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Electric Transmission Policy in the United States

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ELECTRIC TRANSMISSION POLICY IN THE UNITED STATES

By: Eli Goldfarb, Iqra Nasir, and Amanda Spinner

Public Policy 750: Renewable Energy Policy at the State and Local Level

Table of Contents

Introduction

Climate change is an imminent threat to communities and the environment, only quickened by the burning of fossil fuels.[1] According to the Environmental Protection Agency, approximately 63 percent of U.S. electricity sources derive from fossil fuels like coal and natural gas—making them the largest contributors of greenhouse gas emissions.[2] However, reducing greenhouse gas emissions in the electricity sector is possible, and wind and solar generation represent one critical solution to avoiding the worst of climate change's effects.

Over the last decade, the cost of wind and solar generation has decreased while total generation capacity has grown precipitously.[3] As demand has grown, so too has the burden on the electrical transmission lines and infrastructure ("the grid") that transfers energy from one location to another.[4] To make renewable energy widely accessible, and to meet the goals of decreasing greenhouse gas emissions, the installation of transmission lines across the country is critical.[5] However, vocal opposition to transmission is slowing states and local governments' ability to meet these goals, and complex cost allocation rules as well as a lack of inter-regional planning stifles bigger infrastructure build outs.

This research paper outlines the prevailing narratives, discussion, and news coverage at the state and local level around investment in transmission, provides a review of the regional and federal policy and history of transmission systems, and proposes a framework for analyzing and understanding transmission policy from the federal to the local level. It then provides a deep dive into three core areas of transmission policy – state-level siting, regional-level multi-party cost allocation, and grid modernization incentive structures – and presents a comparative analysis of two states representing two ends of the broad spectrum of approaches to transmission policy.

State and Local News Narrative

Need for Transmission Capacity Causes Opposition

Critics of transmission note that the costly lines are often installed in areas with low industrial development, where the transmission lines and their implications are unfamiliar to residents.[6] The location of the lines can be inconvenient to locals, can fail to avoid sensitive areas like vital ecosystems, and do not always ensure that the community affected will receive the energy being sourced from that specific line.[7] As such, these concerns have increased public opposition to transmission, leading many communities to file lawsuits and vocalize concerns in hopes to persuade government officials to reject the lines.[8]

According to a 2020 Pew Research Center study, 79 percent of Americans believe that the United States should prioritize alternative energy sources to reduce the country's reliance on "dirty" coal power plants.[9] But at the same time, many citizens oppose the transmission lines necessary to receive and benefit from clean, renewable energy sources.[10] For example, in Missouri, residents fear that the transmission lines will displace communities, disrupt farm operations, and bring economic disaster while utility companies profit.[11] In Maine, they raise concerns that transmission lines could harm the landscape and environment.[12] These sentiments are echoed in Wisconsin, where residents believe the increase in transmission lines will be ecologically disruptive, and that the line will not be used for clean energy generation.[7] Instead, they worry that all types of generation (coal, wind, solar) will access the line, therefore providing no reassurance that truly clean energy is delivered.[7] Other major concerns include visually unappealing lines, the removal of mature trees, unsubstantiated negative health effects from the electromagnetic field emitted by the lines, and the potential decrease in property values.[13,14]

Equal concern exists among utility companies and Public Utility Commissions (PUCs) who are tasked with providing reliable power to communities while facing pressure to reduce their greenhouse gas emissions. To assist U.S. states in reaching a 100 percent clean energy portfolio, these companies and commissions need to increase their transmission capacity. However, one of the main barriers to de-carbonizing the U.S. grid is low investment in bulk transmission to support renewable-power expansion. Too few transmission lines can result in wind farms building in the parts of that grid that are already covered with turbines; transmission lines and infrastructure projects, however, can reduce the grids' current congestion.[15] Grid congestion—when demand for electricity is high, but the lack of transmission line capacity hampers delivery of the necessary electricity —can cause power outages and prevent renewable developers from introducing clean energy projects to communities. A recent analysis found that 245 clean energy projects had been withdrawn during their advanced stages of development, with many faulting the lack of transmission lines and infrastructure.[16] These projects would have provided more than 20,000 megawatts (MW) of wind and 21,000 MW of solar energy.[16] Just one megawatt would have been enough to power 200-300 homes for a year.[17,18]

States need transmission lines to meet renewable energy goals. Even with 100 percent renewable energy, states may not have adequate solar and wind sources, or space in the grid, to host these sources—therefore requiring transmission lines to move their energy sources and meet their goals. States cannot simply rely on distributed energy resources or in-state resources. NV Energy, a Nevada-based investor-owned utility (IOU), proposed new transmission infrastructure project for this reason: "The proposal is meant to proactively address several issues that the utility expects to deal with over the next decade, including complying with higher renewable energy mandates including a 50 percent Renewable Energy Standard by 2030 that was passed by the legislature."[19] Because transmission lines take over 10 years to implement, state governments cannot afford to wait to meet their goals and must work toward curbing opposition now.[19]

Transmission does not only benefit the states and cities leading the movement toward clean energy. As BloombergNEF's Ethan Zingler explains, "If you want a shot at 100 percent carbon-free, you're simply going to need to transit solar and wind power from America's Saudi Arabia of renewables—the Southwest and the Midwest—to the cities."[20] Increased transmission can enable state and local governments to access low-cost wind and solar generation.[4] As a result, consumers' lower electricity bills helps make it financially possible to meet their governments' renewable energy goals. For example, new transmission lines allowed the State of Texas to more than double the wind energy it could transit, and to save $15 billion in consumer electricity bills through 2050.[21] Similarly, in an analysis conducted by Southwest Power Pool showed that new transmission upgrades saved $800 for each person it served and $12 billion in net present value benefits for residents over the next 40 years.[40] Households can use these cost savings to fund their renewable and energy efficiency investments and support the state's renewable energy goals.

Despite valid criticism, state and local governments can benefit greatly from their commitment to transmission infrastructure. Transmission can not only ensure a reliable energy grid and affordable electricity for communities; it can help the United States meet the urgent need to reduce greenhouse gas emissions and increase investments in renewables.

Electrical Grid Transmission Policy in the United States

Background

The electrical transmission grid in the United States is composed of high-voltage transmission lines and facilities owned by approximately 3,000 different utilities nationwide.[22]

It is broadly organized into three separate, wide-area synchronous grids: The Eastern, Western, and Texas Interconnections. These Interconnections are further segmented into Independent System Operators[23] (ISO[1]): non-profit, utility-member organizations that receive operational control, but not ownership, of the transmission assets of their member utilities[24]. ISOs are tasked with the coordination and reliability of multi-state transmission grids[25], and the administration of wholesale marketplaces for the energy traveling through them[26].

There are seven ISOs in the U.S., covering approximately two-thirds of the U.S. population illustrated in Figure 1.[23] States making up the remaining one-third must conform to the Federal Energy Regulatory Commission (FERC) regulations regarding reliability, but power exchange is managed via bilateral exchanges and Power Purchase Agreements (PPAs), rather than wholesale power markets.

[1] ISOs are a subtype of Regional Transmission Organization; for simplicity's sake, this paper will refer to all such entities as ISOs

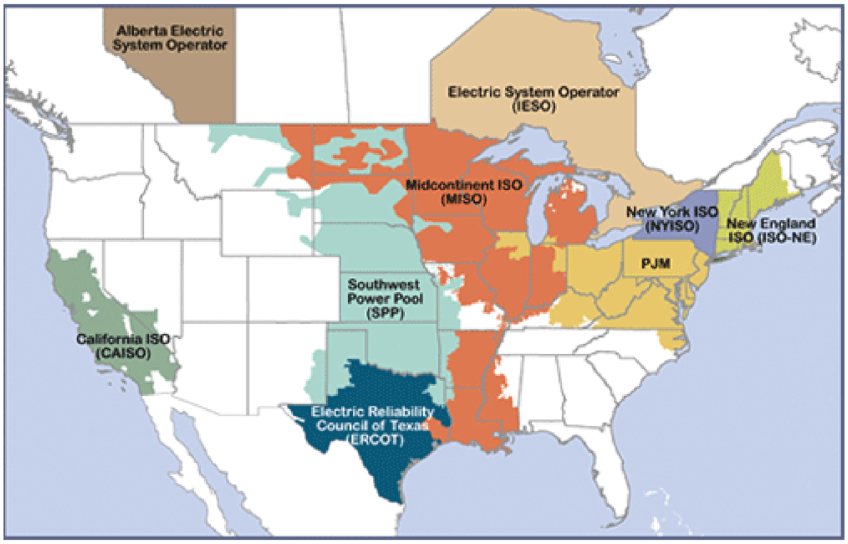


Figure 1: Map of North American ISO/RTOs[3]

To help manage this reliability process, the rest of these states are organized into transmission planning regions, whose primary mission is to conduct regional transmission planning in accordance with FERC Order No. 890 and 1000 (both of which will be discussed later).[27] These other regional transmission zones are shown below. Excluding ERCOT, this brings the total count of FERC Recognized regional transmission planning zones to 12, as show in Figure 2.

