



# Market Configuration Matters

Effects of Market Choices  
on Consumers in the Northwest US

**June 2024**

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# 1 | EXECUTIVE SUMMARY

**There is great interest in expanding wide-area Western electricity markets.** Exchanging power across most of the West through existing “imbalance” markets has yielded substantial benefits including higher levels of reliability, reduced trade barriers and lower consumer costs. The value of regional markets will increase as rapid load growth, more frequent severe weather events, retirement of existing thermal generation, and the addition of new generation continue to increase the need for regional operational flexibility. Several studies cited in this report show substantial additional consumer savings from expanding current markets to include day-ahead functionality.

**Adequate geographic scope and configuration are key to achieving customer benefits.**

Regional wholesale energy markets provide economies of scale and operational efficiencies that translate into consumer savings. Large regional markets that include utility systems in multiple states and across diverse geographic regions tend to have more load and supply diversity than smaller individual utilities. Optimizing a diverse portfolio of supply resources lowers production costs, provides flexibility needed to manage variable output of growing wind and solar supplies, enables reliable and cost-effective congestion management, and allows the system to quickly respond to emergencies such as supply shortage due to extreme weather events.

**Market seams are a persistent drag on efficiency.** A market “seam” is created when neighboring utilities are part of separate energy markets. Seams reduce diversity of supply and demand and create barriers to trade. The trade barriers are subtle but significant and can greatly reduce the benefits otherwise provided through optimization of resources, load, and transmission across a broader region. Energy markets in the Eastern US have implemented Joint Operating Agreements (JOAs) and various market mechanisms intended to mitigate the adverse consequences of market seams. However, while analysis has shown that these measures are beneficial, JOAs and market mechanisms intended to facilitate efficient seams trading have not addressed the detrimental impacts of poor market configuration.

**The Pacific Northwest Region is particularly sensitive to the development of new seams.** The region is undergoing a rapid resource transition as thermal generation retires and renewable sources of energy are added to the grid. At the same time, hydro output has been falling in the US and Canada, reducing availability of the Northwest’s primary source of power. The Northwest is experiencing unprecedented load growth due to climate effects, electrification, and the growth of large data centers. Extreme weather is exacerbating supply challenges making the Northwest more reliant on regional transfers from the Southwest, Rockies, and California.

While final market configuration is not yet known, day ahead market participation decisions of some utilities and announced “leanings” by other utilities suggests a prominent market seam may exist in the region, disrupting existing energy flow patterns and limiting options for future procurement. This could be particularly harmful if a seam in the Northwest separated the IOUs serving the majority of load in Oregon, Washington and Idaho from supplies delivered using the Bonneville Power Administration (BPA) transmission system.

A new market seam in the Northwest also threatens to create opportunities for market manipulation and the exercise of market power. While overall market benefits accrue to customers in the Northwest, not all market participants benefit to the same degree or in the same way. Some entities participating in the western market may even benefit from the addition of new seams, at the expense of consumers. Entities that own or control a large amount of generation or transmission rights can significantly benefit when power and transmission are scarce, especially when seams limit trade.

**It is critical to the success of markets in the West that configuration be a major focus.** Market seams are a regional problem and need a holistic regional solution. Developing solutions will require cooperation between market operators and engagement by utilities, regulators, and other interested stakeholders. Broad engagement will be particularly important given the number of utilities, transmission tariffs and Balancing Areas in the West.

The best option is to avoid the creation of seams from the start. Where this cannot be achieved, it is incumbent on all involved to mitigate the detrimental impact of market seams on consumers to the greatest extent possible.



## 2 | INTRODUCTION AND CONTEXT

Significant time and attention have been invested in developing proposals for new day-ahead energy markets in the Western US. Parallel day-ahead market design efforts by SPP and CAISO have resulted in market tariff filings seeking approval from FERC. The Extended Day Ahead Market (EDAM) tariff filed by the California Independent System Operator (CAISO) has been approved by FERC. The Markets + tariff is before the Commission pending a decision, expected later this year.

Presented with two options, utilities are now choosing which market to join. The weight utilities place on private interest as opposed to the public interest varies by utility and type of utility. For some utilities, the decision will likely be based on maximizing return on resources traded in the market. Differences between EDAM and Markets + market designs may have financial consequences for some market participants and will influence participation choices. However, given limited differences in market design, other factors may have a greater influence.<sup>1</sup>

Market scope and market configuration will have a significant impact on consumer benefits and utility market participation choices will largely determine whether the potential benefits of day-ahead markets are realized. Experience in Eastern RTOs has shown the importance of scope and configuration, and the detrimental impacts of seams between markets. Given the highly interconnected transmission system and large number of balancing authorities in the West, the risk of poorly configured markets is high, and the associated problems and consumer costs cannot be taken lightly. Figure 1 shows WECC Balancing Areas and the highly interconnected and complex overlay in the Northwest and Southern regions.

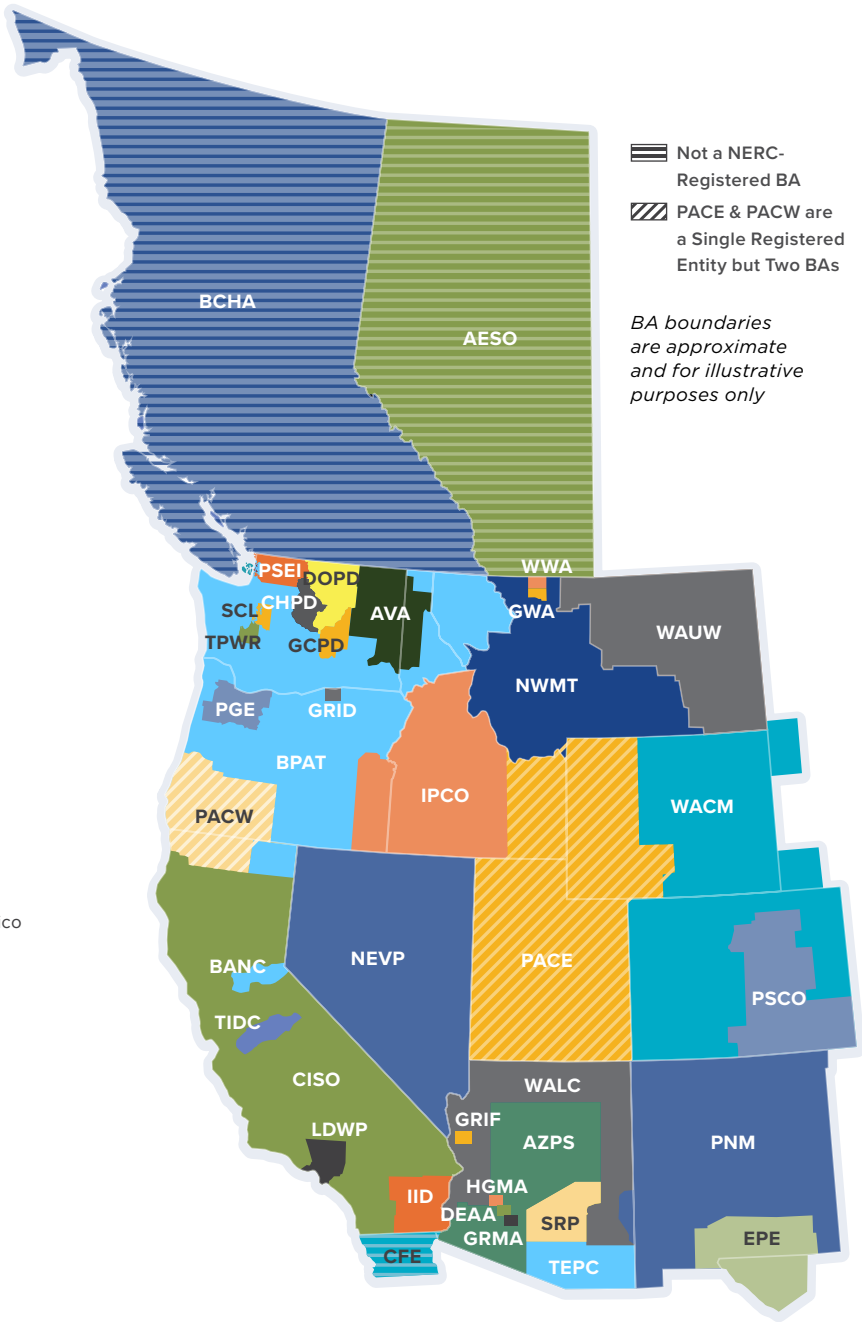
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<sup>1</sup> EDAM and Markets + have very similar designs, consistent with the design of day-ahead and real-time markets operated by CAISO, ERCOT and the five Eastern RTOs. One analysis found that the inclusion of fast-start pricing in Markets + and not EDAM would have significant impacts. WEIM's market expert has called that finding into question stating that the analysis was based on limited data and substantially overstated the potential price impact. [Dr. Susan Pope, Market Expert for the Western Energy Imbalance Market (WEIM) in report to WEIM Governing Body, March 19, 2023.] Experience in SPP and MISO markets, which use fast-start pricing, has shown it to have a very modest impact.

