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# A New State-Federal Cooperation Agenda for Regional and Interregional Transmission

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## Introduction

The experience of grid operators and planners in the United States and around the world has shown that both decarbonization and power system resilience will require large-scale regional and inter-regional transmission expansion. In the United States, transmission planning, cost recovery, and siting are all subject to both state and federal jurisdiction. To meet the challenge of expanding transmission to implement decarbonization, the Federal Energy Regulation Commission (FERC) and the National Association of Regulatory Utility Commissioners (NARUC) recently announced the Joint Federal-State Task Force on Electric Transmission to focus on this issue.[1] Resolving issues of siting and cost recovery for interstate electric transmission lines will encourage constructive state-federal cooperation. The task force and related regional and national coordination among the states, FERC, the Department of Energy (DOE), and federally regulated transmission providers will be critical to ensuring a resilient and clean power system.

## Transmission Limitations are Delaying the Transition to Clean Energy

Over the last few decades, states, utilities, corporations, and the federal government have set increasingly ambitious renewable energy procurement and decarbonization goals. States have been leading the way in recent years with significant clean energy requirements, and new leadership at FERC has been evaluating how to achieve these goals. The Biden-Harris Administration has announced the goal of achieving a carbon pollution-free power sector by 2035 and a net-zero economy by 2050.[2] Multiple studies have indicated that economy-wide decarbonization in the 10- to 15-year timeframe will require widespread electrification and the deployment of wind and solar energy.[3] These studies also note that a stronger regional and interregional grid backbone will be needed to tap into low-cost power sources and access resource and demand diversity across areas with different weather, climate, and time zones.

1 FERC, "FERC, NARUC to Establish Joint Federal-State Task Force on Electric Transmission," June 17, 2021.

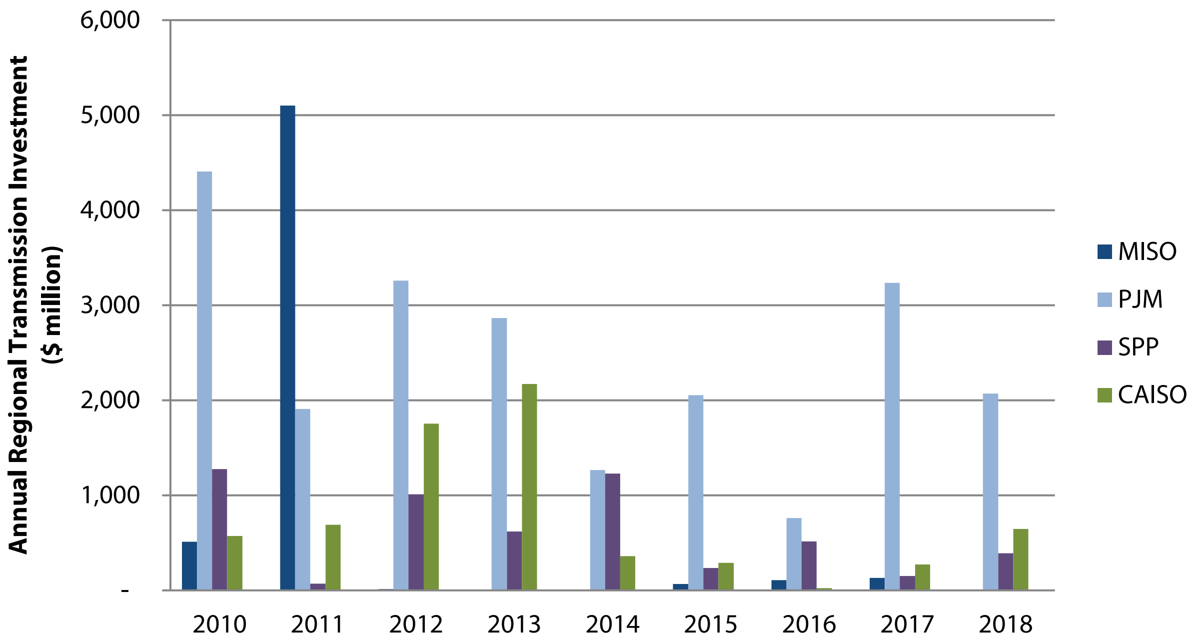
2 The White House, "Fact Sheet: President Biden Takes Executive Actions to Tackle the Climate Crisis at Home and Abroad, Create Jobs, and Restore Scientific Integrity Across Federal Government," January 27, 2021.