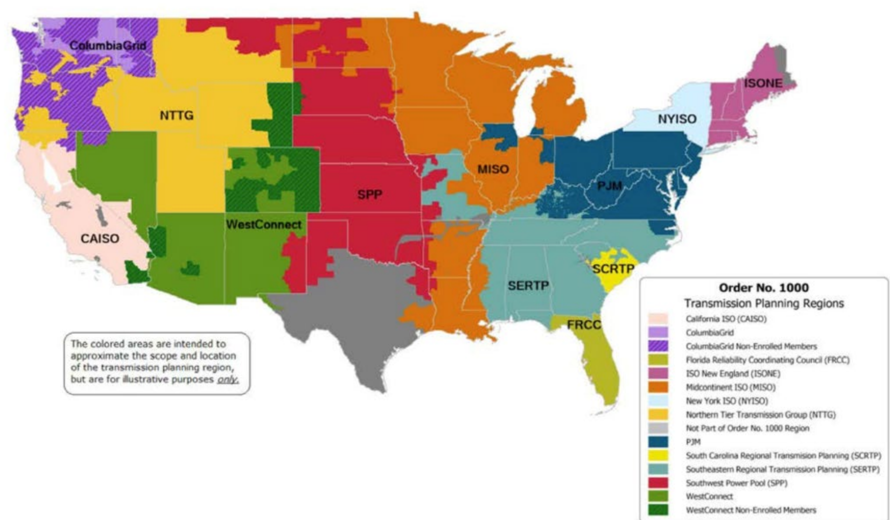


Figure 1. FERC Order 1000 Transmission Planning Regions

Source: FERC. 2016. "Order No. 1000 – Transmission Planning and Cost Allocation." updated March 17, 2016.
http://www.ferc.gov/industries/electric/indus-act/trans-plan.asp

Figure 2: Map of FERC Order 1000 Transmission Planning Regions[28]

Regulatory control of the grid in the United States is a complex, multi-level system. State and local governments regulate individual utilities (who make up the membership of each independent ISO) as well as the siting, construction, and permitting for energy asset development (including transmission) within their borders. However, FERC has regulatory authority over ISOs themselves[29], who in turn manage the actual operation of wholesale transmission markets and ensure transmission reliability. Though this paper will focus primarily on state-level transmission regulatory action, the competing authority at the federal, ISO, and state levels, and the friction it can cause, are necessary background.

Evolution of Transmission Policy in the United States

Peer-reviewed and grey literature surrounding the topic of transmission policy in the United States can be divided into two broad categories. The first describes the evolution of federal transmission policies (and their effect on transmission development) and the second provides recommendations for what transmission policy should include or at least consider including, in order support the changing grid. Other than Texas and NY, which have their own ISOs, (California ISO includes parts of Nevada), state policy is largely ignored in literature.

The electric power industry was built upon geographically constrained monopolies who historically had full ownership of generation, transmission, and distribution. This "vertically integrated" structure was not configured to transition to an open and competitive market, nor to facilitate the integration of geographically constrained renewable energy resources. According to a research report by Paul Joskow, a researcher at Massachusetts Institute of Technology, an ideal restructuring of the industry would separate generation from transmission and distribution, allowing horizontal integration of transmission assets, and enabling the creation of regional transmission companies that span large geographic areas.[30]

Since the Federal Power Act of 1935, FERC has had some control over prices, terms, and conditions for "interstate," transmission.[30] Over the last five or so decades, however, FERC has released orders that try to promote competition, starting with the Public Utility Regulatory Policy Act (PURPA) of 1978 which forced utilities to buy power from non-utility companies, enabling more players to enter the industry.[31] This continued with the Energy Policy Act of 1992, Order No. 888, and Order No. 889.[30] Each of these focused on helping competition, supplying equal access to information, and promoting fair and just pricing.[30] FERC also aimed to promote inter-regional collaboration and pushed for electric utilities to form regional transmission organizations (RTOs) through Order 2000 and required participation in planning at the local and regional level through Order 890.[32,33] FERC Order 1000, one of the more recent orders, established a set of principles for determining how costs get allocated at the regional level.[33]

While federal efforts have been made to expand transmission policy to facilitate open markets and inter-regional collaboration, few success stories exist. However, Joskow turns to PJM Interconnection LLC (an RTO) as a model for "FERC's vision for how wholesale market transactions and supporting transmission institutions should be organized."[30] Where PJM falls short is navigating inter-regional markets effectively.

In addition to some success in PJM, there are a few other examples for how states and regions are being innovative in their approach to transmission policy, as outlined by a paper published in the *Electricity Journal*. A high-level overview is provided below of three examples they focus on:

- **Texas Competitive Renewable Energy Zones (CREZ)**: Senate Bill 20 authorized the creation of CREZs, which are areas with high renewable energy resource potential.[34] The Public Utility Commission of Texas (PUCT) directed ERCOT to identify viable CREZs and cost estimates for transmission plans, and the PUCT approved a large amount of wind and transmission infrastructure[34]
- **Bonneville Power Administration (BPA) Network Open Season:** This new Network Open Season offered transmission service to all generating entities that requested service, with the requirement that these entities purchase a set amount of transmission capacity and provide 1-year of transmission charges in advance. If these conditions were met, BPA would provide a new transmission service if it could be afforded and National Environmental Policy Act requirements could be met. [34]
- **Southwest Power Pool's (SPP) Balanced Portfolio Approach:** The SPP implemented a new process for evaluating and developing transmission system upgrade projects at a pooled level, which looked at groups or portfolios of transmission projects, rather than individual projects, and allowed the SPP to allocate the entire cost to all SPP zones at an equal rate, regardless of how much that zone directly benefits from the project. [34]

Framework for Understanding Regulation of the United States Transmission Grid

Regulation of electrical transmission can be broadly grouped into three main categories: state and local level, interstate/interregional, and grid investment. As discussed above, due to the complexity of transmission regulation, though these archetypes can be generally considered distinct, individual regulations may encompass multiple archetypes or subcategories[35,36].

- **State & Local Regulation**: Individual states typically exert control over energy assets through Public Utility Commissions (PUCs). Inside each state, this authority extends to a key component of the transmission grid: control over the actual construction of transmission assets via siting and permitting allowances.

- **Interstate/Interregional:** Two main areas add complexity to states' ability to regulate interregional transmission: transmission coordination (especially relative to ISO control), and multi-party cost allocation and recovery.

- **Grid Investment:** States can enact regulation to promote or curtail investment in the grid in key areas: grid resiliency (driven especially by the increasing impact of natural disasters[37]), grid efficiency (especially in relation to renewable energy mandates and municipal climate pledges), and promoting smart grid/"grid 3.0" adoption[38,39].

These regulatory categories and archetypes provide a framework for the systemic analysis of transmission regulatory policy in the United States. Our analysis focuses on three policy subcategories: siting, multi-party cost allocation, and grid modernization. We have attempted to create a comprehensive assessment of the policy landscape for each of these subcategories, including a full state-by-state and regional accounting of the regulatory and legislative actions in each.

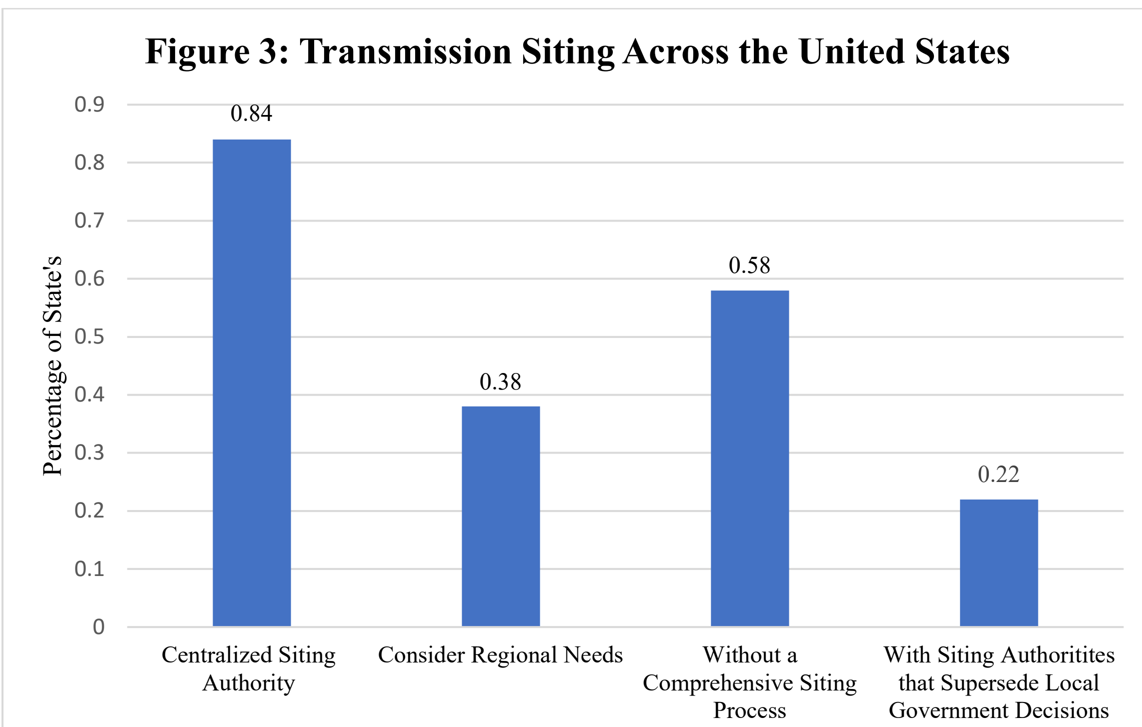
Deep Dive Into United States Transmission Policy: Siting, Multi-Party Cost Allocation, and Grid Modernization