**FIGURE 1**

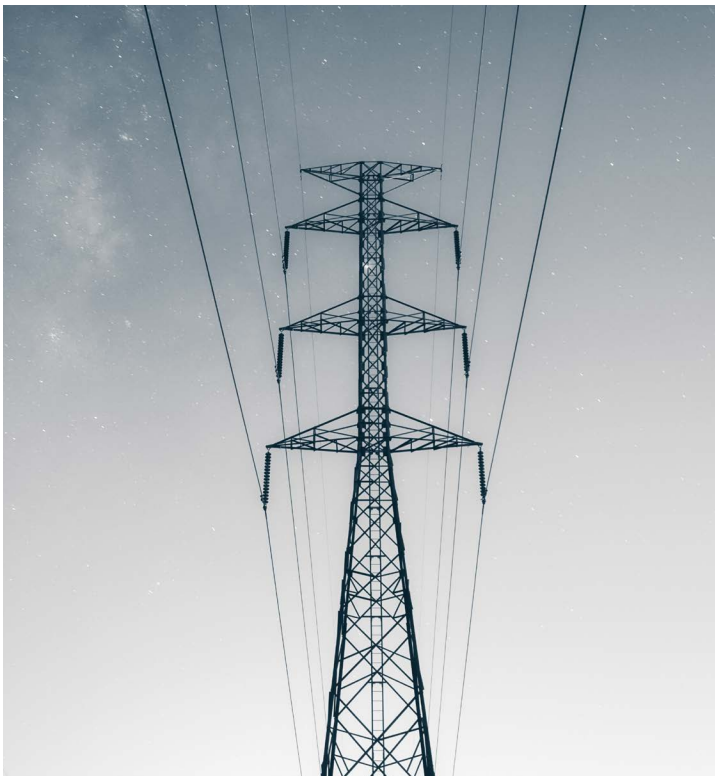
Western Interconnection Balancing Authorities – January 5, 2017

- AESO** Alberta Electric System Operator
- AVA** Avista Corporation
- AZPS** Arizona Public Service Company
- BANC** Balancing Authority of Northern California
- BCHA** British Columbia Hydro Authority
- BPAT** Bonneville Power Administration | Transmission
- CFE** Comision Federal de Electricidad
- CHPD** PUD No. 1 of Chelan County
- CISO** California Independent System Operator
- DEAA** Arlington Valley, LLC
- DOPD** PUD No. 1 of Douglas County
- EPE** El Paso Electric Company
- GCPD** PUD No. 2 of Grant County
- GRID** Gridforce Energy Management, LLC
- GRIF** Griffith Energy, LLC
- GRMA** Gila River Power, LP
- GWA** NaturEner Power Watch, LLC
- HGMA** New Harquahala Generating Company, LLC
- IID** Imperial Irrigation District
- IPCO** Idaho Power Company
- LDWP** Los Angeles Department of Water and Power
- NEVP** Nevada Power Company
- NWMT** NorthWestern Energy
- PACE** PacifiCorp East
- PACW** PacifiCorp West
- PGE** Portland General Electric Company
- PNM** Public Service Company of New Mexico
- PSCO** Public Service Company of Colorado
- PSEI** Puget Sound Energy
- SCL** Seattle City Light
- SRP** Salt River Project
- TEPC** Tucson Electric Power Company
- TIDC** Turlock Irrigation District
- TPWR** City of Tacoma, Department of Public Utilities
- WACM** Western Area Power Administration, Colorado–Missouri Region
- WALC** Western Area Power Administration, Lower Colorado–Region
- WAUW** Wester Area Power Administration, Upper Great Plains West
- WWA** NaturEner Wind Watch, LLC



### 3 | THERE IS GREAT INTEREST IN EXPANDING WESTERN ENERGY MARKETS

Energy Imbalance markets have been operating in the West for nearly a decade and have produced substantial consumer benefits, including lower supply cost, increased output of renewable resources, and higher levels of reliability.<sup>2</sup> CAISO has estimated the Western Energy Imbalance Market (WEIM) produced \$5.49 billion in benefits between November 2014 and March 2024.<sup>3</sup> SPP has estimated the Western Energy Imbalances Services (WEIS) market has produced \$61.2 million in benefits between February 2021 and December 2022.<sup>4</sup>



Changing industry conditions and opportunities to increase consumer benefits has generated interest in expanding market functionality. A report by the Public Generating Pool identified three factors motivating current interest in market expansion: 1) clean energy legislation passed in many states which will lead to continued expansion of renewable resources, increasing the need for system flexibility, 2) the need to capture benefits of regional load and generation diversity, and 3) changing patterns of demand due to climate change and electrification which increase the imperative for efficient use of regional transmission and better integration of demand-side resources.<sup>5</sup>

2 The Business As Usual scenario in Figure 2, on page 9 shows the configuration of current Western markets.

3 CAISO, Western Energy Imbalance Market Benefits Report: First Quarter 2024, April 30, 2024

4 SPP, Benefits of the Market: Western Energy Imbalances Services (WEIS), March 27, 2023

5 Public Generating Pool, Organized Market Retrospective: A Review of Organized Market Efforts in the West, p. 20, October 2021

## 4 BENEFIT STUDIES HAVE SHOWN SUBSTANTIAL ADDITIONAL CONSUMER SAVINGS CAN BE REALIZED BY EXPANDING CURRENT MARKETS TO INCLUDE DAY-AHEAD FUNCTIONALITY

Multiple recent studies have evaluated the benefits of competitive wholesale markets in the West. These studies confirm that current imbalance markets are delivering substantial benefits and that even greater benefits can be realized through the addition of day-ahead markets.<sup>6</sup> Using a generic wholesale market design, Energy Strategies estimated that the addition of Day-Ahead markets in the West would provide an additional \$95 million in production cost savings in 2030.<sup>7</sup> A similar study by Energy Strategies evaluating the specific design elements of EDAM, estimated production savings of \$543 million over the existing WEIM in 2030.<sup>8</sup> Most recently, a report by The Brattle Group estimated incremental day-ahead market production savings across the West of \$1.27 billion in 2032.<sup>9</sup>

Benefits studies have also shown the potential for significant avoided capacity savings from reserve sharing in the West. The Energy Strategies study referenced above estimated potential regional capacity cost savings of \$652 million. Markets in the East have shown similar levels of capacity savings. The Midcontinent ISO (MISO) estimates that resource capacity sharing savings in 2023 were between \$2.5 billion and \$4.1 billion, or 3.1 to 4.6 greater than production costs savings. The cited benefits in MISO arise from a MISO-wide regional resource adequacy program and the ability to share planning reserves on a real-time basis. Western Power Pool's Resource Adequacy Program (WRAP) has the potential to deliver similar benefits once fully functional.

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6 Findings across studies are directionally consistent although not directly comparable due to differences in modeling methods, topology representation, supply retirements or additions, demand growth, fuel costs, and methods used to measure benefits.

7 Energy Strategies, The State Led Market Study, July 30, 2021

8 Energy Strategies, CAISO EDAM Benefits Study Estimating Savings for California and the West Under EDAM Market Scenario, November 4, 2022

9 Brattle, NV Energy Day-Ahead Market Benefits Studies; Comparative benefits for NV Energy of joining EDAM vs Markets+, slide 11, February 2024



## 5 “SCOPE AND CONFIGURATION” IS KEY TO ACHIEVING CUSTOMER BENEFITS

Adequate geographic scope and configuration, sometimes referred to as “market footprint” is critical to wholesale market success. Market scope and configuration determine the extent to which regional diversity of supply and demand can be leveraged to reduce energy supply costs within the market. A market formed with only two member utilities would achieve lower production cost by jointly optimized dispatch of the combined resource portfolio than the two operating independently.<sup>10</sup> The larger the market footprint, the more load and resource diversity exists and the greater the benefits.

Whether in a two-utility market or a large regional market, the ability to realize the benefits of portfolio diversity depends on the ability to transfer generation across utility system boundaries, or seams. Seams create impediments to energy transfers between markets. These impediments do not reflect underlying physical limitations to flow, but barriers to efficient scheduling or trading across a market seam. Within each market footprint, operators continuously monitor and respond to changes in load, generation, and transmission flows, optimizing resources to meet consumer demand. Market operators do not coordinate with neighboring markets to minimize production costs across the larger combined market footprint. Coordination of dispatch across neighboring markets would allow the lowest cost resource within the combined region to serve incremental load in either market. This would result in a single optimization of a much larger set of supply resources, reducing energy production costs and consumer savings in both markets. Without such coordination, each market is independently optimized, each with higher costs than would be the case in the markets operated jointly.

In theory, market participants could schedule power transfers between neighboring markets to achieve the same level of efficiency as a single market. But in practice, scheduling barriers limit trading opportunities at market seams and result in lost benefits. Scheduling barriers include transmission costs, lack of price visibility, an inability to submit price-based offers, and time lag between when a schedule must be submitted and when a schedule clears the market. Market barriers make transacting at the seam more risky and therefore more costly.

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<sup>10</sup> Savings from pooled dispatch of joint system operations are typically included as arguments supporting utilities mergers, reserve sharing between utilities or formation of public power Cooperatives.



The detriment of barriers to trade and therefore the importance of market scope and configuration was recognized by FERC as central to wholesale market restructuring. In Order 2000 FERC established “scope and configuration” as one of four minimum characteristics of an RTO. The Commission explained that it was necessary to enable efficient, reliable, and non-discriminatory transmission service, manage internal and external loop flow, improve reliability, enable more effective optimization of supply and demand, and increase wholesale market liquidity and transparency.

