The Brattle Group

Benefits Determination and Cost Allocation

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Meeting Public Policy Objectives through Transmission Investment

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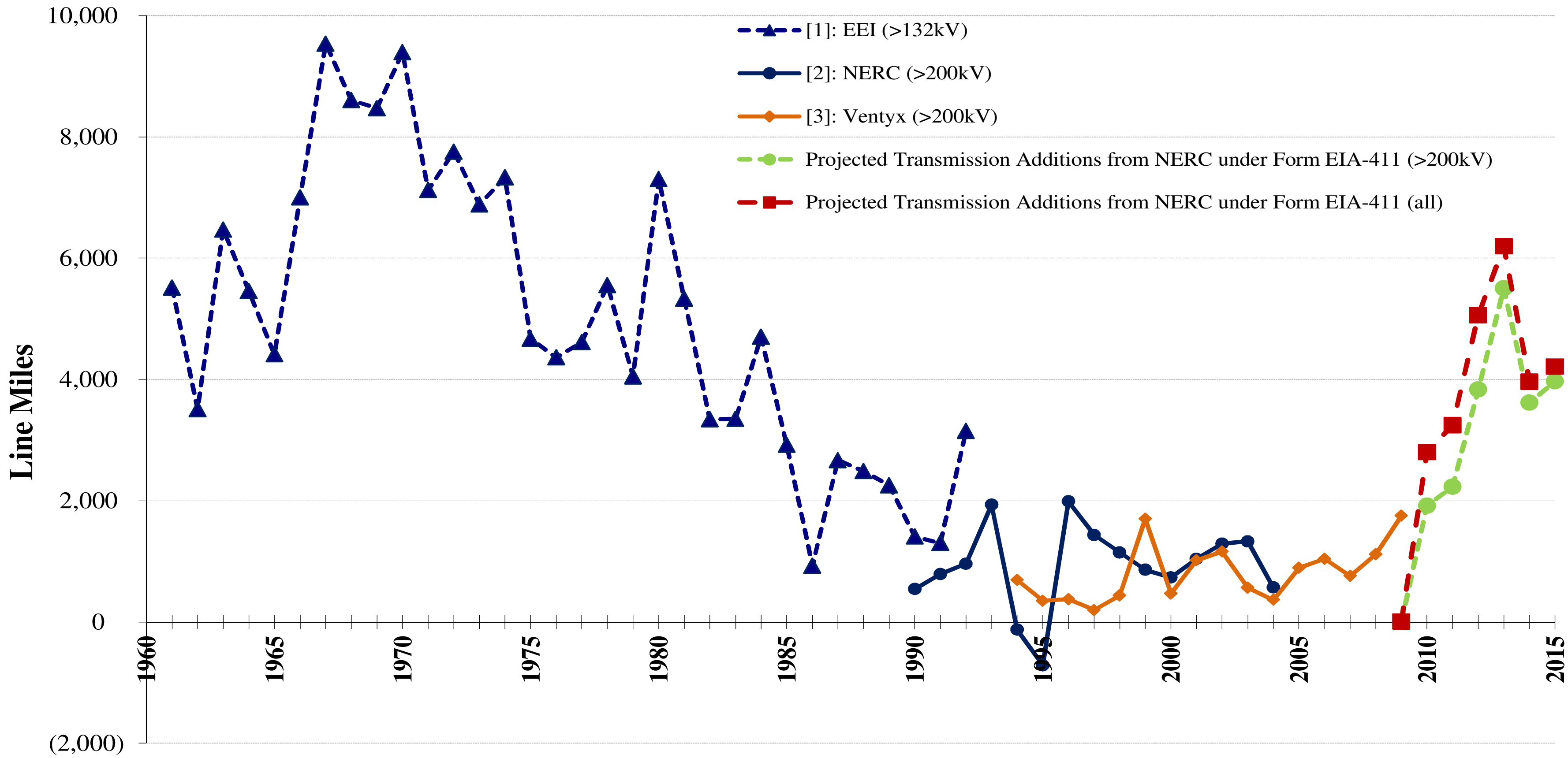
Transmission Investment and Replacement Needs

