Transmission Solutions: Potential Cost Savings Offered by Competitive Planning Processes

Discussion Paper

PRESENTED TO

N A R U C
National Association of Regulatory Utility Commissioners

PRESENTED BY

Johannes Pfeifenberger
Judy Chang
Akarsh Sheilendranath

November 13, 2018

PREPARED FOR:
LSP Transmission Holdings,
GridLiance

THE Brattle GROUP
U.S. transmission investments have stabilized at approx. $20 billion/year in the last five years, after rising steadily from $2 billion/year in 1990s.
Limited Scope of Full ISO/RTO Planning Review (53%) and Competitive Projects (2%)

- 47% of total transmission investments across all ISO/RTO regions are not subject to full ISO/RTO and stakeholder review in regional planning processes.
- Since 2013, fifteen competitively-bid transmission projects account for only 2% of total transmission investments in ISO/RTO regions.

2013-17 Transmission Investments: (1) with Full/Limited Review in Regional Planning Processes  (2) Subject to Competitive Bidding

- $31,469 Total Regional Transmission Investment
- 54% Investment with limited ISO/RTO Review
- 47% of total transmission investments across all ISO/RTO regions are not subject to full ISO/RTO and stakeholder review in regional planning processes.
- Since 2013, fifteen competitively-bid transmission projects account for only 2% of total transmission investments in ISO/RTO regions.

* CAISO Investment Planned and Approved by ISO percentage reflects data from 2014-2016 period. Percentages have been applied to total CAISO Transmission Investment over the 2013-2017 period.
**NYISO data on Investment Planned and Approved by ISO is not available.
STUDY HIGHLIGHTS

Potential Customer Savings from Competitive Transmission Planning Processes ($8 billion)

Cost savings benefit both customer and transmission owners:

- Customers see lower overall costs
- Transmission owners benefit from keeping transmission a more attractive option to in an energy future of low gas prices and declining cost of wind and solar generation, batteries, and DER technologies

Even if long-term savings were only half this 55% difference and if the scope of competition could be expanded from 2% to 33% of total transmission investments, estimated customer benefits would be approximately $8 billion over just five years.
Detailed Study Results
Executive Summary

Competitive transmission planning processes in ISOs/RTOs, the most controversial aspect of FERC Order 1000, have shown potential for significant customer savings:

- While the scope of competition has been limited to only 2% of total U.S. transmission investments over the last 5 years, competitive processes led to innovations in proposed solutions, low bids, cost caps, cost control measures, and innovative financial structuring.

- Winning bids average 40% below initial cost estimates while non-competitive projects are completed at 34% above initial estimates, offering 55% of potential cost savings.

- Long-term savings likely less than the currently-observed 55% cost differences, but real prospect of significant customer benefits and innovation nevertheless.

- Even if long-term savings were only half the 55% difference, if the scope of competition could be expanded from 2% to 33% of total transmission investments, estimated customer benefits would be approximately $8 billion over just five years.

- Lower costs will also make transmission more cost-effective to address market efficiency and public policy needs (e.g., in competition with more local and distributed generation).

Recommendations:

- 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 minimum reporting requirements to facilitate better tracking of project costs across all regions.
Table of Contents

**Background**
- Focus & Scope
- Competition for Regulated Transmission

**Historical Transmission Investments in the U.S.**
- Historical and Projected Transmission Investments
- Scope of ISO/RTO Oversight

**The Current State of Competition**
- Competition Models
- Experience with Competition
- Limits to Competition in U.S. ISO/RTO Planning
- Competitive Projects Summary

**Benefits of Competition**
- Level of Competitive Bids Compared to Initial Project Cost Estimates
- Cost Escalations of Non-Competitive Projects
- Overall Potential for Customer Savings

*This presentation, prepared for LSP Transmission Holdings and GridLiance, 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*
Focus of this presentation: An examination of transmission investment trends and current experience with competitive transmission planning in ISO/RTO regions as mandated under FERC Order 1000

- U.S. transmission investments by FERC-jurisdictional transmission providers increased from $2 billion/year in the 1990s to $20 billion/year in last 5 years
- We project $120-160 billion of investments over the next decade (for reliability, to integrate new resources, upgrade/replace aging existing facilities built in 1950-70s)

Why competition? In 2011, FERC Order 1000 mandated competition in transmission planning to promote “more efficient or cost-effective transmission development”

- We explore competition in ISO/RTO transmission planning to date and the criteria that currently limit the scope of competitive processes
- We assess the extent to which the experience to date points to potential customer savings and how these savings would increase if the scope of competitive processes can be expanded
Transmission investment remain largely regulated, based on state or regional planning with cost recovery at regulated rates.