Siting

To construct new transmission facilities or to upgrade existing facilities in the United States, developers typically need approval from several state and federal agencies, and sometimes local governments as well.[40] Transmission siting and permitting can be a reason that the development of new transmission infrastructure, which is critical for the deployment of renewables, has been delayed.[40] Siting electric transmission lines is currently the responsibility of each state.[40] And if a project is crossing multiple states developers may need approval from each state and potentially impacted locality for the project to move forward.[40] States may have differing transmission siting laws and administrative codes.[40] For some states, utilities may proceed with developing the transmission line if no issues or challenges have been raised.[40] However, the status quo in many states requires the development to demonstrate a need for the proposed facility and the authority's approval that it is in the interest of the public.[40] Several states have siting authorities that include officials from other integral state agencies, such as the Department of Environmental Quality.[40]

For developers to move the application forward due process rules are involved.[40] In most cases, developers must give public notice to parties who may be impacted by the development of the project, though they can exercise the power of eminent domain within reason to obtain land and develop on it.[40] Other commonalities in the transmission siting process in the U.S. is that most states require or suggest an environmental or public health impact study, a Certificate of Environmental Compatibility and Public Need, and/or a Certificate of Public Convenience and Necessity.[40] Issuance of one of these certificates signifies the approval of the project by state government and necessary officials, more specifically that the developers have evaluated the tradeoffs and understood the environmental impact, and that the project is in the best interest of the public.[40] In some states, there may be additional permits or certificates required at the state level and developers may need to consider locality permitting and zoning requirements as well. While these similarities occur amongst many states, differences exist.[40]

According to the research conducted for this project, approximately 84 percent of states have a formal centralized siting authority, or an informal but singular entity has preemptive authority over transmission siting determinations. (Figure 3) Only 38 percent of the states consider regional needs while evaluating transmission siting projects and a mere 58 percent of states have a comprehensive siting process. (Figure 3) Lastly, 22 percent of the states have the authority to supersede local government decision making. (Figure 3) As a result, notice and public comment periods can take time in regard to the siting process as there may be local opposition pressuring officials to deny the request.[40] For example, the public may not want transmission infrastructure because of the impact on the environment, they do not want to have to look at the infrastructure, and/or are worried about the electromagnetic radiation. Appendix A outlines research through this project which specifies which state has a centralized or fragmented siting authority, the name of the overarching siting authority, whether the state considers regional needs, whether state decision-making supersedes local government, if the state requires a certificate or environment impact study prior to construction, whether the state uses the law of eminent domain, and if a public notice is required. Transmission siting can be a difficult process but is a key to decarbonizing the grid and combat climate change. States and local governments can facilitate the development of a project by working with developers and interested parties to understand and abate these concerns. To combat these concerns and get the approval needed for their projects, developers may consider options to run transmission lines underground, along existing easements, or along energy corridors. Given the vital nature of transmission siting, developers can consider all potential concerns before requesting a permit for the new proposed facility.



Multi-Party Cost Allocation

Multi-party cost allocation refers to the process of how costs for transmission projects get assigned. At this point we will note that this section does not cover how costs are ultimately recovered or built up, only how they are initially allocated. A separate analysis would need to be conducted to discuss both concepts. There are two core options for cost allocation, which are either costs are localized to the specific pricing zones affected, or they are regionally allocated. In order to understand how each state allocates costs for various transmission projects, we must look to the policies and guidelines set forth by the relevant ISO/RTO, or other transmission planning regions that are depicted in Figure 2 above. FERC Order No. 890 (2007) required that transmission planning processes to take place at these regional transmission planning levels and Order No. 1000 established the requirements for this planning process. Order No. 1000 set forth requirements for five key areas: regional transmission planning, consideration of transmission needs driven by public policy requirements, non-incumbent transmission development, interregional transmission coordination, and cost allocation for transmission facilities that have been selected in a regional transmission plan for purposes of cost allocation.[41,42] More specifically, Order No. 1000 set forth six principles that must be included in cost allocation methodologies. These include: Costs allocated must be "roughly commensurate" with estimated benefits, those who do not benefit from transmission do not have to pay for it, benefit-to-cost thresholds must not exclude projects with significant net benefits, no allocation of costs outside a region unless other region agrees, cost allocation methods and identification of beneficiaries must be transparent, and different allocation methods could apply to different types of transmission facilities."[41]

While it is up to the regional transmission planning authority to create those cost allocation methodologies, FERC requires that each region abide by each of these principles. In Appendix B, we begin to break this down. We first start with a table of all possible transmission project types, a definition for each of these projects as well as whether they are eligible for regional cost allocation. It's important to note that while FERC Order 1000 requires regional transmission planning, with a goal of selecting more efficient and cost-effective transmission solutions to meet regional needs, it does not require that the projects are selected for regional cost allocation.[41] Effectively, each transmission owner puts together their own transmission plan, considering public policy, economic, and reliability needs, and it is the job of the ISO/RTO or other transmission planning region to decide whether there is a regional project that is more efficient or cost-effective than what is proposed by the localities.[43] In the non-ISO/RTO regions, these local transmission plans become the backbone of the baseline regional transmission plan. Then, the regional transmission planning cycle will feature an open-window period during which stakeholders have an opportunity to suggest regional projects that address economic, reliability, or public policy needs.[41,42] In RTO/ISO regions, these local plans are still important, but the regional entity also does a degree of analysis on its own to form the regional transmission plan.[41]

Each regional entity has a different decision-making authority that approve transmission plans and select projects for regional cost allocation, and these can be found in the next section of Appendix B. Within this section, we also examine a variety of key characteristics for each ISO/RTO and non-ISO/RTO transmission planning region. These are: the project types that get included in regional transmission plans, which are eligible for regional cost allocation, minimum physical requirements for consideration of regional cost allocation, competitive methodology used to select a transmission project or developer (either competitive solicitation or sponsorship), transmission planning cycle timeline, and the authority that approves the transmission plan as well as approves whether a project is selected for regional cost allocation. These regional authorities are comprised of three categories and have important implications for what kinds of transmission projects get approved and who has input. The three types are: a board composed of individuals not affiliated with market participants and who are selected independently by the board (all ISO/RTOs and ColumbiaGrid use this except CAISO, whose board is appointed by the governor), decision-making processes that involve representatives from the participating public-utility transmission providers in the region (SCRTP, SERTP), and boards composed of stakeholders in addition to public-utility (or non-public-utility) transmission providers (FRCC, NTTG, WestConnect). These decision makers play a crucial role in determining whether transmission projects stay local or larger projects take place.

Another important section of Appendix B is the column that identifies which state authorities dictate which public policies are considered during the transmission planning process. This has important implications for the types of projects that can be built, particularly in the future as more states are identifying renewable portfolio standards. In the last section of Appendix B, we break down how each region allocates costs for four types of transmission projects: reliability, economic, generator interconnection, and public policy. There are indeed other project types, but due to time constraints, it was necessary to focus on only these four. Reliability (with some exceptions), economic, and public policy projects are all eligible for regional cost allocation according to FERC, so we have outlined the processes that each transmission planning region has outlined in order to allocate these costs effectively. It's important to note that each of these processes are different, which makes inter-regional coordination even more of a challenge than regional coordination. We have chosen to omit inter-regional allocation methodologies due to time constraints. Additionally, we have outlined processes for generator interconnection costs, a process that is not typically eligible for regional cost allocation, and most often falls on the interconnection customer. For generator interconnection projects, costs are typically broken down into three different categories: study costs, direct assignment facilities to physically interconnect the resource, and upgrades to facilitate the delivery of the resource to ultimate load, which could include new lines, new substations, etc.[44] Appendix B demonstrates the complexities and nuances involved in multi-party cost allocation, and while one entity (FERC) sets the high-level guidelines, there are key differences between regions.

Grid Modernization

To the utilities that own transmission infrastructure, any investment in the grid can be an expensive proposition, often requiring some expense to be passed on to ratepayers[45]. As previously discussed, these investments take three major forms: investment in grid resiliency, investments in grid efficiency, and upgrades in smart grid technology. However, of the three, regulation and discussions around grid resiliency typically have the most immediacy, especially in the context of the increasingly destructive impacts of natural disasters driven by climate change. On the other hand, discussions around investment in grid efficiency and smart grid are more conceptual, with greater room for disagreement about the costs, benefits, and timelines for return on investment [46,47]. For this reason, this paper will focus on regulations of grid efficiency and smart grid deployments. For convenience's sake, we have combined the two into a single category, "*grid modernization*."

