



Uniform Price vs. Differentiated Payment Auctions

A Discussion of Advantages and Disadvantages

PREPARED FOR

Independent Electricity System Operator
ICA Fundamentals and Concepts Stakeholder Meeting

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THE **Brattle** GROUP

Agenda

- **Overview**
- **Uniform Price Auctions**
- **Pay-as-Bid Auctions**
- **Differentiated Payments for Existing and New Resources**
- **Implications for Ontario**

Overview

- Some stakeholders have posed the question of whether all resources should be paid the same price in the capacity auction or whether different prices should be paid to different resources
- To help inform that question, we look at the theoretical and practical implications for Ontario with:
 - **Uniform Price Auctions:** All resources paid the same price
 - **Pay-as-Bid Auctions:** Cleared resources paid at their offer price
 - **New vs. Existing:** Differentiated payments for new and existing resources
- We review the advantages, disadvantages, and implications for Ontario for each of these approaches and provide our thoughts

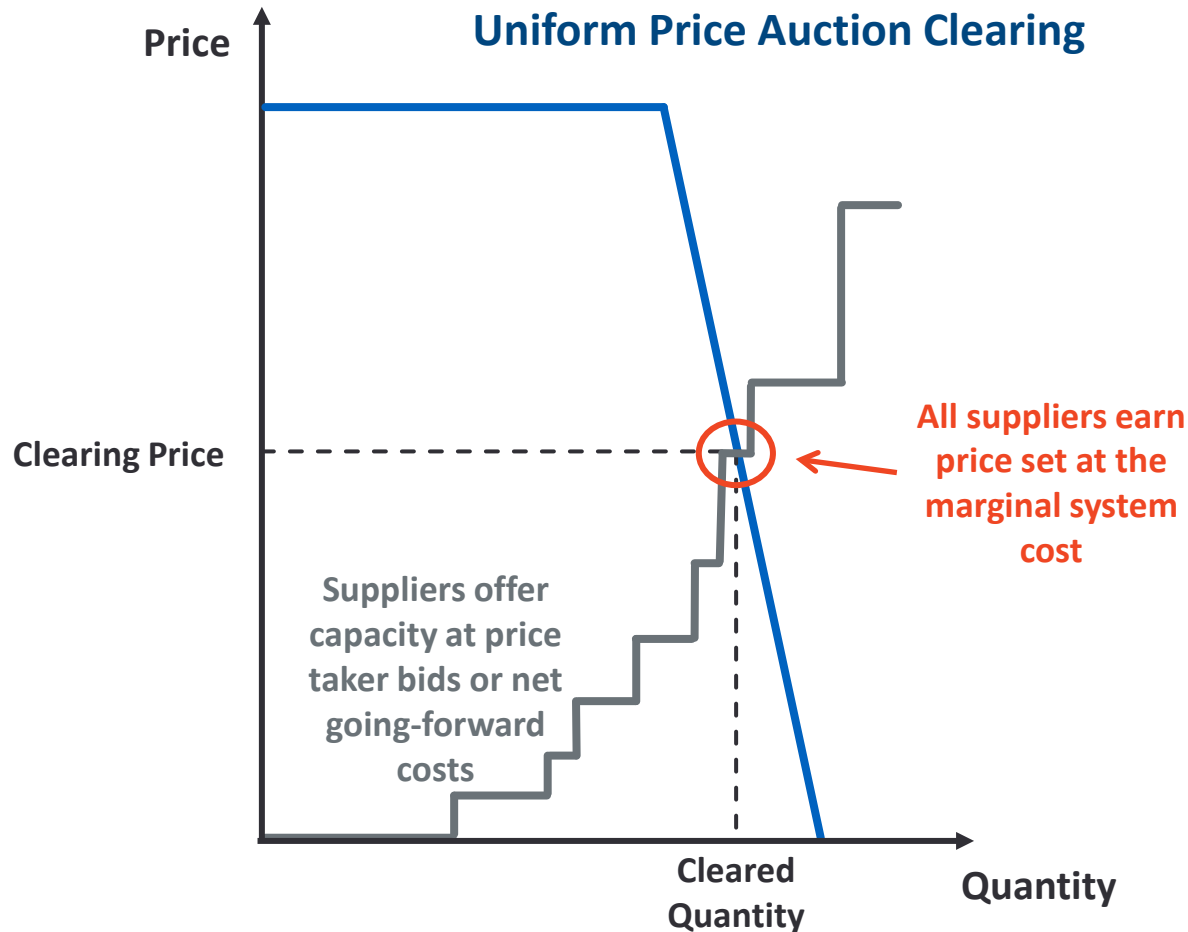
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Uniform Price Auctions

