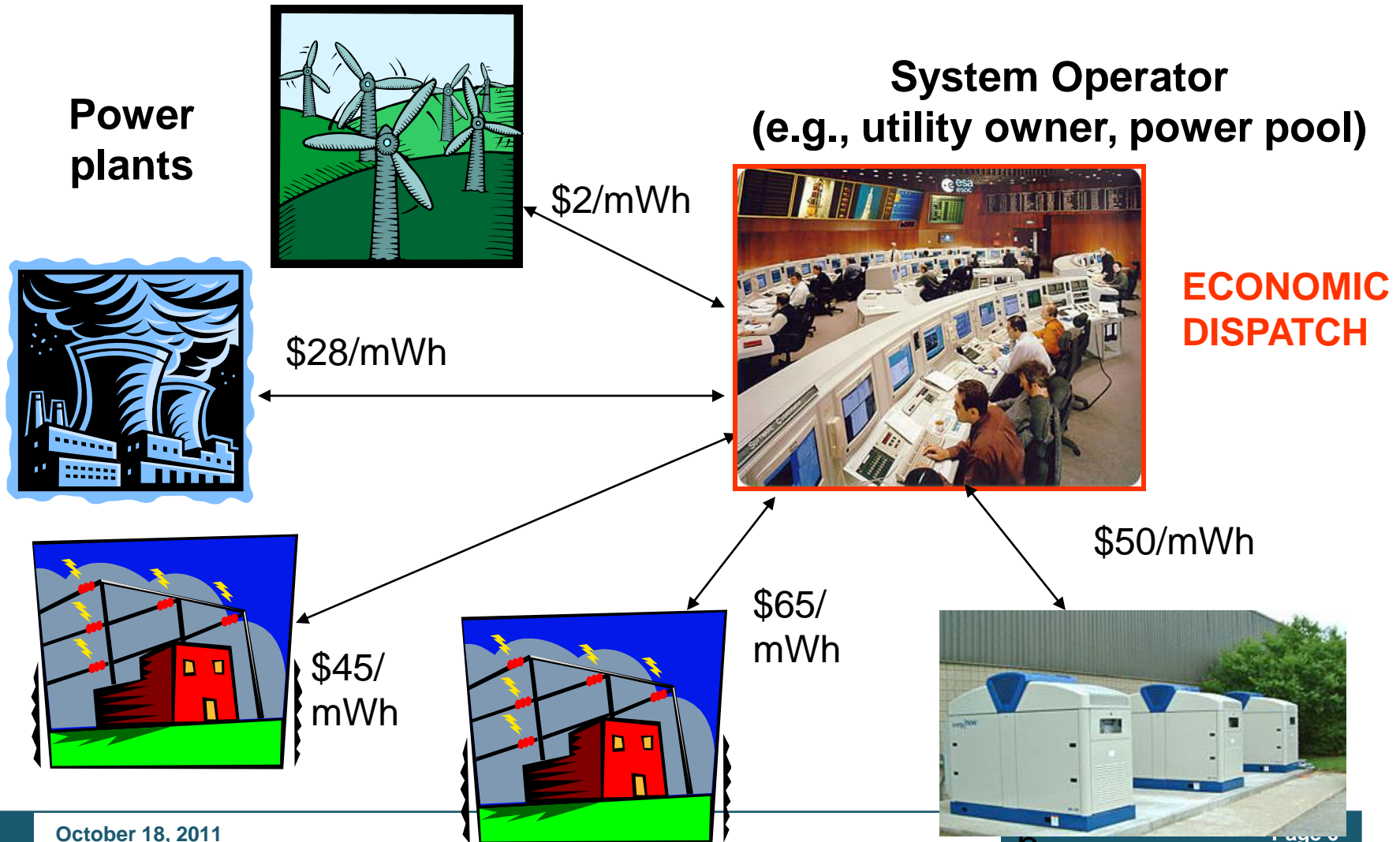
- How should bidders develop their bids?
- How should market administrators choose bids?
- How should bidders be paid?