Transmission is a public good:

- Benefits broad in scope, wide-spread geographically, diverse in impacts on market participants, and occurring over many decades.
- Owners generally unable to capture sufficient portion of benefits.
- Will tend to lead to under-investment and over-use without regulated cost recovery.

Competition is mostly for transmission projects with regulated cost recovery:

- Out-of-footprint investments by established transmission owners and independent developers.
- Elimination of “Right of First Refusal” (ROFR) of incumbent transmission owners for new builds approved in regional transmission plans as required by Order 1000.

Some competitive “merchant” transmission projects (but not the scope of this presentation):

- Mostly HVDC lines between regions with sustained price differentials, resource needs, and ineffective interregional planning of regulated transmission.
- HVDC is more likely to allow owner capture the benefits of the merchant lines.
Background

Competition Mostly for “Regulated” Transmission (Cont’d)

U.S. competitively-planned, regulated transmission opportunities for non-incumbents are limited to:

- Some regionally-planned projects in FERC-jurisdictional RTO/ISO regions
  U.S. ISO/RTOs are at different stages of using various frameworks for competitive planning processes, largely as a result of FERC Order 1000
- ERCOT’s transmission for competitive renewable energy zones (CREZ)

Important international experience with competition for regulated projects

- Alberta: Developed a competitive process for major new projects; assigned first $1.4 billion project (significantly below AESO estimates)
- Ontario: Two competitive solicitations for transmission to date
- Brazil: Since 1999 all transmission projects have been auctioned off (similar processes in other Latin American countries, such as Chile)
- UK: Tenders for offshore grid projects
U.S. transmission investments have stabilized at approx. **$20 billion/year** in the last five years, after rising steadily from $2 billion/year in 1990s.
Historical Transmission Investment in the U.S.

Majority of U.S. Transmission Investments are made within ISO/RTO-Operated Regions

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 also have grown by more (10-16% annually) than investments in the non-ISO/RTO regions (6-10% annually).

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>------</td>
</tr>
<tr>
<td>CAISO</td>
</tr>
<tr>
<td>ISO-NE</td>
</tr>
<tr>
<td>MISO</td>
</tr>
<tr>
<td>NYISO</td>
</tr>
<tr>
<td>PJM</td>
</tr>
<tr>
<td>SPP</td>
</tr>
<tr>
<td>Subtotal FERC-jurisdictional ISO/RTOs</td>
</tr>
<tr>
<td>ERCOT</td>
</tr>
<tr>
<td>Subtotal U.S. ISO/RTOs</td>
</tr>
<tr>
<td>Other WECC</td>
</tr>
<tr>
<td>Southeast &amp; Other</td>
</tr>
<tr>
<td>Total US Reported to FERC and in ERCOT</td>
</tr>
</tbody>
</table>
Historical Transmission Investment in the U.S.

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

Of $70 billion in transmission investments by FERC-jurisdictional TOs in ISO/RTO regions over the last 4-5 years, almost half was made without full ISO/RTO and stakeholder engagement in the planning process:

- Investments based on local planning processes of incumbent TOs are only subject to limited 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

<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>
</tr>
</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>
</tr>
<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>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>$70,810</td>
<td>$36,095</td>
<td>53%</td>
<td>47%</td>
</tr>
</tbody>
</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 Models in Transmission Planning

Sponsor-Based Competitive Processes

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; winner has rights to finance, build, own, and operate projects
- Examples: PJM, ISO-NE, NYISO

Bid-Based Competitive Processes

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

- Planning entities identify need and specify solutions (i.e., specific projects)
- Competition to finance, own, and construct the specified project based on a number of factors, including costs
- Examples: CAISO, MISO, SPP, ERCOT, Brazil, Alberta, Ontario,
State of Competition

Experience with Competition in U.S. ISO/RTO Transmission Planning Processes

Since implementation of FERC Order 1000 (around 2013), FERC-jurisdictional ISO/RTOs have completed **29 competitive transmission project solicitations**

- Of the 29 ISO/RTO competitive processes, 10 were by CAISO, 16 by PJM, and one each in NYISO, MISO, and SPP. These processes have resulted in 15 competitive projects to date.