3 Eric Larson et al., *Net Zero America: Potential Pathways, Infrastructure, and Impacts*, at 88, December 15, 2020; Christopher T.M. Clack, Michael Goggin, Aditya Choukulkar, Brianna Cote, and Sarah McKee, *Consumer, Employment, and Environmental Benefits of Electricity Transmission Expansion in the Eastern U.S.*, October 2020; and Trieu Mai, Debra Sandor, Ryan Wiser, and Thomas Schneider, *Renewable Electricity Futures Study: Executive Summary*, at iii, December 2012. See also Future Power Markets Forum, "Reliable, Efficient, and Low-Carbon Resource Portfolios," (n.d.).

Despite lower costs than thermal generation alternatives and a growing demand for clean energy, renewable development has been limited by a lack of regional and interregional transmission capacity. Transmission is needed to deliver the remote resources to load and to send power back and forth across and between regions. While total transmission investment is a robust $20 billion per year, almost no new interregional transmission has been built in the last decade. Regionally planned transmission in Regional Transmission Organizations/Independent System Operators (RTOs/ISOs) has steadily declined, and almost none has been built outside RTOs. As shown in **Figure 1,** investment identified in RTO/ISO regional transmission planning reports declined by nearly 50 percent between 2010 and 2018.

The limited investment in regional and interregional transmission capacity has caused a backlog of interconnection queue requests. By the end of 2020, there were 755 gigawatts (GW) of proposed generators waiting in interconnection queues nationwide, 90 percent of which were for renewables or storage.[5] A major contributing factor to this backlog is that the current generator interconnection process is an inefficient means of transmission planning. Unlike the centrally located fossil fuel-fired generators that existing transmission infrastructure was constructed to service, renewable generation is location-constrained and is best developed in areas with high quality wind and solar resources. Generator interconnection processes established during the natural gas generation development boom of the early 2000s required interconnecting generators to pay for the network upgrade costs associated with interconnecting to the grid.[6] Whereas this might have worked for natural gas generating facilities that can choose where they interconnect, renewables located far from load centers require grid

**Figure 1: Annual Regionally Planned Transmission Investment in RTOs/ISOs ($ million)[4]**




4 Grid Strategies summary of RTO data.

5 Joseph Rand et al., *Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2020*, at 3, May 2021.

6 See *Standardization of Generator Interconnection Agreements and Procedures*, Order No. 2003, 104 FERC ¶ 61,103, July 24, 2003.

expansion to connect them to the bulk power grid.

The current interconnection process requires the first generator to be interconnected after transmission capacity constraints have been reached to pay for the cost of the upgrades. Assigning all costs to the next generator in line (after the constraint is reached) is like requiring the next car entering a congested highway to pay the full cost of adding a new lane, even though all users would benefit. For this reason, the current interconnection process has discouraged the development of renewable capacity as developers drop out of interconnection queues in the face of such high costs.[7] It has also led to a piecemeal approach to grid expansion. Successful regional planning processes can result in a more cost-effective solution to facilitate the integration of these new resources.

## The Need for Transmission and its Benefits

Large-scale regional and interregional transmission, and eventually an interconnected macro grid, where all regions are stitched together, will be essential to unlocking the renewable energy necessary to reach clean energy targets and decarbonization goals. The Princeton University Net Zero America Study found that a low-carbon economy will require current transmission capacity to expand by 60 percent by 2030 and triple by 2050 at a total cost of $2.4 trillion to connect wind and solar facilities to demand.[8] Similarly, the Brattle Group estimates that between $3 billion and $7 billion in annual incremental transmission investment will be needed to meet the increased demand caused by electrification between 2018 and 2030. According to the study, annual incremental investment between 2031 and 2050 increases to between $7 billion and $25 billion.[9] The benefits of building transmission to accompany the clean energy transition include consumer, reliability, and resilience, and the creation of American jobs.

