

Cost Savings Offered by Competition in Electric Transmission

Experience to Date and Potential
Value for Electricity Consumers

PRESENTED TO

Power Markets Today Webinar

PREPARED BY

Johannes Pfeifenberger

Judy Chang

Michael Hagerty

December 11, 2019

THE **Brattle** GROUP



Executive Summary: Findings

Competitive transmission planning processes in ISOs/RTOs are the most controversial aspect of FERC Order 1000 but show great potential:

- Of \$100 billion in 2013-2017 U.S. transmission investments, **only 3%** have been subject to competitive solicitations by ISOs/RTOs
- Competitive processes led to **innovations** in proposed engineering solutions, low bids, cost caps and cost control measures, and innovative financing – on average offering **20-30% in potential cost savings consistent with international experience**
- If competition could be expanded to 1/3 of total transmission investments, estimated **customer benefits would be \$6-9 billion over just five years**

Competition can make transmission upgrades a more cost-effective solution to address the challenges of electric industry transformation (in light of declining costs for renewable generation, distributed resources, and storage)

Executive Summary: Recommendations

Based on our review of both U.S. and international experience, we recommend that regulators and policy-makers:

- **Reduce qualification thresholds for competitive process** and develop consistent criteria, drawing from best practices from least-restrictive RTOs **to expand scope of competition**
- Establish and implement consistent **cost reporting requirements** to facilitate better tracking of project costs within and across regions
- **Improve transmission planning**
 - Better coordinate local and regional transmission planning; reduce piecemeal infrastructure planning to “get around competition”
 - Focus less on addressing near-term reliability and local needs with least-cost transmission solutions, but more on infrastructure that provides flexibility and higher long-term value at lower total cost
 - Focus on “multi-value” regional and intra-regional transmission investments that can more cost-effectively support the industry transition to clean energy resource
 - Reduce divisiveness of regional cost sharing by (1) recognizing broad range of benefits and (2) focusing on larger portfolios of transmission projects

Table of Contents

Background

- Historical and Projected Transmission Investments
- Drivers of Transmission Development
- Current Shortfalls in Transmission Planning

The Scope of ISO/RTO Oversight

The Current State of Competition

- Experience with Competition
- Limits to Competition in U.S. ISO/RTO Planning
- Competitive Projects Summary

Benefits and Costs of Competition

- Level of Competitive Bids Compared to Initial Project Cost Estimates
- Historical Cost Escalations of Transmission Projects
- Overall Potential for Customer Savings and Transmission-Owner Benefits
- Other studies and international experience

Conclusions

This presentation is based on our recent reports on competitive transmission experience:

- [*Cost Savings Offered by Competition in Electric Transmission: Experience to Date and the Potential for Additional Customer Value*](#) (April 2019)
- [*Response to Concentric Energy Advisors' Report on Competitive Transmission*](#) (August 2019)

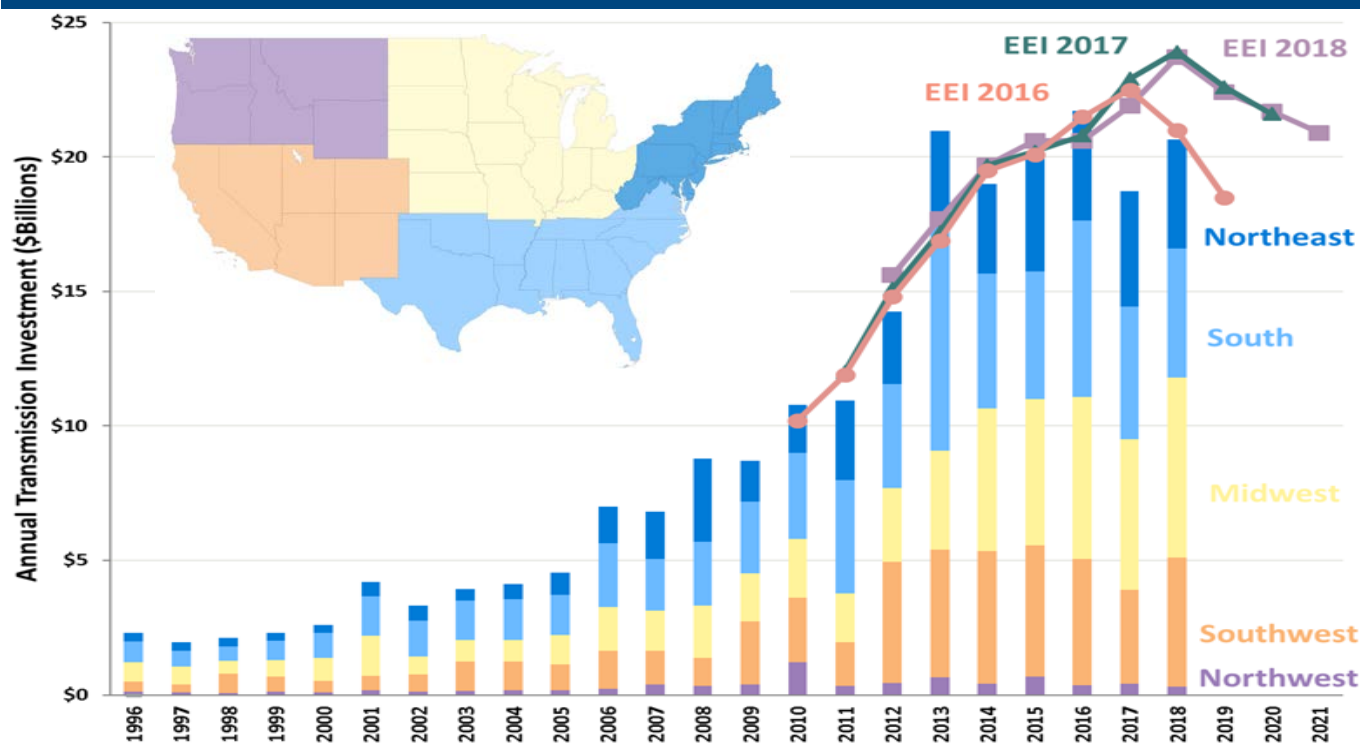
Historical Transmission Investment in the U.S.

