Capacity Auction Forward-Period

Pros and cons of spot vs. forward auctions

PREPARED FOR

Independent Electricity System Operator

ICA Fundamentals and Concepts Stakeholder Meeting

PREPARED BY

Johannes P. Pfeifenberger

Roger Lueken

Kathleen Spees

Will Gorman

James Mashal

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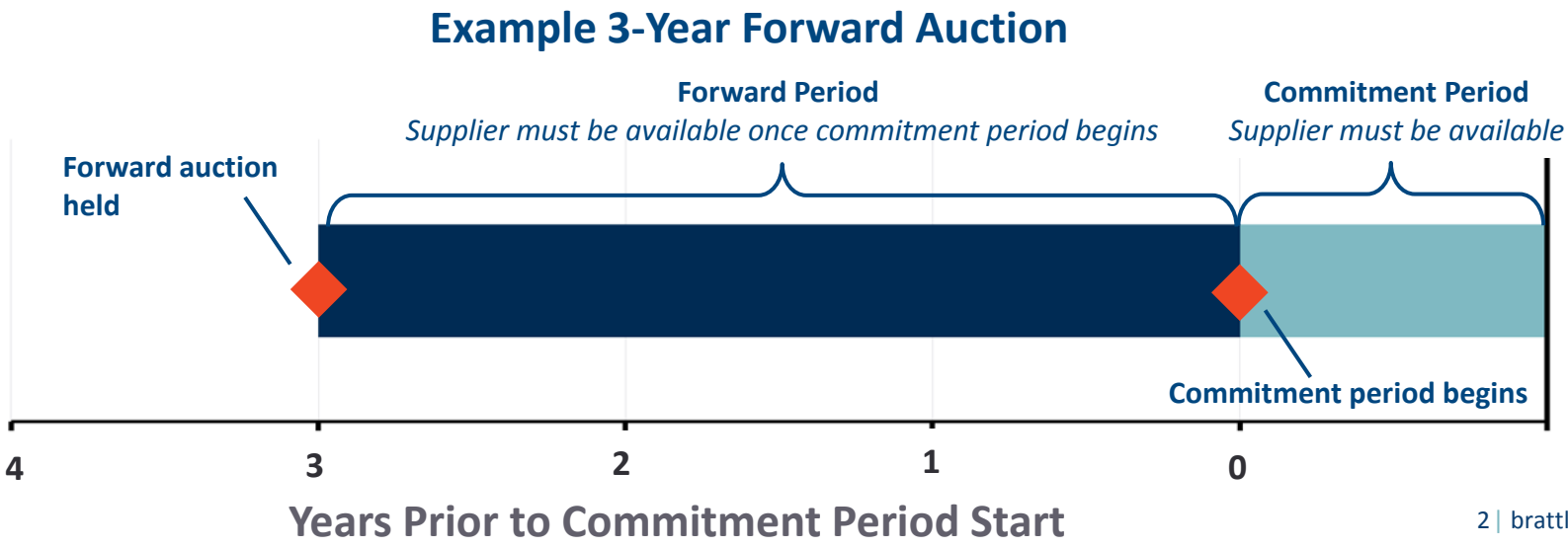
THE Brattle GROUP

Agenda

- Overview
- Forward Period Options
- Forward Periods of Other Jurisdictions
- Implications for Other Design Features
- Takeaways

Overview

- IESO's starting assumption is a **multi-year forward** incremental capacity auction design. However, the **duration** of the forward procurement period has yet to be determined
- Key Questions
  - What are the **options** for the duration of the forward period?
  - What designs are used by **other jurisdictions**?
  - What are implications for **other capacity auction design elements**?



Agenda

- Overview
- **Forward Period Options**
  - Spot Auctions
  - 1 - 2 Years Forward
  - 3 - 4 Years Forward
  - 5 - 10 Years Forward
- Forward Periods of Other Jurisdictions
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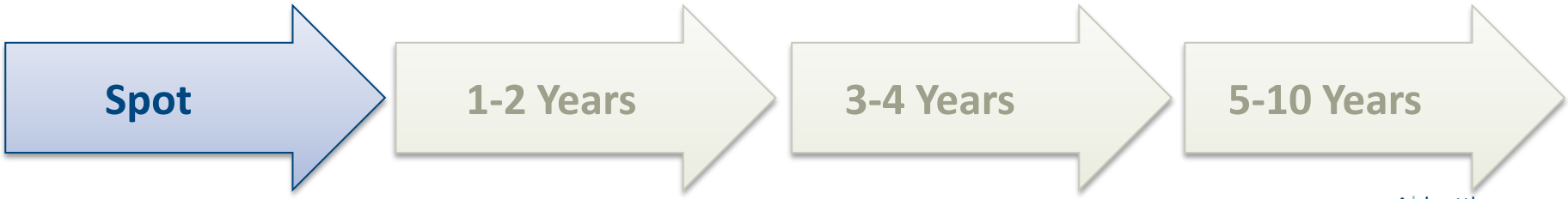
Forward Period Options

