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Western Electricity System Integration: Progression Towards Integration

**Summary of the December 2, 2022,
Integrated Energy Policy Report Workshop
on Western Electricity System Integration**

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California Energy Commission

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Western Electricity Integration: Progression Towards Integration

The Western Interconnection (WI)¹ is in the midst of a progression not seen before. Forces driving this extraordinary, rapid change are improved economics for new fuel and generation technologies, emergence of regional markets and adequacy programs, and unexpected weather events that bring extraordinary precipitation and temperatures outside the range of what has been planned for based on historical records. Magnifying the implications of these disruptive, dynamic forces is the nearly unified push to reduce combustion of fossil fuels for electricity generation, while at the same time decarbonizing buildings and transportation through electrification.

Planning and operating under these conditions would be a tall order for any electric system. Indeed, it is particularly daunting to one that remains fragmented into 34 balancing areas without centralized dispatch, planning, or governance. The key mitigation strategy is to increase integrated system operation and planning. Success in doing this can bring enormous economic and environmental benefits by harnessing diversity in loads, weather, wind/ hydro/ solar resources, renewable generation in multiple time zones, and other unique characteristics of the immense WI footprint.

Western leaders convened a workshop to discuss electricity market integration with the threefold objective to improve understanding of the (1) current landscape of integration in the West; (2) potential economic benefits of markets; and (3) progress implementing initiatives to achieve reliability benefits of increased integration. The 2022 IEPR Update Lead Commissioner Vice Chair Siva Gunda hosted the workshop on December 2, 2022. All California Public Utilities Commission (PUC) and California Energy Commission (CEC) commissioners attended, along with the CEO/President of the California Independent System Operator (California ISO), the California Governor's Energy Advisor, and Chair of California Air Resources Board. Leaders of several western states were on the dais remotely, and directly engaged by facilitating panels. Three "pillars" of system integration — markets, resource adequacy and transmission — were explored by subject matter experts and representatives leading major initiatives in the West. Further, the workshop highlighted California legislation, ACR 188, directing the California ISO to prepare a report on expanded regional cooperation. Highlights of workshop discussion and next steps are described below.

Essential Role of Markets

Facilitated by Commissioner Eric Blank, Chair of the Colorado PUC, the discussion of this first pillar illuminated the benefits and status of existing and emerging western markets. Keegan Moyer of the consulting firm Energy Strategies, highlighted learning from three major studies

¹ The Western Interconnection includes electricity infrastructure in 11 western states, two Canadian provinces, and portions of Mexico.

addressing markets. Mr. Moyer laid a foundation by describing the different kinds of markets and services and common categories of benefits that derive from market service options (Figure 1).

Figure 1: Western Markets: Present and Future Services

Energy Market Services: Where things stand today (roughly)

Market Service	Bilateral Market	Real-Time Market	Day-Ahead Market	RTO
Centrally optimized dispatch	No central optimization	Centrally optimized real-time dispatch; day-ahead unit commitment not optimized	Centrally optimized real-time dispatch and day-ahead unit commitment/dispatch	
Transmission wheeling	Fee applies to all transactions	No fee for in-market real-time transactions	No or nominal fee for in-market real-time and day-ahead transactions	No wheeling fees (except for exports)
Transmission available to market	Transmission rights required for all transfers	Can vary widely depending on market design – some or all capacity could be available	Transmission capacity available up to reliability limit	
Transmission planning	Local planning by individual transmission providers; regional planning and interregional coordination under Order 1000 remain as they are today			Joint transmission planning by RTO; some lower voltage transmission planning remains at the local level
Tariffs and Operational Control of Transmission	Individual transmission providers retain control and have tariffs			RTO provides functional control of system, joint tariff
Reliability Obligations and Balancing Authority Boundaries	BAs are retained, have primary reliability obligations			RTO has primary reliability obligations; BAs consolidated
Ancillary Services and Co-Optimization	No optimization, reserve sharing groups	Can have optimization and ancillary service products		Ancillary service co-optimization and provision in the market
Resource Adequacy Function <small>Note: separate RA programs could also be developed and overlaid across these markets</small>	Addressed by individual regulators; no market requirement	Market addresses intra-hour resource sufficiency, but does not impact long-term resource adequacy planning and processes	Market addresses day-ahead resource sufficiency. Depending on design, could impact long-term resource adequacy planning	Market can include its own longer-term resource adequacy requirements that must be achieved
Transparent Access to Market & Operational Information	Very little access to information, what is available is generally aggregated	Transparent access to pricing information for real-time transactions and transmission in the market	Transparent access to pricing information for day-ahead and real-time transactions and transmission in the market	Transparent access to pricing information for day-ahead and real-time transactions and transmission in the market

