New Transmission Investments & FERC Order 1000

Session B3
Cost Savings Offered by Competition in Electric Transmission
Experience to Date and Potential Value for Electricity Consumers

PRESENTED TO
NARUC Annual Meeting

PRESENTED BY
Judy Chang

November 19, 2019
Here’s the Deal….

- Recent average transmission investment is ~$20 billion a year nation-wide; >80% of which are in ISO/RTO regions
- Major drivers of transmission buildout include access to low cost renewables + replacing aging infrastructure; both provide opportunities for regional facilities that provide broad benefits
- Transparency is needed: ~50% of transmission investments inside ISO/RTO regions are not subject to full stakeholder engagement
- International experience demonstrates competition saves customers money: technology, process, and financing innovation with cost cutting measures bring down costs
- Competition can save 20-30% of ratepayer money
- Competition holds developers accountable: cost containment contracts reduce risks of cost overruns for customers
- Increase competition from 3% to 1/3 of all investments means $6-9 billion savings over 5 years
Proposed Direction for FERC and State Policies

Effective regional plans are the foundation of the future of the industry, FERC and state policies should center around removing barriers

- **Cost-effective “Multi-Value” infrastructure investments are needed** to help meet customers’ desire for renewable energy and decarbonize the grid

- **FERC and State policies should reduce incentives of piecemeal infrastructure fixes** to “get around competition”

- **ISOs and RTOs need to push forward with effective regional and interregional transmission planning**

- **Regionally planned transmission projects can provide broad benefits:** need to break through the cost allocation barrier
## 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
- Cost Escalations of Traditionally-developed Projects
- Overall Potential for Customer Savings and Transmission-Owner Benefits
- Costs of Implementing Competitive Processes

**Conclusions and recommendations**

*This presentation is based on the authors’ analyses of publicly-available transmission data reported to FERC and ISO/RTO transmission project tracking reports, as assembled for prior client engagements and conference presentations. The analyses around competitive transmission process was commissioned by LS Power.*
Annual U.S. transmission investments are approximately **$20 billion/year** in the last five years (compared to ~$2 billion/year in late 1990s).
Transmission investments in markets operated by FERC-jurisdictional 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.


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<td>$2.6</td>
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<td>$1.8</td>
<td>$1.4</td>
<td>$1.7</td>
<td>$1.4</td>
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<td>$0.4</td>
<td>$0.5</td>
<td>$0.5</td>
<td>$0.5</td>
<td>$0.6</td>
<td>$2.6</td>
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<td>$3.4</td>
<td>$2.9</td>
<td>$4.1</td>
<td>$6.6</td>
<td>$7.3</td>
<td>$7.1</td>
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<td>$1.0</td>
<td>$2.1</td>
<td>$0.9</td>
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<td>$0.9</td>
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<td><strong>Subtotal FERC-jurisdictional ISO/RTOs</strong></td>
<td><strong>$1.43</strong></td>
<td><strong>$7.0</strong></td>
<td><strong>$7.3</strong></td>
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<td><strong>$12.9</strong></td>
<td><strong>$15.9</strong></td>
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<td>$1.0</td>
<td>$5.3</td>
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<td><strong>$10.2</strong></td>
<td><strong>12%</strong></td>
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<td><strong>Subtotal U.S. ISO/RTOs</strong></td>
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<td><strong>$7.8</strong></td>
<td><strong>$8.4</strong></td>
<td><strong>$11.7</strong></td>
<td><strong>$18.2</strong></td>
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<td><strong>$16.8</strong></td>
<td><strong>$18.9</strong></td>
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<td><strong>$86.1</strong></td>
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<td>$0.8</td>
<td>$1.2</td>
<td>$0.8</td>
<td>$1.3</td>
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<td>$0.9</td>
<td>$5.2</td>
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<td>$1.8</td>
<td>$1.8</td>
<td>$1.6</td>
<td>$1.6</td>
<td>$1.9</td>
<td>$1.9</td>
<td>$2.3</td>
<td>$9.4</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total US Reported to FERC and in ERCOT</strong></td>
<td><strong>$2.31</strong></td>
<td><strong>$10.8</strong></td>
<td><strong>$11.0</strong></td>
<td><strong>$14.3</strong></td>
<td><strong>$21.0</strong></td>
<td><strong>$19.1</strong></td>
<td><strong>$19.9</strong></td>
<td><strong>$21.8</strong></td>
<td><strong>$18.8</strong></td>
<td><strong>$100.7</strong></td>
<td><strong>12%</strong></td>
</tr>
</tbody>
</table>
Transmission Planning