How Uniform Price Capacity Auctions Work

- Sellers submit offers to sell capacity and lowest-price offers are selected
- Highest selected offer sets uniform clearing price paid to all resources



Same Approach Used in:

- Ontario's energy market
- Other capacity markets (PJM, NYISO, ISO-NE, MISO)

Uniform Price Auctions

Advantages

Uniform price auctions achieve the most efficient results in the short run and in the long run

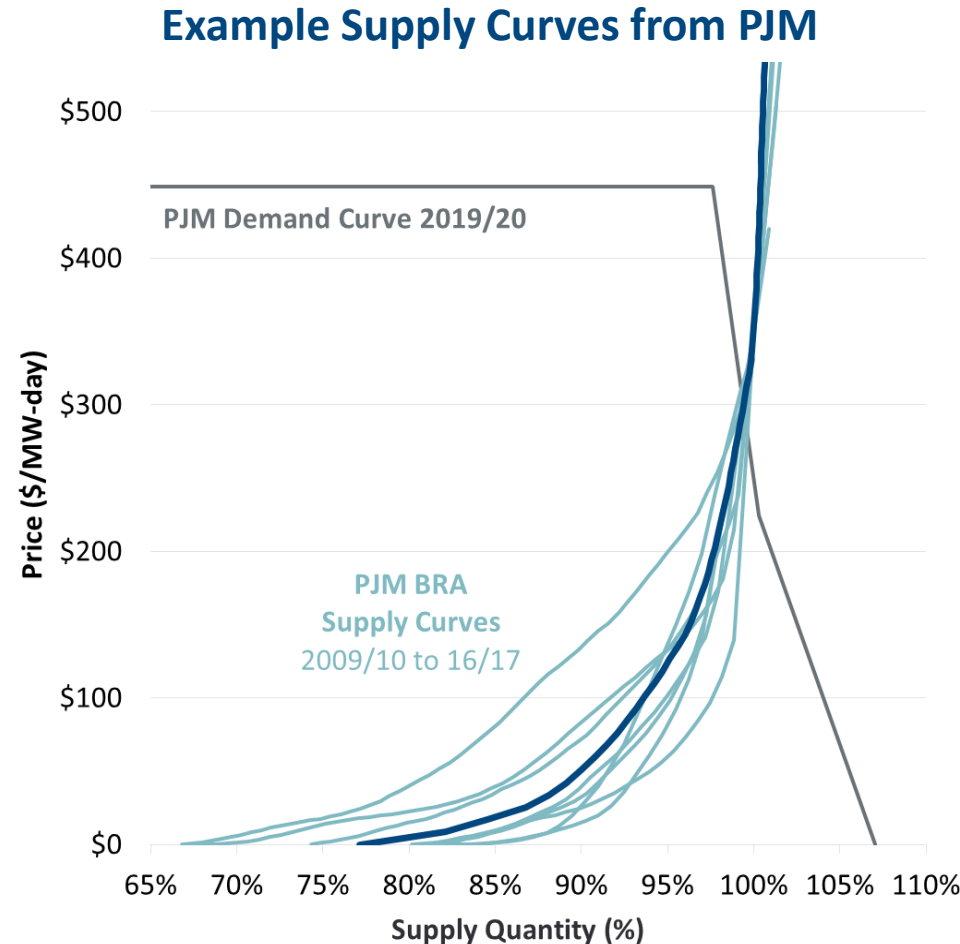
- **Incentives for Suppliers:** Most significant advantage is that it incentivizes suppliers to offer at the lowest-acceptable price to maximize their likelihood of clearing profitably. Other advantages are mostly a consequence of this incentive
- **Societal Costs:** Minimized, as market clears the lowest-cost mix of resources*
- **Customer Costs:** Minimized in the long run, as long-run customer costs are lowest when societal costs are minimized
- **Equity:** Recognizes equal value for all providers of the same product (MW of capacity, derated for probability of being available to serve load)
- **Innovation:** Competition across all resources creates strong incentives for innovative, low-cost resources to enter
- **Mitigation:** allows for enhanced market power monitoring and mitigation
- **Tested:** Proven, well-functioning approach used in all capacity markets to date