Spot Auctions

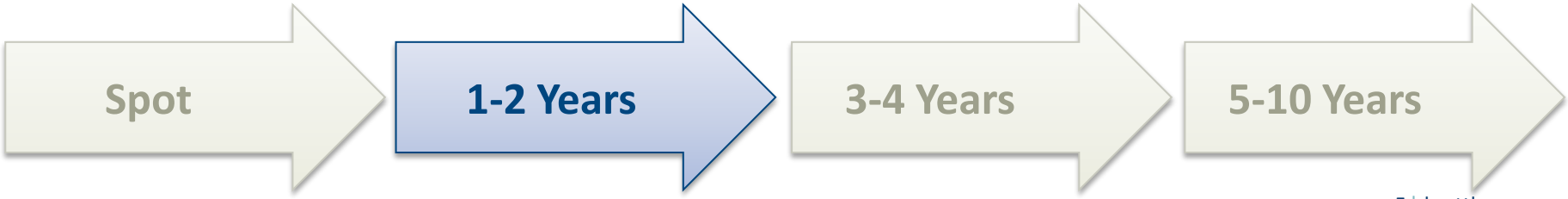
- Held days to a few months in advance of the commitment period
- Absence of forward period limits competition between new (i.e., yet to be developed) and existing resources, reducing market efficiency
- Uncertainty and Risk
  - Least uncertainty in peak load forecasts and resource adequacy needs across all options
  - Shortages (e.g., due to unanticipated retirements) may not be identified in time for effective market-based entry, causing more frequent administrative interventions and reliance on higher-cost (or even emergency) options
  - Potentially extreme price volatility due to little/no recourse for correcting shortages



Forward Period Options

1-2 Year Forward Auctions

- Enables participation by new, short lead-time resources (DR, uprates, mothballed resources, postponed retirements)
- Limits participation by new traditional generation not yet under construction
- Uncertainty and Risk
  - Reduced uncertainty in peak load forecasts and resource adequacy needs (relative to longer forward periods)
  - Some risk that shortages will not be identified in time for market-based entry, causing more frequent administrative interventions
  - High price volatility due to limited recourse to shortages (but reduced relative to spot auctions)



