

Support for MISO MVP Subregional Cost Allocation

PRESENTED BY

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PREPARED FOR



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RECB MEETING

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Summary of MVP Cost Allocation Proposal

- Allows for uniform, subregional MVP postage-stamp rates in MISO's Midwest and South Subregions; retains MISO-wide MVP postage stamp as option.
- Cost of new subregional MVP portfolios (with benefits not spread MISO-wide) allocated entirely to the subregion where benefits are broadly spread
 - Cost of MVP portfolios with benefits broadly spread across the Midwest Subregion and providing benefits primarily to the Midwest Subregion allocated to Midwest Subregion
 - Cost of MVP portfolios with benefits broadly spread across the South Subregion and providing benefits primarily to the South Subregion allocated to South Subregion
- Retains MISO-wide cost allocations for MVP portfolios that benefit the entire footprint
- Does not affect cost allocation of existing 2011 MVP portfolio
- Several tranches of subregional MVP portfolios expected to be approved through MISO's Long Range Transmission Planning (LRTP) effort

Summary

Final Conclusion: Proposed subregional MVP cost allocation **is reasonable for MVP portfolios that:**

1. Have benefits spread broadly within a Subregion (Midwest or South) but provide benefits primarily to only one Subregion (without benefits spread broadly across the entire MISO footprint)
2. Do **not increase the transfer capability** between the Midwest and South Subregions and/or result in transmission-related benefits broadly spread to both subregions

Conclusion is based on analyses showing the modified cost-allocation proposal is consistent with the Commission's requirement that cost allocation of transmission projects be **roughly commensurate** with the distribution of expected benefits

MISO Subregions

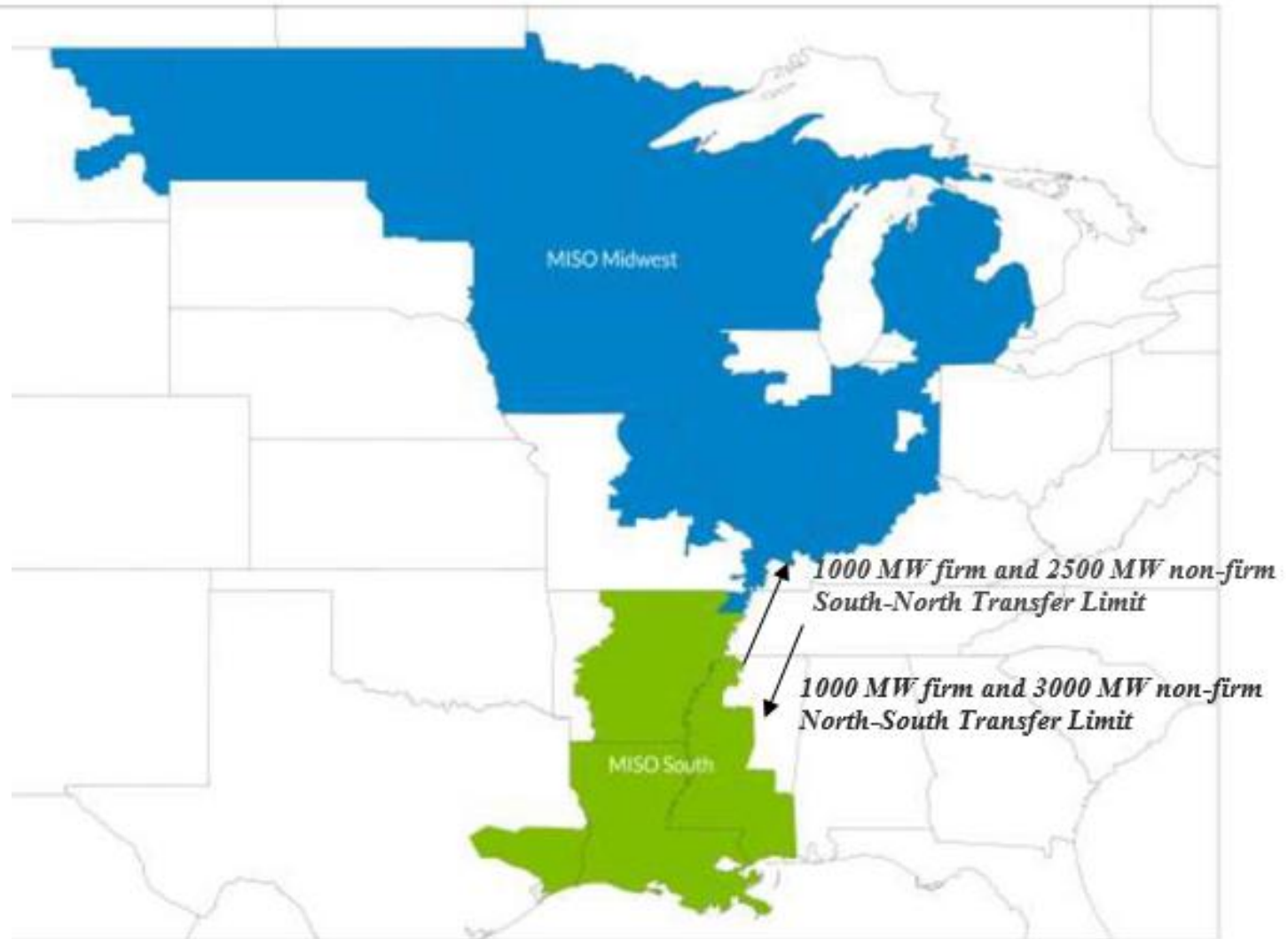


MISO Midwest and South Subregions and Transfer Capability

The Midwest and South Subregions are interconnected with:

- 1,000 MW bi-directional firm contract path between Midwest and South
- 3,000 MW non-firm transfer limit from Midwest to South
- 2,500 MW non-firm transfer limit from South to Midwest

Transfer capability limits established in 2015 Settlement Agreement between MISO, SPP, and certain entities known as “Joint Parties” approved by FERC*

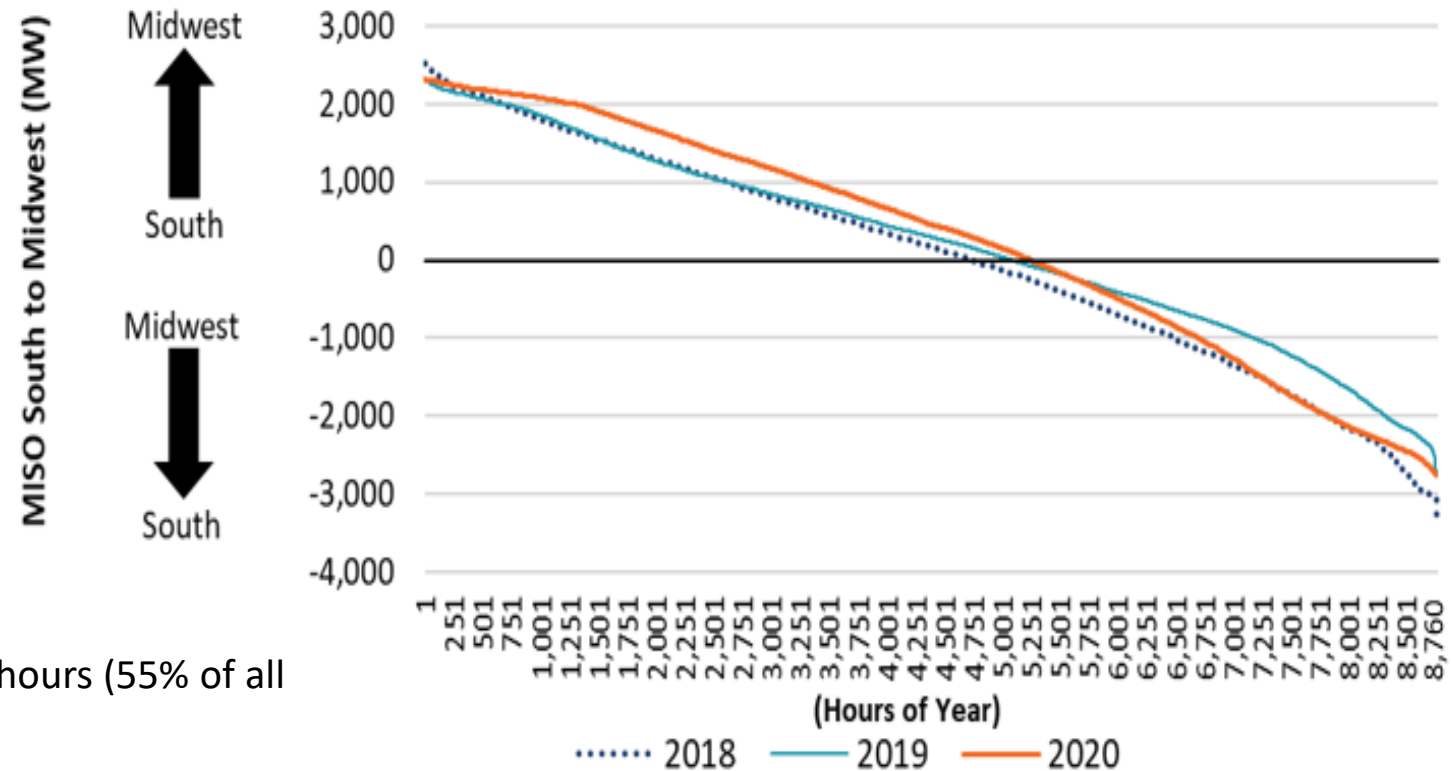


*See *Midcontinent Independent System Operator, Inc.*, 154 FERC ¶ 61,021 (2016).

Historical Flows between Midwest and South Subregions

Flow duration curve plot of power transfers for 2018, 2019, and 2020

- Hourly power flow sorted from highest (representing individual hourly South-to-Midwest flows) to lowest (representing individual hourly Midwest-to-South flows)
- Overall, flows are fairly balanced in both magnitude and direction:
 - South-to-Midwest
 - ▶ Power flowed South-to-Midwest during 4,800 hours (55% of all hours of the year)
 - ▶ Ranged from 2,500 MW to 0 MW per hour
 - Midwest-to-South
 - ▶ Power flowed Midwest-to-South the remaining 45% of the hours
 - ▶ Ranged from 0 to 3,000 MW per hour