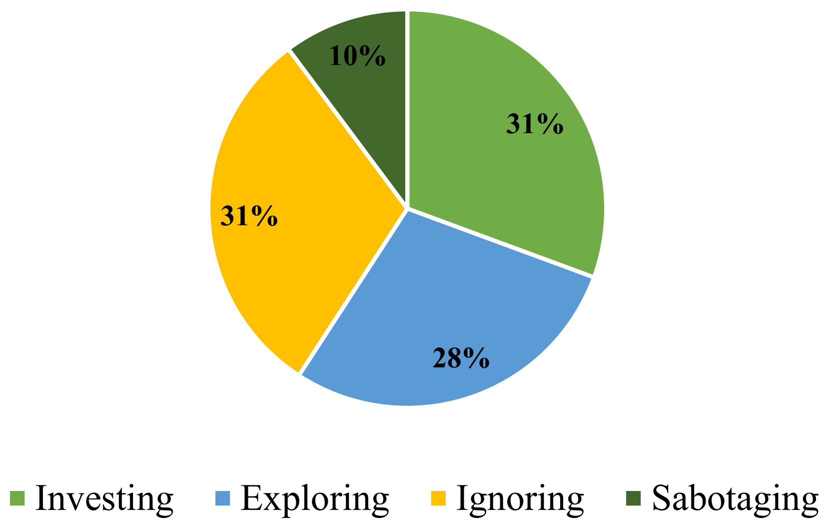
Due in part to the wide variety of perspectives on the impacts of regulation on privately owned infrastructure (such as transmission), state-level regulatory approaches to investment in grid modernization vary widely. At one extreme, some states have aggressive requirements for how and when utilities must deploy technologies like Advanced Metering Infrastructure. At the other extreme, some state legislatures have actively rejected legislations that would have caused increased investment in grid modernization, often in alignment with utility complaints about increased costs and reduced profits, or threats of rate increases to customers. In the middle of the spectrum, some state legislatures and/or PUCs have begun initiatives to gather information and begin planning for grid modernization, without actively incentivizing investment, while others have not directly addressed grid modernization in any formal, meaningful way at all.

This spectrum of policy approaches, combined with the general complexity of regulation of the United States electrical grid across state, ISO, and national levels, makes for a challenging broad-scope analysis of state policy. We therefore have identified four core archetypes of state regulatory approach to investment policy, to simplify and enable systematic comparison of state policies. These archetypes are:

- **Investing,** in which the state legislature and/or PUC have passed laws or other regulations to actively drive the deployment of grid modernization
- **Exploring**, in which there is action to investigate, consolidate, and publish information on grid modernization and potentially prepare for investment, but no active incentivization for in-state parties to invest
- **Ignoring,** where there is no direct state regulation on grid modernization
- **Sabotaging,** in which state regulators and/or PUCs have actively rejected regulation that would have created incentives or exploratory measures around grid modernization

Appendix C is a state-by-state analysis of regulatory policy on grid modernization, with categorization into the four key archetypes and summary of recent regulatory changes. Though it is impossible in this analysis to determine trends around grid modernization policy, as outlined in Figure 4 we can see that more than half of states are in the exploring or investing stage, while only five are categorized as sabotaging, an encouraging metric in national context of growing need for transmission infrastructure.

Figure 4: Distribution of Grid Modernization Archetypes



State Vignettes: A Closer Look at Maine and Oklahoma

Maine

Siting

While the State of Maine's transmission policy has not changed in recent years, transmission policy changes continue to be proposed. Here are the recent proposals from 2020:

- ME 1 – New England Clean Energy Connect Transmission Project: "Directs the Public Utilities Commission to amend the Order Granting Certificate of Public Convenience and Necessity and Approving Stipulation for the New England Clean Energy Connect transmission project, finds that the construction and operation of the NECEC transmission project are not in the public interest and that there is not a public need for the NECEC transmission project."[48]
- ME H 985 - Energy Transmission Corridors: "Prohibits the Public Utilities Commission from issuing a certificate of public convenience and necessity for a high impact electric transmission line unless the Commission finds significant tangible public benefits will result from the construction and use of the line, and that all municipalities through which the high impact electric transmission line will pass, have held a local referendum and certified to the Commission that a majority voted in favor."[47]
- ME H 1004 - Transmission and Distribution Utilities: "Requires a transmission and distribution utility, prior to taking land or an easement by eminent domain, to obtain the approval of the body of government having jurisdiction over the land or easement,

requires a transmission and distribution utility to obtain a certificate of public convenience and necessity from the Public Utilities Commission."[47]

- ME H 1275 – Transmission Grid Reliability: "Directs the Governor's Energy Office to convene a stakeholder group to identify and develop strategies to address the transmission grid reliability and electric rate stability for the northern service territory."[47]

Of these proposals, only ME H 1275 has been enacted.[47] In addition, ME H 1004 and ME 985 have been vetoed by the Governor of Maine, and ME 1 is pending. These bills have had support from local Maine communities who hope to have some authority in decisions that would impact them and to acquire adequate tax benefits.[49] Currently, Maine's eminent domain law allows approved public utility projects to seize land and trump local government laws.[48] ME H 985 and ME H 1004 would allow local governments to be involved in transmission siting processes. However, opponents of these proposals argue that a single town could veto a project that would be vital to deliver electricity to the regional grid.[48]

While no policy is currently proposed that would impact renewables in the State of Maine, there is opposition from locals regarding large scale regional projects, such as the recent Central Maine Power project, which is also opposed by ME 1.[50] Local renewable energy business stated, "Local clean energy will not be able to connect to the line, and the increased flows from the project could further constrain the flow of Maine's renewable energy to markets in New England." [51]Additional opponents state, "Large projects such as the Central Maine Power can jeopardize clean energy job creations and deployment and it would be difficult for in-state wind and solar projects to move forward."[50] The Central Maine Power project would provide generated power from Canada to the State of Massachusetts.[50] To make renewable energy widely available and to meet the demands of increased generations, the installation of transmission lines across the country is critical. State of Maine policymakers and transmission siting authorities can collaborate with local governments to meet the urgent need of increased transmission infrastructure.

Multi-Party Cost Allocation

Maine falls under ISO New England's jurisdiction, so they are required to abide by the policies set forth by this ISO as it relates to cost allocation. Logistically, all projects that fall under 115kV and below are allocated locally to transmission pricing zones within ISO New England, and for reliability and economic projects above this voltage threshold that meet a regional need that is more efficient and cost-effective than a local solution, costs are allocated based on zonal monthly peak loads.

For regionally allocated costs related to public policy related transmission upgrades, it is unclear how the ISO distributes these today. Every state within the ISO has a renewable portfolio standard in place, which may help ease disagreement around which public policies should be included for consideration in transmission planning, although we cannot find specific data to support this. This is consistent with a complaint filed by five of the six governors of states in the ISO (New Hampshire was not included), where among other issues, they claimed that "the market rules set by ISO New England ignore the clean energy goals set in state laws by the states now seeking reform."[52] The article describing this was posted just over one month ago, so these complaints are very current. Maine's renewable portfolio standard (RPS) was updated in June of 2019, with a goal that renewable resources must account for 80 percent of electric sales by 2030 and 100 percent by 2050.[53] This goal is aggressive relative to other states, so it's unsurprising that the Governor would push for more inclusion of clean energy goals into the ISO's processes.

Lastly, ISO-NE was under investigation from FERC for their potential misuse of FERC's exemption for immediate need reliability projects. This exemption is used by ISO-NE, PJM, and SPP, and each of these ISOs were under investigation. The exemption allows incumbent transmission owners to leverage a limited right of first refusal to construct transmission facilities that are needed to resolve a time-sensitive reliability criteria violation.[54] There are five criteria that FERC established for using this exemption, three of which include when the project is needed by, why it's needed, and the posting of information related to the project. [53]

Although the charges were dropped, it raised concerns about transparency in the transmission planning process. ISO-NE identified 29 projects between 2015 and 2018 that fit this exemption, whereas their counterpart, PJM identified 241, and were found to have violated three out of the five criteria.[55]

Grid Modernization

Based on a consistent policy of research, active planning, state-provided funding, and permissive utility cost recovery policy, the State of Maine is rated as "investing" on our grid modernization investment archetype model and is a is a national leader in terms of regulatory action for incentivizing investment in grid modernization. In 2010, Maine's legislature passed House Bill 1079, "Smart Grid Policy Act[56]," which established a state policy on grid infrastructure, including incentivizing the development and employment of a smart grid to improve reliability and efficiency of the grid. The bill allowed for the cost recovery of utilities investing in smart grid infrastructure and directed the PUC to explore creating or designating a special entity in each distribution territory to facilitate the adoption of smart grid, though such entities were ultimately not recommended to be formed. The Smart Grid Policy Act has allowed Maine to become a national leader in smart meter and AMI deployment[57]. Maine's 2015 Comprehensive Energy Plan Update[58] provided further active guidance on smart grid infrastructure; this guidance helped direct Maine's PUC to enact the 2017 rulemaking amendments[59] enabling more direct interconnection procedures for small generators and microgrid assets.

More recently, in 2019 Maine passed H.P. 1016- L.D. 1401, "Resolve to Study Transmission Solutions to Enable Renewable Energy Investment in the State[60]," convening a stakeholder group to research and report on a set of topics including constraints and barriers to transmission investment, transmission infrastructure investment solutions, opportunities for regional coordination to advance transmission solutions, and potential funding sources and strategies. The final report[61], published in January 2020, incorporates a variety of recommendations for investment incentivization.

Though it is too early to fully quantify the impacts of 2019's LD 1401, the rule can be seen as a direct successor to the Smart Grid Policy Act from a decade earlier. Together, they exemplify how consistent regulatory policy can create a framework for incentivizing investment in transmission grid modernization.

