

# **Electric System Reliability and EPA's Clean Power Plan: The Case of MISO**

**Analysis Group**

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## **Acknowledgments**

This report provides an assessment of various reliability issues facing the Midcontinent Independent System Operator and the states in the MISO region, as they look ahead to implementation of the Clean Power Plan, proposed by the U.S. Environmental Protection Agency on June 2, 2014.

This report is the third in a series of reports, and supplements analyses we presented in our first report (February 2015) on EPA's Clean Power Plan. In that report, we assessed the readiness of the nation to ensure a reliable electric system while moving to reduce carbon pollution from existing power plants. Our second report focused on the PJM Regional Transmission Organization (March 2015).

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Analysis Group provides economic, financial, and business strategy consulting to leading law firms, corporations, and government agencies. The firm has more than 600 professionals, with offices in Boston, Chicago, Dallas, Denver, Los Angeles, Menlo Park, New York, San Francisco, Washington, D.C., Montreal, and Beijing.

Analysis Group's energy and environment practice area is distinguished by expertise in economics, finance, market modeling and analysis, regulatory issues, and public policy, as well as significant experience in environmental economics and energy infrastructure development. The practice has worked for a wide variety of clients including: energy producers, suppliers and consumers; utilities; regulatory commissions and other public agencies; tribal governments; power system operators; foundations; financial institutions; and start-up companies, among others.

*Table of Contents*

<b>Executive Summary</b>	<b>1</b>
<b>Our Prior Reliability Studies</b>	<b>4</b>
<b>Spotlight on the MISO Region: Why Focus on this Part of the Country?</b>	<b>5</b>
A Large Regional Transmission Organization Spanning a Significant Portion of the Continental U.S. Land Mass	5
A Multi-State RTO with Many Seams with Other Electrical Regions	5
A More Traditional Utility Industry Structure Under State Jurisdiction	8
Active Involvement of State Regulators in Regional Coordination	8
A Changing Mix of Power Supplies	10
The MISO Region’s Success in Addressing Reliability Challenges Associated with MATS Compliance	16
<b>MISO’s Outlook for the Region’s Resource Adequacy under the Clean Power Plan</b>	<b>18</b>
The Resource Outlook in Advance of the Clean Power Plan	18
MISO’s Analysis of Clean Power Plan Impacts	20
<b>Reliability in the MISO Region: Tools</b>	<b>22</b>
MISO’s Business-As-Usual Reliability Tools	22
Resource Adequacy: The Role of MISO	25
Resource Adequacy: The Role of the States, Utilities’ Integrated Resource Planning, and Competitive Markets	29
Regional Collaboration	31
<b>Conclusion</b>	<b>38</b>

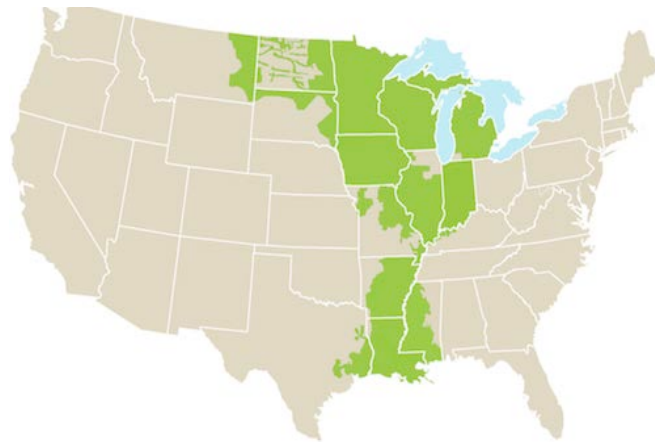
## Executive Summary

The Midcontinent Independent System Operator (“MISO”) has responsibility for reliable electric system operations in all or parts of a 15-state area in the middle of the U.S. The large geographic region covered by its footprint (shown below) makes MISO the largest grid operator in the U.S. in terms of area served. MISO is the second-largest Regional Transmission Organization (“RTO”) in the U.S. in terms of electrical load.

In this report, we analyze reliability considerations in the MISO region as the stakeholders there anticipate compliance with the U.S.

Environmental Protection Agency’s (“EPA”) Clean Power Plan. As we concluded in our prior reports about the PJM Interconnection region and the nation as a whole, **we find that MISO is well positioned to use existing tools and operating procedures to maintain electric system reliability at the same time the region lowers carbon pollution from power plants.**

The MISO Region



The MISO region is interesting to analyze for a number of reasons:

- Like PJM, MISO is one of the largest organized, competitive wholesale power markets in the U.S.; but unlike PJM, most of the 15 states served by MISO have vertically integrated investor-owned electric utilities subject to state regulation, as well as numerous municipal utilities and electric cooperatives.
- MISO faces complicated Clean Power Plan compliance issues due to: the sheer size and economic diversity of a region involving almost a third of the Lower 48 states; the combination of a centralized wholesale electric market with most retail electricity customers in the region served by traditional utility-industry structures; the mix of industry players that will be involved in Clean Power Plan planning and compliance; the extensive number of boundaries with other, non-MISO electric systems; and the region’s heavy reliance on coal-fired power plants.

Source:

[https://www.misoenergy.org/Planning/InterregionalCoordination/PublishingImages/IPSAC\\_MISO\\_Map.png](https://www.misoenergy.org/Planning/InterregionalCoordination/PublishingImages/IPSAC_MISO_Map.png)

- MISO is already actively engaged with states and others to examine how controlling carbon dioxide (“CO<sub>2</sub>”) emissions might affect the region’s electric system. And the MISO states are discussing how their own State Plans might be designed to align with the structure of the regional power market.

Our review concludes that:

- The parties responsible for electric system reliability in the MISO region are well positioned to address collaboratively and constructively the reliability issues that might arise from the electric industry’s compliance with the Clean Power Plan.
- With or without the Clean Power Plan, the MISO region has to address relatively near-term resource-adequacy issues. As a region historically – and still – highly dependent on coal for power generation, the MISO states’ electric systems have been undergoing significant changes in recent years. Until recently, it has had significant surplus capacity. It has seen (and will likely see more) retirements of coal-fired generating units, increased reliance on natural gas to produce power, integration of significant quantities of electricity generated by wind, and significant expansion of the transmission system.
- Like all RTOs, MISO starts with a strong tool kit for managing the “Essential Reliability Services” needed to assure high-quality electric service. Performing various resource-adequacy and system-security functions to ensure continuous operational security of the electric system is MISO’s normal job, which it carries out in conjunction with the states, investor-owned utilities, cooperatives and municipal electric systems, other market participants, and other reliability organizations.
- Given the electric industry structure in the MISO region, there is a strong culture and practice of planning involving the local utilities and their regulators/boards along with MISO. Each plays different roles in assuring electric system reliability. MISO establishes recommended resource-adequacy targets for the states and the industry, while the utilities develop packages of resources consistent with state planning requirements.
- MISO supports this process through various assessments, including the MISO Transmission Expansion Planning (“MTEP”) process and its unique approach – the “Multi-Value Projects” (or “MVP”) process – for identifying transmission projects that support reliability, economic efficiency and policy goals of the states and which provide broad benefits to the region.
- The region has a long history in which states rely upon integrated resource planning (“IRP”) to provide electricity supply. These IRP processes are a key tool through which

utilities assemble their supply portfolios. Many states in the region use IRP processes in conjunction with the MISO markets, competitive-power procurements, and energy-efficiency programs for consumers. This set of tools will help the states and the industry with Clean Power Plan compliance.

- The MISO region and the states also have a history of constructive collaboration that is serving them well as they attempt to overcome the complicated issues they face in integrating major quantities of distant renewable resources, and as the states prepare to comply with the Clean Power Plan. MISO's and others' analyses suggest that the more the states collaborate on a regional, market-based approach, the more this approach will enable the region to comply at a lower cost while also ensuring reliability.
- Finally, the flexibility that EPA has granted states in designing Clean Power Plan implementation plans leaves the door wide open for states to propose in their plans the specific mechanisms needed to ensure that Clean Power Plan compliance does not compromise system reliability.

This paper, which is the third report that we have written in 2015 on electric system reliability issues related to the EPA's Clean Power Plan,<sup>1</sup> is designed to:

- Put a spotlight on the MISO region, by describing the characteristics of its generation mix, its reliance on coal-fired power plants, and the evolving conditions on the system as some units retire and other resources enter the market.
- Provide context on how MISO routinely navigates changing system conditions and the roles it plays vis-à-vis other actors (including the states, the utilities and other market participants) in assuring system reliability.
- Summarize the results of analyses of the impacts of alternative Clean Power Plan approaches on the MISO system.
- Explain the array of tools relied upon in the MISO region to ensure reliability.

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<sup>1</sup> Our first report examined concerns raised by stakeholders across the country about whether the EPA's proposed rule would jeopardize electric system reliability; we concluded it would not. See: Susan Tierney, Paul Hibbard, and Craig Aubuchon, "Electric System Reliability and EPA's Clean Power Plan: Tools and Practices," February 19, 2015. [http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/electric\\_system\\_reliability\\_and\\_epas\\_clean\\_power\\_plan\\_tools\\_and\\_practices.pdf](http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/electric_system_reliability_and_epas_clean_power_plan_tools_and_practices.pdf). Our second report focused specifically on reliability issues in PJM, the nation's largest and oldest grid operator that administers a centralized wholesale electric market. See: Susan Tierney, Paul Hibbard, and Craig Aubuchon, "Electric System Reliability Issues and EPA's Clean Power Plan: The Case of PJM," March 16, 2015. [http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/electric\\_system\\_reliability\\_and\\_epas\\_clean\\_power\\_plan\\_case\\_of\\_pjm.pdf](http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/electric_system_reliability_and_epas_clean_power_plan_case_of_pjm.pdf).

## Our Prior Reliability Studies

Table 1 summarizes the key findings of our two prior reports, which provides good context for our in-depth review of the MISO region.

<b>Table 1</b>	
<b>Key Findings from Our Prior Reports on Electric System Reliability and EPA’s Clean Power Plan:</b>	
<b>“Tools and Practices” (2-2015)</b>	<b>“The Case of PJM” (3-2015)</b>
<p>Looking across the nation as a whole, we found that CO<sub>2</sub> emissions can be controlled at existing power plants without adversely affecting electric system reliability.</p> <ul style="list-style-type: none"> <li>▪ Warnings about reliability are common whenever there is major change in the industry, and play an important role in focusing the industry’s attention on the issue.</li> <li>▪ Given the major shifts already underway in the electric system, the industry would need to adjust its operational and planning practices to accommodate changes even if EPA had not proposed the Clean Power Plan.</li> <li>▪ The standard reliability practices that the industry and its regulators have used for decades are a strong foundation from which any reliability concerns about the Clean Power Plan will be addressed.</li> <li>▪ EPA’s proposal provides a wide range of compliance options that can prevent reliability issues while also reducing CO<sub>2</sub> emissions and compliance costs.</li> <li>▪ Many reliability concerns raised by stakeholders presume inflexible implementation, are based on worst-case scenarios, and assume that parties will stand on the sidelines until it is too late to act. There is no historical basis for these assumptions. Reliability issues will be solved by the dynamic interplay of actions by regulators, entities responsible for reliability, and market participants with many solutions proceeding in parallel.</li> <li>▪ There are many capable entities focused on ensuring electric system reliability, and there are many things that states and others can do to maintain a reliable electric grid. We identify a number of actions that the Federal Energy Regulatory Commission, grid operators, states, and others should take to support system reliability as the electric industry transitions to a lower-carbon future.</li> <li>▪ In the end, the industry, its regulators and the states are responsible for ensuring electric system reliability while reducing CO<sub>2</sub> emissions from power plants as required by law. These responsibilities are compatible and need not be in tension as long as all parties act in a timely way and use the tools at their disposal. We observe that, too often, commenters make assertions about reliability challenges that really end up being about cost impacts. It is important to separate reliability considerations from cost issues to avoid distracting attention from the actions necessary and feasible to keep the lights on.</li> </ul>	<p>PJM and the states in the PJM region are well positioned to lower CO<sub>2</sub> emissions from existing power plants while relying on the reliability tools and operating procedures they have already used with great success.</p> <ul style="list-style-type: none"> <li>▪ PJM is already adapting effectively to changes underway in the electric industry.</li> <li>▪ PJM’s analysis of compliance options demonstrates that regional, market-based approaches can meet Clean Power Plan goals across PJM states at lowest cost, with retirements likely spread out over a number of years. The results indicate that expansion of energy efficiency and renewables can reduce retirements, and that the market is responding with proposals for new projects.</li> <li>▪ PJM and the PJM states have extensive authorities and experience with administrative mechanisms to resolve potential reliability violations associated with the retirement of power plants.</li> <li>▪ PJM has demonstrated success with reliability challenges in the past, including retirements related to low natural gas prices and the Mercury Air Toxics Standard (“MATS”), and stresses on the fleet during the winter 2014 “Polar Vortex.”</li> <li>▪ Given the robustness of existing reliability tools and the flexibility in the Clean Power Plan, we are not convinced that a Reliability Safety Valve, as proposed by PJM, is either needed or practically workable. If EPA wishes to include some sort of reliability “back stop” mechanism in the final carbon rule, we think EPA should design it in a way that creates appropriate incentives for reliance upon normal reliability tools and thus makes it unlikely that a waiver will need to be called upon. If EPA includes one, it should be accompanied with a requirement to offset any emissions associated with implementing the reliability mechanism. And its design should ensure that any requested waiver is approved only if it is appropriate, transparent, equitable, equivalent, and cost-effective.</li> </ul>

## Spotlight on the MISO Region: Why Focus on this Part of the Country?

What is particularly interesting about the MISO electrical region that caused us to focus on it for this report? The MISO region is an important case study for several reasons. In particular, MISO regional processes illustrate many of the tools and practices available to state and regional officials, including grid operators and market participants, to assure both electric reliability and compliance with limits on carbon pollution. This area has:

### A Large Regional Transmission Organization Spanning a Significant Portion of the Continental U.S. Land Mass

First, MISO has the largest physical footprint of any organized wholesale market administered by an independent system operator (“ISO”) or an RTO in the U.S. (as shown in Figure 1). MISO is second in size after the PJM region, in terms of population served and peak electrical demand, and has approximately the same amount of generating capacity (total megawatts (“MW”)) as PJM.<sup>2</sup>

### A Multi-State RTO with Many Seams with Other Electrical Regions

Second, MISO serves an area encompassing all or parts of 15 states: Arkansas, Illinois, Indiana, Iowa, Louisiana, Kentucky, Michigan, Minnesota, Mississippi, Missouri, Montana, North Dakota, South Dakota, Texas, and Wisconsin (Figure 1). Due to its size and the history of different transmission companies joining MISO, this RTO includes many states that participate in more than one RTO.