Main Drivers of Transmission Needs

- Serve growing load
- Generation interconnections
- Local and regional reliability
- Congestion relief

- Access to low-cost renewable and clean energy
- Capture renewable energy and fuel diversity
- Help meet regional economic and public policy needs
- Cost reductions offered by better interregional coordination
- Mitigate risks and create valuable options to address uncertainties proactively
Transmission Planning

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.
Transmission Planning

Key Shortfalls in Traditional Transmission Planning

Three key barriers to identifying and developing the most valuable transmission infrastructure investments:

1. Approximately half of the transmission investments made in ISO/RTO regions do not go through comprehensive ISO/RTO planning process

2. Planners and policy makers do not consider the full range of benefits that transmission investments can provide and thus understate the expected value of such projects

3. Planners and policy makers do not account for the high costs and risks of an insufficiently robust and insufficiently flexible transmission infrastructure on electricity consumers and the risk-mitigation value of transmission investments to reduce costs under potential future stresses

4. Interregional planning processes are ineffective and are generally unable to identify valuable transmission investments that would benefit two or more regions

5. Very limited competitive forces in transmission planning and development

Additional challenges exist related to regional cost recovery and state-by-state permitting processes
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 September 19, 2019 Order denied rehearing and ruled that only transmission that yield “expansion” are subject to full regional planning requirements

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

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.
State of Competition

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**

- **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**

- **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 **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:

- **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

- **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 in savings (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) on average yielded estimated cost savings of 25% (per study prepared by Imperial College and University of Cambridge for U.K. regulator)

*Sources: see Brattle competitive transmission report, pages 44 and 49-51.*
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)

<table>
<thead>
<tr>
<th></th>
<th>CAISO</th>
<th>ISO-NE</th>
<th>MISO</th>
<th>NYISO</th>
<th>PJM*</th>
<th>SPP</th>
<th>Non-RTO</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>2013</td>
<td>$144</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$144</td>
</tr>
<tr>
<td>2014</td>
<td>$148</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$90</td>
<td>$0</td>
<td>$0</td>
<td>$238</td>
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<tr>
<td>2015</td>
<td>$425</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$912</td>
<td>$0</td>
<td>$0</td>
<td>$1,337</td>
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<td>2016</td>
<td>$133</td>
<td>$0</td>
<td>$50</td>
<td>$0</td>
<td>$471</td>
<td>$8</td>
<td>$0</td>
<td>$662</td>
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<tr>
<td>2017</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$181</td>
<td>$142</td>
<td>$0</td>
<td>$0</td>
<td>$323</td>
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</table>

| Total Estimated Competitive Project Costs Selected in 2013-2017 | $851 | $0 | $50 | $181 | $1,615* | $8 | $0 | $2,705 |

*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.
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; 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.