* Customer costs = price x cleared quantity. Societal costs = producers' investment + production costs.

Uniform Price Auctions

Disadvantages

- **Primary Disadvantage:** “Hockey-stick” shaped supply curve can create price volatility. It accurately reflects underlying economics, but produces challenges:
 - Year-to-year price swings may be large
 - Exposure to exercise of market power if not mitigated
- **Challenges can be managed** via market design
 - Price volatility limited by sloped demand curve and forward auctions
 - Robust market monitoring and mitigation to limit exercise of market power
 - With “performance incentives” (new PJM or ISO-NE approach), supply curve is flatter



Sources and Notes:

[http://www.brattle.com/system/testimonies/pdfs/000/001/026/original/Testimony of Newell Spees and Oates Docket No. ER17-284-000.pdf?1478644510](http://www.brattle.com/system/testimonies/pdfs/000/001/026/original/Testimony%20of%20Newell%20Spees%20and%20Oates%20Docket%20No.%20ER17-284-000.pdf?1478644510)

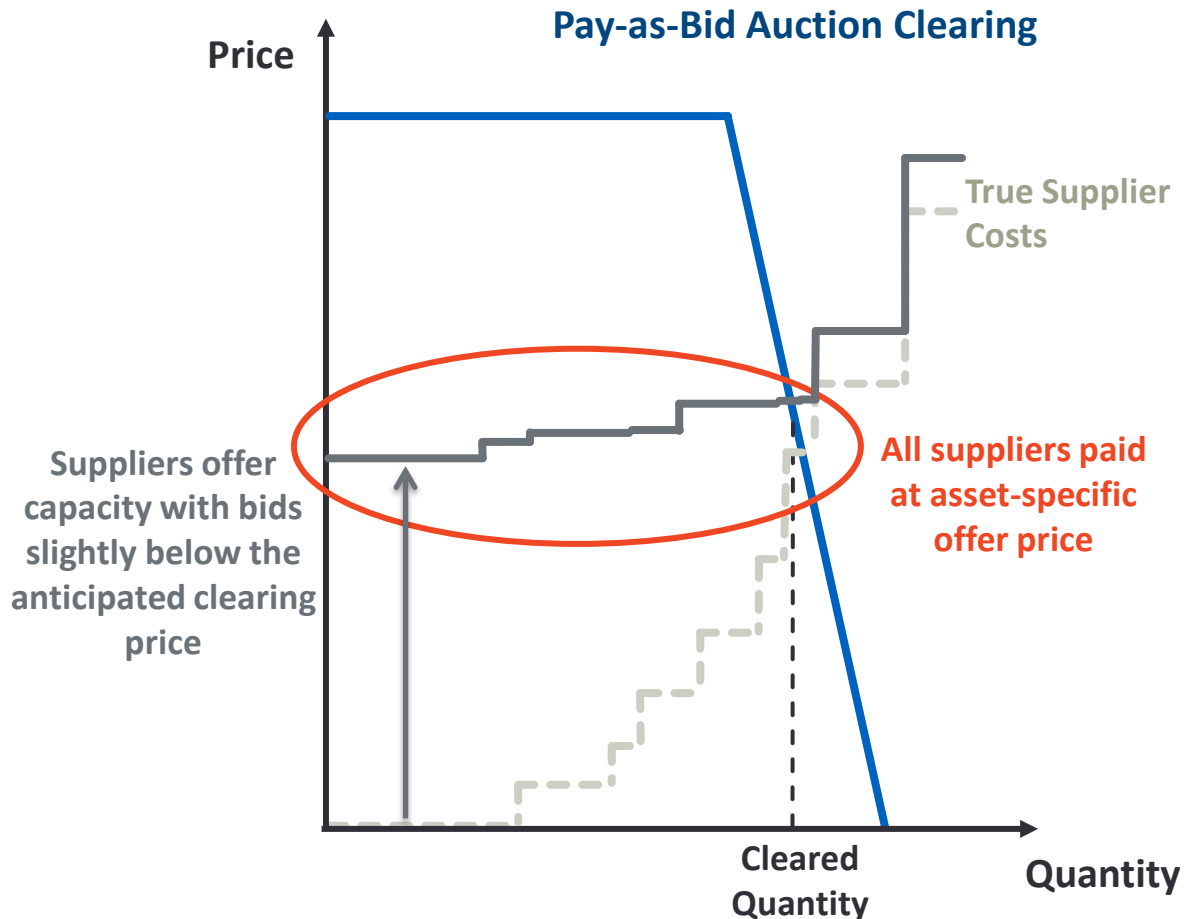
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Pay-as-Bid Auctions

