UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

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| Interregional Transfer Capability Study: Strengthening Reliability Through the Energy Transformation | Docket No. AD25-4-000 |

COMMENTS OF THE NORTHEAST STATES

The States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New York, Rhode Island, and Vermont (the "Northeast States") appreciate the opportunity to comment on the North American Electric Reliability Corporation's ("NERC") Interregional Transfer Capability Study ("ITCS") submitted to the Federal Energy Regulatory Commission ("FERC" or "Commission") on November 18, 2024. The Northeast States work closely together on issues related to the ITCS and interregional transmission coordination more broadly as part of a Northeast States Collaborative on Interregional Transmission.[1]

## I. Introduction/Executive Summary

The undersigned Northeast States are committed to exploring opportunities to expand interregional transfer capability between our three independent system operators ("ISOs") and regional transmission organizations ("RTOs"): ISO New England ("ISO-NE"), New York Independent System Operator ("NYISO"), and PJM Interconnection ("PJM"). Several recently published studies show that interregional transmission expansion can enhance grid reliability in

[1] For more information on the States Collaborative please see https://energyinstitute.jhu.edu/northeast-states-collaborative-on-interregional-transmission/.

times of system stress, lower prices for consumers through a larger marketplace of low-cost energy and meet state policy goals and requirements.[2]

The Northeast States appreciate NERC's work on the ITCS. While the ITCS is an additional helpful tool in understanding potential interregional planning needs, the study focuses only on the reliability need for increased interregional transfer capability and does not consider economic and/or policy benefits from increasing transfer capability. As such, the ITCS represents a conservative view of the full potential value of intertie capability and the necessary amount of interregional transfer capability and falls at the lower end of the range of likely beneficial transmission capacity expansion for the U.S. electric grid. Even so, the ITCS identified a national need for over 35 gigawatts ("GW") of increased interregional transfer capability in times of extreme weather and other risk factors. Other recent studies, such as the U.S. Department of Energy's ("DOE") National Transmission Needs Study ("Needs Study"),[3] the National Transmission Planning Study ("Planning Study"),[4] and various other studies summarized in Appendix A to this filing, which did include economic and public policy objectives showed significantly greater amounts of potentially cost-effective interregional transfer capacity expansions.

In light of this evidence, the Commission now has an ample record to address a fundamental gap in the transmission planning process: the absence of required procedures for neighboring regions to identify, evaluate, select, and agree to share the cost of beneficial

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[2] These include policies related to transmission expansion, reliability and resilience, energy resource diversity, clean energy achievement, affordability for consumers, decarbonization requirements, and economic development, among others.

[3] U.S. Department of Energy, National Transmission Needs Study (2023), https://www.energy.gov/gdo/national-transmission-needs-study.

[4] U.S. Department of Energy, Grid Deployment Office, *The National Transmission Planning Study* (2024), https://www.energy.gov/gdo/national-transmission-planning-study.

interregional transmission projects. We believe that it is time for the Commission to work with states, ISOs/RTOs, and stakeholders, to establish meaningful, binding, and proactive interregional planning standards and processes for ISOs and RTOs, and to incorporate interregional planning needs into the Commission's transmission planning, resource adequacy, and energy market decision-making. Without such action, consumers will continue to pay more than they should and experience risks of resource inadequacy in the face of a changing resource mix and increasing frequency of extreme weather events.

We look forward to working with the Commission to advance both the incremental interregional transfer capability identified by NERC and to establish a process by which states and regions can promote additional transfer capability that they find is in the best interests of their citizens.

## II. Background on the Northeast States Collaborative

The Northeast States Collaborative on Interregional Transmission ("Collaborative") is a group of ten states – Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont – working together to explore increased interconnectivity between regions in partnership with DOE. In July 2024, the states formalized our collaboration through a Memorandum of Understanding[5] which established a framework for coordinating activities to improve interregional transmission planning and development.

The Collaborative serves as a central organization for coordinating with the DOE, ISOs/RTOs, and other stakeholders. Our goal is to identify key interregional transmission priorities and develop practical solutions to achieving the build-out of an affordable and reliable

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[5] *See* Memorandum of Understanding Northeast States Collaborative on Interregional Transmission between Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont, executed July 9, 2024, *available at*: https://energyinstitute.jhu.edu/wp-content/uploads/2024/07/MOU-Northeast-States-Collaborative-on-Interregional-Transmission.pdf.

onshore and offshore transmission grid. The Eastern Seaboard is home to three ISOs/RTOs, PJM, NYISO, and ISO-NE, which each have their own transmission planning processes, making state cooperation both within and across the ISOs/RTOs essential for cost-effectively meeting our state reliability, market efficiency, and clean energy goals and requirements.

## III. Comments on the ITCS

The Northeast States participating in the Collaborative provide the following comments, which are organized by chapter and section of the ITCS as requested by FERC in its notice of request for comments.[6] The parentheticals in the headings below refer to the Commission's preferred comment format.

### A. The Reliability Value of Transfer Capability (ITCS Chapter 1)

The ITCS helpfully documents the reliability value of interregional transmission and the ability to capture more of that value through the study's identified "prudent" expansions. However, as the ITCS notes, its definition of "prudent" expansion does not consider any economic or public policy benefits of interregional transmission beyond the reliability value studied by NERC.[7] Further, the ITCS selected the most conservative of the four different scenarios it examined, suggesting that the actual long-term optimal level of interregional transfer capacity, even for reliability purposes alone, may be substantially higher than what NERC recommends.[8]

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[6] FERC, Notice of Request for Comments Interregional Transfer Capability Study: Strengthening Reliability Through the Energy Transformation, Docket No. AD25-4-000 (Dec. 27, 2024).

[7] ITCS, at vii ("Economic analysis, cost-benefit evaluation, or financial modeling were not factors in determining prudent recommendations. The focus was strictly on improving energy adequacy.")

[8] *See* ITCS Overview of Study Need and Approach at p. vi ("Heavy load growth and/or accelerated retirement scenarios, without mitigation, will further contribute to energy adequacy risks, increasing reliance on transfers."), *available at*: https://www.nerc.com/pa/RAPA/Documents/ITCS_Overview.pdf.

DOE notes that the additions identified by NERC "represent a *minimum* level of interregional transfer capability necessary to protect the nation's power grid against future energy inadequacy," [9] and that DOE's "own power grid studies find that even more interregional transfer capability would *both* support grid reliability *and* lower consumer costs."[10] In particular, both the DOE Needs Study and Planning Study identified substantial benefits of increasing transfer capacity between NYISO and ISO-NE by between 1.7 and 2.8 GWs by 2035.[11] Both studies account for a broader set of benefits, even prior to accounting for anticipated load growth.

Other studies quantify the expected savings associated with non-reliability benefits, particularly during times of stressed grid conditions.[12] Lawrence Berkeley, for example, has identified interregional transmission value significantly growing over time, with the value of 1 GW of additional transfer capability growing from an average of $189 million between 2012-2021[13] to $400 million in 2022[14] resulting in part from that year's severe weather (with winter storm Elliott contributing 8-10% of the value between NYISO and ISO-NE). Interregional transmission expansion could allow for capture of transfer capability benefits, which are expected to continue trending upward due to expansions of demand and frequency of extreme weather events.

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[9] *Comments of the United States Department of Energy*, Docket No. AD24-4-000, at p. 2.

[10] *Id.* at p. 3 (emphasis in original).

[11] *See* Needs Study at p. 133 and Planning Study at Chapter 2, p. 124.

[12] *See* Appendix A, at pp. 17 and 19 (describing substantial impacts from even relatively small interregional transfer capability additions).

[13] Millstein, et al. *Empirical Estimates of Transmission Value using Locational Marginal Prices*, Lawrence Berkeley National Laboratory ("LBNL") August 2022 *available at*: https://eta-publications.lbl.gov/sites/default/files/lbnl-empirical_transmission_value_study-august_2022.pdf.

[14] *See* LBNL, The Latest Market Data Show that the Potential Savings of New Electric Transmission was Higher Last Year than at Any Point in the Last Decade (February 7, 2023).

Similarly, high-load growth scenarios show benefits at even higher levels of interregional transfer capability. The Needs Study, for example, identifies 5 GW of beneficial interregional transfer capability between NYISO and ISO-NE in 2035 with moderate load growth,[15] and over 16 GW in a high load future.[16] These results emphasize the least-regrets nature of the interregional expansions identified by NERC and demonstrate even larger cost-effective expansions of interregional transfer capability in the future. Indeed, the ITCS study notes "that additional transmission has more quantifiable benefits than purely the reliability benefits referenced in this study. For example, these benefits may include factors such as cost savings by providing access to lower-cost sources of generation, voltage support, blackstart, and policy goal implementation"[17] and that the study is not "intended to preclude stakeholders and governmental authorities at federal, state, and local levels from evaluating those additional considerations."[18] Taking into account the economic benefits of interregional transmission would provide substantially higher interregional transmission benefits than NERC identifies purely for reliability.

In taking any action in response to the ITCS, we respectfully request that the Commission explicitly recognize the limited nature of NERC's study. Indeed, the Federal Power Act's mandate that the Commission ensure just and reasonable rates requires the consideration of both reliability *and* economic implications. The multi-value proposition of expanded capacity transfer limits must further consider the public policy benefits for states that choose to incorporate them.

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[15] *See* Needs Study at p. 133.

[16] *See id.*

[17] ITCS Study, at p. 11.

[18] *Id.*

Additionally, NERC recently issued new planning standards for extreme weather events.[19] These new NERC standards do not mention the value of interregional transmission for addressing extreme weather (i.e., the ability to take advantage of interregional resource diversity during weather events) that NERC itself has documented in the ITCS. The Commission should ensure that the value of existing and new interregional transmission is explicitly considered as part of any Commission evaluation of industry's compliance with the new NERC extreme weather planning standards.

### B. Recommendations for Meeting and Maintaining Prudent Additions to Transfer Capability (ITCS Part 2 and Part 3)

The Northeast States commend NERC for identifying a range of options for increasing transfer capability and encouraging planners to consider all feasible options. Identifying "low hanging fruit" interregional transmission upgrades is of particular interest to the Northeast States, including additional interregional transfer capability to ensure reliability and drive economic benefits, particularly as load growth is far surpassing the flat load growth of the past 10-15 years.[20] Additionally, as discussed above, the ITCS, the Needs Study, and the Planning Study, each identify the benefits of increased interregional transfer capacity between PJM, NYISO, and ISO-NE.[21] The Commission has a unique opportunity to lead these efforts by developing a process whereby ISOs and RTOs proactively incorporate expansion of interregional transfer

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[19] In late 2024, NERC's Board of Trustees approved standards designed to "mitigate extreme weather impacts on the grid, help assure adequate energy supply and strengthen cybersecurity protections." *See* NERC Advances Extreme Weather Protection, Energy Assurance, Dec. 10, 2024, *available at*: https://www.nerc.com/news/Headlines%20DL/Board%2010DEC24.pdf.

[20] See John D. Wilson and Zach Zimmerman, The Era of Flat Power Demand is Over (Dec. 2023) (summarizing load growth trends), available at https://gridstrategiesllc.com/wp-content/uploads/National-Load-Growth-Report-2024.pdf; North American Electric Reliability Organization (NERC), 2024 Long-Term Reliability Assessment, at 27-28 (Dec. 2024) (summarizing resource retirement trends), available at https://www.electric.coop/wp-content/uploads/2024/12/NERC_Long-Term-Reliability-Assessment_2024.pdf.

[21] *See* Section III.A above.

capability into their planning processes. This would be a material change from today's planning practices where interregional *coordination* is required, but interregional *planning* is not.

Interregional transmission has the potential to provide both reliability and economic benefits to consumers, but such benefits can only be realized with interregional planning supported by clearly defined processes on file with the Commission. The Northeast States are actively working to strengthen the cooperation and coordination among the three planning regions in which our states are located.