Historical and Projected U.S. Transmission Investment by FERC-Jurisdictional Entities

Annual U.S. transmission investments are approximately **\$20 billion/year** in the last six years (compared to ~\$2 billion/year in late 1990s)

Historical and Projected U.S. Transmission Investments

(FERC- and ERCOT-Jurisdictional Entities Only)



Does not include transmission investments by non-jurisdictional utilities (such as BPA, TVA, WAPA), which own 40% of existing transmission in the western US and 20% in the eastern US

Sources and Notes:

The Brattle Group © 2019. Regional Investment based on FERC Form 1 investment compiled in Ventyx's Velocity Suite, except for ERCOT for years 2010 - 2017, which are based on ERCOT TPIT reports. Based on EIA data available through 2003, FERC-jurisdictional transmission owners estimated to account for 80% of transmission assets in the Eastern interconnection and 60% in WECC. Facilities >300kV estimated to account for 60-80% of shown investments. EEI annual transmission expenditures (updated **October 2018**) are based on prior year's actual investment through 2016 and planned investments thereafter.

Majority of U.S. Transmission Investments Occurs in ISO/RTO Regions

Transmission investments in markets operated by FERCjurisdictional **ISO/RTOs** and **ERCOT** account for **85%** of current transmission investments

Transmission investments in ISO/RTO regions have grown by 10-16% annually, and 6-10% annually in non-ISO/RTO regions.

U.S. Annual Transmission Investments (2010–2017) and Growth Since 1999

	1999	2010	2011	2012	2013	2014	2015	2016	2017	2013-2017 Total	1999-2017 CAGR
CAISO	\$0.33	\$1.7	\$0.9	\$3.5	\$3.2	\$2.6	\$2.5	\$2.4	\$1.8	\$12.6	10%
ISO-NE	\$0.09	\$0.7	\$0.6	\$1.4	\$1.8	\$1.4	\$1.7	\$1.4	\$1.2	\$7.5	15%
MISO	\$0.34	\$1.4	\$1.0	\$1.3	\$2.5	\$2.7	\$3.0	\$4.0	\$3.3	\$15.5	14%
NYISO	\$0.08	\$0.5	\$0.7	\$0.3	\$0.4	\$0.5	\$0.5	\$0.5	\$0.6	\$2.6	12%
PJM	\$0.46	\$1.9	\$3.4	\$2.9	\$4.1	\$6.6	\$7.3	\$7.1	\$6.4	\$31.5	16%
SPP	\$0.11	\$0.8	\$0.6	\$1.2	\$1.0	\$2.1	\$0.9	\$1.4	\$0.9	\$6.2	12%
Subtotal FERC-jurisdictional ISO/RTOs	\$1.43	\$7.0	\$7.3	\$10.6	\$12.9	\$15.9	\$15.8	\$16.9	\$14.4	\$75.9	14%
ERCOT	\$0.14	\$0.8	\$1.2	\$1.0	\$5.3	\$0.9	\$0.9	\$2.0	\$1.1	\$10.2	12%
Subtotal U.S. ISO/RTOs	\$1.56	\$7.8	\$8.4	\$11.7	\$18.2	\$16.8	\$16.8	\$18.9	\$15.5	\$86.1	14%
Other WECC	\$0.32	\$1.7	\$0.7	\$0.8	\$1.2	\$0.8	\$1.3	\$1.0	\$0.9	\$5.2	6%
Southeast & Other	\$0.43	\$1.3	\$1.8	\$1.8	\$1.6	\$1.6	\$1.9	\$1.9	\$2.3	\$9.4	10%
Total US Reported to FERC and in ERCOT	\$2.31	\$10.8	\$11.0	\$14.3	\$21.0	\$19.1	\$19.9	\$21.8	\$18.8	\$100.7	12%

Main Drivers of Transmission Needs

- Serve growing load
- Generation interconnections
- Local and regional reliability
- Need to replace aging infrastructure

Traditional
Drivers

- Regional economic and public policy needs
(Congestion relief; access to low-cost clean energy resources)
- Capture value of resource and load diversity
- Mitigate risks and create options valuable to proactively address future uncertainties
- Cost reductions offered by better interregional planning

New
Drivers

Well-Planned Transmission Reduces Customer Costs

- **SPP:** \$3.4 billion on transmission projects previously planned are expected to reduce customer costs by \$12 billion at a benefit to cost ratio of 3.5-to-1 (retrospective evaluation)
- **MISO MVP:** Previously planned multi-value projects to integrate 40 million MWh of renewables and improve reliability provide benefits that exceed costs by factor of 2.6-3.1
- **Brattle:** Providing access to areas with lower-cost renewable generation that will meet clean energy needs through 2030 has the potential to reduce the combined generation and transmission investment needs by \$30-70 billion
- **Eastern Interconnection States Planning Council:** Multi-stage anticipatory planning can reduce total generation costs by \$150 billion, while increasing interregional transmission investments by \$60 billion, with an overall savings of \$90 billion system-wide
- **Eastern Interconnection Planning Collaborative:** Combination of interregional environmental policy compliance and interregional transmission may offer net savings of up to \$100 billion in a future with stringent environmental policy goals
- **University of Colorado/National Oceanic and Atmospheric Administration:** Building more robust transmission grid would enable reducing U.S. carbon emissions from electricity sector by 80%, saving consumers \$47 billion/year at benefit-to-cost ratio of almost 3-to-1.

