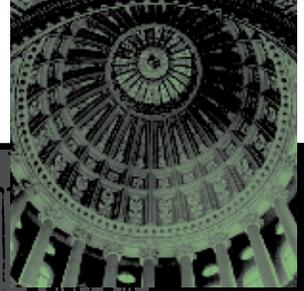


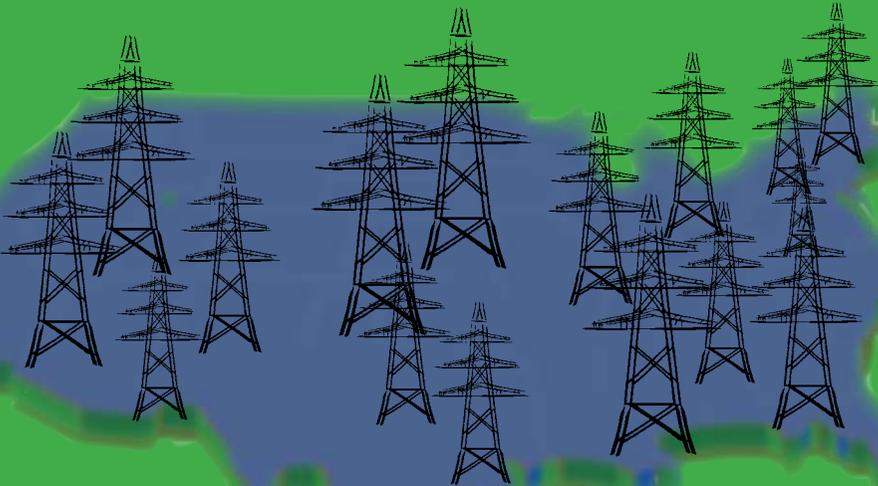


NATIONAL CONFERENCE
of STATE LEGISLATURES

The Forum for America's Ideas



REGIONAL RELIANCE WHY TRANSMISSION COORDINATION IS KEY



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By
Matthew H. Brown



NATIONAL CONFERENCE *of* STATE LEGISLATURES

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INTRODUCTION

We are not living with Thomas Edison's or George Westinghouse's electric power industry. It's not the electric industry of Herbert Hoover's, or Franklin Roosevelt's, or even Ronald Reagan's era. From its experimental origins in Edison's Manhattan, the power industry has evolved into a vast, interstate network that some people call the world's single largest machine. Simply put, it enables the modern economy to function. State legislatures make crucial policy decisions that affect the electricity system, a system that crosses county, state and national borders. State policy choices about electricity now, more than ever, affect more than a single state.

In its earliest days, the power system consisted of a host of small, discrete and separate networks. Now it is a vast network that crisscrosses the nation and extends into Canada and Mexico. According to the U.S. Department of Energy's Energy Information Administration there was a 216 percent increase in interregional trade by investor-owned utilities and a 51 percent increase by cooperatives between 1990 and 1996.¹ Interregional electricity trade has increased manyfold since that point, including the vast amounts of electricity sales that occur between utilities, competitive power suppliers, marketers and commercial, and industrial customers, among many others.

As a result of electricity's increasingly regional nature, policy decisions that once were local now need to consider at least regional factors, even though state or local officials will continue to make many of the final decisions. It is critical for state legislatures to keep this fact in mind whenever they make policy decisions that affect the power system. Decisions based only on local considerations can make the power system less reliable,

less flexible and efficient, and more costly. Regional cooperation brings strength to the power system.

The last five years demonstrate why state policymakers will want to consider the power business in regional terms. Consider the East Coast blackout in August 2003, which within seconds crossed state and national boundaries; the California market collapse of 2000-2001 that affected power and gas prices across the entire western United States; and high natural gas prices and tight supplies across the country that in 2005 have increased power prices in most areas. The nine facts listed here further describe a power system that already is regional and, indeed, international. This report is not meant to be a detailed policy analysis; rather, it illustrates in more detail the need for state policymakers to consider electricity as a regional commodity.

THE EVIDENCE: NINE POINTS

1 States Depend upon Each Other to Export or Import Power

Imports and exports of electricity let regions take advantage of each others' resources. For example, California can use the Northwest's hydroelectric resources in summertime when the Northwest usually has excess power. The Northwest can use California's power resources in the winter when California usually has excess power. This interdependence reduces the total number of power plants that any of the states in this region need to build. Areas with more coal or hydroelectric capacity than they need often export electricity to areas that would otherwise have to use higher-cost sources. Table 1 shows power imports and exports into and out of several U.S. states and regions.