Additionally, the Northeast States appreciate NERC and DOE's recognition of the high potential for new transmission technologies to increase interregional transfer capability, in addition to upgrading existing transmission infrastructure or building new lines. For example, adding 1 GW by rebuilding an aging 230 kV line at 345 kV between ISO-NE and NY could provide over $1 billion in net benefits, while only costing slightly more than rebuilding it at the existing 230 kV level.[22] Adding dynamic line ratings on constrained interregional lines or rebuilding these lines with high-performance conductors may offer similar lower-cost options.

We support NERC's recommendation that planners further consider other options, such as use of advanced performance conductors, installation of a remedial action scheme, dynamic line ratings, and power flow controllers to increase transfer capability.[23] While NERC notes that such solutions require project-specific analysis, these next-generation technologies have the

[22] *See, e.g.*, Clean Resilience Link Study: Assessing the operational impact of increased transmission capacity between New York and New England, E3 Consulting, 6/19/202, *available at:* https://www.ethree.com/e3-national-grid-interregional-transmission/ ("..we found that the project, referred to as the 'Clean Resilience Link', would provide over $1 billion in benefits (NPV) over its lifetime that would well exceed the costs of the upgrades.") ; *see also* https://www.mass.gov/news/new-england-states-seek-federal-funding-for-significant-investments-in-transmission-and-energy-storage-infrastructure.

[23] *See* ITCS at p. 134 (noting that transmission planners may increase transfer limits through the use Dynamic Line Ratings and Power Flow Control Devices, "along with advanced conductors, are frequently referred to as grid enhancing technologies. Grid enhancing technology projects are typically less expensive and require less lead time than building a new transmission line.")

potential to support better interregional planning consistent with state policies promoting the exploration and use of such technologies, where appropriate. Rebuilding other lines with high-performance conductors may offer similar lower-cost options.

### C. Other Comments on Prudent Additions (ITCS Item 7, Part 2)

One important step the Commission could take is to ensure that increases in interregional transfer capability are reflected in ISOs' and RTOs' determination of resource adequacy requirements and capacity in a comparable way. Today, some market regions provide substantial resource adequacy credit for intertie capability, while other markets provide little, or no, credit,[24] even though virtually every study shows that increased intertie capacity makes our electric grid more resilient during extreme weather and other disasters. How ISOs and RTOs value the resource adequacy contribution of interties with neighboring regions is a key factor in capturing the value that existing and new interregional transmission can provide. While the precise value of resource adequacy benefits of interties may be debated, giving zero resource adequacy credit to interties negatively affects the value proposition of interregional capability expansions. A consistent approach to valuing resource adequacy across interties also facilitates cost allocation discussion by ensuring a common understanding of how each region would benefit. Further, undercounting the benefits of interregional transmission leads to higher prices for consumers and reduced reliability, providing another clear example of how Commission leadership could enhance outcomes for consumers.

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[24] For example, despite NERC's ITCS documenting the reliability value of interregional transmission and recommending prudent expansions, PJM does not currently attribute any resource adequacy value to adding intertie capacity with neighboring markets. In contrast, other markets operators (such as NYISO and ISO-NE) do attribute some level of resource adequacy value to interties.

**D. Meeting and Maintaining Transfer Capability (ITCS Part 3 – Future Work)**

The various studies from NERC, DOE, and others looking at expanding interregional transfer capability all highlight areas where future planning could provide substantial benefits to consumers. We support NERC incorporating these additional work scopes as described in "Chapter 11 Future Work" and continuing to perform this type of analysis on a periodic basis. Doing so would highlight trends and provide critical information to integrate into regional planning processes where appropriate.

**IV. Conclusion**

Studies from sources as diverse as the DOE, NERC, and numerous others, identify the potential for interregional transmission planning to improve system reliability and decrease costs. Without required procedures for neighboring regions to identify, evaluate, select, and allocate the costs for needed interregional transmission, however, our regions are limited in our ability to meaningfully respond to this critical need. We respectfully ask the Commission to take advantage of the ample evidentiary record and to direct much needed reforms to ISO/RTO planning processes.

/s/ Gregory Patterson

Katie S. Dykes
Commissioner, Department of Energy and Environmental Protection
On behalf of Connecticut

Gregory Patterson
Secretary, Delaware Department of Natural Resources and Environmental Control
On behalf of Delaware

Dan Burgess
Director, Governor's Energy Office
On behalf of Maine

/s/ Robert Brabston

Paul Pinsky Director, Maryland

Rebecca Tepper, Secretary,

Robert Brabston

Energy Administration
On behalf of Maryland

Massachusetts Executive Office of Energy and Environmental Affairs
On behalf of Massachusetts

Acting General Counsel
On behalf of New Jersey

*/s/ Robert Rosenthal*

Robert Rosenthal
General Counsel
New York State Public Service Commission
On behalf of New York

John Williams
Executive Vice President for Policy & Regulatory Affairs
New York State Energy Research and Development Authority
On behalf of New York

Chris Kearns
Acting Commissioner, Office of Energy Resources
On behalf of Rhode Island

*/s/ Walter Poor*

Walter (TJ) Poor
Director of Regulated Utility Planning, Vermont Department of Public Service
On behalf of Vermont

# APPENDIX A

# Strategic Action Plan, Phase 1:
## Study Synthesis of Transmission Needs


**PREPARED BY**
Joe DeLosa III
Kailin Graham
Johannes Pfeifenberger


**PREPARED FOR**

Northeast States Collaborative on Interregional Transmission

February 2025

Brattle

# Key Takeaways from Review of Studies

## Interregional transmission between NYISO and both ISO-NE and PJM is highly valuable in the near- and long-term, and low-regrets expansion opportunities should be pursued

- Cost-effective expansions between these regions are identified in numerous studies
  - Studies consistently demonstrate benefits of added interregional transmission capability: lower production cost and congestion relief; resilience, capacity and ancillary service benefits; and supporting decarbonization policies
  - The near-term need for transmission is evident **even when decarbonization is not a constraint**: low-regrets interregional transmission expansion is **beneficial purely from a reliability and economic perspective**
- We identify a **low-regrets need of 2 GW between NY and PJM and 1.7 GW between NY and New England**
- In the long-term, the exact magnitude of interregional transfer capability needs are still quite uncertain for both interregional seams and depend on progress on decarbonization as well as load growth beyond 2035 needs
- Studies also highlighted the long-term need for expansion between the **Northeast and Canada**
  - **5 GW between Quebec and both New England and New York by 2050 is low-regrets**
- **Realizing the value of interregional transmission identified in these studies requires overcoming key barriers,** particularly introducing intertie optimization (see Appendix slides for further discussion) and fully accounting for the resource adequacy and resiliency value of existing and new intertie capacity

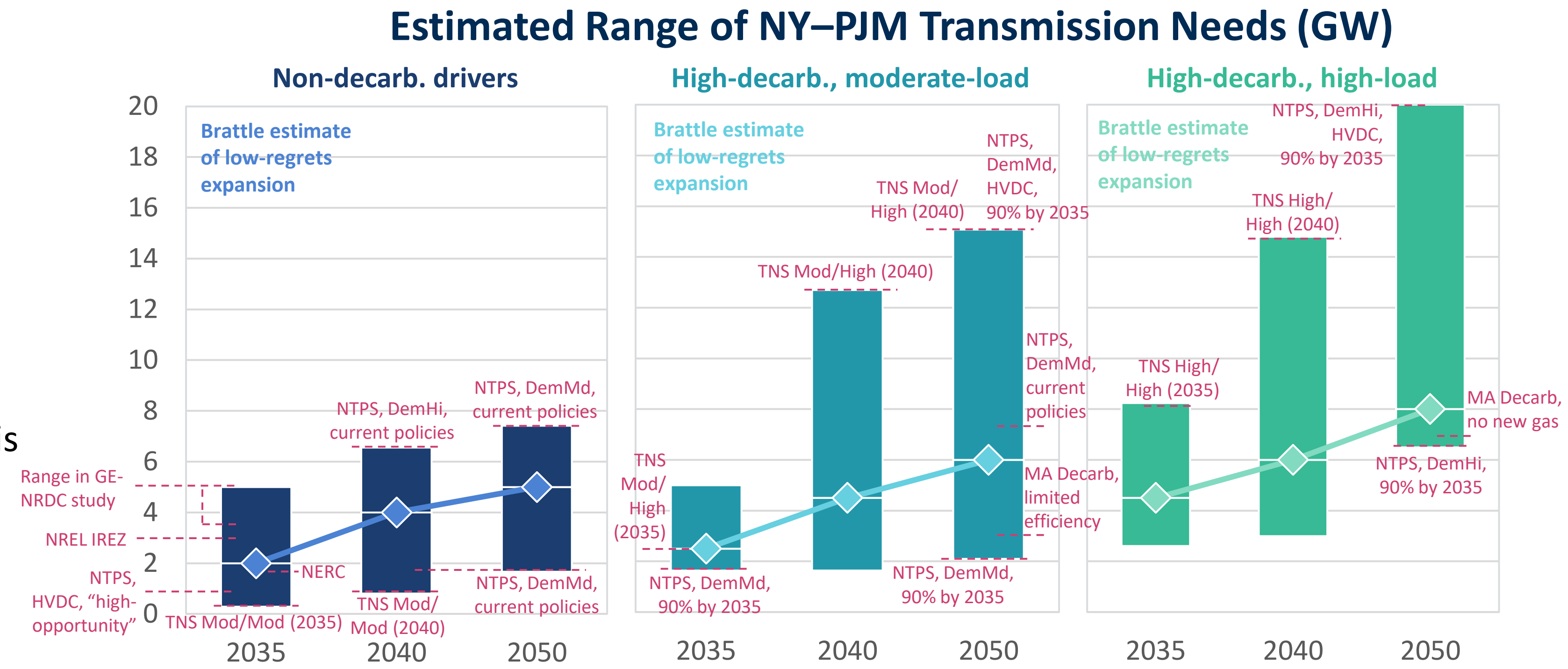
# New York – PJM: Significant transmission expansion between is valuable in the near-term

Based on multiple independent studies, we estimate that at least **2 GW** additional transfer capability between **New York and PJM by 2035 is low-regrets**, even without considering the value of transmission for decarbonization

- Represents low end of range from all studies, and central value of studies that did not consider decarbonization as the driver for transmission development

At least **4 GW by 2040 is likely low-regrets**, but needs may be significantly higher in high-decarbonization futures (up to 12–15 GW)

- Building in **flexibility and expandability** is likely efficient given the potential for much larger long-term needs
- Our low-regrets estimates for high-decarb. futures range from **4.5–6 GW in 2040** to **6–8 GW in 2050**
  - Datacenter and electrification demand in PJM makes high-load scenarios more likely




**Notes:** Ranges above cover transfer capability needs reported in the DOE 2023 Transmission Needs study (TNS, summarizing multiple studies), DOE National Transmission Planning Study (NTPS), GE-NRDC study, MA Decarbonization Pathways study, LBNL study, NREL IREZ study, and NERC ITCS study. These ranges exclude scenarios deemed unrealistic, such scenarios with zero transmission expansion between NY and PJM in the MA Decarb Study. Annotations indicate noteworthy scenarios from these studies. NTPS results are from "AC" expansion scenarios unless denoted otherwise.