<sup>2</sup> Comparison of the size of the various RTOs:

Regional Transmission Organizations (2014)							
	CAISO*	ERCOT	ISO-NE	MISO	NYISO	PJM	SPP
Population served	30 million (consumers)	24 million (consumers)	14.5 million (people)	42 million (people)	20 million (people)	60 million (people)	15 million (people)
Number of states affected	2	1	6	15	1	13 + D.C.	14
Summer Peak Load (GW)	44.67	66.73	24.39	114.86	29.78	141.67	46.14
Operating Capacity (GW)	69.92	99.23	35.81	199.32	44.27	202.78	72.60
Actual Net Energy for Load (GWh)	232,696	341,311	128,651	685,593	160,028	797,648	62,390
Source: SNL Financial for electric industry facts; population and customer information from each RTO.							
* This reflects CAISO's grid / transmission system operations. Note that with the recent integration of PacifiCorp into CAISO's Energy Imbalance Market (“EIM”) and the upcoming integration of NV Energy in the Fall of 2015, CAISO's EIM will serve 44 million people and parts of 7 states. <a href="http://www.caiso.com/Documents/FastFactsEIM-NVEnergy.pdf">http://www.caiso.com/Documents/FastFactsEIM-NVEnergy.pdf</a>							

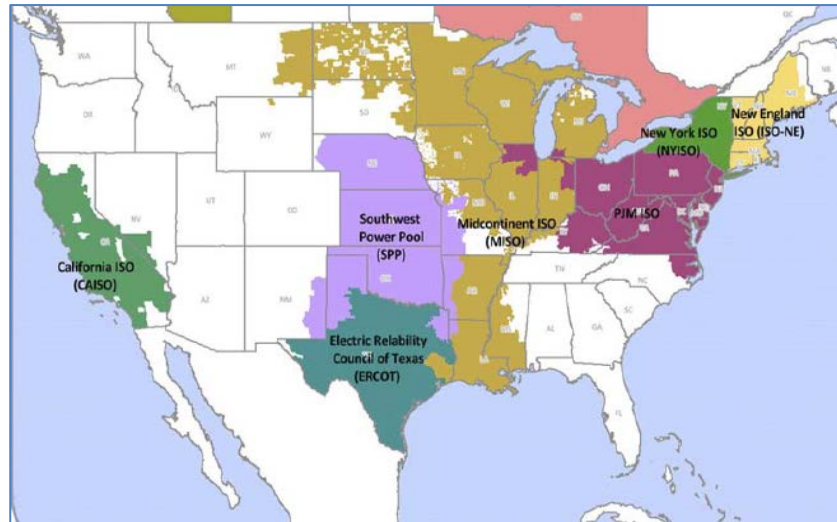


MISO operates as an integrated regional electric system and power market. By contrast, EPA's proposed regulatory framework under Section 111(d) of the Clean Air Act ("CAA") provides for state-specific CO<sub>2</sub>-emission-reduction targets for the 49 states that have power plants covered by the proposed regulation.<sup>3</sup>

This creates a complicated set of potential compliance design options and

challenges, because the proposed emission-reduction targets (in terms of pounds of CO<sub>2</sub> per MWh) vary considerably from one MISO state to another. (See Figure 2, below.) Under the EPA proposal, each state will have the option to decide whether to prepare a State Plan for its state alone or as part of a multi-state program. Some of the MISO states (such as Illinois, Kentucky, and Indiana) have generating units in that RTO as well as generating units in either another RTO or outside of an RTO region.<sup>4</sup> In theory, the power plants participating in MISO's wholesale market could end up being covered by as many as 15 different state plans, a single regional design coordinated across states, or some different mixture of approaches.

**Figure 1:  
Regional Transmission Organizations**

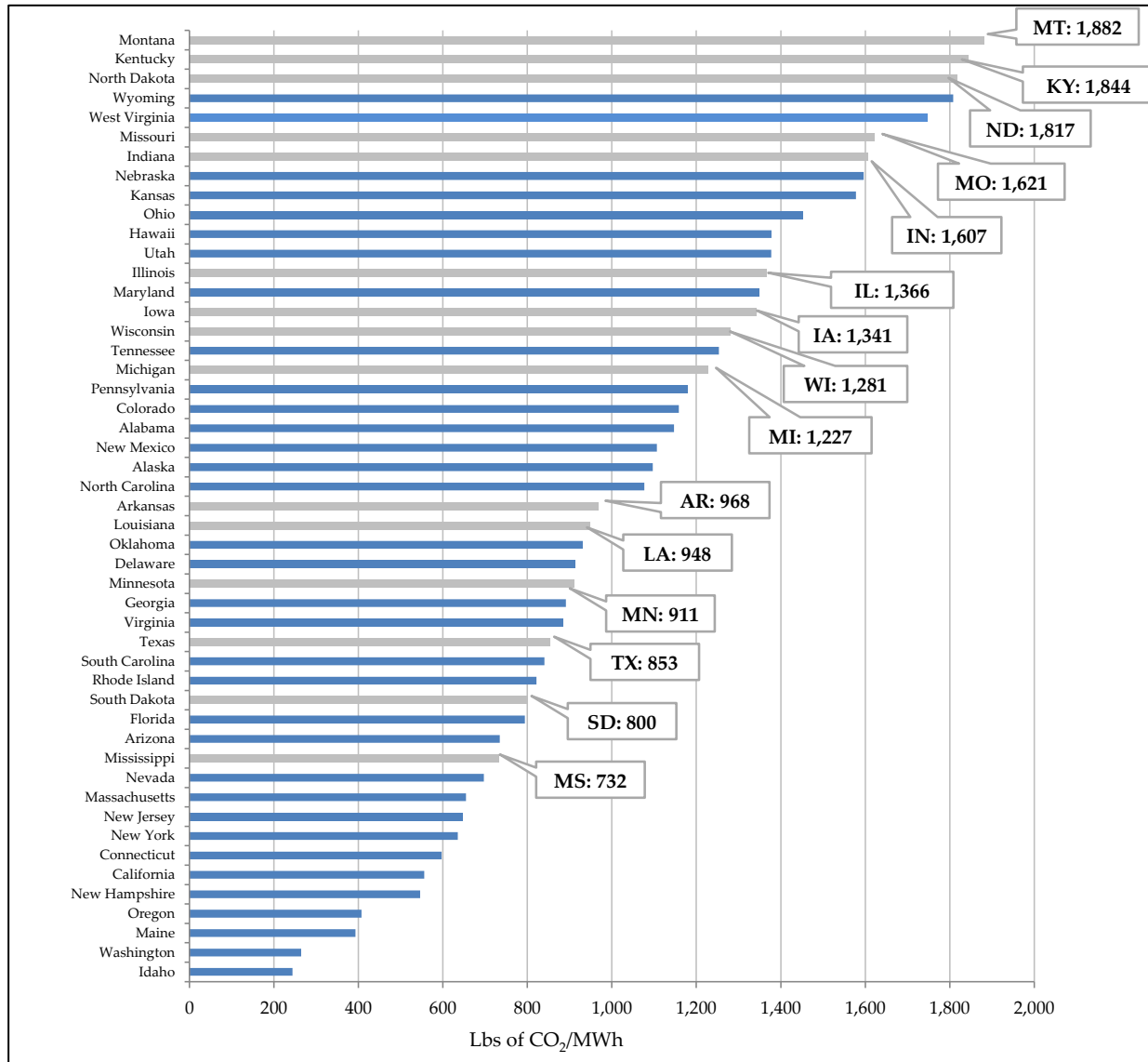


Source: FERC

<sup>3</sup> There are fossil-fuel power plants covered by the Clean Power Plan in all states/districts except for Vermont and the District of Columbia.

<sup>4</sup> Illinois has generating units in both PJM and MISO, as do Indiana and Michigan. Kentucky has generating units in two different RTOs (PJM and MISO), and in areas without an RTO (e.g., power plants owned by the Tennessee Valley Authority). North Carolina has generating units in PJM as well as in areas without an RTO.

**Figure 2**  
**Interim Period (2020-2029) Rate-Based Targets by State**



Source: EPA, Clean Power Plan Technical Support Document

MISO’s extraordinary number of boundaries (“seams”) with other RTOs and non-RTO regions creates some potentially challenging issues in the context of Clean Power Plan implementation and electric system reliability. Several factors complicate the seams issues: In addition to the MISO states having different CO<sub>2</sub>-emission rates and targets, the borders of the MISO footprint do not match up with states’ own borders and vice versa. There are many pockets of small electric systems inside of MISO that do not participate in the MISO markets. Individual MISO states may consider whether to develop State Plans with one approach for their power plants in MISO and another for their other power plants, and MISO will incorporate reliability practices (and potentially other actions) to accommodate different

conditions at the boundaries of its system with neighboring systems.

### **A More Traditional Utility Industry Structure Under State Jurisdiction**

Ninety percent of the MISO region's electrical load served by vertically integrated utilities, including investor-owned utilities, municipal utilities and cooperatives.<sup>5</sup> Few of the MISO states have retail choice.<sup>6</sup> Within the region, the states maintain the authority and responsibility for ensuring resource adequacy, but they do so in close collaboration with MISO.<sup>7,8</sup> This collaboration includes coordination in setting reliability requirements, transmission planning to increase regional import capacities and accommodate integration of remote generation resources, and participation in the MISO Planning Reserve Auction ("PRA") that is used to procure market-based capacity obligations and send price signals for new investment.

The MISO region combines state-regulated, vertically integrated utilities participating (with attendant operational and planning obligations) in a regionally coordinated bulk power system and wholesale market. While this hybrid design and high level of state responsibility may not be necessary for effective functioning of RTOs, the parties in the MISO region already have this asset, which will be a helpful platform for developing robust responses to the changes that may arise in conjunction with the Clean Power Plan.

### **Active Involvement of State Regulators in Regional Coordination**

Fourth, representatives from the public utility commissions ("PUC") of states served by MISO work together through an active association – called the Organization of MISO States, Inc. ("OMS") – that has been in place for over a decade. At OMS, the states discuss wholesale market rules, transmission planning assumptions, and other emerging regulatory issues, and attempt to inform each other and identify points of agreement. OMS sometimes

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<sup>5</sup> See, for example, MISO Staff, Issues Statement on Facilitating Resource Adequacy in the MISO Region, March 2015, page 7. Available: <https://www.misoenergy.org/Planning/ResourceAdequacy/Pages/ResourceAdequacy.aspx>

<sup>6</sup> Only Illinois and Michigan have retail choice in the MISO footprint. Texas has retail choice in the part of the state served by ERCOT, but not in the MISO footprint.

<sup>7</sup> Resource adequacy is governed by Module E of the MISO tariff. Module E-1, section 68A, explicitly states: "Nothing in this Module E-1 affects existing state jurisdiction over the construction of additional capacity or the authority of states to set and enforce compliance with standards for adequacy."

<sup>8</sup> We note here that virtually *all* states throughout the country maintain the ultimate jurisdiction for resource adequacy requirements, regardless of their participation in a RTO or ISO or whether they allow competitive retail service. As discussed throughout this report, a unique feature of the MISO region is the extent to which many states still serve load through vertically integrated utilities, in combination with a centralized, multi-state wholesale market.

takes positions in formal regulatory proceedings (e.g., at the FERC).<sup>9</sup> This helps to make MISO an interesting case study from the perspective of potential multi-state collaboration. In particular, MISO and the states have a unique history of regional transmission planning coordination for non-reliability projects, through its Multi-Value Portfolio process (which we discuss further below).

Additionally, many of the MISO states' energy and environmental regulators have been convening in the recent past to discuss, explore and assess implementation options to meet the proposed Clean Power Plan requirements in their states. This group, called the Midcontinent States Environmental and Energy Regulators ("MSEER") group, includes state officials from 14 midcontinent states,<sup>10</sup> and is an example of proactive involvement of the states to address issues of common interest in their regional power market.

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<sup>9</sup> See Organization of MISO States' "Business Model V2 5/11/2014," available:

<https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/AC/2014/20140423/20140423%20AC%20Item%2002a%20Regulator%20Sector%20Business%20Profile.pdf>

<sup>10</sup> As of the end of 2014, the MSEER discussions have brought together representatives from Arkansas, Illinois, Indiana, Iowa, Kentucky (observer only), Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, South Dakota, and Wisconsin. "North Dakota representatives have expressed support for the effort to explore implementation options but have not to date participated in the discussions." <http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/files/MSEER.pdf>, MSEER letter to Gina McCarthy, September 4, 2014, available: <http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/files/MSEER.pdf>. <http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/files/MSEER.pdf>. See also: Jeffrey Tomich, "Behind the noise, central states study EPA rule cooperation," *EnergyWire*, December 3, 2014, <http://www.eenews.net/energywire/stories/1060009833>.

## A Changing Mix of Power Supplies

As recently as 2012, the MISO region was one of the most coal-dependent RTOs, with 56 percent of the power produced by coal-fired power plants.<sup>11</sup> Several states (Kentucky, Indiana, Missouri, and North Dakota) generated more than 75 percent of their power from coal. (See Table 2.) For years, it had substantial surplus capacity. A relatively low share of MISO's electricity has come from nuclear and natural-gas-fired power plants. Several MISO states (especially Iowa and Minnesota) have robust output at wind farms, but overall reliance on renewables has also been relatively low.