Consistent with FERC’s policy of not mandating RTO participation, the Commission over the years has chosen not to define market boundaries. Consequently, the Commission in some cases accepted what it acknowledged as poorly configured markets, conditioned on the development and implementation of seams coordination agreements to mitigate the adverse consequences of market seams.

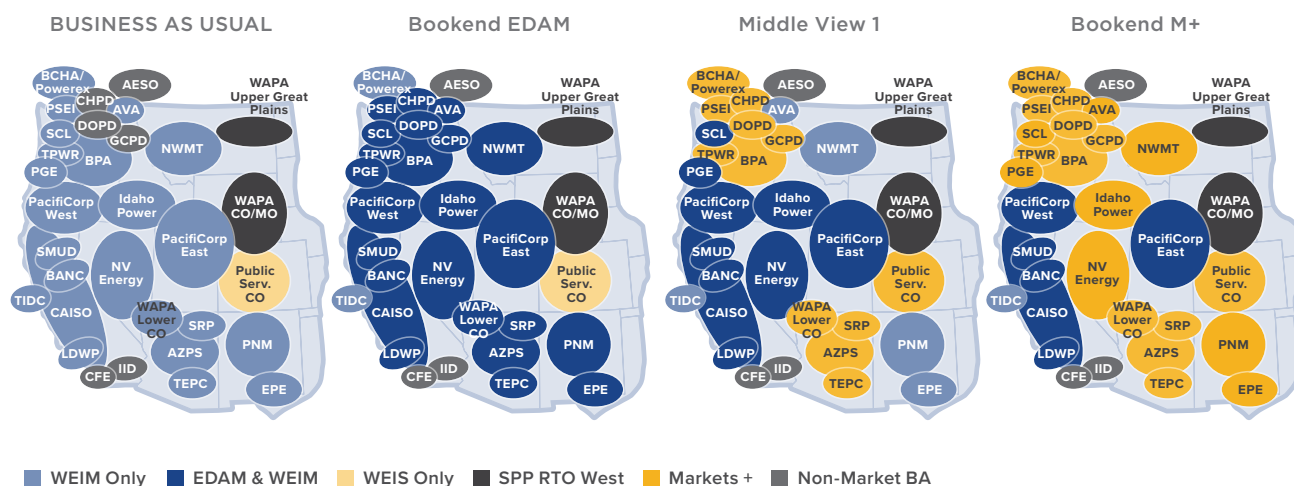
Underlying the Commission’s decisions to accept what it viewed as poorly configured markets was an assumption that markets could be designed to eliminate transactional barriers at market seams. Efforts to accomplish that were underway through a PJM and MISO “Joint and Common Market” initiative. The Commission determined that eliminating transactional barriers would compensate for poor configuration and deliver outcomes across multiple markets that were equivalent to those that would be achieved under a single market. The Commission accepted poorly configured markets trusting that the combination of seams coordination agreements and a common market across multiple RTOs would address identified adverse consequences of seams.

Studies of markets in the West have consistently found that seams trading barriers will have significant detrimental impacts for consumers. Brattle analyses performed for NV Energy (NVE) and Portland General Electric (PGE) evaluated multiple market configuration scenarios and found that estimated production cost savings declined by approximately two thirds

when a market seam was introduced.<sup>11</sup> A study by Energy and Environmental Economics (E3) conducted for the Western Markets Exploratory Group (WMEG), also evaluated benefits under multiple market configurations. The WMEG report estimates incremental savings from adding EDAM to the existing WEIM of \$60 million. However, if a seam is introduced, costs increase by \$281 million relative to the EDAM case.<sup>12</sup> Both Brattle and WMEG findings point to the same conclusion – the introduction of a market seam where none exists today has a direct, negative impact on consumers.

The precise configuration of future energy markets in the West is unknown. Given the highly interconnected Western transmission system and large number of Balancing Areas there are numerous potential market configurations, some of which result in highly fragmented markets exacerbating market seams issues. Figure 2 shows several of the configurations studied by Brattle for NVE. In some studied configurations, areas within a single market may be nearly isolated, effectively resulting in sub-markets within EDAM or Markets +. In all scenarios, the study finds substantial losses were found when market seams were introduced.

**FIGURE 2** | Potential Market Configurations



Brattle, NV Energy Day-Ahead Market Benefits Studies, February 2024

Some stakeholders have argued that footprint does not matter as much as good market design.<sup>13</sup> Studies conducted to date consistently demonstrate that in fact, market footprint may be the most important consideration for consumers. The studies by E3, Brattle and others have shown that a seamless market including centralized operations of a west-wide transmission system provides the greatest benefit to consumers.<sup>14</sup>

11 Portland General Electric Day-Ahead Market Benefits Studies; Comparative benefits for PGE Energy of joining EDAM vs Markets+, March 2024

12 Energy and Environmental Economics (E3), Western Markets Exploratory Group: Western Day Ahead Market Production Cost Impact Study, June 2023

13 Letter from PPC to Administrator Hairston Dated February 23, 2024. Accessed here: [https://www.ppcpdx.org/wp-content/uploads/MDC-Letter-BPA-Leaning-M-Support\\_FINAL.pdf](https://www.ppcpdx.org/wp-content/uploads/MDC-Letter-BPA-Leaning-M-Support_FINAL.pdf)

14 For example, see the Energy Strategies, The State-Led Market Study, July 30, 2021

## 6 | MARKET SEAMS ARE A PERSISTENT DRAG ON EFFICIENCY

When utilities join markets that are not the closest or most integrated with their systems, the market seams can be extensive and convoluted, with significant energy flows between neighboring markets (“loop flows”). Loop flow is an inevitable consequence of a highly interconnected transmission system. If not effectively managed, transmission congestion caused by loop flow can reduce reliability and increase production cost. Cost incurred to manage congestion caused by loop flow can lead to inequitable financial outcomes. Congestion management costs are paid by customers in the market experiencing the congestion, even when congestion is caused by loop flow from a neighboring market. In such a situation, load in the market where the loop flow originates benefits through lower energy prices while imposing the congestion management cost on load in the neighboring market.

Energy markets in the East have developed processes that attempt to partially mitigate market seams impacts:

- ▶ Reliability processes whereby Market Operators coordinate management of congestion caused by loop flows. Market-to-Market (M2M) coordination is intended to ensure that reliability is maintained at the least possible costs and that those costs are equitably allocated to participants in both markets.
- ▶ Market processes whereby buyers and sellers seeking to arbitrage price differences schedule or trade energy across a market seam. These processes are intended to produce results across a market seam like those obtained within an individual market through centralized dispatch. The effectiveness of market processes depends largely on the ease and cost of transacting across the seam.

Market seams also create barriers to efficient energy transfers between markets. In addition to transactional barriers noted previously, differences in pricing algorithms between markets can distort price signals and create situations where even transfers that would be beneficial to consumers are unprofitable for market participants. Barriers are sometimes described solely as a general efficiency loss with higher than necessary costs to consumers, but the impacts have greater consequences, reducing flexibility needed to manage large portfolios of variable resources, inhibiting the ability to respond to energy emergencies, and limiting opportunities for long-term resource procurement and sales.

Enabling and incentivizing real-time regional energy transfers will become increasingly important as decarbonization continues. Retirements of existing thermal plants and the rapid expansion of renewable resources have changed power flow patterns and will increasingly do so. The ability to balance variable output across a large region on a moment-to-moment basis will be critical to managing these changes. An analysis by Western Interstate Energy Board and Energy Strategies conducted in 2019, identified lack of adequate system flexibility as a near-term risk to renewable integration, with that risk growing over time as more renewables are added to the grid. The study found that “[i]n the long-term, results indicate that it will be very difficult, or at least extremely costly, to achieve Western policy targets without broad coordination of wholesale markets.”<sup>15</sup>

Because seams inhibit real-time transfers, they also limit procurement opportunities for load-serving entities. Within a market footprint, real-time flows are managed through market dispatch rather than fixed transmission schedules, enabling purchases for load following or for delivery of output from variable resources. In contrast, flows between markets must be scheduled in advance and typically cannot follow instantaneous changes in load with generator output. This inhibits both flexibility and efficiency.

Pseudo-tie scheduling, currently used in the West, can facilitate dynamic transfers between markets in a limited number of situations but they cannot substitute for the seamless flow of energy within a single market. Pseudo-ties have created reliability issues at the PJM-MISO seam resulting in restrictions on their usage. Pseudo-ties have resulted in market efficiency losses at the MISO-SPP seam.<sup>16</sup> Disagreements about the treatment of pseudo-ties within markets have generated formal complaints by market participants.<sup>17</sup> The tools and market options available to participants do not enable flexible scheduling of the type necessary to support procurement of load following or variable output from resources across a market seam. This uncertainty further inhibits contracting between markets.

Finally, seams give rise to market power and gaming concerns. As described later in this report, Market Monitors for RTOs in the East have raised gaming concerns at market seams, generally and specifically where markets are poorly configured. This will be particularly important to address in the West as both EDAM and Markets + participants will maintain their existing transmission service tariffs. Transmission access will still be largely through individual transmission owner Open Access Transmission Tariffs (OATTs) and it is not yet known how those tariffs will be modified to accommodate market operation. In addition, both EDAM and Markets + include provisions for transmission to be withheld from the market. This “Opt-Out” provision will be of particular importance where market participants hold transmission rights to move across market seams.