Source: Brattle analysis of MISO Internal Data

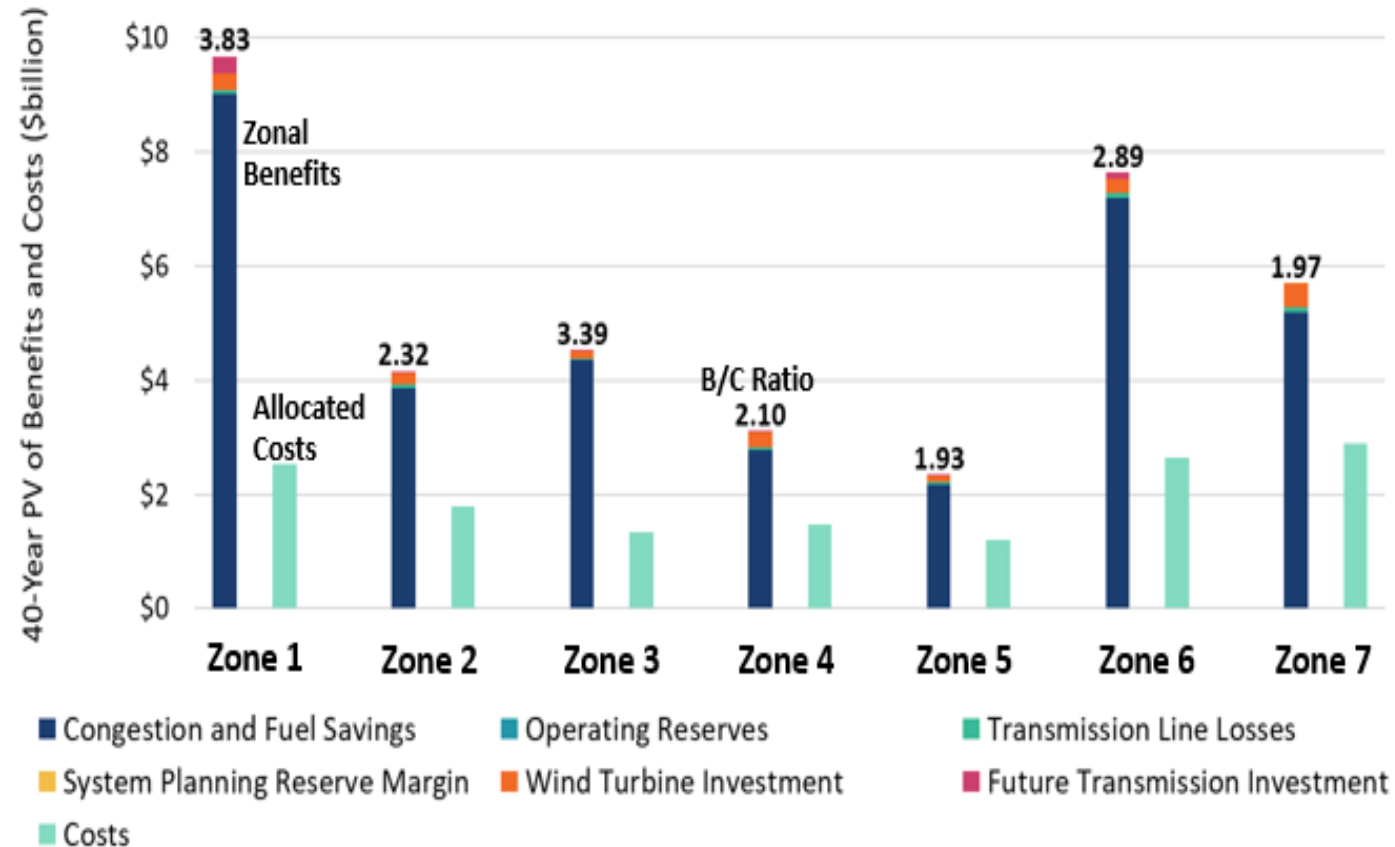
Analysis of Subregional Benefits of 2011 MVP Portfolio

(as proxy for future Midwest MVP portfolio)

2011 MVP Portfolio Benefits (From 2017 Triennial Review)

Costs for the 2011 MVP Portfolio are allocated entirely to MISO's Midwest loads and exports based on energy withdrawals (\$/MWh allocation)

- The entire portfolio being located in MISO Midwest Subregion and limited transfer capability from Midwest to the South Subregion, result in very limited South benefits
- Midwest zones B/C ratio at 1.93-to-1 or above
- The majority of quantified total benefits (average of 93%) are represented by Congestion and Fuel Savings (i.e. "Adjusted Production Cost Savings" or "APC Savings")



