Collaborative Approaches for Advancing Interregional Transmission

NARUC Public Webinar

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Energy+Environmental Economics

Who is E3?

Thought Leadership, Fact Based, Trusted

130+ full-time consultants

30+ years of deep expertise

Engineering, Economics, Mathematics, and Public Policy Degrees


San Francisco


New York

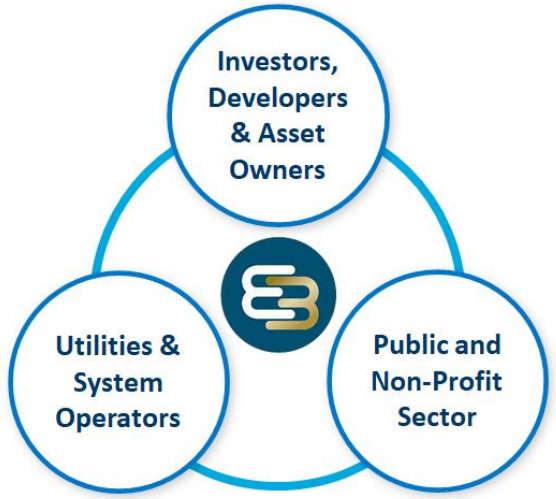

Boston


Calgary


Denver

E3 Clients

300+ projects per year across our diverse client base



Recent Examples of E3 Projects

Experience analyzing resource and transmission implications for clean energy transitions across the US

Transmission planning expertise for state agencies, system operators, and developers

Decades of support for electric system planning in CAISO, ISO-NE, NYISO, ERCOT, MISO, SPP and PJM including transmission planning

Maine and California projects with holistic transmission analysis + stakeholder engagement

NE States and System Operators: Policy, market, grid planning and regulatory strategic guidance across the Eastern Interconnection

National Grid: Conducted benefit analysis for the Clean Resilience Link interregional transmission project

ERCOT: Supported development of new congestion cost test for transmission valuation

WestTEC: Kicking off West-wide transmission planning exercise

Acknowledgments

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- **Sarah Fitzpatrick**, NARUC
- **Hon. Andrew French**, Kansas Corporation Commission
- **Erik Hanser**, Michigan Public Service Commission
- **Asim Haque**, PJM Interconnection
- **Patrick Harwood**, U.S. Department of Energy
- **Hon. Marcus Hawkins**, Organization of MISO States (now Public Service Commission of Wisconsin)
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- **Simon Hurd**, California Public Utilities Commission
- **Gretchen Kershaw**, U.S. Department of Energy
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- **Danielle Sass Byrnett**, NARUC
- **Hon. Doug Scott**, Illinois Commerce Commission
- **Hon. Dan Scripps**, Michigan Public Service Commission
- **Christina Simeone**, National Renewable Energy Laboratory
- **Michael Skelly**, Grid United
- **Robert Taylor**, Invenergy

Agenda

- **Background and Study Focus**
  - Drivers of Interregional Transmission
  - Recent Federal Policy Developments
  - Project Focus and Approach
- **Interregional Transmission Challenges and Solutions**
  - Planning
  - Permitting
  - Operations
- **Q&A**

Background and Study Focus

Energy+Environmental Economics

Interregional Transmission Overview

- **Transmission planning regions are entities tasked with identifying transmission needs and the facilities that can meet those needs in a cost-effective manner**
- **Interregional transmission projects span two or more transmission planning regions**
- **FERC Order 1000 requires planning regions:**
  - Coordinate to share results of regional planning processes
  - Review proposed interregional transmission project proposals within regional transmission studies

FERC-Defined Transmission Planning Regions

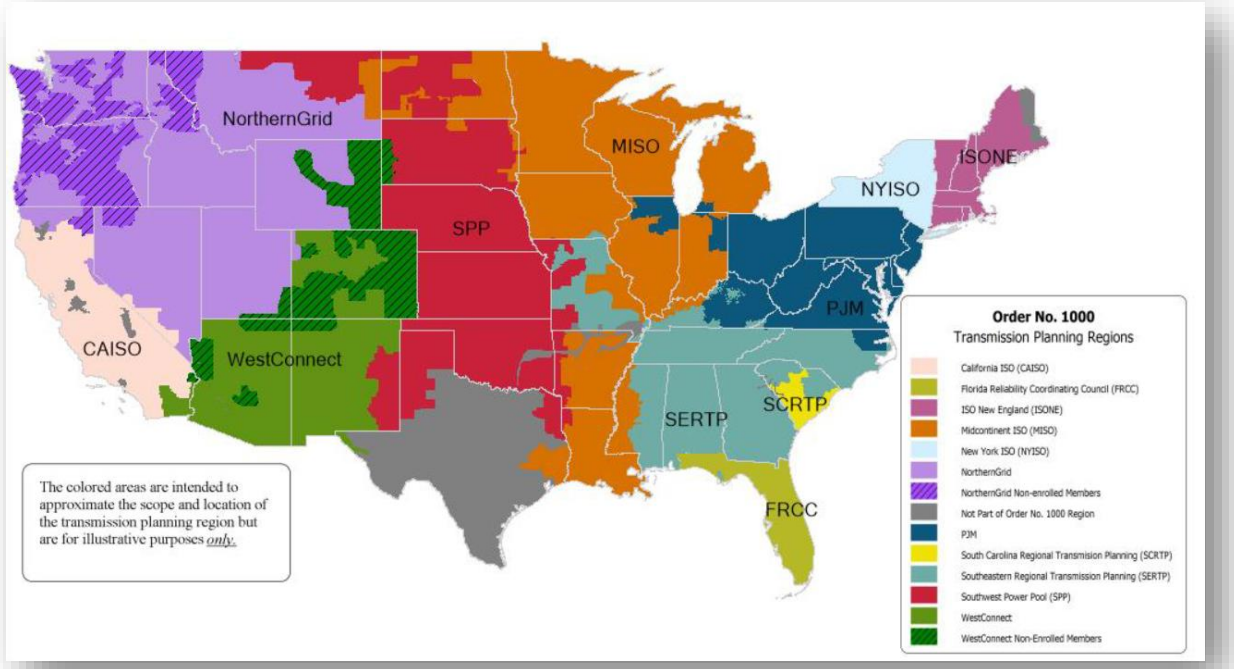
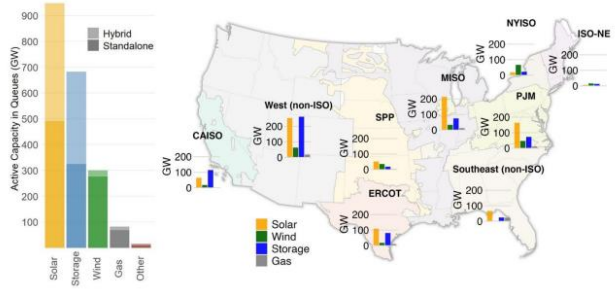