Source: Moyer, Energy Strategies workshop presentation December 2, 2022

Among the critical observations that may be derived from Mr. Moyer’s overview, the highlight was the existing and potential value of markets:

- Incremental, voluntary energy imbalance market approaches have proven successful in achieving participation and saving over \$2.9 billion cumulative over eight years.
- Expansion of existing markets to offer day ahead services could save up to \$1.2 billion per year more. A full western regional transmission organization (RTO) offers additional benefits in the range of \$1.4 billion to \$2 billion.

Benefits derive from four major savings components: operational efficiency, capacity savings,² other energy benefits, and non-energy benefits as shown in Figure 2 by relative magnitude. While operational savings are the most well recognized, these are not the major source of market benefits — capacity savings are more significant. In an analysis by Energy Strategies, day ahead markets if WECC-wide, achieved 78 percent of operational efficiencies of a full RTO.³

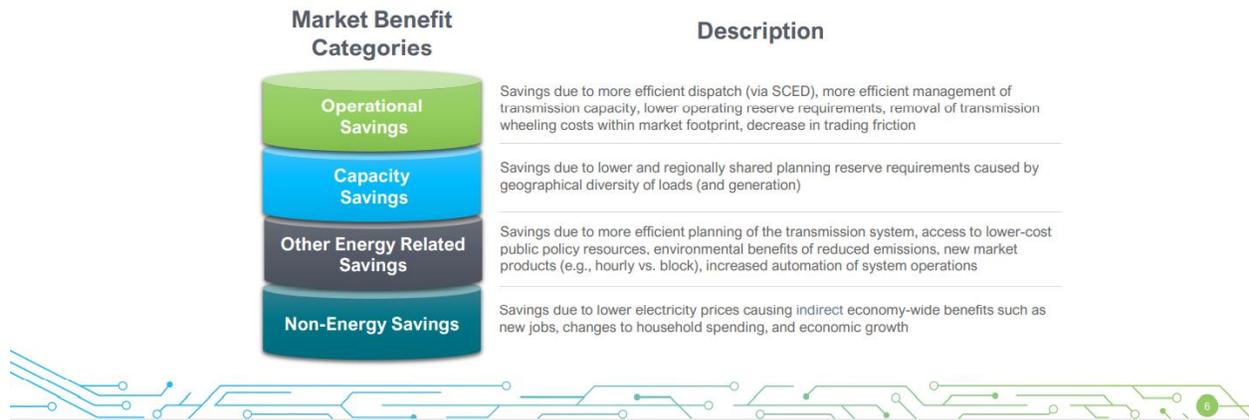
² Capacity savings generally refers to avoiding the need to build new generation because participants share use of existing powerplants that have excess capacity.

³ Keegan Moyer. [Essential Role of Markets](https://efiling.energy.ca.gov/GetDocument.aspx?tn=247865). Presentation on December 2, 2022. <https://efiling.energy.ca.gov/GetDocument.aspx?tn=247865>.