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15 Western Interstate Energy BOD and Energy Strategies, *Western Flexibility Assessment Investigating the West’s Changing Resource Mix and Implications for System Flexibility*, p. 8, December 10, 2019

16 SPP-MISO have found that “pseudo-tied units located near the seams could potentially give rise to issues such as complicating the unit commitment/de-commitment process.” MISO and SPP, *Seams White Paper for the Organization of MISO states and SPP Regional State Committee (RSC) Liaison Committee*, p. 13, November 2, 2018.

17 American Electric Power Service Corporation, FERC Docket No. EL17-89, September 15, 2017; Tilton Energy LLC, FERC Docket No. EL16-108, August 25, 2016.

## 7 | EXPERIENCE WITH EASTERN MARKETS SHOWS THAT SEAMS AGREEMENTS DO NOT FIX BAD CONFIGURATION

Market configuration and seams issues came to the forefront as markets developed in the East. Experience with attempts to mitigate the adverse impact of Eastern market seams offers insights into problems that will likely arise in the West if markets are not well-configured. As in the West, more than one market option was available in the East and utilities faced market membership choices. In some instances, FERC rejected utility choices based on concerns with scope and configuration. In other cases, the Commission accepted poorly configured markets while imposing conditions intended to mitigate the adverse impact of market seams.

Although FERC identified geographic scope and configuration as essential for efficient, competitive markets, Order 2000 did not prescribe RTO boundaries. Instead, the Commission identified factors that could be used to assess regional configuration, related to both the size of an RTO and its electrical boundaries.<sup>18</sup> Applying those factors, FERC rejected a proposal by nine Midwestern utilities to form the Alliance RTO. As those utilities later sought approval to join either PJM or MISO, intervenors raised concerns about market configuration and the adverse impact of market seams. Midwestern State Commissions argued that seams would adversely affect reliability and markets, urging FERC to “eliminate inter-RTO seams.”<sup>19</sup> Customer coalitions, investor-owned utilities and public power utilities raised similar concerns.

The Commission noted the importance of “appropriately configured RTOs with a more geographically contiguous boundary”<sup>20</sup> and found that absent mitigation the newly created seam would not meet Order 2000 scope and configuration requirements. The mitigation imposed by the Commission included the development and implementation of a “common market” spanning both RTOs. MISO and PJM wrote that the common market would “achieve all the benefits of a combined market across the footprint that includes both PJM and MISO” and

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18 89 FERC ¶ 61,285, Docket No. RM99-2-000, P 861, December 20, 1999

19 100 FERC ¶ 61,137 in Docket No. EL02-65-000, et al., P 26, July 31, 2002

20 Ibid, P 38

“coordinate market operations and ensure there are no impediments to trade in either, both, or between the markets.”<sup>21</sup> The Commission relied on achieving this vision as a solution to market seams issues finding that while the seams concerns raised were valid, they “should be obviated with the establishment of that single market.”<sup>22</sup>

MISO’s Independent Market Monitor raised similar concerns in the context of MISO’s market tariff filing arguing that a market seam would lead to inefficiency and gaming opportunities at the MISO-PJM seam. The Market Monitor argued that loop flow between markets would result in inefficient dispatch, inefficient prices, and excessive uplift payments. An investigation into seams issues by the PJM and MISO Market Monitors concluded that efforts by MISO and PJM to develop a Joint Operating Agreement and Market-to-Market congestion management may address the concerns raised.<sup>23 24</sup>

Market seams once again came to the forefront in 2004 when SPP filed to receive approval as an RTO. As was the case with MISO and PJM, market configuration and seams issues were raised by intervenors. SPP argued that it had sufficient scope and configuration given that power flows on “transmission in other areas, such as the Midwest ISO and Mid-Continent Area Power Pool (MAPP), does not significantly affect the power flows within SPP.”<sup>25</sup> Similarly, SPP contended that it could effectively alleviate congestion because the major constraints affecting SPP transactions were within the SPP region.

The Kansas Commission disagreed, arguing that SPP was too small to meet scope and configuration requirements and that “SPP’s proposal would lead to balkanized transmission control and additional seams costs. Kansas Commission argues that an SPP RTO would do nothing to relieve the reliability problems that Kansas Commission experiences because of its proximity to the Midwest ISO, and would only create a new seam obstructing the smooth flow of electric energy in and out of the State of Kansas.”<sup>26</sup>

The Commission once again determined that scope, configuration and market seams challenges could be addressed through the combination of seams coordination and establishment of a common market, finding that “SPP, with its present membership, supplemented with the filed seams agreement with Midwest ISO and participation in the Joint and Common Market, will meet the requirements for scope.”<sup>27</sup> The Order conditioned approval of SPP as an RTO on the filing of a seams agreement with MISO and participation in the Joint and Common Market with Midwest ISO and PJM.<sup>28</sup> The MISO-SPP JOA largely adopted the provisions of the earlier PJM-MISO JOA and was accepted by the Commission.<sup>29</sup>

21 PJM-MISO Joint and Common Market White Paper, Version 1, p. 2, July 2005

22 100 FERC ¶ 61,137 in Docket No. EL02-65-000, et al., P 39, July 31, 2002

23 MISO and PJM Market Monitors, Market Monitors Assessment of RTO Seams in the Midwest, Docket No. EL03-35-002, July 28, 2003

24 The completed Joint Operating Agreement (JOA) was filed and accepted by the Commission as MISO Rate Schedule 5, Joint Operating Agreement Between the Midcontinent Independent System Operator, Inc. And PJM Interconnection, L.L.C., December 11, 2008

25 106 FERC ¶ 61,110, Docket Nos. RT04-1-000 and ER04-48-000, P 49, Feb 10, 2004

26 Ibid. P 59

27 Ibid. P 62

28 Ibid. P 63

29 MISO Rate Schedule 6, Joint Operating Agreement Between the Midcontinent Independent System Operator, Inc. And Southwest Power Pool, Inc., Joint Operating Agreements, Congestion Management Protocols, and Market-to-Market Coordination, December 11, 2008

## Seams management practices have been put in place with the intention of solving seams inefficiencies

To address loop flow and related congestion management, the Joint Operating Agreements (JOAs) developed by PJM, MISO and SPP include Congestion Management Protocols (CMP) and Market-to Market Coordination (M2M). These processes are intended to work together to address aspects of the reliability, efficiency, and equity problems created by market seams.

Congestion Management Protocols (CMPs) provide a framework to manage congestion caused by loop flow. The CPM establishes rights or entitlements to impose flow on neighboring systems at pre-market levels, based on pre-market network and firm point-to-point transmission service. Analysis of pre-market flows is used to define “Firm Flow Entitlements” (FFE) that protect rights to flow over specific external transmission elements or paths. FFEs essentially lock in a baseline set of flows and establish a right to continue those flows in the future.

Market-to-Market (M2M) congestion management enhances the basic CMP by enabling neighboring markets to jointly manage congestion at least cost. When congestion occurs on a coordinated flowgate, market operators compare the cost each market would incur to relieve the congestion and implement the lowest cost redispatch solution. This process minimizes congestion management costs and overall production costs in both markets. For M2M coordination, previously established flow entitlements are used to allocate congestion management costs among market participants.<sup>30</sup>

### JOA Market-to-Market (M2) has not succeeded in resolving inefficiency

MISO’s Market Monitor has assessed Market-to-Market (M2M) performance based on M2M constraint shadow price convergence. Shadow price convergence measures the extent to which joint congestion management results in the least-cost management of a constraint. The Market Monitor determined that for the most frequently congested M2M flowgates, the M2M process contributes to shadow price convergence. The Market Monitor also determined that price convergence suffers in other cases due to inaccurate modeling assumptions and software limitations.

MISO’s Market Monitor has also assessed M2M effectiveness based on administrative performance and reported that in 2022, administrative problems resulted in inefficient flows and inequitable allocation of congestion costs. The report identified several contributors to these outcomes, including failure to identify all eligible constraints, failure to request relief and delays in activating M2M constraints. The Market Monitor found that these issues resulted in excess congestion cost of \$119 million at the MISO-SPP seam.<sup>31</sup>

30 M2M congestion management coordination is not used in the day-ahead market other than through potential day-ahead FFE exchanges, such that one market operator can request unused transmission on the neighboring system. This process is rarely used where it is available. FFE exchange has not been implemented at the MISO-SPP seam. SPP has reported that other M2M improvements and modifications must be undertaken before SPP can “assess the value of developing and implementing a Day-Ahead Firm Flow Entitlement exchange process.” See Southwest Power Pool, Eighteenth Market-to-Market Informational Report Docket No. ER13-1864-000, p. 4, January 22, 2024

31 Potomac Economics, 2022 State of the Market Report for the MISO Electricity Markets, pp. 66-67, June 15, 2023



Ensuring equitable outcomes for consumers under M2M coordination has proven challenging. As detailed above, M2M congestion management costs are based on historical flow entitlements, for PJM, MISO and SPP, using an April 1, 2004 baseline. Over time, new load patterns, generation retirements and additions, and changed transmission topology have resulted in new flow patterns. Congestion cost assignment deemed equitable based on transmission flows in 2004 is not viewed as equitable by all parties in the present. However, updating flow entitlement definitions has proven difficult due to the potential financial consequences for individual market participants. A reset of flow entitlements will produce winners and losers.