MISO's generation mix has changed in recent years, however. With lower natural gas prices, existing gas-fired generating capacity has operated more. To date and compared to other RTOs, there has been a relatively modest amount of retirements of older and less-efficient coal-fired generating resources, although more capacity is scheduled to retire.<sup>12</sup> The overall MISO generation mix has also become more diverse with the integration of Entergy's utilities into MISO, and the new southern zones have considerably more natural gas-fired capacity than the rest of MISO. Also, MISO states have continued to experience development of new wind-generating capacity.<sup>13</sup> The MISO region has six of the U.S.'s top 15 states in terms of

<sup>11</sup> Capacity (MW) and generation (MWh) are for 2012.

Percent of Generating Capacity (MW) by Fuel (2012)								
Generating Asset by Fuel Type	CAISO	ERCOT	ISO-NE	MISO	NYISO	PJM	SPP	USA
Coal	3%	20%	6%	39%	6%	40%	36%	29%
Nuclear	12%	5%	12%	7%	12%	16%	4%	9%
Natural Gas	53%	61%	43%	38%	51%	30%	43%	41%
Hydro, Wind, Biomass, Solar, Geothermal	31%	13%	17%	13%	18%	8%	15%	17%
Other	1%	0%	22%	3%	12%	6%	3%	5%
Total	100%	100%	100%	100%	100%	100%	100%	100%
Percent of Generation Output (MWh) by Fuel (2012)								
Generating Asset by Fuel Type	CAISO	ERCOT	ISO-NE	MISO	NYISO	PJM	SPP	USA
Coal	5%	31%	3%	56%	3%	44%	59%	38%
Nuclear	23%	11%	30%	14%	29%	33%	6%	19%
Natural Gas	47%	50%	51%	22%	44%	18%	25%	30%
Hydro, Wind, Biomass, Solar, Geothermal	25%	8%	15%	8%	22%	4%	10%	13%
Other	0%	0%	1%	1%	2%	1%	0%	1%
Total	100%	100%	100%	100%	100%	100%	100%	100%
Source: SNL Financial								

<sup>12</sup> During 2013-2014, several regions saw coal-fired power plant retirements (4,610 MW in PJM; 74 MW in NYISO; 295 MW in ISO-NE; and 488 MW in MISO). SNL Financial.

<sup>13</sup> Andrew Gelbaugh and Jesse Gilbert, "Generation Investment in RTO Markets - The Challenge and Opportunity," SNL Energy, May 2015 (hereafter "SNL RTO Generation Investment Report"), page 15.

installed wind capacity.<sup>14</sup> (See Figure 3.) As of 2013, renewable generation, comprised primarily of wind, represented nearly 9 percent of total generation that year.<sup>15</sup>

<b>Table 2</b>					
<b>Percent of Generation by Fuel (2012): US, MISO and the States in MISO</b>					
<b>(Ranked by Dependence on Coal as a Share of Total Generation)</b>					
	Coal	Nuclear	Natural Gas	Hydro, Wind, Biomass, Solar	Other
Kentucky	94%	0%	3%	3%	0%
Indiana	82%	0%	12%	4%	3%
Missouri	79%	12%	6%	3%	0%
North Dakota	78%	0%	0%	21%	1%
Iowa	63%	8%	3%	26%	0%
MISO	56%	14%	22%	8%	1%
Montana	52%	0%	2%	45%	1%
Wisconsin	52%	22%	18%	8%	0%
Michigan	47%	25%	21%	6%	0%
Minnesota	44%	23%	14%	19%	0%
Illinois	41%	49%	6%	4%	0%
USA	38%	19%	30%	13%	1%
Texas	33%	9%	50%	8%	0%
Louisiana	25%	15%	54%	3%	3%
South Dakota	24%	0%	2%	74%	0%
Mississippi	14%	13%	71%	2%	0%
Arkansas	10%	0%	52%	23%	15%

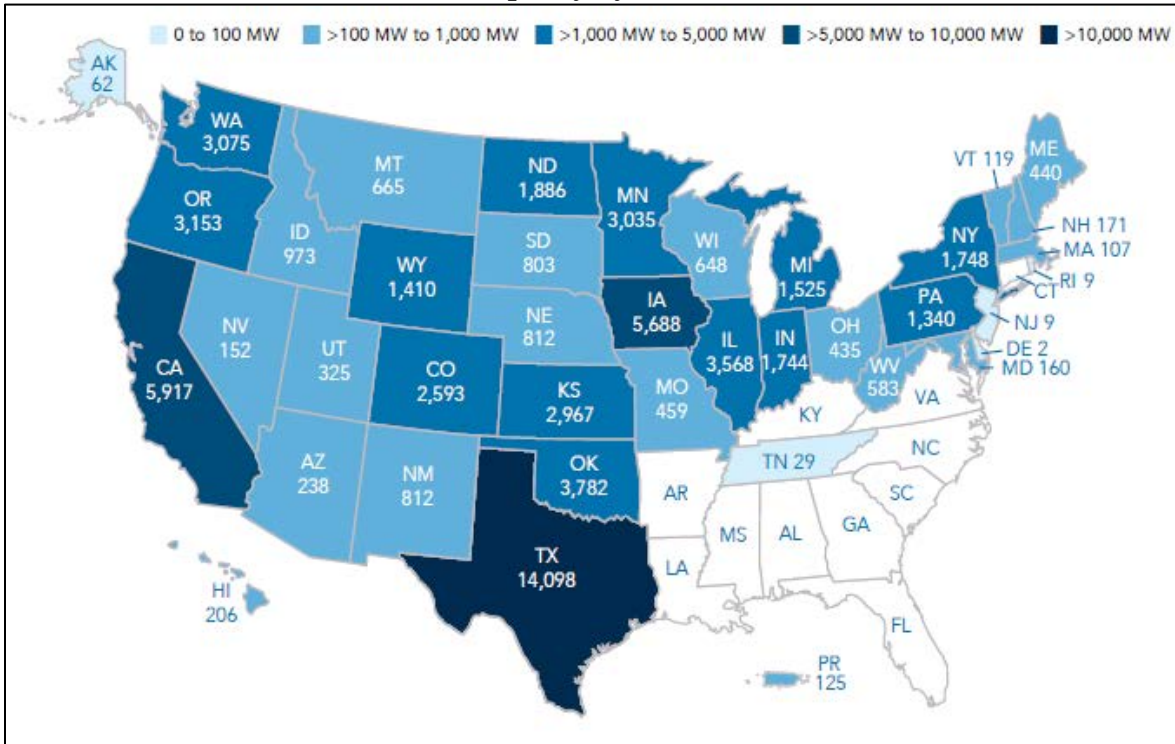
Source: SNL Financial

Given the carbon intensity of coal, this historical lack of fuel diversity and current reliance on coal for over half of the region's generation output exposes many of the MISO states to potentially greater amounts of retirements, more significant fleet turnover, and changes in the system's capacity mix and system operations under the Clean Power Plan.

<sup>14</sup> As of the end of 2014, the following MISO states have significant wind-turbine capacity: Iowa (5,688 MW), Illinois (3,568 MW), Minnesota (3,035 MW), North Dakota (1,886 MW), Indiana (1,744 MW), and Michigan (1,525 MW) South Dakota (803 MW), Wisconsin (648 MW). American Wind Energy Association, "U.S. Wind Industry Fourth Quarter 2014 Market Report," 2015.

<sup>15</sup> SNL Energy.

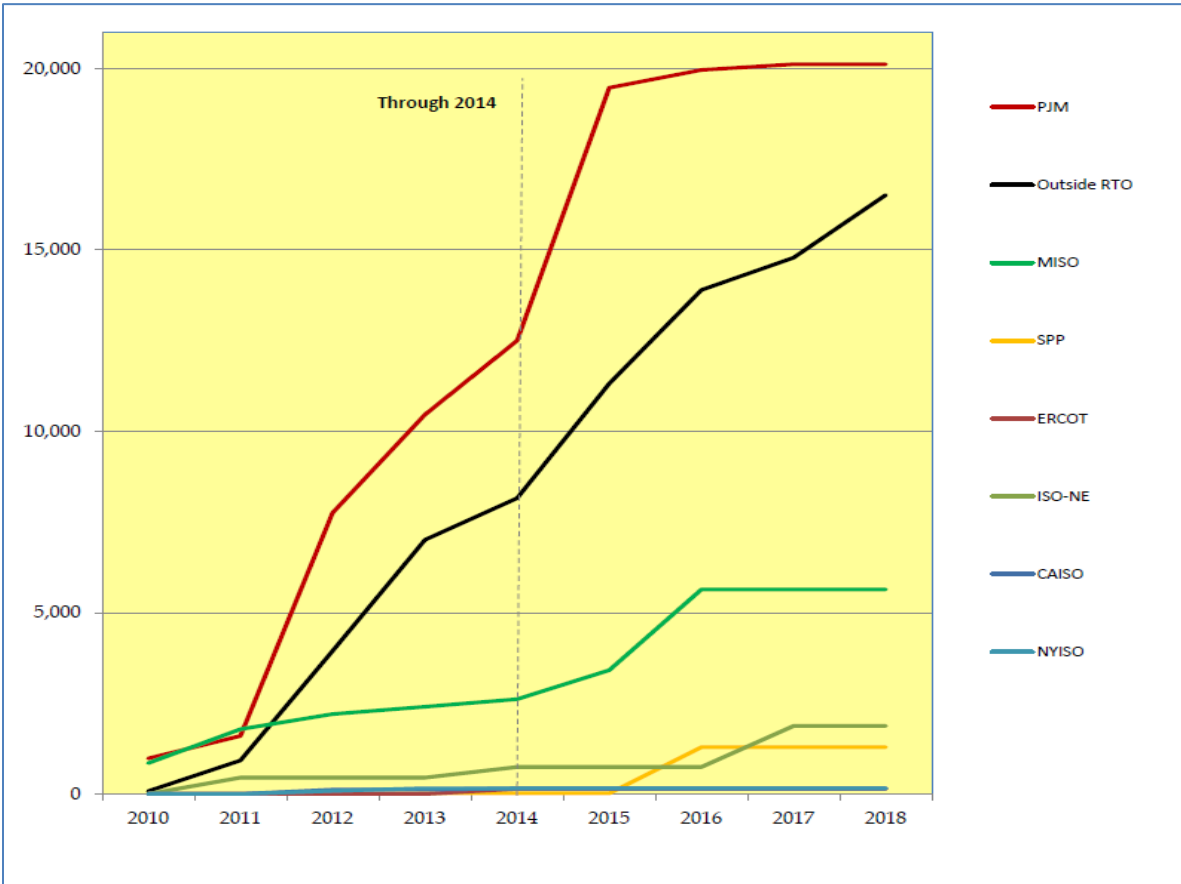
**Figure 3**  
**Total Installed Wind Capacity by State (as of the end of 2014)**



Source: American Wind Energy Association, “U.S. Wind Industry Fourth Quarter 2014 Market Report,” 2015.

As shown in Figure 4, MISO’s coal-plant retirements are relatively small compared to PJM’s and those parts of the U.S. not served by an RTO – both of which are (like MISO) heavily dependent upon coal-fired generation. In recent years, some of the anticipated coal-plant retirement plans in MISO have been modified, and are now undergoing conversions to natural gas. Figure 5 indicates the location of anticipated retirements and conversions of coal-fired power plants in MISO as of the end of 2014, with Table 3 providing state-specific information about retirements, including not only coal-fired plants but also relatively small and inefficient natural-gas-fired and oil-fired generating units.

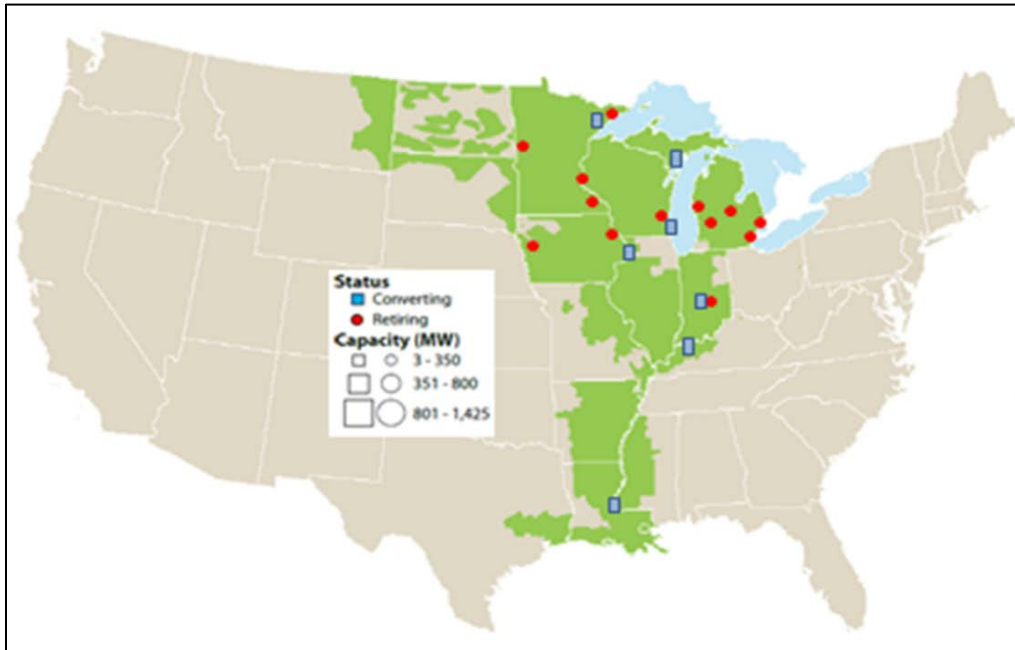
**Figure 4:**  
**Retirements of Coal-Fired Generating Capacity by RTO:**  
**2010-2014 (Actual) & 2015-2018 (Announced) - Cumulative MW of Capacity Since 2010**



Source: Data from SNL Financial



**Figure 5**  
**Location of Coal-Fired Power Plant Retirements and Conversions to Natural-Gas**



Source: data from Michael Niven and Neil Powell, "Coal unit retirements, conversions continue to sweep through power sector," SNL Energy, October 14, 2014.