Image: https://www.ferc.gov/media/regions-map-printable-version-order-no-1000

Key Drivers of Interregional Transmission

Changing Energy Mix Reflected in Interconnection Queues



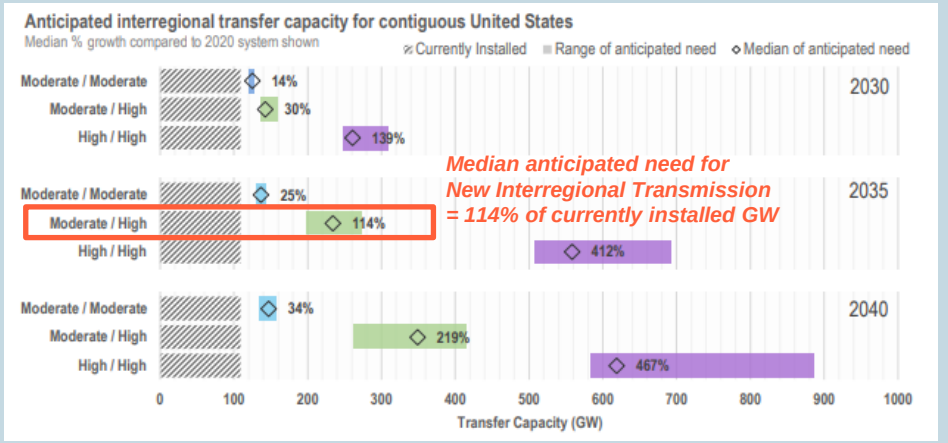
Increasing Expectations for Load Growth

UTILITY DIVE

US electricity load growth forecast jumps 81% led by data centers, industry: Grid Strategies

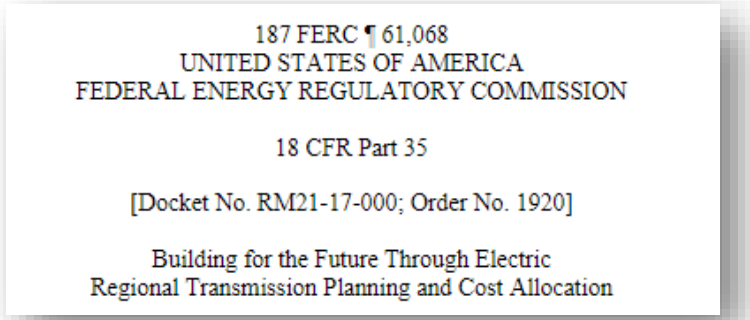
Resiliency and Reliability Needs w/ Extreme Climate Conditions

+ ***DOE's Transmission Needs Study* indicates it would be cost effective to more than double the amount of interregional transmission by 2035**
  - Based on models assuming renewable energy expansion rates for achieving 80% clean energy by 2040



DOE Transmission Needs Study: https://www.energy.gov/sites/default/files/2023-12/National%20Transmission%20Needs%20Study%20-%20Final_2023.12.1.pdf
Utility Dive: https://www.utilitydive.com/news/electricity-load-growing-twice-as-fast-as-expected-Grid-Strategies-report/702366/

Recent Federal Policy Developments are Likely to Impact Interregional Planning and Permitting


187 FERC ¶ 61,068
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

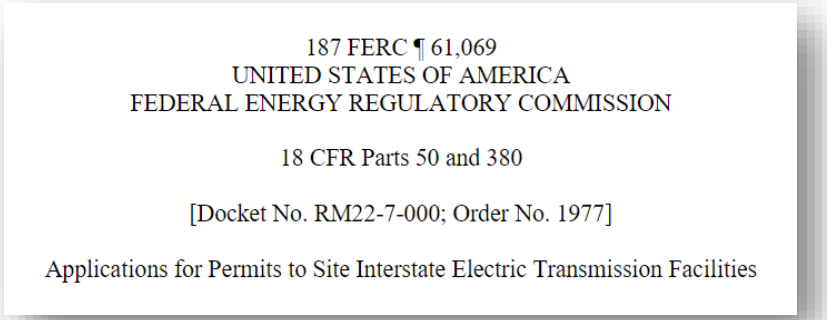
18 CFR Part 35

[Docket No. RM21-17-000; Order No. 1920]

Building for the Future Through Electric Regional Transmission Planning and Cost Allocation

FERC Order 1920 (May 13th)

- Reforming Regional Transmission Planning by requiring:
  - Using 20-year planning horizons
  - Performing scenario-based planning
  - Expanding benefit metric analysis
  - Considering alternative transmission technologies
  - Seeking support from states
  - Many more


187 FERC ¶ 61,069
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

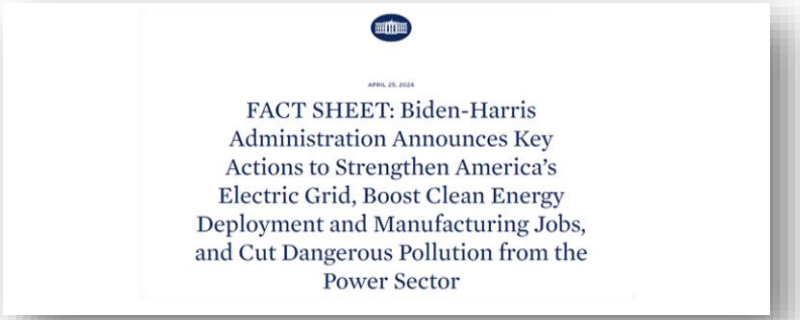
18 CFR Parts 50 and 380

[Docket No. RM22-7-000; Order No. 1977]

Applications for Permits to Site Interstate Electric Transmission Facilities

FERC Order 1977 (May 13th)

- Codifies ability for FERC to utilize federal backstop permitting authority if a state denies a permit
- Enables NIETC to be established in areas expected to experience congestion
- Ensures federal permitting processes occur only after state permitting has completed
- Establishes new standards for engaging with public, landowners, Tribes, and EJ communities


FACT SHEET: Biden-Harris Administration Announces Key Actions to Strengthen America's Electric Grid, Boost Clean Energy Deployment and Manufacturing Jobs, and Cut Dangerous Pollution from the Power Sector

White House's Power Sector actions (April 25th)

- Coordinated Interagency Transmission Authorization and Permits Program
- Transmission Facilitation Program expansion
- Categorical exclusions for projects using existing right of way
- Preliminary list of nominated NIETCs (May 8th)
- Many more

Project Focus and Approach

Research Focus

What process reforms can be made to enable efficient identification and deployment of beneficial interregional transmission projects?