PJM, MISO and SPP have been working to update flow entitlements, but extensive modeling and negotiations have failed to provide a solution deemed equitable by all parties. In their 2024 Biennial Review, PJM and MISO report that “[i]n 2004, a Freeze Date was established to preserve the historical firm rights of the transmission system prior to the formation of organized markets based on the flows that existed in 2004. The Freeze Date represents a compromise solution. Since 2004 there have been changes in topology, operations and planning not contemplated by the Freeze Date solution.”<sup>32</sup> Although the parties have worked in good faith to address the issue, agreement has proven difficult to achieve.<sup>33</sup>

Market seams can also create reliability challenges. MISO and SPP began to experience an increasing incidence of power and price swings due to their large and growing wind portfolios. SPP and MISO initiated a multi-year effort to address the problem and in their 2022 Biennial Review, reported that they had completed Phase 2, implementing modeling changes to help mitigate the effect.<sup>34</sup> With rapid growth of renewables in the West, similar issues should be anticipated at market seams, particularly where seams are irregular creating high levels of loop flow between highly interconnected adjacent markets.

Philosophical differences and disagreement about interpretation of JOA terms and conditions have also caused seams management issues. Entergy’s incorporation into MISO in 2013 resulted in higher levels of north-south flow at the MISO-SPP market seam. The MISO-SPP JOA provided for effective congestion management caused by related loop flow but the RTOs disagreed about JOA financial terms and conditions. SPP argued the increased flows amounted to use of SPP and neighboring systems’ transmission which should be compensated, whether or not congestion occurred. MISO argued that the flows represented normal loop flow under JOA and were not subject to compensation for transmission usage.

The issue was extensively litigated at FERC and later the US Court of Appeals for the District of Columbia. The dispute was ultimately settled through a multilateral agreement involving MISO, SPP, TVA (Tennessee Valley Authority), Southern Company, and AECL (Associated Electric Cooperative Inc.). The agreement provides for increased coordination across signatories’ respective transmission systems, managed transmission usage, and includes compensation

32 Midcontinent ISO & PJM Interconnection, MISO-PJM JOA Biennial Review, at 9, January 22, 2024

33 MISO noted at the end of 2023 that PJM had publicly expressed disagreement with MISO proposals for revising FFE “but hasn’t yet provided any data evidence to support their stance. SPP is still taking the time to work on their mock analysis and may bring up additional proposals but so far there is no update.” See MISO Quarterly Seams Report, p. 7, November 1, 2023

34 Midcontinent ISO & Southwest Power Pool, 2022 MISO-SPP JOA Biennial Review, December 12, 2022

based on the capacity used beyond contractually specified levels, whether or not congestion management is required to manage flows. Although the joint party agreement resolved the legal dispute, SPP and MISO maintain different interpretations of the relevant JOA provisions, resulting in under-utilization of the disputed transmission interface.

Disagreements have also arisen concerning allocation of M2M congestion management costs. Changes in generation or load patterns can result in changed loop flow patterns and disagreements about cost responsibility for managing associated congestion. Such disputes have been an ongoing issue at the MISO-SPP seam. Most recently, Montana Dakota Utilities (MDU) filed a complaint against MISO and SPP alleging violation of the JOA resulting in overpayment for congestion costs by MDU customers.<sup>35</sup> The source of the dispute relates to M2M congestion management needed to control flows associated with a large data center load recently constructed in a constrained area of SPP. Congestion management redispatch by MISO has resulted in costs of over \$18 million incurred by MDU as of the date of the complaint. That figure rose and in a subsequent complaint filed by MISO, the RTO argued that “improper M2M coordination activities” had resulted in \$38 million in “unnecessary, unjust and unreasonable M2M charges.”<sup>36</sup> The MDU case is instructive in the context of market seams in the West as the situation results directly from a complex and poorly configured seam. Utilities and customers will be exposed to similar risks depending on the configuration of markets in the West.

### **Market Mechanisms Generally Have Not Resolved Market Seams Efficiency or Gaming Opportunities**

Contrary to FERC’s hope and expectations, a common market did not materialize between PJM, MISO and SPP. Analysis of market performance has shown that significant seams related inefficiencies exist, exposing consumers to higher costs and reducing the benefits of competitive regional markets. Technical complexity, an inability of market operators and stakeholders to agree on common market design elements, and the need to address other high priority market issues led to limited progress on the Joint and Common Market initiative.<sup>37</sup> Market design has been shown to be a poor substitute for a well-configured market.

Analysis of seams trading showed early on that newly launched wholesale markets were not delivering efficient outcomes. At that time, the only real-time market mechanisms available to transact at the seam was the submission of a physical transmission schedule. Market participants scheduling these transactions were “price takers” meaning that schedules were not evaluated and cleared based on price, instead the schedules were accepted, cleared, and financially settled whether or not profitable. In the 2004-2006 period, Market Monitors in ISO NE, NYISO, PJM and MISO identified market seams transfers as a significant source of

35 Complaint Requesting Fast-Track Processing of Montana-Dakota Utilities Co. Against the Midcontinent Independent System Operator, Inc. and Southwest Power Pool, Inc. under EL-24-61

36 Complaint of Midcontinent Independent System Operator, Inc. v. Southwest Power Pool, Inc. under EL24-85

37 Work under the Joint and Common Market initiative has continued for more than 20 years, with annual Market Monitor analyses and recommendations, stakeholder meetings, and regulatory update filings. In the last several years, efforts have focused primarily on improvements to reliability, transmission planning, and congestion management. See MISO and PJM, MISO-PJM Joint and Common Market Drill-Down Report, August 29, 2022

inefficiency and began recommending market design changes.<sup>38</sup>

To improve inter-market trading, markets in the East developed Coordinated Transaction Scheduling (CTS) to enable economic clearing of real-time transactions. On October 3, 2017, MISO and PJM implemented CTS, allowing market participants to submit offers to schedule imports and exports using an interface price spread. Bids are compared to a market operator price forecast and cleared when the forecast suggests the transaction will be profitable. CTS was hoped to represent a significant opportunity for market participants by providing price transparency and the opportunity to submit price responsive bids and offers to arbitrage between markets.

Analysis conducted since the implementation of CTS showed that CTS did not represent a significant improvement over physical scheduling and that seams transfers remained at inefficiently low levels. The PJM Market Monitor evaluated 252,454 CTS schedules cleared between October 3, 2017 and September 30, 2022 at the PJM-MISO seam. The analysis found 20% of the cleared transactions were unprofitable due to market forecast errors and that “the actual, real-time price differentials meant that the transactions would have been economic in the opposite direction.”<sup>39</sup> In a separate analysis PJM’s Market Monitor analyzed all seams transactions for 2022 and found that energy transfers were unprofitable during 4,176 hours (or 48% of all hours).<sup>40</sup> The analysis found that price differences exceeded \$10/MWh during 4,178 hours; yet flows were inconsistent with those price differences during 1,667 (40%) of these hours. Many participants continue to use physical scheduling to avoid the problems identified with CTS.

Inefficient power transfers are greatest in real-time when wholesale market prices and price volatility can be high. A report by Brattle summarizing Market Monitor analyzes notes that “the average (absolute) value of PJM-NYISO price differences in 2022 was \$12.94/MWh in the day-ahead markets with price differences changing signs 3.1 times per day on average. In stark contrast, the average price difference in the real-time market was \$115.36/MWh with real-time price differences changing sign 47.9 times each day.”<sup>41</sup> Results were similar at the PJM-MISO seam where “the average 2022 real-time price difference between PJM and MISO was \$97.68/MWh with price differences changing sign 62.9 times each day—significantly larger and more volatile than day-ahead price differences.”<sup>42</sup> Given the poor outcomes associated with CTS, not all Eastern markets have adopted the mechanism. CTS has not been implemented, for example, at the SPP-MISO seam.

Inconsistent and inaccurate prices used to settle seams transactions are a significant contributor to seams trading inefficiency. The interface price spread between neighboring markets will determine the incentive for market participants to engage in trading across the seam. The MISO

38 Brattle Group and Willkie Farr & Gallagher LLP, *The Need for Intertie Optimization Reducing Customer Costs, Improving Grid Resilience, and Encouraging Interregional Transmission*, p. 3, October 2023

39 Monitoring Analytics, *2022 Quarterly State of the Market Report for PJM: January through September 2022*, p. 539, March 9, 2023

40 Monitoring Analytics, *2022 State of the Market Report for PJM*, Table 27, March 9, 2023

41 Brattle Group and Willkie Farr & Gallagher LLP, *The Need for Intertie Optimization Reducing Customer Costs, Improving Grid Resilience, and Encouraging Interregional Transmission*, pp. 4-5, October 2023

42 *Ibid.* at 5

Market Monitor, evaluating MISO-SPP interface pricing in 2000, explained the importance of accurate price signals, writing “Interface pricing is essential because: It is the sole means to facilitate efficient power flows between RTOs; It coordinates schedules efficiently and can avoid significant uplift costs and other inefficient outcomes; and It is the basis for any coordinated transaction scheduling systems to maximize the utilization of the interface.”<sup>43</sup>

Although interface pricing is critical, the Market Monitor analysis of interface prices for PJM, MISO and SPP found that differences in interface pricing definitions result in inefficient incentives to schedule imports and exports and consequently inefficient levels of inter-market transfers. When Market-to-Market congestion management is in effect, inaccurate interface pricing can also lead to inequitable congestion cost allocation between markets and uplift. The Market Monitor recommended market design changes to improve interface pricing for PJM, MISO and SPP beginning in 2012. As of the Market Monitor’s 2022 State of the Market Report, these changes had not been made and the report notes that problems persist with price errors, volatility, inefficient scheduling, and uplift at the market seam.<sup>44</sup> Inaccurate interface pricing reduces incentives for efficient transfers at the market seam to the detriment of consumers who experience higher prices.