Thinking About Dispatch of the Electric System

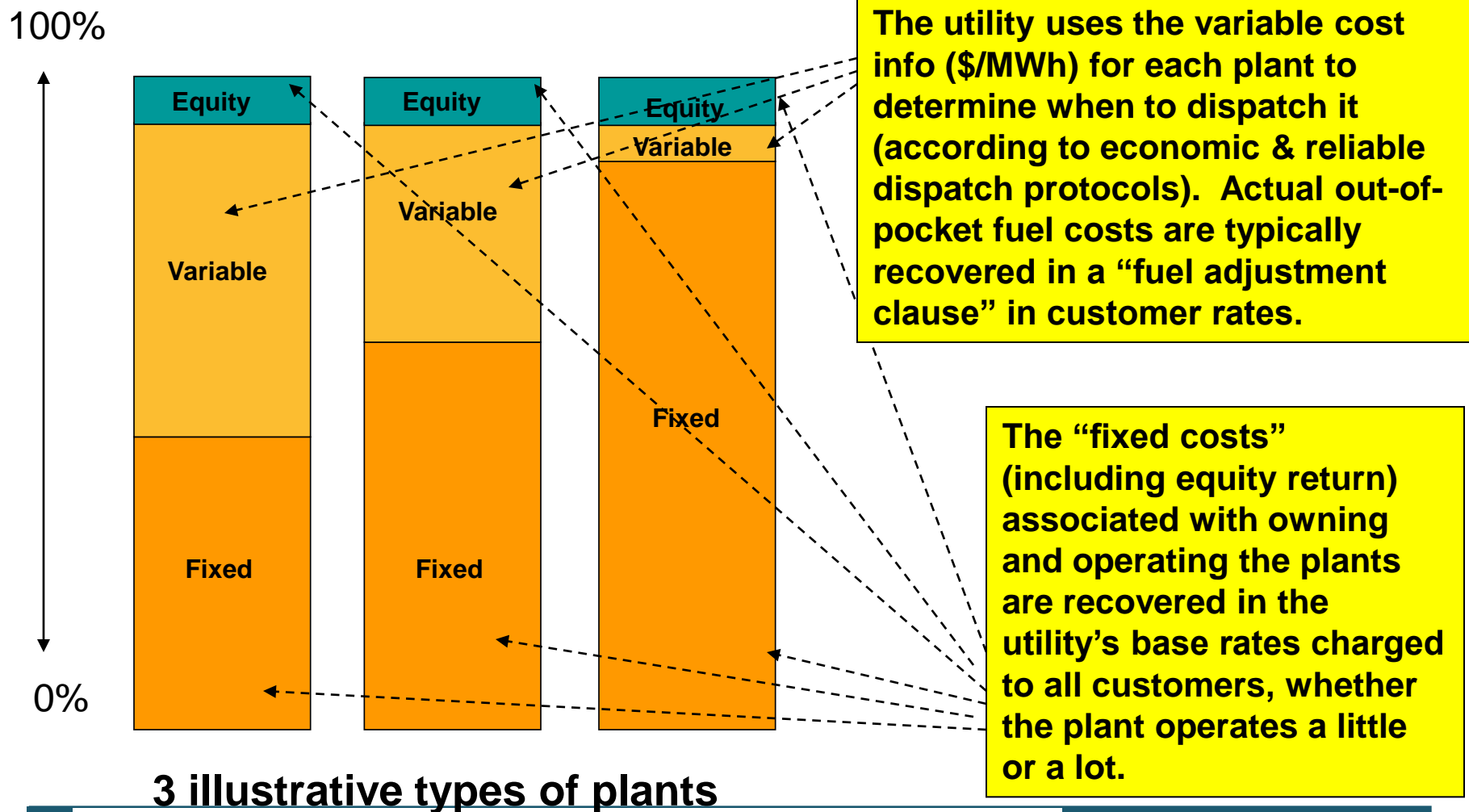
Dispatch Under Different Systems/Market Designs:

- Under traditional utility regulation
- Under a single-clearing-price market design
- Under a pay-as-bid model

Commonalities: A Means to Determine Which Generating Resources to Dispatch



Traditional Cost-of-Service Model: Economic Dispatch and Cost Recovery for Plants