Approach

Literature Review

1. Academic publications
2. Government studies
3. Industry reports
4. Regional tx planning process documents

Interviews

1. State energy regulators
2. System operators
3. Transmission developers

Project Focus and Approach

Key Focus Areas

- Planning
- Permitting
- Operations

Target Solutions Actors

- State Gov't
- Planning Regions
- Federal Gov't

Interregional Transmission Challenges and Solutions

Energy+Environmental Economics

Planning Challenges

Lack of planning motivators	Without an identified mutual transmission need, regions are unlikely to meaningfully collaborate
Cost allocation challenges	Discrepancies in regional transmission analysis and cost allocation approaches can lead to undervaluation of interregional projects
Planning process misalignment and analysis limitations	Differences in benefits quantification, planning methods, and timelines can pose technical challenges to interregional collaboration

Interregional projects currently in development

Majority were not identified through interregional planning process

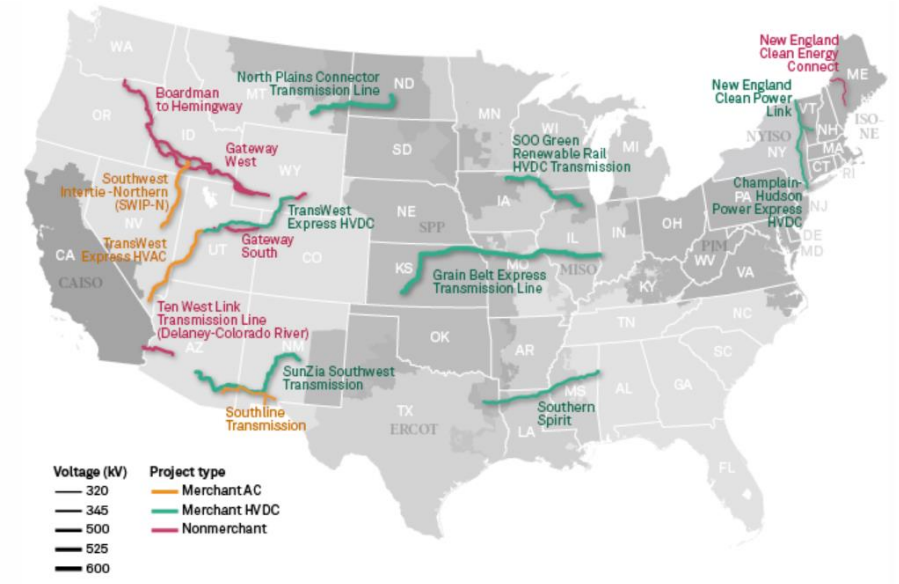


Image: https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/merchant-developers-fill-void-in-us-interregional-grid-build-out-76447354

Planning Challenges: Regional process misalignment

- Differences in technical approaches to transmission analysis can make it challenging to agree upon interregional transmission benefits and cost allocation
- Discrepancies in approaches can lead to a least-common denominator approach to valuation which can undervalue projects
- Order 1920 addresses some of these challenges at a high level, but technical differences will persist

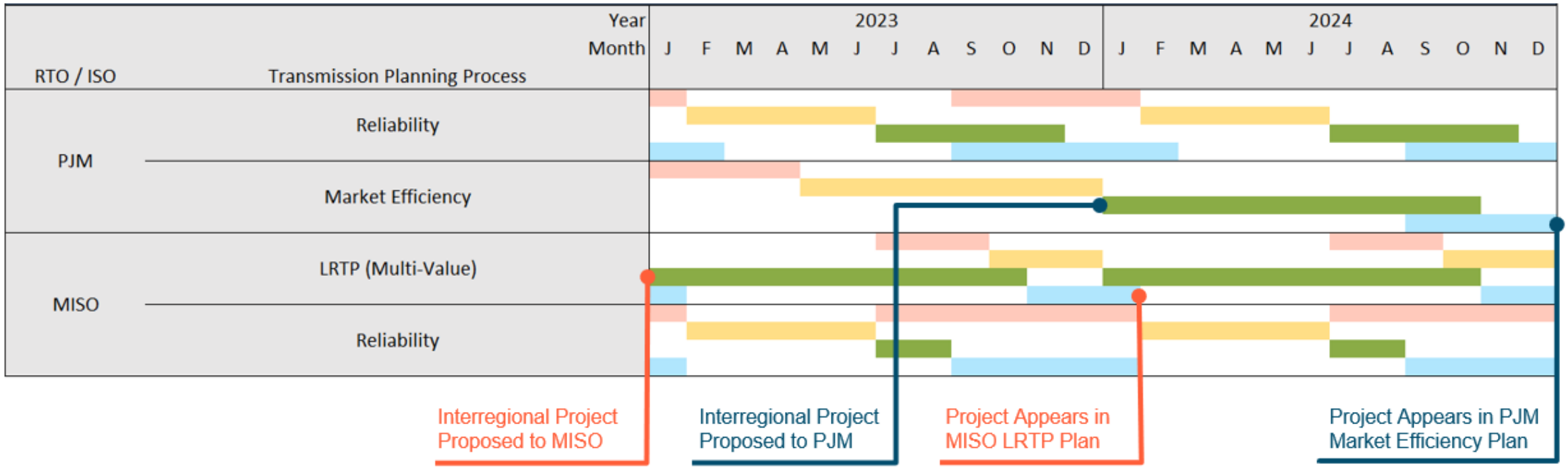
Comparison of MISO LRTP and PJM RTEP Market Efficiency Planning Processes

	MISO LRTP	PJM RTEP Market Efficiency	Difference & Implications
Benefit categories included	1) Congestion & Fuel Savings 2) Avoided Capital Cost of Local Resource Investment 3) Avoided Transmission Investment 4) Resource Adequacy Savings 5) Avoided Risk of Load Loss 6) Decarbonization	1) Energy Benefits (Congestion & Fuel Savings) 2) RPM Benefits (Resource Adequacy Savings)	MISO includes additional benefit categories, including capital cost of local resource investment not shown in PJM; this may risk mismatch.
Calculation of energy (fuel/ congestion) savings	Production Cost Savings	50% * change in production cost + 50% * change in load payment (net of congestion revenue rights held by loads)	Calculation of savings is more heavily weighted to load cost impact in PJM, whereas MISO's production cost test captures generator impact.
Valuation of interregional imports & exports	Imports and exports valued at pool generation-weighted locational marginal pricing (LMP)	Imports valued at load-weighted LMP and exports valued at generation-weighted LMP	Different locational value assigned to interregional transfers.