Table 1. Power Import/Export Data by Regions and States			
California—Hourly Net Interchange			
	Max Exports MW	Max Imports MW	Average Net Exports (Imports) MW
Arizona	1,830	6,754	(3,765)
Imperial Valley	365	597	(331)
Los Angeles Department of Water and Power	1,176	1,626	(135)
Mexico	270	515	(125)

Table 1. Power Import/Export Data by Regions and States (continued)			
California—Hourly Net Interchange			
	Max Exports MW	Max Imports MW	Average Net Exports (Imports) MW
Nevada/Utah	335	1,196	(569)
Northwest	1,900	5,867	(2,457)
Sacramento Municipal Utility District	1,973	430	795
New England—Hourly Net Interchange			
	Max Hourly Exports MW	Max Hourly Imports MW	Average Hourly Net Exports MW
Hydro Quebec - Highgate	82	218	(130)
Hydro Quebec - Phase I/II	707	1,643	(293)
New Brunswick - Keswick	300	678	(151)
New York - Cross Sound Cable	330	50	82
New York - Roseton	1,219	1,048	(63)
New York—Average Hourly Interchange			
	Max Exports MW	Max Imports MW	Average Net Exports (Imports) MW
Hydro Quebec (HQ)	1,001	1,325	(97)
New England (ISO- NE)	1,030	1,219	54
Ontario (IESO)	1,731	2,400	(798)
PJM	2,656	2,807	(856)

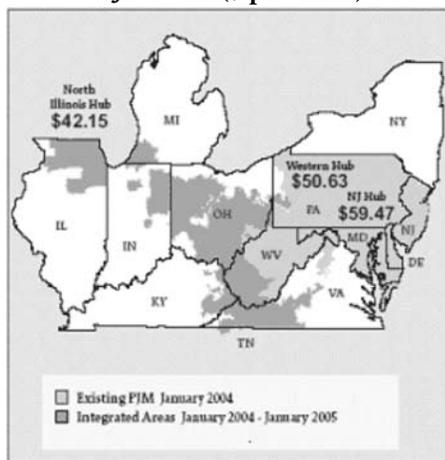
Source: 2004 Federal Energy Regulatory Commission (FERC) *State of the Markets Report*, 2005.

States also benefit from exports and imports to improve the reliability of their power system and to reduce their power prices. Reliability improves when one state has access to a wide variety of different kinds of power stations in different locations. Overall prices decline for the same reasons. The Mid-Atlantic states' average power costs have gone down since the transmission organization (PJM) that manages that region's power system expanded. PJM now operates an integrated transmission system

that lets power flow from the less expensive western regions to the traditionally more expensive eastern regions. PJM has reduced overall regional prices by 16 percent since it expanded westward and integrated this larger power system.² Figure 1 shows the lower cost Midwestern resources that can be integrated into the larger PJM system to reduce overall costs of power. As a general rule, other parts of the country see economic benefits from regional coordination, although the institutions they use to collaborate with one another may be different from those in the Mid-Atlantic states. Sometimes

this overall integration can be controversial. That is, opening the gates to allow inexpensive power to flow out of inexpensive regions tends to reduce electricity prices in high-cost regions, but also may lead to somewhat higher electricity prices in the inexpensive regions. The exporting areas, however, also usually see some offsetting benefits associated with the higher electricity sales (higher incomes in affected industries, increased tax base, etc.).

Figure 1. 2004 Average Power Hub Prices for On-Peak Hours in Existing and Integrated PJM Areas (\$ per MWh)

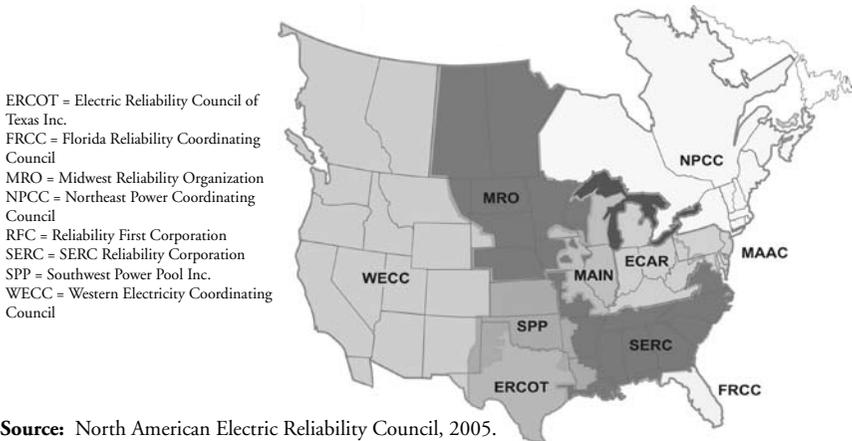


Source: 2004 Federal Energy Regulatory Commission (FERC) State of the Markets Report, 2005.