### *Consumer benefits*

The economies of scale and more efficient use of resources that come with more large-scale transmission capacity could further lower the cost of renewable energy, which ultimately benefits the consumer. A study by Vibrant Clean Energy of increased transmission investment in the eastern United States found that increasing access to low-cost renewables could bring average electric bill rates down by 3 cents/kWh, translating to more than $300 in annual household savings.[10] A national study by MIT found that doubling installed transmission capacity and coordinating power system planning and dispatch across state and regional boundaries could reduce the cost of zero-carbon electricity by as much as 46 percent when comparing a nationally coordinated system to a state-by-state approach.[11] The NREL Interconnections Seams Study, which analyzed the cost and benefits of optimized nationwide transmission expansion, found that every dollar invested in interregional transmission would return more than $2.50.[12] Based on these findings, a proactive approach to building a strong transmission grid could yield net savings of $30-$70 billion in total generation and transmission investment costs through 2030 given current regulatory compliance, and up to nearly $50 billion annually in consumer savings in an environmentally constrained future.[13]

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7 See Jay Caspary, Michael Goggin, Rob Gramlich, and Jesse Schneider, *Disconnected: The Need for a New Generator Interconnection Policy*, January 2021.

8 Eric Larson et al., *Net-Zero America: Potential Pathways, Infrastructure, and Impacts*, at 77, December 15, 2020.

9 Dr. Jürgen Weiss, J. Michael Hagerty, and María Castañer, *The Coming Electrification of the North American Economy: Why We Need a Robust Transmission Grid*, March 2019.

10 Christopher T.M. Clack, Michael Goggin, Aditya Choukulkar, Brianna Cote, and Sarah McKee, *Consumer, Employment, and Environmental Benefits of Electricity Transmission Expansion in the Eastern U.S.*, October 2020.

11 Patrick R. Brown and Audun Botterub, "The Value of Inter-Regional Coordination and Transmission in Decarbonizing the US Electricity System," Joule, Volume 5, Issue 1, January 20, 2021.

12 Aaron Bloom et al., "The Value of Increased HVDC Capacity Between Eastern and Western U.S. Grids: The Interconnections Seam Study," Preprint, October 2020.

13 Johannes Pfeifenberger and Judy Chang, *Well-Planned Electrical Transmission Saves Customers Costs: Improved Transmission Planning is Key to the Transition to a Carbon Constrained Future*, June 2016. WIRES defines an environmentally constrained future as "a generally foreseeable reduction in the use of high-carbon-emitting resources in the process of producing electricity," at 6.

*Climate benefits*

Because transmission expansion allows more renewables to interconnect to the grid, the climate benefits are expected to be significant. The Vibrant Clean Energy study, focusing on transmission expansion in the eastern United States, found that transmission investments can cost-effectively reduce electric sector CO2 emissions 95 percent by allowing the region to obtain more than 80 percent of its electricity from wind and solar by 2050.[14] A separate study by Pfeifenberger and Chang that focused on reaching net-zero emissions by 2050 estimates that expanding interregional transmission by 223 GW-miles — a 2.5-fold increase over existing transmission capacity — would increase the share of wind and solar to 60 percent of total generation.[15] As it relates to wind energy, the DOE Wind Energy Technologies Office finds that incremental transmission-related expenditures can allow wind energy to meet 10 percent, 20 percent, and 35 percent of the nation's end-user demand by 2020, 2030, and 2050, respectively. The study finds that the associated benefits include a total of 12.3 gigatonnes of avoided greenhouse gas emissions through 2050.[16]

