Cost-Effective Transmission between Canada and the US Northeast

PREPARED BY

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PRESENTED AT

Acadia Center

ELM ENVIRONMENTAL LEAGUE OF MASSACHUSETTS

NEW ENGLAND FOR OFFSHORE WIND

Bridging the Power Gap Webinar: How Bidirectional Clean Energy Benefits the US Northeast and Eastern Canada

October 9, 2024

Brattle

The Urgency of Starting to Plan for OSW Transmission Now

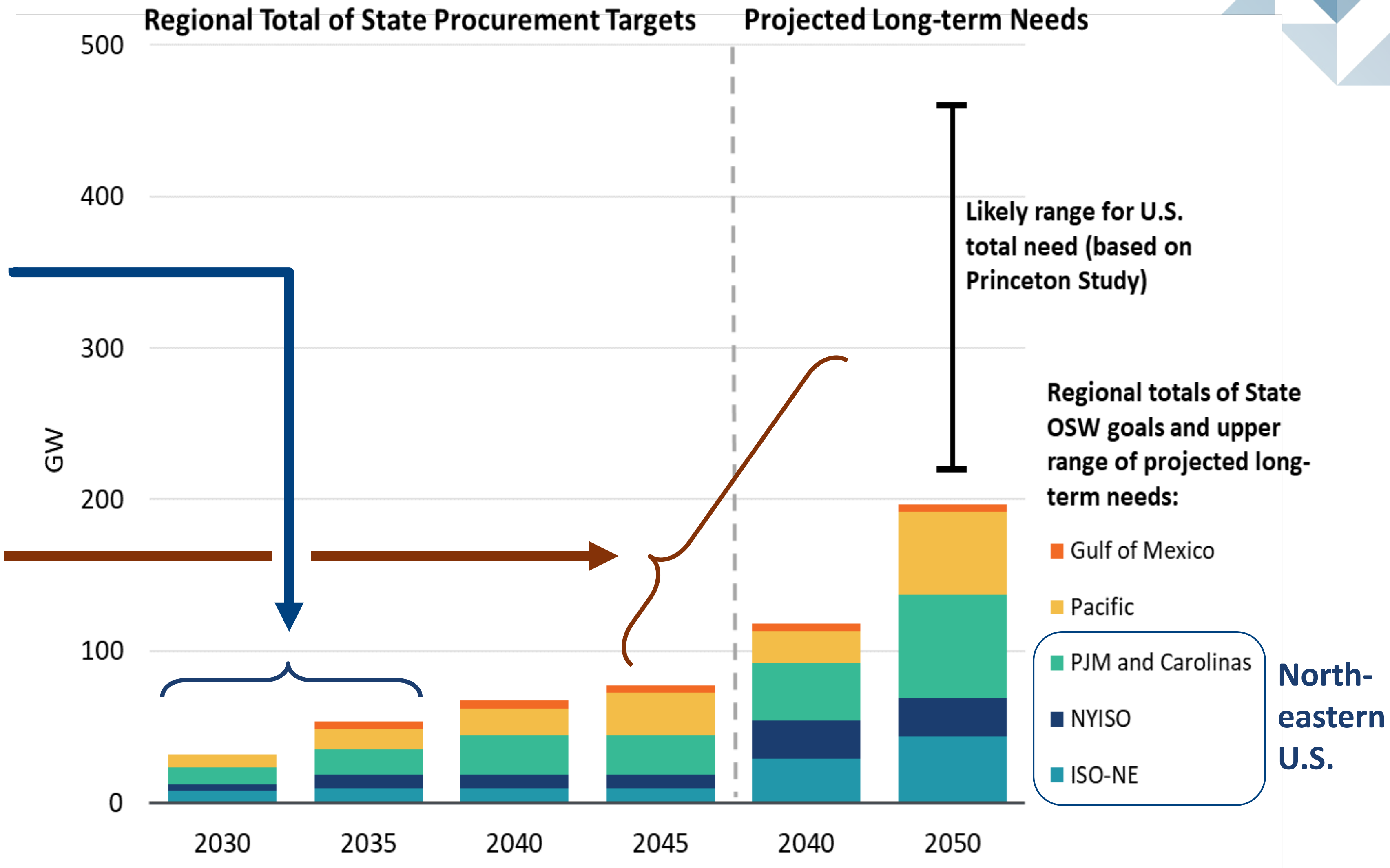
The Northeastern US and neighboring regions need to urgently plan transmission

1. 30-50 GW of OSW by 2030-35, 9 GW in both ISO-NE and NYISO, 15 GW in PJM

while also considering

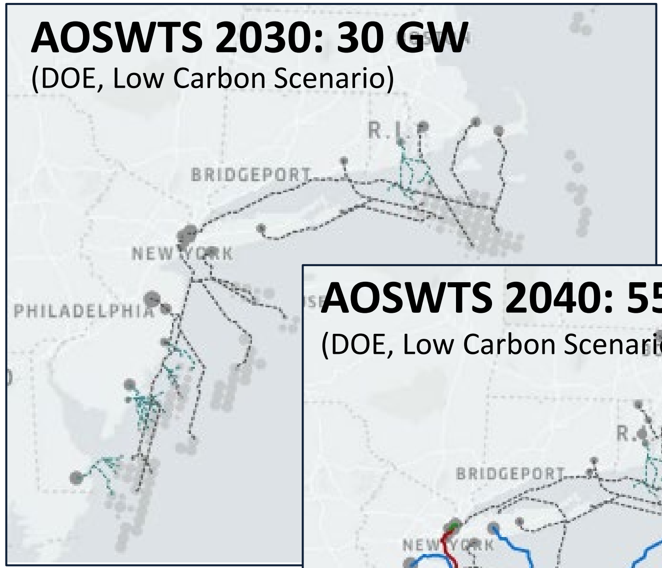
2. The much higher longer-term needs of 200-450 GW of U.S. OSW by 2050, with 20-40 GW in each RTO

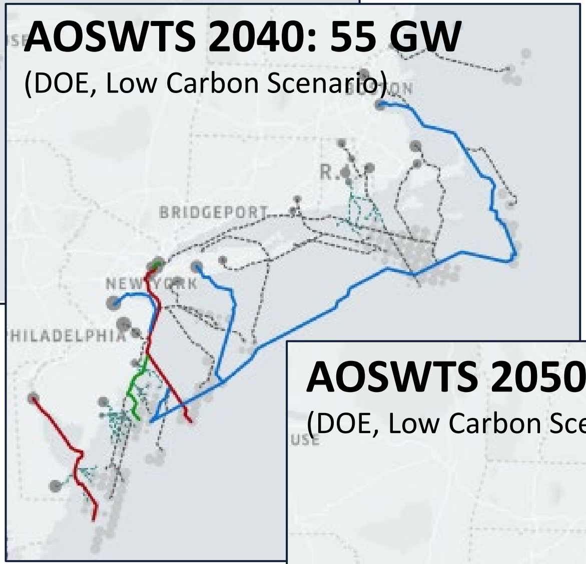
Though increased costs and supply chain disruptions will delay reaching 2030 goals by several years, long-term goals are still achievable

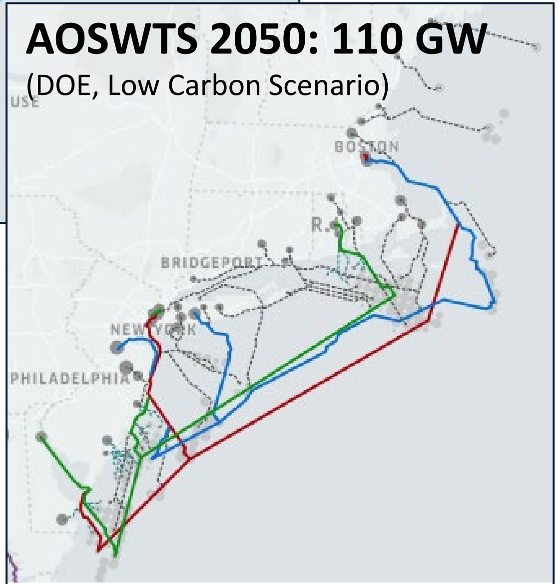


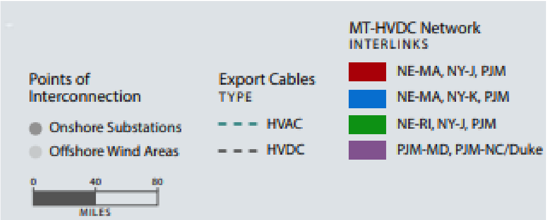
Note: most U.S. OSW generation will need to be delivered to shore; some may be used to produce hydrogen