Forward Period Options

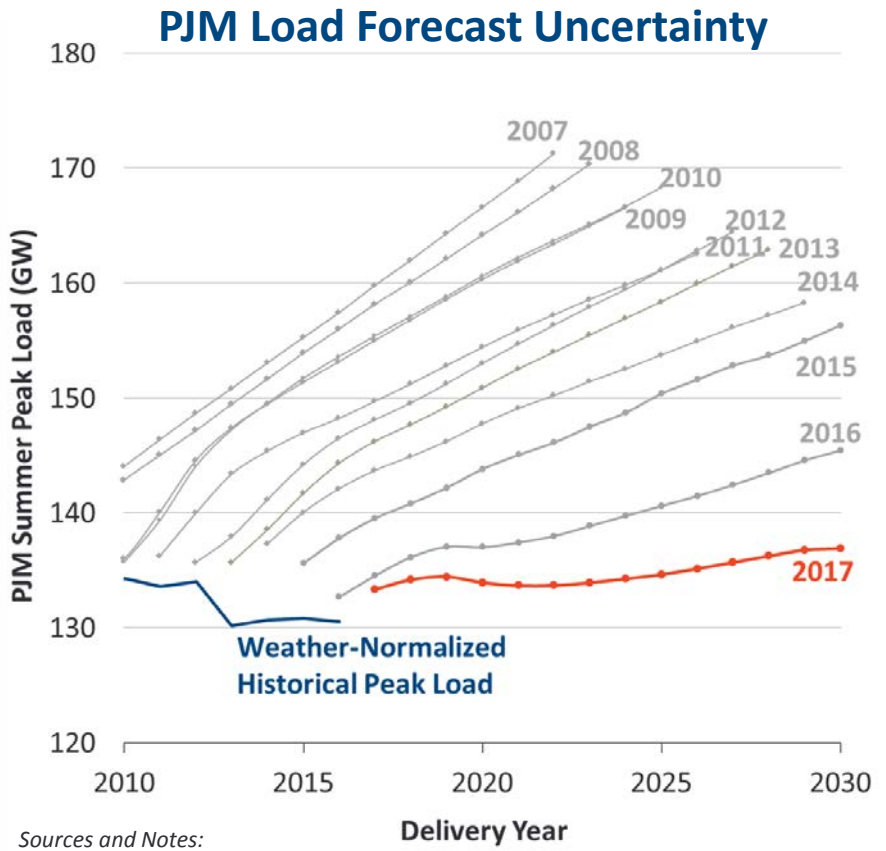
3-4 Year Forward Auctions

- Matches the lead time of major investment milestones for most new resources
  - Provides time to delay/cancel projects before irreversible major financial commitments are made
  - Allows time for speeding up construction when the price is right
- Enables direct competition between most new and existing resources
  - Increases market efficiency
  - Reduces the ability of existing resources to exercise market power
  - Rebalancing auctions can facilitate participation of short lead-time resources
- Uncertainty and Risk
  - Risk of over/under forecasting peak load; but largely mitigated by rebalancing auctions
  - Price volatility reduced by competition between new/existing resources (flattening the supply curve) and by procurement adjustments in rebalancing auctions
  - Mitigates risk by limiting forward period to a “reasonably foreseeable” time period

Forward Period Options

5-10 Year Forward Auctions

- Enables direct competition across all resources
- Price volatility reduced by competition and rebalancing auctions
- Increased supplier and market operation risks
  - **New generators:** Uncertainties about future costs and development schedules
  - **New DR and EE:** Difficulty contracting with load 5+ years forward
  - **Existing resources:** Difficulty estimating costs of older resources 5-10 years in the future
  - **Market operations:** Large risk of over- or under-forecasting peak load
  - Risks are somewhat mitigated by rebalancing auctions



Sources and Notes:
Based on PJM data. Actual weather-normal peak load and forecasts may not reflect the same weather normalization methodology.

Spot → 1-2 Years → 3-4 Years → **5-10 Years**

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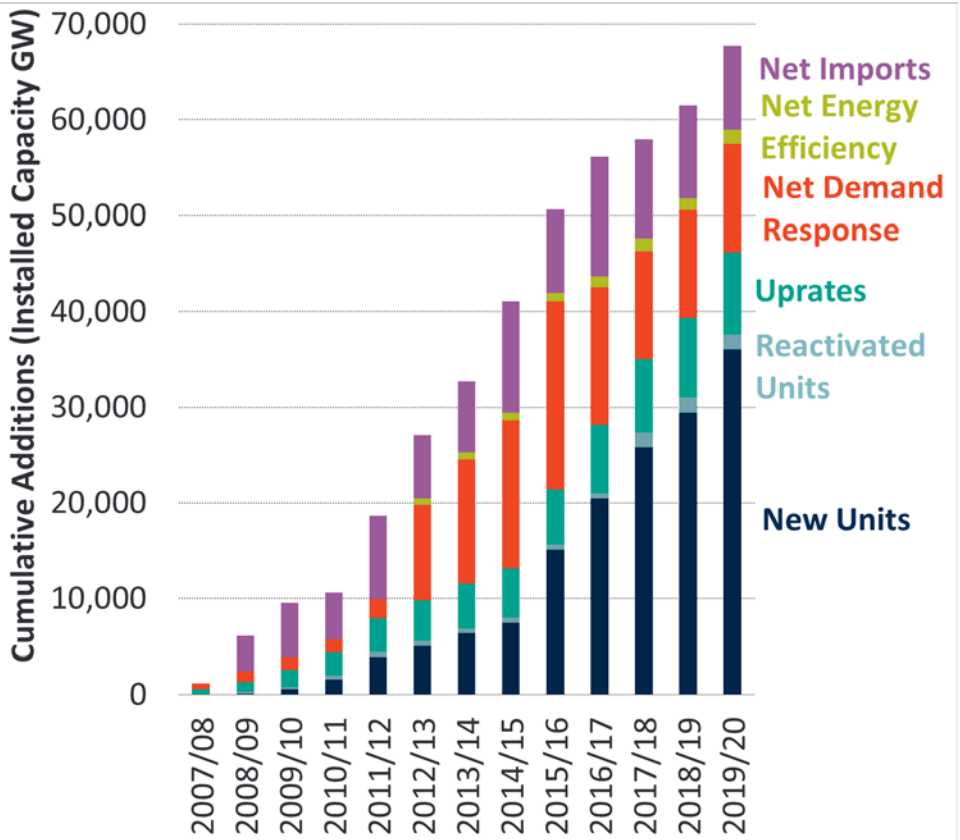
Forward Obligation Period in Other Markets