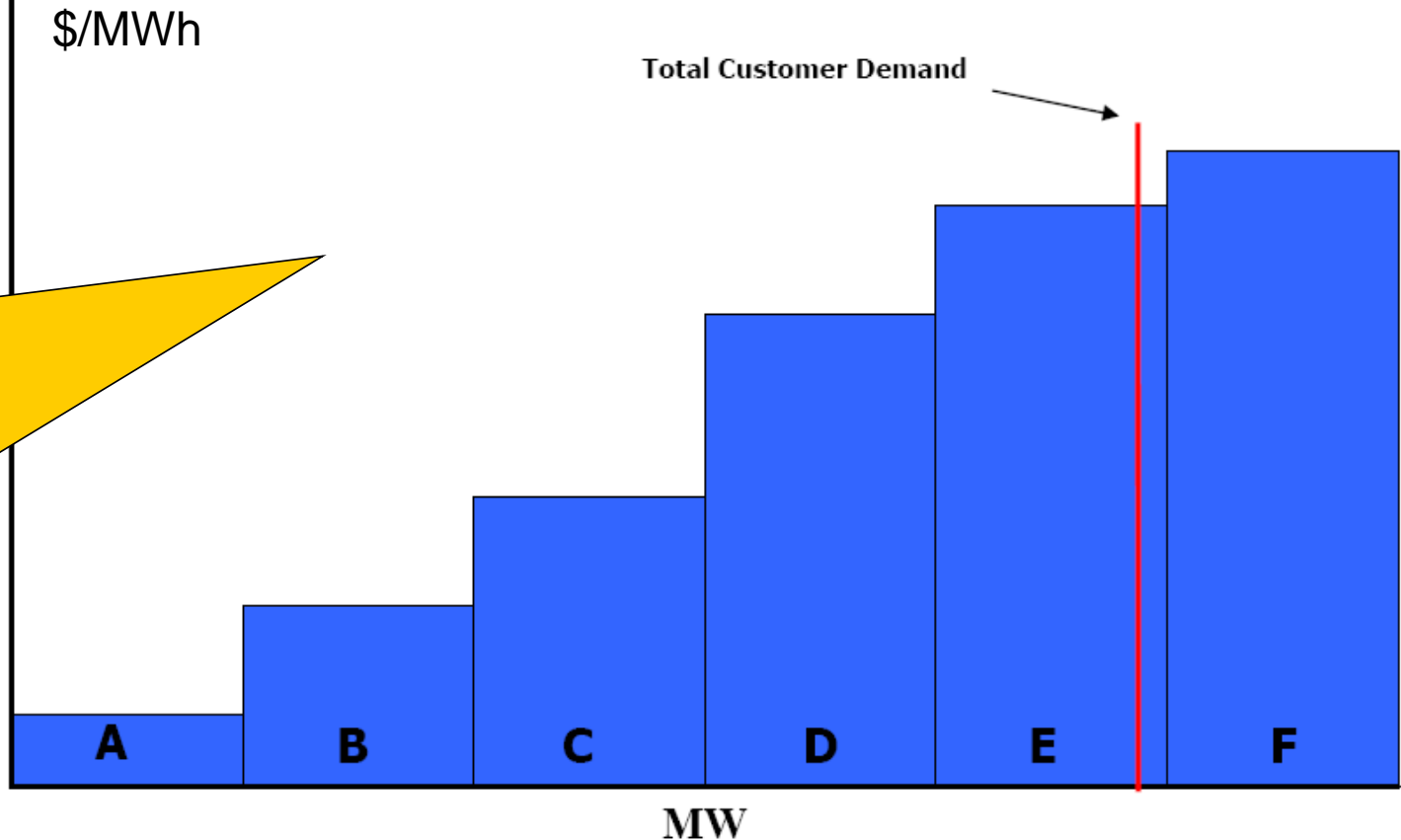


Traditional Cost-of-Service Model: Power Plant Dispatch

* Under traditional regulation, these costs are built into base rates or power supply contracts that cover fixed costs (e.g., capital expenditures, labor, land, taxes, profits, etc.)

* A power plant owner recovers its “fixed costs” of owning and operating the plants outside of the system that determines dispatch order.

Traditional Dispatch of Plants – Where Fixed Costs* Recovered in Ratebase



U.S. Electric Markets with Clearing-Price Markets

State auctions for procuring wholesale supply of default service:

- **New Jersey**
- **Illinois**

State/regional wholesale markets

- **California ISO**
- **ERCOT**
- **ISO-New England**
- **Midwest ISO**
- **NYISO**
- **PJM**
- **SPP**

- This single clearing-price auction design is used in countless other types of markets
 - E.g., agricultural commodities, telecommunications markets

Clearing-Price Markets in RTOs: Economic Dispatch and Cost Recovery for Power Plants

Plants recover revenues in markets which pay them for performance:

- **In an “energy market” (e.g., Day-Ahead) (MWh)**
 - Payments are made when the plant is scheduled for dispatch
 - No payments to a plant not dispatched
- **In a “capacity market” (e.g., installed capacity market) (MW)**
 - Payments made when the plant is selected to provide capacity
 - No payments to a plant not dispatched
- **Other markets**
 - Payments tied to performance of the plant (e.g., for ancillary services) or the system (e.g., transmission congestion contracts)