Figure 2: Market Benefit Categories

Energy Market Benefits: Categorizing Savings

- **Energy markets produce efficiencies (and savings) by changing the way we operate and plan our systems**
 - Not all such savings are quantifiable and some of the largest are commonly overlooked
- **While they are often the most referenced benefit category, operational savings from energy markets generally reflect a relatively small portion of the total benefits created by organized wholesale energy markets**



Source: Moyer, Energy Strategies workshop presentation December 2, 2022

This benefit estimate could be considered an upper bound quantification because it assumes an interconnection-wide footprint, availability of an imbalance product, and, critically, market availability of all transmission. The result is quite robust and consistent with major studies done by others such as those summarized in the ACR 188 study completed by the National Renewable Energy Laboratory (NREL) for the California ISO.⁴ This compelling benefit explains why determined effort is underway to establish western markets. Colorado, for example, has a statute requiring utilities to join a regional wholesale market by 2030, and Nevada has a similar requirement. Also, several major utilities have established the Western Markets Exploratory Group (WMEG) to understand choices that lie ahead, and market expansions are underway in western and eastern sides of the WI.

Impressive progress in implementing real-time markets and expanding them to day-ahead were described by Anna McKenna, VP of Market Policy and Performance (California ISO) and Carrie Simpson Director of Western Services for the Southwest Power Pool (SPP). Describing the success of existing energy imbalance markets and the status of rapidly emerging day ahead markets — the Extended Day-Ahead Market (EDAM) by the California ISO and Markets+ (by SPP) — reinforced the immense potential value of markets. For example, since its inception in 2014, the Western Energy Imbalance Market (WEIM) has grown to 19 participating entities and has produced over \$3 billion in benefits to its participants. In 2023, the number of participants will grow to 22 entities, representing approximately 79 percent of the load across the WI. By leveraging the significant resource diversity and transmission

⁴ California ISO. [Website](http://www.caiso.com/informed/Pages/RegionalSolutions.aspx). <http://www.caiso.com/informed/Pages/RegionalSolutions.aspx>.

connectivity that exists between the major supply and demand regions of the West, the WEIM has clearly demonstrated the value of strong collaboration across a broad regional footprint.

EDAM is a voluntary day-ahead electricity market design developed by WEIM participants that can efficiently and effectively integrate renewable resources and address significant operational challenges presented by a rapidly changing resource mix, emerging technologies, and the impacts of climate change. The EDAM design and WEIM and EDAM governance proposals were unanimously approved in a joint meeting by both the California ISO Governing Board and the WEIM Governing Body on February 1, 2023. EDAM builds upon the proven ability of WEIM to increase regional coordination, support state policy goals, and meet demand cost-effectively. EDAM will provide significant additional benefits through optimal commitment and scheduling of supply in the more extensive day-ahead timeframe. The EDAM design will apply equitably to all participating entities, including the California ISO, ensuring a level playing field for participants, inside and outside of California.

The design will also support the rapidly evolving Western resource adequacy landscape. Recognizing there are differences in how different programs ensure resource adequacy within various jurisdictions, EDAM is designed to provide a market platform that complements, coordinates, operationalizes, and maximizes the value of these programs through the California ISO's sophisticated security constrained economic dispatch and unit commitment capability. This will ensure participants can account for the capacity and optimize use of resources they have procured to support reliability within their footprint.⁵ An incremental step forward, the California ISO will introduce an imbalance reserve product to manage uncertainty between day ahead and real time, which will be used in the EDAM. Recent studies⁶ of benefit estimates for EDAM, *incremental to WEIM*, suggest potential savings for California greater than \$543 million *annually* and greater than \$1.2 billion *annually* for the larger West⁷ (Figure 3).

5 Western Energy Imbalance Market Benefits Report Third Quarter 2022, October 31, 2022.

6 California ISO. November 4, 2022. "[CAISO EDAM Benefits Study: Estimating Savings for California and the West Under EDAM Market Scenarios](http://www.caiso.com/Documents/Presentation-CAISO-Extended-Day-Ahead-Market-Benefits-Study.pdf)." <http://www.caiso.com/Documents/Presentation-CAISO-Extended-Day-Ahead-Market-Benefits-Study.pdf>.