Regional and Interregional Transmission for OSW Generation







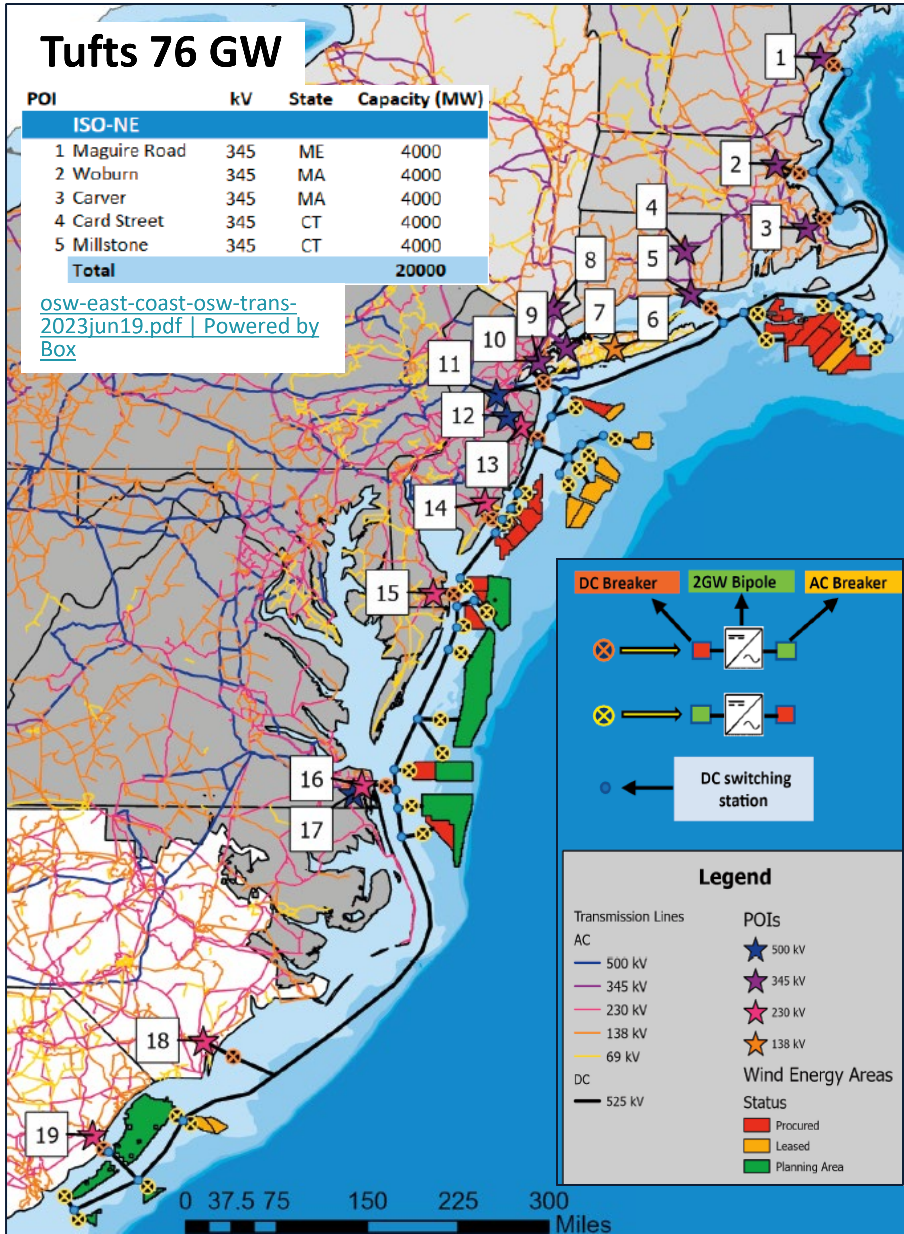


[Atlantic-Offshore-Wind-Transmission-Plan-Report_September-2023.pdf (energy.gov)](Atlantic-Offshore-Wind-Transmission-Plan-Report_September-2023.pdf)

Studies by **DOE (AOSWTS)** and **Tufts** point to the value of combining OSW generation interconnection (and necessary onshore upgrades) with new interregional (mostly offshore) transmission links.

These studies do not currently take into account attractive new links with Canada.

Analyses show additional 4-7 GW of interties likely will be cost-effective for New England. Same additions for NY.



POI	kV	State	Capacity (MW)
ISO-NE			
1 Maguire Road	345	ME	4000
2 Woburn	345	MA	4000
3 Carver	345	MA	4000
4 Card Street	345	CT	4000
5 Millstone	345	CT	4000
Total			20000

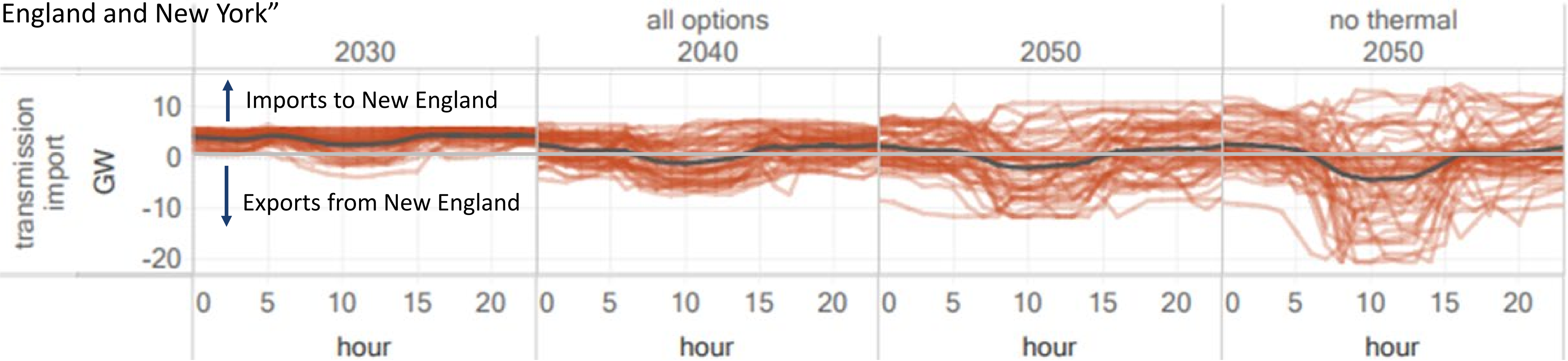
MA Study: Additional transmission between the Northeastern US and Canada will be cost effective and used bi-directionally

Example: MA Decarbonization Pathway Study shows additional transmission is needed and bidirectional used starting in 2030:

"the Quebec hydro system in effect as a form of seasonal energy storage, with energy exported to Quebec during many hours to serve Quebec loads, and with imports from Quebec in other hours to serve loads in New England and New York"

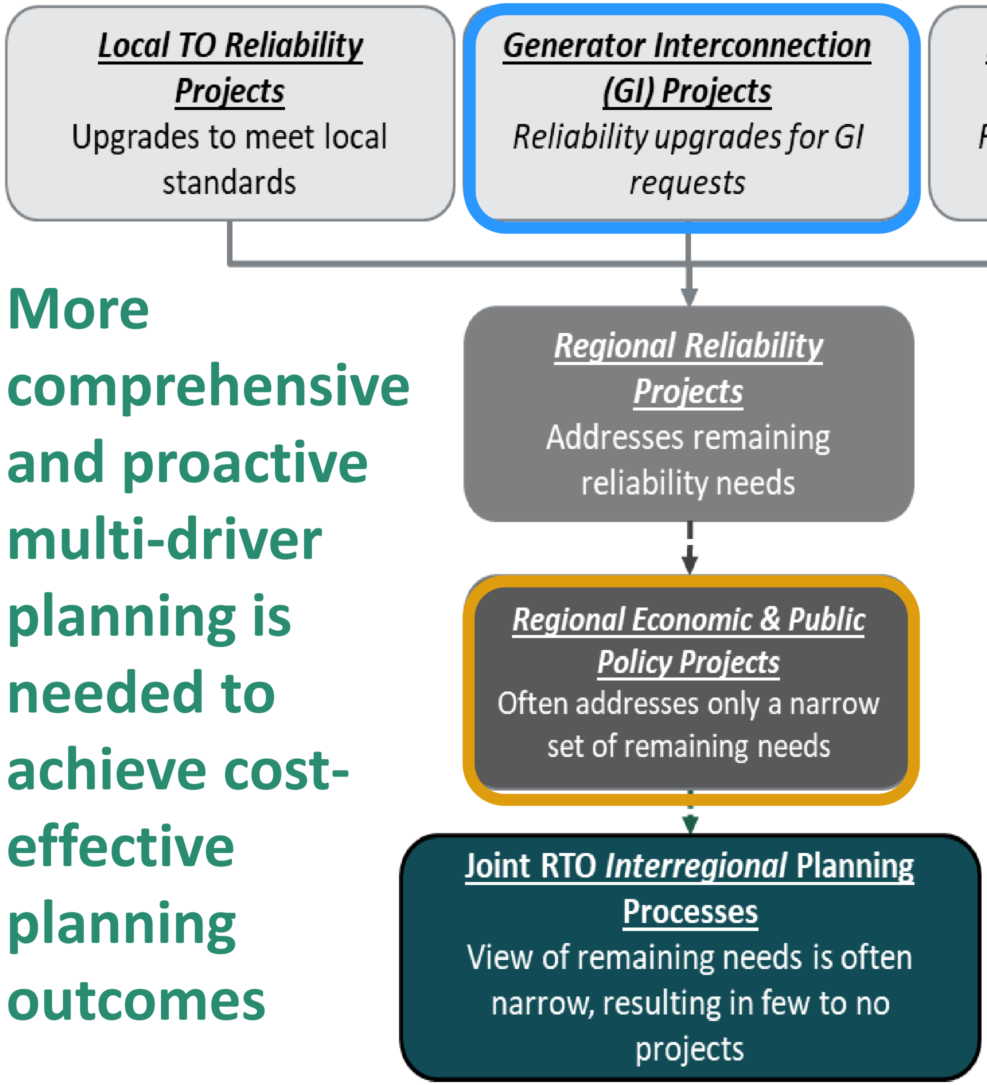
Cost effective new transmission by 2050:

Zone from	Zone to	no thermal	regional coordination	limited efficiency	100% renewable primary	all options	breakthrough der	pipeline gas	constrained offshore wind
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



Source: MA Decarbonization Pathways Study, Dec 2020, Table 8, Figure 27.