Note: Mexican market also includes mid- an long-term contracting auctions that are organized more similarly to utility competitive procurements rather than traditional capacity markets

Experiences of U.S. Jurisdictions

- **PJM and ISO-NE:** 3-year forward base auction with annual rebalancing auctions
  - Have attracted substantial new supply, both traditional generation and DR (see chart)
- **MISO:** Spot auction only
  - Limited merchant development due to several factors including high reserve margins, regulated market environment, and unpredictable pricing (vertical supply curve)
- **NYISO:** Spot auction with voluntary seasonal auctions
  - Limited new development due to high reserve margins, but some new development recently (CPV Valley, Cricket Valley combined cycle plants)

PJM New Capacity Additions



Source: PJM BRA Results

Examples of Other Jurisdictions

- **Ireland:** 4-year forward base auction with 1-year ahead rebalancing auction
  - Have not held their first auction yet. Transitional auction in December 2017; first full auction around September 2018
- **Great Britain:** 4-year forward base auction with secondary capacity markets
  - Has attracted new supply (gas, diesel, DR, and storage)
- **Western Australia:** 3-year forward base auction with 1-year ahead rebalancing auction (proposed design, not yet implemented)
- **Mexico:** Long-term procurement auctions and short-term capacity market
  - Two long-term auctions have procured capacity and clean energy at low prices relative to other Latin American nations
- **France:** 4-year trading period, with ex-post rebalancing settlement
  - Capacity providers certify their capacity during a 4-year window before the commitment year, may offer into a third-party market or trade bilaterally
  - Load serving entities purchase these certificates during the same period and are debited for shortfalls to their capacity needs as determined after the commitment year

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  - Rebalancing Auctions
  - Tracking and Incentivizing New Resource Delivery
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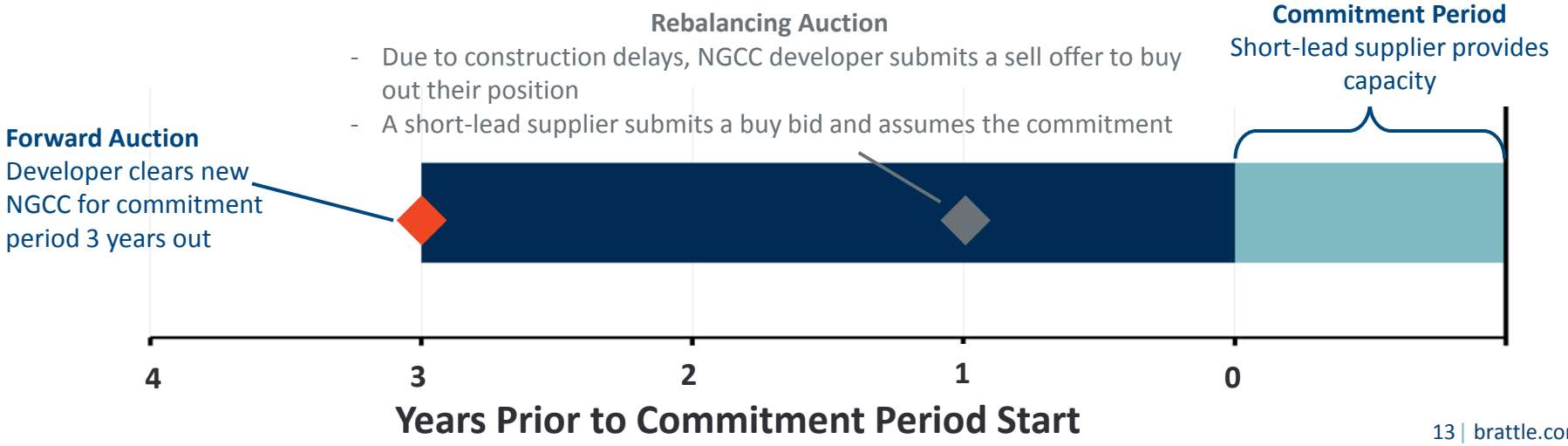
Rebalancing Auctions