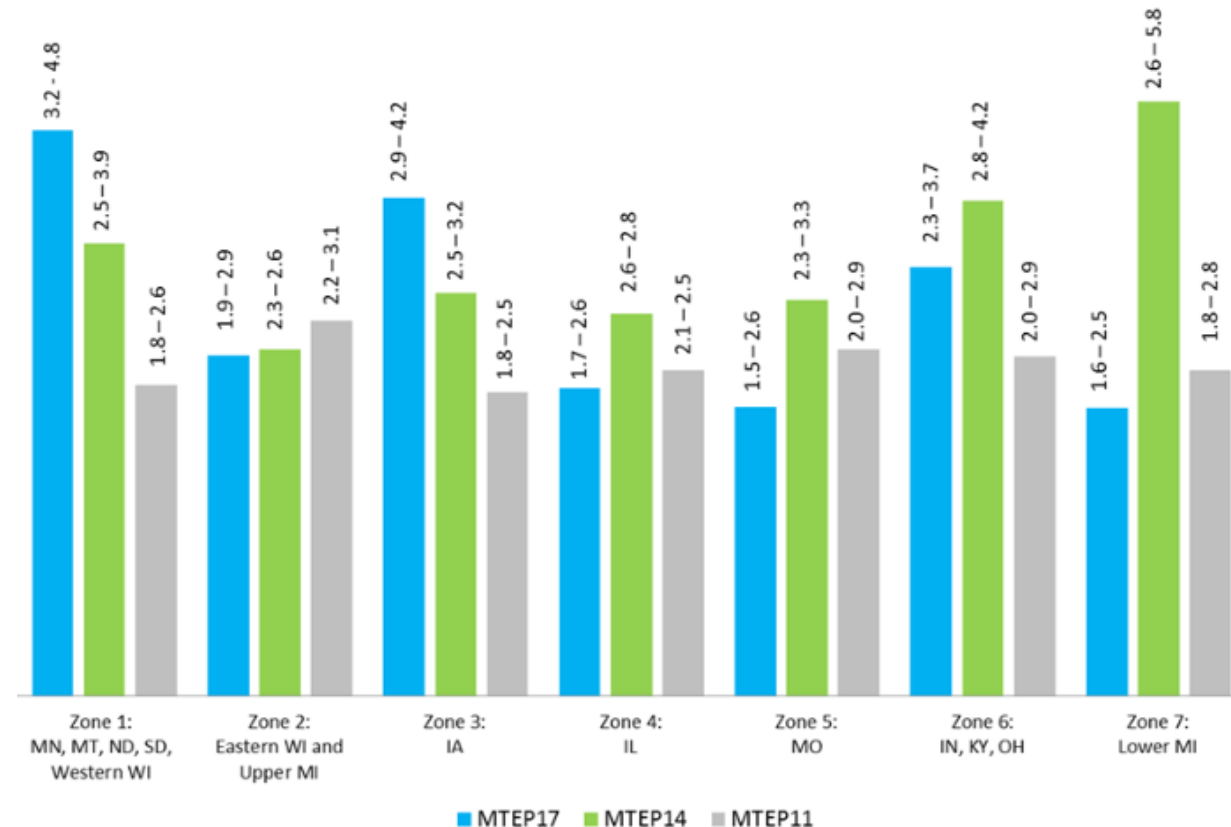
Source: Brattle analysis of MISO's 2017 Triennial Review Data (for Scenario with 8.2% Discount Rate), posted at

<https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf>

Estimates of MVP Benefits Change Across Triennial Reviews

Across the 2011, 2014, and 2017 Triennial reviews the B/C ratios change but benefits remain broadly distributed across Midwestern zones

- Indicates the importance of the roughly commensurate standard as estimated benefits fluctuate as projections of system use change over time
- It would not be practical to base cost allocations precisely on any single estimate of long-term transmission benefits
- As long as benefits remain roughly commensurate with allocated costs, cost allocation methodology should be deemed reasonable*



Source: MISO 2017 Triennial Review, Figure E-3, posted at:

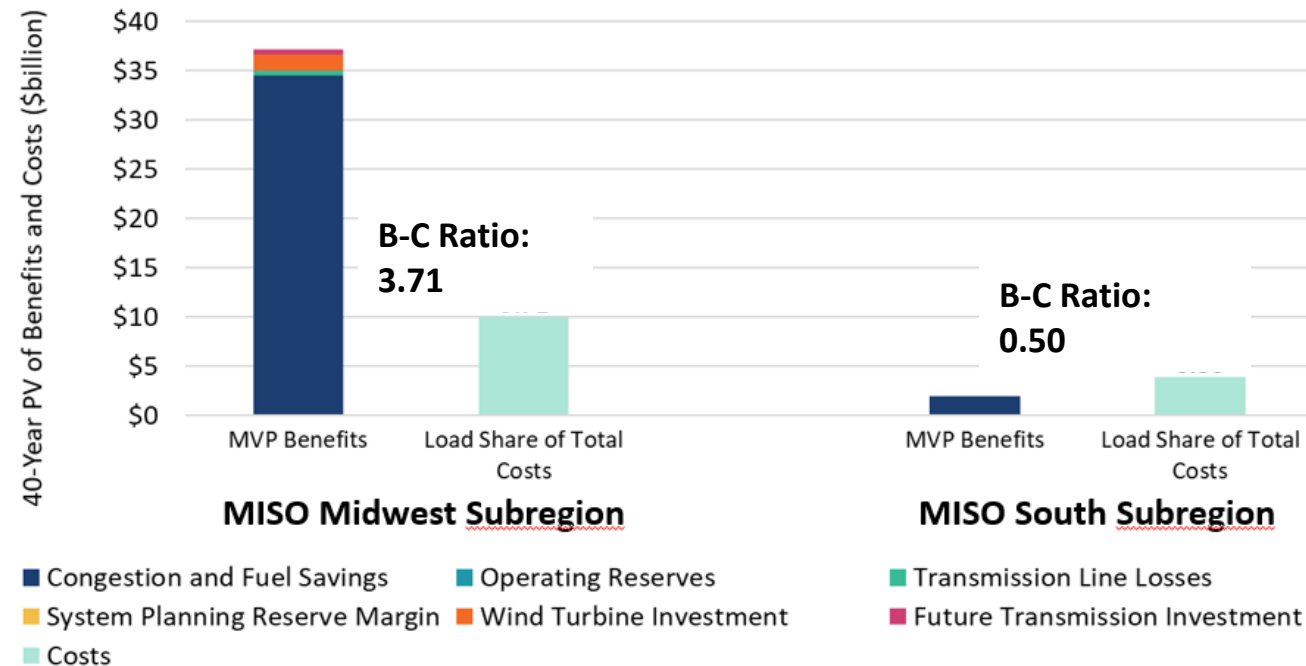
<https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf>

* Note: for example, under SPP's Regional Cost Allocation Review (RCAR) process, cost allocation is deemed reasonable as long as the benefit-to-cost ratios estimated for individual zones exceed 0.8-to-1 during any particular review cycle

MISO-wide Benefits Compared to Hypothetical MISO-Wide Allocation of 2011 MVP Costs