# New York – New England: Interregional upgrades across the interface presents low-regrets, near-term opportunities

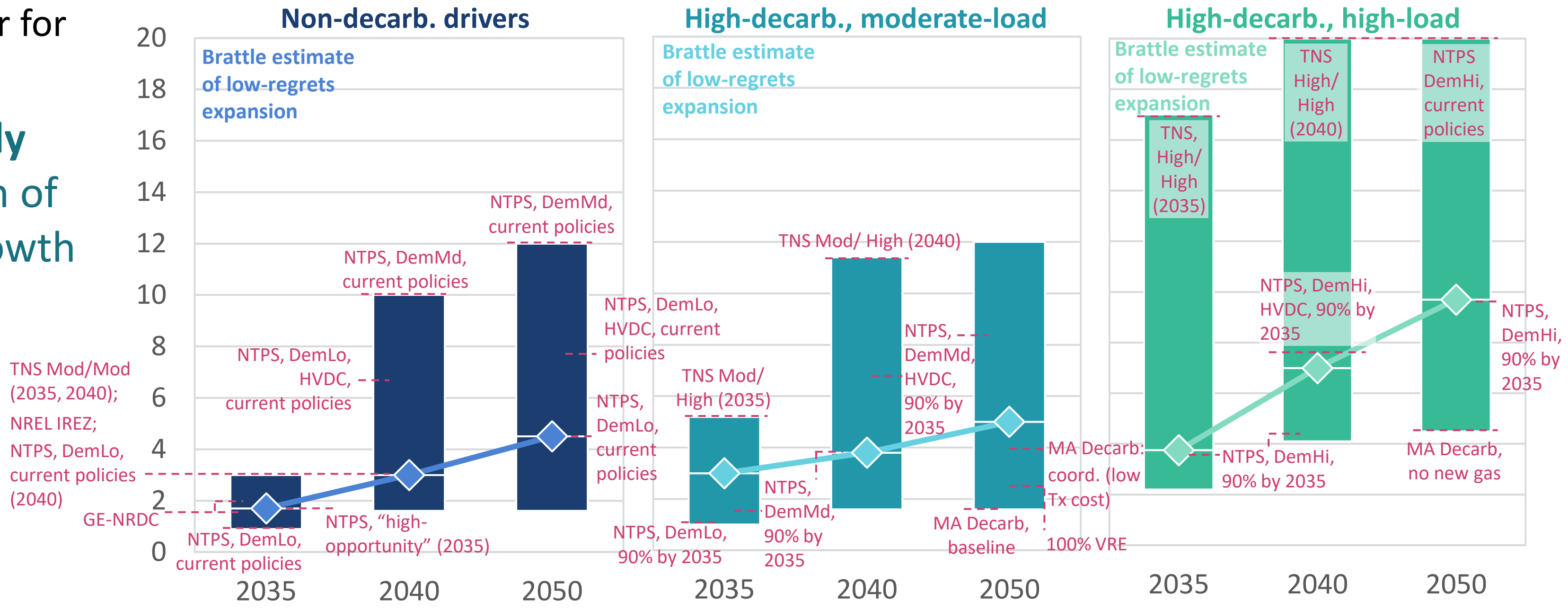
Based on multiple independent studies, we estimate that at least **1.7 GW** additional transfer capability between **NY and New England by 2035 is low-regrets**, even without considering the value of transmission for decarbonization.

- Similarly represents low end of range across studies and central estimate of studies that did not consider decarbonization as the driver for transmission development

## **Long-term (2040–2050) needs are highly uncertain**; depend on scale and location of renewables adoption as well as load growth

- **3 GW by 2040 is low-regrets**, but may be conservative given decarbonization ambitions of both regions
  - Our low-regrets estimates for high-decarbonization scenarios conservatively skew towards the bottom of each range given the uncertainty amongst projects
- Option value for increased transfer capability is particularly valuable, given potentially high interregional needs

**Estimated Range of New England–NY Transmission Needs (GW)**




**Notes:** "Non-decarb. drivers" refers to scenarios where decarbonization was not a driver/constraint for the analysis. Ranges above cover transfer capability needs reported in the DOE 2023 Transmission Needs study (TNS, summarizing multiple studies), DOE National Transmission Planning Study (NTPS), GE-NRDC study, MA Decarbonization Pathways study, and NREL IREZ study. These ranges exclude scenarios deemed unrealistic, such as low-electrification and low-offshore wind scenarios in the MA Decarb. study which report low transmission needs due to new nuclear capacity in NY and CT. Annotations indicate noteworthy scenarios from these studies. NTPS results are from "AC" expansion scenarios unless denoted otherwise.

# Canada: Significant expansion between the Northeast and Quebec is valuable long-term, and near-term for reliability in New York

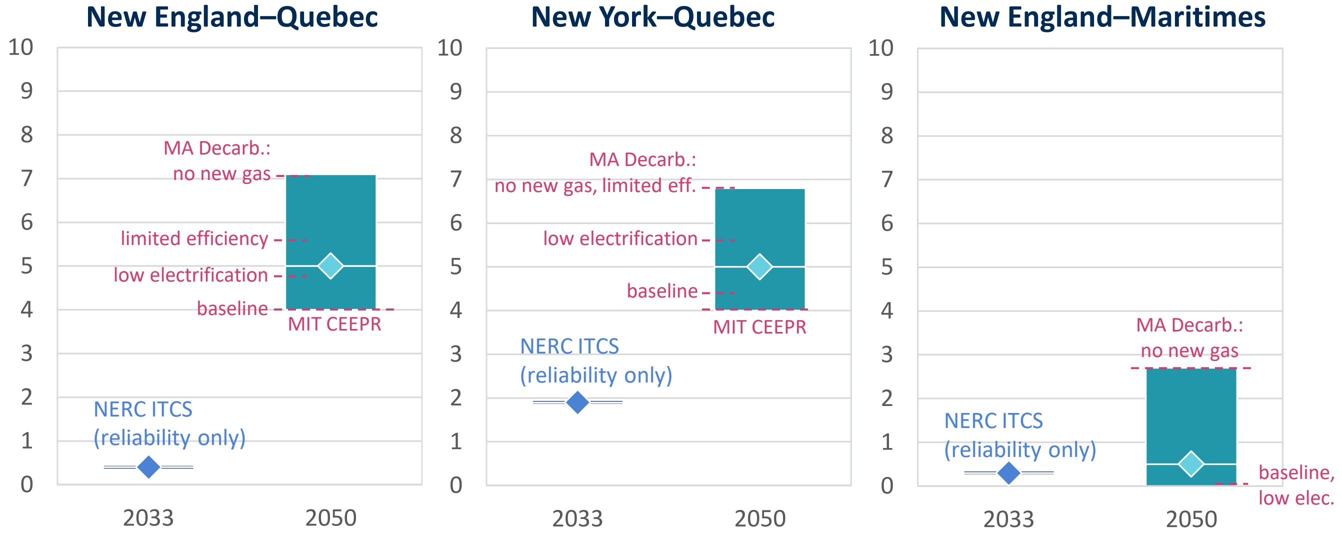
Based on multiple independent studies, we estimate that at least **5 GW** additional transfer capability **by 2050** between both **New England and Quebec** and **New York and Quebec is low-regrets**. When just considering reliability benefits, **1.9 GW between New York and Quebec by 2033 is low-regrets**.

- While fewer studies considered transmission expansion to Canada, long-term (2050) studies show consistent value in significant expansion between Quebec and both New England and New York.
  - Needs are greater (up to 7 GW) in higher renewables/low thermal generation futures.
  - Value is derived from operating lines **bidirectionally** to balance Northeast renewables.
- The MA Decarbonization Pathways study found a moderate need between **New England–New Brunswick** between 0–0.8 GW by 2050, scaling to 2.7 GW in a future with no new gas generation.

## NERC study demonstrates near-term reliability need

- **0.4 GW between NE–QC, 1.9 GW between NY–QC, 0.3 GW between NE–Maritimes**
- These figures consider resource adequacy only, and are therefore **conservative estimates that do not consider economic or public policy benefits of further expansion.**

### Estimated Range of Northeast–Canada Transmission Needs (GW)



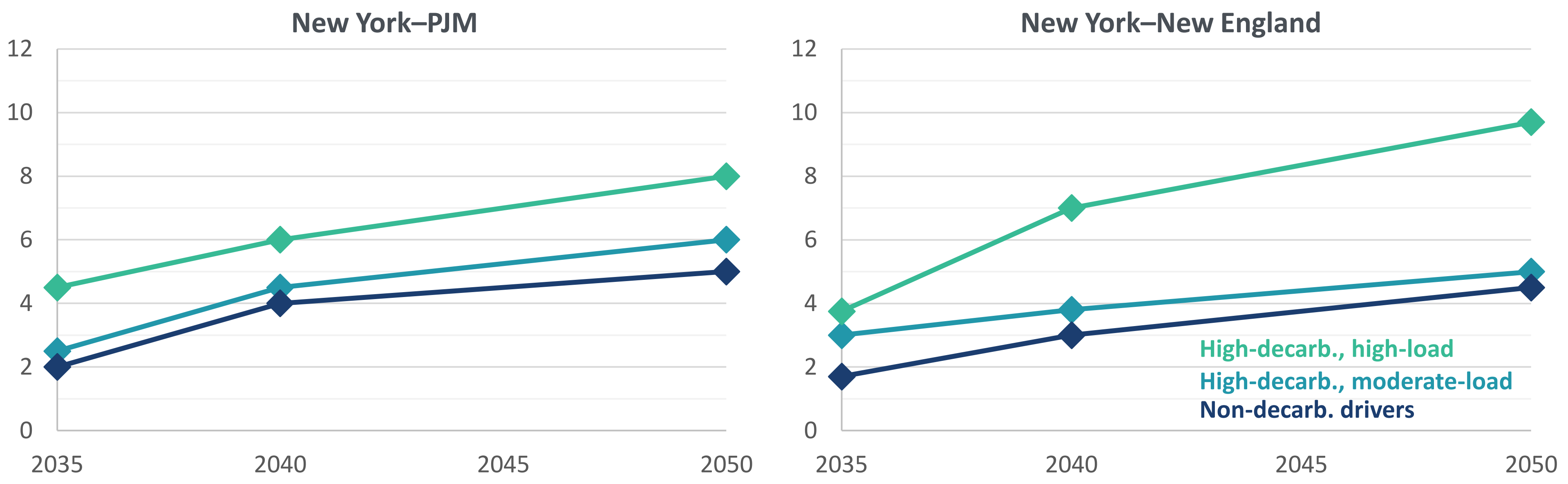

**Notes:** Ranges above cover transfer capability needs reported in the NERC ITCS (2033 only), the MIT CEEPR study (2050 only) and the MA Decarbonization Pathways study (2050 only). Annotations indicate noteworthy scenarios from these studies.