*Reliability and resilience benefits*

A more interconnected power system will help strengthen the reliability and resilience of the grid. One useful aspect of a larger transmission network is its ability to assist in the wide-scale aggregation of variable energy resources. Wind and solar energy tend to complement each other by generating energy at different times of the day and year. For this reason, having a more geographically diverse set of renewable resources can help further smooth aggregated output. This will become crucial as renewable resources comprise a majority of new interconnecting resources. A North American Electric Reliability Corporation task force explains:

> Variability and uncertainty can be reduced through aggregation. Larger aggregations of wind and solar generation are proportionately less variable. Forecast accuracy is also improved for larger wind and solar aggregations. Net variability is reduced when variable energy resources (VERs) are aggregated with load, and it is net variability that must be balanced to maintain reliability. The pool of flexible resources, like generators and responsive load, increases as the size of the balancing authorities (BAs) is increased. Balancing should be conducted over the largest geographic area possible, either through consolidating smaller BAs or through coordinated operations.[17]

A grid that supports the transfer of capacity between regions can help prevent widespread power outages during extreme weather events. Just as expanding transmission makes the grid bigger than individual weather systems that affect wind and solar output, a larger grid helps cancel out the impact of severe weather events that cause localized peaks in electricity demand or generator forced outages.

Winter Storm Uri, during which extreme cold weather conditions in Texas and the central U.S. left millions of homes and businesses without power, highlights the need for interregional transmission. The Electric Reliability Council of Texas (ERCOT) has limited transmission ties to the Southeast and West. The lack of interconnection meant that ERCOT was only able to import 800 megawatts (MW) (vs. a 2020 peak load of 75,200 MW)[18] of capacity after widespread generator outages left local supply unable to meet demand. During the same cold weather event, however, Southwest Power Pool (SPP) and the Midcontinent Independent System Operator (MISO), two RTOs/ISOs with more interregional transmission capacity, experienced similar weather conditions, but were able to

14 Christopher T.M. Clack, Michael Goggin, Aditya Choukulkar, Brianna Cote, and Sarah McKee, *Consumer, Employment, and Environmental Benefits of Electricity Transmission Expansion in the Eastern U.S.*, October 2020.

15 National Academies of Sciences, Engineering, and Medicine, "Accelerating Decarbonization of the U.S. Energy System," The National Academies Press, 2021.

16 U.S. Department of Energy, *Wind Vision: A New Era for Wind Power in the United States,* 2015.

17 North American Electric Reliability Corporation, *Integration of Variable Generation Task Force*, at 56, June 2015.

18 ERCOT, "ERCOT Reserve Margin up for Summer 2020, Energy Alerts Still Possible," May 13, 2020.

import more than 15 times as much power as ERCOT.[19] As climate change intensifies and unexpected weather extremes continue, access to unaffected capacity in geographically distant regions (i.e., the ISO's "neighbor's neighbors") may be essential to grid resilience.

The resilience benefit also translates into consumer value. For example, during Winter Storm Uri, each GW of additional transmission capacity between Texas and the Southeast would have more than paid for itself in just three days, generating a $1 billion benefit compared to about a $700 million cost.[20] An additional GW of capacity between MISO and the Southeast would have returned $100 million in consumer benefit during the same period, and it would not take many severe weather events to cover the cost of similar $700 million lines.[21]

### *Rural economic development benefits*

Transmission and associated renewable generation projects also provide direct economic benefits to the communities where they are located, which are often rural and economically challenged areas. Much of the anticipated transmission and renewable generation construction activity will take place in these rural areas, where jobs and employment rates are often well below national averages. For example, the recently announced construction of an 80 MW solar facility and related transmission line in the Delta Montrose Electric Association service area in rural Western Colorado will provide 350 to 400 jobs over a two-year construction period. Temporary though they may be, these jobs will infuse cash into the local economy that will help this region spur employment after the closure of two underground coal mines. A recent white paper by the Rocky Mountain Institute provides evidence of the efficacy of renewable generation and transmission projects on the economies of rural communities.[22]

