National Transmission Planning Study

Economic Analysis

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NOTICE

This presentation includes specific examples from preliminary modeling to facilitate discussion and feedback; final results will differ from any results shown here.

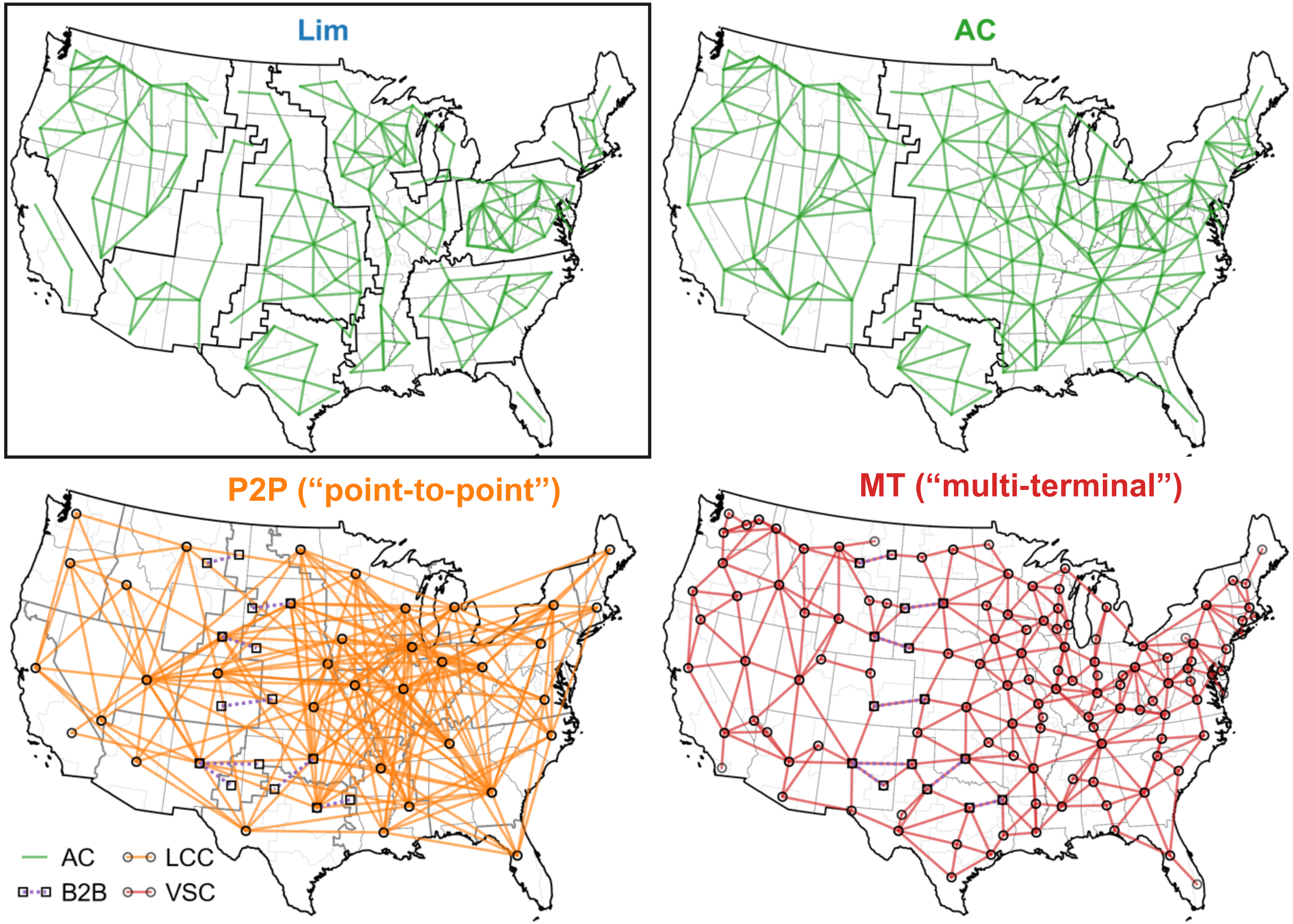
Economic Analysis

What is the systemwide value of transmission?