# Summary: “Low-Regrets” Interregional Transmission Expansion

Based on our review of multiple independent transmission studies across several possible decarbonization and load growth scenarios, we believe the following transmission expansions to be low-regrets:

- **New York–PJM:** 2–4.5 GW by 2035, 4–6 GW by 2040, 5–8 GW by 2050
- **New York–New England:** 1.7–3.7 GW by 2035, 3–7 GW by 2040, 4.5–9.7 GW by 2050
- **Northeast–Canada (not pictured):** 1.9 GW NY–QC by 2033; 5 GW NE–QC and 5 GW NY–QC by 2050

**Estimated Range of *Low-Regrets* Transmission Expansion Needs (GW)**



# Summary of Relevant Interregional Transmission Studies

# Summary of Studies Reviewed

| Study | Years analyzed | Considerations/assumptions | Findings |
|---|---|---|---|
| **1. DOE 2023 Transmission Needs Study** | 2030, 2035, 2040 | Review of 300 scenarios and sensitivities from 6 independent national transmission studies. Almost all have decarbonization constraints (in addition to BAU scenarios) | Range of transmission needs:<br>**NY-New England:** 2035: 2.8–17 GW; 2040: 2.9–21.4 GW<br>**NY-PJM:** 2035: 0.29–8.24 GW; 2040: 0.81–12.7 GW<br>Excludes values from the moderate load growth/moderate clean energy cases, which represent business-as-usual scenarios without the IIJA and IRA and are "an unlikely representation of future power sector need." |
| **2. DOE National Transmission Planning Study** | 2035, 2040, 2050 | Conducted zonal capacity expansion & resource adequacy modelling through 2050 under 96 scenarios covering different transmission frameworks (AC, P2P HVDC & meshed HVDC), decarbonization assumptions, load growth assumptions, and 15 sensitivity cases | **NY-New England:** 1.7–2.9 GW by 2035, 3.8–6.7 GW by 2040 in central case<br>**NY-PJM:** ~1 GW by 2040 for AC, but much higher in HVDC futures |
| **3. DOE Atlantic OSW Transmission Study** | 2050 | Optimized offshore transmission cables for five difference transmission topologies, and modeled production cost benefits as well as grid reliability, resource adequacy, power flow, grid strength and contingency analysis. | Interregional topology resulted in a **total of 14 GW of offshore transmission** between Atlantic states, with a **benefit-cost ratio of 2.9** ($2.4 billion/yr in production cost and resource adequacy benefits) [granular results on transfer capability needs between individual regions not provided]. |
| **4. GE-NRDC Study** | 2035 | Uses nodal model to optimize transmission buildout by 2035 and estimate resilience benefits under severe weather events as well as production cost and capacity savings. | $12 billion in net present value from 87 GW interregional transmission (2 GW between NY-NE, 5 GW between NY-PJM), including $1 billion in resilience benefits from single 2035 polar vortex event. |
| **5. MA Decarb Pathways Study** | 2050 | Models 8 pathways to net zero for MA, including detailed capacity expansion modeling | **NY-New England:** 0.5–4.5 GW (1.6–4.5 GW when focusing on most realistic scenarios)<br>**NY-PJM:** 1.5–7 GW (Caveat: PJM was not explicitly modeled as its own zone but a boundary condition for New York)<br>**QC-NY:** 3.8–6.8 GW<br>**QC-New England:** 4.1–7.1 GW<br>**New England-Maritimes:** 0–2.7 GW (0–0.8 GW when focusing on most realistic scenarios) |

# Summary of Studies Reviewed (cont'd)

| Study | Years analyzed | Considerations/assumptions | Findings |
|---|---|---|---|
| **6. LBNL Analyses** | 2012–2023 | Estimates congestion value (production cost savings) of expanding interregional transmission using historical data (2012-2023) on nodal marginal prices. Does not estimate transfer capability needs in GW. | **NY-New England:** documents historical energy market value of $137–189 million/yr per GW of transmission<br>**NY-PJM:** documents historical energy market value of $149–156 million/yr per GW of transmission |
| **7. NREL IREZ** | 2022 | Models energy cost savings of transmission corridor from Midwest wind to Eastern part of the Interconnection | 3 GW expansions from PJM to New York and New York to New England increases energy cost savings of transmission corridor by $118 million/yr and $28 million/yr, respectively (incremental costs: $27 million/yr and $21 million/yr, respectively) |
| **8. MIT CEEPR** | 2050 | Modeled power system cost savings associated with 4 GW transmission expansions for Quebec-New York and Quebec-New England. Analysis was constrained to meet OSW targets. | **QC-New England:** 4 GW provides power system cost savings of $1,121 million/yr (13%)<br>**QC-NY:** 4 GW provides power system cost savings of $913 million/yr (13%)<br>Value is generated by utilizing the transmission bidirectionally to balance Northeast renewables, avoiding firming costs |
| **9. NERC ITCS** | 2033 | Identifies "prudent" interregional transmission additions needed to maintain reliability—does not include any additional transmission justifiable based on economic and public policy benefits | **NY-New England:** 0 GW (this is unlikely once considering economic and public policy benefits)<br>**NY-PJM:** 1.8 GW to alleviate significant resource deficiencies in New York<br>**QC-New England:** 400 MW<br>**QC-NY:** 1.9 GW<br>**New England-Maritimes:** 300 MW |

# Note on Existing Interregional Transfer Capability

- In additional to transmission expansion needs, **we found that there were a range of values reported across different studies for how much interregional transfer capability exists today**.
- Namely, the DOE Transmission Needs Study, DOE National Transmission Planning Study (NTPS), and NERC Interregional Transfer Capability Study report different existing transfer capabilities at the New York–New England and New York–PJM interfaces.
- Different assumptions on existing capability partially explain differences in additional transfer capability needs.
  - e.g. DOE NTPS assumes greater existing transfer capability between New York and PJM than the Transmission Needs Study, and as a result finds less expansion is needed at that interface.

| | DOE Transmission Needs Study | DOE NTPS | NERC ITCS |
|---|---|---|---|
| **New York <> New England** | 2,030 MW | 3,500 MW | Summer: >1,303 / <1,660 MW<br>Winter: >2,432 / <1,359 MW |
| **New York <> PJM** | 2,000 MW | 6,600 MW | Summer: >913 / <1,356 MW<br>Winter: >4,019 / <4,814 MW |

**Sources:** DOE NTP Study Team letter, December 17, 2024; NERC ITCS Phase 1 results.

# 1. DOE National Transmission Needs Study (2023)

Takeaway

By **2035**, interregional transmission needs between New York–New England and New York–Mid-Atlantic will likely exceed **5 GW** and **2.4 GW**, respectively. By **2040**, these needs could grow to **11 GW** and **15 GW**

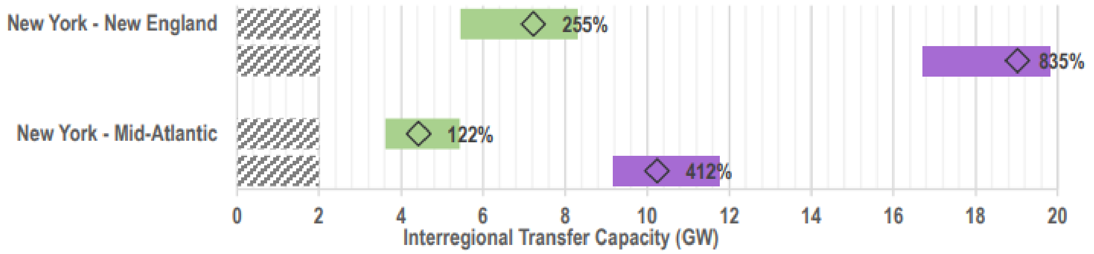
- Summarizes results from six national capacity expansion studies on interregional transmission expansion needs for 2030, 2035 and 2040 to achieve decarbonization
- In **2035** additional transfer capability requirements will be between **5.19–17.0 GW** for New York–New England and **2.43–8.24 GW** for New York–Mid-Atlantic
  - By **2040**, 11.4–21.4 GW and 12.7–14.8 GW, respectively
  - Dependent on load growth and clean energy penetration assumptions
    - We exclude values from the moderate load growth/moderate clean energy cases, which represent business-as-usual scenarios without the IIJA and IRA and are "an unlikely representation of future power sector need."

Gap

Expanding transmission between NY and PJM and New England is **low-regrets**; potential for **"low-hanging" interregional projects** that are cost effective but highly valuable

**Within-region transmission and interregional transfer capacity need for New York in 2035**

Range of new transmission need for future scenarios with moderate load and high clean energy growth (green, top for each region) and high load and high clean energy growth (purple, bottom). Median % growth compared to 2020 system shown.




| Regional Pair | 2020 GW | Scenario Group | New in 2030 | | New in 2035 | | New in 2040 | |
|---|---|---|---|---|---|---|---|---|
| | | | GW | % Growth | GW | % Growth | GW | % Growth |
| **Mid-Atlantic – New York** | 2.00 | Mod/Mod | 0.00 | 0.0% | 0.29 | 14.7% | 0.81 | 40.6% |
| **Mid-Atlantic – New York** | 2.00 | Mod/High | 0.00 | 0.0% | 2.43 | 122% | 14.8 | 742% |
| **Mid-Atlantic – New York** | 2.00 | High/High | 2.03 | 102% | 8.24 | 412% | 12.7 | 634% |
| **New England – New York** | 2.03 | Mod/Mod | 1.46 | 71.7% | 2.84 | 140% | 2.90 | 142% |
| **New England – New York** | 2.03 | Mod/High | 1.53 | 75.1% | 5.19 | 255% | 11.4 | 559% |
| **New England – New York** | 2.03 | High/High | 3.96 | 195% | 17.0 | 835% | 21.4 | 1050% |

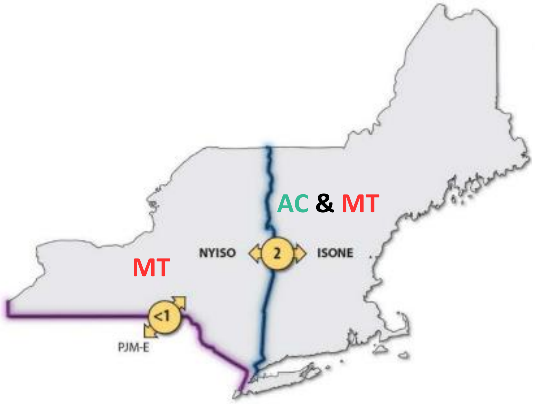
Source: DOE National Transmission Needs Study

# 2. DOE National Transmission Planning Study (2024)

**Takeaway**

At least **2 GW** of NY–ISO-NE transmission is likely needed by **2035**, increasing to nearly **5 GW** by **2040**. Significant expansion between NY–PJM and within New England is necessary by 2040. Results in net savings of **$56 billion, $54 billion** and **$33 billion by 2050** for ISO-NE, NYISO and PJM, respectively. HVDC buildout has higher value.

- Conducted zonal capacity expansion & resource adequacy modelling through 2050 under 96 scenarios covering:
  - Transmission frameworks (AC, P2P HVDC & meshed HVDC)
  - Policy assumptions (current policies; 90% power sector decarbonization by 2035; and 100% by 2035 [disregarded in this summary])
  - Low, medium and high demand futures
  - 15 sensitivity cases
  - Does not consider interchange or transmission expansion with Canada (international imports/exports set exogenously)
- "High-opportunity interfaces" for **2035**: Conservative estimates based on central scenario (see figure)
  - **1.7 GW** between **NYISO–ISO-NE**, **0.9 GW** between **NYISO–PJM** in the "meshed HVDC" scenario
  - However, needs increase significantly by 2040, and are sensitive to demand scenarios and transmission framework (see next slide)
- Central expansion scenario generates net cost savings through 2050. HVDC futures increase cost savings
  - ISO-NE: $56 billion (19%), up to $62 billion (21%) with HVDC
  - NYISO: $54 billion (16%), up to $63 billion (19%) with HVDC
  - PJM: $33 billion (2%), up to $75 billion (5%) with HVDC
  - Costs allocated amongst regions using "adjusted production cost" based on zonal marginal prices




**NYISO & ISONE**

AC Framework
**Interface Capacity (GW)**

| REGION | EXISTING | 25TH | 50TH | 75TH |
|---|---|---|---|---|
| | | Percentile of New Capacity | | |
| NYISO, ISONE | 3.5 | 1.7 | 1.8 | 2.5 |
| NYISO, PJM-E | 6.6 | 0 | 0 | 0 |