In addition, there are areas of the country with excellent wind and solar resources where traditional farming and ranching are becoming increasingly difficult. As an example, the Ogallala aquifer, which is a primary water source for farming and ranching from South Dakota to the Texas Panhandle, has been depleting rapidly in recent years. In Kansas, about 30 percent of wells have already run dry, and the entire aquifer is projected to be 70 percent depleted by 2050.[23,24] Without sufficient water to support it, agriculture in these areas will become an increasingly marginal proposition, and in some areas is likely to disappear altogether. Transmission and renewable energy leases and tax payments could provide an alternative source of income to help to support rural communities in adapting to the changing climate. The remaining land would continue to be available for farming and ranching.

## Barriers to Large-scale Transmission

There has been very little new regional or interregional transmission planned or built over the last decade. The barriers are often described as the three Ps: permitting, planning, and paying (cost allocation). The last of these is often the hardest problem, because there is no rate base across many states, only different forms of voluntary contributions where market participants pay to reserve capacity. Transmission is a classic public good in that all of society benefits once it is built, and it is therefore in no individual or company's self-interest to pay for it. Planning is a challenge, because capturing the large economies of scale and regional benefits requires long-term, proactive planning and coordination among many interests and states across wide geographic areas. Permitting is handled mainly at the state and local levels, often with no statutory ability for state and local authorities to consider regional and national benefits. Federal permitting for transmission over federal lands has also been very slow and difficult,

19 Michael Goggin, Rob Gramlich, and Michael Skelly, *Transmission Projects Ready to Go: Plugging Into America's Untapped Renewable Resources*, April 2021.

20 Michael Goggin, *Transmission Makes the Power System More Resilient to Extreme Weather*, July 2021,

21 *Ibid.*

22 Katie Siegner, Kevin Brehm, and Mark Dyson, *Seeds of Opportunity*, 2021.

23 Bruce Finley, "The Water Under Colorado's Eastern Plains is Running Dry as Farmers Keep Irrigating "Great American Desert"," January 2, 2018.

24 Matthew R Sanderson, Burke Griggs, and Jacob A. Miller, "Farmers are Depleting the Ogallala Aquifer Because the Government Pays Them to Do It," November 9, 2020.

especially when multiple agencies are involved. Transmission policies are needed to overcome these planning, permitting, and paying barriers.

## First, Fully Utilize the Existing Network

New transmission can be expensive and acquiring new rights of way can be contentious. Minimizing the cost of providing service to customers requires that maximum use is being made of the existing network and existing rights of way before new lines are built. A number of grid-enhancing technologies (GETs) are being deployed all over the world that can very quickly and cheaply deliver more energy over the existing network. GETs are low-cost, proven technologies that allow existing grid operators to better control and manage flows to use the latent capacity on the existing network by leveraging technologies including sensors, algorithms, and communication networks. System operators gain better situational awareness regarding the grid as a result of GETs. This awareness helps to pinpoint outages, facilitate restoration, and thereby reduce outage costs. A recent case study sponsored by the WATT Coalition demonstrates the economic and environmental benefits based on actual operating models updated to reflect expected system conditions in 2025.[25] The study finds that GETs deployment would accelerate the integration of renewable resources with signed interconnection agreements in Kansas and Oklahoma regions of SPP.

Over the past few decades, several utilities have evaluated GETs in research and pilot projects to understand the technology. As a recent example, Pennsylvania Power & Light has deployed dynamic line ratings (DLR) on two facilities that have been identified as market efficiency projects to see if traditional transmission expansion solutions can be deferred or displaced.[26] Through a better understanding of facility loadings, the operator can distinguish actual binding constraints from those that are artifacts of static assumptions.