7 Anna McKenna Memo to Governing Entities. January 26, 2023. [Decision on the Extended Day Ahead Market](http://www.caiso.com/Documents/DecisiononExtendedDay-AheadMarket-Memo-Feb2023.pdf). <http://www.caiso.com/Documents/DecisiononExtendedDay-AheadMarket-Memo-Feb2023.pdf>.

Figure 3: Extending California ISO Market Benefits to the Western Region

EDAM Economic Benefits – Incremental to WEIM

- Operational savings – driven by more efficient resource commitment and reduced operating costs, efficient transmission management, lower operating reserve requirements.
 - Includes imbalance reserve savings.
- Studies have produced a range of benefits, with the most recent *Energy Strategies* study indicating the following benefits:

Area	Operational Savings (\$M/year)	Capacity Savings (\$M/year)	Total Savings (\$M/year)
California	\$214	\$95	\$309
Other Western States	\$329	\$557	\$886
Total	\$543	\$652	\$1,195

CAISO Benefits estimated to be 50-80% of total quantified California benefits
Source: <http://www.caiso.com/Documents/Presentation-CAISO-Extended-Day-Ahead-Market-Benefits-Study.pdf>



Source: McKenna California ISO workshop presentation December 2, 2022

Ms. McKenna concluded noting 2023-24 plans to implement EDAM:

- February 2023, approval by joint decision of EIM Governing Body and California ISO Board of Directors.
- Q1, 2023, publish draft tariff and seek input from stakeholder process.
- Q2, 2023, file proposed tariff with FERC.
- Q4, 2023, implementation activities.

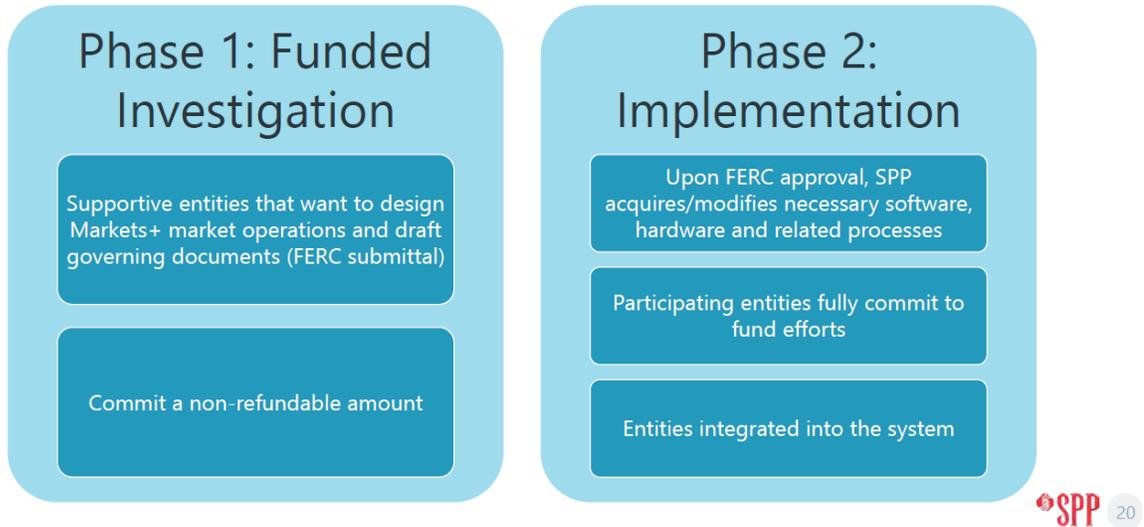
EDAM go live is planned in 2024 and will be closely coordinated with entities indicating their intent to participate in that time frame. Indeed, a critical participant has already stepped forward. With consensus on a hybrid governance approach of shared authority, PacifiCorp, on behalf of its subsidiary utilities in six western states, has announced it is joining EDAM, a momentous step forward for integration.