High current transmission additions still well below 40-50 years ago, when much of the current grid was built



[1]: Circuit miles of overhead electric lines from EEI's Historical Statistical Yearbook. Data excludes REA cooperatives.
[2]: Courtesy of the North American Electric Reliability Corporation. NERC data is only available for lines 200kV and above. Note: transmission line additions are calculated as the difference in existing tranmission between the current and prior year (i.e. 2003 additions = 2003 miles - 2002 miles).
[3]: Ventyx Suite.

Cost Allocation: A Barrier for Regional Projects

Single-state projects – Planning, permitting, and cost allocation process is "easier" (and more sequential):

- Planning determines need (e.g., overall benefits in excess of total project costs)
- State permitting process confirms need and approves project
- Approved projects receive cost recovery from customers within state
- Still, some challenges for in-state projects with regional benefits

Multi-TO, Multi-State Projects – Interaction between cost allocation and permitting creates barrier:

- Permitting often focused on costs and benefits to individual states and utilities: share of benefit in excess of allocated share of costs
- **"Beneficiary pays" framework creates incentives to dismiss difficult-to-quantify benefits to achieve lower cost allocations**
- Result: projects beneficial to region often do not appear beneficial to individual states or utilities based on their shares of costs and benefits

Challenge: Wide-spread Benefits

Wide-spread nature of transmission benefits creates both planning and cost allocation challenges

▪ **Broad in scope**	• Increased reliability and operational flexibility • Reduced congestion, dispatch costs, and losses • Lower capacity needs and generation costs • Increased competition and market liquidity • Renewables integration and environmental benefits • Insurance and risk mitigation benefits • Fuel diversification and fuel market benefits • Economic development from G&T investments
▪ **Wide-spread geographically**	• Multiple transmissions service areas • **Multiple states** or regions
▪ **Diverse in their effects on market participants**	• **Customers**, **generators**, **transmission owners** in regulated and/or deregulated markets • Individual market participants may capture one set of benefits but not others
▪ **Occur and change over long periods of time**	• Several decades • Changing with system conditions and future generation and transmission additions • Individual market participants may capture different types of benefits at different times

Benefits of Projects vs. Regional Plans

Estimation of benefits frequently unworkable (or not even meaningful) on a project-by-project basis

- Sum of benefits of individual projects can be significantly less than the overall benefits of a comprehensive regional plan ➔ resulting in rejection of desirable projects

Benefits distributed more uniformly for regional plans (complete portfolio of projects), facilitating cost allocation

- More uniform benefit distribution will make it easier to find allocation that is "roughly commensurate with estimated benefits"
- Portfolio of projects in regional plans allows consideration different types of benefits to different types of stakeholders ➔ makes it easier to achieve multi-state agreements

Interregional Cost Allocation

Interregional cost allocation effort by Regional State Committee of Southwest Power Pool

Pfeifenberger and Hou, "Seams Cost Allocation: A Flexible Framework to Support Interregional Transmission Planning,“ April 2012

Framework identifies best practices for interregional planning and cost allocation agreements, including:

1. Process to propose and analyze interregional projects
2. Benefits considered by each of the neighboring regions
   - **Avoid least-common denominator outcomes**
   - **Each region should, at a minimum, consider all benefit metrics that are used for internal project evaluation**
   - Additional benefits provided by interregional transmission
3. Principles to determine cost sharing based on monetized benefits, contribution to needs, or rights to added capability
4. Payment mechanisms and transmission rights

Overreliance on Production Costs Savings

Majority of economic planning processes measure only short-term dispatch cost savings without an evaluation of long-term resource cost impacts. For example, they:

- Over-rely on "production costs" and LMP impacts from dispatch simulation models – which measure only fuel, variable O&M, and emission costs
  - Ignores investment and fixed O&M cost of generation
- Evaluate a "snap shot" of the system without considering market response (e.g., reduction in market prices will tend to speed up retirements and delay new generation investments)
- Often assume same amount of generation is built (e.g., wind) and retained in same locations irrespective of the transmission investment

Often Overlooked "Other" Transmission Benefits

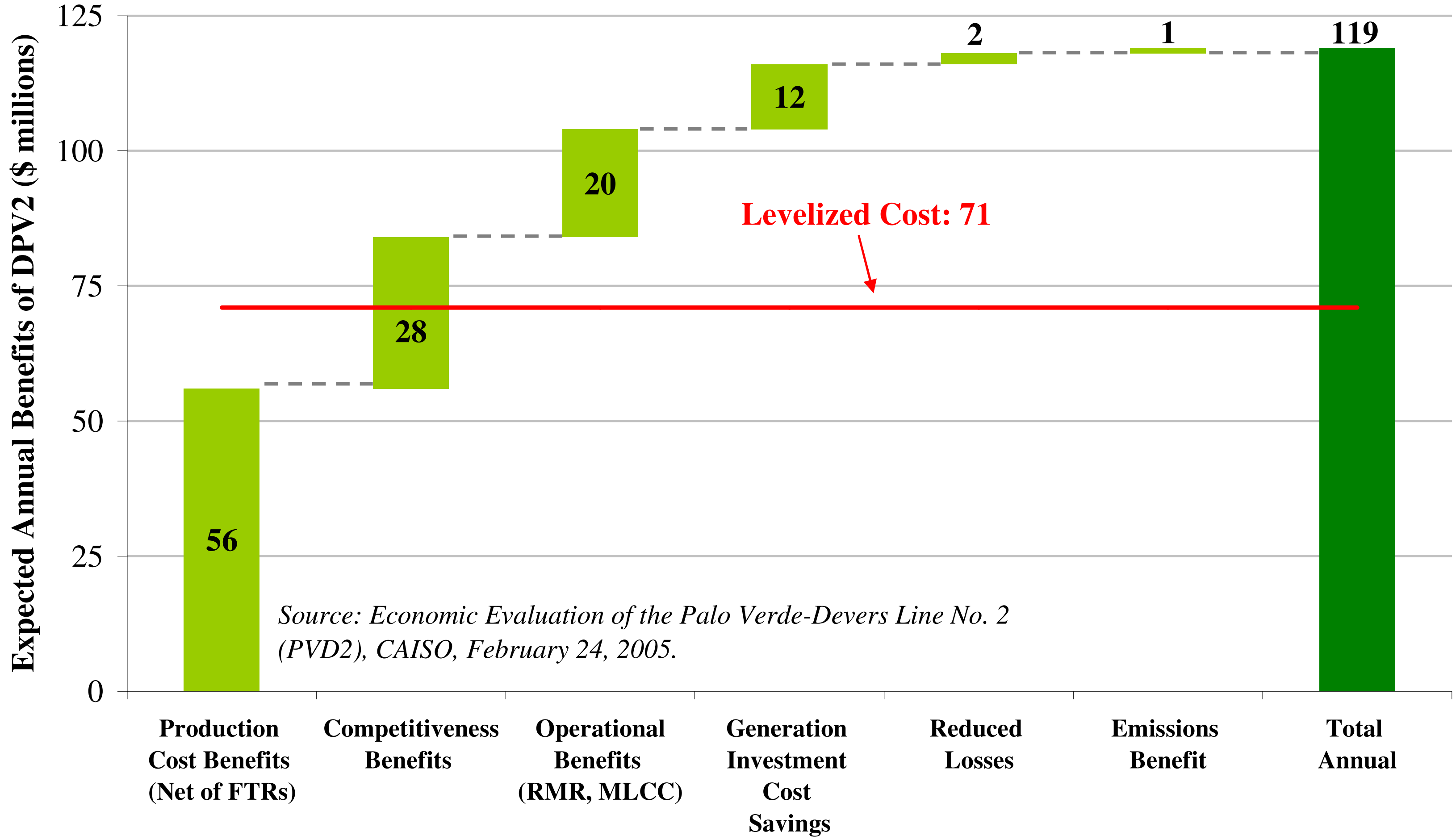
Important transmission benefits are often overlooked because of production cost model limitations and the complexity involved in quantifying these benefits:

1. Enhanced market competitiveness 2. Enhanced market liquidity	Additional market benefits
3. Economic value of reliability benefits 4. Added operational and A/S benefits 5. Insurance and risk mitigation benefits	Reliability/operational benefits
6. Capacity benefits 7. Long-term resource cost advantage 8. Synergies with other transmission projects	Investment and resource cost benefits
9. Impacts on fuel markets 10. Environmental and renewable access benefits 11. Economic benefits from construction and taxes	External benefits

These benefits can <u>double</u> benefits quantified in typical production cost studies

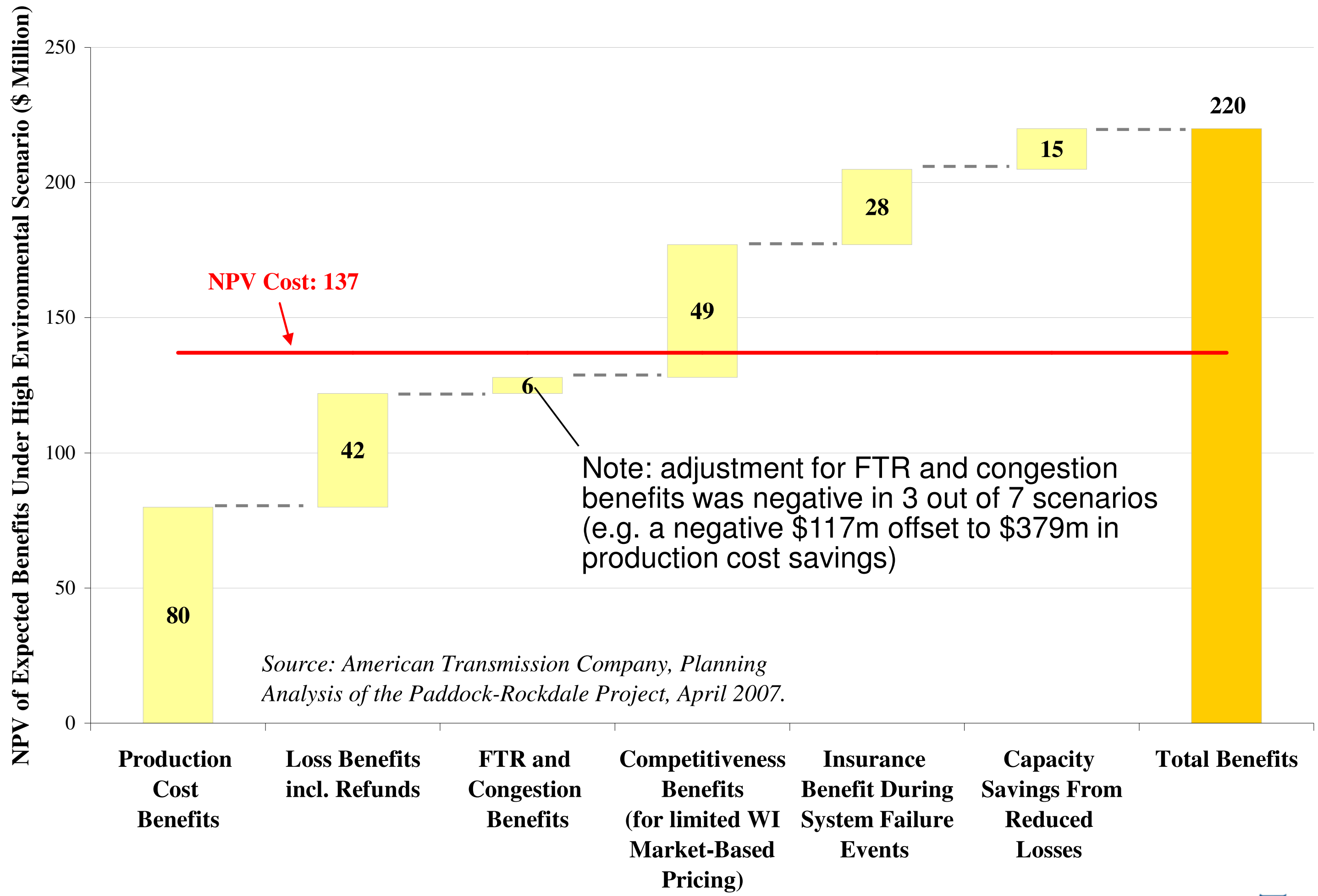
Example: Electricity Market Benefits vs. Costs