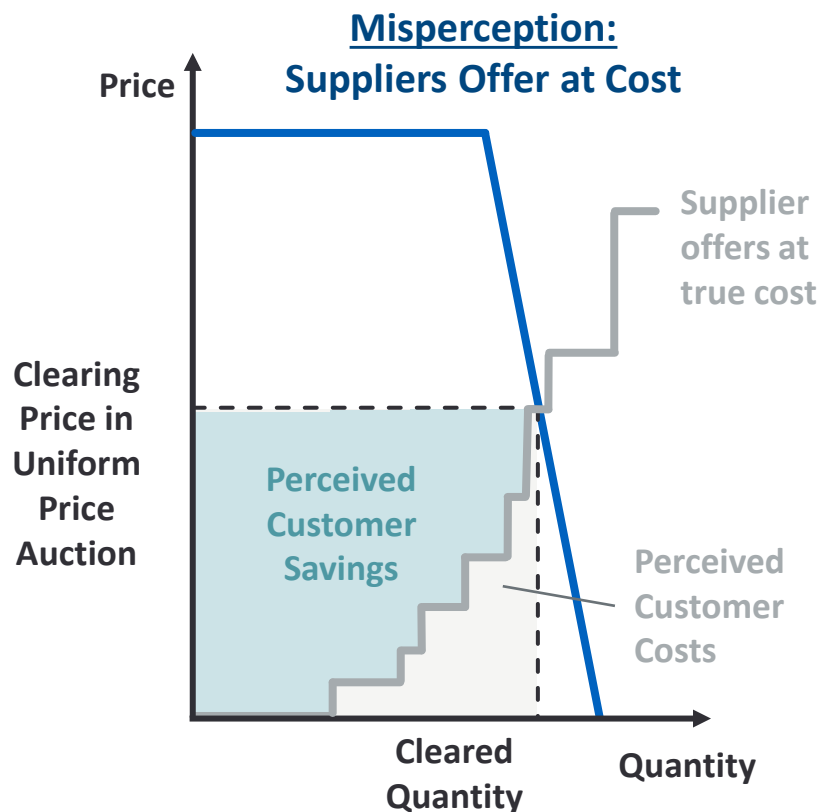
How Pay-as-Bid Auctions Work

- Sellers are incentivized to offer above cost (and just below the highest expected clearing price) to clear at a high market price
- Cleared offers are paid at their offer price