MT Framework
**Interface Capacity (GW)**

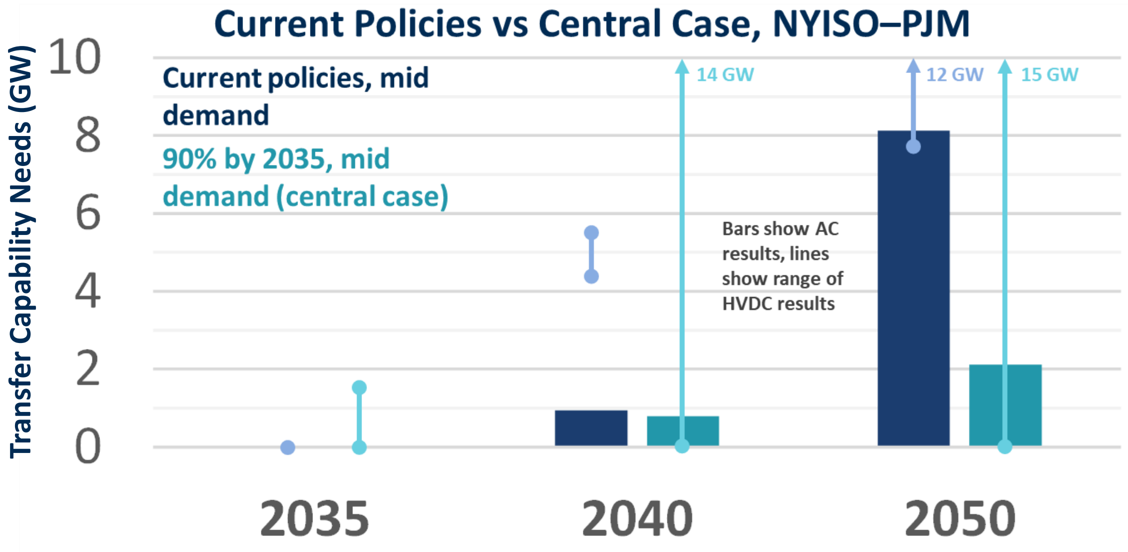
| REGION | EXISTING | 25TH | 50TH | 75TH |
|---|---|---|---|---|
| | | Percentile of New Capacity | | |
| NYISO, ISONE | 3.5 | 1.6 | 2.2 | 2.9 |
| NYISO, PJM-E | 6.6 | 0.9 | 2.4 | 3.7 |

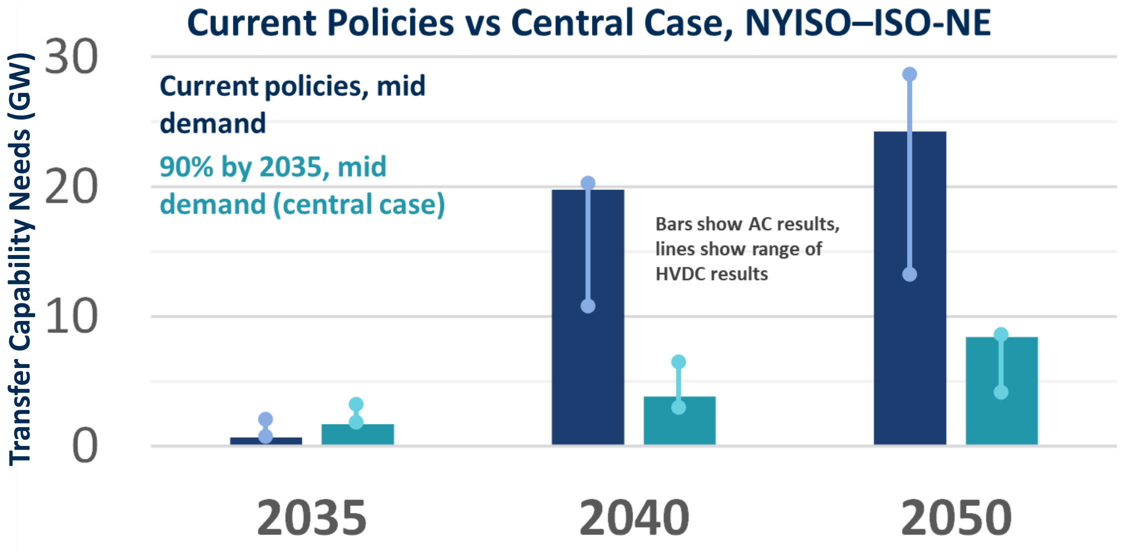
Source: DOE National Transmission Planning Study

# 2. DOE National Transmission Planning Study (2024) (cont'd)

## Transmission needs increase by 2040, but vary greatly

- **NYISO–ISO-NE**: from 1.7–2.9 GW by 2035 to **3.8–6.7 GW by 2040** in central case
  - Under current policies, 2040 needs are much higher (11–21 GW)
- **NYISO–PJM: to ~1 GW by 2040** for AC scenario, but much higher in HVDC scenario
  - Low end of HVDC range represents point-to-point HVDC, whereas high end reflects multiterminal future



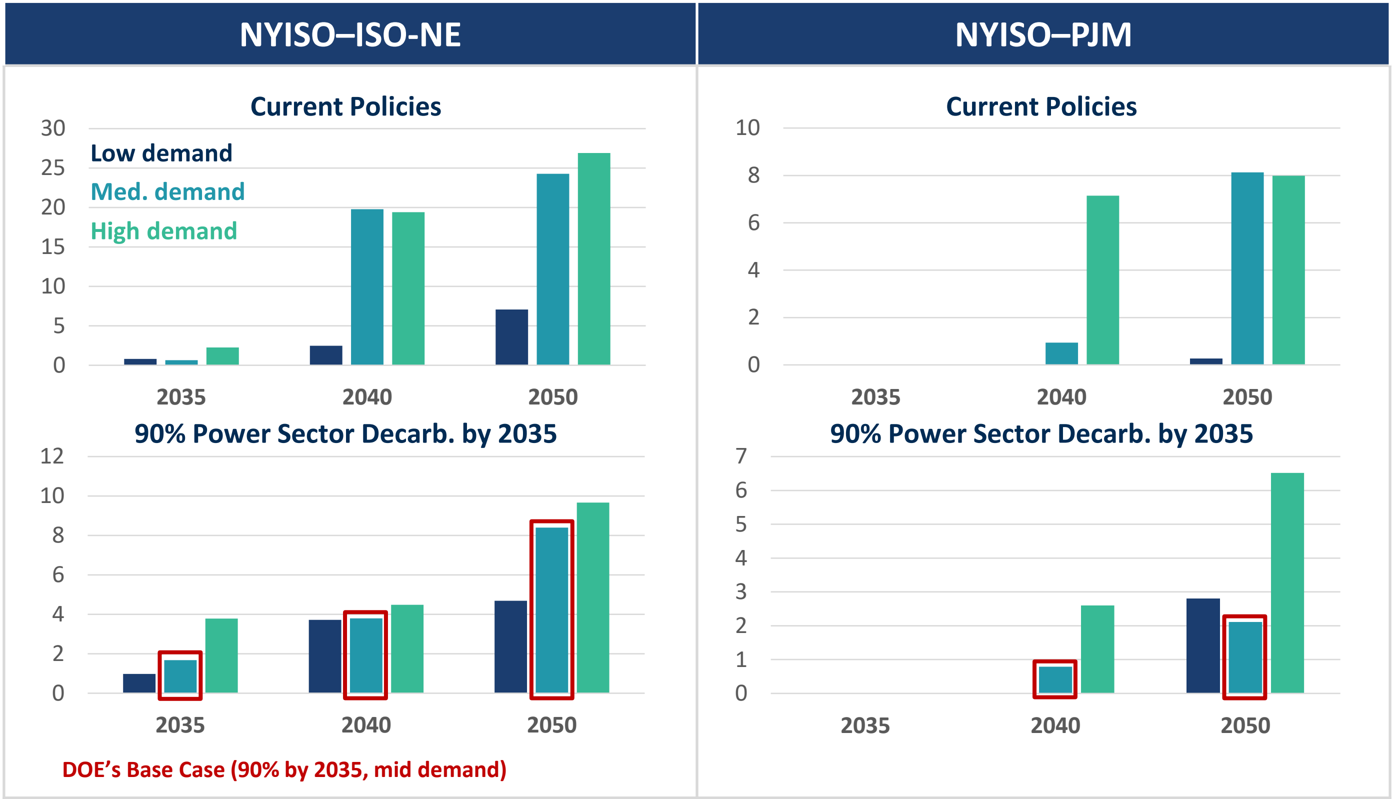



# 2. DOE National Transmission Planning Study (2024) (cont'd)

## Load Assumptions Significantly Affect Interregional Transfer Capability Additions

- High demand increases transmission needs, particularly between NYISO–PJM (1 GW to 7 GW from mid to high demand)
- Even under low load and moderate decarbonization assumptions, nearly 4 GW is needed between NYISO–ISO-NE by 2040

### Transfer Capability Needs (GW), AC Framework



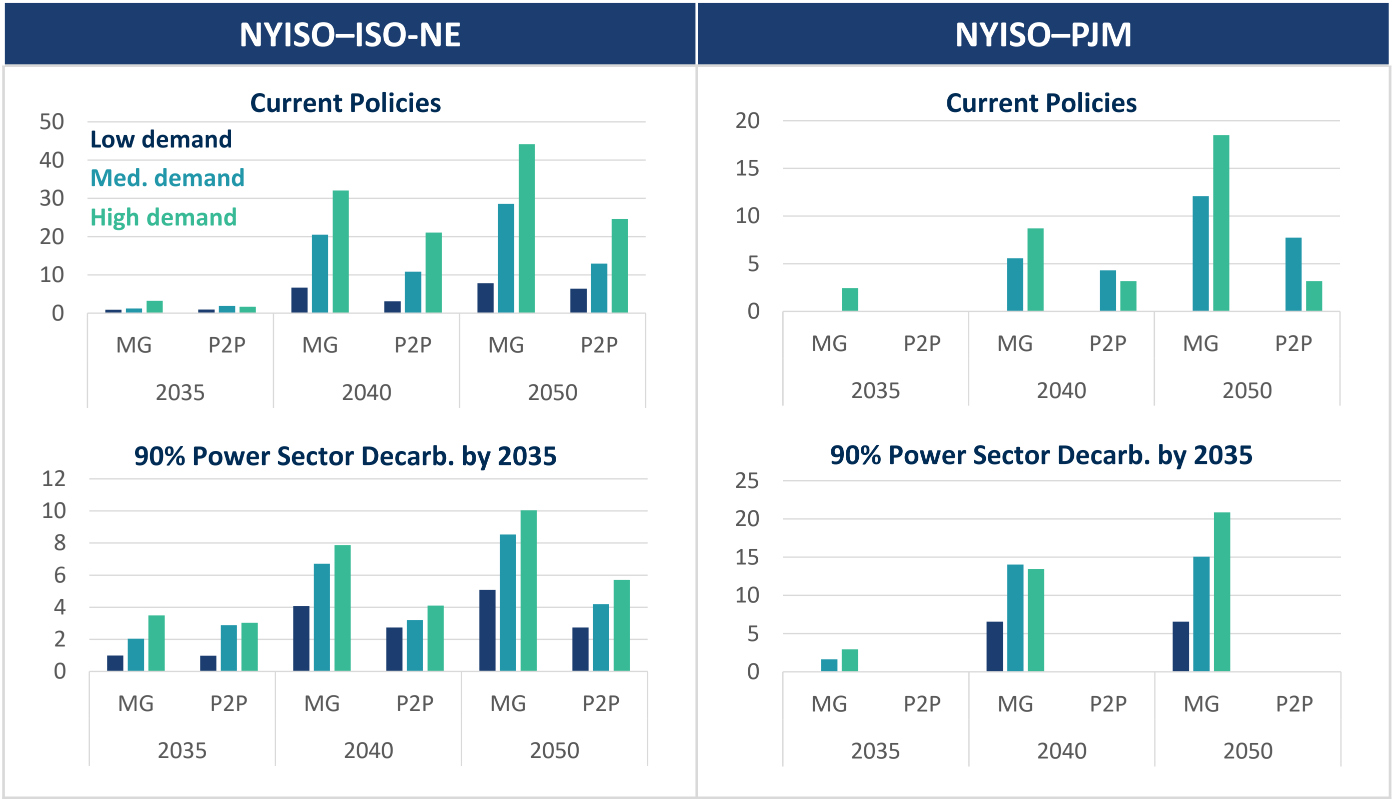

**Note:** All results assume an early phaseout of IRA tax credits in 2032.

# 2. DOE National Transmission Planning Study (2024) (cont'd)

## HVDC Futures See Greater Variation in Transfer Capability Needs

- While NYISO–ISO-NE needs are similar to AC case, large differences in NYISO–PJM buildout
- Multiterminal HVDC sees significant buildout between NYISO–PJM by 2040, even under low load growth