2 Transmission Systems Have Become Regional in Size and Scope

North America has three geographically separate grids, or “interconnects”: the western states and provinces (not including Alaska), the eastern states and provinces, and Texas. Within these grids, power moves chiefly through networks of alternating current (AC) transmission lines. No AC lines cross the interconnect boundaries, but the interconnects are linked in a few places by direct current (DC) transmission lines. Within the interconnects, electricity flows along the transmission lines over paths of least resistance. Figure 2 shows the boundaries of these grids and demonstrates, again, that the power system has become regional. A disruption on a power line in Montana can affect the power system as far away as California, or a power plant disruption in New York can affect the entire east coast. Since the interconnects are separated (except for a few limited DC links), however, an electrical problem in Utah (located in the western interconnect) will not have much effect on Chicago (in the eastern interconnect). These regional power systems function in order to send power within regions—sometimes over long distances within those regions—and have little to do with state boundary lines.

Figure 2. Boundaries of U.S. Electric Grids



3 The Distance Between Power Plants and the Load They Serve Often Is Great

Thomas Edison built his first power plants in 1882 to serve the small area immediately surrounding Pearl Street in lower Manhattan. Shortly thereafter, he built another small system to serve the town of Menlo Park, New Jersey. His and others' early systems were essentially small, distributed power systems. They were isolated and disconnected from one another. In part, this reflected the fact that the early systems used a distribution technology called direct current, which in its form at the time required that generators be located within a mile or so of the electric load (customers) they served.

By the 1890s, other inventors had developed new electricity transmission technologies that allowed for transmission of electricity over longer distances. In 1896, George Westinghouse built an 11,000 volt power line to connect generators at Niagara Falls to Buffalo, 20 miles away. The transmission system grew quickly from that point. Within the next 25 years, it had grown from its early beginnings as a strictly locally delivered commodity to increasingly larger regional networks that crossed state boundaries. The power system had become a truly regional network by the middle of the 20th century, although as a network it still had many weak points.

Today, people are trying to use that regional network more intensively to generate power at sites that are far from urban load centers. Proposed coal and wind plants in Wyoming would serve customers in Colorado, Utah, Nevada and California. California is an attractive market because its size dwarfs that of the rest of the western United States, but it is difficult to site new power plants there. By comparison, coal, wind and gas resources are abundant in many other western states, and the permitting process to build a new power station is generally faster and easier. A recent *Rocky Mountain News* article describes one example of companies sending power far across state lines (see text box below).

Excerpt from “Plan Aims to Power Up Transmission Lines,” by Gargi Chakrabarty, Rocky Mountain News, September 28, 2005

A \$318 million project announced Tuesday to upgrade transmission lines between Colorado and Wyoming could benefit both electricity consumers and producers.

The proposed project involves the addition of a 345-kilovolt line from northeastern Wyoming to the Ault substation, just east of Fort Collins.

Wyoming officials initiated the project to help that state’s coal-burning power plants in the Powder River Basin sell cheaper electricity to Colorado homes and businesses along the Front Range.

The upgraded lines also would help Colorado power plants, especially wind farms along the state’s northern border, to sell power in Wyoming and eventually other markets, including California, said Steve Waddington, executive director of the Wyoming Infrastructure Authority.

The WIA, set up by the Wyoming legislature last year, is one of the partners in the project. The other two are the Western Area Power Administration and Virginia-based Trans-Elect, a private company.

That would help Colorado power plants, especially wind energy farms, to sell in California. And it would enable Colorado utilities to buy renewable energy—such as wind, solar and geothermal—from Wyoming and Utah.

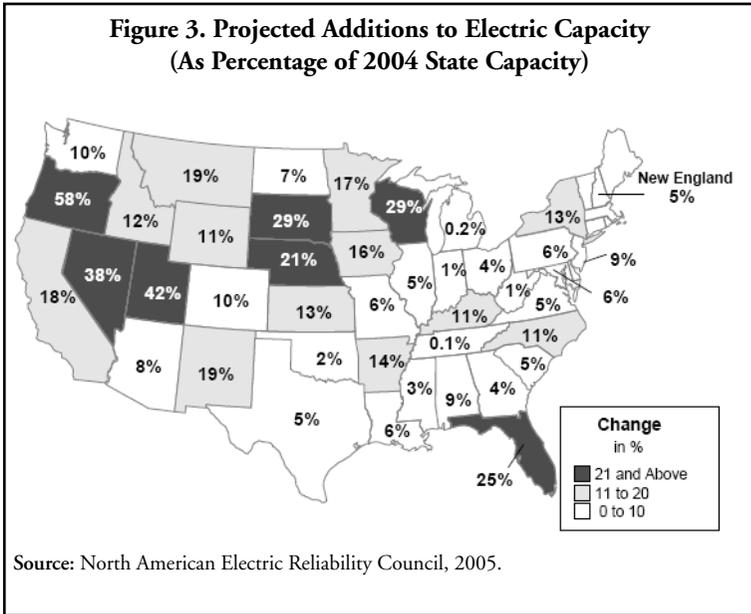
Similarly, power companies have built power plants in Arizona to serve California customers, and they would like to build more. The existing transmission system limits this trade, however, giving rise to concerns about reliability and the need for more interstate transmission capacity (see text box).