Customer Costs in a Pay-as-Bid Auction

- Common misperception is that customer costs would be lower with pay-as-bid auction compared to uniform price
- In reality, customer costs are likely to be similar or higher because supplier bids are incentivized to be higher



Advantages of Pay-as-Bid Auctions

Primary advantages are associated with the relatively flatter supply curve in pay-as-bid auctions

- **Volatility:** Decreases price volatility and customer cost volatility to the extent participants accurately anticipate clearing prices (does not reduce supplier revenue volatility due to risk of not clearing)
- **Market Power:** Can reduce incentives and ability to exercise market power (as long as there is a sufficient number of suppliers and they have limited information about others' offers and final clearing results)

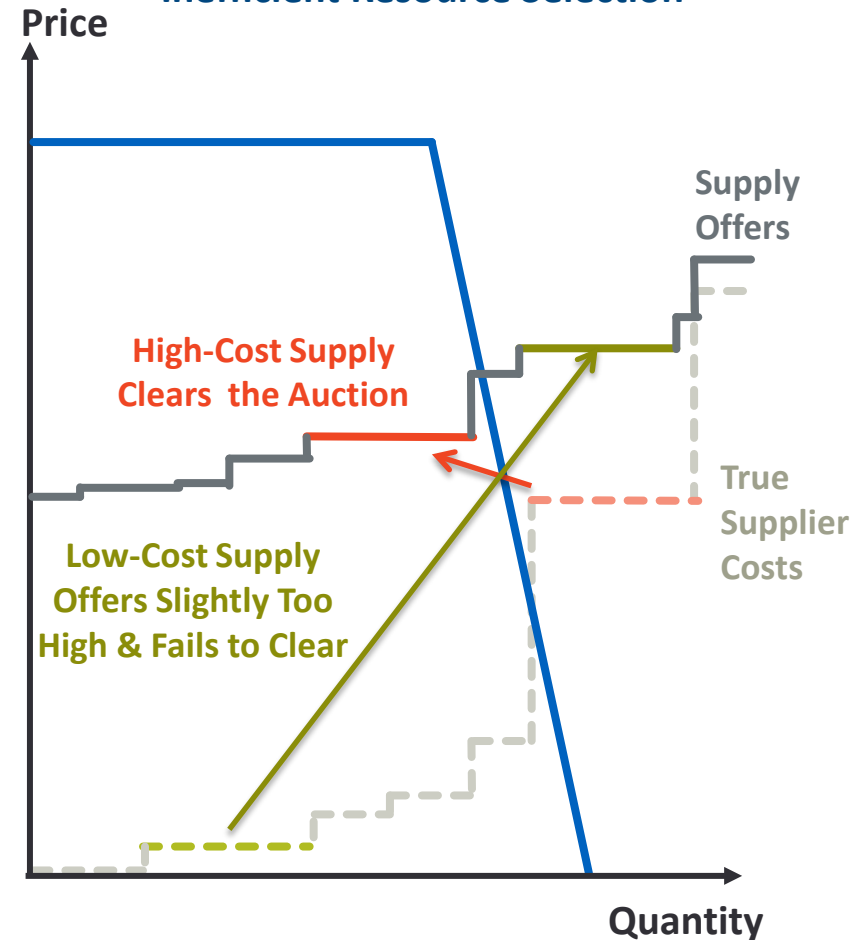
Pay-as-Bid Auctions

Disadvantages

Auction format incentivizes offers above net going-forward cost, potentially leading to undesirable outcomes

- **Inefficient Clearing:** Low-cost resources may offer too high and fail to clear, causing them to exit while higher-cost resources enter
- **Higher New Entry Offer Prices:** New entrants will need to offer at higher prices due to risk of not clearing in subsequent auctions, creating a “target” price above that of a uniform price auction*
- **Disadvantages Small and New Suppliers:** Creates an economic advantage for incumbents and large players with more information about supply offers
- **Higher System and Customer Costs:** Inefficiencies will tend to drive higher system and customer costs than uniform price auction

Example of Inefficiency: Supply Offers Not Reflective of True Cost Resulting in Inefficient Resource Selection



*As illustrated in the figure, low-cost resources face the risk of not clearing the auction if they inadvertently offer above the highest accepted offer price.