Key Challenges in U.S. Transmission Planning

Current planning processes do not yield the most valuable transmission infrastructure. Key barriers to doing so are:

1. Planners and policy makers do not consider the full range of benefits that transmission investments can provide, understating the expected value of such projects and how these values change over time
2. Planners and policy makers do not account for the risk-mitigation and option value of transmission infrastructure that can avoid the potentially high future costs of an insufficiently-robust and insufficiently-flexible transmission grid
3. Shared regional cost recovery is overly divisive, particularly when applied on a project-by-project (rather than portfolio- or grid-wide) basis
4. Ineffective Interregional planning processes are generally unable to identify valuable transmission investments that would benefit two or more regions
5. Substantial recent investments solely for reliability and local needs make it more difficult to justify even beneficial new transmission
6. Very limited competition in transmission planning and development reduces opportunities and innovation

Scope of ISO/RTO Oversight in U.S. Transmission Investments

Of \$75 billion in transmission investments by FERC-jurisdictional TOs in ISO/RTO regions between 2013 to 2017, **~47% was made without comprehensive ISO/RTO and stakeholder engagement** through the regional planning process

- Currently, transmission investments based on local planning by incumbent TOs are not subject to full ISO/RTO review
- FERC’s August 31 Order (Docket No. EL17-45, still subject to rehearing): only transmission “expansion” activities are subject to full regional planning requirements

Transmission Investments Subject to Full or Limited Review in ISO/RTO Regional Planning Processes

	Years Reviewed	FERC Jurisdictional Additions by Transmission Owners (nominal \$million, based on FERC Form 1 Filings)	Investments Approved Through <u>Full</u> ISO/RTO Planning Process (nominal \$million)	% of Total FERC Jurisdictional Investments Approved Through <u>Full</u> ISO/RTO Planning Process	% of Total FERC Jurisdictional Investments with <u>Limited</u> ISO/RTO Review
CAISO	2014 - 2016	\$7,528	\$4,043	54%	46%
ISO-NE	2013 - 2017	\$7,488	\$5,300	71%	29%
MISO	2013 - 2017	\$15,530	\$8,068	52%	48%
NYISO	2013 - 2017	\$2,592	n/a	n/a	n/a
PJM	2013 - 2017	\$31,469	\$14,458	46%	54%
SPP	2013 - 2017	\$6,202	\$4,226	68%	32%
Total	-	\$70,810	\$36,095	53%	47%

Sources & Notes: Data based on FERC Form 1 and ISO/RTO Tracking Reports. CAISO data reflects only select transmission additions/approved investments of PG&E, SCE, and SDG&E for 2014 -2016, based on available data. Aggregate Investment for each ISO/RTO reflects total FERC Form 1 transmission additions over indicated time periods. Investments approved by ISO/RTO reflects total value of transmission additions placed in-service over indicated time periods, approved through ISO/RTO processes.

Competition in Transmission Development

FERC's Order No. 1000 was intended to promote "more efficient or cost-effective transmission development" by increasing competition.

Competitive Sponsorship Processes



```
graph LR; A[Needs Assessment] --> B[Solutions Offered and Selected];
```

Needs Assessment

Solutions Offered
and Selected

Developers compete to provide and build innovative solutions to meet needs

- Planning entities identify needs and solicit competitive proposals/solutions
- Planning entities select preferred solution; selected developers finance, build, own, and operate projects
- **Examples: PJM, ISO-NE, NYISO**

Competitive Bid-Based Processes



```
graph LR; A[Cost and Experience Offered and Selected];
```

Cost and Experience
Offered and Selected

Developers compete to finance, build, own, and operate specified projects

- Planning entities identify need and specify solutions and projects
- Planning entities select developer to finance, construct, and own project based on factors including bid prices
- **Examples: CAISO, MISO, SPP, ERCOT, Brazil, Alberta, Ontario,**

Experience with Competitive Solicitations for Transmission in U.S.

Across the U.S., **only 3% of FERC-jurisdictional transmission investments** has been subject to **full competitive processes** between 2013 through 2017.

On average, ~\$540 million/year out of ~\$20 billion/year of transmission investment has been subject to full competitive process in the U.S.

Competitively-Developed Projects in FERC-Jurisdictional Regions In 2013-2017 (Project costs in nominal \$million)									
	CAISO	ISO-NE	MISO	NYISO	PJM*	SPP	Non-RTO	Total	
2013	\$144	\$0	\$0	\$0	\$0	\$0	\$0	\$144	
2014	\$148	\$0	\$0	\$0	\$90	\$0	\$0	\$238	
2015	\$425	\$0	\$0	\$0	\$912	\$0	\$0	\$1,337	
2016	\$133	\$0	\$50	\$0	\$471	\$8	\$0	\$662	
2017	\$0	\$0	\$0	\$181	\$142	\$0	\$0	\$323	
Total Estimated Competitive Project Costs Selected in 2013-2017	\$851	\$0	\$50	\$181	\$1,615*	\$8	\$0	\$2,705	
Total Reported FERC Form 1 Transmission Investment in 2013-2017	\$12,600	\$7,500	\$15,500	\$2,600	\$31,500	\$6,200	\$14,600	\$90,500	
Total Estimated Competitive Project Costs Selected in 2013-2017 (% of 2013-2017 Total Investment)	6.8%	0.0%	0.3%	7.0%	5.1%*	0.1%	0.0%	3.0%	

* In estimating the total costs of competitive projects approved in PJM, we include 136 projects awarded under competitive windows to incumbent transmission owner with total costs of \$952 million, of which 132 projects are upgrades to existing facilities that were not open to competitors.

Projects Selected Through Competitive Process by ISO/RTOs (as of March 2019)

Experience to date shows strong competition across many companies

- **20 projects** in the U.S. and 3 in Canada
- From 2013-17, PJM received 794 proposals competing to meet needs
- PJM approved 139 projects of which 132 were upgrades; just 3 awarded to non-incumbents

* While Imperial Irrigation District (the selected developer of the Imperial Valley project) is the incumbent in the Imperial Valley Region, it is not a CAISO PTO and thus not an incumbent within the CAISO footprint.