Oklahoma

Siting

The State of Oklahoma's transmission policy hasn't changed for some time and no transmission policy changes have been proposed in the last few years according to the National Conference of State Legislatures Energy Tracking Database. Even though no policy changes are being proposed, Oklahoma is continuing to work towards siting transmission lines. In 2016, Oklahoma approved a $2.5 billion effort to build a high-voltage, direct-current power lien that would take wind energy produced in Oklahoma's windy Panhandle region to the Memphis, TN area.[62] However, local opposition ensued due to the project. The public comment period yielded numerous objections to the project from property owners who objected to the use of eminent domain to secure access and easements.[61] Objections also were lodged by local and state government officials from all three states, Oklahoma, Arkansas, and Tennessee, through which the line would cross or enter.[61] Wildlife officials in Arkansas and Oklahoma and some municipalities cited concerns about sensitive watersheds and wildlife habitats that could be disrupted by the construction of the transmission line if precautions are not taken.[63] The Oklahoma Attorney General's Office expressed dissatisfaction with the process used to design the project and develop the draft environmental impact statement.[62] These types of transmission projects have the opportunity to carry wind- and solar-generated power from places where it is plentiful to places where it would not be cost-effective to produce and further assist in decarbonizing the grid.

Multi-Party Cost Allocation

Oklahoma is a member of the Southwest Power Pool ISO (SPP), which implies that the state must abide by transmission policies set forth by this ISO. This ISO leverages what they call a "Highway/Byway" approach to their cost allocation structure, which implies that once a project has been chosen for regional cost allocation, these costs are allocated based on voltage specifications, with some degree of consideration to historical load. This isn't entirely different from other regions, but SPP relies much more on voltage than any other ISO and uses less rigor to assigning benefits. "Electric Highways" are transmission lines that are 300kV and above, and 100 percent of these costs are allocated to the SPP region based on electric utilities' load across the system (using historical use as a basis).[64] "Electric Byways" are lower voltage transmission projects, and range from 100kV to 300kV, and allocated 33 percent to the entire SPP region and 67 percent to the local zones.[65] "Electric Byways" can also be considered 100kV and lower, and these projects are allocated 100 percent to the local zone.[64]

Similar to Maine, we could not find specific data as to how SPP broke down cost allocation for public policy transmission projects, and unlike ISO NE, they actually do not make reference to public policy projects in their regional transmission planning documents (from what we could identify). We looked at the breakdown of RPSs within this region and found that of the 11 states that are included in this region, three do not have RPSs and four have RPSs that range from only 10-20 percent renewable. As such, we would expect to see little activity around public policy motivated transmission.[66]

Recently, SPP was also under investigation from FERC for their potential misuse of FERC's exemption for immediate need reliability projects, similar to ISO-NE. SPP had identified fie projects that fit the bill for exemption, but in the end were not found to have violated any of the criteria established by FERC to enact one of these projects.[67]

Grid Modernization

With no existing policy regarding grid modernization incentives, a formal state-level energy plan dating to 2011, and a history of rejecting or underfunding utility-proposed transmission investments, the State of Oklahoma has among the least permissive regulatory landscapes for grid modernization of any state. Based on this, and in the context of previously outlined minimal policies on transmission siting, Oklahoma is categorized as "sabotaging" on our grid modernization archetype index, placing it among the bottom 10 percent of states for grid modernization policy.

In September 2018, Public Service Co. of Oklahoma (PSO) submitted an $88M grid modernization plan representing a 6.5 percent base rate increase to the Oklahoma Corporate Commission (OCC)[68]. The Commission ultimately approved $46M of the requested amount[69], approximately half of the original total, citing an effort to reduce burden on electricity customers. In February 2020, Oklahoma Gas & Electric (OG&E) submitted an $810M, 5-year grid modernization plan to the OCC; the proposal remains under review as of December 2020, and equity analyst projections for its success are dim, especially with regards to the proposed rate tracker that would allow for more accurate cost recovery.[70]

To provide further clarity, Oklahoma is not entirely devoid of grid modernization investment. Smart meter penetration among residential meters is approximately 86 percent[71], in line with the national average and due in large part to rate-case approvals for PSO and OG&E in 2007 and 2008, respectively[72]. However, the lack of any distinct regulation momentum or policy frameworks create clear headwinds for future grid modernization initiatives. These headwinds are thrown into stark relief when compared to the permissive policies of the State of Maine.

Conclusion

Electrical grid transmission infrastructure is a vital component of the growing shift towards renewable energy and reduced greenhouse gas emissions in the United States. However, along with the growth in renewables comes an increased tax on the grid itself, driving a commensurate need for increased investment. This needed investment is framed in the context of a complex interplay of federal, regional, state, and local regulatory bodies, along with competing incentives and priorities among infrastructure owners, state and local authorities, and energy customers. This paper attempts to distill sections of this complex web and provide insight into the specific challenges pertaining to each section. While there unfortunately is no "one-size-fits-all" recommendation with which one could improve transmission policy in the United States, our intent is that through detailed analysis and recommendations for future research, we can provide tools for future decision-makers in the transmission policy space.

<u>Appendices</u>

A. Transmission Siting Policies by State

B. Multi-Party Cost Allocation

C. State Analysis – Grid Modernization Regulation

Appendix A.

State	Siting Authority	Centralized Siting Authority	Fragmented Siting Authority	Does Not Have a Comprehensive Siting Process	Consider Regional Needs	Siting Authority Supersedes Local Government	Environment or Public Health Impact Study Suggested or Required	Certificate of Environmental Compatibility and Public Need Required	Certificate of Public Convenience and Necessity Required	Eminent Domain	Public Notice Required	Other Type of Approval Required	Other Information
Alabama	Alabama Public Service Commission	X		X	-	-	-	-	X	X	X		X *Electric transmission code
Alaska	Regulatory Commission of Alaska	X		X	X	-	X	-	X	X	X		
Arizona	Arizona Corporation Commission & Transmission Line Siting Committee		X	-	X	-	X	X	-	X	X		
Arkansas	Arkansas Public Service Commission	X		X	X	X	X	X	X	X	X		
California	California Public Utilities Commission	X		X	-	X	X	-	X	X	X		X *Local government involvement
Colorado	Colorado Public Utilities Commission	X		X	-		X	-	X	X	X		
Connecticut	Connecticut Siting Council	X		-	X	-	X	X	-	X	X		
Delaware	Delaware Local Governments		X	-	-		-	-	-	-	-		
Florida	Florida Department of Environmental Protection	X		-	-		X	-	X	X	X		
Georgia	Georgia Public Services Commission		X	X	-		X			X	X		
Hawaii	Hawaii Public Utilities Commission	X		X	-	-	X	-	X	X	X		
Idaho	Idaho Public Utilities Commission	X		X	X	X	X	-	X	X	X		
Illinois	Illinois Commerce Commission	X		X	-	-	X	-	X	X	X		
Indiana	Indiana Utility Regulatory Commission and Local Authorities		X	X	X		X	-	X	X	X		
Iowa	Iowa Utilities Board	X		X	-			-		X	X	X *Requires a petition vs certificate	
Kansas	Kansas Corporation Commission	X		X	X	X	X	-		X	X	X *Requires permit vs certificate	
Kentucky	Kentucky Public Service Commission & Kentucky State Board on Electric Generation and Transmission Siting		X	-	-		X	-	X	X	X	X *Requires construction certificate	
Louisiana	Louisiana Public Service Commission	X		X	-	-	-	-	X	X	X	X *General order	
Maine	Maine Department of Environmental Protection & Maine Public Utilities Commission		X	-	-	-	X	-	X	X	X	X *Site location of development permit also required	
Maryland	Maryland Public Service Commission	X		X	-	-	X	-	X	X	X		
Massachusetts	Massachusetts Energy Facilities Siting Board	X		-	-	-	X	-	X	X	X		
Michigan	Michigan Public Service Commission	X		X	-	X	X	-	X	X	X		
Minnesota	Minnesota Public Utility Commission	X		-	X	-	X	-	-	X	X	X *Route permit required	
Mississippi	Mississippi Public Service Commission	X		X	-	-	-	-	X	X	-		
Missouri	Missouri Public Service Commission	X		X	X	-	-	-	X	X	X		X *Code of Regulations
Montana	Montana Department of Environmental Quality	X		X	-	-	X	-	X	X	X		X *Program requirements
Nebraska	Nebraska Public Service Commission and Nebraska Power Review Board		X	-	X	-		X	X	X	X		X *Does not have a state siting act X **Nebraska Power Review Board Guidelines
Nevada	Nevada Public Utilities Commission	X		X	X	X	X	-	X	X	X		
New Hampshire	New Hampshire Site Evaluation Committee	X		-	-	-	X	-	-	X	X	X *Certificate of Site and Facility	
New Jersey	New Jersey Board of Public Utilities, locality within jurisdiction		X	-	-		-	-	-	X	X	X *Petition of Prosposed Construction	
New Mexico	New Mexico Public Regulation Commission	X		-	-	X	X	-	X	X	X		
New York	New York State Public Service Commission	X		X	X	-	X	X	-	X	X		
North Carolina	North Carolina Public Utilities Commission	X		X	-		X	X	-	X	X		
North Dakota	North Dakota Public Service Commission	X		-	-		X	X	-	X	X	X *Route permit required	
Ohio	Ohio Power Siting Board	X		-	-		X	-	X	X	X		
Oklahoma	Oklahoma Corporation Commission	X		X	X	-	X	-	X	X	X		

Oregon	Oregon Energy Facility Siting Council	X		-	-		X	-	X	X	X		
Pennsylvania	Pennsylvania Public Utility Commission	X		-	-	-	X	-	X	X	X		
Rhode Island	Rhode Island Energy Facility SIting Board	X		-	-	-	X	-	X	X	X		
South Carolina	South Carolina Public Service Commission	X		X	X	X	X	-	X	X	X		
South Dakota	South Dakota Public Utilities Commission	X		-	-	X	X	-	X	X	X	X *Notification of Intent to Apply Required	
Tennessee	Tennessee Public Utility Commission	X		X	X	-	-	-	X	X	X		
Texas	Texas Public Utilities Commission	X		X	X	-	X	-	X	X	X		
Utah	Utah Public Service Commission	X		-	-		X	-	-	X	X	X *Notice of Intent Required	
Vermont	Vermont Public Utility Commission	X		X	-	-	X	-	-	X	X	X *Certificate of Public Good	
Virginia	Virginia State Corporation Commission	X		X	-	X	X	-	X	X	X		
Washington	Washington State Energy Facility Site Evaluation Council	X		-	X		X	-	-	X	X	X *Energy Facility Site Certification	
West Virginia	West Virginia Public Service Commission	X		X	X	-	X	-	X	X	X		
Wisconsin	Wisconsin Public Service Commission	X		X	X	X	X	-	X	X	X		
Wyoming	Wyoming Public Service Commission	X		-	-	-	-	-	X	X	X		

Column B data official links to siting authority websites.