The interface pricing problems noted above are unlikely to be addressed soon. SPP reported in a January 2024 FERC seams informational filing that interface pricing improvements were under consideration but that any “identified solution to the Interface Bus Pricing issue will be vetted through the various MISO and SPP stakeholder groups and, if required, filed at the Commission.”<sup>45</sup> In a recent MISO and PJM JOA Biennial Review, the market operators report that they “are evaluating what price formation changes in both markets means for the Market-to-Market Process. These changes are likely to be a subset of a broader set of enhancements to the Market-to-Market process in the distant future.”<sup>46</sup>

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43 Potomac Economics, OMS-RSC Seams Study: Interface Pricing, p. 4, August 2020

44 Potomac Economics, MISO 2022 State of the Market Report, pp. 92-95, June 15, 2023

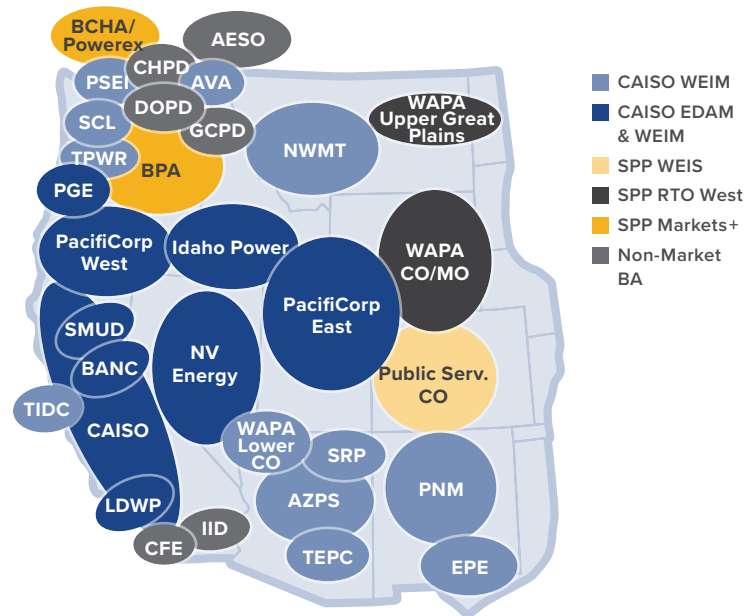
45 Southwest Power Pool, Inc., Docket No. ER13-1864-000 Eighteenth Market-to-Market Informational Report, p. 4, Jan 22, 2024

46 MISO-PJM JOA Biennial Review, p. 4, January 22, 2024

## 8 SEAMS WILL BE ESPECIALLY IMPORTANT IN THE NORTHWEST US

Utilities in the Northwest and elsewhere in the West are evaluating market participation options. These decisions will determine the configuration of markets in the Northwest and the impact of seams on consumers. PacifiCorp has made a firm commitment to join EDAM.<sup>47</sup> Portland General Electric (PGE) and NV Energy have announced a commitment to join EDAM.<sup>48 49</sup> The Balancing Authority of Northern California (BANC) and Sacramento Municipal Utility District (SMUD) announced that EDAM is their preferred option.<sup>50</sup> Powerex has indicated their intent to join Markets +. Others have indicated “leanings,” with Idaho Power leaning toward EDAM, and BPA has indicated a leaning toward Markets +.<sup>51 52</sup> Other studies have been completed with results not

**FIGURE 3** EDAM and Markets + Configurations Based on Current Utility Commitments and Announced Leanings



47 California ISO announcement on PacifiCorp formally joining EDAM, dated December 8, 2022, accessed here: <https://www.caiso.com/Documents/california-iso-welcomes-pacificorps-announcement-to-participate-in-the-extended-day-ahead-market.pdf>

48 Portland General Electric announces intent to join CAISO EDAM regional energy market to benefit customers, environment, March 31, 2024, accessed here: <https://www.prnewswire.com/news-releases/portland-general-electric-announces-intent-to-join-caiso-edam-regional-energy-market-to-benefit-customers-environment-302096360.html>

49 NV Energy opts to join CAISO-developed day-ahead market over SPP alternative, Utility Dive, June 3, 2024, accessed here: <https://www.utilitydive.com/news/nv-energy-caiso-day-ahead-market-edam-pathways-initiative/717748>

50 BANC and SMUD Move Forward with Consideration of EDAM for Day Ahead Market Engagement, August 30, 2023, access here: [https://thebanc.org/docs/news/BANC%20SMUD%20EDAM%20Press%20Release\\_083023.pdf](https://thebanc.org/docs/news/BANC%20SMUD%20EDAM%20Press%20Release_083023.pdf)

51 Idaho Power letter to CAISO indicating a leaning towards joining EDAM, dated March 21, 2024, accessed here: <https://www.caiso.com/Documents/Idaho-Power-EDAM-Letter.pdf>

52 BPA Day Ahead Policy Paper dated April 2024, accessed here: <https://www.bpa.gov/-/media/Aep/projects/day-ahead-market/2024/02-day-ahead-market-attachment-1-staff-recommendation.pdf>

yet announced and still other studies are in process. Figure 3 shows the current market configurations based on utility commitments or announced leanings. Current indications are that seams will be a significant issue in the Northwest, interrupting existing trade patterns and creating barriers to imports and exports with other parts of the West, and to transfers between Northwest utilities.

The situation is complicated by the fact that the Northwest is host to one of the United States' Power Marketing Agencies, the Bonneville Power Administration ("BPA") which provides low-cost hydropower to public power customers and backbone transmission infrastructure for the region. BPA is the main transmission provider in the region with 15,000 miles of transmission lines, including interties connecting the Northwest to California and Desert Southwest markets. Other entities, like IOUs, use the BPA transmission system to serve their customers, and even have ownership of transmission rights or joint ownership of some of this infrastructure. This creates a complex transmission overlay, accounting for 75% of the Northwest's transmission system, that exists on top of the existing Balancing Areas, which will still operate in a western day-ahead market future.

Northwest utilities are heavily reliant on the BPA transmission system to ensure access to supply. While BPA's power sales are prioritized by federal statute to deliver to Northwest preference customers, the transmission system was intended to not only support the preference delivery, but also to be used as a delivery mechanism for non-federal power which over the years has resulted in extensive investment by the region's Independent Power Producers and IOUs to use the BPA transmission system to deliver power to customers. Given the interconnectivity between BPA and its customers and between BPA and neighboring IOUs, barriers to trade represent a serious risk. An ill-placed market seam would separate load centers from the critical transmission infrastructure. For both existing and future procurement, such a seam would not only remove scheduling flexibility, but it would also significantly increase cost of transferring power across the seam. The E3 study identified significant additional transmission service charges and transactional friction for energy transfers into and out of the Northwest. This would result in large price disparities between the two market footprints and result in some IOUs customers paying a substantially higher price for use of the BPA transmission system than they do currently.

In a recent FERC filing, BPA highlighted the importance of and need to address market seams, writing "Bonneville and PacifiCorp are a prime example of this overlapping interconnectivity, with 79 points of interconnection between their balancing authority areas and multiple long-term firm Tariff contracts and legacy contracts for transmission on each other's systems. Due to this reliance on other transmission providers, any market (day-ahead or real-time) must use the firm transmission rights held by market participants on non-participating transmission providers' systems."<sup>53</sup> BPA goes on to explain that "[t]he usage of non-participating transmission systems by a market is a typical seams issue and agreements between the market and the non-participating transmission provider should be in place."<sup>54</sup> While experience in other markets support BPA's argument that a seams agreement is necessary, experience also shows

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<sup>53</sup> Bonneville Power Administration Motion for Leave to Answer and Answer, Docket No. ER24-1658, p. 2, May 20, 2024

<sup>54</sup> *Ibid*, p. 3

that seams agreements do not reduce barriers to transacting across market seams and will not address the detrimental impact of market seams on consumers.

The supply situation in the Northwest and across the West is changing. According to EIA, 37% of the nation's hydro capacity is in Washington and Oregon, and hydropower accounts for the majority of Northwest supply needs. However, in the last few years drought conditions have resulted in historically low hydro output and has changed traditional flow patterns. In 2022-2023, hydropower output in Washington was down 23% and Oregon was down 20% as compared to the 2021-2022 water year.<sup>55</sup> Low water levels on the Columbia River system have required conservative operation of the Grand Coulee Dam, dramatically reducing hydro output in some periods.

British Columbia has also experienced a significant decline in hydropower output. Although historically a net power exporter, British Columbia has been a net importer for 7 of the last 15 years. According to Statistics Canada, "electricity imports rose 54.2% year over year to 21.7 million MWh in 2023 and British Columbia accounted for the vast majority (77.3%) of 2023 imports."<sup>56</sup> Powerex has reported that BC Hydro's energy deficit in 2023 was "expected to be an all-time record"<sup>57</sup> and that "in 2023, Powerex has been a net importer of energy into the BC Hydro system for approximately 10,000 GWh, greatly exceeding the previous annual net import record."<sup>58</sup>

While hydropower production has declined in the Northwest, the regional capacity mix is also undergoing change. The Pacific Northwest Utilities Conference Committee (PNUCC) forecasts that in the Northwest alone, by 2034 utilities will have reduced coal capacity by nearly 10,000 MW relative to 2019. Substantial amounts of wind, solar and storage are also being added. PNUCC forecasts that Northwest utilities will add nearly 29,000 MW of new resources between 2025 and 2034, with more than 90% coming from renewables and storage.<sup>59</sup>

Demand growth is accelerating across the West. Over the past two decades, power demand has grown a mere 0.6% per year. Recently utilities across much of the country, including the West, have stated that their load expectations have increased significantly. The March 2024 PNUCC forecast shows that load is projected to increase by over 30% in the coming 10 years. The report highlights growth of data centers, electrification, and climate change as significant drivers of higher demand.