Palo Verde Transmission Development Lags Generation Growth

During 2002 and 2003, more than 6,000 MW of new generation was connected to the transmission grid near the Palo Verde Hub in Arizona. By the end of 2003, grid upgrades had increased the maximum power flow from Palo Verde eastward (towards Phoenix) to 6,970 MW from 3,810 MW. The capacity to transfer power west from Phoenix into California has not grown [from its level of 2,800 MW] since the new merchant generation was built. Westbound transfer capability was enough to support historical levels of peak hour power exports to California, but not more. The Arizona Corporation Commission (ACC) reported in 2004 that merchant generators may find themselves “stranded at the hub due to transmission limitations into California...In its transmission assessment, ACC staff raised reliability concerns about the large amounts of generation built near the Palo Verde transmission hub...

Source: FERC 2004 State of the Markets Report, 2005.

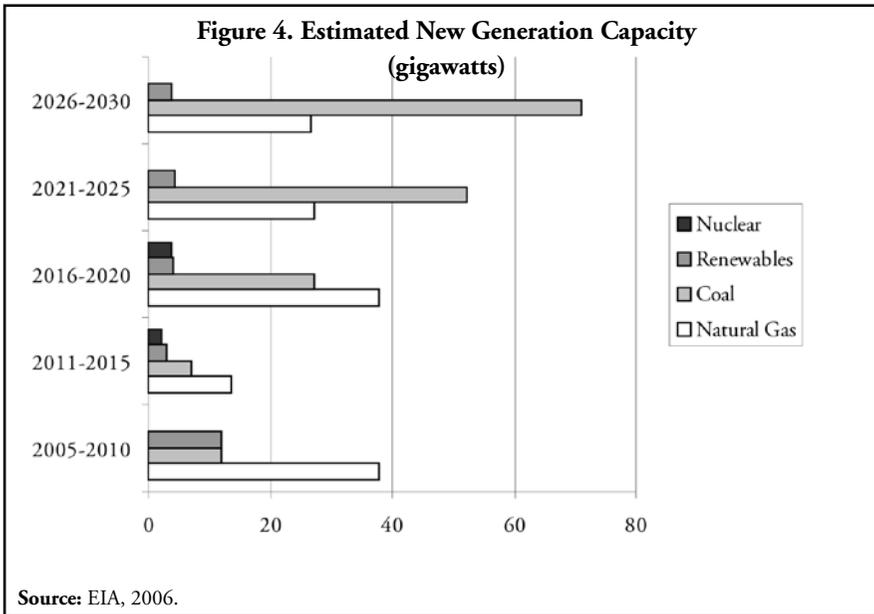
As noted above in table 1, states both import and export power. Figure 3 shows projected additions to electric capacity as a percentage of each state's 2004 capacity. California, for example, is a net importer of power; Arizona is a net exporter. Much of the projected new generation shown in figure 4 will be built for export to other states. In many cases, the states with projections of large amounts of new generating capacity are not expecting their in-state demand to grow at the same rate.



4 Regional Interdependence Will Increase in the Near Future

The country is on a track toward more regional interdependence because of increasing reliance on two resources: coal and wind. Coal is expensive to ship by rail to distant power plants located near population centers. Developers also often meet with opposition from local groups that oppose building coal facility near the large population centers. Project developers frequently prefer to build a coal plant near the mouth of the coal mine and generate electricity to send over power lines to distant markets. Wind power plants must be built where the strongest and steadiest winds blow. Wind plants need a strong network of transmission lines to deliver their power to market. Natural gas, on the other hand, is different. It often is easier to ship gas through an interstate pipeline network to serve gas-fired power plants situated close to the loads that they serve.

For the last several years, the United States has relied on natural gas to fuel almost all its new power plants. It was cheap to do so when gas prices were at about \$2 per mMBtu (million British Thermal Units), and reasonable to do so when gas cost about \$4 per mMBtu. It became less practical as gas prices rose higher, to more than \$6 and, at the end of 2005, to more than \$11. These changes have made other generation sources, particularly coal and wind, more attractive. Figure 4 shows these trends continuing through 2030, with gas-fired power plants dominating for a few years, but then falling out of favor in a higher cost environment.



The projections for the future of generating capacity show more increased reliance on coal and on wind plants, although the U.S. Energy Information Administration continues to project that the country will use considerable amounts of natural gas for power plants.⁶ If these projections hold, a stronger interstate network of transmission will be critical to move the power from distant plants to loads. Figures 5 and 6 show projections for both coal and wind power plants.