On the eastern side of the interconnection, a non-WI entity – SPP – is implementing an energy imbalance service (WEIS) and proposing an extensive “more than day-ahead market” termed Markets+. Ms. Simpson summarized that SPP has attracted the interest of potential participants from across the WI, particularly hydroelectric utilities embedded within, or adjacent to, the federal Bonneville Power Administration (BPA) and the BPA itself, along with Powerex and some Arizona and Nevada utilities. BPA committed to provide funding toward developing Markets+ in August 2022, which came *with assurances that no decision had yet been made with respect to joining the market*. SPP has identified Spring 2023 as a critical time frame for western utilities to make financially binding commitment to Scope Implementation. If substantial financial commitments are received, phased market development will proceed.

Phase 1 is to develop market protocols and tariff language, a 21-month process and Phase 2 is to fund implementation with launch estimated in 2026 (Figure 4).

Figure 4: Alternative Market Designs Present Choices for Capturing Benefits

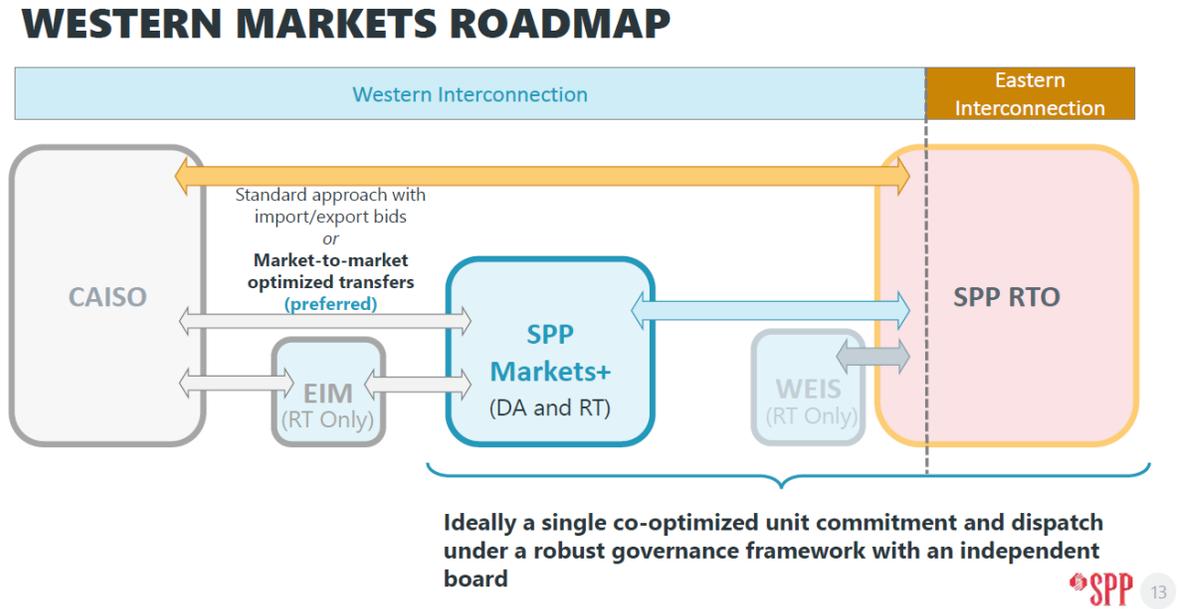
MARKETS+ PHASES – INCREMENTAL APPROACH



Source: Simpson Southwest Power Pool workshop presentation December 2, 2022.

SPP’s aggressive business development strategy reflects a broad vision of integration (Figure 5) and includes expanding its current RTO into the West. Seven western entities have indicated an interest in this potential opportunity. Panelist Spencer Gray (Northwest & Intermountain Power Producers Coalition [NIPPC]) highlighted the need for a “Blue Sky exercise” (starting with a clean slate without presuming any particular approach) regarding governance of western proposed RTOs, particularly in reference to California initiatives that go beyond EDAM.