How are benefits distributed among regions?

Can we achieve the quantified benefits of transmission under current market rules and regulations?

Economic Impact: Changes in system cost relative to the <u>Limited</u> framework

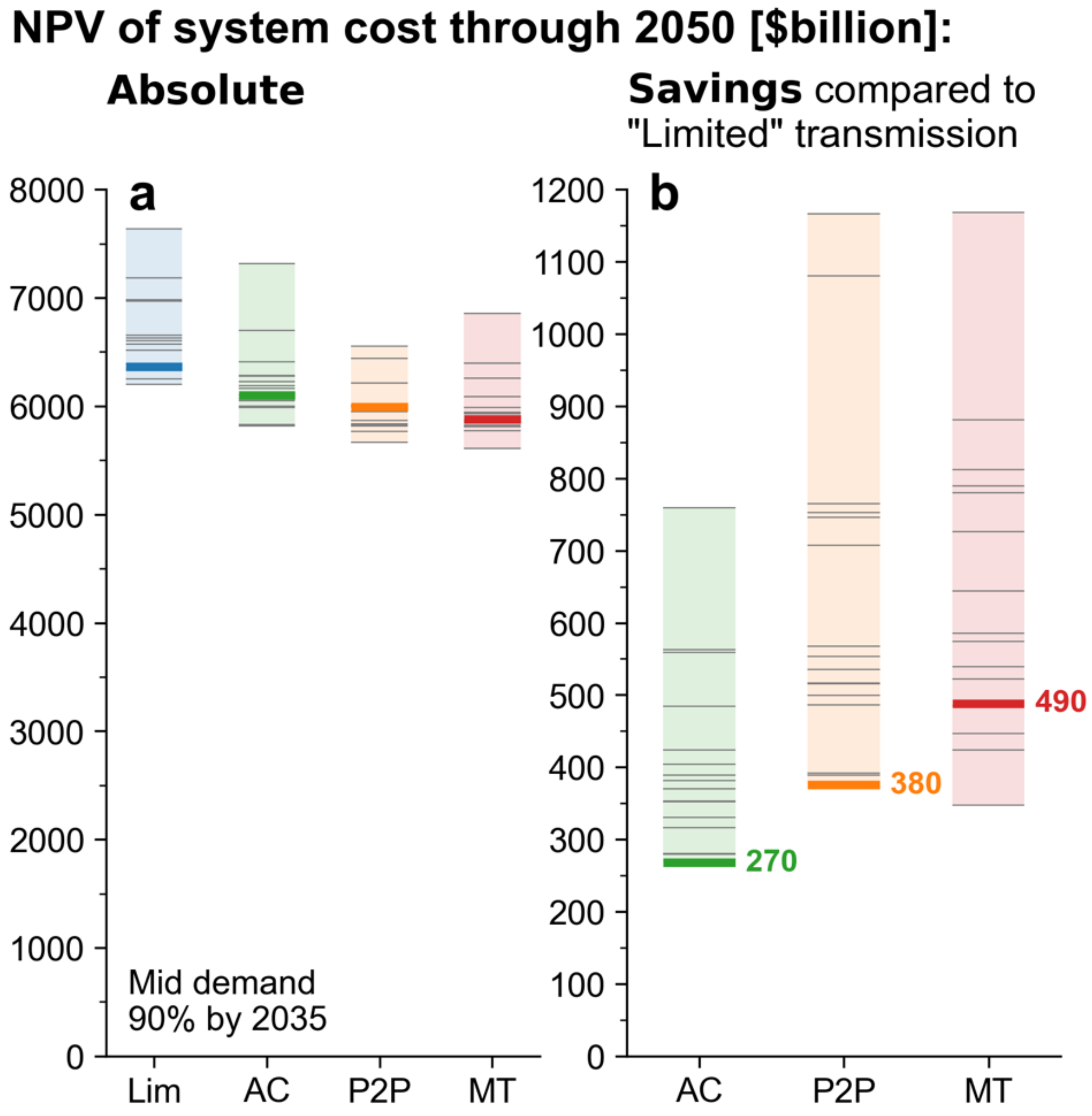


Broad Range of Benefits Selected for Valuation

Capital Costs	• Avoided generation capacity investments • Access to lower cost generation sites • Access to policy incentives for RE investments (e.g., investment tax credit)
Operating Costs	• Avoided costs for fuel, cycling, and other variable costs • Reduced transmission losses • Access to policy incentives for RE generation (e.g., production tax credit)