Today’s reliability-focused regional transmission planning are too silo-ed to identify cost-effective or interregional solutions



More comprehensive and proactive multi-driver planning is needed to achieve cost-effective planning outcomes

These solely reliability-driven processes account for > 90% of all U.S. transmission investments

- None involve any assessments of economic benefits (i.e., cost savings offered by the new transmission)

Incremental generation interconnection has become the primary tool (and efficiency barrier) to support public policy goals

Planning for economic & public-policy needs results in less than 10% of all U.S. transmission investments

Interregional planning processes are large ineffective

- Essentially no major interregional transmission projects have been planned and built in the last decade
- Numerous national studies show that more interregional transmission is needed to reduce total system costs

See: DeLosa, Pfeifenberger, Joskow, Regulation of Access, Pricing, and Planning of High Voltage Transmission in the US, MIT-CEEPR, March 7, 2024.

Many significant barriers to interregional transmission exist

A. Leadership, Alignment and Understanding	1. Insufficient leadership from RTOs and federal & state policy makers to prioritize interregional planning 2. Limited trust amongst states, RTOs, utilities, & customers 3. Limited understanding of transmission issues, benefits & proposed solutions 4. Misaligned interests of RTOs, TOs, generators & policymakers 5. States prioritize local interests, such as development of in-state renewables
B. Planning Process and Analytics	**6. Benefit analyses are too narrow, and often not consistent between regions** 7. Lack of proactive planning for a full range of future scenarios **8. Sequencing of local, regional, and interregional planning** 9. Cost allocation (too contentious or overly formulaic)
C. Regulatory Constraints	10. Overly-prescriptive tariffs and joint operating agreements 11. State need certification, permitting, and siting

Source: Appendix A of A Roadmap to Improved Interregional Transmission Planning, November 30, 2021. Based on interviews with 18 organizations representing state and federal policy makers, state and federal regulators, transmission planners, transmission developers, industry groups, environmental groups, and large customers.

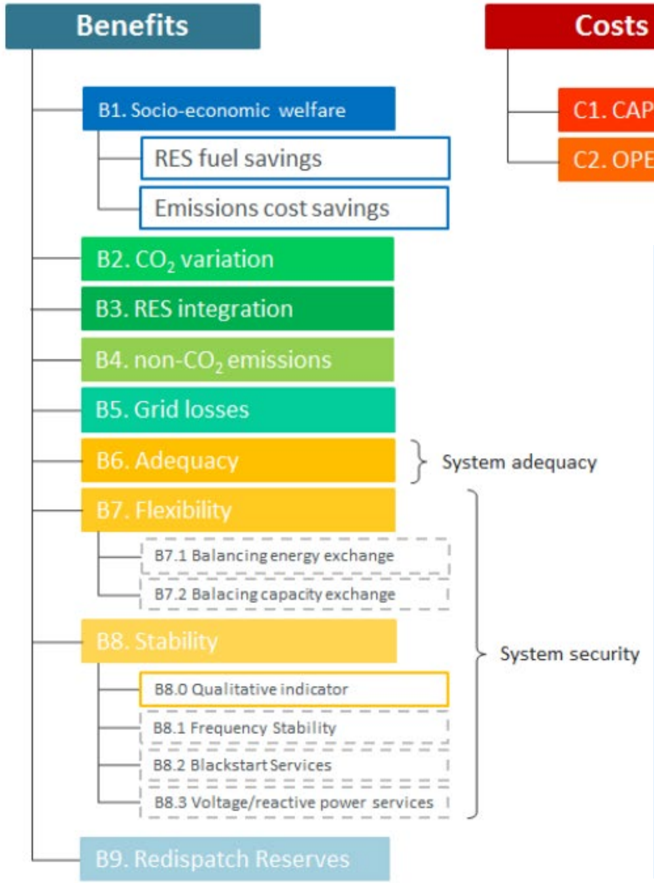
Proactive, holistic, multi-value planning is needed!

The benefits (overall cost savings) of proactive planning increase for transmission planning processes that:

1. Holistically consider all transmission needs over longer time frames (i.e., two decade of already known or likely needs for generator interconnection, local and regional reliability, economic benefits, and public policies, as opposed to need at a time)
2. Use proactive, multi-value planning processes to address both urgent near-term needs and long-term needs
3. Reduce the scope of network upgrades triggered by generator interconnection through proactive, holistic planning (and improve generator interconnection study criteria)
4. Look beyond regional seams to identify more cost-effective interregional solutions to the range of identified transmission needs
5. Rely on advanced transmission technologies to address identified needs
6. Utilize pragmatic cost allocations that are roughly commensurate with (but not formulaically based on) benefits received

Example of continent-wide proactive, multi-value planning: The European 10-year Network Development Plan (TYNDP)

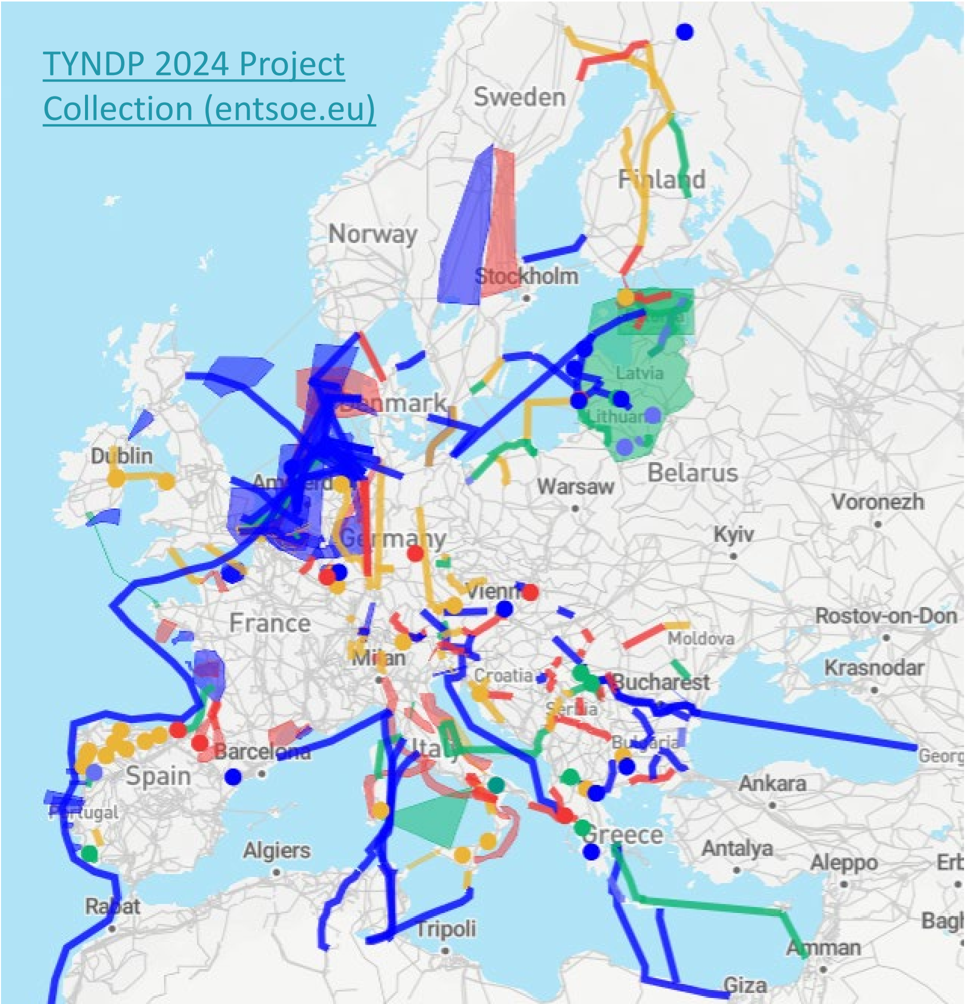
ENTSO-E: Standardized Multi-value Benefit-Cost Analysis Framework for EU-wide Transmission Planning (incl. HVDC)



Entso-E Planning and CBA framework

- Forecast-based up to 10 years
- Scenario-based for 10-30 years
- Standardized benefit-cost analysis
- Specifically addresses HVDC benefits: cost savings achievable from optimized dispatch of HVDC lines; transient, voltage, and frequency stability benefits of HVDC lines; blackstart services; voltage and reactive power support

10-Year Network Development Plan (TYNDP) to Evaluate 176 Transmission, 33 Storage Projects



Source: ENTSO-e, *4th ENTSO-e Guideline for Cost Benefit Analysis of Grid Development Projects*, Oct 18, 2023, Figure 8; TYNDP 2024 Implementation Guidelines, Mar 4, 2024.
For a summary of the ENSTO-e framework, incl. HVDC, see pp. 77-80 here.