** Transource is a joint venture between AEP and Great Plains Energy.

Processes Completed

ISO/RTO	Processes Completed	Process Type	Awards
CAISO	10	Projects	10
MISO	2	Projects	2
SPP	1	Projects	1
PJM	16	Solutions	139
NYISO	2	Solutions	3
ISO-NE	0	Solutions	0
All Regions	31		155

Competitive Transmission Project Summary

ISO/RTO	Project	Year of Decision	Selected Developer	Award to Incumbent?
CAISO	Gates-Gregg project (subsequently cancelled)	2013	PG&E/MidAmerican w/ Citizen Energy	Yes
CAISO	Imperial Valley Project	2013	Imperial Irrigation District	No*
CAISO	Sycamore-Peñasquitos 230 kV	2014	SDG&E w/ Citizen Energy	Yes
CAISO	Delaney-Colorado River Project	2015	DCR Transmission	No
CAISO	Estrella Substation Project	2015	NextEra	No
CAISO	Wheeler Ridge Junction Project	2015	PG&E	Yes
CAISO	Suncrest Project	2015	NextEra	No
CAISO	Spring Substation	2015	PG&E	Yes
CAISO	Harry Allen-Eldorado Project	2016	Desert Link	No
CAISO	Miguel Substation	2014	SDG&E	Yes
MISO	Duff-Coleman 345 kV	2016	LS Power w/ Big Rivers	No
MISO	Hartburg-Sabine Junction 500 kV	2018	NextEra	No
NYISO	Western NY Public Policy Transmission	2017	NextEra	No
NYISO	AC Transmission Public Policy Segment A	2019	North America Transmission and NYPA	No
NYISO	AC Transmission Public Policy Segment B	2019	Niagara Mohawk and New York Transco	Yes
PJM	Artificial Island Project	2015	LS Power	No
PJM	Thorofare Project	2015	Transource	No**
PJM	AP South Market Efficiency Project	2016	Transource w/ BGE and Allegheny Power	No**
PJM	136 Projects Awarded to Incumbents (132 Upgrades)	2014-2017	Various	Yes
SPP	North Liberal – Walkemeyer 115 kV (subsequently cancelled)	2016	Mid Kansas Electric	Yes
AESO	Fort McMurray West 500 kV	2014	Alberta PowerLine Limited Partnership	Yes
IESO	East West Tie Line	2013	NextBridge Infrastructure	No
IESO	Wataynikaneyap Power Project	2015	Fortis Inc.	No

Criteria for Competitive Processes in ISOs/RTOs

ISO/RTO qualifications and exclusion criteria greatly reduce the scope of projects eligible for competitive processes. Experience shows scope can be expanded.

	CAISO	ISO-NE	MISO	NYISO	PJM	SPP
Types of Projects Eligible for Competition	Reliability, Economic, Public Policy	Reliability, Economic, Public Policy	Market Efficiency, Multi-Value (MVP)	Reliability, Economic, Public Policy	Reliability, Economic, Public Policy	ITP, High Priority, Interregional
Exclusions						
Exclusions for Reliability Projects		✓ (Based on Need Date)	✓*		✓ (Based on Need Date)	✓ (Based on Need Date)
Exclusions for Local Cost Allocated Projects (per Order 1000)	✓	✓	✓	✓	✓	✓
Exclusion of Upgrades (per Order 1000)	✓	✓	✓	✓	✓	✓
Exclusions Based on Voltage						
Voltage > 300 kV						
Voltage 200-300 kV			✓** (For MEP)			
Voltage 100-200 kV	✓		✓** (For MEP)		✓***	
Voltage < 100 kV	✓	✓	✓**		✓***	✓

Notes: Additionally, competitive transmission may be precluded in certain states, due to state Right of First Refusal (ROFR) provisions. *In MISO, projects that are only classified as Baseline Reliability Projects are locally allocated (regardless of voltage), making them ineligible for competitive processes. Projects designated as Baseline Reliability Projects and MEPs/MVPs are cost-allocated as though they are MEPs/MVPs. **MISO limits competition to MEPs and MVPs; MEPs must have a total cost of at least \$5 million and a minimum voltage of 230 kV; MVPs must have a total cost of at least \$20 million and a minimum voltage of 100 kV; see MISO Tariff Attachment FF, Sections II.B, and II.C. ***PJM has exceptions to these exclusions on lower voltage facilities for specific types of reliability violations. These exceptions are detailed in PJM Manual 14F Section 5.3.4.

Potential Cost Savings from Competitive Transmission: Bids vs. Initial Cost Estimates

Experience with 16 projects selected through the ISO/RTO competitive planning processes show potentially large cost advantages of competition

- On average, the winning bids of these 15 competitive transmission projects have been priced **40% below** the ISO/RTOs' or incumbent TO's initial project cost estimates
- Similar bid cost advantages observed in Alberta
- All 16 projects are still under development (in-service dates post-2019), so final costs are not yet known
- Selected developer offer **cost caps or cost-containment** measures, reducing the risk of significant cost increases

Cost advantage calculated as:

- Bid-based processes (MISO, SPP, CAISO): cost difference = between costs of winning bids and ISO/RTO's or TO's initial reference cost estimate for the project
- Sponsorship-based processes (PJM and NYISO): cost difference = between winning bid and lowest-bid of incumbent TOs