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Perspectives: Differentiating New/Existing Supply

- Perspectives of customer and existing supplier likely differ significantly on whether it would be appropriate to differentiate payments to new and existing resources

Potential Customer Perspective

- Existing suppliers have already earned back investment costs under prior contracts
- Existing resources do not need the same capacity revenue as new resources to keep operating
- Customer costs will be lower if existing resources are paid less
- Unfair to ask customers to pay above cost for previously-contracted resources

Potential Supplier Perspective

- Suppliers participating in RFPs for new contracts assumed some terminal value (investment costs not fully recovered)
- Existing plants need capital expenditures for reinvestment/refurbishment to continue operating and compete with new plants
- Taking on new risk of low or volatile capacity prices (as observed in other markets)
- Unfair to pay less when providing the same value

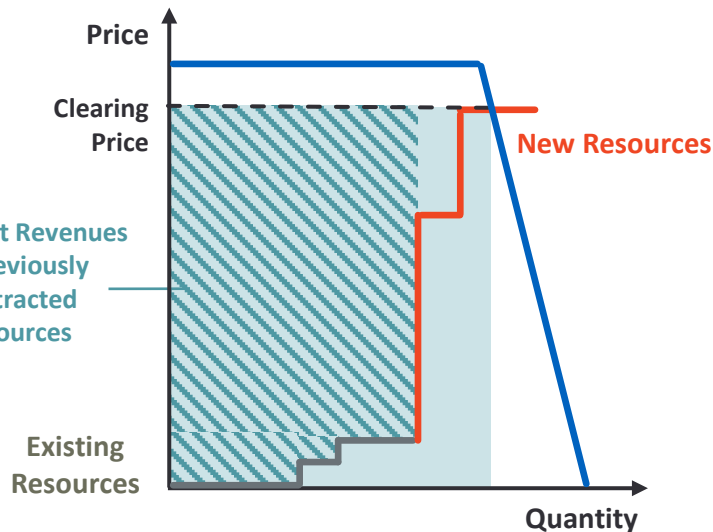
New vs. Existing

Perspectives Driven by “Worst Case Scenario”

Customers are likely to focus on the risk of high prices. Suppliers will focus on the risk of low prices

Customers' Concern

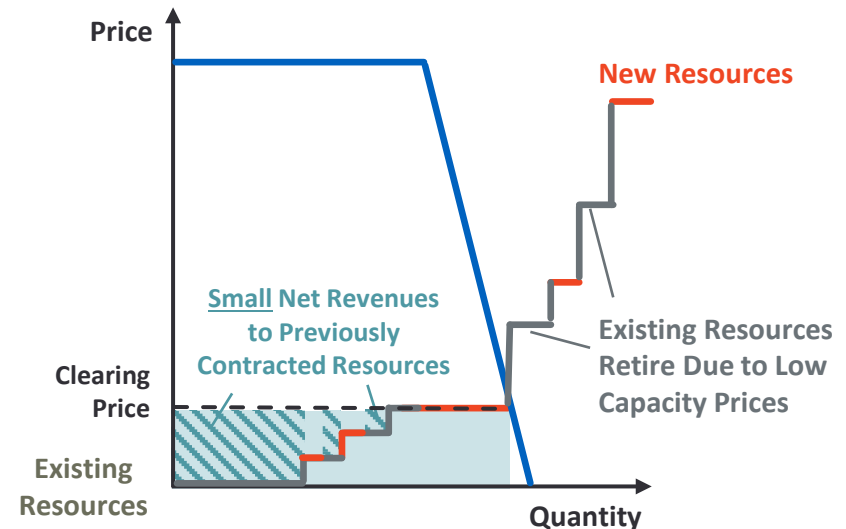
Previously-Contracted Resources Earn Revenues Above Going-Forward Costs