**Table 3**

Generator Retirements, Additions, and Reliability Planning, by State, 2010-2018										
State	Retirements (MW)					Additions (MW)				
	Coal	Oil	Gas	Other	Total	Gas	Solar	Wind	Other	Total
Kentucky	-	-	-	-	-	-	-	-	-	-
Indiana	1,773	60	17	5	1,855	680	89	20	25	814
Missouri	17	10	34	-	61	49	6	-	14	69
North Dakota	2	14	11	-	26	358	-	1,422	-	1,780
Iowa	802	84	184	-	1,070	712	-	2,560	11	3,283
Montana	-	-	-	-	-	96	-	-	-	96
Wisconsin	613	8	259	-	880	74	1	187	126	388
Michigan	1,465	53	453	-	1,971	941	0	1,494	100	2,535
Minnesota	416	63	75	-	554	226	2	1,560	23	1,811
Illinois	709	278	315	-	1,301	7	40	1,031	-	1,078
Texas	-	-	112	-	112	390	-	-	50	440
Louisiana	-	16	820	114	950	680	-	-	50	730
South Dakota	-	-	-	-	-	300	-	668	-	968
Mississippi	-	-	407	-	407	285	-	-	-	285
Arkansas	-	5	1,522	-	1,527	-	-	-	1	1
<b>Total</b>	<b>5,797</b>	<b>590</b>	<b>4,209</b>	<b>119</b>	<b>10,715</b>	<b>4,797</b>	<b>137</b>	<b>8,942</b>	<b>401</b>	<b>14,277</b>

**Notes and Sources:**  
 All Resource Retirements and Additions (including planned units in advanced development or under construction) reflect operating capacity, using SNL Financial data, accessed May 2015.  
 Michigan solar additions are less than 0.5 MW and round to zero in this table.

“SNL Energy projects a modest decline in coal generation in MISO over the next several years in response to the EPA MATS rule, with natural gas and renewables picking generation lost to coal retirements. By 2021, SNL Energy projects coal will lose some market share in MISO, dropping to 52.20% of generation, with gas climbing to about 23% of total MWhs and renewables contributing nearly 10%.”<sup>16</sup>

For years, MISO has had substantial surplus capacity. But with the anticipated level of retirements between 2010-2018, MISO's latest member survey (in summer 2014) of upcoming changes in the fleet of power plants indicated a tightening of reserve margins in the northern half of the MISO system, with the need to add some 2,300 MW of capacity by 2016 to meet resource-adequacy requirements. (The survey found that there was more than that amount of surplus in the southern part of the system, but that transmission constraints would only allow the transfer of 1,000 MW from south to north.)

These trends, combined with policies (e.g., renewable portfolio standards (“RPS”), pre-approval of investment in wind projects) in many MISO states, have stimulated investment interest. Modeling by SNL Energy indicates that approximately “4,940 MW of new capacity will be added in MISO in 2015-2021 made up of 2,351 MW from firm new projects and uprates at existing plants, roughly 2,500 MW from new gas capacity needed to meet reserve margin targets, and 110 MW of capacity contribution from renewables needed to meet state RPS requirements.”<sup>17</sup> (Note that as shown in Table 3, more than 8,940 MW of wind capacity is in development, but due to its intermittency, its capacity value for resource adequacy purposes is discounted to the amount expected to be available on peak.<sup>18</sup>)

Together, these changing conditions in MISO's fleet – becoming somewhat more diverse in its generation mix, experiencing new investment to modernize parts of the system while shifting to somewhat greater reliance on natural gas, developing local wind resources, and anticipating tightening reserve margins – position MISO and the MISO states to play an active role in managing the transition from such historical reliance on highly carbon-intensive generation. While this trend is happening already as a result of market forces, it will also be affected by compliance requirements with EPA's Clean Power Plan.

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<sup>16</sup> SNL RTO Generation Investment Report, page 16.

<sup>17</sup> SNL RTO Generation Investment Report, page 16.

<sup>18</sup> MISO assigned a 14.7-percent capacity value to wind for resource adequacy purposes. See <https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/LOLEWG/2014/20141215/DRAFT%202015%20Wind%20Report.pdf>.

## The MISO Region's Success in Addressing Reliability Challenges Associated with MATS Compliance

Finally, MISO is interesting also because it has recently had to navigate reliability issues as some of the system's coal-fired power plants faced compliance deadlines associated with the MATS rule, which went into effect on April 16, 2015.<sup>19</sup> Many units have been allowed an extra year to comply, meaning that they are allowed to operate up until April 16, 2016. Under the MISO tariff, any generator intending to retire must provide notice to MISO by no later than 26 weeks in advance of the proposed retirement date. Many but not all generators have filed such notices to date.<sup>20</sup>

Several generators did, however, signal their intention to retire by April 2016, by seeking relief from their obligations under MISO's Planning Reserve Auction ("PRA") rules (which include a must-offer requirement for all weeks of a Planning Year, which ends at the end of May of each year). A MATS-related retirement coincident with a MATS compliance date of April 16, 2016, would have left these generators in violation of the FERC-approved MISO tariff (the PRA rule) for the six weeks between mid-April and the end of May 2015. Because

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<sup>19</sup> When the EPA issued its regulatory package relating to the MATS rule, the agency included a specific statement of enforcement policy to explain that, "[w]here there is a conflict between timely compliance with a particular requirement and electric reliability, the EPA intends to carefully exercise its authorities to ensure compliance with environmental standards while addressing genuine risks to reliability in a manner that protects public health and welfare." EPA December 2011 MATS Enforcement Response Policy, page 1. <http://www2.epa.gov/enforcement/enforcement-response-policy-mercury-and-air-toxics-standard-mats>. To provide the electric industry and its regulators greater assurance of the agency's intention to support reliable electricity supply while also reducing toxic air emissions, the EPA incorporated into the MATS rule a "reliability safety valve," allowing the owners of particular generating units an opportunity to request a one-year extension in the compliance time lines if a unit could not meet the deadlines in EPA's regulations, and the unit was needed for electric system reliability. The extra year potentially available under the MATS reliability safety valve would be in addition to an extra year available to companies making good-faith efforts to comply but needing additional time beyond the April 2015 deadline. Note that MATS includes a 3-year compliance period, with an extension of the compliance deadline for a 4<sup>th</sup> year for units able to demonstrate to state permitting authorities that additional year is needed for installing technology. In some cases a 5<sup>th</sup> year may be allowed, in light of EPA's intention to allow use of administrative orders "...with respect to sources that must operate in noncompliance with the MATS for up to a year to address a specific and documented [electric] reliability concern." EPA December 2011 MATS Enforcement Policy, page 2. This would extend MATS compliance deadlines from April 2015 to April 2016 for certain units.

Since EPA issued that guidance, affected power plant owners in MISO and elsewhere have been taking steps either to bring their generating units into compliance or to plan for their retirements. So far, very few owners of power plants (and RTOs, in support of them) have requested a waiver for reliability purposes.

<sup>20</sup> Based on its survey of information from generators as of April 21, 2015, MISO reported the following information about retirements and requests for compliance extensions: of the 74.8 GW of capacity (312 total units) in MISO that has been affected by MATS, the breakdown of units was as follows:

- 17.1 GW (50 units) did not require any additional action pursuant to the MATS rule;
- 17.7 GW (57 units) had completed compliance actions;
- 29.5 GW (81 units) required additional action;
- 0.6 GW (1 unit) was undergoing repowering;
- 1.4 GW was undergoing a fuel conversion;
- 2.0 GW had already retired; and
- 7.1 GW is still to be determined (in terms of retirement or other outcomes).

<https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/PAC/2015/20150415/EPA%20Survey%20Q1%202015.pdf> (document properties April 21, 2015).

resource obligations are for the entire planning year (as opposed to a month-by-month requirement), these units would need to purchase replacement capacity for the entire 2015/16 planning year to cover the six-week gap. Thus, several generators sought waivers from the reliability rule.<sup>21</sup> While doing so would not literally produce a resource-adequacy violation, it would require that the generators purchase replacement capacity.

MISO urged FERC not to grant the waivers, and was reported to say that “entering a planning year already knowing that a unit being relied upon to meet planning reserve margin requirements will be unavailable for a portion of that year ‘contributes to the erosion of the resource adequacy planning process.’”<sup>22</sup> MISO did, however, attempt to address the generators’ concerns by proposing “to essentially exempt those market participants from physical withholding mitigation measures if they choose to completely opt out of the market for the year.”<sup>23</sup>

Ultimately, through a process of coordination and eventual FERC review, most of the waivers were granted. FERC concluded that the retirements would not lead to a reliability problem. FERC did encourage continued coordination among MISO, the states and market participants in the region to address both near-term resource adequacy issues and eventual compliance with the Clean Power Plan’s upcoming compliance requirements.<sup>24</sup>

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<sup>21</sup> The resources for which waivers were sought include: Indianapolis Power and Light (216 MW), Consumers Energy (940 MW), DTE Electric (120 MW), MidAmerican Energy (496 MW), Duke Energy Indiana (668 MW), and Wisconsin Power and Light (200 MW). FERC approved the waiver of must-offer requirements for all resources except Wisconsin Power and Light (Docket No. ER15-872), which sought an exemption for the five months between January 1, 2016 and May 31, 2016. In denying the request, FERC noted that the MISO Tariff allows Wisconsin Power and Light the ability to sell capacity bilaterally and participate in the energy and ancillary services market.

<sup>22</sup> Marcy Crane, “MISO asks FERC not to grant MidAmerican’s MATS-related waiver request,” SNL Energy, November 18, 2014.

<sup>23</sup> Marcy Crane, “Over MISO’s objections, divided FERC grants MATS-related waivers for 4 companies,” SNL Energy, February 23, 2015.

<sup>24</sup> “In granting this relief, we remain cognizant of the Commission’s responsibilities under the FPA [Federal Power Act] for the reliability of the bulk electric system and the oversight of the regional electricity markets to ensure that they sustain reliability at just and reasonable rates... We note that the limited relief granted herein does not implicate resource adequacy requirements for the 2015/16 Planning Year... [and] that the Commission continues to monitor resource adequacy in the MISO region... and remains committed to working with the States, MISO, and stakeholders to ensure resource adequacy in the MISO region. Again, utilities and other resources need not wait until State Implementation Plans are finalized to begin planning for future regulations. Instead, they can – and are – taking advantage of the policies and procedures in place today to begin shaping investment decisions for tomorrow.” FERC, Order Granting Request for Waiver, February 20, 2015, Docket No. ER15-592-000, 150 FERC ¶ 61,126, ¶69.

## MISO's Outlook for the Region's Resource Adequacy under the Clean Power Plan

### The Resource Outlook in Advance of the Clean Power Plan

The MISO region is not without its own resource adequacy challenges, however, with or without the changes that will be introduced with the EPA's proposed Clean Power Plan. As its surplus capacity has been slimmed down with asset retirements in recent years, MISO and other stakeholders have been working to assess the outlook for resource adequacy under various assumptions about events and trends that could affect demand levels, retirements, investment cycles, fuel prices, and so forth.

As noted above, the MISO region forecasts declining reserve margins with the potential to fall below the planning reserve target as early as 2016 (when MISO anticipates reserves would be at 13.2 percent). Looking beyond 2016, MISO forecasts that with further retirements, and assuming no new capacity entering the market, the region's reserve margin could fall to as low as 4.9 percent by 2024.<sup>25</sup>

Other assessments focus on these near-term challenges. For example, the National Energy Technology Laboratory ("NETL") recently reported on resource adequacy issues in MISO, stating that MISO

...is facing a number of challenges to their resource adequacy.... Regardless of what may transpire in the mid-to long-term for MISO, the current short term (2014-2016) focus identifies potential issues associated with generation retirements and retrofits and transmission system issues.

Large amounts of coal-fired generation (~11 GW) are expected to retire in the MISO region by 2016. These units have been rendered uneconomic due to the declining price of natural gas, expensive retrofits necessary to maintain compliance with new environmental regulations, and advanced age. MISO is also projecting nearly 2 GW of other retirements, mostly older, uneconomic gas-fired plants. However, new generation is not expected to come online in amounts sufficient to offset these retirements. These circumstances are a cause for concern over MISO's ability to maintain sufficient capacity to meet demand in the next few years.<sup>26</sup>

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<sup>25</sup> See, for example, MISO Staff, "Issues Statement on Facilitating Resource Adequacy in the MISO Region," March 2015, page 3. Available: <https://www.misoenergy.org/Planning/ResourceAdequacy/Pages/ResourceAdequacy.aspx>

<sup>26</sup> C. Elise Logan, John Brewer, Thomas Davis, and Robert Wallace (Booz Allen Hamilton, Inc.), "Profile of Resource Adequacy in the MISO Region," Energy Sector Planning and Analysis, NETL, U.S. Department of Energy, March 17, 2015. DOC/NETL-2015/1706. (hereafter, "NETL Report"), page 1 of Executive Summary.

The NETL Report also states that reserve margins may be even lower in the North and Central regions, falling to 12.9 percent by 2016. This value is also reported in the 2014 Long Term Resource Assessment published by the North American Electric Reliability Corporation (“NERC”), based on analyses provided by MISO.<sup>27</sup>

Assessments, like MISO’s and NETL’s and others’, are part of the normal processes through which grid operators and other parties provide information to signal that actions will be required to assure electric system reliability. MISO, the states, electric utilities, and other market participants have different roles and responsibilities for reliability matters in the MISO region.<sup>28</sup>

The NETL Report, for example, identifies a number of things that MISO has been doing to address resource adequacy issues, including: providing information to the states and to market participants so that they can respond; adjusting maintenance schedules of generators to accommodate generating-unit retrofits for MATS compliance; and entering into System Support Resource (“SSR”) agreements (similar to reliability must-run (“RMR”) contracts in other regions), which prevent or postpone generating units from retiring until reliability issues can be adequately addressed.