Aspects of the Uniform-Clearing-Price Auction

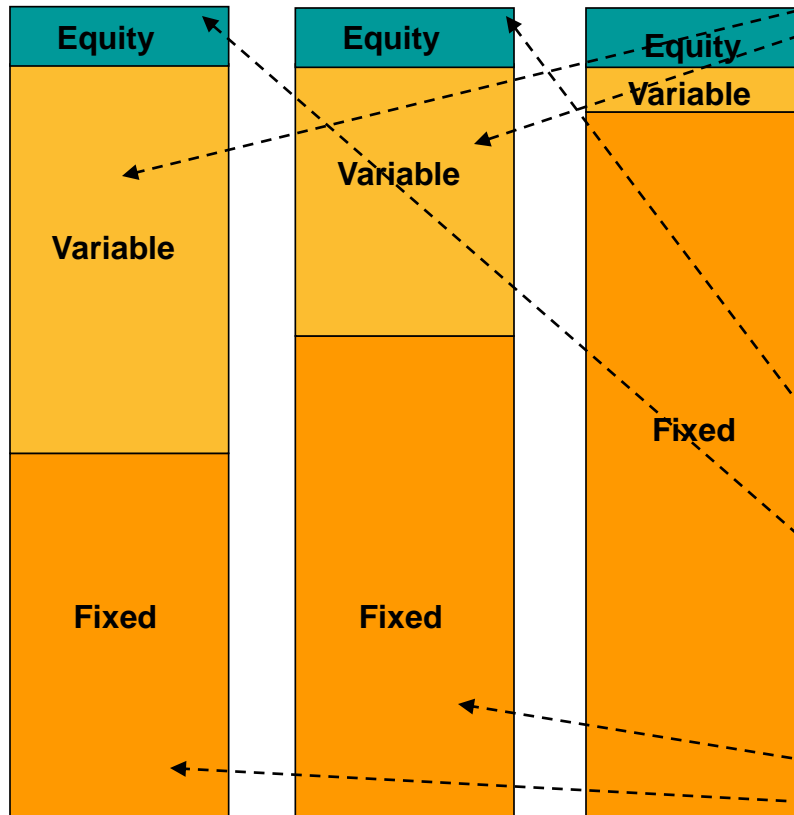
- **Clearing Price:**
 - Offer price of the last supply resource selected in the market
 - \$ paid to sellers selected in the market
 - \$ paid by buyers in the market
- **Suppliers not selected are not paid in this market**
- **Buyers that elect not to buy power at a price above \$x, are not supplied when the clearing price would hit that level**

RTO Clearing-Price Market: Economic Dispatch and Cost Recovery for Power Plants

100%



0%



The RTOs uses offers from the plant (\$/MWh) to determine when to dispatch it (according to economic & reliable dispatch protocols) to meet load in any hour:

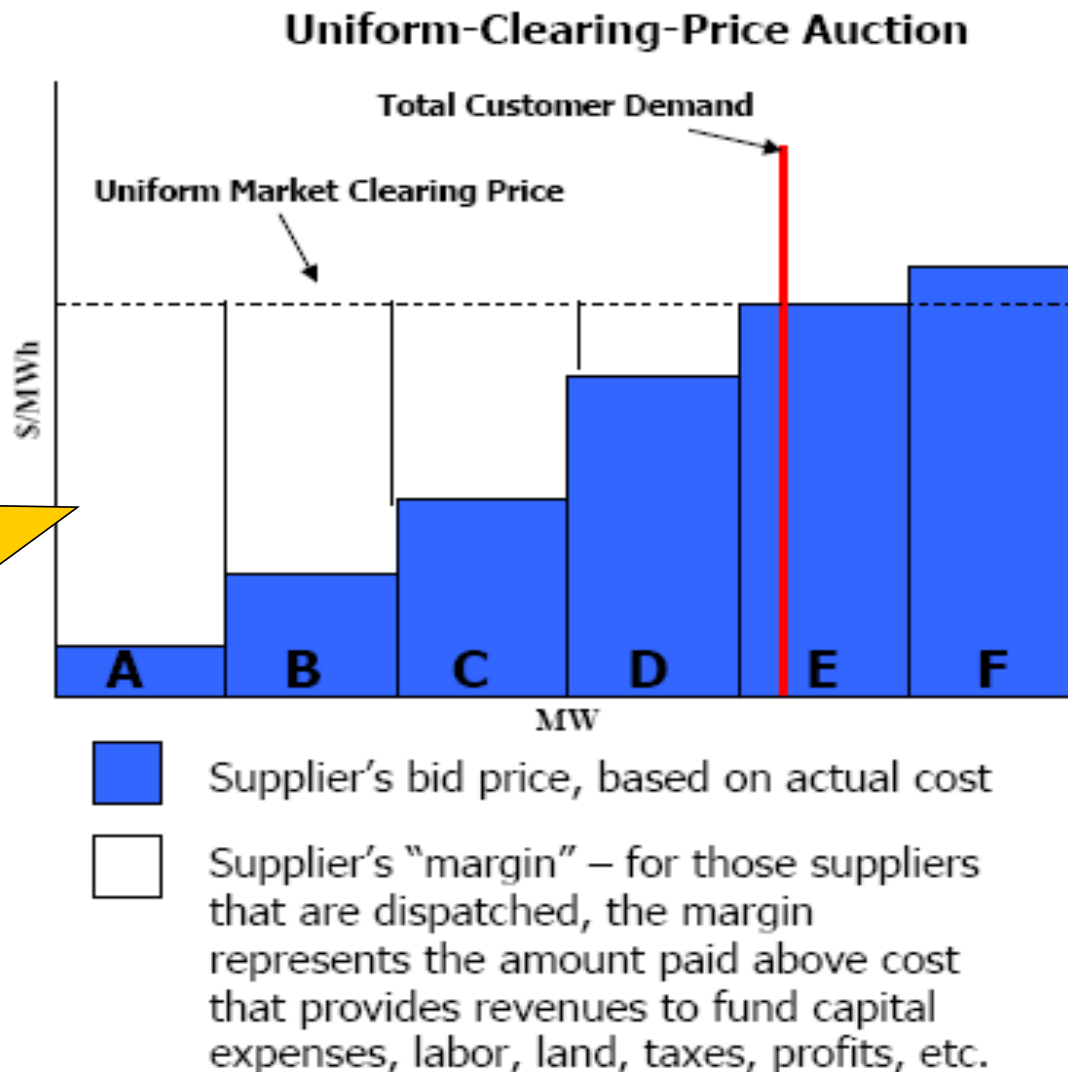
- An offer selected for dispatch is paid; a plant not selected is not paid.

Recovery of “fixed costs” (including equity return) is “at risk” – that is, fixed costs are recovered through the plant’s actual performance in various markets (e.g., energy, ancillary service, capacity markets).

3 illustrative types of plants in a “pure” clearing-price market

RTO with Clearing Price Model: Dispatch

- Under a single clearing price energy market design, power plant owners' fixed costs are not in utility rate base.
- The owner must attempt to recover its fixed costs through operating its plant and recovering monies in the energy market (and through a combination of other strategies, including contract payments, capacity market payment, ancillary service market payments, etc).
- Recovery of these fixed costs is typically at risk – and tied to power plant performance



Motivations in Developing Supply Offers – And Implications for the Market (including Buyers)

- **When paid the clearing price, offers at variable cost accomplish several objectives:**
 - **For the seller:**
 - Increases the chance of being selected and being paid a price above out-of-pocket operating costs
 - Provides “contribution” towards paying fixed costs
 - **For the system:**
 - System will be accomplish economic dispatch of plants (with lowest-cost producers selling ahead of other higher-cost producers)
 - This will minimize the overall cost to buy power in this market
 - Important for cost-effective “demand response”
 - Provides clear and transparent energy price information