Columns C-E data obtained from OpenEI. OpenEI is developed and maintained by the National Renewable Energy Laboratory with funding and support from the U.S. Department of Energy and a network of International Partners & Sponsors.

Column F-N data obtained from state statutes, administrative code, and/or regulations.

A (-) denotes information was not specified or included in states statute, administrative code, or siting authority website.

Appendix B.

Name	Eligible for Regional Cost Allocation?	Definition
Generator Interconnection projects	No	Enable delivery of a generator's electricity production to the transmission system. These projects are requested by generators. FERC calls these facilities "direct assignment and network upgrade facilities." They are part of a broader category of interconnection facilities. Although these projects are included in all regions' planning studies, whether these projects are included in regional transmission plans varies among regions.
Transmission delivery service projects	No	Satisfy a wholesale transmission customer's request for transmission service. These projects are requested by the customer. FERC also calls these "network upgrades." They are often included in regional transmission plans.
Participant-funded projects	No	Costs are allocated only to those entities that agree to bear the costs. These projects are sometimes included in regional transmission plans.
Reliability projects	Yes	Ensure that the transmission system will be operated in compliance with reliability standards. Traditionally, these projects have been proposed by public- (and non- public) utility transmission providers as additions to the transmission systems that they own. Under FERC Orders 890 and 1000, ISO/RTOs are responsible for planning to meet reliability needs within their regions. Projects are proposed when expectations for future demand growth and/or requests for firm transmission service indicate that reliability standards will be violated at some time in the future if prior action is not taken to reinforce the transmission system. Subsection 3.3 of this report describes both how reliability analysis is conducted for projects and how that analysis is supplemented for transmission solutions that may be selected for regional cost allocation.
Economic projects	Yes	Relieve economic congestion and/or improve the overall economic efficiency of generation dispatch. Planning for projects or project needs that address these economic considerations was initially required under Order No. 890 and is subject to new requirements under Order No. 1000. Subsection 3.4 discusses the procedures that direct how these projects are identified and assessed.
Public-Policy Projects	Yes	Address transmission needs driven by federal, state, or local public-policy requirements. This can be a new category of project type or an aspect of other project types that must now be considered as a result of FERC Order No. 1000.32 Subsection 3.5 discusses the determination of which public policies are considered and how they may affect or drive the need for a transmission solution.
Interregional Projects	Yes	Address the needs of more than one planning region within an interconnection. FERC Order No. 1000 formalized requirements for considering and allocating costs of this category of projects. Subsection 3.6 discusses the identification of these projects and the means by which each region considers them, including how affected regions coordinate their assessments with one another.

***Note on sources: The information above is the culmination of two papers produced by the Lawrence Berkeley National Laboratory. These papers are cited below.**

1.) Eto, Joseph H. "Planning Electric Transmission Lines: A Review of Recent Regional Transmission Plans." 2017. doi:10.2172/1351315.

2.) Eto, Joseph H., and Guila Gallo. "Regional Transmission Planning: A Review of Practices Following FERC Order Nos. 890 and 1000." 2017. doi:10.2172/1411666.

Region	Acronym	ISO?	Project Types Included in Regional Transmission Plan	Project Types eligible for Regional Cost Allocation	Approval Authority for Regional Transmisison Plan and thus, Regional Cost Allocation
California ISO (CAISO)	CAISO	Yes	Reliability, Economic, Public Policy, Interregional	Reliability, Economic, Public Policy, Interregional	Board of Governors (5), approved by CA Governor
ISO New England	ISO-NE	Yes	Generator Interconnection, Elective transmission upgrades, Merchant transmission, Reliability, Market efficiency, Public Policy	Reliability, Market Efficiency, Public Policy	Independent Board of Directors (10) - Not affiliated with market participants
Midcontinent ISO	MISO	Yes	Generator Interconneciton, Transmission Delivery Service, Market participant funded, Baseline Reliability, Other, Market Efficiency, Multi-value	Market Efficiency, Multi-value	Independent Board of Directors (10) - Not affiliated with market participants
New York ISO (NYISO)	NYISO	Yes	Reliability, Economic, Public Policy, Interregional	Reliability, Economic, Public Policy, Interregional	Independent Board of Directors (10) - Not affiliated with market participants
PJM Interconnection	PJM	Yes	Network projects (identified through System Impact studies for new generator and merchant transmission, long-term firm transmission service, and upgrade requests), Baseline projects (address operational perofmrance, market efficiency, and reliability criteria)	Baseline projects	Independent Board of Managers (10) - Not affiliated with market participants
Southwest Power Pool	SPP	Yes	Transmission service, generator interconnection, 10-year and near-term assessments, Balanced Portfolio, high priority studies, sponsored upgrades	10-year and near-term assessment, high priority studies	Independent Board of Directors (10) - Not affiliated with market participants
ColumbiaGrid	ColumbiaGrid	No	Reliability, and "Order 1000 Projects"	"Order 1000 Projects"	Independent Board of Directors (3) - Not affiliated with market participants
Florida Reliability Coordinating Council	FRCC	No	Reliability, "More cost-effective of efficient regional transmission solutions (CEERTS)", Public Policy Projects, Interregional Transmission projects	"More cost-effective of efficient regional transmission solutions (CEERTS)", Interregional transmission projects	Board of Directors (16), organized into 6 sectors, each with different voting weights
Northern Tier Transmission Group	NTTG	No	More Efficient or cost effective than other options		Steering Committee composed of the 6 utilities, state public utilities commissions (ID, MT, OR, UT, WA, WY), and state consumer advocates (UT and MT)
South Carolina Regional Transmission Planning	SCRTP	No	Regional transmission projects that are selected from regional cost allocation (either reliability, economic, or public policy projects)	Regional transmission projects that are selected from regional cost allocation	Transmission providers (South Carolina Electric and Gas, and Santee Cooper)
Southeastern Regional Transmission Planning	SERTP	No	Projects that are more cost-effective or efficient	Projects that meet prerequisites set forth in the tariff	Transmission providers (10 sponsors, including jurisdictional transmission providers and non-jurisdictional utilities)
WestConnect	WestConnect	No	Projects selected as the more efficient or cost-effective alternative to an identified regional need (analyze reliability, economic, and policy)	Projects selected as the more efficient or cost-effective alternative to an identified regional need	Planning Management Committee (representatives organized in five sectors)

Region	Minimum Physical Requirements for Regional Cost Allocation	Competitive methodology to select transmission project or developer	Allow for reliability driven circumstances that do not require competitive process?	Transmission Planning Cycle	Entity that determines which Policy Requirements should be considered (ISO Specific)
California ISO (CAISO)	1.) Greater than or equal to 200kV 2.) Located in more than one retail distribution service territory or footprint if < 200kV	Competitive solicitation	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	15 month cycle, begins every January (overlap in cycles for 3 months)	Do not know
ISO New England	1.) Greater than or equal to 115kV	Sponsorship	**Yes,** Projects required to meet reliability needs within next 3 years (except when a market efficiency transmission upgrade is likely a solution)	No set planning cycle - evaluates transmission needs and transmission projects on an ongoing basis	New England States Committee on Electricity (NESCOE)
Midcontinent ISO	**Market Efficiency** 1.) Greater than or equal to $5 million 2.) Greater than or equal to 345kV 3.) Greater than 100kV if less than 50% of the project and needed for greater than 345kV transmission facilities **Multi-Value** 1.) Greater than or equal to $20 million 2.) Greater than 100kV	Competitive solicitation	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	18-month cycle, and each new cycle begins in June (cycle overlap for 6 months)	Organization of MISO States for MISO
New York ISO (NYISO)	1.) Generally Greater than 200kV 2.) For Economic projects, greater than or equal to 100kV	Sponsorship	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	Two-year cycle, typically begins on January of even numbered years	NY Department of Public Service (NYDPS)
PJM Interconnection	**Reliability and Economic Regional Facilities** 1.) Greater than or equal to $5 million 2.) Greater than or equal to 345 kV 3.) Greater than or equal to 500 kV single circuit	Sponsorship	**Yes,** Projects required to meet reliability needs within next 3 years	Two-year cycle, typically begins on January of even numbered years	Organization of PJM States
Southwest Power Pool	**Highway** 1.) Greater than or equal to $100k cost 2.) Greater than or equal to 300kV **Byway** 1.) Greater than or equal to $100k cost 2.) Between 100kV and 300kV	Competitive solicitation	**Yes,** Projects required to meet reliability needs within next 3 years	Three-year cycle, new one begins each january	Do not know
ColumbiaGrid	None	Sponsorship	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	Two-year cycle, new cycle begins January of odd-numbered calendar year	Do not know
Florida Reliability Coordinating Council	1.) Greater than or equal to 230kV 2.) Greater than or equal to 15 miles 3.) Materially different from projects already in regional tranmission plan	Sponsorship	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	Two-year cycle, new cycle begins January of odd-numbered calendar year	Do not know
Northern Tier Transmission Group	1.) Greater than or equal to $20 million	Sponsorship	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	Two-year cycle, typically begins on January of even numbered years	Do not know
South Carolina Regional Transmission Planning	1.) Greater than or equal to 230kV 2.) Materially different from projects already in the regional plan	Sponsorship	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	Two-year cycle, typically begins in Fall of even numbered years	Do not know
Southeastern Regional Transmission Planning	1.) Greater than or equal to 300kV 2.) Greater than or equal to 50 miles	Sponsorship	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	One-year cycle, begins each January	Do not know
WestConnect	None	Competitive solicitation	**No,** all new projects that seek regional cost allocation must be selected through an open, competitive process	Two-year cycle, typically begins on January of even numbered years	Do not know