These are tools available to the grid operator sequence retirements when needed. Also, many market participants offer other remedies, including readiness to bring new power plant projects, gas infrastructure, demand-side measures, and other solutions into the electric system) where needed.<sup>29</sup> For example, INGAA has described the capability of the natural gas pipeline industry to add new infrastructure.<sup>30</sup> Calpine has stated its readiness (along with

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<sup>27</sup> As described in the NETL Report, this analysis was the product of a number of changes MISO made to its resource-adequacy forecast between 2013 and 2014. These changes include: a decrease in total load, an increase in new resources, the inclusion of all available unclaimed generation that have not contracted with LSEs, the exclusion of resources committed to PJM through its capacity auction, and a review of firm interconnection rights to existing generators based on potential discrepancies with nameplate and reported capacity values. See NETL Report, pages 6 and 7.

<sup>28</sup> Examples include various processes and actions that support reliability in the face of changing system infrastructure, including utilities’ integrated resource plans, regional transmission plans, project development proposals, and potential changes to MISO rules.

<sup>29</sup> Although we think it is ultimately a good thing that the industry is paying close attention to reliability issues – so that any potential problems can be avoided through planning and infrastructure – we do note that serious questions have been raised about the assumptions used in recent reliability assessments performed by NERC. For example, Brattle Group’s February 2015 report found that NERC failed to account for how industry is likely to respond to market and operational changes resulting from the Clean Power Plan. See Jurgen Weiss, Bruce Tsuchida, Michael Hagerty, and Will Gorman, “EPA’s Clean Power Plan and Reliability: Assessing NERC’s Initial Reliability Review,” The Brattle Group, February 2015.

<sup>30</sup> Comments of the Interstate Natural Gas Association of America (“INGAA”), submitted to the EPA regarding the Clean Power Plan, Docket ID No. EPA-HQ-OAR-2013-0602, filed December 1, 2014.



other market participants) to add new gas-fired generation (and to offer under-utilized capacity already existing on the system).<sup>31</sup>

A recent, specific example is the recent actions of the Minnesota PUC to approve several actions by Xcel Energy: two power-purchase agreements (one with Calpine for the output of a 345-MW expansion at its Mankato plant, and another with Geronimo for 100 MW of solar) and installation of a new 215-MW combustion turbine at its own Black Dog facility. The Minnesota PUC considered four projects with a combined capacity of 840 MW for a 2017 need of 150 MW (increasing to 500 MW by 2019), and stated in its order that it was approving resources in excess of the short-term identified need because, given future uncertainty, “the risk of possibly being overbuilt was preferable to the possibility of being underbuilt.”<sup>32</sup>

### MISO's Analysis of Clean Power Plan Impacts

In addition to its standard resource assessments, in November 2014 MISO published the results of its initial review of the implications of the Clean Power Plan for the region. To date, the focus of MISO's analyses has been more on the economics of different compliance approaches, rather than the reliability implications of potential approaches.<sup>33,34</sup>

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<sup>31</sup> Comments of Calpine Corporation, submitted to the EPA regarding the Clean Power Plan, Docket ID No. EPA-HQ-OAR-2013-0602, filed November 26, 2014.

<sup>32</sup> See: Minnesota PUC Staff Briefing Papers, Docket No. CN-12-1240/M-14-788/M-14-789, Issued April 9, 2015, pages 2, 11; Minnesota PUC, “Order Approving Power Purchase Agreement with Calpine, Approving Power Purchase Agreement with Geronimo, and Approving Price Terms with Xcel,” Docket No. CN-12-1240/M-14-788/M-14-789, Issued February 5, 2015, page 1.

<sup>33</sup> For example, MISO's analyses look at the cost per ton of emissions reductions associated with different strategies, noting that regional compliance approaches can reduce estimated costs by 40 percent. Also, MISO's assessment indicates that Interim targets could be met by 2020 through the retirement of MATS-related coal units, without the need to add new natural-gas combined cycles (“NGCCs”), but that a lower-cost compliance path would include additional coal retirements with new NGCCs. MISO, “Analysis of EPA's Proposal to Reduce CO<sub>2</sub> Emissions from Existing Electric Generating Units,” November 2014 (hereafter “MISO Clean Power Plan Analysis”), page 12 and 17. Available: <https://www.misoenergy.org/WhatWeDo/EPARegulations/Pages/111%28d%29.aspx>.

<sup>34</sup> In our initial report discussing reliability implications of the Clean Power Plan, we noted that “too often, commenters make assertions about reliability challenges that really end up being about cost impacts.” We made the following findings after reviewing many parties' comments to the EPA: “In the end, the industry, its regulators and the States are responsible for ensuring electric system reliability while reducing carbon emissions from power plants as required by law. These responsibilities are compatible, and need not be in tension as long as all parties act in a timely way and use the many reliability tools at their disposal. We observe that, too often, commenters make assertions about reliability challenges that really end up being about cost impacts. Although costs matter in this context, we think it is important to separate reliability considerations from cost issues in order to avoid distracting attention from the actions necessary (and feasible) to keep the lights on. There may be “lower cost” options that reduce emissions some part of the way toward the target reductions, but that fail to meet acceptable reliability standards. We do not view such ‘solutions’ as the lowest cost solution precisely because they fail to account for the cost of unacceptable system outages to electricity consumers. Any plan that starts with consumer costs and works backward to reliability and then to emission reduction is one that fails to consider the wide availability of current tools that have served grid operators for more than a decade to meet reliability needs. There is no reason to think that cost and reliability objectives cannot be harmonized within a plan to reduce carbon pollution.” Susan Tierney, Paul Hibbard, and Craig Aubuchon, “Electric System Reliability and EPA's Clean Power Plan: Tools and Practices,” February 19, 2015, page ES-5.

One of MISO's concerns, however, is that the region could face incremental challenges associated with compliance on top of the nearer-term resource-adequacy issues faced even before the 2020 start date of the proposed Clean Power Plan's interim compliance period.

MISO estimated that between 10 and 12 GW of coal-fired generating capacity will retire by 2016 for MATS compliance and that an additional 11 GW will retire by 2020 to meet the Clean Power Plan's interim emission-reduction goals. MISO commented that in order to avoid going below the region's planning reserve margin ("PRM") targets, future retirements of coal-fired capacity would require a 1-to-1 replacement of capacity at the time of retirement to maintain reliability. Based on its estimates of lead times for replacement capacity, MISO believes that "[t]his is well before sufficient replacement capacity can be placed into service."<sup>35</sup>

This theme of needing more time to adjust the system's infrastructure, including through adding electric transmission and natural-gas pipelines, was mentioned in comments by several utilities, state regulators and grid operators at the FERC technical conference on reliability issues held in the Midwest in April 2015.<sup>36</sup>

In subsequent correspondence between the EPA's and FERC's leadership, EPA has indicated that "we recognize, as we emphasized in our presentations, that it is incumbent on us to craft a rule that provides sufficient time, flexibility and latitude for states, utilities and reliability entities to take the actions that they must take to ensure system reliability. In addition, commenters have provided us with a number of important suggestions for addressing reliability concerns directly through a variety of substantive and procedural mechanisms. We are reviewing these carefully and weighing several for possible inclusion in the final rule."<sup>37</sup> The response from the five FERC commissioners reiterated that "[a]s your letter recognizes, EPA's final rule should provide enough time and flexibility for affected entities to take the actions that they must take to ensure system reliability.... Thus, we trust EPA will consider the concerns raised with the interim goals, and other views expressed on this issue,

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<sup>35</sup> Comments of MISO submitted to the EPA regarding the Clean Power Plan, Docket ID No. EPA-HQ-OAR-2013-0602, November 25, 2014. MISO assumes that: new gas-fired generating units (NGCCs) or combustion turbines typically require three to six years, from the start of development to entering commercial operation; new transmission expansion requires at least six to ten years; and new natural gas delivery infrastructure requires several years. MISO Clean Power Plan Analysis, pages 3 and 17.

<sup>36</sup> Jeffrey Tomish, "States to FERC: Clean Power Plan too much, too fast," *EnergyWire*, April 2, 2015.

<sup>37</sup> Letter from Janet McCabe, Acting Assistant Administrator for Air and Radiation, U.S. EPA, to Chairman Norman C. Bay of the FERC, May 6, 2015.



as EPA finalizes its rule. Various commenters indicated, for example, that more flexibility on the interim goals may lessen reliance on other processes for addressing reliability.”<sup>38</sup>

## Reliability in the MISO Region: Tools

In the end, securing reliable system operations in the MISO region throughout the Clean Power Plan transition will be supported by the combination of many things: MISO's “business-as-usual” reliability procedures, which include (among other things) generation-retirement notification requirements and review process; other obligations of MISO-member utilities to participate in MISO to maintain system reliability; MISO's comprehensive resource-adequacy assessment processes, coordinated with the states and market participants; the states' own resource adequacy processes; and a demonstrated and historically successful level of multi-state coordination around MVP projects and other planning tools. We discuss each of these tools, below.

### MISO's Business-As-Usual Reliability Tools

In our first report,<sup>39</sup> we described the wide range of planning and operational tools used by system operators, regulators, and other entities to maintain power system reliability. Although these tools are well-established, grid operators (like MISO) and utilities (including in the MISO region) are already looking at what adjustments may be needed to stay abreast of, understand, and adapt to changes already underway in the industry. Some of these transitions are already affecting the MISO region years in advance of the proposed start of the Clean Power Plan's interim period in 2020.

Every region – including MISO – has shown the resilience of processes in place to maintain system reliability in the face of major resource changes. These regions have demonstrated, time and time again, their ability to absorb and process such changes in a way that meets efficiency and reliability objectives. The tools available to maintain reliable system operations in the face of short-notice retirement decisions or loss of resources extend – when needed – well beyond the “normal” planning and market structures that govern most outcomes.

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<sup>38</sup> Letter of FERC Chairman Norman Bay and Commissioners Philip Moeller, Cheryl LaFleur, Tony Clark, and Collette Honorable, to Janet McCabe, Acting Assistant Administrator for Air and Radiation, U.S. EPA, May 15, 2015.

<sup>39</sup> Susan Tierney, Paul Hibbard, and Craig Aubuchon, “Electric System Reliability and EPA's Clean Power Plan: Tools and Practices,” February 19, 2015.

As we noted above, MISO and the MISO states have already begun to experience changes in the overall generation mix. MISO is managing to integrate increasing amounts of variable energy resources and rely upon them during extremely cold winter conditions (including during the Polar Vortex). It is adapting to changes in dispatch as the relative prices of coal and natural gas have changed in recent years. It is overseeing reliability as the industry responds to a more restrictive set of air-pollution-control mechanisms under MATS (as compared to the Clean Power Plan).

MISO, the states, and the industry have multiple “business-as-usual” mechanisms to assure system reliability:

- ***Planning and market/regulatory outcomes that address most resource retirements.*** MISO and others conduct “what-if” analyses of potential resource changes based on industry forecasts and individual unit economics. A formal notice to deactivate or retire a generating unit spurs system studies to evaluate reliability impacts related to the overall level of resources on the system (i.e., resource adequacy) or the impact of the loss of a generating source on local and regional system operations (i.e., system security). Market outcomes or utility resource planning/procurement requirements then typically cause the development and operation of new resources as needed to meet resource-adequacy and system-security needs. If the loss of a resource is found to cause security violations on the transmission system that are not or cannot be addressed through resource additions, regional planning processes are initiated for the development and construction of transmission system upgrades to eliminate the reliability issues. For the most part, changes to electric systems are gradual over time, and effective planning and market structures allow for the orderly replacement and addition of transmission and generation infrastructure (and demand-side resources) to address evolving needs.
- ***With short-notice retirements, resources may be retained for an interim period until reliable solutions are developed.*** On occasion, changes on power systems occur without sufficient notice for typical planning and market procedures to cause timely replacement. Certain losses of resources cannot be delayed (e.g., due to an accident or safety considerations). But the request to promptly deactivate or retire a resource for economic reasons triggers an immediate review of system impacts, and in most cases the deactivation of the unit is delayed if the shutdown of the unit would violate

transmission-security standards. In MISO, the rejection of a deactivation request typically leads to an SSR contract until other solutions can be put in place.<sup>40</sup>

- *Even in rare cases where a short-notice loss of resource cannot be delayed, system operators and utilities have tools to maintain reliability until replacement resources or upgrades are in place.* The industry has a number of tools to fill in the gap left by the sudden loss of a resource on the system that is needed for reliability. System operators can and do take emergency actions as needed to protect system security, including operating procedures that provide for accessing in-region and neighboring regions' reserves, posturing units to manage flows on the transmission system, initiating demand-response resources and voluntary curtailments, and other actions. Utilities can do other things, including such things as: solicitation of additional energy efficiency, load curtailment and/or demand response; installation of moveable generation as needed to support system operations; re-wiring components in the electric system to allow changes in flows; and immediate development of temporary generation through utility self-build projects or fast-track solicitations (e.g., "gap RFPs").

Power system reliability remains a high priority in the MISO footprint. MISO and the utilities and power suppliers that are members of MISO have provided reliable energy supply on a continuous basis. And given their business-as-usual roles, responsibilities and practices – in combination with the active role of utilities and utility regulators in the MISO states – there is no reason to believe that these entities will do anything short of what is required to assure resource adequacy and operational security in the MISO footprint, even with the advent of the Clean Power Plan.

Furthermore, the flexibility that EPA granted states in designing Clean Power Plan implementation plans leaves the door wide open for states to propose in their plans the specific mechanisms needed to ensure that Clean Power Plan compliance does not compromise system reliability.