### Transfer Capability Needs (GW), HVDC Frameworks




**Note:** MG = multiterminal, P2P = point-to-point. All results assume an early phaseout of IRA tax credits in 2032.

# 3. DOE Atlantic Offshore Wind Transmission Study (2024)

Takeaway

**Proactive, coordinated interregional transmission planning is urgently needed** to integrate Atlantic OSW, and **networking offshore transmission generates that benefits significantly outweigh the costs**

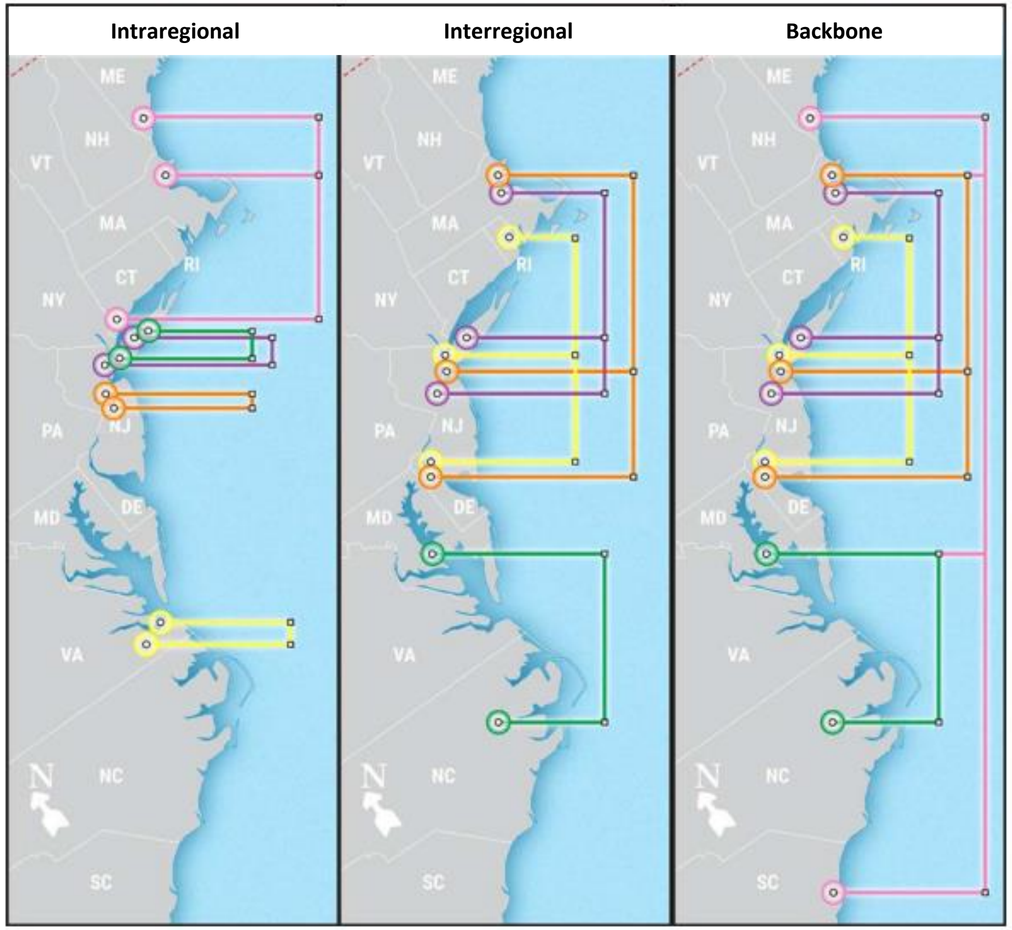
- Considered several transmission configurations to integrate **85 GW** of OSW: radial (reference case, directly from onshore to offshore), intraregional, interregional, inter-intra, and backbone
- **By 2050, benefits of interlinking offshore transmission outweigh costs by more than 2 to 1** across all configurations, with **interregional configurations offering the highest value-to-cost ratio**
  - Arise from reduced curtailment and generation costs, and increased reliability

**Table ES-3. Annual Offshore Transmission Costs and Benefits of the Networked Topologies (Compared to Radial) in 2050**

| Topology | Annual Offshore Networking Costs ($ million) | Annual Gross Benefit ($ million) | Net Annual Value ($ million) [Benefits - Costs] | Benefit-to-Cost Ratio [Benefits/Costs] |
|---|---|---|---|---|
| Intraregional | 260 | 590 | 330 | 2.3 |
| Interregional | 840 | 2,400 | 1,560 | 2.9 |
| Inter-Intra | 1,090 | 2,850 | 1,760 | 2.6 |
| Backbone | 1,470 | 3,940 | 2,470 | 2.7 |

Note: Costs in this table represent the additional annualized capital costs and operations and maintenance costs of the networked topologies compared to the radial topology. Benefits represent the 2050 annual production cost and resource adequacy value in the networked topologies compared to the radial topology.

Source: Atlantic Offshore Wind Transmission Study



# 3. DOE Atlantic Offshore Wind Transmission Study (2024) (cont'd)

Takeaway

**Proactive, coordinated interregional transmission planning is urgently needed to integrate Atlantic OSW, and networking offshore transmission generates that benefits significantly outweigh the costs**

- Interregional offshore transmission generates **significant resource adequacy value** by displacing generation investment
  - This contributes substantially to total value of offshore transmission
  - Accrues in winter-peaking conditions in colder, electrified regions like PJM, NYISO, and ISO-NE
- AOSWTS did not answer the question of when building offshore transmission is cost-effective (benefits were only evaluated for 2050)

Gap

**Resource adequacy value** must be appropriately captured within **benefit assessment methodologies**

Gap

**HVDC technology standards** will be required to enable a phased rollout of interregional offshore transmission

Gap

Standards to for design of meshed offshore facilities **("mesh-ready standards")** required to overcome barriers to offshore networking

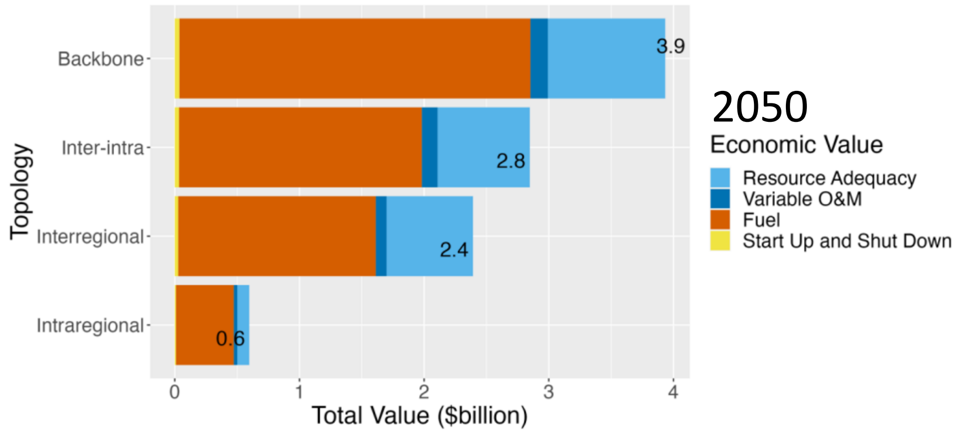



**Table ES-1. Equivalent Firm Capacity Result**

| Topology | Quantity of Offshore Interlink Transmission Built (megawatts [MW]) | Equivalent Firm Capacity (Potential Displaced Generation) (MW) |
|---|---|---|
| **Intraregional** | 7,600 | 565–664 |
| **Interregional** | 14,000 | 4,062–4,726 |
| **Inter-Intra** | 21,600 | 4,453–5,000 |
| **Backbone** | 20,000 | 5,859–6,250 |
| **Intraregional** | 7,600 | 565–664 |

Source: Atlantic Offshore Wind Transmission Study

# 4. GE & NRDC: Benefits of Interregional Transmission Capacity (2022)

Takeaway

Expanding interregional transfer capability on Eastern Interconnect provides **significant resilience benefits** against major weather events, in addition to capacity and production cost savings

## Resilience benefits

- **76 GW** of additional interregional transmission on Eastern Interconnect (~**1.3 GW** between ISO-NE and NYISO and **~5 GW** between NYISO and PJM) protects against simulated major weather events in **2035**, with **resilience benefits of $0.875–1 billion**
  - Summer heat wave: 27 GW (~0.7 GW ISO-NE to NYISO, ~5 GW NYISO to PJM) avoids loss of load equivalent to **$875 million**
  - Winter polar vortex: 65 GW (~1.3 GW ISO-NE to NYISO) avoids loss of load to ~2 million customers, equivalent to **$1 billion** of resilience benefits
- Assumes 28 GW of OSW by 2035 and 39 GW by 2040

## Production cost and capacity savings

- Buildout would result in 20 GW of **capacity savings worth $2 billion/yr** and **ancillary service savings of $50 million/yr**
- Optimizing buildout to enable access to lower cost generation would build 54 GW of new interregional transmission (**~2 GW** ISO-NE–NYISO, **~3.5 GW** NYISO–PJM) and generate production cost savings of **$3 billion/yr in 2035** and **$4 billion/yr in 2040**

Altogether, 87 GW of additional interregional transmission (**~2 GW** ISO-NE–NYISO, **~5 GW** NYISO–PJM) would generate **$12 billion in net benefits**

Gap

**Consistent benefit assessment frameworks** are necessary for resilience benefits of interregional transmission to be correctly valued

Source: Economic, Reliability, and Resiliency Benefits of Interregional Transmission Capacity

# 5. MA Decarbonization Pathways Roadmap (2020)

Takeaway

**Significant interregional transmission** expansion, particularly New England–New York and both New England and New York to Quebec, is **required to integrate OSW** and reach **net-zero** economy-wide by **2050** at lowest cost

## Offshore wind is pivotal to MA's decarbonization roadmap

- At least 15 GW installed in MA across all scenarios where OSW isn't limited

## Integration of OSW requires significant new transmission capacity

- **1.7–4.5 GW** between New England and New York (excluding low OSW and low load growth cases)
- **1.5–7 GW** between NY–PJM in aggressive decarb., high load scenarios
  - Caveat: PJM was not explicitly modeled as its own zone but a boundary condition for New York
- **4.1–7.1 GW** and **3.8–6.8 GW** between QC–New England and QC–NY, respectively
  - Operated **bidirectionally** in all cases
- **0–2.7 GW** between New England and New Brunswick.