Figure 5. U.S. Coal Capacity Additions, 1940-2025

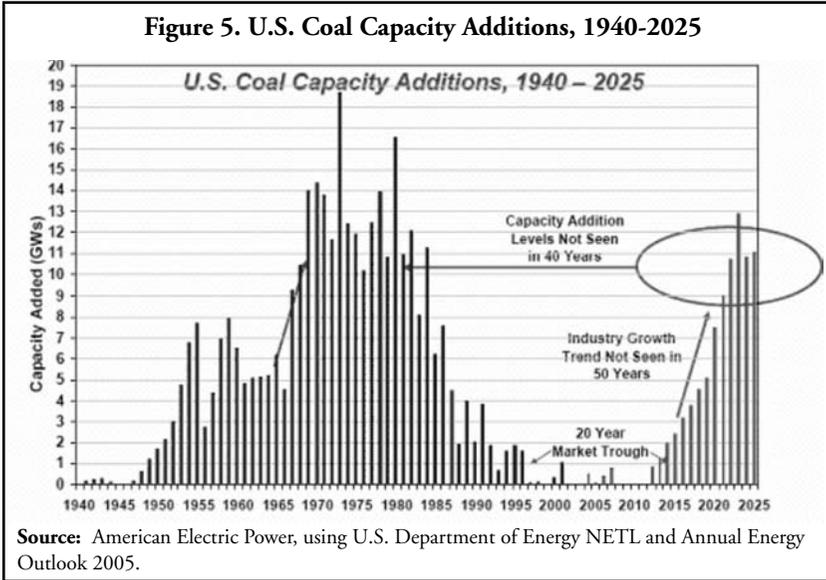


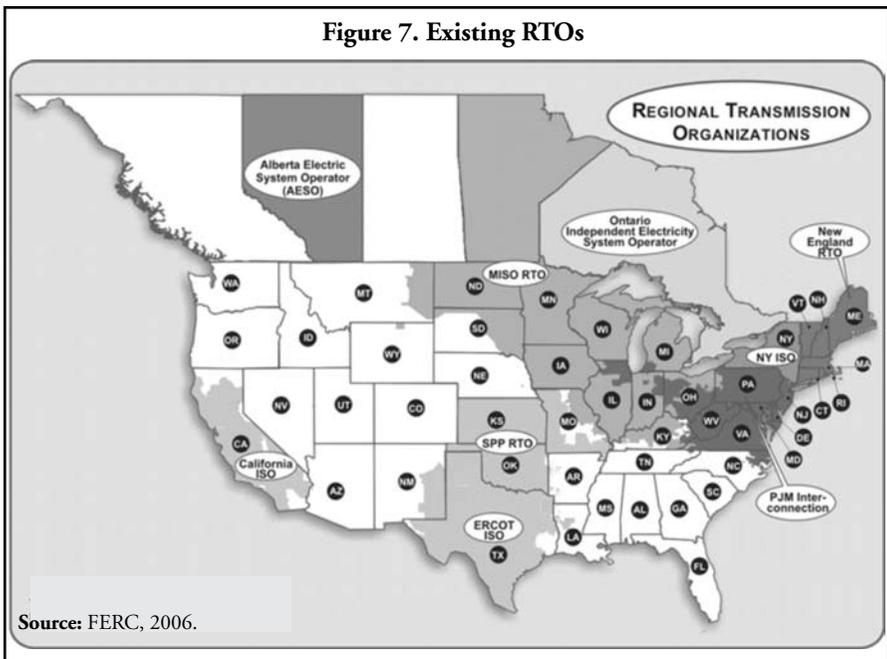
Figure 6. Installed Wind Capacity (Megawatts), 1981-2005

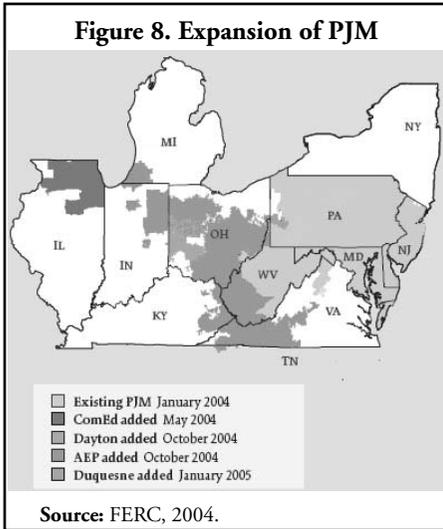
Year	MW
1981	10
1982	70
1983	240
1984	597
1985	1,039
1986	1,222
1987	1,356
1988	1,396
1989	1,403
1990	1,525
1991	1,575
1992	1,584
1993	1,617
1994	1,656
1995	1,697
1996	1,698
1997	1,706
1998	1,848
1999	2,511
2000	2,578
2001	4,275
2002	4,686
2003	6,353
2004	6,725

Source: American Wind Energy Association, 2005.