- Rebalancing auctions, conducted between the forward auction and the commitment period, serve three purposes:
  - Allow the RTO to adjust (up or down) procured quantities due to changes in the load forecast
  - Enable suppliers to buy out of forward positions due to unforeseen circumstances
  - Facilitate participation by resources that did not participate in the forward auction or cannot as easily make a forward obligation (e.g. DR)
- Functionality is very similar to base auction: clear all supply against demand, but supply and demand include RTO procurement adjustments and supplier offers to buy into or out of the market

Rebalancing Auction Illustration



Tracking and Incentivizing New Resource Delivery

- Mechanisms are needed to track the progress of commitments from new resources and incentivize them to either be built or to buy out of their forward position
- Special processes are needed for short lead-time resources (such as DR and imports) without traditional "new steel in the ground" characteristics
- PJM mechanisms:
  - **Deficiency payments:** Suppliers that do not fulfill their capacity obligation are charged on a daily basis 120% of the weighted-average capacity market clearing price
  - **Credit requirement:** To reduce counter-party risk, PJM also has a credit requirement for new planned resources. Requirements are lowered as resources achieve construction milestones
  - **DR/Imports:** DR and import capacity offers must be certified to participate. DR is certified through an Emergency Load Response Registration, and Imports must show evidence of securing firm transmission service for the complete transmission path. Credit requirements are lowered as resources are certified

Note:
In addition to these mechanisms, all capacity resources in PJM must pay a capacity performance charge for each emergency hour the resource is unable to provide capacity. Each supplier's total annual charges are capped at 150% of Net CONE.

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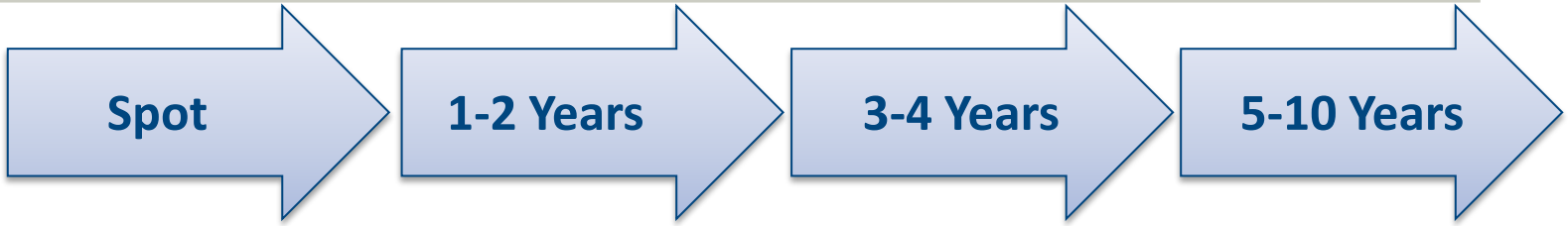
Takeaways

Comparison of Options



	Spot	1-2 Years	3-4 Years	5-10 Years
Competition Between New and Existing Resources				
Price Volatility				
Other Uncertainties and Risks				

Takeaways

Implications for Ontario

- Evolving best practice is a 3-4 year forward auction based on successful experiences of PJM and ISO-NE
  - Shorter periods would likely increase price volatility and limit competition between existing and new resources
  - Longer periods would likely increase risks to suppliers, market operations (forecasting uncertainty), and older existing resources
  - Many non-U.S. jurisdictions have also proposed mechanisms with similar forward periods
- IESO can transition over time from an 1-year forward auction initially to a multi-year forward auction as the need for new build supply emerges
- The forward-period auction design will need to be combined with other market design elements
  - Rebalancing auctions
  - Commitment tracking and performance penalties

Biography and Contact Information

JOHANNES P. PFEIFENBERGER

Principal | Cambridge

Hannes.Pfeifenberger@brattle.com

+1.617.864.7900

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.

Biography and Contact Information

ROGER LUEKEN

Associate | Washington, DC

Roger.Lueken@brattle.com

+1.202.419.3321

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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