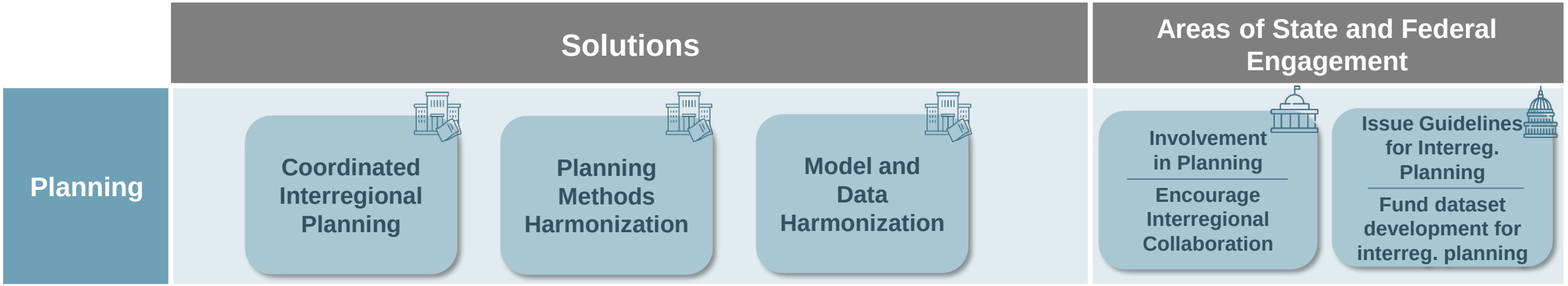
MISO: https://cdn.misoenergy.org/20220329%20LRTP%20Workshop%20Item%2002%20Detailed%20Business%20Case623671.pdf
PJM: https://www.pjm.com/-/media/planning/rtep-dev/market-efficiency/2022-me-study-process-and-rtep-window-project%20evaluation-training.ashx

Planning Challenges: Regional timeline misalignment

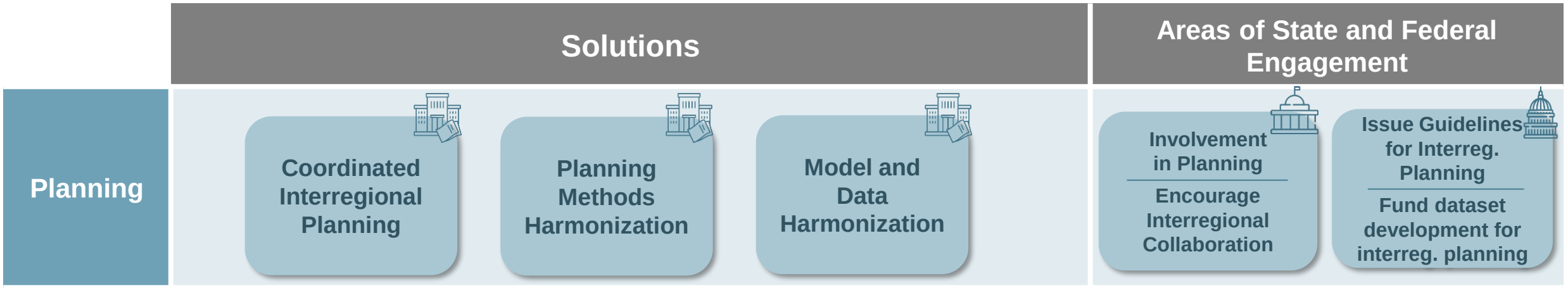
Planning cycle misalignment complicates collaboration and can delay approval and development of interregional projects



Planning Solutions Overview



Planning Solutions: Coordinated Interregional Planning



Barrier: Lack of Planning Motivators

Solution: Planning regions could expand coordination between planning regions to identify planning motivators, determine joint transmission needs, and identify interregional transmission solutions.

Solution Examples: JTIQ, WestTEC

Planning Solutions: Coordinated Interregional Planning

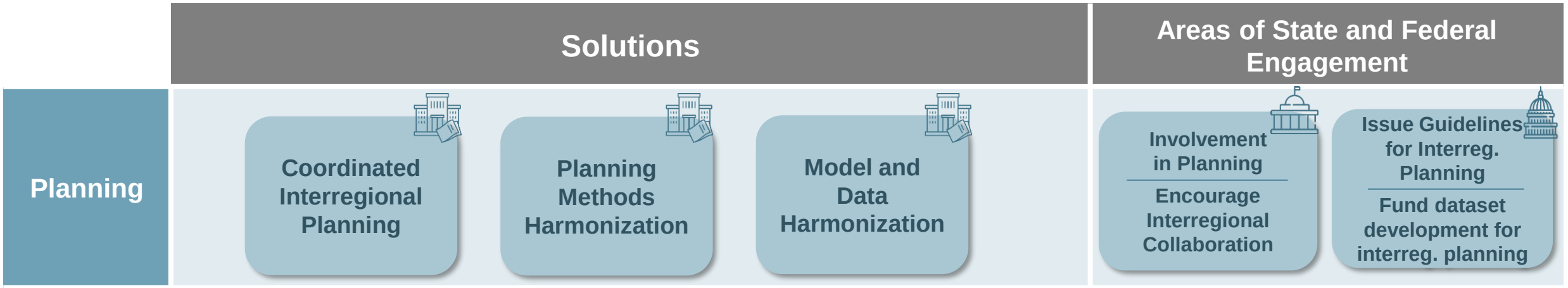
Coordinated Interregional Planning

- MISO and SPP found a common planning motivator: interconnection queue constraints at seam
- Collaborated to identify $1.7 billion portfolio called the ***Joint Targeted Interconnection Queue*** to enable efficient interconnection of up to 53 GW of new generation resources
- Approach could be expanded to meet additional interregional transmission needs and evaluate a more comprehensive set of benefit metrics

JTIQ Portfolio

Image: https://www.spp.org/documents/71208/jtiq%20revision%20request%20kickoff%20022624%20final.pdf

Planning Solutions: Planning Methods Harmonization



Barrier: Process Misalignment

Solution: Regions could align planning process timelines and interregional project solicitation so interregional projects can be evaluated in regional planning processes. They could also define best practices in transmission planning to ensure the best available projects are being identified.