The Challenge: How to keep the energy transition affordable

The challenge to achieving an affordable clean-energy transition is formidable:

1. Much of the (aging) existing generating resources will need to be replaced over the next two decades
2. Electrification and data center load growth will double the amount of generation supply needed (even with EE)
3. Local, regional, and interregional transmission capacity will need to double or triple to achieve a cost-effective outcome (as numerous studies have already shown)

More investment will be needed than can easily be provided and recovered

Unless done efficiently and cost-effectively, the size of investments and customer rate impacts will quickly exceed feasible and acceptable levels!

Nobody will be “happy” if rates start to exceed certain levels

- Unaffordable rates will undermine or delay policy goals
- High fixed costs will create uneconomic bypass of existing facilities, which will further increase total costs
- Unhappy customers and regulators create risk and challenges for regulated companies and their investors
- Utility credit ratings will deteriorate and limit the amount of investments that can be financed

Thank You!

(Additional Slides)

About the Speakers

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(webbio and publications)

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 Visiting Scholar at MIT's Center for Energy and Environmental Policy Research (CEEPR), a former Senior Fellow at Boston University's Institute of Sustainable Energy (BU-ISE), a IEEE Senior Member, 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 renewable generation interconnection 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, WECC, and Canada and has analyzed offshore-wind transmission challenges in New York, New England, and New Jersey.

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.

Options for achieving a more affordable energy transition

Achieving cost-effective transmission-related outcomes requires a multi-faceted approach:

1. More **proactive and holistic transmission planning**
   - Multi-driver/value planning (incl. for generator interconnection) to find lowest-total-cost solutions
   - Least regrets planning to mitigate risk and costs of both overbuilding and undersizing
2. "**Loading order**" for transmission planning that prioritizes lower cost/impact options
   - Optimize existing grid → upsize existing lines → add new lines
3. **Cost control incentives**
   - Broad-based PBR, targeted incentives, soft/hard caps, shared savings/overruns
4. **Competitive solicitations**
   - Where possible and practical; with added cost-control incentives
5. **Efficiency and demand flexibility**
   - To reduce transmission, distribution, generation, and resource-adequacy costs

Need: to double or triple transmission capability in North America! Question: How can we do so quickly and cost-effectively?

1. Advanced, grid enhancing technologies

- Dynamic line ratings
- Flow control devices
- Topology optimization
- Grid-optimized DER/storage
- Remedial action schemes
- Grid-forming inverters

2. Upgrades of existing lines

- Advanced conductors
- Rebuild aging lines at higher voltage
- Conversions to HVDC

3. New transmission

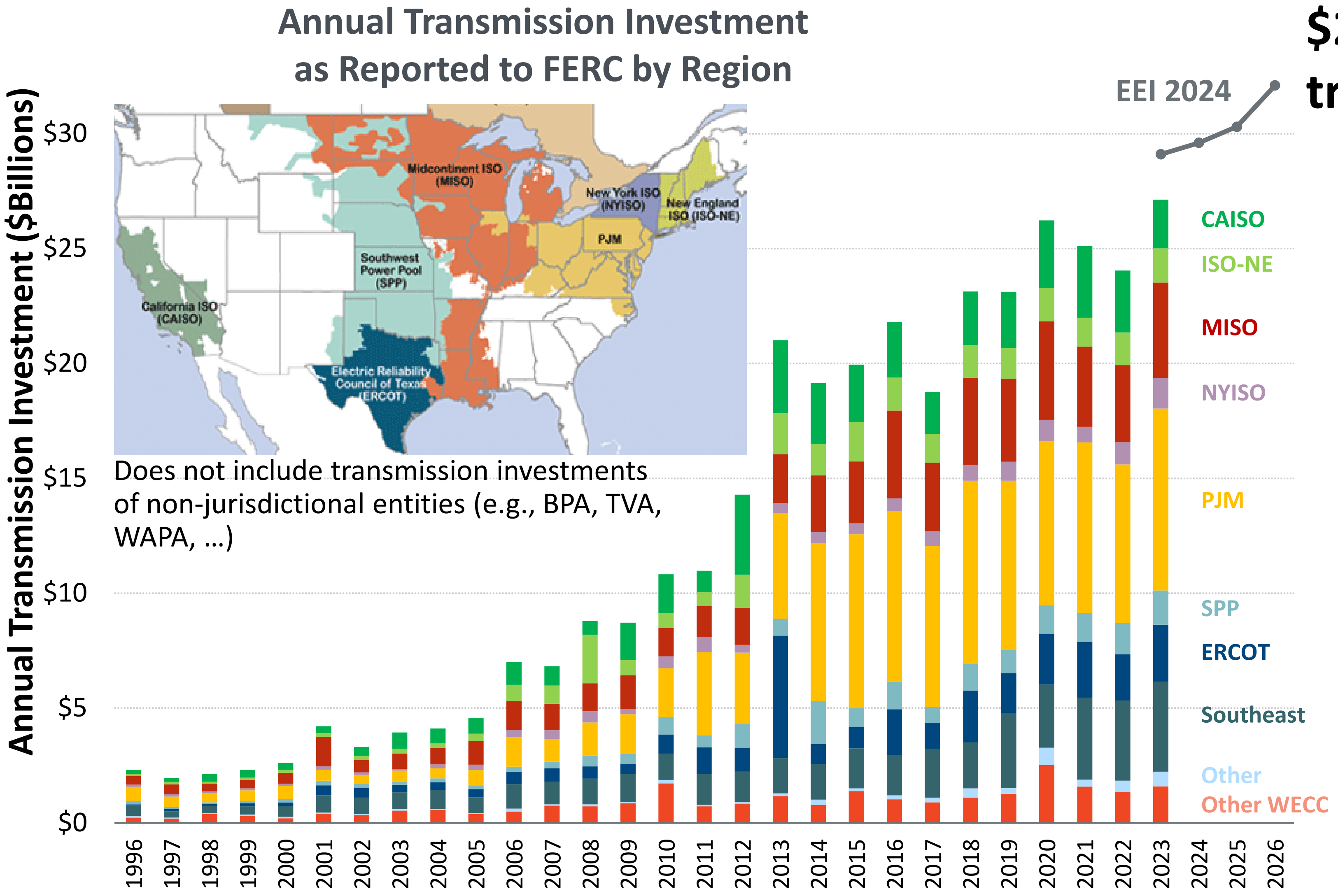
- Highway/railroad corridors
- ROW-efficient AC designs
- HVDC transmission
- Submarine/undergound
- New greenfield overhead

Examples:

Priority order required by the German “NOVA Principle”

MA CETWG Report: Loading Order and ATT/GETs recommendations

Annual U.S. Transmission Investments 1996-2023

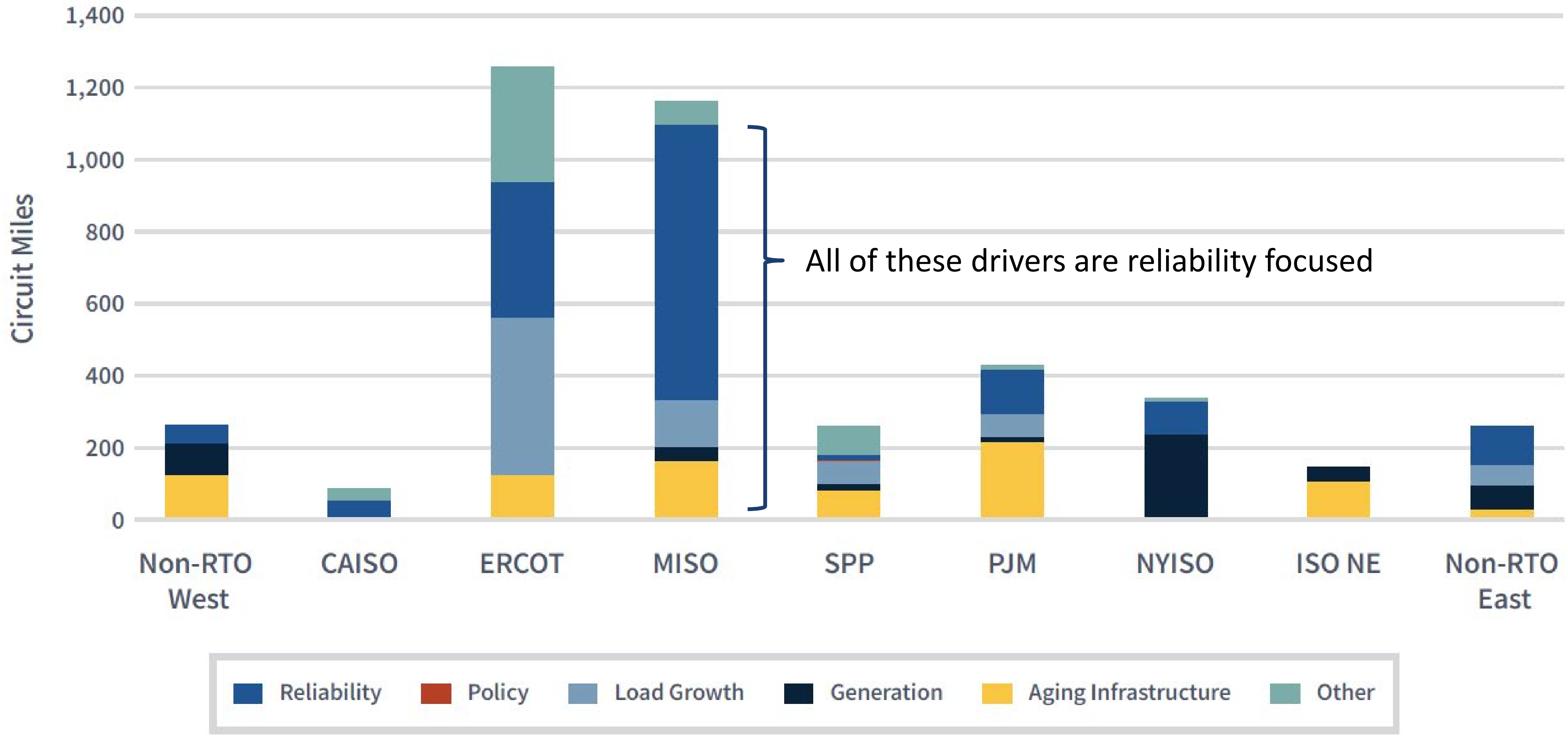


Sources: The Brattle Group analysis of FERC Form 1 Data; EEI "Historical and Projected Transmission Investment" report.