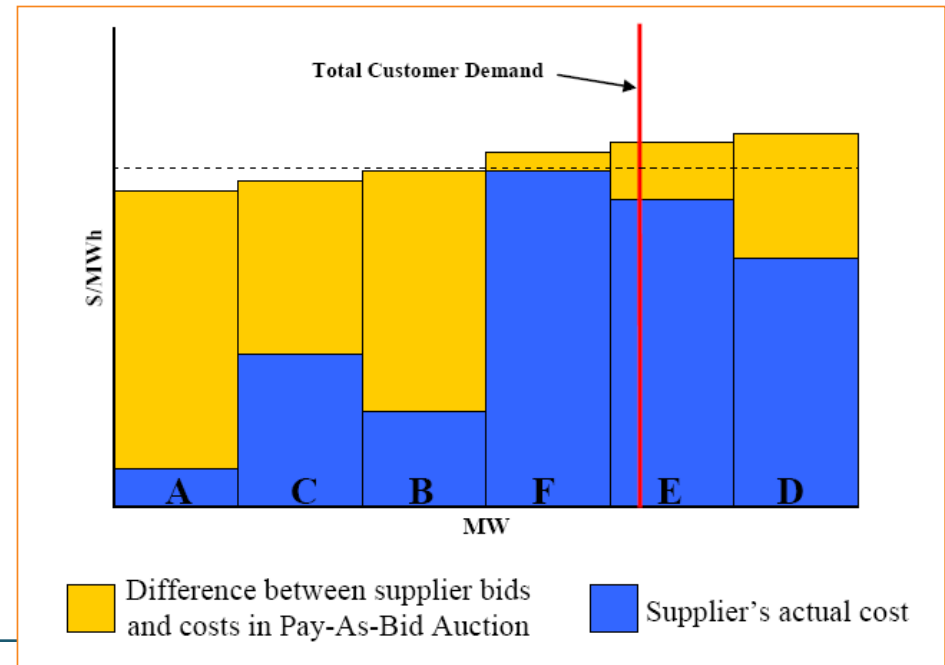
Pay-As-Bid

Mechanics:

- Bidders make offers to auction administrator
- Market administrator selects bids according to minimizing the total offer prices to supply load
- Winners paid their actual bid, not the clearing price

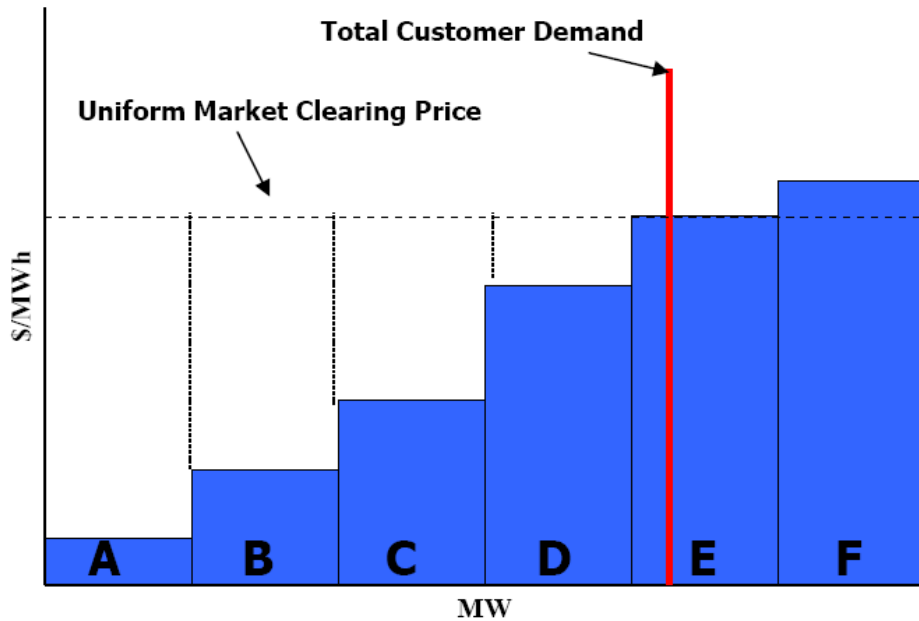
Basis for intuitive appeal:

- Some observers argue that “pay-as-bid” auctions will lower costs because sellers are paid their offer price, not clearing price