Solution Example: New planning standards in FERC Order 1920

Planning Solutions: Planning Methods Harmonization

Planning Methods Harmonization

+ **Sets new standards for best practices in regional planning including:**
  - 20-year planning horizons
  - Scenario-based planning
  - Standardizing certain benefit metrics
  - Consideration of emerging technologies
  - Analysis must incorporate policy impacts and best available system and cost data

+ **Could be expanded to interregional processes and could incorporate timeline harmonization**

Transmission Benefits in Order 1920

Required Benefit Metrics	Avoided or deferred reliability transmission facilities and aging transmission infrastructure replacement
	Reduced loss of load probability or reduced reserve planning margin
	Production cost savings
	Reduced transmission energy losses
	Reduced congestion due to transmission outages
	Mitigation of extreme events and system contingencies
	Capacity cost benefits from reduced peak energy losses
Optional Benefits Metrics	Deferred generation capacity investments
	Access to lower-cost generation
	Increased competition
	Increased market liquidity

Source: https://www.ferc.gov/media/e1-rm21-17-000

Permitting Challenges

Redetermining Project Need

Projects must prove to be in public interest in each state through which it passes

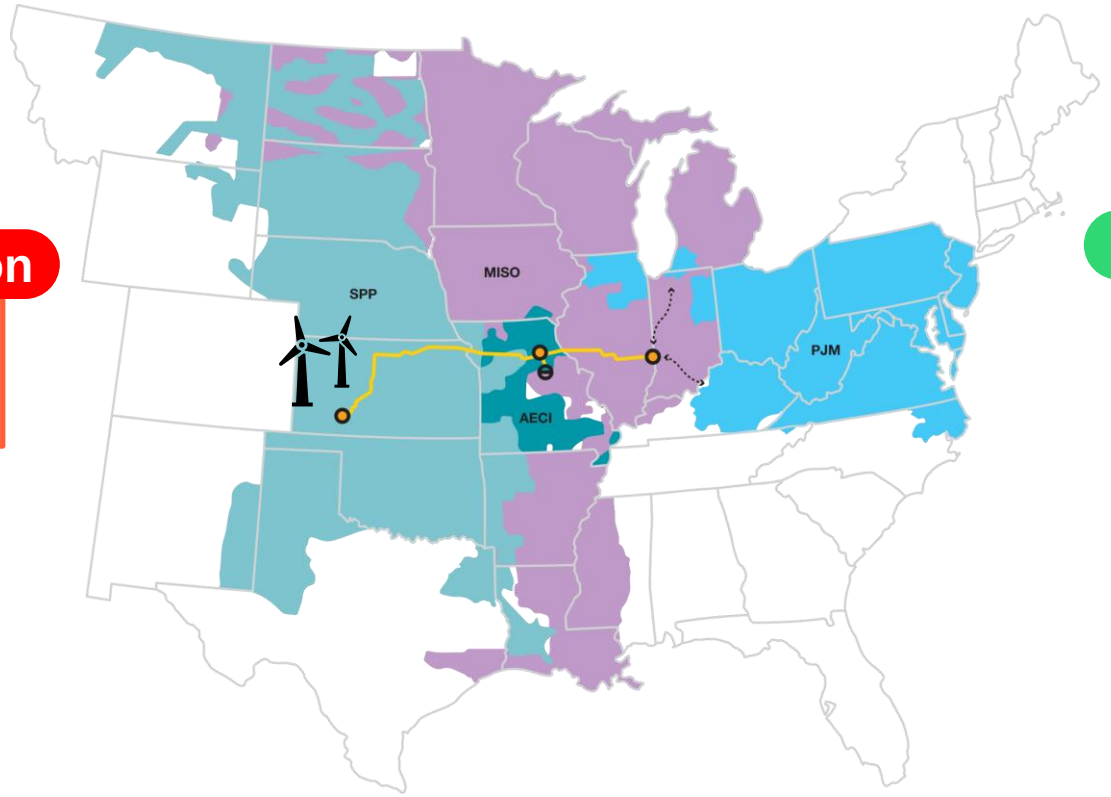
State permitting entities often limited in ability to participate in planning analysis

Passthrough Communities

The burden of hosting projects is often not fully captured in project value propositions, creating natural opposition in permitting proceedings

Permitting Challenges

The Grain Belt Express project crosses multiple regional boundaries and has undergone multiple permitting proceedings