Total electricity market benefits of SCE's DPV2 project in CAISO exceeded project costs by more than 50%



Example: Electricity Market Benefits vs. Costs

ATC's Paddock-Rockdale study: Significant net benefits (production cost savings alone exceeded costs in some scenarios)



RTOs Increasingly Address these "Other" Benefits

SPP ITP analysis:

Quantified

1. **production cost savings**
2. reduced transmission losses
3. wind revenue impacts
4. natural gas market benefits
5. reliability benefits
6. economic stimulus benefits of transmission and wind generation construction

Not quantified

7. enabling future markets
8. storm hardening
9. improving operating practices/maintenance schedules
10. lowering reliability margins
11. improving dynamic performance and grid stability during extreme events
12. societal economic benefits

(SPP Priority Projects Phase II Final Report, SPP Board Approved April 27, 2010; see also SPP Metrics Task Force, *Benefits for the 2013 Regional Cost Allocation Review*, July, 5 2012.)

MISO MVP analysis:

Quantified

1. **production cost savings**
2. reduced operating reserves
3. reduced planning reserves
4. reduced transmission losses
5. reduced renewable generation investment costs
6. reduced future transmission investment costs

Not quantified

7. enhanced generation policy flexibility
8. increased system robustness
9. decreased natural gas price risk
10. decreased CO_2 emissions output
11. decreased wind generation volatility
12. increased local investment and job creation

(Proposed Multi Value Project Portfolio, Technical Study Task Force and Business Case Workshop August 22, 2011)

CAISO TEAM analysis

(DPV2 example)

Quantified

1. **production cost savings** and reduced energy prices from both a societal and customer perspective
2. mitigation of market power
3. insurance value for high-impact low-probability events
4. capacity benefits due to reduced generation investment costs
5. operational benefits (RMR)
6. reduced transmission losses
7. emissions benefit

Not quantified

8. facilitation of the retirement of aging power plants
9. encouraging fuel diversity
10. improved reserve sharing
11. increased voltage support

(CPUC Decision 07-01-040, January 25, 2007 (Opinion Granting a Certificate of Public Convenience and Necessity)

Additional Reading

Johannes P. Pfeifenberger and Delphine Hou, "Seams Cost Allocation: A Flexible Framework to Support Interregional Transmission Planning,“ April 2012.

Pfeifenberger, Hou, *Transmission's True Value: Adding up the Benefits of Infrastructure Investments*, Public Utilities Fortnightly, February 2012.

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Pfeifenberger, *Easier Said Than Done: The Continuing Saga of Transmission Cost Allocation*, Harvard Electricity Policy Group meeting, Los Angeles, February 24, 2011.