$25+ billion in annual U.S. transmission investments, but:

- More than 90% of it justified solely based on reliability needs without benefit-cost analysis
  - About 50% solely based on “local” utility criteria (without going through regional planning processes)
  - The rest justified by regional reliability and generation interconnection needs
- While significant experience with transmission benefit-cost analyses exists, very few projects are justified based on economics to yield overall cost savings
- FERC Order 1920 may change that

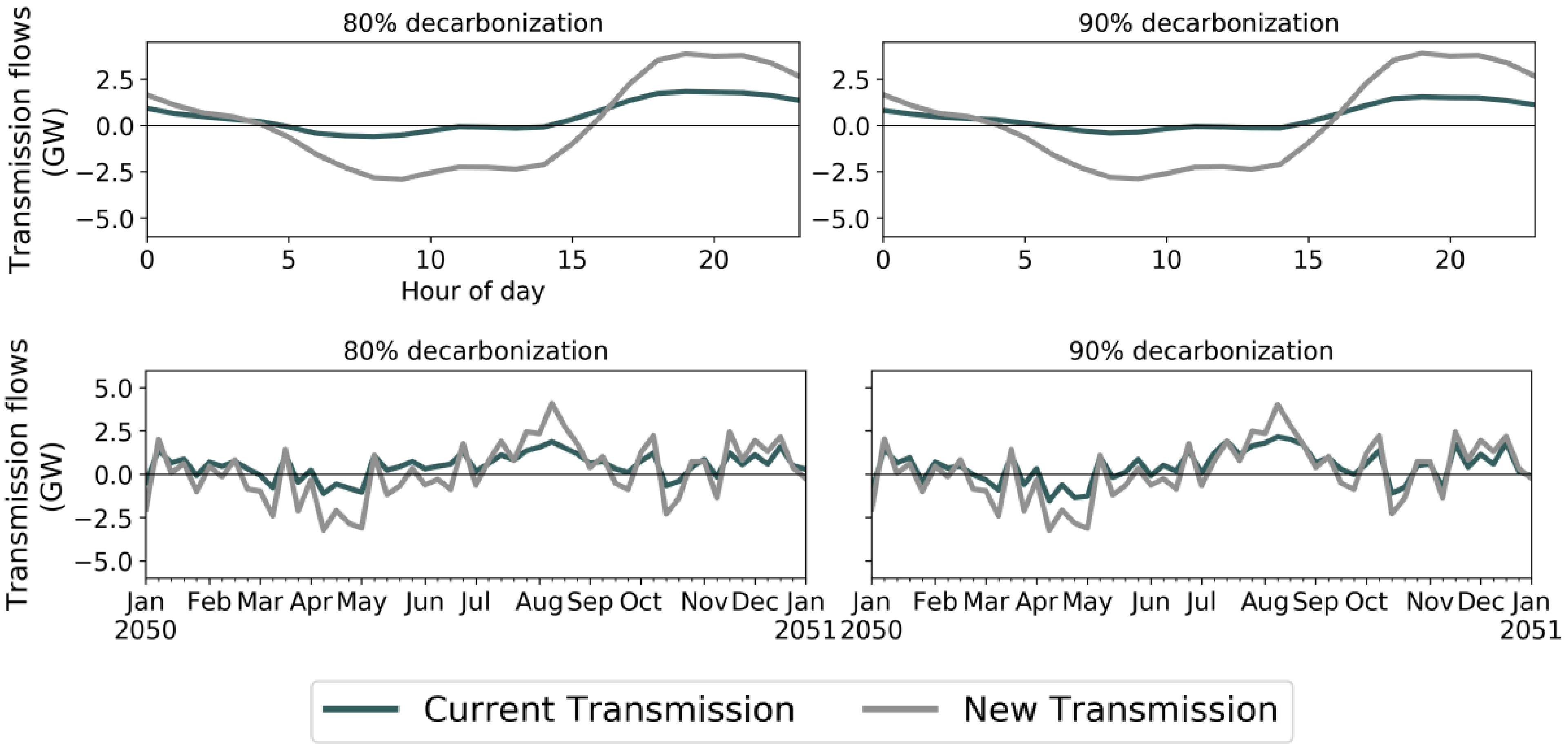
2023 Transmission Investments by Driver



Source: FERC Staff Report: 2023 State of the Markets (March 21, 2024), Figure 15 (based on C3 Group data)

MIT Study: Additional transmission between the Northeastern US and Canada will be cost effective and used bi-directionally

MIT similarly found that decarbonization of the electric grid in the Northeastern US will increase the need for transmission capacity and bidirectional power flows.



Source: Two-Way Trade in Green Electrons: Deep Decarbonization of the Northeastern U.S. and the Role of Canadian Hydropower, MIT, Feb 2020.

Examples of Brattle Reports on Regional and Interregional Transmission Planning and Benefit-Cost Analyses

Well-Planned Electric Transmission Saves Customer Costs:
Improved Transmission Planning is Key to the Transition to a Carbon-Constrained Future

PREPARED FOR
WIRES

Link: [Well-Planned Transmission]

PREPARED BY
Judy W. Chang
Johannes P. Pfeifenberger

May 2016

THE Brattle GROUP

Toward More Effective Transmission Planning:
Addressing the Costs and Risks of an Insufficiently Flexible Electricity Grid

PREPARED FOR
WIRES

Link: [Effective Transmission Planning]

PREPARED BY
Johannes P. Pfeifenberger
Judy W. Chang
Akarsh Sheilendranath

April 2015

The Brattle Group

Link: [Transmission Benefits]

The Benefits of Electric Transmission: Identifying and Analyzing the Value of Investments

July 2013

Judy W. Chang
Johannes P. Pfeifenberger
J. Michael Hagerty

Link: [Diversity Value]

BU
Boston University Institute for Sustainable Energy

The Value of Diversifying Uncertain Renewable Generation through the Transmission System

September • 2020

A Roadmap to Improved Interregional Transmission Planning

Link: [Interregional Roadmap]

PREPARED BY
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November 30, 2021

Transmission Planning for the 21st Century: Proven Practices that Increase Value and Reduce Costs

Link: [Brattle Grid Strategies]

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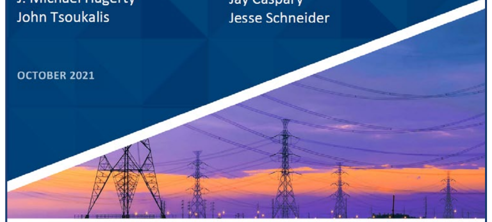

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Summarizes proven approaches to quantifying various benefits

"Checklist" of Transmission Benefits With Proven Practices for Quantifying Them

We documented in our report proven practices, which were largely adopted in FERC Order 1920:

1. Consider for each project (or synergistic portfolio of projects) the full set of benefits that transmission can provide (*see* table)
2. Identify the benefits that plausibly exist and may be significant for that particular project or portfolio; then
3. Focus on quantifying those benefits

(See our report with Grid Strategies for a summary of quantification practices)

Benefit Category	Transmission Benefit
1. Traditional Production Cost Savings	Adjusted Production Cost (APC) savings as currently estimated in most planning processes
2. Additional Production Cost Savings	i. Impact of generation outages and A/S unit designations
	ii. Reduced transmission energy losses
	iii. Reduced congestion due to transmission outages
	iv. Reduced production cost during extreme events and system contingencies
	v. Mitigation of typical weather and load uncertainty, including the geographic diversification of uncertain renewable generation variability
	vi. Reduced cost due to imperfect foresight of real-time system conditions, including renewable forecasting errors and intra-hour variability
	vii. Reduced cost of cycling power plants
	viii. Reduced amounts and costs of operating reserves and other ancillary services
	ix. Mitigation of reliability-must-run (RMR) conditions
	x. More realistic "Day 1" market representation
3. Reliability and Resource Adequacy Benefits	i. Avoided/deferred cost of reliability projects (including aging infrastructure replacements) otherwise necessary
	ii. (a) Reduced loss of load probability or (b) reduced planning reserve margin
4. Generation Capacity Cost Savings	i. Capacity cost benefits from reduced peak energy losses
	ii. Deferred generation capacity investments
	iii. Access to lower-cost generation resources
5. Market Facilitation Benefits	i. Increased competition
	ii. Increased market liquidity
6. Environmental Benefits	i. Reduced expected cost of potential future emissions regulations
	ii. Improved utilization of transmission corridors
7. Public Policy Benefits	Reduced cost of meeting public policy goals
8. Other Project-Specific Benefits	Examples: increased storm hardening and wild-fire resilience, increased fuel diversity and system flexibility, reduced cost of future transmission needs, increased wheeling revenues, HVDC operational benefits

Examples of Significant U.S. Experience with Identifying and Quantifying a Broad Range of Transmission-related Benefits

SPP 2016 RCAR, 2013 MTF

Quantified

1. **production cost savings***
   - value of reduced emissions
   - reduced ancillary service costs
2. avoided transmission project costs
3. reduced transmission losses*
   - capacity benefit
   - energy cost benefit
4. lower transmission outage costs
5. value of reliability projects
6. value of mtg public policy goals
7. Increased wheeling revenues

Not quantified

8. reduced cost of extreme events
9. reduced reserve margin
10. reduced loss of load probability
11. increased competition/liquidity
12. improved congestion hedging
13. mitigation of uncertainty
14. reduced plant cycling costs
15. societal economic benefits

(SPP Regional Cost Allocation Review Report for RCAR II, July 11, 2016. SPP Metrics Task Force, *Benefits for the 2013 Regional Cost Allocation Review*, July, 5 2012.)