Puget Sound Energy (PSE) planning area's 2028 forecast increased from 4.4 GW to 4.9 GW in the past year, a 10.7% increase, reflecting electric vehicle charging, air conditioning growth and the impact of warmer days on cooling and heating demand.<sup>60</sup> Portland General Electric

55 EIA, Western U.S. hydropower generation fell to a 22-year low last year, March 26, 2024, accessed here: <https://www.eia.gov/todayinenergy/detail.php?id=61645>

56 Statistics Canada, Hydroelectricity Generation Dries Amid Low Precipitation and Record High Temperatures, March 5, 2024, accessed here: <https://www.statcan.gc.ca/o1/en/plus/5776-hydroelectricity-generation-dries-amid-low-precipitation-and-record-high-temperatures>

57 Powerex letter to Western Energy Imbalance Market Governing Body, p. 1, December 12, 2023

58 Ibid. p. 4

59 Pacific Northwest Utilities Conference Committee, Northwest Regional Forecast of Power Loads and Resources: August 2024 through July 2034, pp. 5-6, May 2024

60 PSE, 2023 Electric Progress Report, March 31, 2023



(PGE) planning area’s 2028 forecast increased from 4.38 GW to 4.48 GW in the past year, a 2.4% increase. In July 2023, PGE roughly doubled its 5-year growth forecast, explaining that “In the past 18 months, PGE’s industrial class load has grown rapidly, at a rate of 10.6% in 2022 and 8.3% in the first quarter of 2023.”<sup>61</sup> PGE points to rapid industrial growth and data centers as primary drivers of load growth.

In the face of rapid load growth, declining local hydro output, coal retirements, GHG regulations, and the growth in renewable generation, regional power flows and the need to seamlessly transmit power across the West will become increasingly critical. PNUCC reports that the “Pacific Northwest region will continue to rely on imports and West-wide collaboration is crucial for accessing diverse resources. Utilities are making commitments to broader regional wholesale electricity markets that would help make more efficient use of the existing and newly added resources and optimize transmission across a broader footprint.”<sup>62</sup>

While the Northwest will remain dependent on imports, market seams diminish procurement opportunities. The E3 study notes that an important benefit of regional markets is the ability to lower procurement costs by enabling “entities to contract with resources from across a larger market footprint (supported by a transparent locational market price and frictionless transmission access) rather than restrictions to procuring resources in one’s own local area or with direct transmission schedules to reserve transfer capability to a local area.”<sup>63</sup> This potential benefit is substantially reduced by introduction of seams in the Northwest. A recent study exploring the consequences of market seams found that “economic transactions between

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61 Grid Strategies, *The Era of Flat Power is Over*, December 2023

62 Pacific Northwest Utilities Conference Committee, *Northwest Regional Forecast of Power Loads and Resources: August 2024 through July 2034*, p. 13, May 2024

63 Energy and Environmental Economics (E3): *Western Markets Exploratory Group Western Day Ahead Market Production Cost Impact Study*, p. 4, June 2023



the two proposed day-ahead markets (EDAM and Markets+) may be highly limited or non-existent.”<sup>64</sup> Experience in the East shows this to be the case for firm capacity, very little of which flows across market seams. The introduction of a market seam in the Northwest can significantly reduce procurement options and threaten the ability of Northwest utilities to import power needed to meet long-term demand or state policy goals..

The impacts of climate change and the incidence of extreme weather events makes efficient and reliable power flows even more critical. Recent experience highlights both the value of inter-regional transfers and the risks of impeding transfers through market barriers. During the January 12-16, 2024 extreme winter weather event, substantial quantities of power were imported by the Northwest, thereby avoiding threats of outages. A Western Power Pool (WPP) analysis reported that the “Northwest was a net importer of an average of 4,900 MW per hour during the five days from January 12 – January 16, 2024.”<sup>65</sup>

Over 30% of the imports into the region during the event came across the Malin intertie at the Oregon-California border. The magnitude of the South to North power flow stressed the physical infrastructure, requiring redispatch and generating sizable congestion costs. The ability to manage flows across the Malin intertie is directly attributable to the existing real-time imbalance market and highlights the risk of market seams that tend to inhibit flows. As the frequency of extreme weather events continues to increase, it will become even more critical to ensure the ability to seamlessly transfer power across the region to respond to sub-regional power shortages.

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64 Energy Strategies and Gridwell Consulting, Exploring Potential Seams Issues Between Proposed Western Day-Ahead Electricity Markets, slide 36, January 2024

65 WPP, Assessment of January 2024 Cold Weather Event, p. 2, February 2024

## 9 GOOD CONFIGURATION IS HARD TO ACHIEVE BECAUSE SOME PARTIES BENEFIT FROM BAD CONFIGURATION AND INEFFICIENT SEAMS

While overall benefits may accrue to customers in the Northwest, not all benefit to the same degree or in the same way. Studies and statements of parties indicate there can be lost revenues to some parties from a more efficient market. In particular, those who have supplies and extensive physical transmission rights benefit when power and transmission are scarce.<sup>66</sup> Efficient markets hinder their ability to exploit these market advantages.

The entities in the Pacific Northwest with the greatest amount of power supply and transmission (either ownership or capacity) are BPA and Powerex Corp. Powerex Corp. is the exclusive marketer of BC Hydro capability in the U.S., holding substantial hydro generation, storage, and transmission rights, and is a major energy supplier to the Northwest. Powerex's mission in its US market participation is to maximize profits. As the exclusive marketer for BC Hydro, Powerex reports that electricity "trade provides economic and environmental benefits for British Columbia. All income generated by Powerex is returned to BC Hydro, which helps the utility keep electricity rates amongst the lowest in North America."<sup>67</sup>

Powerex has indicated that their future market behavior will depend on market configuration. The WMEG study authors worked closely with Powerex to develop model assumptions for the analysis. The study reports that in a scenario where NW utilities join EDAM, Powerex "expects that its most attractive market opportunities would be forward sales"<sup>68</sup> and Powerex would therefore limit hourly flexibility of exports. In contrast, in a scenario where NW utilities

66 In Citizens Power & Light Corporation, 48 FERC 61,210, 1989. FERC found that "[t]he most likely route to market power in today's electric utility industry lies through ownership or control of transmission facilities. Usually, the source of market power is dominant or exclusive ownership of the facilities. However, market power may be gained without ownership. Contracts and transmission right ownership can confer the same rights of control. When a small number of entities have contractual control over a large amount of transmission facilities, they can withhold supply and extract monopoly prices just as effectively as those who control facilities through ownership."

67 <https://powerex.com/about-us>

68 Energy and Environmental Economics (E3), Western Markets Exploratory Group: Western Day Ahead Market Production Cost Impact Study, p. 27, June 2023

join Markets +, Powerex “expects that its most attractive market opportunities will be hourly optimized transactions”<sup>69</sup> and would make its full hourly flexibility available.” E3 estimates that the incremental region-wide cost increase attributable to Powerex’s withholding hourly flexibility in these scenarios is approximately \$7 million.”<sup>70</sup> This example shows how positional power and control of transmission can have significant financial consequences for consumers in the Northwest.

Inefficiency benefits some parties. The WMEG study found that individual WMEG member utilities’ benefits can vary widely within market cases, in some cases sellers see lower sales revenues, in other cases “some entities receive less wheeling revenue from exports or wheel-through transactions in the market cases than in the BAU case because the market cases do not charge wheeling on intra-market transactions.”<sup>71</sup> Although some participants, such as those selling power and holding transmission rights for opportunistic trading, benefit from inefficient markets, those benefits come at the expense of consumers generally through higher energy costs. Policy makers should remain focused on what benefits consumers. Physical rights allow transmission capacity to be withheld, or not fully utilized. That withholding increases its value at certain times, due to basic laws of supply and demand (removing supply when it is already scarce raises price). Holders of those physical rights can therefore benefit from inefficiency and withholding.

Consumers in electricity markets are vulnerable to the exercise of market power by “pivotal suppliers.” Pivotal supplier is a form of market power that is prevalent in electricity markets where one entity’s power is needed to serve demand, usually at times of scarcity. The situation is common in electricity markets because of the lack of consumer response to prices (inelasticity of demand).<sup>72,73</sup> The situation occurs in both physical bilateral markets like the Northwest, and centralized electricity markets like in RTOs. It is likely more of a risk in bilateral markets because of the inefficiency of transmission service, with physical scheduling and rate pancaking that tend to reduce delivery opportunities from remote alternative supply sources. In either case, long-term contracts between load-serving entities and suppliers can help shield consumers from getting caught short and having to pay a pivotal supplier what the market will bear. But even with robust long-term contracting, parties often wind up with less power than they need at times. It is those times where geographically broad, seamless, and competitive markets prevent any one party from extracting monopoly rents from consumers.