5 Multi-State Electricity Organizations Are Increasingly Important

Utilities in New England, New York and some of the Mid-Atlantic states have long collaborated to make their power systems run efficiently. Beginning in the 1990s, the scale of that collaboration increased, and utilities and generating companies in other parts of the country similarly began to collaborate. The Federal Energy Regulatory Commission encouraged power transmission companies, generation companies, some customers and others to form regional transmission organizations (RTOs). These RTOs are one way for utilities, their customers, independent power companies and others to develop and operate unified, coordinated power systems. RTOs often are the organizations that the power industry uses to manage regional markets in electricity and plan the electric system. Regional transmission organizations also coordinate electricity system planning and operation in the east and midwest. Figure 7 shows how widespread these organizations have become, with





a graphical description of approved and proposed RTOs. It is important to note that RTOs may or may not be appropriate for all parts of the country. Some feel strongly that RTOs are not appropriate.

These RTOs are growing larger too; many experts suggest that larger RTOs lead to lower costs and better reliability. PJM, the RTO in the Mid-Atlantic states, now covers an area ranging from as far west as Illinois all the way to the east coast of the United States. Figure 8 shows its original contours and its gradual expansion westward.

State regulators also have realized that they need to cooperate with one another to develop compatible policies across state lines and to speak with a coordinated voice to the regional electricity transmission organizations and to federal regulators. With funding from the regional transmission organizations, several state-based organizations have formed, with boundaries that coincide with those of the RTOs. These organizations include:

- The Organization of MISO States, which covers most of the Midwest;
- The Southwest Power Pool Regional State Committee;
- The Organization of PJM States Inc.; and
- A group in New England that currently is forming.

Electricity Collaboration in the States that Do Not Have RTOs

Much of the southeast and the western United States are collaborating without a formal RTO construct. Many in the west feel that the costs of an RTO outweigh its benefits, and that the western United States is ill-suited to this type of

organization. The western states are working collaboratively through a number of regional efforts. The Western Governors Association points out that power sales have taken place across large geographic areas and between regions for decades, without a formal RTO organization. The organization explicitly acknowledged the importance of regional thinking in transmission, stating that:

“Open transmission access has accelerated the regionalization of electric power markets in the West. Existing transmission systems that were generally designed to move power within local utility systems, bring power from generation sites to regulated utility customers, and interconnect neighboring utilities to improve reliability with some coordination transactions are now increasingly being used to enable power sales across large geographic areas.”

Source: Western Governors Association, 2002.⁴

For example, western governors are working collaboratively to ensure adequate energy supplies and electricity for the region. In June 2004, the governors adopted a resolution (see text box) to establish the Clean and Diversified Energy Committee. In this effort, the western states recognized the benefits of developing a collaborative and coordinated energy policy (figure 9).

Figure 9. Western Governors Energy Policy

Western Governors agree to collaborate in the exploration of opportunities to develop a clean, secure, and diversified energy system for the West and to capitalize on the region's immense energy resources. Western Governors will examine the feasibility of and actions that would be needed to:

- Achieve a goal to develop 30,000 MW of clean energy in the West by 2015 from resources such as energy efficiency, solar, wind, geothermal, biomass, clean coal technologies, and advanced natural gas technologies.
- Increase the efficiency of energy use by 20% by 2020. While energy efficiency does not eliminate the need for new generation, it is critical that western states pursue an energy efficient system.
- Meet the West's generation and transmission needs over the next 25 years.
- Deliverability of energy resources will be examined, including an assessment of promising new resources and technologies. The evaluation will also consider price, reliability, and environmental impacts.
- In addition, the project shall examine the obstacles to both intrastate and interstate transmission siting and construction in order to access clean energy resources.

Source: Western Governors Association, 2004.

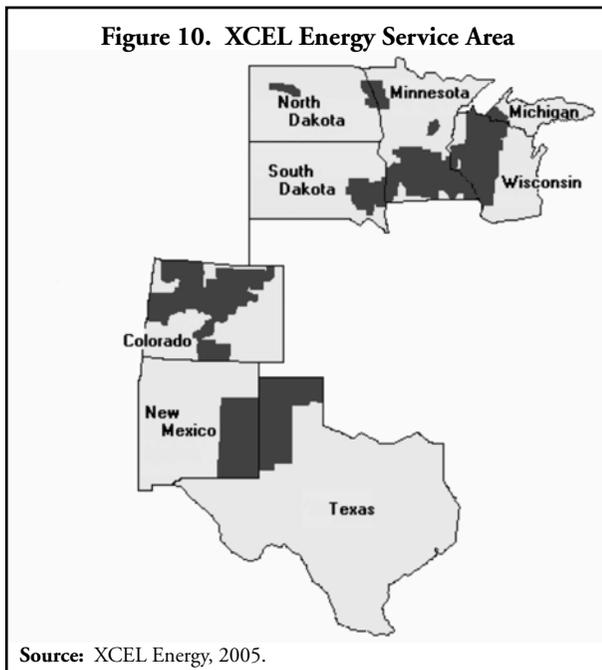
6 Most of the Power Industry Is Controlled and Monitored Regionally