Reliability	• Reduced cost of meeting requirements for ancillary services and resource adequacy

Benefit valuation does not include other relevant impacts such as resiliency, reduced loss of load probability, mitigation of weather and load uncertainty, air quality and health outcomes, etc.

Accelerating transmission deployment consistently reduces system cost across a spectrum of modeling assumptions



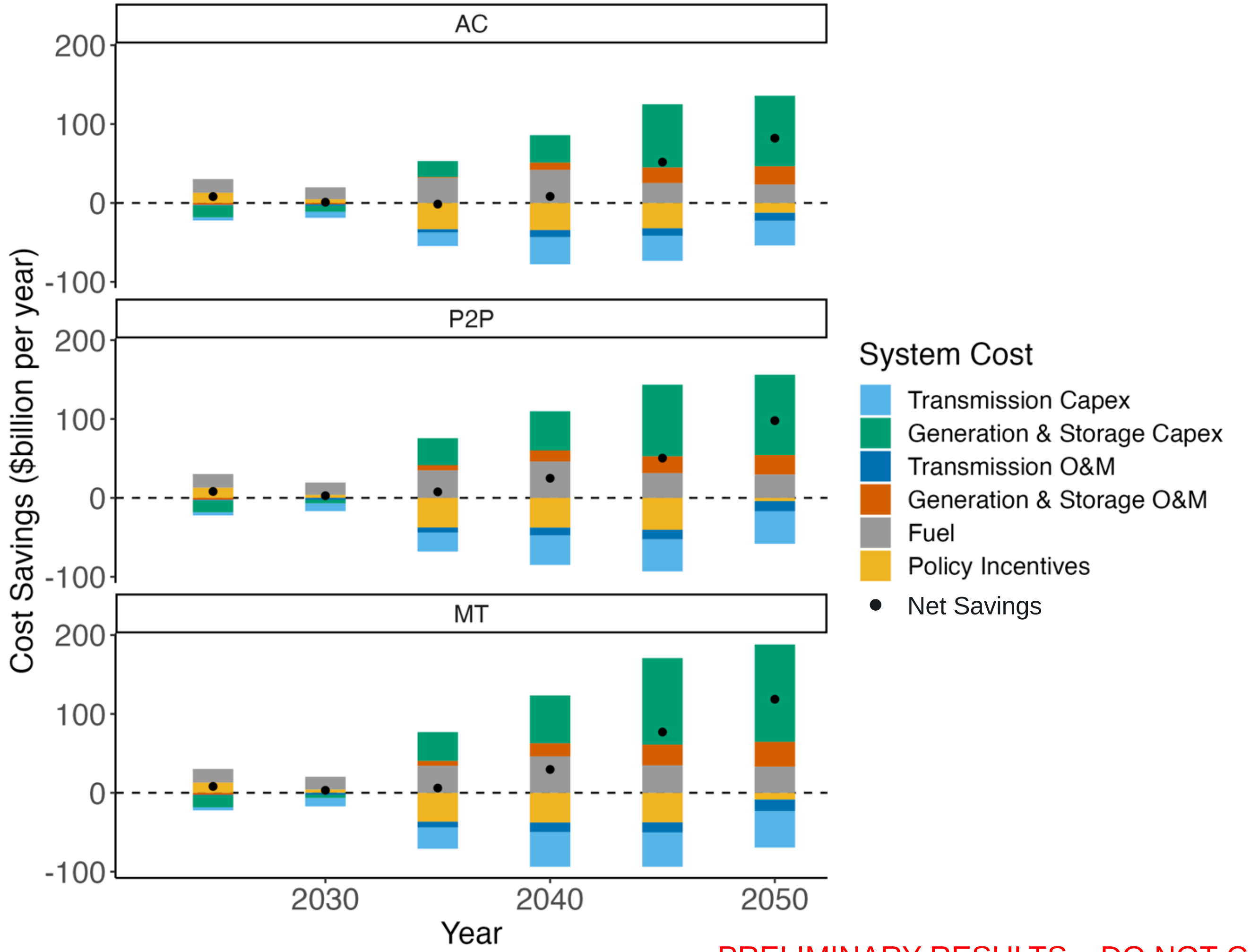
- Core P2P and MT scenarios achieve a benefit-to-cost ratio of 1.7 and 1.8, respectively
- Scenarios where new low-carbon technologies are not available have higher benefit-to-cost ratios, reaching 1.9–2.3