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69 Ibid. p. 27

70 Ibid. p. 27

71 Ibid. p. 24

72 FERC Order No. 697 updating the Commission’s policy on market-based rates in 2007, stated at pp. 18-19: “The second screen is the pivotal supplier screen, which evaluates the potential of a seller to exercise market power based on uncommitted capacity at the time of the balancing authority area’s annual peak demand. This screen focuses on the seller’s ability to exercise market power unilaterally. It examines whether the market demand can be met absent the seller during peak times. A seller is pivotal if demand cannot be met without some contribution of supply by the seller or its affiliates.”

73 “A supplier that faces a residual demand curve that is positive for all possible positive prices is said to be a pivotal because some of its supply is necessary to serve the market demand regardless of the offer price.” p. 115 Wolak, F. “An Assessment of the Performance of the New Zealand Wholesale Electricity Market”, Investigation report, May 2009, accessed here: <http://www.comcom.govt.nz/BusinessCompetition/Publications/Electricityreport/DecisionsList.aspx>. Also see Borenstein, S. J. Bushnell and F. Wolak (2002), “Measuring Market Inefficiencies in California’s Restructured Wholesale Electricity Market”, American Economic Review, 92, 1376-1405.

Transmission between the Southwest and Northwest is critical to the reliable and efficient use of the Western regional transmission system. Transmission on those paths is also scarce, offering opportunities for market power as discussed previously. The WMEG study found that in a two market scenario, demand for Northwest to Southwest transfers exceeded “the transmission available when transactions over paths connecting through zones participating in EDAM are subject to wheeling charges and friction on market seams.”<sup>74</sup> Control of key transmission capacity rights connecting the Northwest to the Southwest is highly concentrated, with a meaningful portion controlled by Powerex, who as a power marketer has an objective of maximizing profits, rather than minimizing consumer costs as do load serving transmission capacity owners.<sup>75</sup> When power is scarce, and control of transmission rights is highly concentrated, opportunities to exercise market power by a pivotal supplier increase. A pivotal supplier exercising market power can manipulate prices, benefiting itself to the detriment of load serving entities and consumers. It is very difficult to mitigate this market power in a two-market setting with no centralized oversight of the broader region. If the seams were more efficiently managed internally within a single market, this would be less likely to occur.

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74 Energy and Environmental Economics (E3): Western Markets Exploratory Group Western Day Ahead Market Production Cost Impact Study, p. 18, June 2023

75 Powerex is also seeking to expand its bi-directional Northwest to Southeast transmission holdings by 1,200 MW. Salt River Project Agricultural Improvement and Power District (“Salt River Project”), Puget Sound Energy, Inc. (“PSE”), and Powerex Corp. (“Powerex”), Motion for Leave to Answer and Answer of Supporting Intervenors, Docket Nos. ER24-1658-000 and ER24-1658-001, pp. 14-15, May 20, 2024

## 10 | POLICY MAKERS SHOULD ADVOCATE ON BEHALF OF END-USE CUSTOMERS AND ENCOURAGE OR REQUIRE WELL-CONFIGURED MARKETS

The typical approach of each utility making its profit-maximizing market membership decision is likely not in the public interest. Markets offer the promise of substantial consumer savings but poorly configured markets harm consumers. Market seams result in reduced reliability, higher consumer costs, reduced procurement opportunities, higher cost of achieving policy objectives or state requirements, and inequitable cost allocation outcomes. The magnitude of the harm and the incidence of cost for consumers will depend on market participation decisions.

When evaluating market participation alternatives, utilities and policy makers should consider several factors to help determine the best outcome for customers:

- ▶ Existing supply arrangements and whether market seams may interfere with existing supply contracts, including purchases or delivery from jointly owned units. In some cases, seams may increase price or delivery risk and necessitate reopening the contract to address these or related issues.
- ▶ Consumer costs and reliability consequences of barriers to inter-regional transfers. Consumer costs will be higher to the extent transactional barriers interfere with otherwise efficient energy transfers across market seams. Similarly, reliability will be lower to the extent barriers reduce the ability to rapidly respond to sub-regional supply shortages.
- ▶ Future procurement where load growth, resource replacement or regulatory mandates may require purchases from yet unidentified sources. It will be important to consider potential impacts on the ability to procure from resources that may be required to deliver across a market seam.
- ▶ Resource adequacy requirements and the ability to participate in regional pooling arrangements. Mutual reliance on planning reserves is only effective if operating reserves can be shared in real-time, in the case of the Western Resource Adequacy Program (WRAP), across a market seam. The WRAP operating protocol has not yet been developed and it is unclear how transmission service and seams issues will impact the ability for utilities in different markets to pool planning resources.

When performing these evaluations, it is important to note that the future cannot be predicted and that near-term decisions have long-term consequences. Issues that have not yet been addressed, such as cost allocation for seams congestion management, will leave market participants locked into long-term financial positions that may later be deemed unfair, but difficult to change. Similarly, governance has been noted as motivating some Northwest utility decisions, as has GHG treatment and other market design elements. Efforts are underway to address governance and market design details for both EDAM and Markets+. When weighing the costs and benefits of market participation options, it will be important to consider the range of potential outcomes for each of these issues.

It is critical to the success of markets in the West that market configuration be a major focus. An important lesson from Eastern energy markets is that seams issues are complex, discussions around equity can be contentious, and the process of developing and implementing joint operating agreements takes considerable time and stakeholder engagement.

Efforts in Eastern markets to address seams are instructive but M2M coordination practices developed for Eastern markets cannot be easily translated to the West. Differences in congestion management protocols will require the development of novel mechanisms to model and jointly dispatch resources to control transmission congestion at the market seam.<sup>76</sup> Moreover, M2M coordination in the West will involve not just the market operators, but 38 individual Balancing Authorities.

Ongoing efforts should be leveraged to address seams issues prior to the implementation of day-ahead markets. A Markets+ stakeholder working group was formed to identify seams risks and to the extent possible address solutions in the filed tariff. However, progress on external seams coordination and management has been limited.

Additional efforts will be needed and will require a broader initiative with active engagement from all stakeholder sectors, considering the number of stakeholders, transmission tariffs and Balancing Areas in the West. The best option is to avoid the development of seams from the beginning by maximizing market footprint and to the extent possible avoid seams between major load centers and critical transmission paths which currently serve them. Where this cannot be achieved, it is incumbent on all involved to mitigate the detrimental impact of market seams on consumers to the extent possible.

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<sup>76</sup> Eastern markets dispatch and manage congestion based on the physical limits of individual transmission elements. In the West, congestion management is based on "contract paths," a contractual limit that may or may not reflect underlying physical system limitations. See overview at: Western Markets Exploratory Group, Seams White Paper, pp. 5-6, June 2023



## 11 | KEY TAKEAWAYS

Implementation of markets in the West has provided substantial consumer benefits, including savings realized from WEIM and WEIS, exceeding \$5 billion since markets started in 2014. The addition of day ahead markets will further increase value, in the Brattle NVE study of up to \$1.27 billion in incremental benefits in 2032.

Experience in Eastern markets shows that configuration matters and that poorly configured markets can dramatically reduce the value of regional markets. In the Brattle NVE study, the introduction of a seam reduced market benefits from \$1.27 billion to between \$354 and \$393 million.

FERC is unlikely to mandate good configuration and does not have a template for effective, efficient, and equitable seams coordination. It will fall on utilities and Western regulators to evaluate customer impacts and make the best decisions for ratepayers.

Joint operating agreements have been implemented in other markets to address seams related to congestion management. M2M coordination provides cost effective congestion management but creates secondary reliability issues and inequitable cost shifts between market participants. Despite 20 years of experience and refinement, issues with M2M coordination remain unresolved. Seams agreements are poor substitutes for well-configured markets.

Attempts to address market efficiency losses caused by seams have been largely unsuccessful, with expectations of a Joint and Common Market in

the East largely unfulfilled and market mechanisms that were implemented largely ineffective. Transactions between markets are far below efficient levels resulting in higher consumer costs.

Concentration of ownership or control or transmission or supply resources caused by market seams create opportunities for market power that must be closely monitored and mitigated. Market monitoring can reduce market manipulation in energy markets, but when some suppliers own enough generation and transmission rights, their structural market power is difficult to mitigate. Seams exacerbate seller market power. Energy markets do not have similar controls in place to mitigate capacity supplier market power and given more limited procurement opportunities in a bifurcated market, the cost of meeting resource adequacy targets can be negatively affected.

Given the heavy reliance on the BPA transmission system in the region by public and private utilities, creation of a seam which cuts-off utilities and customers from uninhibited access to this transmission creates a potentially significant issue. If market seams are developed between the major load centers in the region and the generation and transmission needed to serve these load centers, costs to consumers will increase and efforts to bring new clean energy generation to load will be hindered. Particular attention should be paid to avoiding development of these seams today and ample opportunity currently exists to develop a market which will minimize negative impacts to customers.







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Grid Strategies LLC is a power sector consulting firm helping clients understand the opportunities and barriers to integrating clean energy into the electric grid. Drawing on extensive experience in transmission and wholesale markets, Grid Strategies analyzes and helps advance grid integration solutions.

Based in the Washington DC area, the firm is actively engaged with the Federal Energy Regulatory Commission, Department of Energy, state Public Utility Commissions, Regional Transmission Organizations, the North American Electric Reliability Corporation, Congressional committees, the administration, and various stakeholders.