Original value proposition

1. Wind development in KS
2. Serve loads in IL/IN

Permit denied by MO PSC

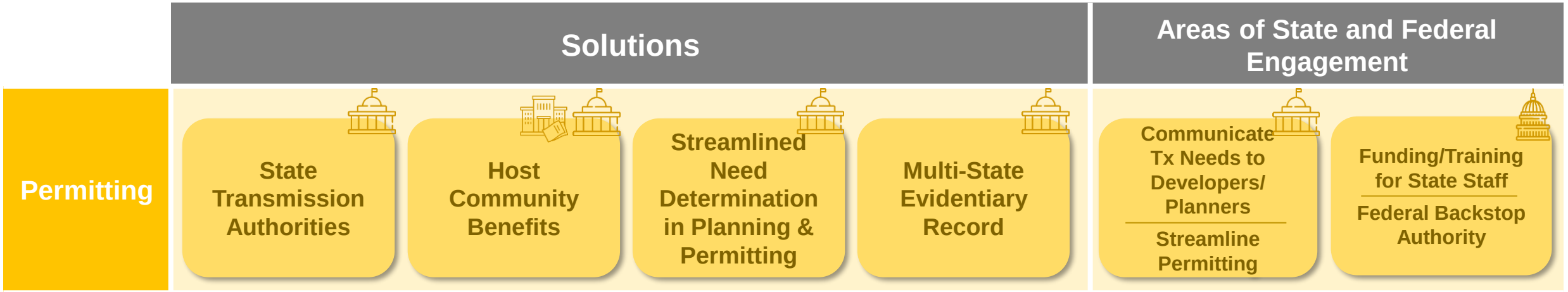
Revised value proposition

1. Serves loads in MO in addition to IL/IN
2. Compensates landowners 150% market rates

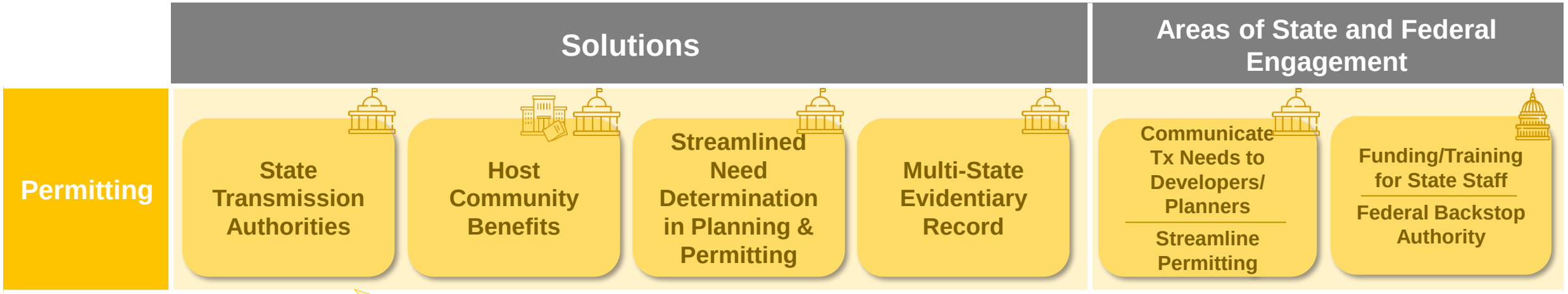
Permit granted by MO PSC

Image: https://grainbeltexpress.com/

Permitting Solutions Overview



Permitting Solutions: State Transmission Authorities



Barrier: State permitting entities often limited in ability to participate in planning and permitting analysis

Solution: State funding of special agencies to engage in transmission planning activities, analyze transmission needs, provide siting guidance to developers, and participate in or even fund transmission development.

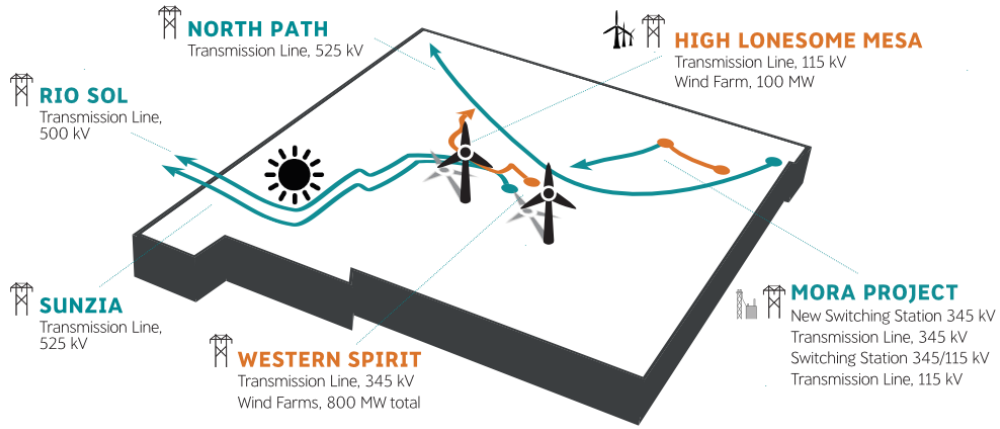
Examples: New Mexico Renewable Energy Transmission Authority

Permitting Solutions: State Transmission Authorities

State Transmission Authorities

+ **New Mexico Renewable Transmission Authority (RETA) established to expand transmission capabilities within the state by:**
  - Protecting landowners by overseeing right of way acquisition
  - Directly investing in projects advancing state interests
+ **Transmission authorities can also be used to**
  - Engage in transmission planning activities
  - Study state transmission needs
  - Identify priority transmission corridors
  - Issue siting guidelines

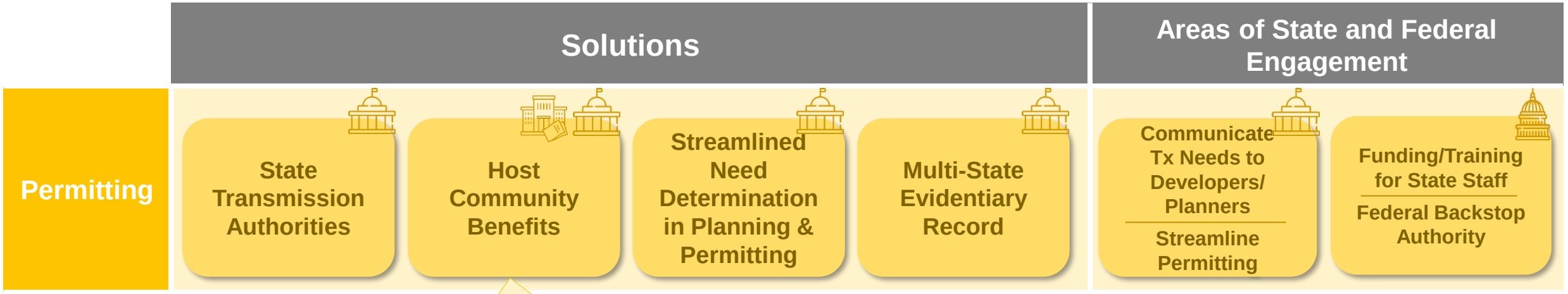
RETA's Public-Private Partnerships



Operational
In Development

Image: https://nmreta.com/transmission-lines/

Permitting Solutions: Host Community Benefits



Barrier: Passthrough community conundrum

Solution: Projects could be designed to provide non-energy benefits to host communities to ensure communities that bear the physical impact of a project also receive benefits. Options include providing jobs and job training, revenue sharing, and investment in capital projects, social programs, and economic development opportunities.