PRELIMINARY RESULTS – DO NOT CITE

Transmission expansion helps reduce capital, operating, and fuel expenditures for generation and storage

- Generation and storage capital costs decline by 11%–20% in the accelerated transmission frameworks; fuel costs decline 44-49%
- Transmission expenditures increase by 42-76% compared to the Limited framework
- Investments in interregional transmission grow noticeably after 2030 in the accelerated transmission frameworks and reach $20 billion per year by 2050

Source of cost savings (real $billion per year) compared to the Limited framework



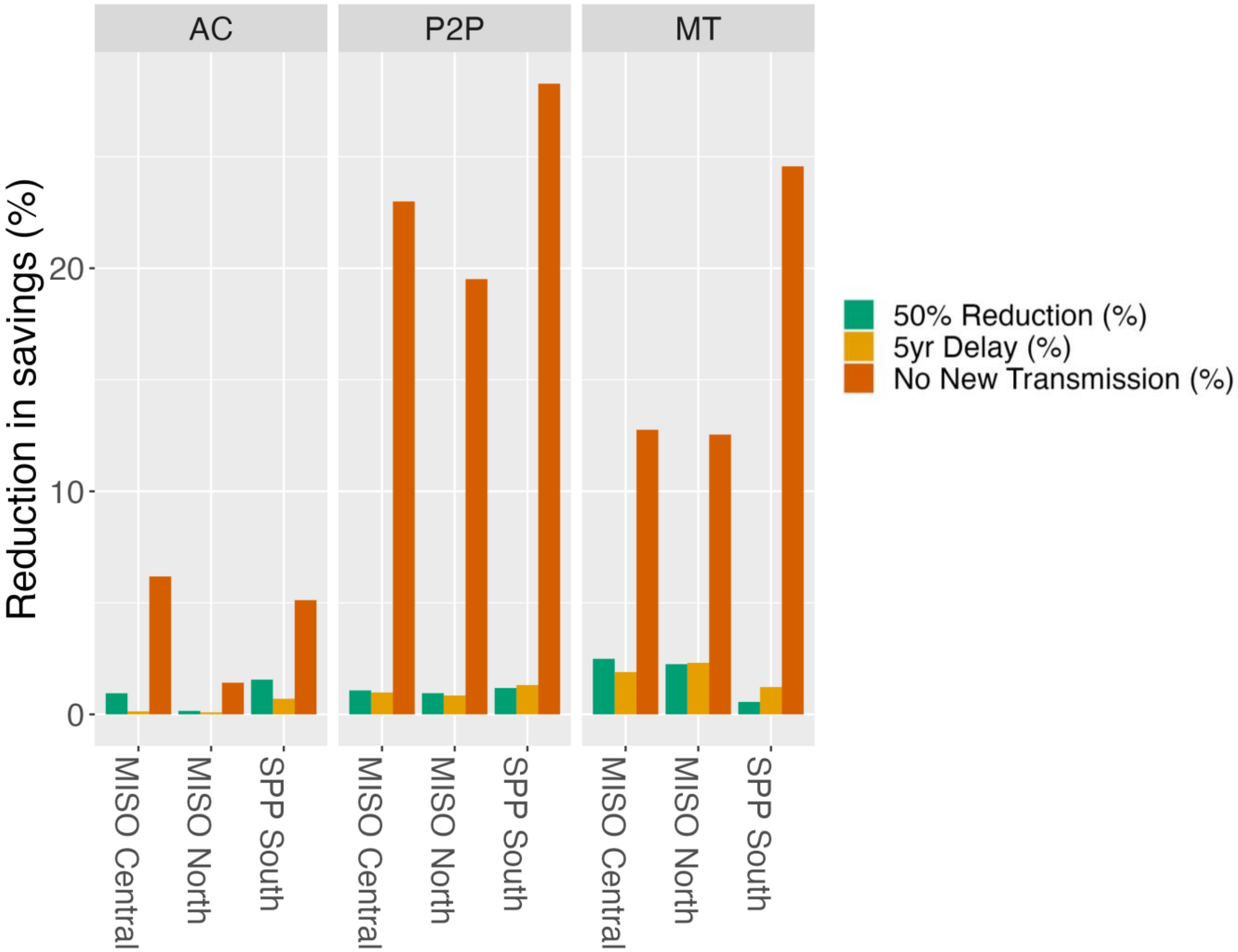
PRELIMINARY RESULTS – DO NOT CITE

Note: Positive values indicate savings; negative values indicate additional costs; *90% by 2035 (100% by 2045), Mid Demand*

Developing transmission through high opportunity regions provides significant national benefits

- Not allowing new transmission with each subregion reduced systemwide savings by 5% to >20%
- Reducing the amount of new transfer capacity by 50% or delaying transmission development by 5 years still results in 98% of original system value