MISO MVP Analysis

Quantified

1. **production cost savings** *
2. reduced operating reserves
3. reduced planning reserves
4. reduced transmission losses*
5. reduced renewable generation investment costs
6. reduced future transmission investment costs

Not quantified

7. enhanced generation policy flexibility
8. increased system robustness
9. decreased natural gas price risk
10. decreased CO_2 emissions output
11. decreased wind generation volatility
12. increased local investment and job creation

(Proposed Multi Value Project Portfolio, Technical Study Task Force and Business Case Workshop August 22, 2011)

CAISO TEAM Analysis

(DPV2 example)

Quantified

1. **production cost savings*** and reduced energy prices from both a societal and customer perspective
2. mitigation of market power
3. insurance value for high-impact low-probability events
4. capacity benefits due to reduced generation investment costs
5. operational benefits (RMR)
6. reduced transmission losses*
7. emissions benefit

Not quantified

8. facilitation of the retirement of aging power plants
9. encouraging fuel diversity
10. improved reserve sharing
11. increased voltage support

(CPUC Decision 07-01-040, January 25, 2007, Opinion Granting a Certificate of Public Convenience and Necessity)

NYISO PPTN Analysis

(AC Upgrades)

Quantified

1. **production cost savings*** (includes savings not captured by normalized simulations)
2. capacity resource cost savings
3. reduced refurbishment costs for aging transmission
4. reduced costs of achieving renewable and climate policy goals

Not quantified

5. protection against extreme market conditions
6. increased competition and liquidity
7. storm hardening and resilience
8. expandability benefits

(Newell, et al., Benefit-Cost Analysis of Proposed New York AC Transmission Upgrades, September 15, 2015)

* Fairly consistent across RTOs

What is Proactive, Scenario-Based, Long-Term Planning?

Scenario-based planning is a process first developed in the 1940s and 1950s as a tool for integrating uncertainties into long-term strategic planning:

- Used by Shell with great success since the 1970s for long-term planning under large uncertainties
- **Assists planners to think, in advance, about the many ways the future may unfold and how to respond effectively and flexibly as the future becomes reality**
- Ranks among the top-ten management tools in the world today
- Scenario = one fully-defined, plausible view of what the future may look like

Scenario-based planning is a multi-step process:

1. Define scenarios of plausible futures by scanning the current reality, trends and forecasts, uncertainties, and important internal and external drivers
2. Develop a series of plans (initiatives, projects, policies, tactics) that support a certain scenario, work well in multiple scenarios, or are flexible and robust across all scenarios
3. Implement preferred plan and define indicators to alert planners that a certain future is likely to occur, so they can take action (e.g., change course to address the new developments)

See also, e.g., Living in the Futures (hbr.org), Scenario Planning-A Review of the Literature.PDF (mit.edu)

Risk Mitigation Through Proactive “Least-Regrets” Planning

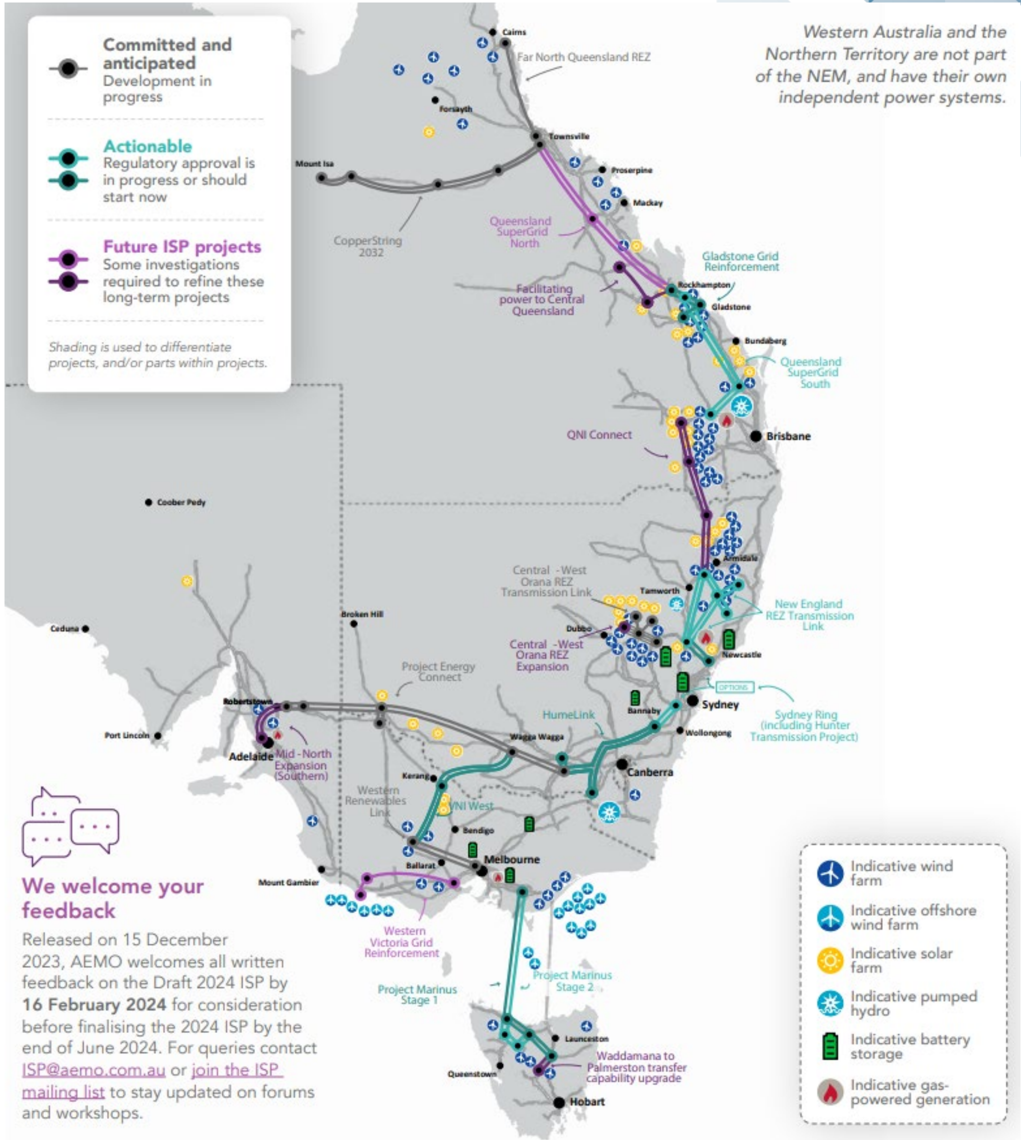
Planning processes need to consider the risk-mitigation and insurance value of transmission infrastructure:

- Given that it can take a decade to develop new transmission, delaying investment can easily **limit future options** and result in a **higher-cost, higher-risk** overall outcomes
  - “Wait and see” approaches can limit options, so can be more costly in the long term
  - The industry needs to plan for both short- and long-term uncertainties more proactively – and develop "anticipatory planning" processes that comprehensively address all future needs
- **“Least regrets” planning** needs to focus on minimize the risk of both under- and overinvesting
  - Scenario-based planning to minimize possible regrets … must focus not only on (1) identifying projects that are beneficial under most circumstances; but also consider (2) the many “regrettable” high-cost outcomes that could result if transmission investments are not made
  - In other words: can’t just focus on the “cost” of insurance without considering the cost of not having insurance when it is needed
- Taking probability-weighted averages is insufficient as it assumes risk neutrality and cannot distinguish between plans with higher/lower risk distributions

Example: Australian Integrated System Plan (ISP)

The Australian Energy Market Operator (AEMO) integrated planning process is "best in class" for proactive, scenario-based planning:

- Clearly-specified methodology (link) produces updated plans every two years with extensive stakeholder consultations (see Draft 2024 ISP)
  - Scenario-based analysis explicitly considers long-term uncertainties over next 30 years (link)
  - Plans distinguish: (1) actionable projects for which the need is certain enough now to move forward; and (2) future projects that are likely needed at some point
  - Least regrets planning values optionality that can be exercised if/when needed (e.g., projects that can be built/expanded in stages; or undertaking "early works" to develop shovel-ready projects that can be constructed quickly in the future)
- Guidelines for cost-benefit framework, forecasting, and "investment tests" from the Australian Energy Regulator (AER) make AEMO plans actionable (link)