Example: NYSERDA's Tier 4 RECs Solicitation

Permitting Solutions: Host Community Benefits

Host Community Benefits

+ **NYSERDA Tier 4 project evaluation criteria included providing non-energy benefits to host communities and the larger state economy incl.:**
  - Jobs
  - Establishing local offices
  - Locally sourced materials
  - Property tax payments to local communities
  - Host community payments, mitigation or conservation payments, or other funds to benefit host communities
  - Land purchases above market value
  - Internships/apprenticeships for students
  - Environmental justice programs

NYSERDA Tier 4 REC projects selected to provide renewables to NYC

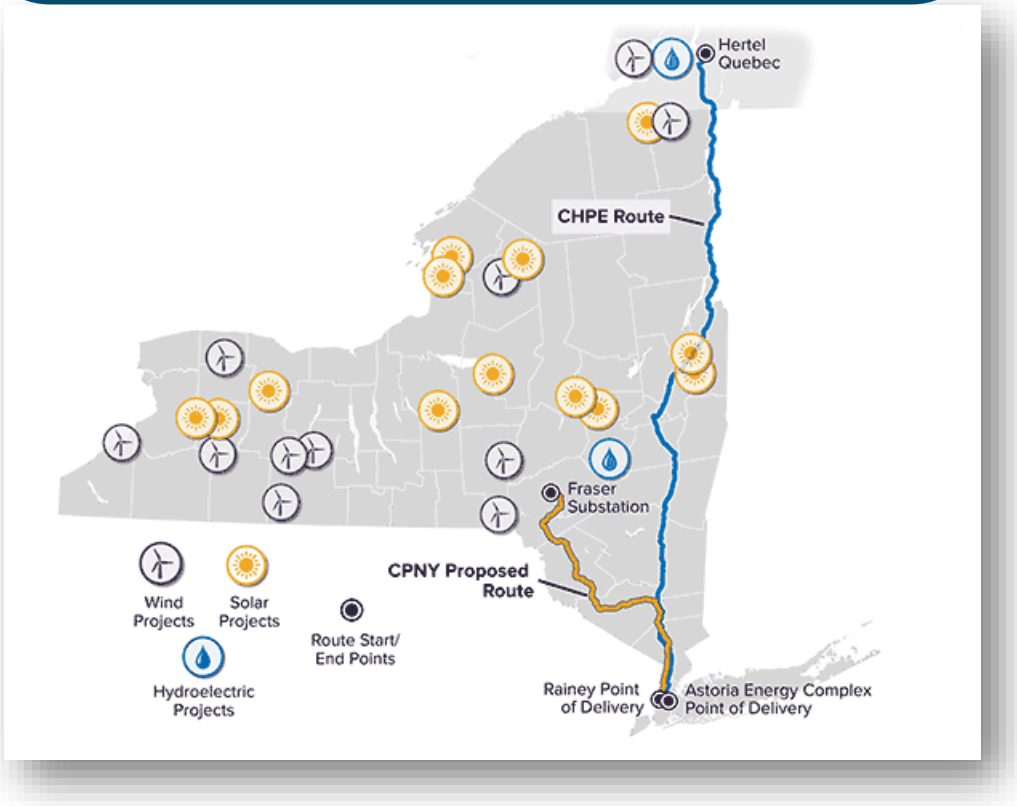


Image: https://www.nyserda.ny.gov/All-Programs/Large-Scale-Renewables/Tier-Four

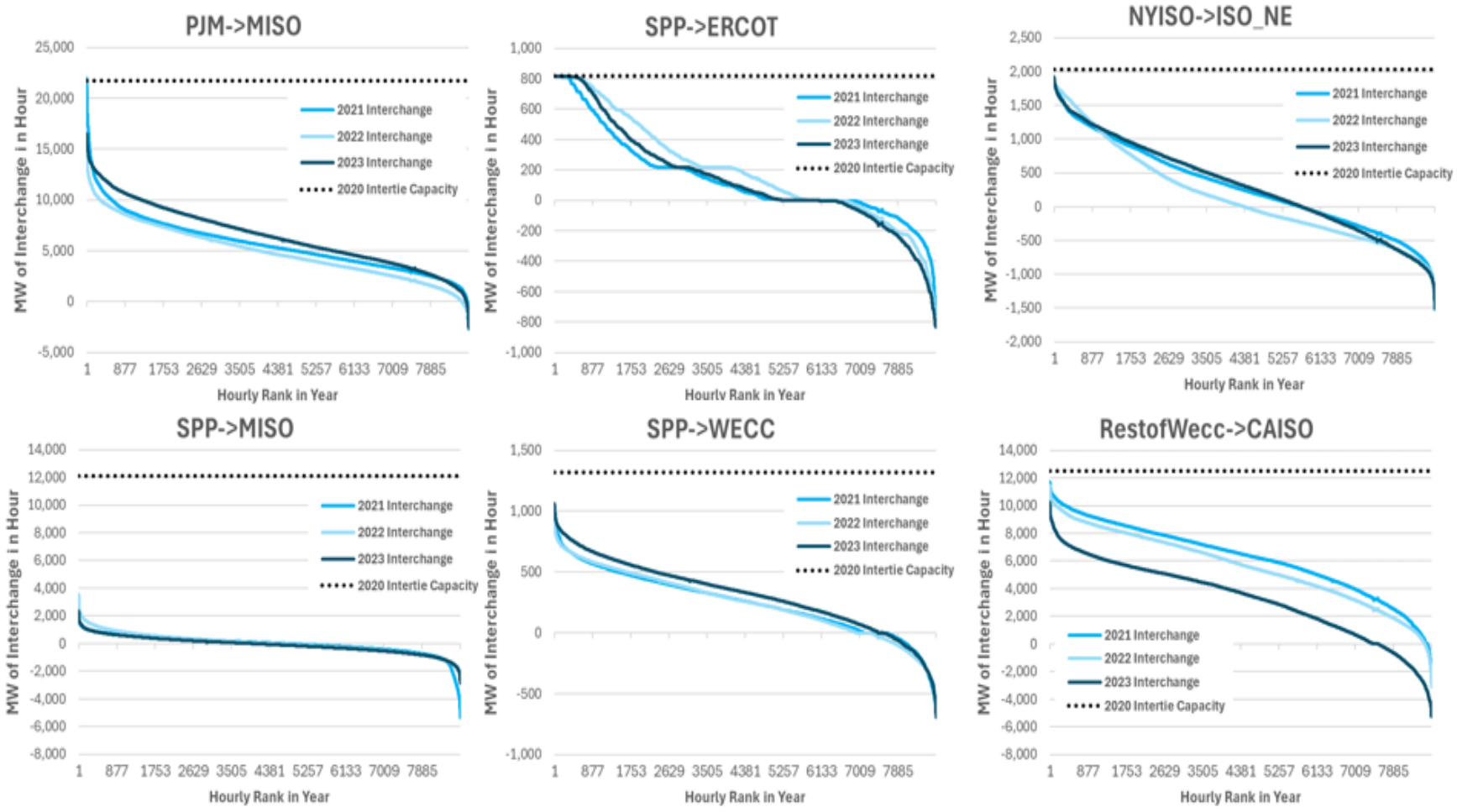
Operations Challenges

Transaction charges and scheduling cost limit beneficial exchanges	• Adds to marginal costs of exchanges, limiting interregional transfers
Interregional schedules locked in ahead of the operating hour can lead to uneconomic transactions	• Actual conditions can change from the hour-ahead forecast • The longer that bids or self-schedules must be placed, the greater the risk of forecast error • Risk aversion to lock-in can reduce what each side makes available
Uncertainty of interregional transactions	• Under-reliance on interregional transfers due to concern that other regions may modify planned transactions when grid is strained