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<sup>40</sup> MISO maintains the ability to retain generators as an SSR asset under Attachment Y of the MISO tariff. Currently, resources must provide at least 26 weeks of notice to retire. During that period, MISO evaluates the retirement request for reliability needs. If a need is identified, MISO and the affected transmission owner work to identify alternative solutions, before negotiating an SSR. MISO did not execute an SSR until 2012, and since that time, has issued eight agreements – with seven still in effect as of June 2014. These SSRs cover 1,027 MW of capacity, primarily located in the upper peninsula of Wisconsin and Michigan. See MISO, MTEP 2014, page 79.

## Resource Adequacy: The Role of MISO

More specifically, MISO operates on a platform of rules, processes and member obligations that creates a strong foundation for maintaining reliability. These include requirements that member utilities participate in region-wide planning and abide by MISO processes to support regional resource adequacy, ensure system security, and assess potential reliability issues. Although there are differences in the specific processes and practices in place in MISO compared to other regions, there are fundamental services provided by MISO that are parallel to those that exist in all parts of the U.S. This is a key support structure upon which the various players – states, owners of power plant assets, providers of transmission service, the grid operator, and others – consider and address changes that are occurring in the resource mix, including any changes in state policy related to the Clean Power Plan.

### MISO sets resource adequacy targets

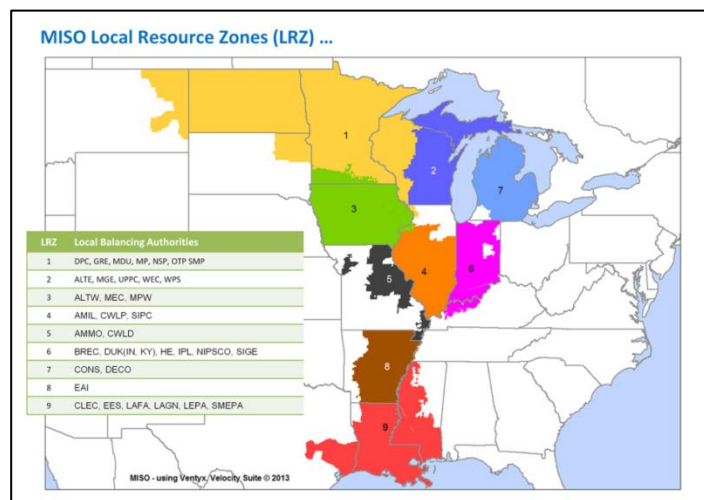
Under its current tariff, MISO is responsible for setting the PRM target for the applicable planning year. For the 2015/2016 planning year, the PRM is set at 14.3 percent,<sup>41</sup> based on the 1-day-in-10-year loss of load expectation (“LOLE”) standard in the region.

This process involves collaboration with others at every step. For example, MISO first develops its load forecast

based on the demand forecasts of each individual utility or other load-serving entity (“LSE”) in the region. Although the states maintain the ultimate authority to set a different PRM, which would be adopted by MISO in setting its system-wide margin,<sup>42</sup> in practice the states have adopted MISO’s recommendation.

MISO also separately models locational requirements within each

Figure 6



Source: MISO

<sup>41</sup> “Planning Year 2015-2016: Loss of Load Expectation Study Report,” MISO Loss of Load Expectation Working Group, November 2014, page 31. MISO reports the planning reserve margin in both Installed Capacity (“ICAP”) and Unforced Capacity (“UCAP”) terms. UCAP accounts for the availability of generators throughout the year, based on historical and planned outage schedules. Throughout our report, we provide ICAP planning reserve margins, unless otherwise noted.

<sup>42</sup> Resource Adequacy Business Practice Manual, BPM-011-r14, page 27.

of nine transmission zones (Figure 6). This is used to set a separate local clearing requirement (“LCR”) that takes into account the local reliability requirement (“LRR”) needed to meet local peak demand and the capacity import and export limits into and out of each region.<sup>43</sup>

These LCRs are important for several reasons. First, they provide market signals throughout the MISO region and indicate where new generation is likely to be most needed, based on local changes in demand or supply conditions. Second, the LCRs also tie into MISO’s regional transmission-planning processes – the more general MTEP process, or the more specific MVP process – by illuminating capacity import limits between zones which, if mitigated, might allow for excess generation in one zone (or state) to meet the local resource adequacy need of another.

Once established, LSEs in all states can meet their respective resource-adequacy requirements in a number of ways. These include: the option for companies to self-schedule supply (for example, through their own resources or the use of bilateral contracts), submit a Fixed Resource Adequacy Plan (“FRAP”) that demonstrates compliance through its own resource plan, or purchase zonal resource credits through the MISO PRA process. Most LSEs satisfy their capacity obligations through self-scheduling their supplies and FRAPs. Any resource that is submitted as part of a plan is converted to a zonal resource credit (“ZRC”) based on its qualified unforced capacity, and any resources that wish to retire before the end of the planning year are required to replace the respective capacity through additional ZRCs or must face a deficiency charge.

Resources that are submitted as a part of the PRA or a FRAP are subject to must-offer requirements and performance standards, which are reviewed on an ongoing basis by MISO’s Independent Market Monitor. At the same time, an LSE can also choose to not meet a resource adequacy requirement and instead pay a deficiency charge.<sup>44</sup>

### **The MISO Planning Resource Auction allows market participants to adjust their resources over time and sends signals to investors**

As noted above, under MISO’s current market design, as a means for LSE to demonstrate that it has sufficient capacity to meet its own obligations, an LSE may participation in the

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<sup>43</sup> Resource Adequacy Business Practice Manual, BPM-011-r14, page 27.

<sup>44</sup> See Module E-1, Section 69A and 69A.7.1 “All LSEs will be required to meet their PRMR through the PRA process, unless they have opted out of the PRA pursuant to Section 69A.9 [FRAP] and/or have decided to pay the Capacity Deficiency Charge.” The deficiency charge is equal to 2.748 multiplied by the Cost of New Entry and the total quantity of deficient resource credits. (Module E-1, Section 69A.10).

PRA.<sup>45</sup> As summarized by MISO's Independent Market Monitor, "[t]he PRA allows participants to buy and sell capacity to satisfy residual capacity requirements and better identifies locational capacity needs throughout the MISO."<sup>46</sup>

MISO introduced this current capacity market construct in 2013, and the PRA is now used to provide additional flexibility for market participants to voluntarily and efficiently meet their residual resource adequacy obligations from resources other than self-supplies or FRAP. The transition to the PRA represented an important improvement over the previous Voluntary Capacity Auction ("VCA") in part because it better defines locational capacity needs.<sup>47</sup>

The PRA and the 2015/16 auction results, in particular, have recently come under increased scrutiny, with the Illinois Attorney General raising concerns about the causes of price separation across zones. These price separations appear to be due to a number of factors, including local capacity requirements, transfer constraints, market design,<sup>48</sup> the opportunity cost of supply capacity into neighboring regions.<sup>49, 50</sup> For example, many resources in Illinois can also deliver into PJM which may allow them to choose to participate in either capacity auction.<sup>51</sup>

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<sup>45</sup> Any LSE with an excess of supplies must offer those supplies into the market, subject to a 50 MW withholding threshold. (Module D, Section 64.1.1).

<sup>46</sup> Potomac Economics, "2013 State of the Market Report," page 1.

<sup>47</sup> See, for example, Potomac Economics, "2013 State of the Market Report," page 1.

<sup>48</sup> For example, the current PRA effectively uses a vertical demand curve. The MISO's Independent Market Monitor has recommended that MISO develop a sloped demand curve to better reflect the incremental value of capacity for reliability benefits. The vertical demand curve appears to have contributed in part to the jump in capacity prices. See Jeffrey Tomich, "Illinois Legislators question MISO executive about capacity auction," E&E Publishing - Electricity, April 21, 2015.

<sup>49</sup> In MISO, the Market Monitor establishes the initial reference level based on the opportunity cost of exporting to a neighboring region (Module D, Section 64.1.4). The IMM reviews all offers above the reference level plus 10 percent of CONE for withholding. (Module D, Section 64.1.2).

<sup>50</sup> We are aware that there are differences of opinion with regard to the causes of price divergence in the recent MISO auction. We have not conducted an analysis of the particular matters in dispute and therefore are not taking a position on the disputed issues. For example, MISO has reportedly said that the Independent Market Monitor for the MISO market "reviewed the offers and determined that the final results were not impacted by physical or economic withholding and other conduct prohibited by MISO's Tariff," Statement of Kari A.E. Bennett, MISO's senior corporate counsel, as reported by Chris O'Malley, "MISO: Nothing Amiss in High Illinois Capacity Prices," *RTO Insider*, April 27, 2015. <http://www.rtoinsider.com/miso-illinois-capacity-prices-14758/>. The Illinois Attorney General has subsequently filed a complaint at FERC, allegedly that the auction results were a product of the exercise of market power. See: [Paul Ciampoli](http://www.publicpower.org/Media/daily/ArticleDetail.cfm?ItemNumber=43978), "Illinois AG files complaint against MISO related to auction results," *Public Power Daily*, June 1, 2015 (originally published May 29, 2015). <http://www.publicpower.org/Media/daily/ArticleDetail.cfm?ItemNumber=43978>.

<sup>51</sup> For the latest MISO auction, capacity prices in Zone 4 (Illinois) increased from \$16.75/MW-day to \$150/MW-day. In contrast, Zones 2 through 7 (excluding 4) cleared at \$3.48/MW-day. PJM's most recent auction cleared at \$136/MW-day for the 2015/16 year. See "2015-2016 PRA Detailed Report" and "2014-2015 PRA Detailed Report," available: <https://www.misoenergy.org/Library/Pages/ManagedFileSet.aspx?SetId=2054>.



That said, an increase in capacity prices – while difficult in the short term for consumers – is expected to provide an appropriate signal to investors that capacity is needed in the market. In theory, this is what the PRA is designed to do, especially when there are changing conditions in MISO's market (such as the draw-down of prior/existing capacity surpluses).

As noted by the global market research firm UBS, “separate and distinct price signals between regulated and competitive markets is a crucial element to setting appropriate price signals in restructured markets...”<sup>52</sup> According to Richard Doying, COO of MISO: “This was really a local issue where the local demand had to be cleared with local resources... price spreads across the region, I think are consistent with the design of the market, and the market is, in fact, designed as you would hope to design a competitive market to achieve competitive outcomes.”<sup>53</sup>

Using this price information, developers of potential projects can come forward with potential capacity resources. A utility or other market participant can use the results of capacity auctions as it considers the cost-effectiveness of adding new generating assets (whether self-build or power procurements), or a new transmission project, or incremental demand-side resources. For example, this information can inform the regional MTEP process to identify cost-effective transmission solutions, such as the MVP, that can be used to increase capacity imports into affected zones within MISO. (See more on the MTEP/MVP processes below.) This could allow any excess capacity in neighboring zones – that may currently be limited by these import limits and therefore “stranded” from a zonal resource adequacy perspective – to help meet resource adequacy standards.

Additionally, MISO, the region's market participants, state regulators, and FERC could consider changes to MISO market rules to address local and regional reliability concerns associated with the tightening reserve margins anticipated to emerge over the next several years.<sup>54</sup> For example, analysts at SNL Energy recently offered the following insight:

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<sup>52</sup> Julien Dumoulin-Smith, Michael Weinstein, and Paul Zimbardo, “Learning what's in the MISO soup (includes conference call transcript)”. April 22, 2015.

<sup>53</sup> Cited in the transcript of a conference call, in Julien Dumoulin-Smith, Michael Weinstein, and Paul Zimbardo, “Learning what's in the MISO soup,” April 22, 2015.

<sup>54</sup> For example, the absence of a long-term forward capacity market and of a minimum-offer price rule (“MOPR”), which exist in some other RTOs (but not in MISO) and have proven to be controversial in several regions (e.g., PJM), have some effect on potentially dampening capacity price signals in MISO: “As a largely regulated, cost-of-service market, new merchant projects will have to compete against utility self-supply through the RFP process, which often proves difficult given the less expensive financing structures typically available to utilities. Furthermore, without a forward capacity market, market participants can only see forward pricing signals through the bi-lateral contracting process which makes it more difficult to push through projects without a contract in hand. Unlike other Eastern ISO markets, the MISO capacity market currently does not have in place a MOPR, which would require new projects to bid into the market at minimum levels. This means that prices out of the

SNL Energy's projected rise in capacity values in MISO is highly dependent on tight supply-demand balance... MISO currently models the ability of generators in the market to export capacity to the larger transmission system, and transmission limitations resulting from this are part of what drives the tightness in the market. Currently, greater than 3,000 MW of conventional generation is not counted toward capacity totals due to transmission limitations, with this number even higher when considering trapped wind generation. Some of this capacity may be able to be freed up by modest transmission investments with costs far below the cost of new build. Additionally, it is also likely that some of the shortfall in MISO's North and Central regions could be offset by additional imports from the MISO South region, which is estimated to have a surplus in excess of 2,000 MW. MISO has issued a number of estimates on potential transfer capability between the South region and the rest of MISO quoting numbers as high as 4 GW. The issue of contribution from the South may be clouded by how the transmission battle between MISO and SPP [Southwest Power Pool] over the use of SPP's system to transfer energy between the south region and the rest of MISO plays out. Currently MISO has voluntarily limited transmission from its southern region to 1 GW following a March 28, 2014, FERC decision which forced MISO to pay for using SPP's unreserved transmission capacity when routing power between MISO's northern and southern regions. If this assumed transfer capability is expanded, it could increase the effective reserve margin in MISO and pressure capacity values.<sup>55</sup>

### **Resource Adequacy: The Role of the States, Utilities' Integrated Resource Planning, and Competitive Markets**

The MISO States have a long and successful history of using IRP processes to ensure resource adequacy for their utilities and their customers, and continue to successfully implement IRP processes within the broader MISO planning process.<sup>56</sup>

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formal market could be depressed even when new build is needed, if utility-contracted or self-supplied capacity bids in as a price taker... In August 2014, a trio of MISO IPPs including Dynegy and Exelon filed with FERC petitioning for expedited action on capacity market reforms in MISO which included changes such as a MOPR, a forward capacity auction with downward sloping demand curve and mandatory participation by both load and resources. The comment deadline has since past but FERC has not acted as of this writing. This will be something to watch closely as capacity market reform could improve the relative attractiveness of the MISO market for merchant investment." SNL RTO Generation Investment Report, May 2015, page 17.