MISO production cost simulation models used to estimate Midwest Subregion MVP benefits cover the entire Eastern Interconnection, including the South Subregion

- MISO staff was able to extract simulation data estimates of congestion and fuel savings (i.e. APC savings) that the 2011 MVP portfolio provides to MISO South
- Allowed calculation of MVP 40-year present value of MVP benefits to both Midwest and South Subregions
- MISO South Subregion benefits are *de-minimis* compared to the Midwest Subregion's benefits
- The B/C ratio for MISO Midwest Subregion is 3.71 while MISO South benefits would be well below allocated costs and not meet the *roughly commensurate* standard



Sources and notes: Benefits and costs based on Brattle analysis of data from MISO's 2017 Triennial Review, Scenario with 8.2% Discount Rate. The South Subregion MVP Benefits shown only reflect APC Savings; however, most of the other benefits would accrue locally, in proximity to the MVP projects and thus likely would not provide benefit in MISO South. Illustrative load-share cost allocation based on 2019 energy (MWh) supplied in MISO Midwest and MISO South.

Projected Subregional Benefits of Increasing Transmission Capability in one Subregion



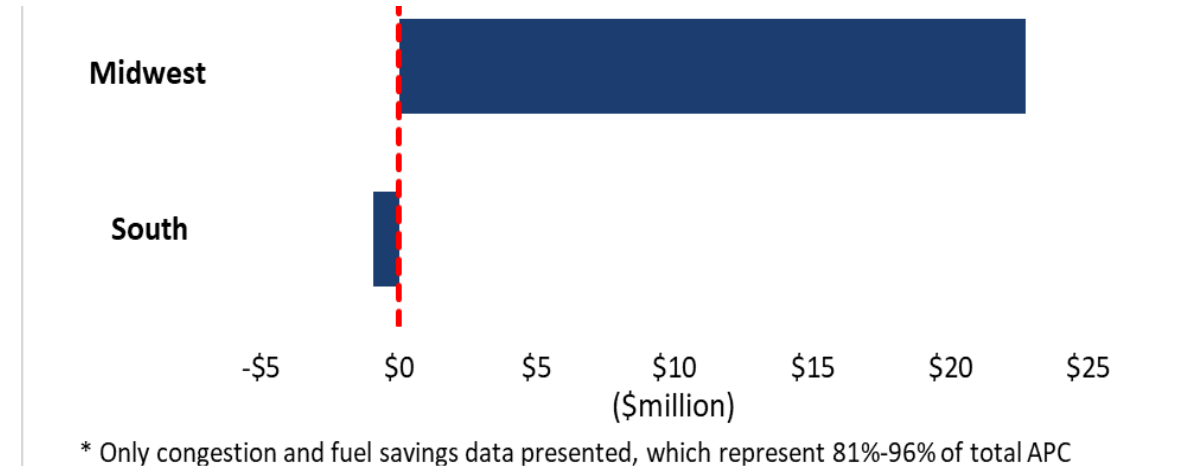
Benefits of a 10% Change in Bulk Transmission Capacity in one Subregion

MISO Staff performed a PROMOD simulation for year 2040 with assumptions based on the LRTP

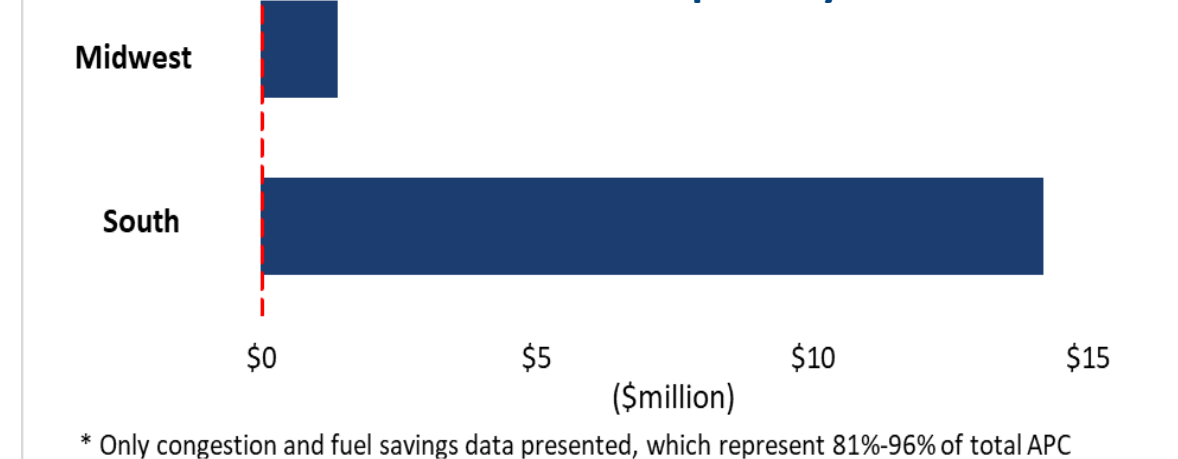
- Staff evaluated the APC benefits to each subregion of a hypothetical 10% increase in bulk transmission capacity in the Midwest (345+kV) and South (230+kV) Subregions
- In each case, the benefits of the added transmission almost exclusively accrue to the subregion in which transmission capability is increased
- Benefits to neighboring subregion are *de minimis* due to limited transfer capability between subregions

Note: To undertake this analysis, MISO staff first simulated a case in which the existing transmission capacity of facilities at 345kV and above were derated to 90% of their current limits. This 90% case was then compared to a simulation at 100% of their current limit, with the difference showing the benefit of the 10% higher actual limit.