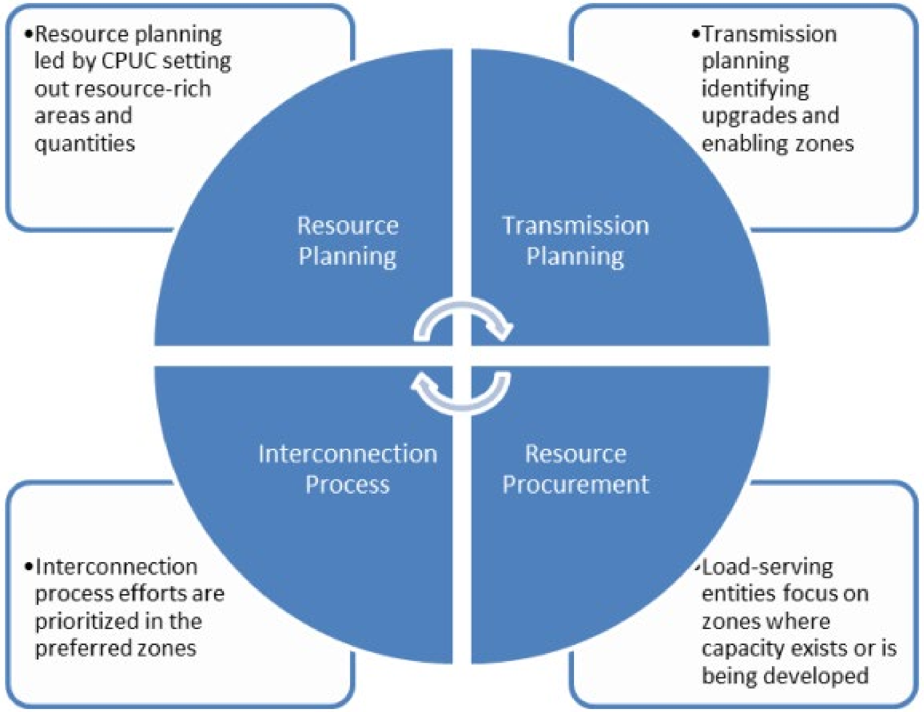


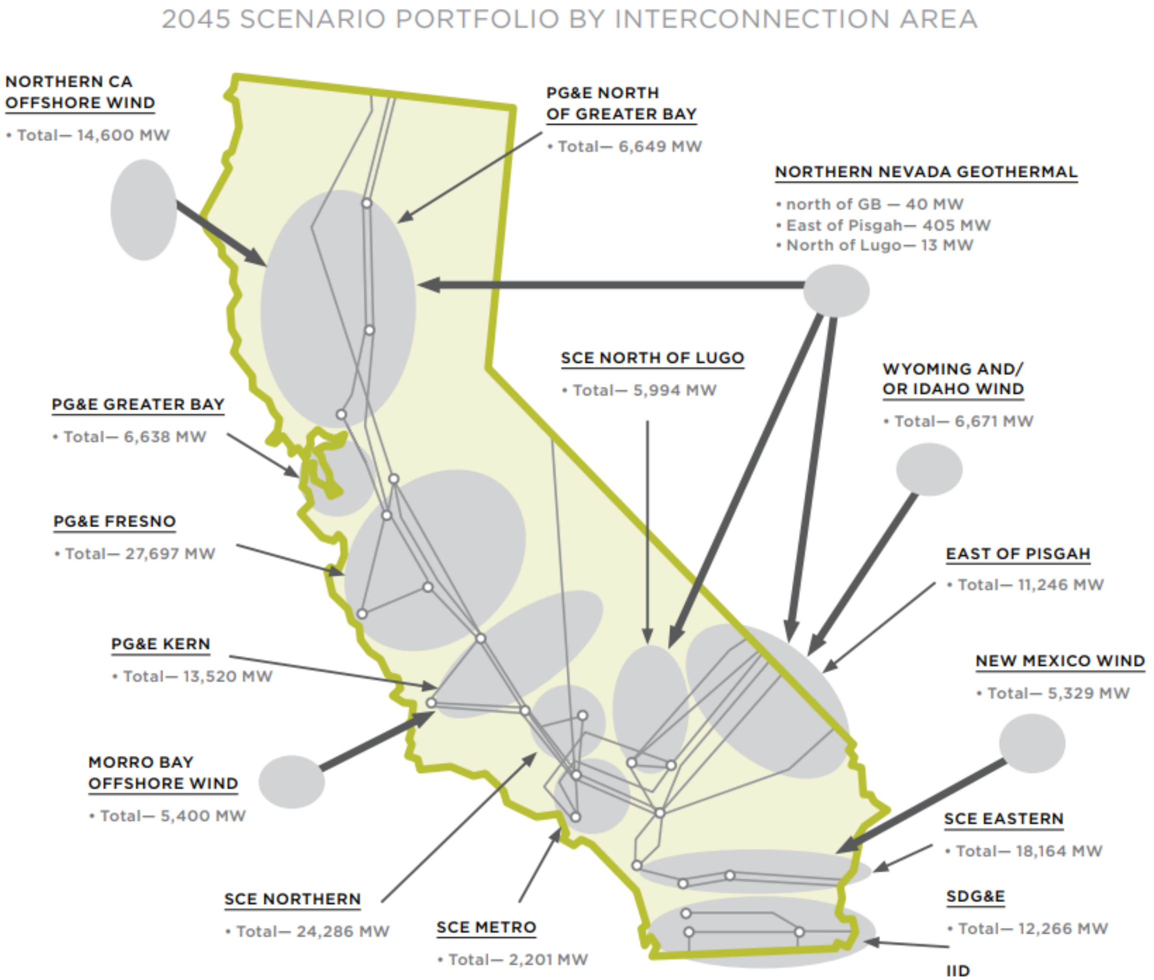
Source: AEMO | Draft 2024 ISP Consultation

Example: California's Transmission Planning Process (TPP)

California's TPP combines (1) scenario-based, zonal resource development outlooks prepared by state agencies with (2) the planning and procurement of transmission solutions by the California ISO

- See overview and board-approved 2022-2023 Plan
- Improved generator interconnection process (link) offers substantial headroom