### Competitive Transmission Project Summary

<table>
<thead>
<tr>
<th>ISO/RTO</th>
<th>Project</th>
<th>Year of Decision</th>
<th>Selected Developer</th>
<th>Award to Incumbent?</th>
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<tr>
<td>CAISO</td>
<td>Gates-Gregg project (subsequently cancelled)</td>
<td>2013</td>
<td>PG&amp;E/MidAmerican w/ Citizen Energy</td>
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<td>CAISO</td>
<td>Imperial Valley Project</td>
<td>2013</td>
<td>Imperial Irrigation District</td>
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<td>CAISO</td>
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<td>SDG&amp;E w/ Citizen Energy</td>
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<td>CAISO</td>
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<td>DCR Transmission</td>
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<td>CAISO</td>
<td>Estrella Substation Project</td>
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<td>NextEra</td>
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<td>CAISO</td>
<td>Wheeler Ridge Junction Project</td>
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<td>PG&amp;E</td>
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<td>CAISO</td>
<td>Suncrest Project</td>
<td>2015</td>
<td>NextEra</td>
<td>No</td>
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<td>CAISO</td>
<td>Spring Substation</td>
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<td>PG&amp;E</td>
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<td>Harry Allen-Llanoado Project</td>
<td>2016</td>
<td>Desert Link</td>
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<td>CAISO</td>
<td>Miguel Substation</td>
<td>2014</td>
<td>SDG&amp;E</td>
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<td>MISO</td>
<td>Duff-Colman 345 kV</td>
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<td>LS Power w/ Big Rivers</td>
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<td>PJM</td>
<td>AP South Market Efficiency Project</td>
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<td>Transource w/ BGE and Allegheny Power</td>
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<td>PJM</td>
<td>136 Projects Awarded to Incumbents (132 Upgrades)</td>
<td>2014-2017</td>
<td>Various</td>
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<td>SPP</td>
<td>North Liberal – Walkemeyer 115 kV (subsequently cancelled)</td>
<td>2016</td>
<td>Mid Kansas Electric</td>
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<td>AESO</td>
<td>Fort McMurray West 500 kV</td>
<td>2014</td>
<td>Alberta PowerLine Limited Partnership</td>
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<td>IESO</td>
<td>East West Tie Line</td>
<td>2013</td>
<td>NextBridge</td>
<td>Infrastructure</td>
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<td>IESO</td>
<td>Watamykaneaway Power Project</td>
<td>2015</td>
<td>Fortis Inc.</td>
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### Processes Completed

<table>
<thead>
<tr>
<th>ISO/RTO</th>
<th>Processes Completed</th>
<th>Process Type</th>
<th>Awards</th>
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<tbody>
<tr>
<td>CAISO</td>
<td>10</td>
<td>Projects</td>
<td>10</td>
</tr>
<tr>
<td>MISO</td>
<td>2</td>
<td>Projects</td>
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<tr>
<td>SPP</td>
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<td>PJM</td>
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<td>Solutions</td>
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<td>NYISO</td>
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<td>Solutions</td>
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<td>ISO-NE</td>
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<tr>
<td>All Regions</td>
<td>31</td>
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</table>
State of Competition
Criteria for Entering 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.

<table>
<thead>
<tr>
<th>Types of Projects Eligible for Competition</th>
<th>CAISO</th>
<th>ISO-NE</th>
<th>MISO</th>
<th>NYISO</th>
<th>PJM</th>
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<td>✓</td>
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<td>✓</td>
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<td>Reliability, Economic, Public Policy</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Market Efficiency, Multi-Value (MVP)</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>Reliability, Economic, Public Policy</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>ITP, High Priority, Interregional</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Exclusions

| Exclusions for Reliability Projects       | ✓     | ✓      | ✓    | ✓     | ✓   | ✓   |
| (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.
Many transmission projects experience cost escalations:

- Data for initial project cost estimates and final project costs of transmission projects show **average cost escalations 34%**
- These escalations reflect 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.*
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

### Differences in Competitive Bids and Initial Cost Estimates for Competitive Processes of FERC-Jurisdictional ISO/RTOs

<table>
<thead>
<tr>
<th>RTO</th>
<th>Number of Competitive Projects</th>
<th>ISO/RTO or Incumbent Estimate of Project Cost ($million)</th>
<th>Winning Bid of Competitive Projects ($million)</th>
<th>Average Cost Advantage of Competitive Bids</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAISO*</td>
<td>10</td>
<td>$1,180</td>
<td>$833</td>
<td>29%</td>
</tr>
<tr>
<td>ISO-NE</td>
<td>0</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>MISO</td>
<td>2</td>
<td>$181</td>
<td>$154</td>
<td>15%</td>
</tr>
<tr>
<td>NYISO</td>
<td>1</td>
<td>$232</td>
<td>$181</td>
<td>22%</td>
</tr>
<tr>
<td>PJM*</td>
<td>2</td>
<td>$692</td>
<td>$280</td>
<td>60%</td>
</tr>
<tr>
<td>SPP</td>
<td>1</td>
<td>$17</td>
<td>$8</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td><strong>$1,948</strong></td>
<td><strong>$1,171</strong></td>
<td><strong>40%</strong></td>
</tr>
</tbody>
</table>