Since 2013, **only 2%** of all FERC-jurisdictional transmission investments have been subject to competitive processes

<p>| Total Costs of Competitively-Bid Projects by ISO/RTO and Project-Selection Year ($million) |</p>
<table>
<thead>
<tr>
<th>CAISO</th>
<th>ISO-NE</th>
<th>MISO</th>
<th>NYISO</th>
<th>PJM</th>
<th>SPP</th>
<th>All Six FERC Jurisdictional ISO/RTOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>$144</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>2014</td>
<td>$148</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>2015</td>
<td>$425</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$283</td>
<td>$0</td>
</tr>
<tr>
<td>2016</td>
<td>$133</td>
<td>$0</td>
<td>$50</td>
<td>$0</td>
<td>$320</td>
<td>$8</td>
</tr>
<tr>
<td>2017</td>
<td>$0</td>
<td>$0</td>
<td>$50</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total Estimated Competitive Project Costs 2013 - 2017 ($million)</td>
<td>$851</td>
<td>$0</td>
<td>$50</td>
<td>$181</td>
<td>$603</td>
<td>$8</td>
</tr>
<tr>
<td>Total Reported Investment in Each RTO 2013-2017 ($billion)</td>
<td>$12.6</td>
<td>$7.5</td>
<td>$15.5</td>
<td>$2.6</td>
<td>$31.5</td>
<td>$6.2</td>
</tr>
<tr>
<td>Estimated Total Competitive Project Costs as a % of Total RTO Spend</td>
<td>6.8%</td>
<td>0.0%</td>
<td>0.3%</td>
<td>7.0%</td>
<td>1.9%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>
State of Competition

List of Projects Selected Through Competitive Solicitations by ISO/RTOs

Despite the limited number of competitive projects, independent TOs have competed successfully across ISO/RTO regions

- 15 projects in the U.S. plus 3 in Canada
- Independent developers won in both NYISO’s and MISO’s first competitive procurements and in 40% of all of CAISO’s
- PJM has awarded projects mostly to incumbents:
  - Out of 16 projects, all but 2 were awarded to the incumbent TOs
  - PJM received 622 proposals between 2013 and 2016, of which 37% to 50% were submitted by non-incumbents

Participation in competitive processes (as documented by FERC staff) indicates strong interest by both incumbent and independent developers, but RTO criteria are limiting competitive opportunities