***Note on sources: The information above is the culmination of two papers produced by the Lawrence Berkeley National Laboratory. These papers are cited below. I have also added clarity from regional transmission plans where applicable, into column D. All of these transmission plans are linked in this column**

1.) Eto, Joseph H. "Planning Electric Transmission Lines: A Review of Recent Regional Transmission Plans." 2017, doi:10.2172/1351315.

2.) Eto, Joseph H., and Giulia Gallo. "Regional Transmission Planning: A Review of Practices Following FERC Order Nos. 890 and 1000." 2017, doi:10.2172/1411666.

**The NYISO link is only for the reliability plan. They have their documents split out into separate documents. Below are the others

Policy

Interregional

Transmission Expansion/Interconnection

***NTTG does not have links because they were recently dissolved as a regional transmission entity, so their website is no longer active. ColumbiaGrid and NTTG dissolved to create one entity, Northern Grid, but this is new as of this year, so no documents

****Other relevant report for SPP

Appendix C.

State	Policy Phase	Summary of Policy	Relevant Legislation	Relevant Legislation 2	Energy Plan
Alabama	Ignoring	Alabama has no state regulation driving the investment in transmission infrastructure or smart grid. In October 2020, AL ruled to increase a rooftop solar tax, and can generally be considered a regressive, anti-renewable, anti-investment, anti-smart grid state.			
Alaska	Ignoring	Alaska's Railbelt Electric Grid would mandate that utilities form an Electric Reliability Organization, or ERO, that would oversee implementation of system-wide reliability standards and coordinate long-term planning amongst the utilities. It also gives the RCA explicit authority to rule on the necessity of large infrastructure projects. Alaska does not directly address Grid Modernization, focusing instead on general resiliency and asset utilization			In progress: Railbelt electric grid legislation
Arizona	Exploring	Arizona has strong state regulatory support for Grid Modernization; in 2018 the Arizona Corporation Commission proposed the "Arizona Energy Modernization Plan," including a policy framework with specific goals and guidance on grid optimization investment			2019 Arizona Energy Modernization Plan
Arkansas	Exploring	The 2019 Arkansas Energy Assurance Plan evaluates the potential for developing a smart grid, and the 2017 ASPC recommended exploration of DERs, Advanced Metering Infrastructure	2017: ASPC Docket 16-028-U		2019 Arkansas Energy Assurance Plan
California	Investing	California is the national leader in state policy regarding Grid Modernization. In 2008, California PUC enacted a rulemaking to actively guide and incentivize Smart Grid. It requires the published an annual Smart Grid Report by the PUC, and requires each of the three major IOUs to submit annual "Smart Grid Deployment" reports to the PUC.	2008: R.08.-12-009		2019 Smart Grid Annual Report
Colorado	Exploring	In 2017, Colorado PUC approved Xcel Energy's $610M Grid modernization Investment proposal for AMI and voltage optimization. In 2010 SB10-180 created CO Smart Grid Task Force for planning and incentivizing Grid Modernization investment	2010: SB10-180		2018 State Trends in Grid Modernization
Connecticut	Exploring	In October 2019, CT PURA launched House Bill 06238, an effort to create a framework for an "Equitable Modern Grid." July 2020 saw launch of 3 specfic proceedings to explore most efficient and effective Grid Modernization policies (currently in phase 3/4 planning).	2019: HB 6238		
Delaware	Investing	Delaware's state legislature has supported Grid Modernization since at least 2009, with specific language and requirements in the 2009 State Energy plan. Has achieved 68% AMI penetration without receiving ARRA funds. In 2009, issued order supporting deployment by all electric utilities of DR, Efficiency, AMI, and Smart Grid, with dynamic pricing.			2009 Delaware Energy Plan
Florida	Sabotaging	Florida's most recent publidiation regarding energy is the 2008 Energy & Climate Change Action Plan, which recommends upgrading and modernization, but FL does not have a specific grid modernization plan, nor specific policy incentives to encourage. 2018's SB S1586 to create a Grid Modernization initiative died in legislation			2008 Energy & Climate Change Action Plan
Georgia	Ignoring	Georgia does not have a specific Grid Modernization plan, primary focus is on investment in resiliency and hardening. The 2014 Georgia Energy Report mentioned "Smart Grid" two times in 20 pages.			2014 Georgia Energy Report
Hawaii	Investing	In 2017 Hawaii's PUCO established a Grid Modernization Plan via Order No. 34821. In March 2019 approved $86M in first phase for Hawiian Energy, and is among the national leaders of grid modernization investment policy.	2017: Order No 34281		
Idaho	Ignoring	Idaho does not have a specific Grid Modernization plan. Investments in Grid Modernization are being driven by Utilities; Idaho Power has proposed net metering changes, but no other major AMI or smart grid investments of policies exist			2012 Idaho Energy Plan
Illinois	Investing	Illinois is among the very best states in terms of grid investment policy, creating a grid modernization plan in 2011 via the Energy Infrastructure Modernization Act, along with further legislation actively incentivizing investmetn via 2018 Future Energy Jobs Act	2017: "Future Energy Jobs Act"	2011: Energy Infrastructure Modernization Act	
Indiana	Ignoring	Indiana does not have a legislated Grid Modernization plan, but the PUC approved Duke's (2016, $1.4B/7 years), Vectren's (2017, $446M/7) and IPL's (2020, $1.2B/y) grid mod plans			
Iowa	Exploring	Iowa released the 2016 Iowa Energy plan, which discusses grid modernization with guidance on AMI and other smart grid adoption, but has not actively passed legislation incentivizing or requiring investment in smart grid. In 2018, the IUB required Alliant Energy to file a grid modernization plan as commentary on a rate case, citing slim details in the existing filing (no further news available).		2016 Iowa Energy Plan	
Kansas	Sabotaging	A January 2020 independent study found that Kansas had no state energy plan, no active grid mondernization plans, and does not require utilities to submit IRPs. The PUC has been accused of deliberate foot dragging. Kansas has some of the highest residential energy rates in the country, while state IOUs are among the most profitable.			
Kentucky	Sabotaging	Kentucky has no grid modernization plan, and its only state energy plan was released in 2008. Kentucky is an actively regressive grid modernizaton regulator, having denied in 2018 state IOU proposales for AMI investment.			
Louisiana	Ignoring	Louisiana has no state energy plan in place, but does require utilities to submit IRPs, and approved Entergy's Grid Modernization plan in 2019. The city of New Orleans has independently worked with Sandia National Labs on a Grid Modernization plan, but no state-level legislation exists.			
Maine	Investing	Maine passed the Smart Grid Policy Act in 2010, creating a framework and inventive system for comprehensive grid modernization, and failed to enact follow-on legislations including 2017's "Act to Improve Efficiency Through Electric Rate Design and Advanced Technology" and 2018's "Act to Control Electricity Transmission Costs Through the Development of Nontransmission Alternatives"	2010: HP1079 "Smart Grid Policy Act"		2020 Strengthening Maine's Clean Energy Economy
Maryland	Investing	Maryland is among the national leaders in grid modernization policy, and maintains a Strategic Energy Investment Fund. Recent moves including a 2016 PCS-ordered review called "Transforming Maryland's Electric Grid," and the passing of 2017 PC44 Transforming Maryland's Electricity Grid. Maryland hosted the 2019 National Governors Association "Grid Modernization Retreat." These initiatives have led to multiple legislations on grid modernization & investment.	2017: PC44 "Transforming Maryland's Electric Grid"		
Massachusetts	Investing	Mass passed the DPU Grid Modernization order of 2018, requiring and approving a plan for each state IOU, requiring tri-annual modernization reports, and is in Phase 2 of the plan as of July 2020	2019: HB 2808 "Promoting Local Energy Investment and Infrastructure Modernization"	2018 Grid Modernization Order	2018 Comprehensive Energy Plan
Michigan	Exploring	In October 2019, Michigan PSC established a grid modernization information consolidation initiative "MI Power Grid," following on 2016 revision or state energy laws. March 2020 saw an update with more specifics about MI regulatory requirements for Consumers & DTE.			2018 MI Power Grid plan
Minnesota	Exploring	Minnesota's PUC released the State Report on Grid Modernization in 2016, alongside the 2016 "Energy Policy and Conservation Quadrennial Report" but does not have further legislative action to actively incentivize or drive grid modernization investment among IOUs.			2016 Grid Modernization Report
Mississippi	Exploring	Mississippi's 2017 Energy Roadmap includes specific guidance on grid modernization, building on the 2011 Blueprint Mississippi. However, in 2016 the state legislature shot down DER and Net Metering program legislations that would have helped actively incentivize actual investment.			2017 Energy Roadmap
Missouri	Exploring	Missouri's 2015 State Energy Plan has explicit provisions for incentivizing grid modernization investment. In Feb 2018, SB564 passed, simplifying the rate case and creating incentives for IOUs to invest in infrastructure, including smart grid, AMI and other modernization efforts.	2018: SB564		2015 State Energy Plan