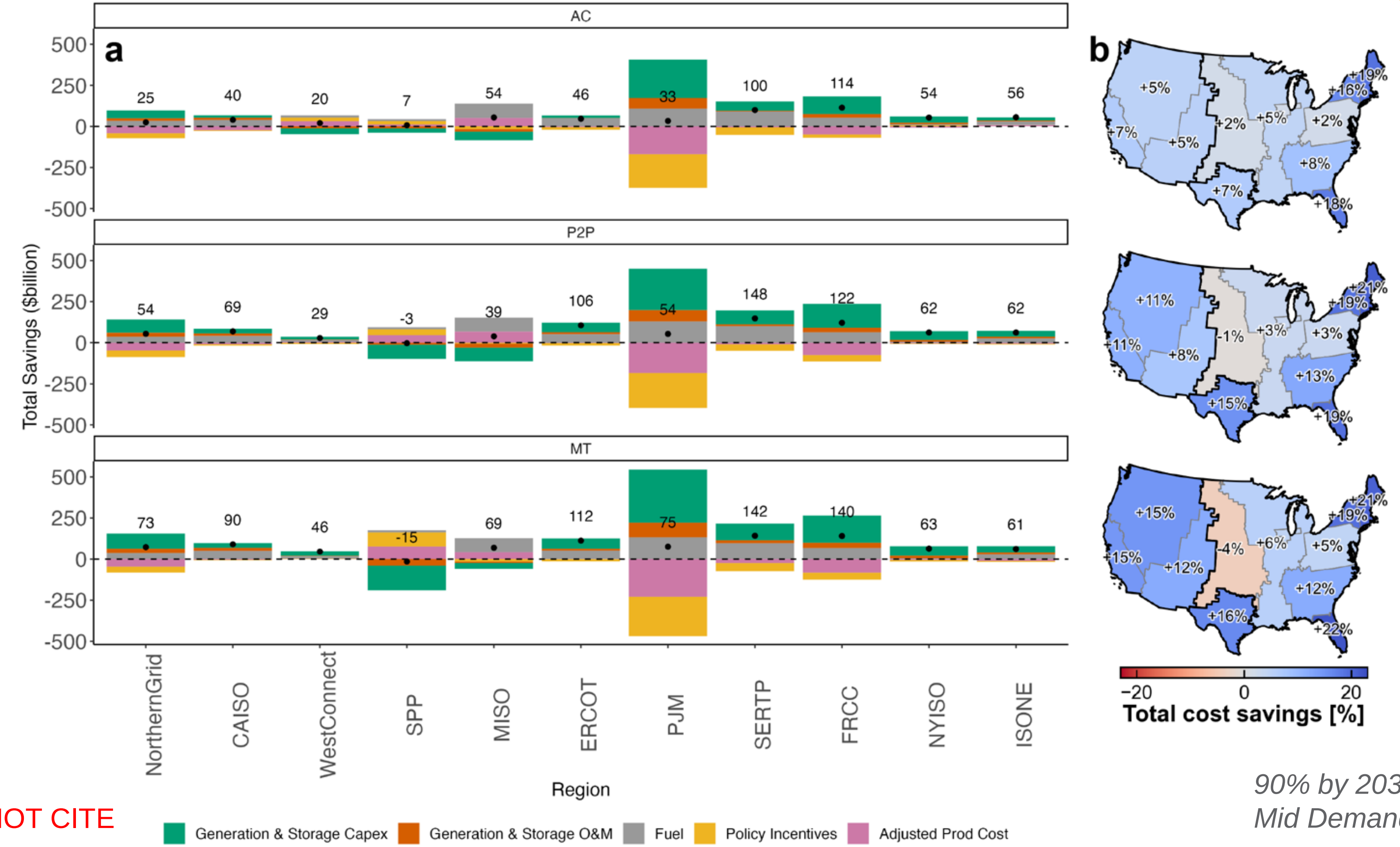
Reduction in systemwide savings (%)
compared to the core scenarios



PRELIMINARY RESULTS – DO NOT CITE

Interregional transmission brings cost savings in almost all regions

Net present value of **system savings by region** absolute $billion (a) and percentage (b) of avoided costs



90% by 2035 (100% by 2045), Mid Demand

PRELIMINARY RESULTS – DO NOT CITE

What is the Production Cost Adjustment?
The difference in total production costs *adjusted for purchase costs and generator revenues* with and without a proposed transmission upgrade

Adjusted PC = Production Cost **+ Purchase Costs – Generator Revenue**

The regional value of transmission is sensitive to technology availability, siting constraints, and climate conditions

NPV of regional savings through 2050 compared to Limited framework ($billion)