<sup>55</sup> SNL RTO Generation Investment Report, May 2015, page 19.

<sup>56</sup> See for example, Comments of Nancy Lange, Commissioner Minnesota Public Utilities Commission, FERC Central Region Technical Conference, March 31, 2015: "But we recognize that we don't just live in an IRP world, we live in an RTO world. Minnesota has derived economic and reliability benefits from participation in MISO. For example, regional transmission planning and projects have enabled cost effective reductions in carbon emissions in our state through integration of substantial Midwestern wind resources. Our ratepayers benefit from power markets that are governed by economic dispatch. Our agency engages actively with OMS and MISO to ensure that MISO's planning, procedures, and tariffs represent the best interest of



These processes focus attention on ensuring enough capacity resources, but they also have the ability to place value on the attributes of capacity resources that can facilitate compliance with Clean Power Plan requirements. This capability has led many states to develop IRP processes that assure fair consideration of demand-side, supply-side and transmission alternatives, and that rely on market-based mechanisms (e.g., competitive procurements) to determine whether it is cost-effective to allow the utility to build its own assets or to buy power from third party suppliers. Use of such state authorities can provide signals to the market aligned with transitions underway in the industry.

Within MISO, some states have already begun to consider prices on carbon and other pollutants when making long-term resource planning and siting decisions. Since 1997, for example, Minnesota has required that utilities account for environmental damages (including relating to emissions of CO<sub>2</sub>) when preparing cost analyses as part of their resource acquisition plans.<sup>57</sup> The Minnesota PUC reopened its “environmental externalities docket” in February 2014, and under this proceeding is considering, among other things, a recommendation from the state’s Department of Commerce and the Pollution Control Agency to adopt the Federal Social Cost of Carbon for CO<sub>2</sub> values going forward.<sup>58</sup>

The state’s regulators also consider the environmental damages of CO<sub>2</sub> emissions in two separate but related dockets. First, in its Value-of-Solar docket, the Minnesota PUC established that the Social Cost of Carbon should be used when assessing the marginal cost of CO<sub>2</sub> emissions when setting solar tariffs. Under Docket CI-07-1199, the Minnesota PUC also established a range of CO<sub>2</sub> values that reflect future regulatory compliance costs. Starting in 2019, utilities will be required to include this cost range in their long-term plans. The Minnesota PUC explicitly stated that utilities will not be required to include both a regulatory cost and the environmental externalities cost.<sup>59, 60</sup>

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Minnesota. We understand that living in an RTO world, actions taken by Minnesota to ensure resource adequacy can be enhanced or compromised by actions of other states or even the RTO itself. We are joined at the reliability hip.”

<sup>57</sup> The Minnesota PUC established a range of environmental cost values for Sulfur Dioxide (“SO<sub>2</sub>”), particulates (“PM10”), carbon monoxide, nitrogen oxides (“NO<sub>x</sub>”), lead, and CO<sub>2</sub> in an Order issued January 3, 1997 in Docket CI-93-583. The Minnesota PUC reopened its “environmental externalities docket” in February 2014, and under this docket is considering, among other things, a recommendation from the state’s Department of Commerce and the Pollution Control Agency to adopt the Federal Social Cost of Carbon for CO<sub>2</sub> values going forward. See Minnesota PUC Docket No. 14-643. For a comprehensive summary, see Minnesota Public Utilities Commission Staff Briefing Papers, September 4, 2014, Docket No. CI-14-643.

<sup>58</sup> See Minnesota PUC Docket No. 14-643.

<sup>59</sup> For a comprehensive summary, see Minnesota PUC Staff Briefing Papers, September 4, 2014, Docket No. CI-14-643.

<sup>60</sup> We note too another recent example of state/utility action in this area (although occurring in the neighboring RTO, the Southwest Power Pool). In its most recent Integrated Resource Plan, Kansas City Power and Light explicitly addressed the proposed Clean Power Plan when it filed plans to phase out coal plants by 2020 and to increase its renewable resources. Lauren Bellerio, “Environmental rules prompt less coal, more renewables in Great Plains IRPs,” SNL Financial, April 14, 2015.

These implicit or explicit economic values for CO<sub>2</sub> emissions are reflected in the utility's plans and regulators' siting and resource-adequacy decisions, and do not directly affect the dispatch decisions of MISO and the energy markets (except to the extent that the siting process leads to the entry of new generating assets with favorable efficiency profiles (e.g., low heat rates)). However, these examples point out the role that individual state IRP processes can – and do – play in affecting resource adequacy while also lowering CO<sub>2</sub> emissions from power plants.

States will have many other options for integrating the value of CO<sub>2</sub> emissions into their planning processes in ways that support resource adequacy and system reliability. And states can design their State Plans to comply with EPA's Clean Power Plan in a number of ways. These options are broad, and have been compiled in numerous studies and reports in the past year.<sup>61</sup>

States will have significant discretion in how they shape their plans. There are many strong reliability (and economic) reasons why states in the MISO region would seek voluntarily to align the elements of their State Plans with the competitive-market character of the electric industry structure affecting power plants in the MISO portion of their states.<sup>62</sup> Even if the states do not end up filing a single joint multi-state plan, the states in an RTO can – and we think should – design their plans to be compatible with one another. This will help support reliability outcomes and lower the cost of compliance.

### Regional Collaboration

Finally, given its history of collaboration across the many states of the MISO region, this group of states seems well prepared to capture the benefits of regional coordination. As we noted in our overview of the region, there is a culture of voluntary cooperation and coordination. For more than a half century, utility regulators have convened as the Mid-

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<sup>61</sup> See, for example: Susan Tierney and Paul Hibbard, "Carbon Control and Competitive Wholesale Electricity Markets: Compliance Paths for Efficient Market Outcomes," May 2015; Natural Association of Regulatory Utility Commissioners ("NARUC") guide to "Multistate Coordination Resources for Clean Power Plan Compliance," May 12, 2015; Franz Litz and Jennifer Macedonia, "Choosing a Policy Pathway for State 111(d) Plans to Meet State Objectives, Great Plains Institute and Bipartisan Policy Center," April 24, 2015; Rachel Wilson, et al., "Best Practices in Planning for Clean Power Compliance: A Guide for Consumer Advocates," Synapse Energy Economics, Prepared for the National Association of State Utility Consumer Advocates, April 29, 2015; Comments of Exelon Corporation, submitted to the EPA in Docket ID No. EPA-HQ-OAR-2013-0602, submitted on December 1, 2014; Paul Hibbard, Andrea Okie and Susan Tierney, EPA's Clean Power Plan: States' Tools for Reducing Costs and Increasing Benefits to Consumers," July 2014; and Susan Tierney, "Greenhouse Gas Emission Reductions From Existing Power Plants Under Section 111(d) of the Clean Air Act: Options to Ensure Electric System Reliability," May 8, 2014.

<sup>62</sup> We recently identified the importance of states in multi-state RTOs adopting mass-based, multi-state emission-trading approaches that cover both existing and new generating units. Susan Tierney and Paul Hibbard, "Carbon Control and Competitive Wholesale Electricity Markets: Compliance Paths for Efficient Market Outcomes," May 2015.

America Regulatory Conference (“MARC”) group to discuss and work through issues of common interest. Other examples include: the MISO-sponsored voluntary survey of generation statistics; the states working together through the Organization of MISO States; the long-standing work of NERC’s regional partner, the Midwest Reliability Organization (“MRO”) and its predecessor organizations); and the Midwestern Power Sector Collaborative, a group of energy and environmental regulators, power companies and environmental groups that have been discussing (among other things) ways to provide options for parties in the region to enter voluntarily into a cap-and-trade system in the region.<sup>63</sup>

The recent efforts of Mid-Continent utility and environmental regulators (in MSEER) to discuss issues relating to the EPA’s proposed Clean Power Plan is yet another recent, active and constructive example of regional collaboration. At present and going forward, the MSEER discussions are a critical venue for multi-state cooperation and analysis, with the potential to significantly support both regional planning and preparedness for the wide range of potential actions (including multi-state approaches, and other demand-side options) that may be adopted voluntarily by the states in designing and implementing their State Plans.<sup>64</sup>

The MISO’s MTEP process with its process for evaluating MVP projects is another clear instance of this regional coordination, and offers pathways for helping the region work through reliability issues relating to Clean Power Plan compliance going forward.

MISO conducts transmission planning and assessments under its current MTEP framework, which is used more broadly to collaborate on all transmission planning issues in the MISO footprint. This framework is based on five key principles:<sup>65</sup>

- Make the benefits of a competitive energy market available to customers by providing access to the lowest possible energy costs.
- Provide a transmission infrastructure that safeguards local and regional reliability.

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<sup>63</sup> In April, the group asked EPA to create a framework for establishing such a system. “Midwestern states ask EPA to set up regional carbon trading rules to meet Clean Power Plan,” Climate Wire, May 11, 2015.

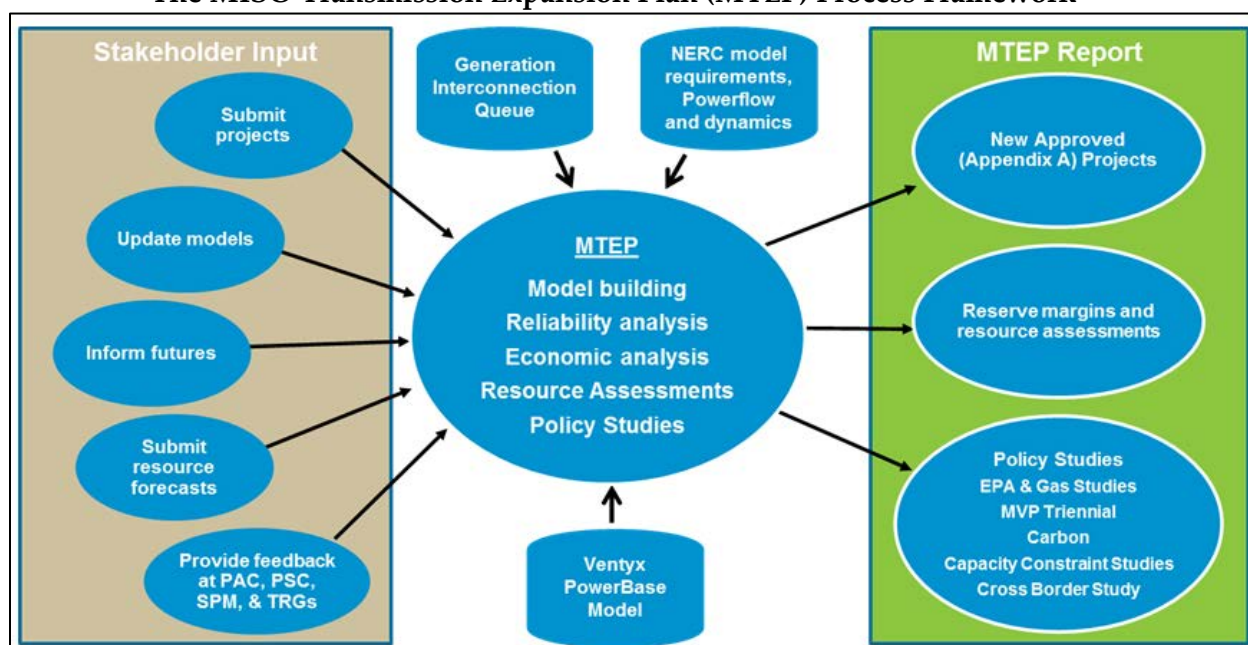
<sup>64</sup>The MSEER discussions have been supported by the Great Plains Institute, with analytic support from the Bipartisan Policy Center. The latter organizations recently hosted an all-day meeting on June 5, 2015 (“Midcontinent States Regional Workshop: Implementation Options for EPA’s Proposed Clean Power Plan”) to discuss: Policy Pathways for States to Achieve State Emissions Goals; Opportunities and Challenges for Multistate Collaboration; and Achieving State Goals in the Midcontinent Region. [http://bipartisanpolicy.org/events/midcontinent-states-regional-workshop-implementation-options-for-epas-proposed-clean-power-plan/?\\_cldee=c3RpZXluZXlAYW5hbHlzaXNncm91cC5jb20%3d](http://bipartisanpolicy.org/events/midcontinent-states-regional-workshop-implementation-options-for-epas-proposed-clean-power-plan/?_cldee=c3RpZXluZXlAYW5hbHlzaXNncm91cC5jb20%3d).

<sup>65</sup> These five bullets are quoted directly from: MISO Business Practices Manual, Transmission Planning, Manual No. 020, BPM-020-r11, page 14.

- Support State and Federal renewable energy objectives by planning for access to all such resources (e.g. wind, biomass, demand-side management).
- Create a mechanism to ensure that investment implementation occurs in a timely manner.
- Develop a Transmission System scenario model and make it available to State and Federal energy policy makers to provide context and information regarding potential policy choices.

This framework (depicted in Figure 7) and the previous success of the MTEP process, including its MVP process, create a strong platform that will be used to help states in the Mid-Continent area to meet the goals of the Clean Power Plan while also ensuring system reliability. The MTEP process provides both the tools and solutions to respond to potential challenges from individual state implementation plans, and at the same time, provides an important framework for how to implement a broader regional coordination approach.

**Figure 7**  
**The MISO Transmission Expansion Plan (MTEP) Process Framework**



Source: MISO MTEP14, Book 1, Chapter 2.3.