With the exception of Hawaii, Alaska and parts of Texas, the utilities and regional transmission organization that control and monitor the bulk power system do so on a regional basis. Much large-scale planning occurs at the reliability council level (see Figure 3). Regional control centers match the output from different power plants with the need for power and ensure that power flows do not exceed the safety limits of the transmission lines. It is possible to visit these control centers, where electronic displays show the capabilities of each major component on the transmission system and indicate whether that component is close to exceeding its capabilities. These control centers take little note of the political boundaries between states; from an engineering perspective, such boundaries do not matter.

7 Multi-State (or Multi-National) Power Companies Now Are the Norm

Many electric power utility holding companies are interstate companies and organizations comprised of intrastate operating utilities. Many public power entities and rural cooperatives work across several states, and the federal Power Marketing Authorities all operate across several states. Although most utilities started out as small, local companies, many have grown and consolidated into multi-state entities. The trend toward multi-state utilities sped up when the industry began its long restructuring process in the early 1990s. The Energy Policy Act of 2005 repealed the Public Utility Holding Companies Act (PUHCA), which restricted mergers in the industry. The act, however, maintained a state's power and jurisdiction to review and either approve or reject a utility merger proposal. It is still too early to determine the real effects of repealing PUHCA, although some analysts expect a new round of mergers will occur. Many investor-owned utilities are, indeed, multi-state entities. The shaded areas in

figure 10 show the service territories of Xcel Energy, an investor-owned utility that serves numerous states. A similar map could show the extensive interstate networks of both public power utilities and rural electric cooperatives as well.



8 Air Policy Is Regional and Forces Regional Decisions

States often work together in order to meet air policy goals, sometimes because the U.S. Environmental Protection Agency requires them to coordinate and sometimes because collaboration is the only way to meet their air quality goals. Each regional air pollution mitigation effort affects the electric power industry because it influences the industry's choice of fuels for new power plants and the plans that companies make to transmit power from one region to another. In the end, regional air quality collaboration requires extensive interstate electric industry collaboration. Table 2 shows major air quality

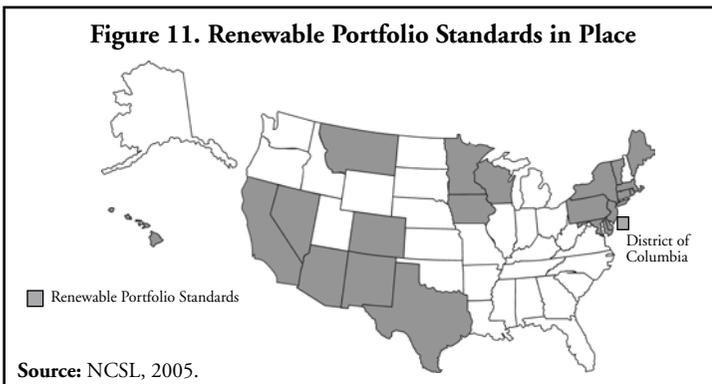
rules or agreements and the regions and states these policies affect.

Table 2. Air Quality Policies and Affected Areas	
Air Quality Policy	Region Affected
Clean Air Mercury Rule (EPA mandate)	All states
NOx SIP Call (EPA mandate)	22 eastern states and the District of Columbia
Clean Air Interstate Rule (EPA mandate)	28 eastern states and the District of Columbia
Western Regional Air Partnership (Voluntary)	Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming; also federal agencies and tribes
Conference of New England Governors and Eastern Canadian Premiers (Voluntary)	Six New England states and two Canadian provinces
Regional Greenhouse Gas Initiative (Voluntary)	Northeast and Mid-Atlantic states: Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont

Source: NCSL, 2005.

9 Companies in Most States Can Use Renewable Energy Generated in Other States to Meet Their Renewable Energy Standards

Twenty-one states and the District of Columbia now have standards in place that require electricity retailers in the state to sell a certain percentage of electricity generated from renewable sources. With a few exceptions and distinctions, these obligations allow the retailers to rely on out-of-state renewable resources to meet their requirements. A Rhode Island retailer could use Connecticut-based resources to meet its obligation. A California retailer could use Nevada-based resources to meet its obligation. This flexibility reduces the cost of these renewable energy standards, since the cheapest renewable resources might not be located in the state with the renewable energy standard. Arizona and Nevada require that in-state resources be used to satisfy their renewable portfolio standards. Many of the states that have renewable portfolio standards also allow companies to comply with the standards by using “green tags,” or “renewable energy certificates.” These tags or certificates represent proof that a generator has produced a certain amount of renewable energy. Generators sell them in what usually are regional markets to companies, such as utilities, that need to meet their renewable energy obligations. Figure 11 shows the states and jurisdiction that have RPS policies in place.