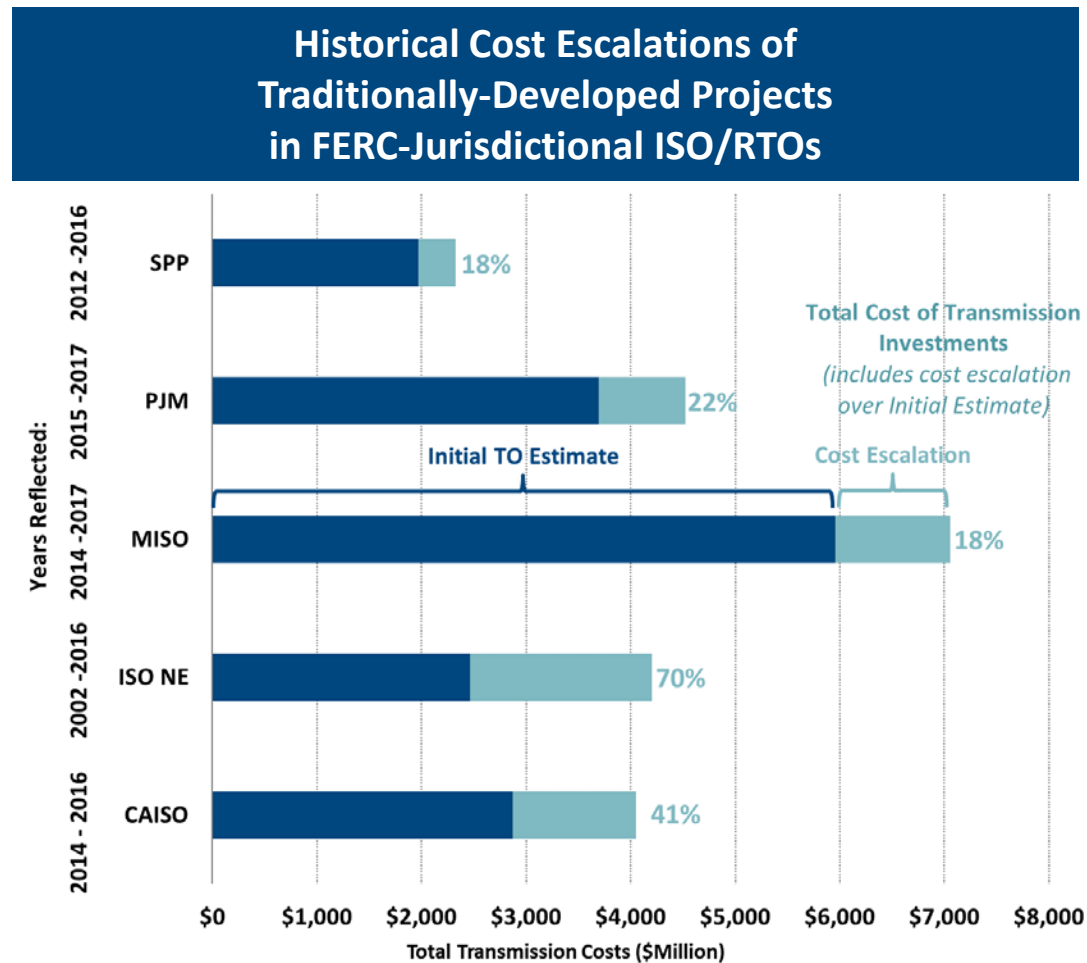
Differences in Competitive Bids and Initial Cost Estimates for Competitive Processes of FERC-Jurisdictional ISO/RTOs				
RTO	Number of Competitive Projects	ISO/RTO or Incumbent Estimate of Project Cost (\$million)	Winning Bid of Competitive Projects (\$million)	Average <u>Cost Advantage</u> of Competitive Bids
CAISO*	10	\$1,180	\$833	29%
ISO-NE	0	n/a	n/a	n/a
MISO	2	\$181	\$154	15%
NYISO	1	\$232	\$181	22%
PJM*	2	\$692	\$280	60%
SPP	1	\$17	\$8	50%
Total	15	\$1,948	\$1,171	40%

* Note: The only competitively selected project in NYISO project is not reflected in the average cost advantage. Additionally, just 1 of 2 competitively selected projects in PJM projects are reflected in the average cost advantage.

Historical Cost Escalations ISO/RTO Transmission Projects

Many transmission projects experience cost escalations:

- Data for initial project cost estimates and final project costs show significant cost escalations for many traditionally-developed transmission projects
- Escalations include inflation, routing or project changes, and siting complications
- The absence of cost-tracking mechanisms in some ISO/RTOs (CAISO and NYISO) makes it difficult to analyze project cost increases (CAISO data from FERC Complaint, EL17-45)
- Having consistent and transparent project cost tracking and reporting would be important

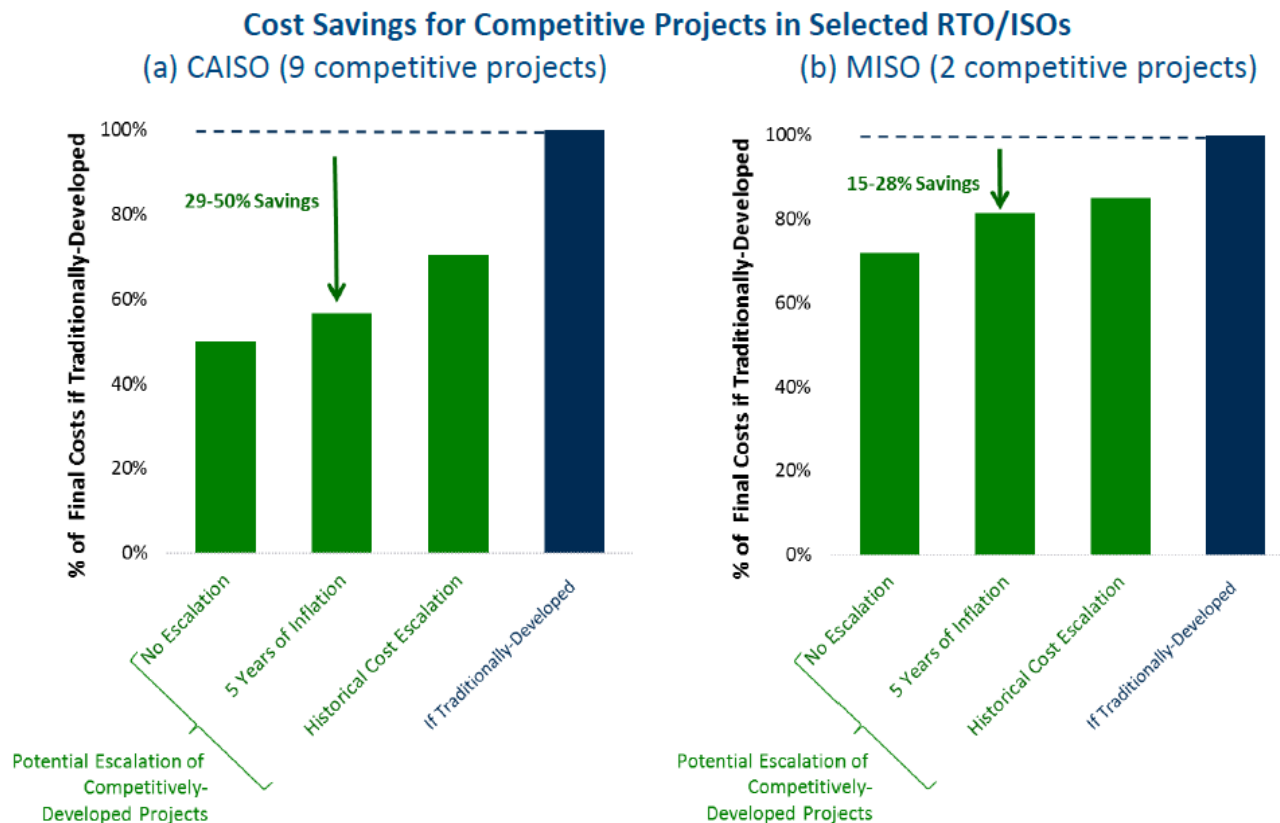


* Weighted average based on *competitively selected transmission investments* in each ISO/RTO. ISO-NE has yet to select any transmission project through its competitive planning processes. Therefore, the weighted average of historical cost escalation of traditionally-developed *projects* shown above excludes ISO-NE projects' observed historical cost-escalation.