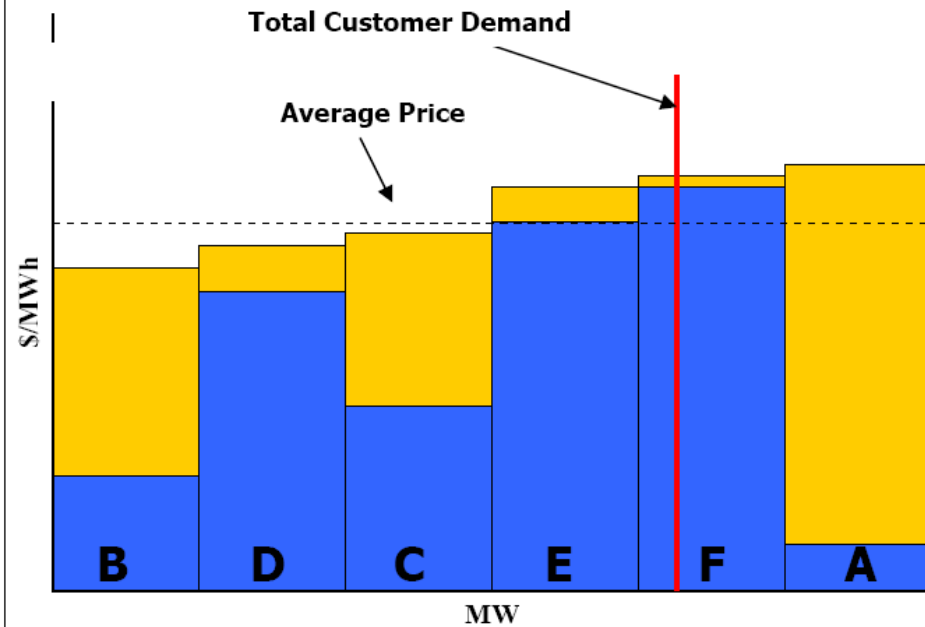
Power Plant Dispatch and Cost Recovery Under a Pay-As-Bid Market Design

Uniform-Clearing-Price Auction



- Supplier's bid price, based on actual cost
- Supplier's "margin" – for those suppliers that are dispatched, the margin represents the amount paid above cost that provides revenues to fund capital expenses, labor, land, taxes, profits, etc.

Pay-As-Bid Auction



- Supplier's actual cost
- Amount above supplier's cost that is built into supplier's bid.
- + = supplier's bid

Comparing Pay-As-Bid Versus Clearing-Price Markets

- **Suppliers no longer motivated to offer to sell at their variable price, since their offer price is their payment if selected.**
 - **Suppliers motivated to guess where the auction will end up and offer a price just below it.**
 - **Pay-as-bid pricing likely leads to more opportunities to game the system.**
- **Because pay-as-bid auctions put greater emphasis on market price forecasting, all generators would face increased costs to ramp up energy price forecasting programs.**
 - **These costs would ultimately find their way down to the rate payers.**

Comparing Pay-As-Bid Versus Clearing-Price Markets

- **The LMP provides accurate price signals to market participants for generation and demand-side resources.**
 - **In a pay-as-bid model, the system operator cannot see offers reflecting variable costs**
- **System dispatch is no longer economic, since it is based on offers reflecting both fixed and variable costs.**
- **True low-cost suppliers may not be dispatched:**
 - **Example: wind plant must guess a price that will allow it to sell but recover fixed costs; if the guess is too high, the wind plant (with virtually zero operating costs) won't be selected.**

Comparing Pay-As-Bid Versus Clearing-Price Markets

- **Bottom line: Why so many organizations use clearing-price mechanisms:**
 - **The LMP is more likely to result in a dispatch stack that truly reflects the market supply curve and grid conditions.**
 - **Conversely, pay-as-bid auctions may not result in a least-cost dispatch stack and are more likely to result in an inefficient plant dispatch.**
 - **Studies show that “pay-as-bid” markets do not produce results lower than single-clearing-price auction designs.**

Questions?

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Implementing a WECC-Wide Imbalance Market: Lessons from the California ISO Real-Time Market

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Outline of Talk



- Imbalance market for Western Electricity Coordinating Council (WECC) currently exists in California
 - California ISO's real-time market price provides real-time opportunity cost of energy in WECC
- Many “seams” issues have arisen in California ISO over the years, many of which must be addressed in WECC-wide imbalance market
 - Ex ante versus ex post pricing
 - Consequences of failing to perform
 - Treatment of intermittent versus dispatchable resources
 - Financial transmission rights
 - Allocation of ancillary services costs
- External issues
 - Regulatory treatment of imbalance purchases and sales
 - How many market operators



California ISO's Real-Time Market

- Two ways for imports to participate in the ISO's real-time market
 - Dynamic schedules—Must respond to 5-minute dispatch instructions similar to internal resources
 - Requires demonstrating ability of resource to respond to ISO operators
 - Static intertie schedules—Set during hour-ahead scheduling process (HASP) and deemed delivered as scheduled
 - Does not require showing responsiveness of resource to ISO operators
- Dynamic schedules receive and pay 5-minute real-time price (RTP)
 - Liable for imbalance costs if fail to respond to ISO's dispatch instructions
- Static intertie schedules—Paid real-time pre-dispatch price (RTPD)
 - If schedule has been tagged with neighboring control area, then it is that control area's responsibility to ensure delivery of energy to ISO control area