- Enhancing interregional coordination on transmission planning was found to reduce overall system costs and result in greater interregional buildout
  - However, study did not evaluate processes required to achieve improved interregional coordination, but rather simply represented it through a lower transmission cost

*Table 8. Cumulative transmission build 2020-2050 by pathway. The 17 modeled transmission paths are assumed to be symmetrical, meaning that 3.7 GW from New Hampshire to Massachusetts also implies operational capability of 3.7 GW from Massachusetts to New Hampshire.*

| Zone from | Zone to | no thermal | regional coordination | limited efficiency | 100% renewable primary | all options | der breakthrough | pipeline gas | constrained offshore wind |
|---|---|---|---|---|---|---|---|---|---|
| Connecticut | Rhode Island | 0.5 | 0.9 | 1.3 | 1.6 | 0.3 | 0.3 | 0 | 0 |
| Massachusetts | Connecticut | 1.5 | 0.1 | 0 | 0.2 | 0 | 0 | 0 | 0 |
| Massachusetts | Rhode Island | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rest of US | New York | 7 | 6 | 3 | 1.5 | 0 | 0 | 0 | 0 |
| New Brunswick | Maine | 2.7 | 0.5 | 0.1 | 0.8 | 0 | 0 | 0 | 0.1 |
| New Hampshire | Maine | 3 | 1.8 | 1.2 | 1.5 | 1 | 0.9 | 0.9 | 0 |
| New Hampshire | Massachusetts | 3.7 | 2 | 1.6 | 0.2 | 0.6 | 1.3 | 0 | 0 |
| New York | Connecticut | 1.5 | 1 | 0.8 | 0.8 | 0.6 | 0.5 | 0.5 | 0.5 |
| New York | Massachusetts | 2.6 | 2.5 | 1.5 | 1.5 | 1 | 1.2 | 0 | 0 |
| New York | Vermont | 0.4 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quebec | Maine | 2 | 1.2 | 1.1 | 0.9 | 0.6 | 0.6 | 0.6 | 0.9 |
| Quebec | Massachusetts | 4.3 | 4.8 | 3.7 | 3.3 | 2.7 | 2.8 | 3.1 | 3.9 |
| Quebec | New Brunswick | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quebec | New York | 6.8 | 6.8 | 6.8 | 4.7 | 4.4 | 4.2 | 5.6 | 3.8 |
| Quebec | Vermont | 0.8 | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| Vermont | Massachusetts | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vermont | New Hampshire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sum | 37.3 | 28.7 | 21.9 | 17.8 | 12 | 12.6 | 11.5 | 10 |

Gap

Expanding transmission **between New England and New York is low-regrets**; indicates potential for **"low-hanging" interregional projects** that are cost effective but highly valuable

Source: Energy Pathways to Deep Decarbonization – A Technical Report of the Massachusetts 2050 Decarbonization Roadmap Study

# 6. LBNL: Empirical Estimates of Transmission Value (2022)

Takeaway

**Expanding New England–New York and New York–PJM transfer capability could generate $137–400 million per GW of transfer capability and $149–313 million per GW, respectively, in energy trading value alone**

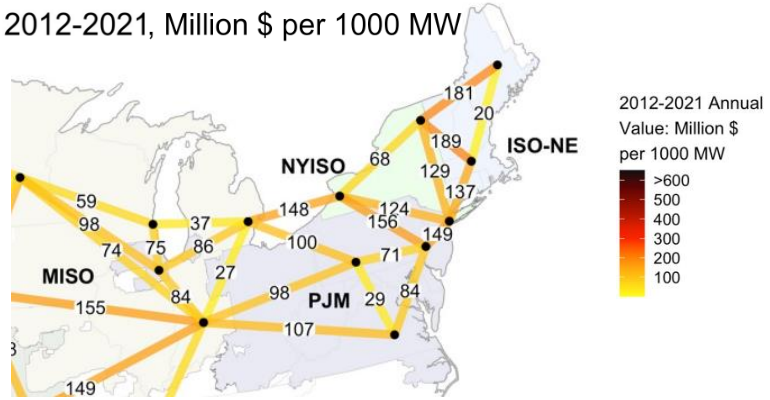
Expanding **New England–New York** and **New York–PJM** transfer capability could generate **$137–400 million per GW of transfer capability** and **$149–313 million per GW**, respectively, in energy trading value alone

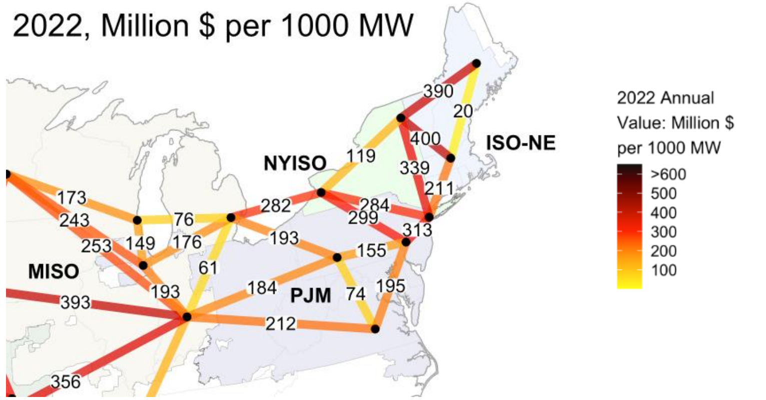
## Energy trading value / production cost savings:

- Expanding interregional transmission capacity between ISO-NE–NYISO and NYISO–PJM would have generated **$137–189 million/yr per GW** and **$149–156 million/yr per GW** of trading value alone on average, respectively, between 2012 and 2021
- 2022 Update: ISO-NE–NYISO $211–400 million/yr, NYISO–PJM $219-313 million/yr
- Interregional transmission is more valuable than regional

## Resilience benefits:

- Not explicitly modelled, but **40–80%** of congestion value arises from **top 5%** of hours due to extreme conditions
- Winter storm Elliott (Dec 22–31 2022, ~2.5% of the year) made up **8–10%** and **12–13%** of the total 2022 value of expanding transmission between **ISO-NE–NYISO** and **NYISO–PJM**, respectively




Gap

Realizing congestion value of interregional transmission requires RTOs to implement effective **intertie optimization**

Source: Empirical Estimates of Transmission Value using Locational Marginal Prices
The Latest Market Data Show that the Potential Savings of New Electric Transmission was Higher Last Year than at Any Point in the Last Decade
Transmission Value in 2023

# 7. NREL Interregional Renewable Energy Zones Study (2024)

Takeaway

**Interregional transmission corridor** along Eastern Interconnect generates **significant energy cost savings** even without considering integration of Northeastern OSW resources

- Companion study to DOE's National Transmission Planning Study
- Extending Iowa–DC transmission corridor to New York City and Boston with **3 GW** of transfer capability increases annual energy cost savings from $740 to $886 million while only increasing transmission revenue requirement from $296 to $344 million
  - Incremental benefit: **$146 million/yr**; Incremental cost: $48 million/yr; Benefit-cost ratio of incremental expansion: **3.04**
  - Total benefit-cost ratio of transmission corridor from Iowa to Boston: 2.58
- Did not investigate cost savings of integrating OSW – would provide additional energy cost savings


**Destinations**
- Washington to New York to Boston
- Chicago/Milwaukee
- Indianapolis

| | Washington, DC | New York | Boston |
|---|---|---|---|
| Energy cost savings[a] ($millions) | $740<br>*$994 with solar[d]* | $858 | $886 |
| Annual revenue requirement for transmission[b] ($millions) | $296<br>*$521 with solar[d]* | $323 | $344 |
| Benefit/cost ratio (energy savings only) | 2.50<br>*1.91 with solar[d]* | 2.66 | 2.58 |
| Expected unserved energy (IREZ vs. local renewables)[c] | Worse<br>*Better with solar[d]* | Similar | Similar |
| 3 GW as % of 2022 peak (included load zones) | 9%<br>(PJM: PEPCO, BGE, Dominion) | 9%<br>(all NYISO) | 12%<br>(all ISO-NE) |

Source: Interregional Renewable Energy Zones

Gap

**Expanding transmission between PJM, New York and New England is low-regrets**; potential for **"low-hanging" interregional projects** that are cost effective but highly valuable

# 8. MIT-CEEPR QC Hydro & Northeast Decarbonization (2020)

Takeaway

Expanding interregional transmission by **4 GW** between both **Quebec and New England** and **Quebec and New York** would **reduce net system costs in 2050** under a range of decarbonization scenarios

- **Quebec–New England:** increasing transfer capability by **4 GW** reduces power system costs (accounting for costs of transmission expansion) by **$913 million/yr** (13%) and **$2,387 million/yr** (24%) under 99% and 100% decarbonization scenarios, respectively
- **Quebec–New York:** increasing transfer capability by **4 GW** reduces power system costs by **$1,121 million/yr** (13%) and **$3,057 million/yr** (23%), respectively
- Value is generated by utilizing the transmission **bidirectionally** to balance Northeast renewables, avoiding firming costs
  - While the 4 GW increase was a model input (not reflective of max possible transmission value), this figure is in line with the low end of the ranges of transmission needs between Quebec and both New England and New York in the MA Decarbonization Pathways Roadmap, which reports 4.1–7.1 GW and 3.8–6.7 GW, respectively, by 2050
- Analysis was constrained to meet the OSW targets of each state
- Economic benefits remain robust under a range of sensitivities, including limited nuclear/carbon capture and sequestration as well as high load growth scenarios

Gap

Bidirectional operation of transmission to Quebec requires significant improvements in **intertie optimization**

Source: Two-Way Trade in Green Electrons: Deep Decarbonization of the Northeastern U.S. and the Role of Canadian Hydropower

# 9. NERC Interregional Transfer Capability Study (ITCS) (2024)

**Takeaway**

Significant transmission expansion between **NY–PJM** and from **Quebec to New England and NY** is required in the **next 10 years** to maintain reliability. **Larger additions are likely justifiable when considering economic benefits.**

- Identifies "prudent" interregional transmission additions needed to maintain reliability
  - **Considers resource adequacy only and does not include assessment of economic or public policy benefits:** Transmission expansion results therefore represent only the lower bound of what would be valuable at each interface

## New York–PJM transmission expansion is justifiable on a reliability basis alone

- **1.8 GW by 2033** to alleviate significant resource deficiencies in New York

## Expansion to Quebec improves resource adequacy in both New England and NY

- **1.9 GW by 2033** between NY–QC (Champlain Hudson Power Express to provide 1.2 GW)
- **400 MW by 2033** between New England–QC (and 300 MW to Maritimes)
  - New England Clean Energy Connect likely to address a significant portion of this need

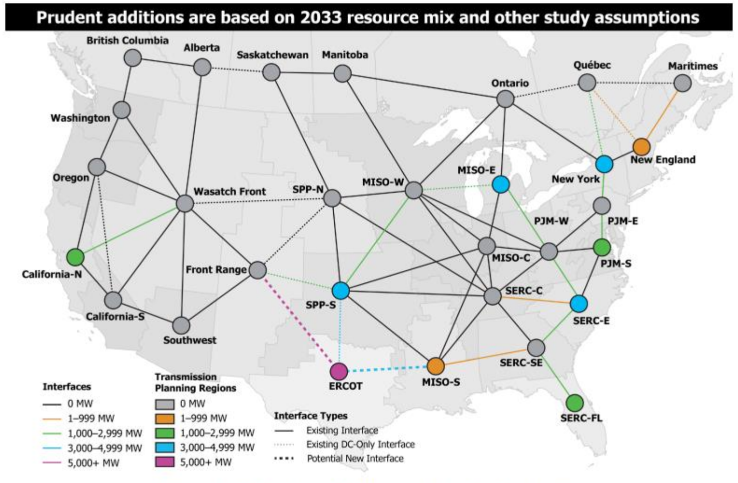



Figure ES.2: Prudent Additions to Transfer Capability

**Table ES.1: Recommended Prudent Additions Detail**

| Transmission Planning Region | Weather Years (WY) / Events | Resource Deficiency Hours | Maximum Deficiency (MW) | Additional Transfer Capability (MW) | Interface Additions (MW) |
|---|---|---|---|---|---|
| **New York** | WY2023 Heat Wave and seven other events | 52 | 3,729 | 3,700 | PJM-E (1,800)<br>Québec (1,900) |
| **New England** | WY2012 Heat Wave and two other events | 5 | 984 | 700 | Québec (400)<br>Maritimes (300) |

**Gap**

Consistent **benefit assessment frameworks covering economic, resiliency and public policy benefits**—not solely reliability—are essential to identify valuable transmission expansion opportunities and minimize risk of undersizing

Source: Interregional Transfer Capability Study (ITCS) - Recommendations for Prudent Additions to Transfer Capability (Part 2) and Recommendations to Meet and Maintain Transfer Capability (Part 3)

# Appendix: The Need to Address Inefficiencies Across Market Seams

# Five Sources of Inefficiencies Created by Market Seams

**Seams between RTOs will generally be more efficient than seams between non-market regions that rely entirely on bilateral trades. Nevertheless, significant seams-related inefficiencies exist between RTO markets:**