Potential Customer Savings from Competitive Transmission Planning Processes

Potential Cost Savings from Competition (CAISO and MISO)

The CAISO and MISO experience shows that if competitive projects can be developed as bid (without further cost escalations), savings would be 28%-50% relative to the costs had these projects been traditionally-developed



Even if costs of competitive projects escalated like traditionally-developed projects, the savings would still range from 15%-30%

Customer Savings from U.S. and International Experience with Competitive Processes

The potential cost savings from expanding competitive processes in the U.S. could range from approximately 20% to 30%, consistent with savings achieved with similar competitive transmission processes in Canada, the U.K., and Brazil.

Region	Estimated Cost Savings	No. of Projects	Estimated Cost of Winning Proposal	Notes
CAISO	29–50%	9	\$833 million	Winning proposal costs compared to CAISO initial cost estimate; assumed range of cost escalation of winning bid from no escalation to escalation of traditionally-developed projects in CAISO (+41%)
MISO	15–28%	2	\$154 million	Winning proposal costs compared to MISO initial cost estimate; assumed range of cost escalation of winning bid from no escalation to escalation of traditionally-developed projects in MISO (+18%)
PJM	60–67%	1	\$280 million	Winning proposal cost (including necessary incumbent upgrades) compared to lowest-cost solution offered by incumbent in the initial proposal window; assumed range of cost escalation of winning bid from no escalation to escalation of traditionally-developed projects in PJM (+22%)
SPP	50–58%	1	\$8 million	Winning proposal cost compared to SPP initial cost estimate; assumed range of cost escalation of winning bid from no escalation to escalation of traditionally-planned projects in SPP (+18%); project cancelled following selection
NYISO	22%	1	\$181 million	Winning proposal cost compared to lowest-cost bid from incumbent
Ontario	16%	1	CAD \$777 million	Winning proposal cost compared to bid from incumbent
Alberta	21%	1	CAD \$1,614 million	Winning proposal cost compared to AESO initial cost estimate; costs of the winning bid later increased due to changes in route
U.K.	23–34%	15	~£3,000 million	Winning bid cost estimate compared to merchant and regulated counterfactuals estimated by Ofgem
Brazil	~25% (20–40%)	Many	\$28 billion	Based on Brazil's experience since 1999 holding auctions for all projects over 230 kV; over 50,000 km of lines built through this process

Experience with Completed Competitive Transmission Projects

While the transmission projects competitively developed under Order 1000 have not yet been completed, there is significant experience with competitively bid projects that have been completed, showing 18-34% in cost savings:

- **Path 15, California**: 84 mile, 500 kV project in CAISO completed in 2004 on time and under budget at a cost of approx. \$250 million, **18% below** the incumbent's \$306 million initial cost estimate (with savings even higher if incumbent costs had escalated above estimate)
- **Fort McMurray, Alberta**: 508 km, 500 kV project in Alberta was completed in March 2019 on budget (\$1.6 billion) and three months ahead of schedule, providing Alberta ratepayers over \$400 million, a **21% cost saving** (per AESO estimate)
- **U.K. Offshore Transmission**: the U.K. regulator estimated that since 2009 three rounds of competitive solicitations resulted in **savings** ranging from £683 million to £1,092 million (**averaging 23%–34%**, net of the cost of conducting the process)
- **Brazil**: since 1999, auctions for 87 transmission projects (receiving 399 bids by 112 companies and consortiums) yielded estimated **average cost savings of 25%** (per study prepared by Imperial College and University of Cambridge for U.K. regulator)

Costs of Competitive Transmission Planning Processes

UK experience: cost of conducting and participating in competitive solicitations for large transmission projects is approx. 4% of project cost

- 2% for project developers, 1% for solicitation process, and 1% by system operators

Costs of implementing and administering competitive processes by U.S. ISOs/RTOs

- As of December 2017, PJM covered 97% of its \$1.7 million of total 2016–2017 evaluation costs for 39 projects, which amounts to ~\$44,000 of evaluation costs per approved project
- SPP-internal costs of the competitive process for the North Liberal–Walkemeyer 115 kV project were reported at ~\$500,000 or ~3% of the relatively small project's \$17 million cost estimate

Project developers incur additional costs for developing proposals*

- Both ISO administrative costs and developer costs are absorbed by developers and will (at least ultimately) need to be reflected in bids

* SPP estimated that developers spent \$300,000 to \$400,000 for each of the 11 proposals submitted to its solicitation for North Liberal – Walkemeyer 115 kV, for a total of \$3.3 million to \$4.4 million of developer costs. Similar to SPP's costs of administering the competitive solicitation process, these costs are not directly passed through to customers. Prepared Statement of Paul Suskie, Executive Vice President and General Counsel, Southwest Power Pool, Inc., Before the Federal Energy Regulatory Commission, Docket No. AD16-18-000. brattle.com | 19

Potential Savings from Expanding Competitive Transmission Planning Processes

As documented in many other studies, making valuable transmission investments provide significant overall cost savings through a wide range of benefits.