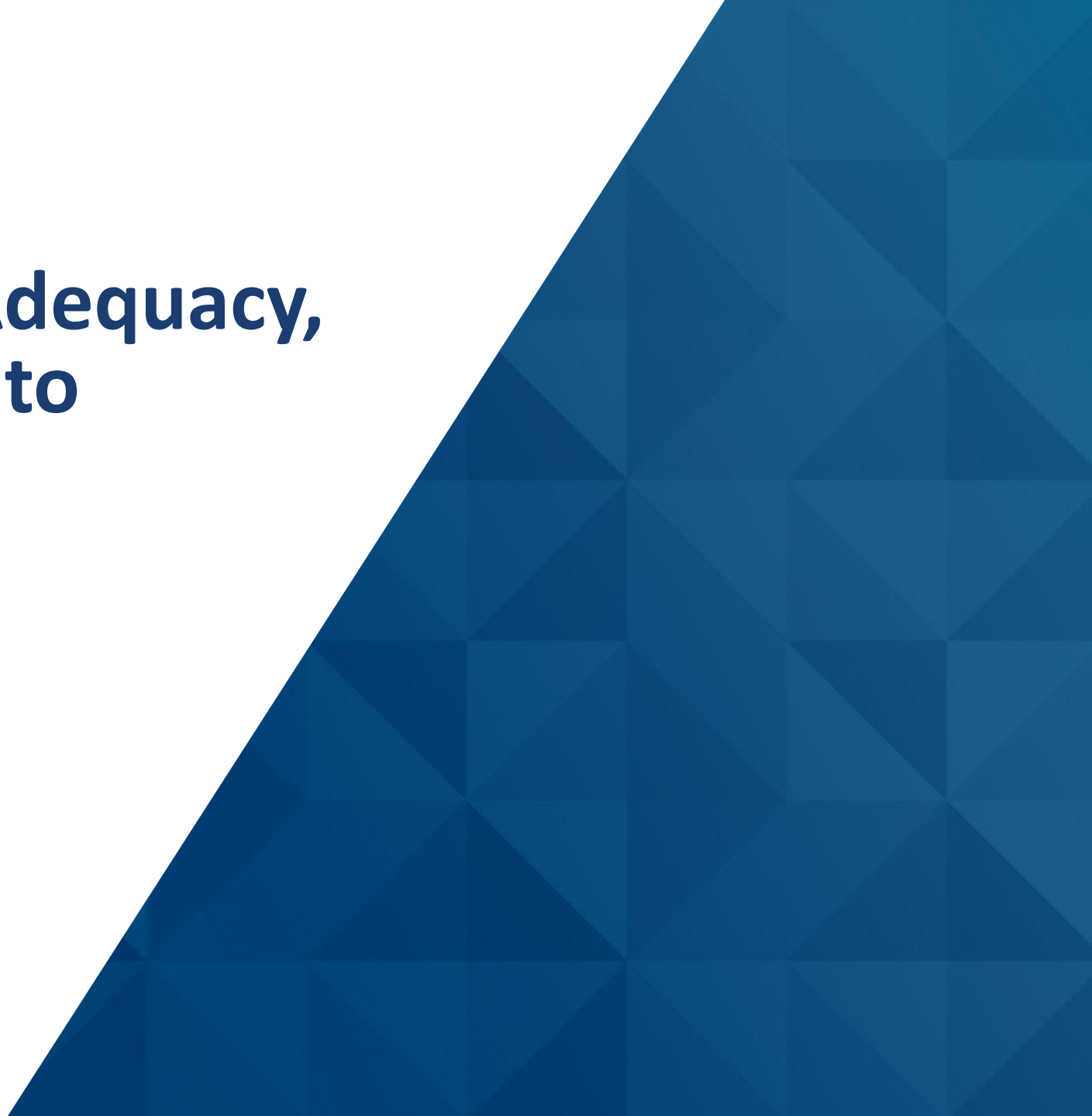
Benefits from 10% increase in Midwest Subregion Bulk Transmission Capability



Benefits from 10% increase in South Subregion Bulk Transmission Capability

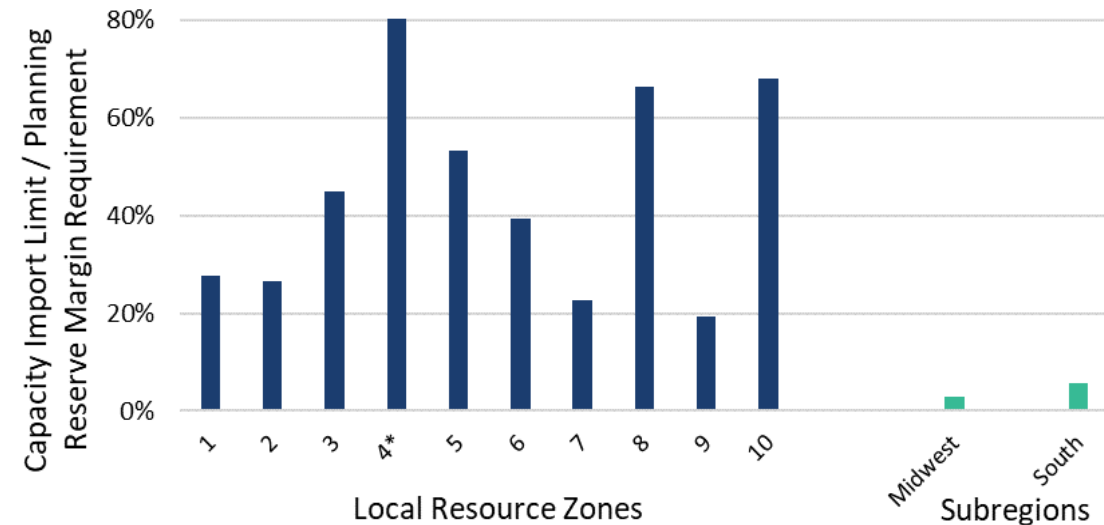


Reliability, Resource Adequacy, and Capacity Benefits to Subregions



Capacity Import Limit Between Zones are Large Compared to the Capacity Transfer Limit between Subregions