Additionally, the replacement of aging assets provides a unique opportunity to significantly boost transmission capacity for select facilities in currently existing critical corridors so that they can better accommodate regional needs, as well as more efficiently accommodate interregional transmission expansion. To capitalize on existing rights of way, conductors can be replaced with carbon or composite core cables and high-temperature superconductors, whereas high-voltage direct current (DC) lines can be used to replace alternating current (AC) lines. Advanced conductors are being deployed by many utilities in new construction, as well as in upgrades to existing lines, to increase system capacity. Additional circuits can also be added to many existing single-circuit lines.

Existing rights of ways are a valuable asset that could easily support more substantial transmission capability using advanced designs, available technologies, and creative solutions. Such capacity expansion could not only support renewable resource development, but also support system resilience requirements associated with extreme weather as recently experienced during Winter Storm Uri in Texas and the southern plains.

## Plan Transmission to Maximize Net Benefits

Along with maximizing use of the existing network and rights of way, there will surely be a need to plan new lines. Regional and interregional planning will be critical to determine an efficient set of lines and appropriately allocate the costs. The following improvements need to be made to typical planning:

- Incorporate a "generation forecast" just like standard practice includes a "load forecast." The information necessary to create this forecast is available from state policies, utility resource plans and decarbonization targets, electrification estimates, interconnection queues, and other sources;
- Incorporate the value of transmission in extreme weather scenarios into plans; and
- Incorporate multiple values of transmission, rather than the common current approach of siloed economic, reliability, and public policy buckets of benefits.

25 T. Bruce Tsuchida, Stephanie Ross, and Adam Bigelow, *Unlocking the Queue With Grid-Enhancing Technologies*, February 1, 2021.

26 See PPL, "Dynamic Line Ratings Strategy," 2021.

FERC's Advance Notice of Proposed Rule discusses these and other planning improvements.[27]

## State Participation in Transmission Planning and the Need for a State-Federal Partnership

State and federal roles in transmission are intertwined. Transmission siting and permitting authority is generally a state function, whereas planning and cost allocation issues are in an awkward middle ground between state and federal jurisdiction. The courts have affirmed FERC's ability to require planning and cost allocation policies if it finds unjust and unreasonable wholesale rates resulting from the current arrangements.[28] For its part, in some areas, such as with Regional State Committees involved in RTO planning processes, FERC has shown deference to the input of states or groups of states, but this is not always the case. The states and federal government need to be well coordinated for transmission plans to provide reliability and reasonable costs for consumers.

States generally regulate generation and resource choices under the Federal Power Act in both restructured and traditionally structured states.

A reimagined transmission planning process that includes state participation would prove productive in the following ways:

1. *Ensure a comprehensive review of transmission plans and alternatives*

Allowing states to participate and provide input in transmission planning could create transmission solutions that have broad public support and consensus on what is best for a particular need. This would extend to both proposed lines, as well as any alternatives presented in the planning process.

2. *Provide local input regarding siting and permitting*

In most cases, state commissions approve the siting of electric transmission facilities. In some cases, they do this as members of a siting board composed of Commission staff (for example, the New York Public Service Commission's participation in Article VII siting cases). State commissions can advise regional planners on permitting issues, areas to avoid, and various constraints that may ultimately be critical to incorporate into any successful transmission project.

3. *The regional-state committee model*

When SPP and MISO were in the process of becoming RTOs, the states asked FERC to be active participants in RTO policies. FERC was interested in forming the RTOs and their associated joint dispatch and regional transmission planning. Under the cooperative federalism model, they reached agreements later formalized in FERC's orders approving the RTOs. Under these orders, the Regional State Committee[29] developed positions on transmission plans, cost allocation, and resource adequacy that continue to have significant influence over RTO policies. Such an approach could be used elsewhere and expanded to include inputs into transmission planning assumptions and methods.

4. *Federal-state cooperation*

The Joint Federal-State Task Force on Electric Transmission was established by FERC under the rarely used section 209 of the Federal Power Act, "Use of Joint Boards; Cooperation with State commissions."[30] The FERC Order[31] cites Section 209(b), which states:

> The Commission may confer with any State commission regarding the relationship between rate structures, costs, accounts, charges, practices, classifications, and regulations of public utilities subject to the jurisdiction of such State commission and of the Commission; and the Commission is authorized, under such rules and regulations as it shall prescribe, to hold joint hearings with any State commission in connection with any matter with respect to which the Commission is autho-

27 *Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection*, 86 Fed. Reg. 141, July 27, 2021.