Increasing the scope of competition would provide additional benefits:

- **Customer Benefits**: With average savings of 20%-30%, expanding the scope of competition from 3% to 33% of total transmission investments would yield **customer benefits of \$6-\$9 billion over five years**
- **Innovation brings long-term advances** to the electric industry, which will further benefit customers and transmission providers

Estimated Savings from Competitive Processes (% of Transmission Costs)	20%	30%
Estimated 5-year US-wide Transmission Investment	\$100 billion	\$100 billion
Current Share of Competitive Projects (% of Total Investment)	3%	3%
Estimated Cost Savings over 5 years		
25% of Transmission Investment Subject to Competition	\$4.4 billion	\$6.6 billion
33% of Transmission Investment Subject to Competition	\$6.0 billion	\$9.0 billion

Prof. Paul L. Joskow's Take on Competitive Transmission Since Order 1000

Prof. Joskow's (M.I.T) recent paper on competitive transmission comes to very similar conclusions:

- “there is quite a bit to learn from the 16 projects selected through an organized competitive procurement process by ISOs since Order 1000 went into effect”
- Non-incumbents’ “projects often have significantly lower cost estimates than the incumbent’s, often combined with cost containment commitments”
- “The competitive procurements demonstrate that competing transmission developers can reduce expected costs by coming up with innovative designs to resolve transmission needs identified through the ISO regional planning process, taking on more performance risk... etc”
- “Competitive procurement may also induce incumbents and non-incumbents to sharpen their pencils”
- “While the jury is necessarily still out on whether competitive procurement leads to lower costs to meet specific transmission needs, I think that there are good reasons to believe that it likely does. The evidence from other countries ... is consistent with this view.”
- “[T]he experience to date is sufficiently promising to consider expanding the use of open competitive procurement solicitations for transmission projects...there are potential efficiency gains from expanding open competitive solicitation opportunities....

Source: “*Competition for Electric Transmission Projects in the U.S.: FERC Order 1000*,” March 16, 2019.

Emphasis added. Available at: <https://economics.mit.edu/files/16832>

Examples of “Cost Caps” offered in Competitive Transmission Solicitations

Cost caps offered by LS Power in its successful bids illustrate the nature of bid-based cost control mechanisms:

- **Artificial Island Project (PJM)**: \$146 million cost cap escalated with inflation until construction start. Covers all LS-Power-related construction costs, including those associated with obtaining permits, acquiring land, and environmental assessments and mitigations. Exclusions force majeure-type events, taxes, financing, and any incremental costs to the project caused by PJM-directed changes.
- **Harry Allen–Eldorado 500 kV (CAISO)**: Project cost is capped at \$147 million in 2020 dollars. Exclusions for force majeure events, financing costs, and cost increases caused by changes mandated by the ISO or from incumbent transmission owners at their substations.
- **Duff-Coleman 345 kV (MISO)**: Total rate base capped at \$58.1 million, with exclusions for force majeure events, on-going O&M costs, and material changes to the scope of work.

Exclusions to cost caps allow for some cost escalations, but we anticipate these escalations to be more limited than those of traditionally-developed projects without such cost caps (and a much wider set exclusions)

- The 20-30% range of our estimated cost savings is based on three possibilities of cost escalations: (1) no escalation beyond offer price; (2) inflation-based escalation; and (3) same escalation as those experienced by traditionally-developed projects in the region.

Risk Sharing for Competitive Projects as Proposed by NY PSC

The competitive bidding process for public policy transmission in New York includes a PSC-mandate that in addition to bids based on traditional full cost recovery, bids also need to be prepared consistent with the NPSC's "cost-overrun-sharing incentive regime":

- If actual costs are above the bid, developers bear 20% of the actual cost over-runs, ratepayers bear 80%
- If actual costs are below the bid, developers retain 20% of the savings
- The bid price caps FERC incentives: if the developer seeks incentives from FERC above the base ROE otherwise approved by FERC, the developer will not receive any incentives above the base ROE on cost overruns over the bid price

Source: NYPSC, CASE 12-T-0502, et al., Dec 17, 2015.

Brattle-Concentric Differences in Estimating Historical Cost Escalations for Transmission

Our analysis of potential savings from competitive transmission development processes uses initial planning estimates as a common reference point:

1. Initial planning cost estimates for competitive projects are compared with the price of winning bids (plus a range of plausible cost escalations)
2. Initial planning cost estimates for traditional projects are compared with the cost of completed projects (to determine typical cost escalations)

In contrast, Concentric relies on updated cost estimates, yielding unreasonable results without providing a common reference point.

Example: Replication of Concentric's approach for a certain MISO Project

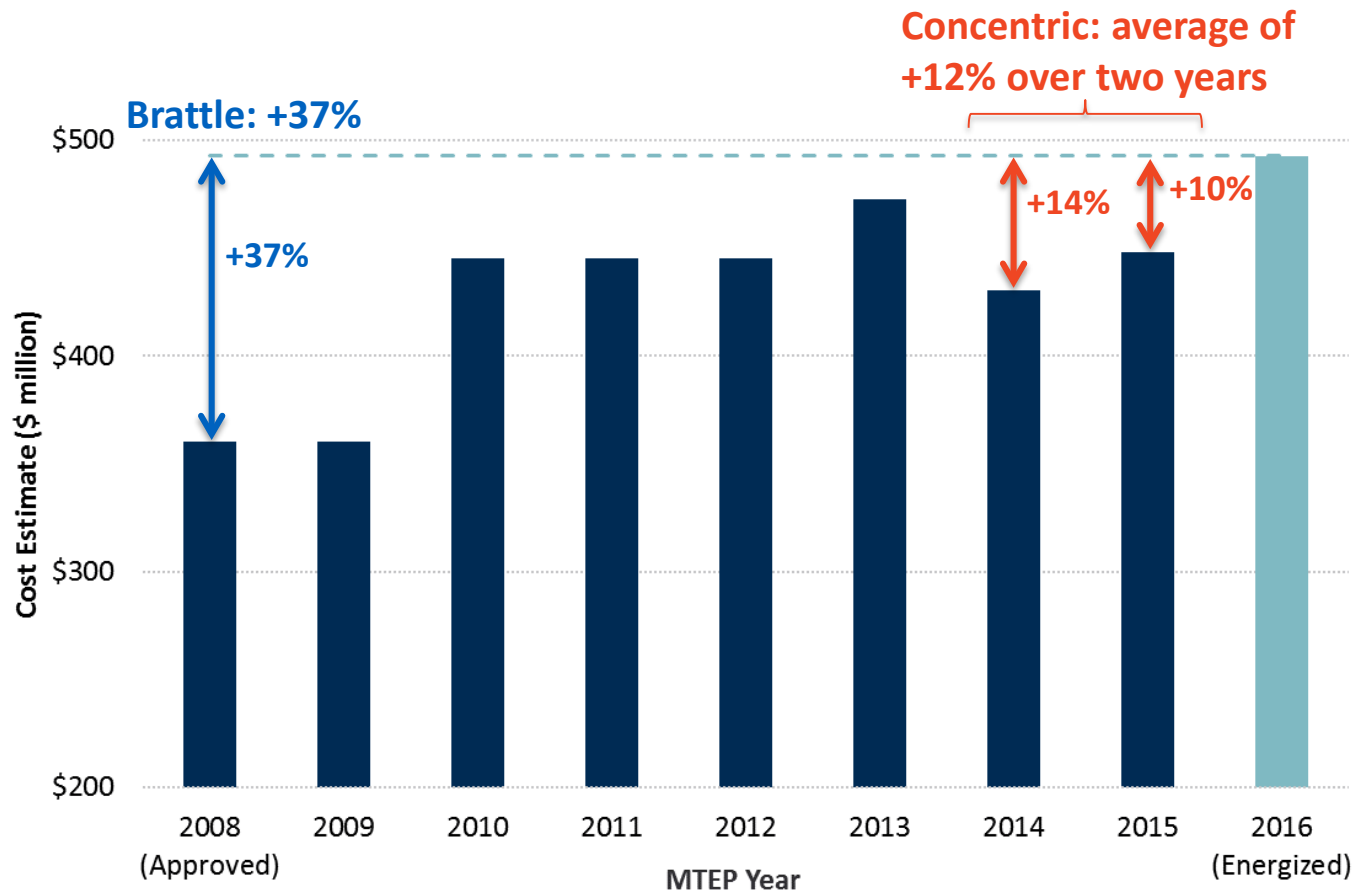
- Brattle approach: MISO project was approved in 2008 at an initial cost estimate of \$360 million and placed into service in 2016 for \$493 million (a 37% escalation)
- Concentric approach: compares MISO's updated 2014 and 2015 cost estimates of \$430 and \$448 million to final 2016 project cost of \$493 million (12% escalation)