- **Perceived high-cost scenario:** New entry required at a high cost; low going-forward costs for previously-contracted resources
- **Result:** Customers may see high revenues to previously-contracted resources as “unfair” if they have already recovered investment costs

Suppliers' Concern

Capacity Prices May Be Low (As Realized in Other Capacity Markets)



- **Realized scenario in other capacity markets:** Innovation, competition, and low-cost entry keep customer costs low
- **Result:** Customers benefit from low costs (existing suppliers may earn insufficient revenue to continue operating)

Advantages of Differentiated Payments

Primary advantage of differentiated payments is the possibility to contain customer costs over a transitional period (not an advantage from a supplier or efficiency perspective)

- **Short-Run Customer Cost Savings:** Customer costs may be lower in the short run with differentiated payments under certain specialized conditions as long as:
 - Capacity prices clear at high levels, significantly above most existing resources' costs
 - Existing resources would not retire even at lower payments (e.g. assuming that there are minimal fixed or reinvestment costs required to stay online)
 - Impacts of differentiation (inefficiencies and reduced competition between existing and new resources) are modest
- **No Customer Savings Longer-Term:** Over time, customer benefits will erode and possibly reverse due to growing inefficiencies (see next slide)

New vs. Existing

Disadvantages

Primary disadvantage of differentiating payments is the economic inefficiency that would be introduced

- **Higher-Cost Supply Mix:** Preferential treatment for new resources will introduce greater incentives to attract higher-cost new supply, even while lower-cost existing resources may retire prematurely (less competition between existing and new resources)
- **Higher Prices Needed to Attract Entry:** New entrants will wait for higher prices before entering the market due to prospects of low revenue once they become “existing” supply
- **Higher Long-Run Customer Costs:** Customer costs may be lower during a transition period, but will eventually rise higher than in a resource-neutral approach due to the impact of economic inefficiencies and reduced competition
- **Equity and Implementation Challenges:** How to define new vs. existing capacity? What price to pay existing resources? How long to set the transitional period?

New vs. Existing

California Experience with Differentiated Payments

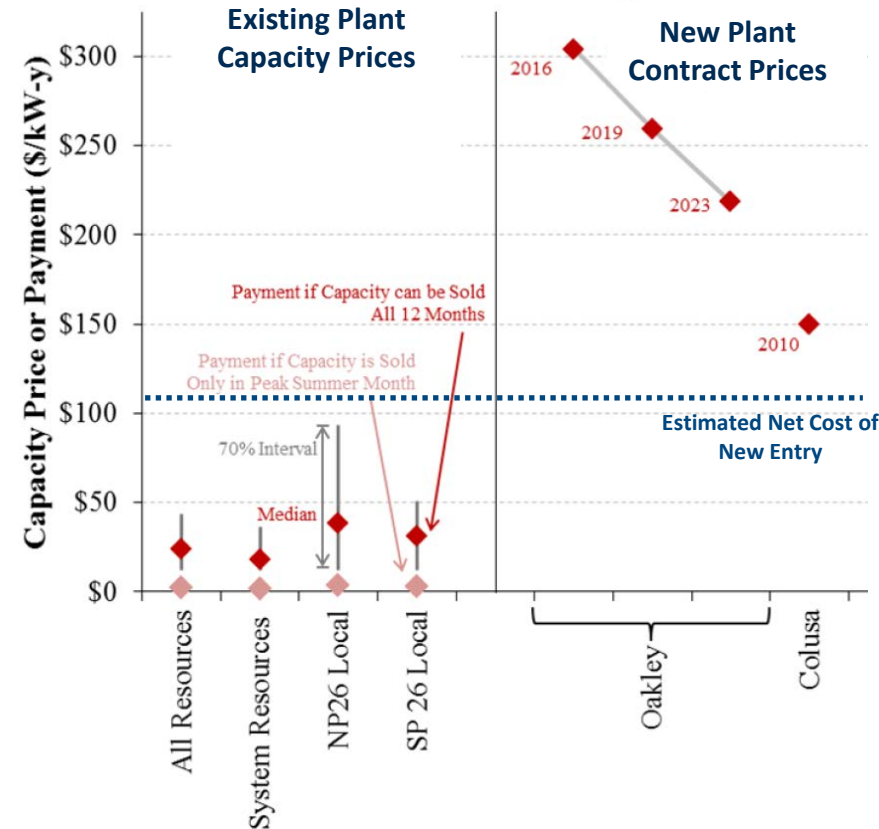
California has separate mechanisms for compensating new and existing supply