<table>
<thead>
<tr>
<th>ISO/RTO</th>
<th>Project Description</th>
<th>Year</th>
<th>Winner</th>
<th>Incumbent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAISO</td>
<td>Gates-Gregg</td>
<td>2013</td>
<td>PG &amp; E/MidAmerican Citizen Energy</td>
<td>Yes</td>
</tr>
<tr>
<td>CAISO</td>
<td>Imperial Valley</td>
<td>2013</td>
<td>Imperial Irrigation District</td>
<td>Yes*</td>
</tr>
<tr>
<td>CAISO</td>
<td>Sycamore-Peñasquitos 230 kV</td>
<td>2014</td>
<td>SDG &amp; E w/ Citizen Energy</td>
<td>Yes</td>
</tr>
<tr>
<td>CAISO</td>
<td>Delaney-Colorado River</td>
<td>2015</td>
<td>DCR Transmission</td>
<td>No</td>
</tr>
<tr>
<td>CAISO</td>
<td>Estrella Substation</td>
<td>2015</td>
<td>NextEra</td>
<td>No</td>
</tr>
<tr>
<td>CAISO</td>
<td>Wheeler Ridge Junction</td>
<td>2015</td>
<td>PG &amp; E</td>
<td>Yes</td>
</tr>
<tr>
<td>CAISO</td>
<td>Suncrest Project</td>
<td>2015</td>
<td>NextEra</td>
<td>No</td>
</tr>
<tr>
<td>CAISO</td>
<td>Spring Substation</td>
<td>2015</td>
<td>PG &amp; E</td>
<td>Yes</td>
</tr>
<tr>
<td>CAISO</td>
<td>Harry Allen-Eldorado</td>
<td>2016</td>
<td>Desert Link</td>
<td>No</td>
</tr>
<tr>
<td>CAISO</td>
<td>Miguel Substation</td>
<td>2014</td>
<td>SDG &amp; E</td>
<td>Yes</td>
</tr>
<tr>
<td>MISO</td>
<td>Duff-Coleman 345 kV</td>
<td>2016</td>
<td>LS Power w/ Big Rivers</td>
<td>No</td>
</tr>
<tr>
<td>NYISO</td>
<td>Western NY Public Policy</td>
<td>2017</td>
<td>NextEra</td>
<td>No</td>
</tr>
<tr>
<td>PJM</td>
<td>Artificial Island</td>
<td>2015</td>
<td>LS Power</td>
<td>No</td>
</tr>
<tr>
<td>PJM</td>
<td>ApSouth Market Efficiency</td>
<td>2016</td>
<td>Transource, BGE, and Allegheny Power</td>
<td>No</td>
</tr>
<tr>
<td>SPP</td>
<td>North Liberal - Walkemeyer 115 kV</td>
<td>2016</td>
<td>Mid Kansas Electric</td>
<td>Yes</td>
</tr>
<tr>
<td>AESO</td>
<td>Fort McMurray West 500 kV</td>
<td>2014</td>
<td>Alberta PowderLine</td>
<td>Yes</td>
</tr>
<tr>
<td>IESO</td>
<td>East West Tie Line</td>
<td>2013</td>
<td>NextBridge</td>
<td>No</td>
</tr>
<tr>
<td>IESO</td>
<td>Wataynikaneyap Power</td>
<td>2015</td>
<td>Fortis Inc.</td>
<td>No</td>
</tr>
</tbody>
</table>

* IID is not a CAISO PTO but the incumbent in the Imperial Valley Region
ISO/RTO qualifications and exclusion criteria greatly reduce the scope of projects eligible for competitive processes. Experience shows scope can be increased.

<table>
<thead>
<tr>
<th>Types of Projects Eligible for Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAISO</td>
</tr>
</tbody>
</table>

| Exclusions Based on Need Date | ✓ | ✓ | ✓ | ✓ | ✓ |

| Exclusions for Local Reliability or Local Cost Allocated | ✓ | ✓ | ✓ | ✓ | ✓ |

| Excludes Upgrades/Addition to Existing Facilities and on Existing ROW | ✓ | ✓ | ✓ | ✓ | ✓ |

| State Mandated Exclusion | ✓ | ✓ | ✓ |

| Exclusions Based on Minimum Cost Requirements | ✓ |

**Additional Exclusions Based on Voltage**

| Voltage > 300 kV | ✓ | ✓ | ✓ | ✓ | ✓ |

| Voltage 200-300 kV | ✓ | ✓ | ✓ | ✓ | ✓ |

| Voltage 100-200 kV | ✓ | ✓ | ✓ | ✓ | ✓ |

| Voltage < 100 kV | ✓ | ✓ | ✓ | ✓ | ✓ |
Benefits of Competition

Competitive Project Experience Indicates Potential for Significant Cost Savings

Experience with 15 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
- However, all 15 projects are still under development (in-service dates post-2019), so final costs are not yet known
- In addition to low bid prices, winning bids generally offer **cost caps or cost-control** measures, reducing the risk and magnitude of significant cost increases as they are developed and constructed

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

<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>1</td>
<td>$59</td>
<td>$50</td>
<td>15%</td>
</tr>
<tr>
<td>NYISO</td>
<td>1</td>
<td>$232</td>
<td>$181</td>
<td>22%</td>
</tr>
<tr>
<td>PJ M*</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>

* 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.
Transmission investments outside competitive processes (98% of total since Order 1000 was implemented) often experience cost escalations:

- Comparing initial estimates and final project costs of transmission projects not subject to competitive processes shows cost escalations average **34%**

- Average cost escalations range from 18% (for projects in MISO and SPP) to 33%–70% (for projects in CAISO and ISO-NE)

- A portion of these observed cost escalations reflects inflation, routing changes, etc.