1. **Interregional transmission planning** is ineffective
2. **Generator interconnection** delays and cost uncertainty created by affected system impact studies (and effectiveness coordination through means such as the SPP-MISO JTIQ, reducing costs by 50%)
3. **Resource adequacy** value of interties (often not considered in RTO's resource adequacy evaluations) and barriers to capacity trades (often created by RTOs' restrictive capacity import requirements and incompatible resource accreditations)
4. **Loop flow management** inefficiencies through market-to-market coordinated flowgates (with shares of firm flow entitlements) under the existing JOAs
5. **Inefficient trading** across contract-path market seams and the need for intertie optimization
   - **This is the focus of these appendix slides**

# Note

**This content is in part based on:**

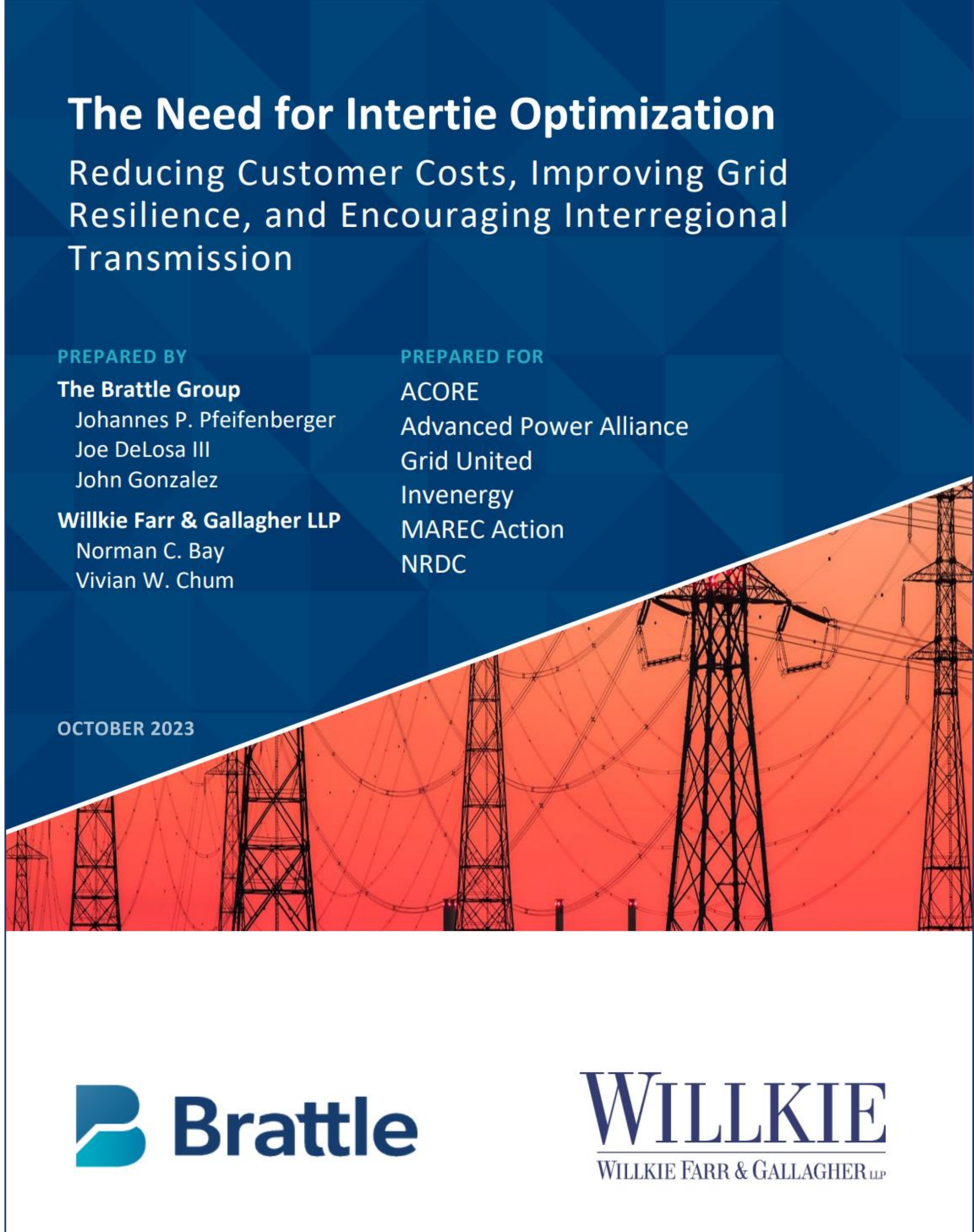
The Need for Intertie Optimization, prepared for ACORE, Advanced Power Alliance, Grid United, Invenergy, MAREC, and NRDC, October 2023

Intertie Optimization FAQs and Implementation Principles, February 2024

Intertie Optimization: Efficient Use of Interregional Transmission (Update), presented to OPSI, April 12, 2024

Market Benefits and Seams: Options and Implications, presented to CREPC-WIRAB, April 24, 2024.

Various State of Market, LBNL, and NREL reports
(as cited in the slides)


**The Need for Intertie Optimization**

Reducing Customer Costs, Improving Grid Resilience, and Encouraging Interregional Transmission

PREPARED BY

**The Brattle Group**
Johannes P. Pfeifenberger
Joe DeLosa III
John Gonzalez

**Willkie Farr & Gallagher LLP**
Norman C. Bay
Vivian W. Chum

PREPARED FOR

ACORE
Advanced Power Alliance
Grid United
Invenergy
MAREC Action
NRDC

OCTOBER 2023

Brattle

WILLKIE
WILLKIE FARR & GALLAGHER LLP

# NREL Report: Barriers and Opportunities to Realize the System Value of Interregional Transmission (June 2024)

**NREL recommends reforms to "significantly enhance the value of interregional transmission and deliver additional within-region benefits":**

**Common Actions**
- Develop a framework for resource adequacy sharing among regions
- Support joint studies to identify transfer needs during extreme events and develop operational procedures to mitigate issues
- Evaluate internal transmission system ability to accommodate large power transfers as the underlying generation mix changes

- Recognize resource-adequacy and resilience value of interregional transmission

**Nonmarket and Hybrid Actions**
- Implement coordinated scheduling and operations platforms or consolidation
- Pursue joint congestion management programs and reevaluate qualified paths for congestion management
- Develop consistent methods to calculate available transfer capacity
- Update processes to prioritize system reliability in scheduling market and wheeling transactions

- Improved coordination and joint congestion management

**Market Actions**
- Eliminate fees and improve price forecasting for coordinated transaction scheduling or move toward intertie optimization
- Update corridor flow limits, automate procedures, and align assumptions for congestion management programs
- Revise interface pricing methods and validate interregional transactions
- Integrate operational control of merchant HVDC lines with regional market operations

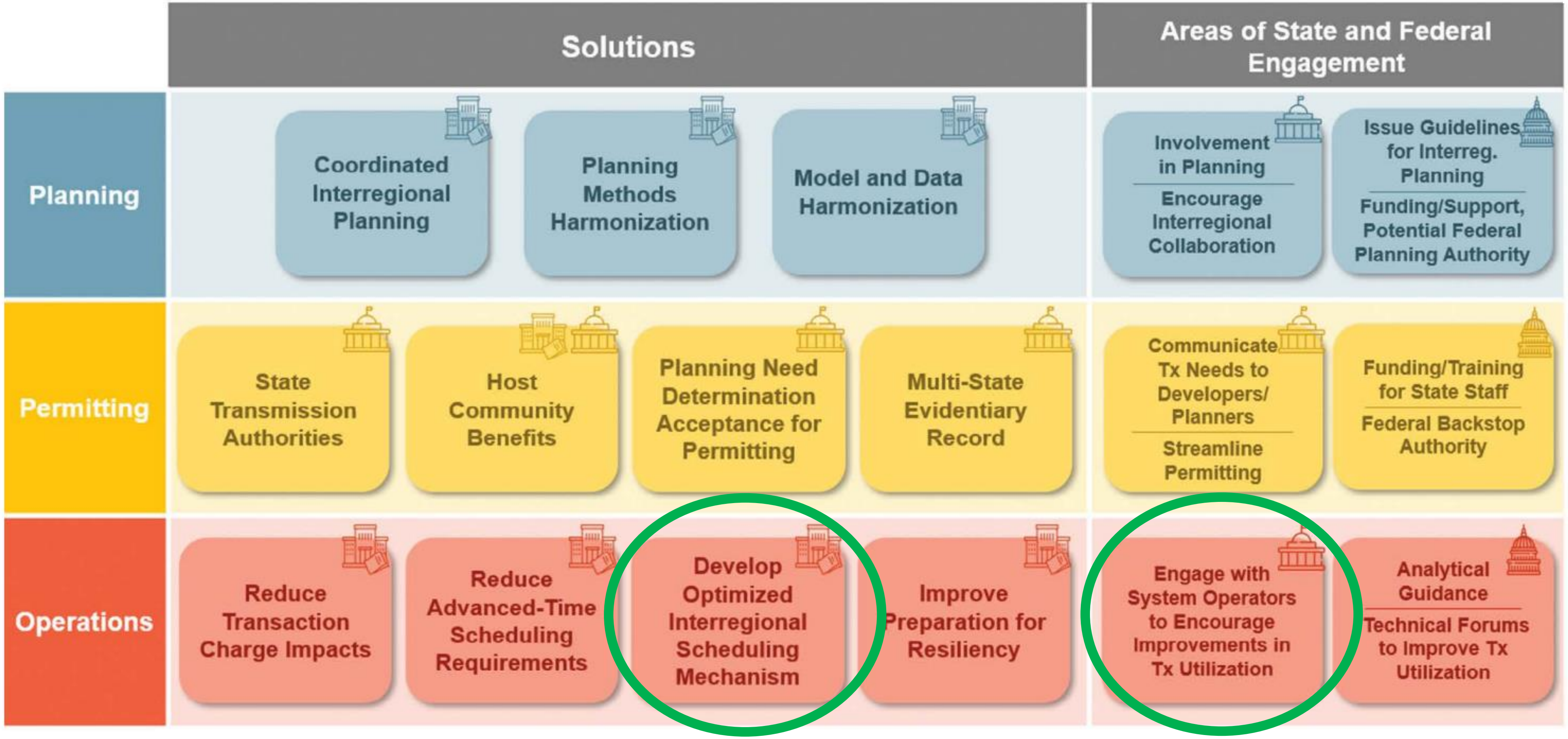
- De-pancaking
- Improved intertie pricing
- **"Move toward intertie optimization"**

**Transformative Actions**
- Conduct long-range, nationwide 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

- Interregional planning
- Interconnection-wide optimization

# NARUC Report: Collaborative Enhancements to Unlock Interregional Transmission (June 2024)

**Recommends reforms improve planning, permitting, and operational utilization of interregional transmission, including intertie optimization:**




Source: https://pubs.naruc.org/pub/BACDBB9D-02BF-0090-0109-B51B36B74439

NARUC
National Association of Regulatory Utility Commissioners

# Promising Initiative: SPP’s Inter-Market Optimization Framework


- SPP staff has been exploring an Inter-Market Optimization Framework to improve the efficiency of transfers between SPP and its neighbors, resulting in increased economic benefits for SPP’s market participants
- On October 16, 2024, SPP’s Strategic Planning Committee (SPC) endorsed that staff’s work on this concept be prioritized within the “Optimized Seams” objectives of SPP’s strategic planning roadmap
- SPP’s proposed next steps:
  - Further evaluate potential value of adding this feature to the market design
  - Prioritize inter-market optimization within the Optimized Seams strategic opportunity
  - Develop policy proposals to address challenges identified

Source: SPP Documents & Filings – SPC Meeting Materials, Oct 8, 2024