- **New Capacity:** Competitively-procured under 10-year contracts based on regulatory planning
- **Existing Resources:** Procured via short-term bilateral capacity market

Differentiation led to inefficiencies and higher customer costs:

- New plant contracts significantly above Net CONE (due to need to earn full capital costs over 10-year contract)
- More new capacity procured than needed for supply adequacy (due to difference in timing of procurements)
- Relatively-new existing plants retire after contract expiration (e.g. Sutter plant)

California: New vs. Existing Capacity Payments



Source:

http://www.brattle.com/system/publications/pdfs/000/004/827/original/Resource_Adequacy_in_California_Calpine_Pfeifenberger_Spees_Newell_Oct_2012.pdf?1378772133

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Implications for Ontario

- **Uniform Price Auction:** Evolving as best-practice approach based on international experience. Expected to achieve lowest societal costs and lowest customer costs in long-run
- **Pay-as-Bid Auction:** Would likely lead to inefficiencies, customer cost implications, and other challenges. Moderately higher price stability are not commensurate with significant risks and disadvantages
- **New vs. Existing:** Need to evaluate whether, despite the phase-in under the incremental auction design, the risk of high-priced outcomes during phase-in is anticipated to be materially greater than the risk of inefficiencies that may be introduced through differentiated pricing. If pursuing this option, consider limiting application only to guard against high-price outcomes, only to previously-contracted resources, and only over a limited transition period

Biography and Contact Information



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Mr. Pfeifenberger is an economist with a background in electrical engineering and over twenty-five years of experience in the areas of electricity markets, regulation, and finance. He has assisted clients in the formulation of business and regulatory strategy, submitted expert testimony to the U.S. Congress, courts, arbitration panels, and regulatory agencies around the world, and provided support in mediation, arbitration, settlement, and stakeholder processes. Mr. Pfeifenberger specializes in electricity market design, utility industry regulation, transmission cost-benefit analyses and network access, financial valuation, energy industry litigation, and business strategy. On behalf of his clients, Mr. Pfeifenberger has addressed resource adequacy and capacity market designs, the economic benefits and cost allocation of transmission projects, the reasons behind rate increases, implications of restructuring policies, competitive conduct in electric power markets, and the effects of proposed mergers. He has also explored the benefits of alternative regulation, the desirability of settlement proposals, and the impact of regulatory and legislative actions in the context of evolving market conditions.

Mr. Pfeifenberger received an M.A. in Economics and Finance from Brandeis University and an M.S. in Power Engineering and Energy Economics from the University of Technology in Vienna, Austria.

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Dr. Lueken is an economist and engineer with expertise in wholesale electricity market design, environmental policy design, asset valuation, and business strategy. Dr. Lueken has worked with clients throughout the U.S. and internationally, including market operators, regulated utilities, and market participants. Electricity market design assignments include designing and implementing capacity markets; enhancing energy and ancillary service market scarcity pricing; incorporating climate policies into market design; evaluating market reforms to support the high levels of renewable generation; and identifying system resource adequacy requirements in the face of uncertainty. He has supported utilities and merchant investors with multiple asset valuation studies of generation and storage assets in CAISO, ERCOT, and PJM.

Dr. Lueken earned his Ph.D. in Engineering and Public Policy from the Carnegie Mellon Electricity Industry Center at Carnegie Mellon University, and a Masters of Engineering and Public Policy from the University of Maryland.

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