28 See *South Carolina Public Service Authority v. FERC*, 762 F.3d 41 (2014).

29 This committee is called the Organization of MISO States in the MISO region and Regional State Committee in SPP.

30 See 16 U.S.C. § 824(h).

31 *Order Establishing Task Force and Soliciting Nominations*, 175 FERC ¶ 61,224, Docket No. AD21-15-000, June 17, 2021.

rized to act.[32]

The Joint Task Force agenda includes addressing the planning and cost allocation barriers discussed previously, including:

- Identifying barriers that inhibit planning and development of the optimal transmission necessary to achieve federal and state policy goals, as well as potential solutions to those barriers;
- Exploring potential bases for one or more states to use FERC-jurisdictional transmission planning processes to advance their policy goals, including multi-state goals;
- Exploring opportunities for states to voluntarily coordinate to identify, plan, and develop regional transmission solutions;
- Reviewing FERC rules and regulations regarding planning and cost allocation of transmission projects and potentially identifying recommendations for reforms;
- Examining barriers to the efficient and expeditious interconnection of new resources through the FERC-jurisdictional interconnection processes, as well as potential solutions to those barriers; and
- Discussing mechanisms to ensure that transmission investment is cost effective, including approaches to enhance transparency and improve oversight of transmission investment, including potentially, through enhanced federal-state coordination.[33]

The Task Force will need to grapple with the reality that planning and cost allocation for the grid cannot be performed just at the utility or state level. Some form of broad regional planning and cost allocation will be needed.

## Toward a Vision for Cooperative Planning

Regional and interregional transmission siting involves many interests beyond the normal electricity stakeholders (e.g., generators, transmission owners, large and small customers). Any parcel of land has people who care about how that land is used. Economics, land use, reliability, environmental justice, and other factors ultimately need to be managed together, not handled through completely separate processes. Past examples of cooperative planning between states, utilities, and various stakeholders, such as the MISO Multi-Value Project process,[34] have become more the exception than the rule as competitive transmission planning by private developers has been attempted around the country. Having private developers all privately pitching transmission proposals to landowners and communities across wide multi-state areas is not necessarily helpful when trying to achieve the regional consensus required to plan, permit, and pay for large scale transmission. A more coordinated and transparent public process may be a better approach.

## Conclusion

As policy makers embark on ambitious transmission planning efforts, it will be important to involve the states and state commissions at all levels of the discussion. States are in the lead on resource choices and can provide the inputs for what transmission planners can plan. States are also in the lead on transmission siting and can head off problems by integrating siting considerations into transmission plans. States can also work to create cost allocation agreements among states. Although FERC will ultimately need to implement transmission plans and make cost allocation decisions, it can provide substantial deference to states on what is planned and who will pay for it. The new Joint Federal-State Task Force on Electric Transmission will be a critical first step in designing transmission policies to achieve the resilient, low-carbon grid we all need.

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32 See 16 U.S.C. § 824h(b).

33 *Order Establishing Task Force and Soliciting Nominations*, 175 FERC ¶ 61,224, Docket No. AD21-15-000, June 17, 2021.

34 See MISO, "Multi-Value Projects (MVPs)," (n.d.).

## About the Authors

John Gavan has served on the Colorado Public Utilities Commission since January 2019. He was a member of the board of directors for Delta-Montrose Electric Association for five years prior to his appointment. He has also served on boards for Delta County Economic Development, Tri-State Generation and Transmission Association, and Solar Energy International. Commissioner Gavan has spent most of his career in technology, beginning in the U.S. Navy, where he served as an engineering and communications officer on a guided missile destroyer. After the Navy, he spent 19 years as a director of information technology at MCI Communications.

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