Montana	Ignoring	Montana included no Grid Modernization language in its 2014 State Energy Plan and no known legislation regarding Grid Modernization guidance or incentives. Participated in the Pacific Northwest Smart Grid Demo plan 2010-2014 but no further investment. 2020 transmission meeting does not materially mention Smart Grid or any other Grid Modernization concepts.			2014 State Energy Plan
Nebraska	Ignoring	Nebraska has no Grid Modernization lanugage included in its 2011 State Energy Plan, and no known regulation related to Grid Modernization has been introduced or discussed in Nebraska legislative sessions.			2011 State Energy Plan
Nevada	Ignoring	Nevada has no direct grid modernization plan in its 2016 Energy Markets Roadmap; minimal emphasis on smart grid upgrades among NV utilities, and no legislation currently pending or discussion known.			2016 Energy Markets & Planning Roadmap
New Hampshire	Investing	New Hampshire enacted smart grid legislation in 2012, created the Grid modernization Working Group in 2015, and passed legislation to implement working group findings in 2017. Published the Grid Modernization in NH report in 2017, with continual upgrades through 2020. Among the national leaders in Grid Modernization.	2018: HB401	2019 Investigation into Grid Modernization	2017 Grid Modernization In New Hampshire
New Jersey	Enabling	New Jersey has a specific grid modernization goal in the 2019 Energy Master Plan. NJ utilities have been allowed to invest in smart grid and other AMI upgrades, no known specific regulation incentivizing GM			2019 NJ Energy Master Plan
New Mexico	Investing	In 2020 New Mexico passed HB 233 directing the development of a roadmap for grid modernization, the establishment of a GM grant program, and actively enabling utilities to submit for GM investment cost recovery	2020: HB233		
New York	Investing	In 2019 New York enacted the New York Grid Modernization Act, following 2019's $15M "Future Grid" GM challenge. 2020's Accelerate Act led to a "Transmission Planning Order" to further provide guidance and investment in GM initiatives	2019: A1835 "New York Grid Modernization Act"		2015 State Energy Plan
North Carolina	Investing	NC is among the top states for grid modenization actions in the US. 2017 SB 619 established a study of GM in NC. The 2016 Energy Policy Council Report established a grid modernization plan, and Duke Energy is investing $2.5B in AMI and GM upgrades (though that was cut down from proposed $7.8B)	2017: SB 619		2020 Energy Policy Council Biennial Report
North Dakota	Sabotaging	North Dakota has negligible public mention of Grid Modernization, and even in the most recent legislative and regulatory sessions can be characterized as aggressively ignoring transmission investment. North Dakota's 2020 Transmission Authority Annual report mentions "Grid Modernization" once; smart grid is not mentioned at all			2020 North Dakota Transmission Authority Annual Report
Ohio	Exploring	Ohio released the 2018 Power Forward Grid Modernization plan; no active investment yet known, utilities have been able to cost recover for smart grid upgrades			2018 Power Forward Grid Modernization Plan
Oklahoma	Sabotaging	Oklahoma has no identiable energy plan nor grid modernization plan, nor any active regulation around Grid Modernization. Oklahoma utilities have proposed but not received permission for upgrades, OCC remains heavily budget conscious and investment conservative.			2011 Oklahoma First Energy Plan
Oregon	Investing	In September 2018, Oregon adopted a grid modernization plan as part of SB 978 "Adapting to a Changing Energy Sector", requiring utilities to file biannual Smart Grid Reports on their implementation of AMI and other Smart Grid investments.	2018: SB979 "Adapting to a Changing Energy Sector"		Oregon Grid Modernization Plan
Pennsylvania	Exploring	Pennsylvania has no Grid Modernization plan as part of its 2014 State Energy Plan; Utilities have been able to implement GM investment programs, with some permissive regulation around rate setting for GM investment (2018 HB 1782)	2018: HB 1782		2014 State Energy Plan
Rhode Island	Investing	Rhode Island is a national leader in grid investment; Governor Raimondo has pushed agencies to consider energy sector transformation, resulting in the 2017 "RI Power Sector Transformation" proposal, and 2018 legislation has provided advanced rate structures for National Grid to invest in AMI and other GM	2018: Advanced Rate Structures		2017 Power Sector Transformation Initiative
South Carolina	Exploring	In 2020, South Carolina passed SB 998, enabling a comission to study grid modernization recommendations following a 2019 grid modernization study conducted with GridLab. No major utility GM initiatives currently known	2020: SB 998		
South Dakota	Ignoring	South Dakota is among the worst states for Grid Modernization investment, with no state energy plan and essentially negative regulatory permissiveness			
Tennessee	Ignoring	Tennessee is among the worst states for Grid Modernization investment, with no state energy plan, negative regulatory permissiveness			
Texas	Investing	Texas is a national leader in grid modernization investment policy, first deployed AMI in 2008. Due in part to the power and solidarity of ERCOT, as well as recent experiences hurricanes have made investment policy an easy sell. 2018 saw the approval of legislation enabling AMI deployment. In 2016, Pacific Northwest National Laboratory wrote a DOE case study on Texas' energy policy			Case Study: Texas Wind, Markets, Grid Modernization
Utah	Ignoring	Utah's 2018 energy action plan is short and relatively vague, does not have any specific emphasis on grid modernization. No regulation addresses grid modernization, one provision dictates data gathering for utility customers, but is otherwise irrelevant	2020: HB 230		2018 Utah Energy Action Plan
Vermont	Exploring	Vermont's PUC initiated grid modernization exploration in 2017, but Vermont does not currently have active investment regulations for smart grids			2016 Comprehensive Energy Plan
Virginia	Exploring	2018's State Energy Plan includes specific guidance and recommendations around Grid Modernization. In 2018 Virginia enacted SB 966 "Electric Utility Regulation, Grid Modernization, Energy Efficiency," creates permissive rate schedules for VA utilites. However, the SCC has rejected Dominion's AMI plan twice, most recently March 2020.	2018: SB966 "Electric Utility Regulation, Grid Modernization and Energy Efficiency"		2018 Energy Plan
Washington	Investing	Washington is home to the Clean Energy Fund (CEF), which drove ~$50M of investment over the 2010s specifically towards grid modernization initiatives. In 2017, WA released a detailed Distributed Energy Resources (DER) planning report laying out goals and processes for grid modernization	Washington Clean Energy Fund		2017 DER Planning Report
West Virginia	Ignoring	West Virginia's state energy plan was enacted in 2012 with 5 year horizon, and does not contain the phrases "Grid Modernization" with a single "Smart Grid" in 400 pages. No further policy or regulatory attention known.			2013-2017 Energy Plan
Wisconsin	Ignoring	Wisconsin's 2018 Strategic Energy Assessment includes specific guidance and programs to collaborate with utilities on grid modernization. No active regulation incentivizing investment in Wisconsin			2017 Strategic Energy Assessment
Wyoming	Ignoring	Wyoming has no direct mention of grid modernization in its 2013 Energy plan, and no legislation regarding grid modernization incentives, enablement, or anything else			2013 Energy Plan

Glossary of Terms

Advanced Metering Infrastructure: Smart meters, IoT-connected meters, and other digital energy metering systems that enable real-time monitoring and coordination of energy usage

Centralized Siting Authority: One entity has preemptive authority over transmission siting determinations.

Certificate of Convenience and Necessity: A certificate issued by an agency granting a company authority to operate a public service especially as a utility or transportation company.

Comprehensive Siting Process: According to the OpenEI, "Some states have a process for siting and/or coordinating various reviews and approvals for constructing a transmission facility. These comprehensive siting processes may consider environmental, ecological, scenic, recreational, and historic values of the state. Typically, the state public utility authority (e.g., public utility commission) or an energy, power, or siting board consisting of members from several interested state agencies is charged with conducting comprehensive siting reviews. Additionally, the developer must comply with any applicable local siting or zoning ordinances."

Eminent Domain: The right of a government or its agent to expropriate private property for public use, with payment of compensation.

Fragmented Siting Authority: More than one entity has preemptive authority over transmission siting determinations.

Acronyms

BPA	Bonneville Power Administration
CREZ	Texas Competitive Renewable Energy Zones
FERC	Federal Energy Regulatory Commission
ISO	Independent System Operator
IOU	Investor-Owned Utility
MISO	Midcontinent Independent System Operator
NCSL	National Conference of State Legislatures
NREL	National Renewable Energy Laboratory
PJM	Pennsylvania-New Jersey-Maryland Interconnection LLC

PPA	Power Purchase Agreement
PUC	Public Utility Commission
PURPA	Public Utility Regulatory Policy Act
RTO	Regional Transmission Organization
SPP	Southwest Power Pool

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