THE IMPLICATIONS: HOW CAN POLICYMAKERS USE THIS INFORMATION?

As the nine points in this report show, the electric industry operates across state and even national boundaries. States increasingly are relying upon each other for the least costly and most reliable energy. Today's high energy prices and tight energy supplies make it clear just how much states are affected by each others' decisions, and that benefits exist to working together. It is worth noting that, when sometimes states fail to collaborate, the federal government sees reason to take action. In fact, although this report focuses primarily on state policy, the federal government recognizes the regional nature of the electric power industry. Current federal laws, carried out by both the Federal Energy Regulatory Commission and the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability, take into account regional differences and regional coordination.

State policymakers therefore will want to consider the following three categories of policy action.

1. Consider the regional implications of policy. Look at implications of your policy on neighboring states, and the implications and policy questions related to new or proposed policies from the nearby states on you. For example:
 - Who pays for regional infrastructure such as transmission lines or upgrades if power is being moved from generating sites to end users in other states or regions?

- What are the likely effects on local prices of exporting power from lower-cost producing areas to higher-cost areas, and do other local benefits exist to offset a potential increase in price in the low-cost producing areas?
 - What are some of the emerging technologies that may enhance the regional transmission network to make it operate more efficiently? Who will invest in those new technologies?
2. Use the regional effects of policy to your advantage. It can be cheaper to meet energy or air quality objectives when states collaborate.
- Transmission lines increase the number and diversity of power plants available to you; choose from the least costly or the cleanest.
 - Look at regional solutions to air quality challenges.
3. Consider addressing restrictions that may be preventing your state from acting regionally.
- Consider ways in which rules, processes or policies can be harmonized with those other nearby states in ways that would ease cross-border collaboration.
 - Authorize your administration officials to work with other states. State agencies such as utility commissions may need specific statutory authority to meet and collaborate with colleagues in other states. They also may need authorization for associated details such as travel expenses.
 - Allow state officials to include regional considerations in their decisions about:

- Siting power plants,
 - Siting power lines, and
 - Electricity plans and planning processes.
- Review statutes in other states that authorize such activity. Nevada, Ohio and Washington have such authorizations in statute.
 - Consider NCSL sample legislation on transmission planning and siting, which incorporates approaches from Nevada, Ohio and Washington and detailed provisions for RTO states.

For more information about how states are working together to plan the electric transmission system, see the accompanying NCSL/National Governors Association document, *Connecting the Grid: A Review of Regional Transmission Practices*.

NOTES

1. Energy Information Administration, http://www.eia.doe.gov/cneaf/electricity/etus/exec_sum.html, 2004. These numbers have certainly increased since 1996, but no reliable data has been collected since then, in part due to the onerous process of compiling such data. We define interregional trade here as trade between the electric regions in North America, as defined by the North American Electric Reliability Council.

2. Rebecca Smith, “Eastern Power Is Getting Cheaper as Midwest Utilities Join Market,” *Wall Street Journal*, Wednesday, January 26, 2005.

3. EIA’s projections for 2006 suggest that more than 60 percent of new capacity additions will be natural-gas-fired combined-cycle, combustion turbine, or distributed generation technologies. More than 80 percent of the capacity additions will be needed after 2010, when the current excess of generation capacity has been reduced. As natural gas prices rise later in the forecast, new coal-fired capacity is projected to become increasingly competitive, accounting for nearly one-third of the expansion.

4. “Protocol Among the Members of the Western Governors Association, the U.S. Department of the Interior, the U.S. Department of Agriculture, the U.S. Department of Energy, and the Council on Environmental Quality Governing the Siting and Permitting of Interstate Electric Transmission Lines in the Western United States,” <http://www.westgov.org/wieb/electric/Transmission%20Protocol/9-5wtp.pdf>, 2002.

REGIONAL RELIANCE

WHY TRANSMISSION COORDINATION IS KEY

Today's electric power industry is not that of Thomas Edison or George Westinghouse. It has evolved into a vast network—designated by some as the world's largest machine—that enables the modern economy to function. State policymakers make crucial decisions that affect an electricity system that crosses county, state and national borders.

The nine points in this book describe a regional power system and illustrate in more detail the need for policymakers to consider electricity as a regional commodity. Decisions based only on local considerations can make the power system less reliable, less flexible and efficient, and more costly. Regional transmission coordination brings strength to the power system.



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