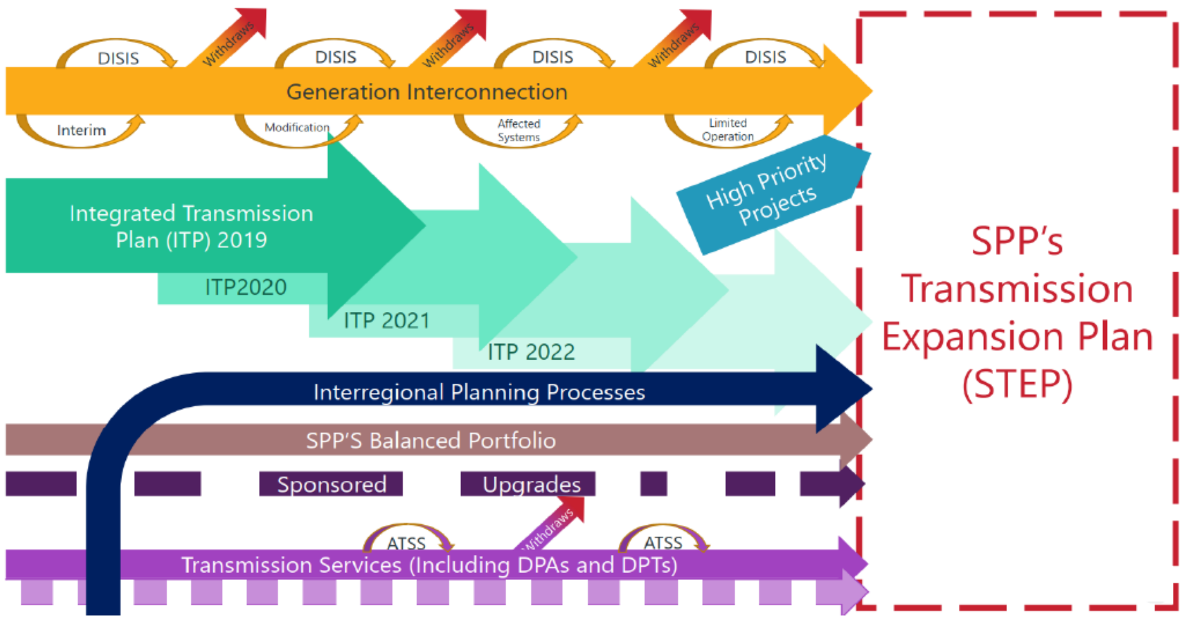


Source: CEERT summary of CA transmission planning

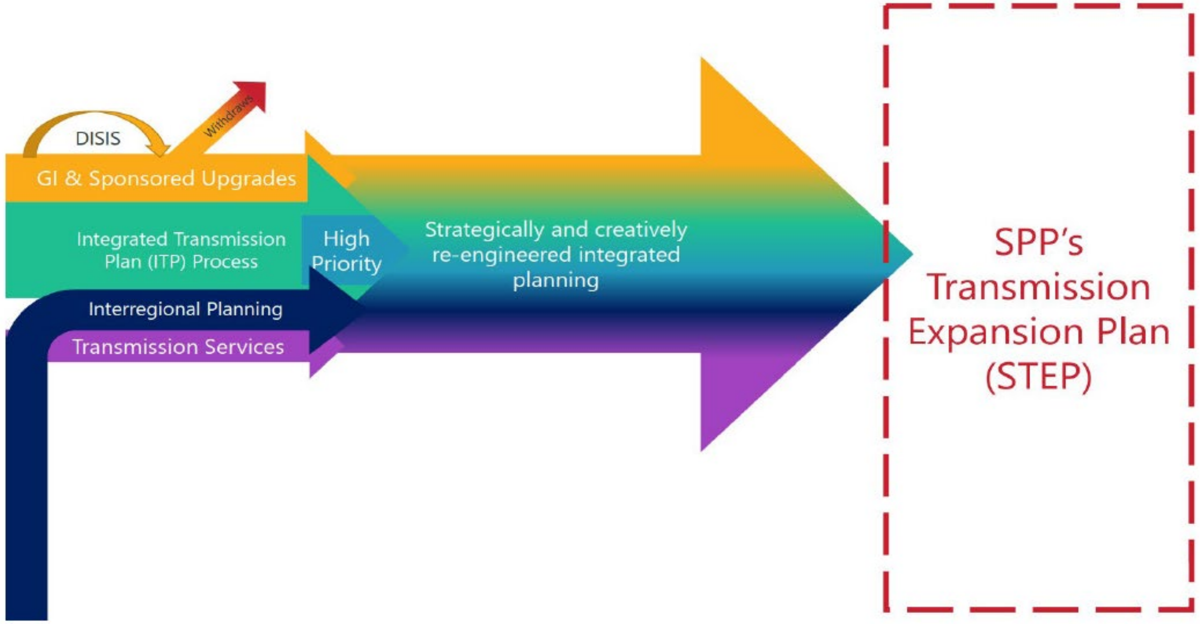
Example: SPP's Proposed Consolidated Planning Process (CPP)

The Southwest Power Pool (SPP) is working on consolidating its several siloed planning processes (e.g., for generator interconnection, integrated regional transmission, transmission service requests, and interregional planning) into a single holistic process:

Current Planning Process



Proposed Consolidated Planning Process



Source: SPP, Strategic and Creative Re-Engineering of Integrated Planning Team (SCRIPT), CPP Task Force, Dec 13, 2021

Options for interconnecting resources more quickly and efficiently

With FERC Order 2023 guidance and emerging best practices from other regions, the following measures can add resources more quickly and cost-effectively:

1. Implement fast-track process for sharing and transfers of existing POIs
2. Identify existing “headroom” at possible POIs
3. Fast-track new POIs for “first-ready” projects
4. Allow for GETs and (simple) RAS/SPS to address interconnection needs
5. Simplify ERIS (energy-only) interconnections with option to upgrade to NRIS (capacity) later
6. Proactively and holistically plan for long-term transmission needs
7. Speed up state & local permitting for projects with signed interconnection service agreements (PJM blog: 44+ GW with ISAs yet only 2 GW brought online in 2022)

More more detail see: Are Firm Capacity Requirements Outpacing Replacements?, January 25, 2024

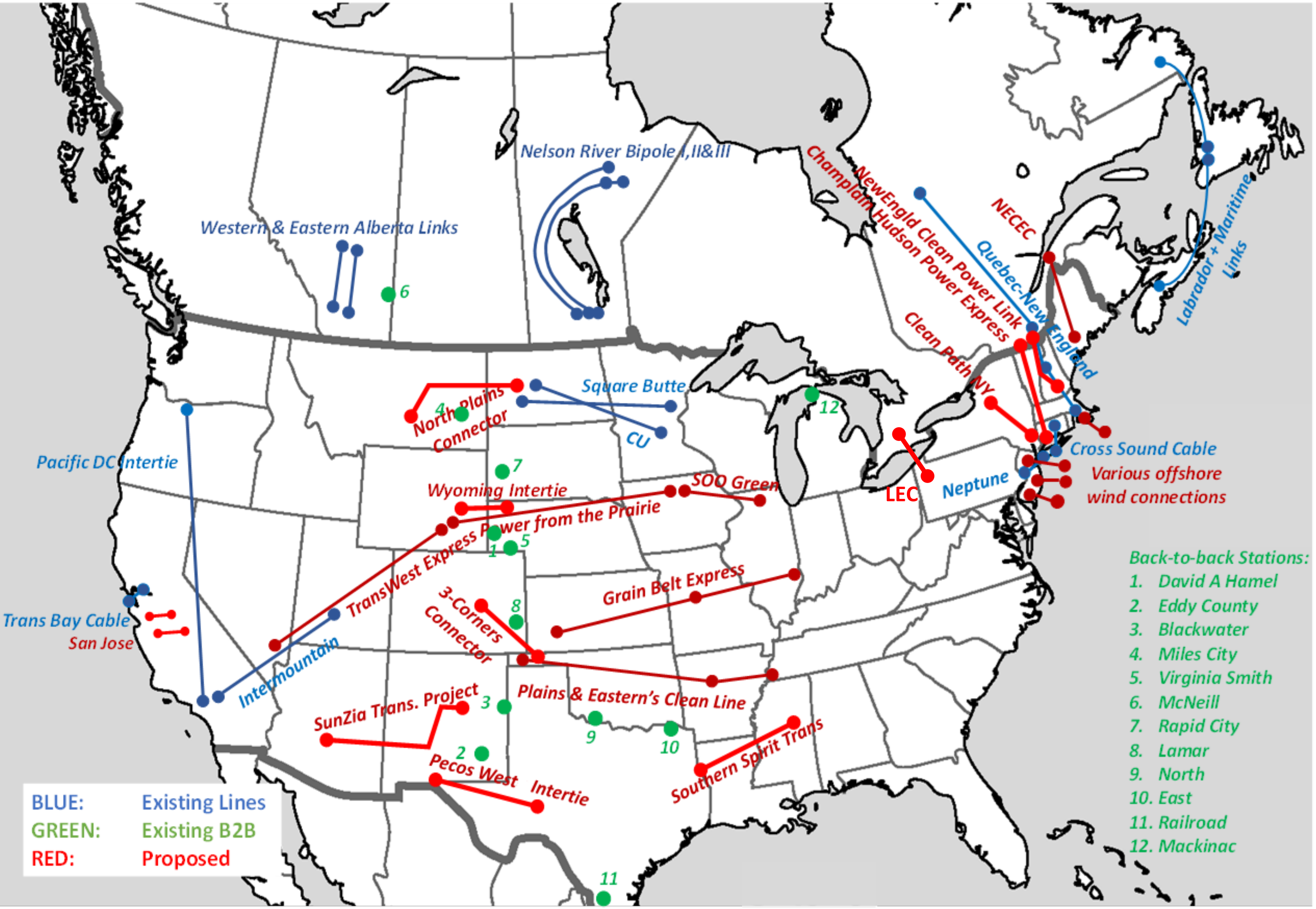
Need: Expand and More Efficiently Utilize Interregional Transmission

Significant seams-related inefficiencies exist between RTO markets, which make it difficult to capture the full value of both existing and new interregional transmission:

1. **Interregional transmission planning** is mostly not existing or ineffective (beyond merchant T)
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** 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 (see link)

Interregional Transmission Needs Are Addressed Mostly Through Proposed Merchant HVDC Lines

North American HVDC Projects (Existing and Planned/Proposed)



Source: Jim McCalley, Iowa State University

Most U.S. interregional transmission projects are HVDC lines proposed by merchant and OSW developers (i.e, not planned by system operators)

Main HVDC advantages:

- High capacity (1-5 GW), long-distance
- Efficient right of way (including underground and submarine)
- Controllable power flows (for transmission access, economic dispatch and during contingencies)
- Synchronous and asynchronous applications
- Grid-forming capability / weak AC grids
- Grid services (to support AC network)

The Bottom Line: Necessary Improvements

Holistic and proactive transmission planning

- More cost-effective solutions (that integrate generator interconnection, asset refurbishment) and all other transmission needs) can be identified
- The costs and time required to address future transmission needs (and interconnect the large number of resources necessary to meet clean-energy goals) can be reduced dramatically
- More flexible plans can be developed to address the wide range of uncertain long-term needs

The benefits of holistic, proactive planning increase for processes that:

1. Consider both near- and long-term transmission needs (i.e., a decade of already known resource needs, as opposed to one resource or one class year at a time)
2. Simultaneously considers multiple needs (generator interconnection, local and regional reliability, economic benefits, and public policy needs)
3. Reduce the scope of network upgrades triggered by generation interconnection through proactive and holistic planning
4. Look beyond regional seams to identify more cost-effective interregional solutions to the range of identified transmission needs (and minimize the scope of and uncertainties associated with “affected system studies”)
5. Rely on advanced transmission technologies and upsizing of existing lines to address some of the identified needs
6. Utilize pragmatic cost allocations that are roughly commensurate with benefits received

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- 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
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- Bankruptcy & Restructuring
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- Commercial Damages
- Environmental Litigation & Regulation
- Intellectual Property
- International Arbitration
- International Trade
- Labor & Employment
- Mergers & Acquisitions Litigation
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- White Collar Investigations & Litigation

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