- The absence of cost-tracking mechanisms in some ISO/RTOs (CAISO and NYISO) makes it difficult to document project cost increases (CAISO data from FERC Complaint, EL17-45)

- More consistent and transparent project cost tracking and reporting standards are needed

### Historical Cost Escalations of Non-Competitive Projects In FERC-Jurisdictional ISO/RTOs

<table>
<thead>
<tr>
<th>RTO</th>
<th>Years Reviewed</th>
<th>Transmission Cost Data Analyzed</th>
<th>Average Cost Escalation of Non-Competitive Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAISO</td>
<td>2014-16</td>
<td>2014-2016 PG&amp;E and SDG&amp;E projects for which data is available (from FERC Complaint)</td>
<td>41%</td>
</tr>
<tr>
<td>ISO-NE</td>
<td>2013-17</td>
<td>Reflects eleven major 345 kV/115 kV projects approved by ISO-NE between 2002 and 2016</td>
<td>70%</td>
</tr>
<tr>
<td>MISO</td>
<td>2013-17</td>
<td>2014-2017 In-Service or Under-Construction Baseline &amp; Network Upgrade projects.</td>
<td>18%</td>
</tr>
<tr>
<td>NYISO</td>
<td>2013-17</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>PJM</td>
<td>2013-17</td>
<td>2015-2017 In-Service, and 2018 In-Service or Under-Construction projects</td>
<td>22%</td>
</tr>
<tr>
<td>SPP</td>
<td>2013-17</td>
<td>Selected 2012-2016 ITP Portfolio Projects, and completed Balanced Portfolio and Priority projects, as reported in SPP’s 2017 Quarterly Project Tracking Reports</td>
<td>18%</td>
</tr>
</tbody>
</table>

### Weighted Average of Cost Escalation*

*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 in non-competitive projects shown above excludes ISO-NE projects’ observed historical cost-escalation.
Benefits of Competition

Potential Customer Savings from Competitive Transmission Planning Processes

The experience with ISO/RTO competitive transmission planning processes to date indicates a significant potential for customer savings:

- Winning bids of FERC-jurisdictional competitive projects selected by ISO/RTOs on average were priced 40% below the ISO/RTOs’ initial project cost estimates or the lowest-cost incumbent bids.
  - Bids generally include cost caps or cost controls, reducing the risk and magnitude of cost escalations.

- In contrast, historical cost escalations of non-competitive ISO/RTO projects averaged 34% above initial cost estimates (including inflation).

- As a result, if competitive projects can be developed as bid (without further cost escalations), savings would be 55% relative to the escalated costs of non-competitive projects.
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**: Even if long-term savings were only half the 55% difference documented to date, if the scope of competition could be expanded from 2% to 33% of total transmission investments, estimated customer benefits would be approximately $8 billion over just five years.

- **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.
The views expressed in this presentation are strictly those of the presenter(s) and do not necessarily state or reflect the views of The Brattle Group, Inc. or its clients.
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
Our Practices and Industries

ENERGY & UTILITIES
- Competition & Market Manipulation
- Distributed Energy Resources
- Electric Transmission
- Electricity Market Modeling & Resource Planning
- Electrification & Growth Opportunities
- Energy Litigation
- Energy Storage
- Environmental Policy, Planning and Compliance
- Finance and Ratemaking
- Gas/Electric Coordination
- Market Design
- Natural Gas & Petroleum
- Nuclear
- Renewable & Alternative Energy

LITIGATION
- Accounting
- Analysis of Market Manipulation
- Antitrust/Competition
- Bankruptcy & Restructuring
- Big Data & Document Analytics
- Commercial Damages
- Environmental Litigation & Regulation
- Intellectual Property
- International Arbitration
- International Trade
- Labor & Employment
- Mergers & Acquisitions Litigation
- Product Liability
- Securities & Finance
- Tax Controversy & Transfer Pricing
- Valuation
- White Collar Investigations & Litigation

INDUSTRIES
- Electric Power
- Financial Institutions
- Infrastructure
- Natural Gas & Petroleum
- Pharmaceuticals & Medical Devices
- Telecommunications, Internet, and Media
- Transportation
- Water
Our Offices

BOSTON

NEW YORK

SAN FRANCISCO

WASHINGTON

TORONTO

LONDON

MADRID

ROME

SYDNEY
THE POWER OF ECONOMICS

brattle.com