WECC-Wide Imbalance Market

- Setting prices in multiple locations without centralized market mechanism induces market inefficiencies particularly with a locational marginal price (LMP) market in California
 - Optimal dispatch and LMPs for California ISO control area given intertie offers is different from optimal dispatch and LMPs for entire WECC given offers for entire WECC
 - California ISO could run imbalance market for entire WECC using final schedules and offers submitted to a WECC-wide imbalance market
 - Real-time pre-dispatch for static schedules
 - Real-time market for dynamic schedules



WECC-Wide Imbalance Market

- Multiple control areas using ex ante pricing, as in California ISO control area, makes running WECC-wide market more difficult
 - Stale prices that are inconsistent with actual system conditions more likely to prevail across control areas
 - Can create incentives for suppliers deviate from schedules
 - Ex post pricing can be used in neighboring control areas to set prices based on instructions suppliers received and actions they actually took
 - Limits incentives for suppliers deviate from schedules
 - Suppliers obey system operator in their control areas and ex post prices are set based on actions that they took and offers they submitted
 - Can require suppliers that significantly deviate from operator's instructions to be price-takers in ex post price-setting process



Consequences of a Failure to Perform

- Under current California ISO market failure to perform handled differently depending on type of intertie schedule
 - For static intertie schedule that has been tagged with neighboring control area, it is responsibility of that control area to deliver energy to California control area
 - For dynamic schedule, market participant submitting schedule is held responsible for deviations
- A penalty mechanism is necessary to ensure all participants perform on their WECC-wide imbalance market commitments
 - Can be incorporated into pre-existing mechanisms in each control area
- As size of market grows, the cost of participants not honoring their dispatch commitments grows
 - In a WECC-wide market with static and dynamic schedules creating and resolving deviations from schedules can be profitable



Symmetric Treatment of Generation Sources

- All generation sources offering into WECC-wide imbalance market must be treated symmetrically
- California ISO has Participating Intermittent Resource Program (PIRP) that does not require intermittent resources to pay imbalances charges on an hourly basis if they agree to be scheduled by California ISO
- Only resources that provide standardized product sold in WECC-wide market to should be allowed participate



Congestion Management in Imbalance Market

- Degree of spatial granularity in pricing should be consistent configuration of transmission network
- Setting a zonal price over an entire region can create system reliability challenges
 - Suppliers in congested local area may deviate from schedule because of high zonal price
- Extending California ISO's real-time LMP market to WECC is most straightforward way to address this problem
- Alternatively running ex post market in each control area is also possible, but also more complex



Financial Transmission Rights

- Creation of financial transmission rights to allow entities to hedge congestion charges
- Sellers located distant from load center may wish to hedge congestion costs
- Inter-state or inter-control area financial transmission rights (FTR) needed to hedge locational price risk
- How will these transmission rights operate and how will they be funded?



Ancillary Services Costs

- Due to anticipated trading in WECC imbalance market different control areas may need to procure more or less ancillary services
- Regions with significant wind may require significant amounts of ancillary services even though wind energy may be sold to other control areas
- How will ancillary services be serve WECC imbalance market be procured and how will costs be allocated?



Regulatory Treatment

- How will regulators in neighboring control areas treat participation in WECC imbalance market?
- Making costs and benefits a pass-through to consumers may lead to excessive reliance on market
- Not passing costs or benefits through to consumers could cause entities to avoid participating in market



How Many Market Operators?

- Consolidation of control areas for operation of WECC-wide imbalance market has potential for cost savings
- Consolidation implies giving up state-level control over market
- Oversight of WECC-wide imbalance market by regulatory authorities in each state could be a way to address this problem
 - Market should not be created without adequate regulatory oversight



Conclusions

- Significant benefits to WECC-wide imbalance market
 - Suppliers rewarded for remaining on and providing additional energy when it is needed anywhere in WECC
- A number of market design challenges can be solved by extending California ISO design to entire WECC
 - Political resistance likely to be substantial
- A more loosely connected WECC-wide market has a significant risk of adverse consequences
- Do not create a WECC-wide imbalance market without adequate state-level regulatory oversight

Response – Commissioner Jason Marks New Mexico PRC



Participant Questions



Thank you for participating.

This presentation and a recording of this webinar will be available on our website at <http://www.westgov.org/wieb/>.