As a first step in its MTEP planning process, MISO classifies transmission projects into two buckets, called Appendices A and B.<sup>66</sup> Projects that are matched as a potential solution to a

<sup>66</sup> See the MTEP14 Report. Originally, there was a third category, Appendix C, in which all projects started. These were expansions proposed by any stakeholder (e.g., a utility, an independent transmission company), under the belief that they offer some positive system-wide benefits. Appendix C projects were not specific to a known reliability need or issue.

known reliability need, policy or other need, or an identified cost savings or other benefit are moved to Appendix B. Within Appendix B, there could be multiple projects that satisfy a given need. The preferred solution of projects that serve multiple needs is then moved into Appendix A.

The MTEP has an 18-month planning cycle that includes reliability analyses, economic analyses, and resource assessments. To support this process, MISO is responsible for collaborating and coordinating with stakeholders (including state PUCs and local utilities) for necessary forecasts of system load and generator availability. MISO then models the impact of various types of projects (e.g., baseline reliability projects, new transmission access projects such as generation interconnection and transmission delivery service projects, and market efficiency projects) over both the short-term (1 to 10 years) and the long-term (20 year) time horizons, and compares these model results against a business as usual scenario. These studies provide necessary planning recommendations, such as system-wide and local planning reserve margins, and also provide timely review of pressing policy issues and the impacts on stakeholders.

Unique to the MTEP process is a special class of transmission projects known as Multi-Value Projects.<sup>67</sup> Broadly, MVP projects are used to help meet state and/or federal policy objectives or solve an identified reliability violation under NERC standards. MVP projects are unique in that they provide multiple different streams of quantifiable benefits, in excess of project costs, to multiple regions in the MISO footprint. Because of their regional nature, MVP project costs are allocated to all load in the MISO region and shared proportionately.

The benefits of these projects can include production-cost savings that arise from serving load more efficiently (e.g., through lower operating reserves or reduced operating costs), or savings resulting from avoided capacity costs and payments (e.g., through reduced system losses during peak demand and/or from reduced planning reserve margins as identified

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<sup>67</sup> Specifically, MVP projects those projects whose “primary purpose... is to enable cost sharing of projects that are regional in nature and developed to enable compliance with public policy requirements, which include state and federal laws and regulations, and/or to provide economic value, defined as the difference between financially quantifiable benefits related to the provision of transmission service and the project costs.” MVP projects must meet one of three criterion:

- Enable the transmission system to “reliably and economically deliver energy in support of documented energy policy mandates or laws that have been enacted or adopted through state or federal legislation or regulatory requirements that directly or indirectly govern the minimum or maximum amount of energy that can be generated by specific types of generation. The MVP must be shown to enable the Transmission System to deliver such energy in a manner that is more reliable and/or more economic than it otherwise would be without the transmission upgrade.”
- [P]rovide multiple types of economic value across multiple pricing zones with a total MVP benefit-to-cost ratio of 1.0 or higher...
- [A]ddress at least one Transmission Issue associated with a projected violation of a NERC or Regional Entity reliability standard and must provide economic value across multiple pricing zones.”

MISO Business Practices Manual, Transmission Planning, Manual No. 020, BPM-020-r11, pages 148-149.

through LOLE studies), or by accelerating, deferring, or replacing alternative infrastructure plans needed in either the short-term or long-term.

The roots of the MTEP process are changes that have been taking place in the region's electric system for more than a decade. As we have noted in our previous reports on electric system reliability and the Clean Power Plan, many of the changes it envisions are already underway and the industry is already in the midst of crafting solutions to these challenges. The MISO MVP projects are a perfect example of this trend.

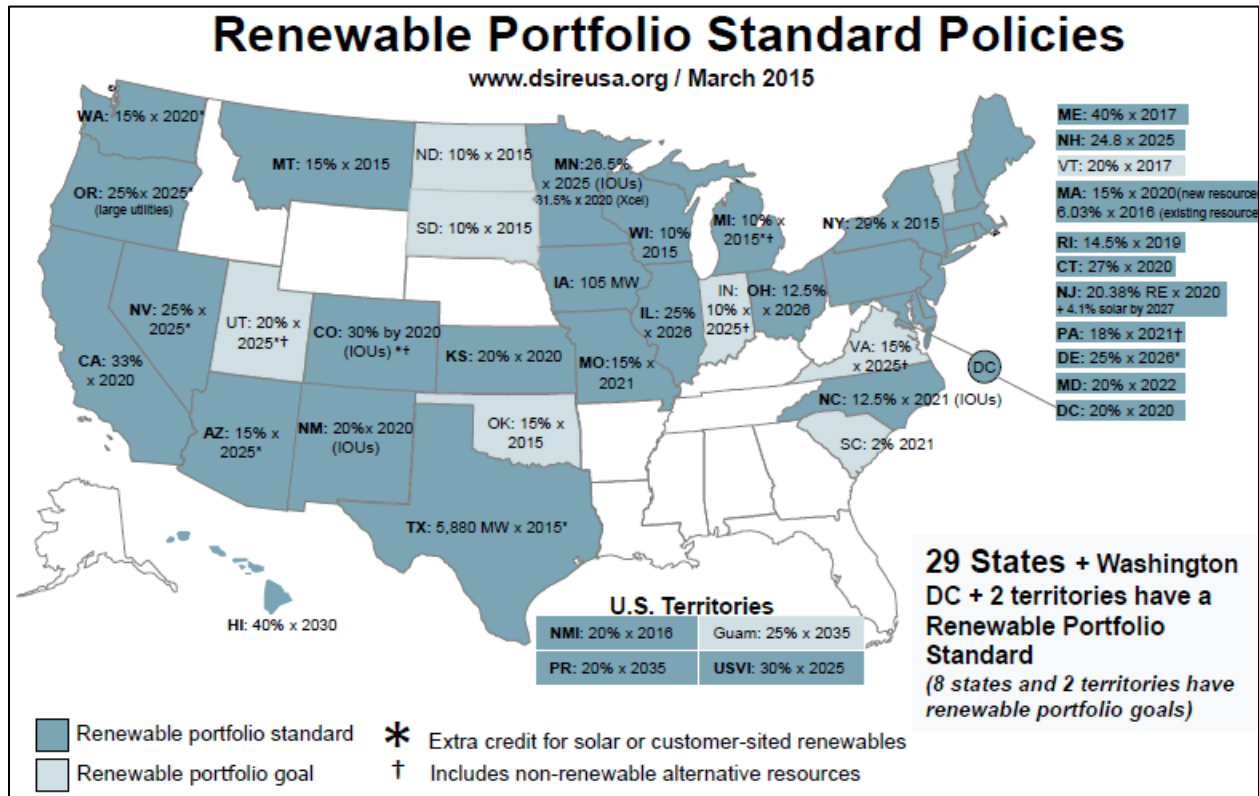
As early as 2003, MISO members met to discuss a regional planning approach. By 2008, they had identified a need for a more "regional and robust" transmission system to help meet the Renewable Portfolio Standards ("RPS") of member states by enabling additional wind-powered generation, particularly in the western edge of the MISO footprint.<sup>68</sup> (See Figure 8.)

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<sup>68</sup> Kentucky is the only state in MISO without an RPS mandate or goal. Most states have a mandate or goal to generate between 10-to-15 percent of energy from renewables, with timeframes varying from 2015 to 2025. Minnesota and Illinois have the most aggressive goals, with 25 percent of energy (or more) from renewables by 2025. Each state has slightly different definitions of qualifying renewables, but the majority of most standards will be met through increased wind generation, enabled in part by the MVP projects. See MISO, "Multi-Value Project Portfolio, Results and Analyses," January 10, 2012, page 3.



Figure 8  
States’ Renewable Portfolio Standards



Source: Database of State Incentives for Renewables and Efficiency (“DSIRE” <http://www.dsireusa.org/>)

In 2011, the MISO Board of Directors approved the first suite of 17 different MVP projects in nine different states, noting that these “no regrets” projects provided multiple reliability and economic benefits, under a wide range of scenarios.<sup>69</sup>

In its 2014 MTEP Review, MISO re-evaluated the multiple benefits of these projects, and found that they significantly improved reliability while enabling greater use of renewables, at a lower cost and lower total system-wide emissions.<sup>70</sup> Specifically, the portfolio was found to mitigate the need for \$300 million baseline upgrades for approximately 650 reliability constraints (under 6,700 different transmission outage conditions), where some of these constraints would have been large enough to potentially cause a cascading system outage if left unaddressed. And MISO found that absent the MVP projects, more than 32 million MWh of wind generation would have had to be curtailed for reliability reasons; with the

<sup>69</sup> See MISO, “Multi Value Project Portfolio, Results and Analyses,” January 10, 2012, page 84.

<sup>70</sup> All numbers cited in the following two paragraphs can be found in MISO, MTEP14 MVP Triennial Review: A 2014 review of the public policy, economic, and qualitative benefits of the Multi-Value Project Portfolio, September 2014.

MVP projects, an additional 11 million MWh of wind could be accommodated and serve future RPS mandates, for a total of 43 million MWh of renewable energy attributed to the MVP projects. All told, the projects reduce carbon emissions from a business-as-usual scenario by up to 9 million tons annually in 2023 growing to 15.1 million tons by 2028.

The MTEP review found that the transmission upgrades also defer the need for additional capacity, both in localities and system wide. From a local clearing-requirement (and resource-adequacy) perspective, the projects allowed for the deferral of 852 MW of capacity expansion in LRZ 3 due to greater capacity-import limits and lower planning-reserve margins.

From a system-wide perspective, the MVP projects provide two capacity benefits. First, the projects reduced system losses during peak periods by 122 MW, thereby avoiding necessary capacity expansions; the projects caused a large shift in the proportion of NGCCs cycle and combustion turbines in the base capital expansion plan. Second, the projects would be online a year earlier than expected (by 2020). Combined with the tighter reserve margins (and the need for new capacity as early as 2016), the deferment value fell within a range of \$291 million to \$1,079 million (based on different scenarios and assumptions). Accounting for these benefits, MISO found that the MVP projects will provide \$17 to \$60 billion in net present value benefits on a 20-to-40-year time horizon. From a reliability point of view, there are additional benefits: increased system robustness, ability to share reserves, and enhanced generation flexibility.

The MTEP/MVP process helps to position the MISO states and region to examine the benefits of a regional, coordinated approach to the EPA Clean Power Plan. For example, MISO's own analysis of the Clean Power Plan found that a regional approach could save regulated entities in aggregate \$3 billion per year.<sup>71</sup> The MTEP/MVP project process offers a framework through which individual states, with their own individual state mandates (e.g., state RPS requirements) can successfully collaborate to form cost-effective solutions for themselves and for the region.

Together the MTEP and MVP processes are strong tools to further position the parties in the MISO states to collaborate to develop workable and reliable Clean Power Plan compliance strategies.<sup>72</sup>

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<sup>71</sup> "MISO Clean Power Plan Analysis," page 12. These savings are relative to a sub-regional approach.

<sup>72</sup> Additionally, some states in the MISO footprint are already working cooperatively to improve their permitting processes and decrease the total time to completion. For example, Minnesota is piloting a pre-application process with the Department of Energy ("DOE"). As part of this pilot, the final Environmental Impact Statement for Great Northern Transmission (a 220-mile,



## Conclusion

Based on our analysis, we make the following conclusions:

- The parties responsible for electric system reliability in the MISO region are well positioned to address collaboratively and constructively the reliability issues that might arise from the electric industry's compliance with the Clean Power Plan.
- With or without the Clean Power Plan, the MISO region has to address relatively near-term resource-adequacy issues. As a region historically – and still – highly dependent on coal for power generation, the MISO states' electric systems have been undergoing significant changes in recent years. Until recently, it has had significant surplus capacity. It has seen (and will likely see more) retirements of coal-fired generating units, increased reliance on natural gas to produce power, integration of significant quantities of electricity generated by wind, and significant expansion of the transmission system.
- Like all RTOs, MISO starts with a strong tool kit for managing the “Essential Reliability Services” needed to assure high-quality electric service. Performing various resource-adequacy and system-security functions is MISO's normal job, which it carries out in conjunction with the states, electric utilities, other market participants, and other reliability organizations, to ensure continuous operational security of the electric system.
- Given the electric industry structure in the MISO region – with an organized power market administered by an RTO and with most electricity consumers in the region served by traditional utilities – there is a strong culture and practice of planning involving the local utilities and their regulators/boards along with MISO. Each plays different roles in assuring electric system reliability. MISO establishes recommended resource-adequacy targets to the states and the industry, while the utilities assemble packages of resources after the states establish planning requirements for them.
- MISO supports this process through various assessments, including the MTEP process and its unique approach – the “Multi-Value Projects” process – for identifying transmission projects that support reliability, economic efficiency and policy goals of the states and which provide broad benefits to the region.
- The region has a long history in which states rely upon IRP processes to provide electricity supply. These IRP processes are a key tool through which utilities assemble

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500-kV line) is expected to be complete within 16 months of DOE's notice of intent. Comments of Lauren Azar, Attorney and Advisor, FERC Central Regional Technical Conference, March 31, 2015, page 4.

their supply portfolios. Many states in the region use IRP processes in conjunction with the MISO markets, competitive-power procurements, and energy-efficiency programs for consumers. This set of tools will help the states and the industry with Clean Power Plan compliance.

- The MISO region and the states also have a history of constructive collaboration that is serving them well as they attempt to overcome the complicated issues they face in preparing to comply with the Clean Power Plan. MISO's and others' analyses suggest that the more the states in the MISO footprint collaborate on a regional, market-based approach, the more this approach will enable the region to comply at a lower cost while also ensuring reliability.
- Finally, the flexibility that EPA has granted states in designing Clean Power Plan implementation plans leaves the door very wide open for states to propose in their plans the specific mechanisms needed to ensure that Clean Power Plan compliance does not compromise system reliability.