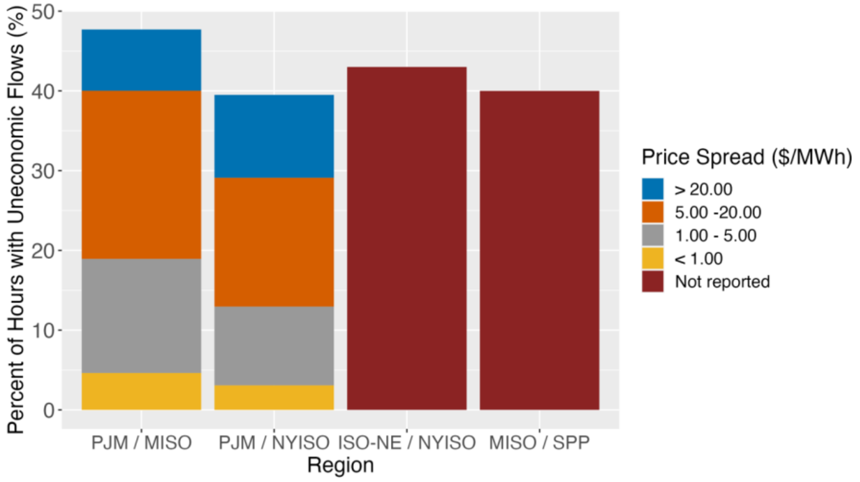
PRELIMINARY RESULTS – DO NOT CITE

The promise and reality of transmission benefits

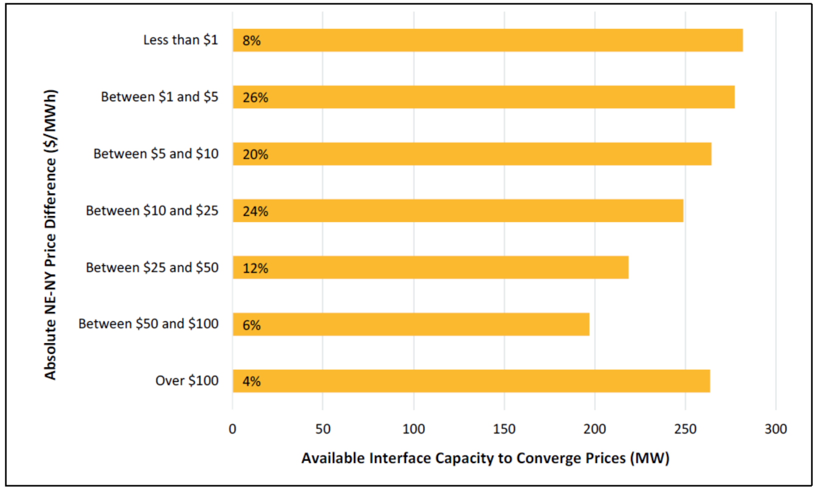
Potential benefits of transmission

Capital Costs	• Avoided generation capacity investments • Access to lower cost generation sites • Access to policy incentives for RE investments (e.g., investment tax credit)
Operating Costs	• Avoided costs for fuel, cycling, and other variable costs • Reduced transmission losses • Access to policy incentives for RE generation (e.g., production tax credit)
Reliability	• Reduced loss of load probability • Reduced cost of meeting requirements for ancillary services and resource adequacy
Resiliency	• Reduced severity and duration of outages • Reduced outages during extreme events • Mitigation of weather and load uncertainty

Hours with **uneconomic power flows** across major interregional seams, 2022



ISO-NE and NYISO **unused scheduling capacity**, 2022



PRELIMINARY RESULTS – DO NOT CITE

Opportunities to increase systemwide transmission value

Common Actions

- Framework for resource adequacy sharing among regions
- Identify transfer needs during extreme events
- Plan within-region network to accommodate large power transfers

Non-Market and Hybrid Actions

- Coordinated scheduling and operations platforms or consolidation
- Joint congestion management programs
- Consistent methods to calculate available transfer capacity
- Prioritize system reliability in scheduling market and wheeling transactions

Market Actions

- Eliminate fees and improve price forecasting for CTS or move towards intertie optimization
- Update corridor flow limits, automate procedures, and align assumption for congestion management programs
- Revise interface pricing methods and validate interregional transactions
- Operational control of merchant HVDC lines with regional market operators

Transformational Actions

- Long-range, nation-wide interregional transmission planning
- Implement interconnection-wide intertie optimization
- Establish a national system operator and planner to coordinate national network planning, scheduling, and resource adequacy functions

PRELIMINARY RESULTS – DO NOT CITE

Summary

- Accelerated transmission deployment can save hundreds of billions through reduced capital, operating and fuel expenditures for generation and storage
- Marginal benefits of building interregional transmission are high

- Interregional transmission brings cost savings in almost all regions
- The regional value of transmission is sensitive to technology costs and availability, siting constraints, and climate conditions

- Existing regulations and practices may reduce the systemwide value of interregional transmission
- A number of incremental and transformation solutions are being explored to improve the utilization of transmission

Thank you

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