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

*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.
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.
The experience in U.S. indicates a significant potential for customer savings:

- If competitive projects can be developed as bid (without further cost escalations), savings would be 28%-50% relative to the costs had this projects been traditionally-developed.

- If costs of competitive projects escalate like traditionally-developed projects, the savings would still be between 15%-30%.

Potential Cost Savings from Competition

Cost Savings for Competitive Projects in Selected RTO/ISOs

(a) CAISO (9 competitive projects)
(b) MISO (2 competitive projects)
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.”

Benefits and Costs of Competition

Costs of Competitive Transmission Planning Processes

Costs for implementing and administering competitive processes for the ISOs/RTOs

- SPP reports internal costs of the competitive process for the North Liberal–Walkemeyer 115 kV project ~$500,000, ~3% of the relatively small project’s ~$17 million cost estimate.

- As of December 2017, PJM covered 97% of its ~$1.7 million of total 2016–2017 evaluation costs.

- PJM approved 39 projects from these proposal windows, which amounts to ~$44,000 of evaluation costs per approved project.

- Project developers incur additional costs when developing proposals.
  - Both ISO administrative costs and developer costs are absorbed by developers (and will ultimately be reflected in bids).

<table>
<thead>
<tr>
<th>Project Size</th>
<th>Submission Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$20 million</td>
<td>$0</td>
</tr>
<tr>
<td>$20 – $100 million</td>
<td>$5,000</td>
</tr>
<tr>
<td>&gt;$100 million</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

Implications for Customers and Electric Industry

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.

<table>
<thead>
<tr>
<th>Estimated Savings from Competitive Processes (%) of Transmission Costs</th>
<th>20%</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated 5-year US-wide Transmission Investment</td>
<td>$100 billion</td>
<td>$100 billion</td>
</tr>
<tr>
<td>Current Share of Competitive Projects (%) of Total Investment</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Estimated Cost Savings over 5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25% of Transmission Investment Subject to Competition</td>
<td>$4.4 billion</td>
<td>$6.6 billion</td>
</tr>
<tr>
<td>33% of Transmission Investment Subject to Competition</td>
<td>$6.0 billion</td>
<td>$9.0 billion</td>
</tr>
</tbody>
</table>
Bio and Contact Information

Judy W. Chang  
Principal, Director  
Judy.Chang@brattle.com  
617.864.7900 office  
617.234.5630 direct

Ms. Judy Chang is an energy economist and policy expert with a background in electrical engineering and 20 years of experience in advising energy companies and project developers with regulatory and financial issues. Ms. Chang has submitted expert testimonies to the U.S. Federal Energy Regulatory Commission, U.S. state and Canadian provincial regulatory authorities on topics related to power market designs, contract issues, and transmission rate design. She has authored numerous reports detailing the economic issues associated with system planning, including comparing the costs and benefits of transmission; renewable integration; and value of electricity storage. In addition, she assists clients in comprehensive organizational strategic planning, asset valuation, finance, and regulatory policies.