Operations Challenges

- **Interregional intertie capacity has historically been underutilized**
  - Potentially leaving possible economic savings and resiliency benefits unrealized
  - When used, flow is frequently in uneconomic direction (from region with higher hourly price to region with lower price)

Interregional Hourly Interchange MW vs. Intertie Capacity



Data Source: https://www.eia.gov/electricity/gridmonitor/dashboard/electric_overview/US48/US48

Operations Solutions Overview

	Solutions				Areas of State and Federal Engagement	
Operations	Reduce Transaction Charge Impacts	Reduce Advanced-Time Scheduling Requirements	Develop Optimized Interregional Scheduling Mechanism	Improve Preparation for Resiliency	Engage with System Operators to Encourage Improvements in Tx Utilization	Analytical Guidance Technical Forums to Improve Tx Utilization

Operations Solutions: Optimized Interregional Scheduling Mechanism

	Solutions				Areas of State and Federal Engagement	
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Barrier: Advanced-time transaction requirements, transaction charges, and transaction uncertainty can lead to under-utilization.

Solution: New operational mechanisms can optimize use of unutilized interregional transmission headroom.

Examples: Western Energy Imbalance Market, Europe's market coupling efforts

Operations Solutions: Optimized Interregional Scheduling Mechanism

Develop Optimized Interregional Scheduling Mechanism

+ **New operational mechanisms can optimize use of unutilized headroom on interregional transmission**

+ **CAISO's Western Energy Imbalance Market (EIM) operates in real time to optimize headroom across inter-BAA interties after prescheduled flows**

+ **The European Market Operator (ENTSO-E) uses:**
  - Flow-based market coupling (FBMC) and Single Intraday Coupling (SIDC) platform for 15-minute trading across market borders

EIM Participants across the WECC

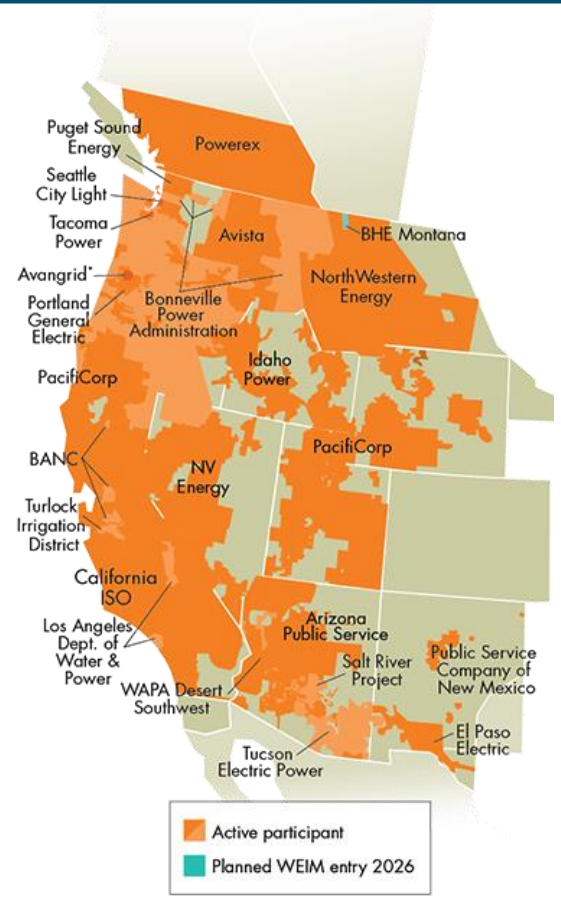

Image: https://www.nyserda.ny.gov/All-Programs/Large-Scale-Renewables/Tier-Four

Operations Solutions: Preparation for Resiliency

	Solutions				Areas of State and Federal Engagement	
Operations	Reduce Transaction Charge Impacts	Reduce Advanced-Time Scheduling Requirements	Develop Optimized Interregional Scheduling Mechanism	Improve Preparation for Resiliency	Engage with System Operators to Encourage Improvements in Tx Utilization	Analytical Guidance Technical Forums to Improve Tx Utilization

Barrier: Uncertainty of interregional transactions

Solution: Neighboring market operators can work together to define possible emergency conditions and establish protocols for rapid communication and operations during periods of high resiliency need.

Solutions Summary

	Solutions	Areas of State and Federal Engagement
Planning	Coordinated Interregional Planning; Planning Methods Harmonization; Model and Data Harmonization	Involvement in Planning — Encourage Interregional Collaboration; Issue Guidelines for Interreg. Planning — Funding/Support, Potential Federal Planning Authority
Permitting	State Transmission Authorities; Host Community Benefits; Planning Need Determination Acceptance for Permitting; Multi-State Evidentiary Record	Communicate Tx Needs to Developers/ Planners — Streamline Permitting; Funding/Training for State Staff — Federal Backstop Authority
Operations	Reduce Transaction Charge Impacts; Reduce Advanced-Time Scheduling Requirements; Develop Optimized Interregional Scheduling Mechanism; Improve Preparation for Resiliency	Engage with System Operators to Encourage Improvements in Tx Utilization; Analytical Guidance — Technical Forums to Improve Tx Utilization

Conclusion: Priority Areas of Focus

Collaborative approaches to interregional planning across states and planning regions to enable joint identification of transmission needs and coordinated analysis of solutions

State engagement in regional and interregional transmission planning processes to support permitting processes for any projects selected to move on to permitting

Exploration of the **development of new state agencies dedicated to transmission development** to enhance state-level support and expertise

Improvements to intertie utilization by reducing transaction charges, shortening advanced time for transaction scheduling, joint dispatch approaches, and preparing for resiliency conditions

Federal support to enable enhanced state- and planning region-led solutions through direct funding, identification of gaps in planning, development of best practices and guidelines, and convening stakeholders for capacity building and information sharing

Questions?

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