- Capacity Import Limit accounts for between 20% to 70+% of installed capacity requirements of Load Resource Zones in MISO Subregions (**blue bars**)
- In contrast, the Capacity Transfer Limit between the subregions is much smaller (**green bars**)
- The disproportionately smaller Midwest-to-South Subregional Capacity Transfer Limit, compared to the Capacity Import Limit of individual zones within each subregion shows that transmission upgrades that increase capacity import limits within a subregion must be expected to offer minimal reliability, resource-adequacy, and capacity-related benefits to the other subregion



*Zone 4 has no Capacity Import Limit. Local Resource Zones calculation from Capacity Import Limit divided by Planning Reserve Margin Requirement, taken from MISO Final Preliminary PRA Data – PY 2021-2022 ([MISO Preliminary Primary Resource Auction, posted at: https://cdn.misoenergy.org/Preliminary%20PRA%20Data_Final_WIDESCREEN532872.pdf](https://cdn.misoenergy.org/Preliminary%20PRA%20Data_Final_WIDESCREEN532872.pdf))

MISO Market Benefits are Distinct from Transmission Benefits

RTO-market Benefits are Unrelated to Transmission Benefits



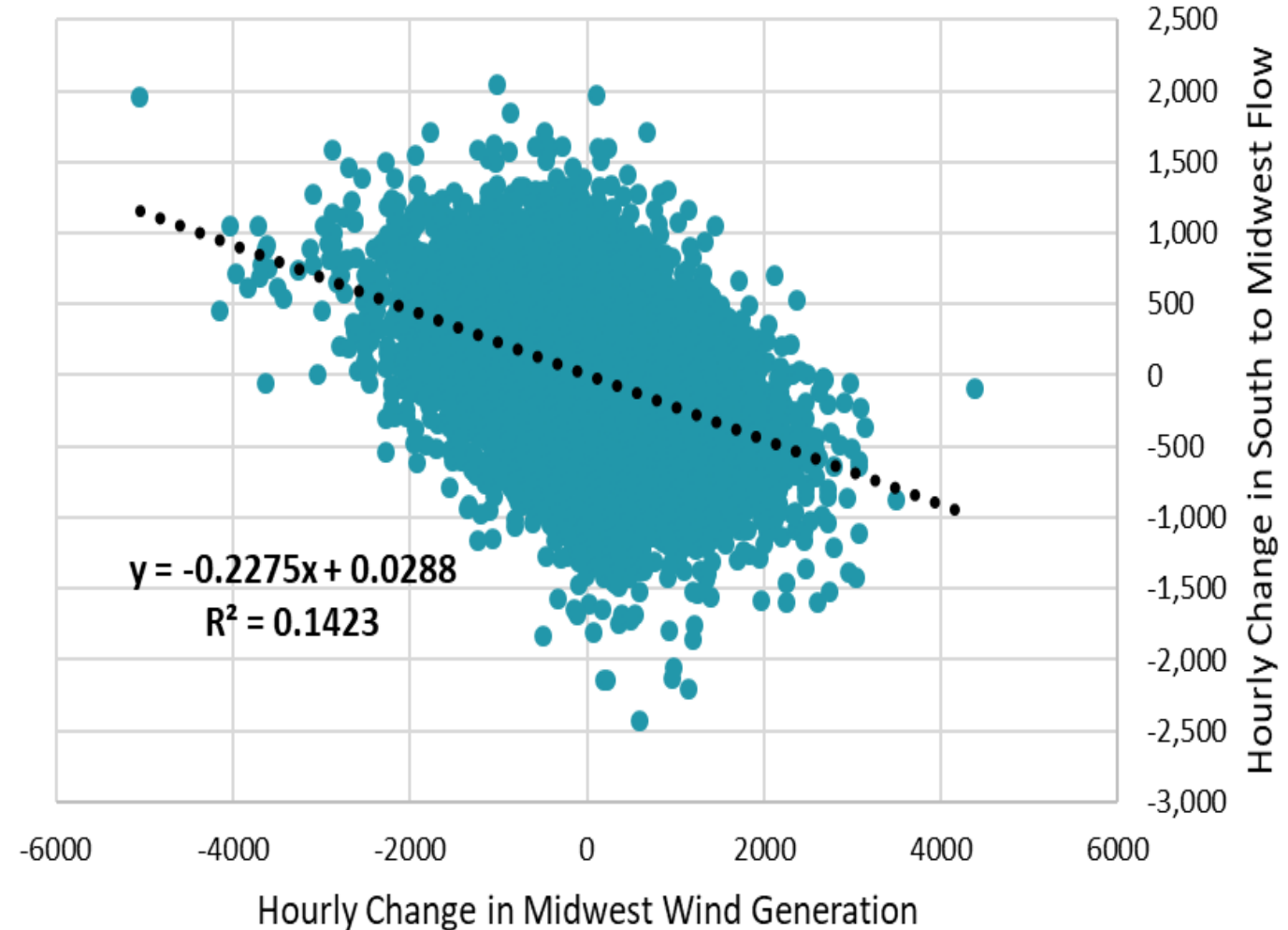
MISO market benefits accrue to both subregions irrespective of transmission additions:

- Benefits from security-constrained optimal unit commitment and economic dispatch
- Efficient congestion management
- Liquidity and transparency in MISO's day-ahead energy, real-time energy, and ancillary services markets
- Cost savings from participating in single MISO-wide balancing authority (vs. higher costs of operating multiple balancing authorities prior to MISO participation)
- Operational benefits from MISO balancing authority
 - ▶ Real-time assistance during emergencies
 - ▶ More cost-effective integration, balancing, and diversification of high amounts of intermittent renewable generation resources

Example: Cheap wind energy imports to South and assistance with wind generation balancing for Midwest Subregion

Changes in hourly Midwest wind generation compared to changes in hourly South to Midwest flows:

- Negative correlation
- When wind generation in Midwest Subregion decreases (negative x-values), imports from the South Subregion tend to increase, thereby **benefitting the Midwest Subregion**
- When wind generation in Midwest Subregion increases (positive x-values), the **South Subregion benefits** from an increase in lower-cost imports



Source: Brattle analysis of MISO internal data

Conclusions



Conclusions

The proposed modification of MVP cost allocation to allow for cost allocation of transmission portfolios that whose benefits are broadly spread within the Midwest or South Subregions (but not spread MISO-wide) from only the respective Subregion is consistent with the Commission's "roughly commensurate" principle

- When benefits are spread broadly across a subregion (but not MISO-wide), the proposed Subregion-based allocation of the costs of subregional MVP portfolios is roughly commensurate with the benefits provided by subregional portfolios
- The option for MISO-wide cost allocation should be retained for MVP portfolios that are spread throughout the two subregions, that broadly benefit both Subregions, and/or increase the transfer capability between the two subregions

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Johannes (Hannes) Pfeifenberger, a Principal at The Brattle Group, is an economist with a background in electrical engineering and over twenty-five years of experience in wholesale power market design, renewable energy, electricity storage, and transmission. He also is a Senior Fellow at Boston University's Institute of Sustainable Energy (BU-ISE), a Visiting Scholar at MIT's Center for Energy and Environmental Policy Research (CEEPR), and currently serves as an advisor to research initiatives by the U.S. Department of Energy, the National Labs, and the Energy Systems Integration Group (ESIG).

Hannes specializes in wholesale power markets and transmission. He has analyzed transmission needs, transmission benefits and costs, transmission cost allocations, and transmission-related renewable generation challenges for independent system operators, transmission companies, generation developers, public power companies, industry groups, and regulatory agencies across North America. He has worked on transmission matters in SPP, MISO, PJM, New York, New England, ERCOT, CAISO, and WECC.

He received an M.A. in Economics and Finance from Brandeis University's International Business School and an M.S. and B.S. ("Diplom Ingenieur") in Power Engineering and Energy Economics from the University of Technology in Vienna, Austria.

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 or its clients.

Additional Reading on Transmission

Pfeifenberger, Spokas, Hagerty, Tsoukalis, [A Roadmap to Improved Interregional Transmission Planning](#), November 30, 2021.

Pfeifenberger, [Transmission—The Great Enabler: Recognizing Multiple Benefits in Transmission Planning](#), ESIG, October 28, 2021.

Pfeifenberger et al., [Transmission Planning for the 21st Century: Proven Practices that Increase Value and Reduce Costs](#), Brattle-Grid Strategies, October 2021.

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Pfeifenberger, [Transmission Planning and Benefit-Cost Analyses](#), presentation to FERC Staff, April 29, 2021.

Pfeifenberger et al., [Initial Report on the New York Power Grid Study](#), prepared for NYPSC, January 19, 2021.

Pfeifenberger, [“Transmission Cost Allocation: Principles, Methodologies, and Recommendations,”](#) prepared for OMS, Nov 16, 2020.

Pfeifenberger, Ruiz, Van Horn, [“The Value of Diversifying Uncertain Renewable Generation through the Transmission System,”](#) BU-ISE, October 14, 2020.

Pfeifenberger, Newell, Graf and Spokas, [“Offshore Wind Transmission: An Analysis of Options for New York,”](#) prepared for Anbaric, August 2020.

Pfeifenberger, Newell, and Graf, [“Offshore Transmission in New England: The Benefits of a Better-Planned Grid,”](#) prepared for Anbaric, May 2020.

Tsuchida and Ruiz, [“Innovation in Transmission Operation with Advanced Technologies,”](#) T&D World, December 19, 2019.

Pfeifenberger, [“Cost Savings Offered by Competition in Electric Transmission,”](#) Power Markets Today Webinar, December 11, 2019.

Pfeifenberger, [“Improving Transmission Planning: Benefits, Risks, and Cost Allocation,”](#) MGA-OMS Ninth Annual Transmission Summit, Nov 6, 2019.

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. [“Response to Concentric Energy Advisors’ Report on Competitive Transmission,”](#) August 2019.

Ruiz, [“Transmission Topology Optimization: Application in Operations, Markets, and Planning Decision Making,”](#) May 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.

Newell et al. [“Benefit-Cost Analysis of Proposed New York AC Transmission Upgrades,”](#) on behalf of NYISO and DPS Staff, September 15, 2015.

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, Hagerty, [“The Benefits of Electric Transmission: Identifying and Analyzing the Value of Investments,”](#) on behalf of WIRES, July 2013.

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,”](#) on behalf of SPP, April 2012.

Pfeifenberger, Hou, [“Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada,”](#) on behalf of WIRES, May 2011.

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