She holds a BSc. In Electrical Engineering from University of California, Davis, and Masters in Public Policy from Harvard Kennedy School. She is co-leading Brattle’s energy practice and is the founding Director of New England Women in Energy and the Environment.
Appendix
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% overall estimate:

- 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.
An Example for Comparison

- 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 chart illustrates the cost estimates for each year from 2008 to 2016. The Brattle project shows an average increase of 37% over the years, while Concentric’s approach, using later and updated cost estimates, results in an average increase of 12% over two years. The cost escalation for Brattle is shown explicitly, while Concentric’s average increase is indicated for the years 2016 and 2015.
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 for 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 NYPSC’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

Additional Reading


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
Transmission Investments & FERC Order 1000

Session B3
Building New Transmission Experience To-Date Does Not Support Expanding Solicitations

NARUC Annual Meeting, November 2019

Emma Nicholson*, Meredith Stone, and Danielle Powers

*Presenter
Concentric Report Conclusions

• Experience to-date does not support significantly expanding solicitations for new transmission projects
• Actual savings from most ISO/RTO solicitations unknown because:
  • final costs of the majority of projects are unknown
  • cost caps have exclusions
• Solicitations are time and resource intensive
• Based on the full sample from ISO/RTO tracking databases, incumbent TOs experience either no increase or a fairly modest increase between initial estimates and final or updated project cost estimates
Incumbent TOs Have No or Modest Difference Between Initial Cost Estimates and Final or Updated Costs

ISO/RTO | Brattle Report | Concentric Report
---|---|---
CAISO* | 41% | PG&E: 6.1 to 18.8% SDG&E: 5.9%
ISO-NE | 70% | -2.9%
MISO | 18% | 5.9%
PJM | 22% | 7.0%
SPP | 18% | -2.4%

Source: Brattle estimates are from Brattle Report, p. 41, Figure 18, column 5. CAISO does not have a cost tracking database so Concentric’s estimates for PG&E and SDG&E projects are not representative of either CAISO as a whole or of these TOs’ full portfolio of projects. The CAISO estimate is only provided for purposes of comparison with the Brattle Report’s CAISO estimate.
# Solicitations are Time and Resource Intensive

<table>
<thead>
<tr>
<th>Project</th>
<th>Days Between Project Identification and ISO/RTO Board Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial Valley</td>
<td>113</td>
</tr>
<tr>
<td>Gates-Gregg</td>
<td>231</td>
</tr>
<tr>
<td>Sycamore Penasquitos</td>
<td>349</td>
</tr>
<tr>
<td>Suncrest</td>
<td>174</td>
</tr>
<tr>
<td>Delany Colorado River</td>
<td>359</td>
</tr>
<tr>
<td>Estrella</td>
<td>238</td>
</tr>
<tr>
<td>Harry Allen to Eldorado</td>
<td>544</td>
</tr>
<tr>
<td>Miguel†</td>
<td>55</td>
</tr>
<tr>
<td>Spring</td>
<td>238</td>
</tr>
<tr>
<td>Wheeler Ridge</td>
<td>238</td>
</tr>
<tr>
<td>Duff-Coleman</td>
<td>385</td>
</tr>
<tr>
<td>Hartburg-Sabine</td>
<td>361</td>
</tr>
<tr>
<td>Walkemeyer</td>
<td>448</td>
</tr>
<tr>
<td>Artificial Island</td>
<td>1,498</td>
</tr>
<tr>
<td>AP South</td>
<td>893</td>
</tr>
<tr>
<td>NY Western Public Policy</td>
<td>820</td>
</tr>
<tr>
<td>AC Transmission</td>
<td>1,208</td>
</tr>
</tbody>
</table>

†The Miguel solicitation had a single bidder – San Diego Gas & Electric.
New Transmission Investments & FERC Order 1000

Session B3
New Transmission Investments and FERC Order 1000
NARUC 131st Annual Meeting and Education Conference

Edward D. Tatum, Jr.  November 19, 2019
Majority of Projects Driven by TO Needs
Short Planning Horizons

Time Between Local Plan Submission By TO and the Project In-Service Date

- Average For All PJM TO's: 17.7
- Median For All PJM TO's: 13.9
Short Planning Horizons

Months Between TO’s Need Presentation & Supplemental Project ISD

PJM 5-Year Planning Horizon

Average For All PJM TO’s: 26.2

Median For All PJM TO’s: 22.6
New Transmission Investments & FERC Order 1000

Session B3