MISO has recognized cost escalations similar to our 18% estimate for MISO:

- 2017 MVP Update (p.5): "Total portfolio costs have increased from \$5.56 billion in MTEP11 to \$6.65 billion in MTEP17." That is a 19.6% cost increase.

Example: Comparison of Brattle and Concentric Estimated Cost Escalations

- Concentric's approach of counting the same project multiple times, year after year, distorts the calculations for each project
- Using later and updated cost estimates guarantees a lower cost escalation



The Bottom Line: Implications for Customers and Transmission Owners

As documented in many studies, transmission investments have been providing significant overall cost savings through a wide range of benefits. Increasing the scope of competition will further improve the value proposition of transmission investments to the benefit of both customers and transmission owners.

- **Customer Benefits**: Both international and limited U.S. experience show that expanding the scope of competition offers substantial long-term savings
- **Transmission-Owner Benefits**: More cost-effective transmission would...
 - Reduce “rate pressure” which is already causing significant opposition by customers and policy makers to all types of transmission investments
 - Increase the attractiveness of transmission as the preferred solution to enhance wholesale power market efficiencies and to integrate and balance increasing amounts of renewable generation
 - Cost reductions needed to maintain attractiveness of transmission in an environment of low natural gas prices and declining costs for wind, solar, storage, and distributed resources
 - Lower costs mean more transmission projects can exceed benefit-to-cost thresholds

PRESENTER BIO & CONTACT INFORMATION

Johannes Pfeifenberger

Principal, Boston

+1.617.864.7900 (Main)

+1.617.234.5624 (Direct)

Hannes.Pfeifenberger@brattle.com



Mr. Johannes (Hannes) Pfeifenberger is an economist with a background in power engineering and over 25 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 wholesale power markets and transmission systems. His recent experience includes the analysis of transmission benefits, hydro and battery storage economics, reviews of wholesale power market designs, testimony in contract disputes, 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. (Dipl. Ing.) in Power Engineering and Energy Economics from the University of Technology in Vienna, Austria.

Additional Reading

Chang, Pfeifenberger, Sheilendranath, Hagerty, Levin, and Jiang, "[*Cost Savings Offered by Competition in Electric Transmission: Experience to Date and the Potential for Additional Customer Value*](#)," April 2019.

Chang, Pfeifenberger, Hagerty, and Cohen, "[*Response to Concentric Energy Advisors' Report on Competitive Transmission*](#)," August 2019.

Chang and Pfeifenberger, "[*Well-Planned Electric Transmission Saves Customer Costs: Improved Transmission Planning is Key to the Transition to a Carbon-Constrained Future*](#)," WIRES and The Brattle Group, June 2016.

Pfeifenberger, Chang, and Sheilendranath, "[*Toward More Effective Transmission Planning: Addressing the Costs and Risks of an Insufficiently Flexible Electricity Grid*](#)," WIRES and The Brattle Group, April 2015.

Chang, Pfeifenberger, and Hagerty, "[*The Benefits of Electric Transmission: Identifying and Analyzing the Value of Investments*](#)," WIRES and The Brattle Group, July 2013.

Pfeifenberger, Chang, and Tsoukalis, "[*Dynamics and Opportunities in Transmission Development*](#)," presented at TransForum East, December 2, 2014.

Chang, Pfeifenberger, Newell, Tsuchida, Hagerty, "[*Recommendations for Enhancing ERCOT's Long-Term Transmission Planning Process*](#)," October 2013.

Pfeifenberger and Hou, "[*Seams Cost Allocation: A Flexible Framework to Support Interregional Transmission Planning*](#)," Prepared for SPP RSC, April 2012.

Pfeifenberger, Johannes, "[*Transmission Investment Trends and Planning Challenges*](#)," presented at the EEI Transmission and Wholesale Markets School, Madison, WI, August 8, 2012.

Pfeifenberger, Hou, "[*Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada*](#)," prepared for WIRES, May 2011.

About The Brattle Group

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

We combine in-depth industry experience and rigorous analyses 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 include:

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

Our Offices



BOSTON



BRUSSELS



CHICAGO



LONDON



MADRID



NEW YORK



ROME



SAN FRANCISCO



SYDNEY



TORONTO



WASHINGTON