Pfeifenberger, Newell, *Direct testimony on behalf of The AWC Companies re: the Public Policy, Reliability, Congestion Relief, and Economic Benefits of the Atlantic Wind Connection Project*, filed December 20, 2010 in FERC Docket No. EL11-13.

Pfeifenberger, "Transmission Investments and Cost Allocation: What are the Options?" ELCON Fall Workshop, October 26, 2010.

Pfeifenberger, "Transmission Planning: Economic vs. Reliability Projects," EUCI Conference, Chicago, October 13, 2010.

Fox-Penner, Pfeifenberger, Hou, *"For Grid Expansion, Think 'Subregionally'," The Energy Daily*, June 8, 2010.

Pfeifenberger, Chang, Hou, Madjarov, *"Job and Economic Benefits of Transmission and Wind Generation Investments in the SPP Region," The Brattle Group, Inc.*, March 2010.

"Comments of Peter Fox-Penner, Johannes Pfeifenberger, and Delphine Hou," in response to FERC's Notice of Request for Comments on Transmission Planning and Cost Allocation (Docket AD09-8).

Pfeifenberger, Fox-Penner, Hou, *"Transmission Investment Needs and Cost Allocation: New Challenges and Models,"* The Brattle Group, Inc., presented to FERC Staff, Washington, DC, December 1, 2009.

Fox-Penner, Pfeifenberger, *"The Anchor-Tenant Model – And Some of the Chickens and Eggs,"* The Electricity Journal Guest Editorial, Volume 22, Issue 6, July 2009.

Pfeifenberger, *"Assessing the Benefits of Transmission Investments,"* presented at the Working Group for Investment in Reliable and Economic Electric Systems (WIRES) meeting, Washington, DC, February 14, 2008.

Pfeifenberger, Direct Testimony on behalf of American Transmission Company re: Transmission Cost-Benefit Analysis Before the Public Service Commission of Wisconsin, Docket 137-CE-149, January 17, 2008.

Pfeifenberger, Testimony on behalf of Southern California Edison Company re: economic impacts of the proposed Devers-Palo Verde No. 2 transmission line, before the Arizona Power Plant and Transmission Line Siting Committee, Docket No. L-00000A-06-0295-00130, Case No. 130, September and October, 2006.

About *The Brattle Group*

The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies around the world.

We combine in-depth industry experience, rigorous analyses, and principled techniques to help clients answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.

Our services to the electric power industry and users include:

- Climate Change Policy and Planning
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- Demand Response and Energy Efficiency
- Electricity Market Modeling
- Energy Asset Valuation
- Energy Contract Litigation
- Environmental Compliance
- Fuel and Power Procurement
- Incentive Regulation
- Market Design and Competitive Analysis
- Mergers and Acquisitions
- Rate Design, Cost Allocation, and Rate Structure
- Regulatory Strategy and Litigation Support
- Renewables
- Resource Planning
- Retail Access and Restructuring
- Strategic Planning
- Transmission
- Valuation and Risk Management

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Note:

The views expressed in this presentation are strictly those of the presenter and do not necessarily state or reflect the views of *The Brattle Group, Inc*.

Johannes (Hannes) Pfeifenberger is an economist with a background in power engineering and over 20 years of experience in the areas of public utility economics and finance. He has published widely, assisted clients and stakeholder groups in the formulation of business and regulatory strategy, and submitted expert testimony to the U.S. Congress, courts, state and federal regulatory agencies, and in arbitration proceedings.

Hannes has extensive experience in the economic analyses of electricity wholesale markets and transmission systems. His recent experience includes reviews of RTO capacity market and resource adequacy designs, testimony in contract disputes, and the analysis of transmission benefits, cost allocation, and rate design. He has performed market assessments, market design reviews, asset valuations, and cost-benefit studies for investor-owned utilities, independent system operators, transmission companies, regulatory agencies, public power companies, and generators across North America.

Hannes 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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