Figure 5: Relationships Across Potential Market Designs and Service Offerings



Source: Simpson Southwest Power Pool workshop presentation December 22, 2022

Resource Adequacy as the Foundation

A second pillar of integration, resource adequacy, was explored by a panel facilitated by Commissioner Letha Tawney of the Oregon PUC. In short, the discussion revealed that western sub-regions must add large increments of resources of a magnitude and at a rate never experienced in history. The interconnection is under-resourced and faces continuing risk of unserved load. This decade, 40 gigawatts (GW) are needed and as much as 100 GW if full electrification of transport and buildings is achieved (Figure 6).⁸ A second and related eye-opening takeaway is: *"Firm, carbon-free resources will be crucial for reliability if gas resources are retired."*⁹ California will still need over 30 GW of firm capacity to maintain resource adequacy even after adding hundreds of GW of wind, solar, and storage. ("Firm capacity" includes resources that can run whenever needed without emitting carbon.) Five candidates for "Clean Firm" were (1) enhanced geothermal, (2) small modular nuclear reactors, (3) fossil generation with carbon capture and sequestration, (4) very long-duration energy storage, and (5) clean fuels such as renewable gas, hydrogen, or synthetic gas. Arne Olsen from E3, an energy consulting firm, presented analysis showing that the cost of achieving carbon reduction goals could double if Clean Firm technologies are not deployed.¹⁰

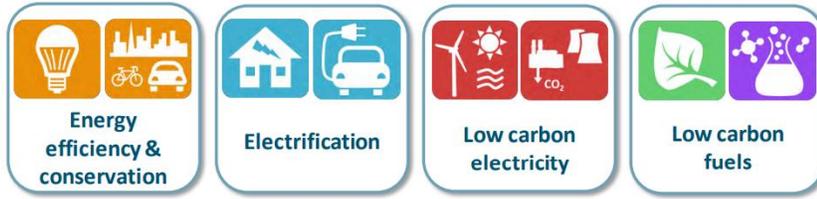
⁸ CEC staff analysis of data from Arne Olson's presentation on December 2, 2022. "[Maintaining Resource Adequacy on a Changing Electricity System,](https://efiling.energy.ca.gov/GetDocument.aspx?tn=247875)" <https://efiling.energy.ca.gov/GetDocument.aspx?tn=247875>.

⁹ Olson, Arne. Presentation December 2, 2022. "[Maintaining Resource Adequacy on a Changing Electricity System,](https://efiling.energy.ca.gov/GetDocument.aspx?tn=247875)" <https://efiling.energy.ca.gov/GetDocument.aspx?tn=247875>.

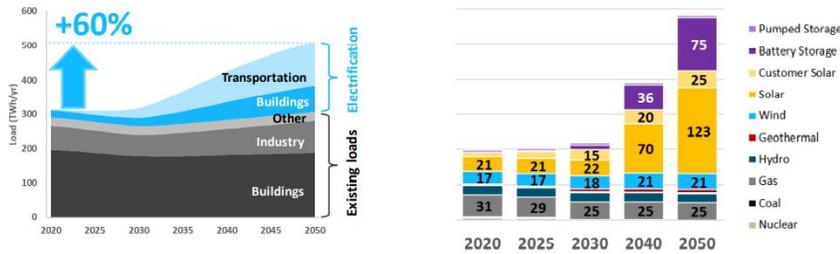
¹⁰ Olson, Arne. Presentation December 2, 2022. "[Maintaining Resource Adequacy on a Changing Electricity System,](https://efiling.energy.ca.gov/GetDocument.aspx?tn=247875)" <https://efiling.energy.ca.gov/GetDocument.aspx?tn=247875>.

Figure 6: Critical Roles in the Clean Energy Transition

“Four Pillars” of decarbonization point to the crucial role of the electricity sector



California Electric Loads under Deep Carbon Reductions California Electric Resources under Deep Carbon Reductions



Clean electricity displaces fossil fuels as the main source of primary energy

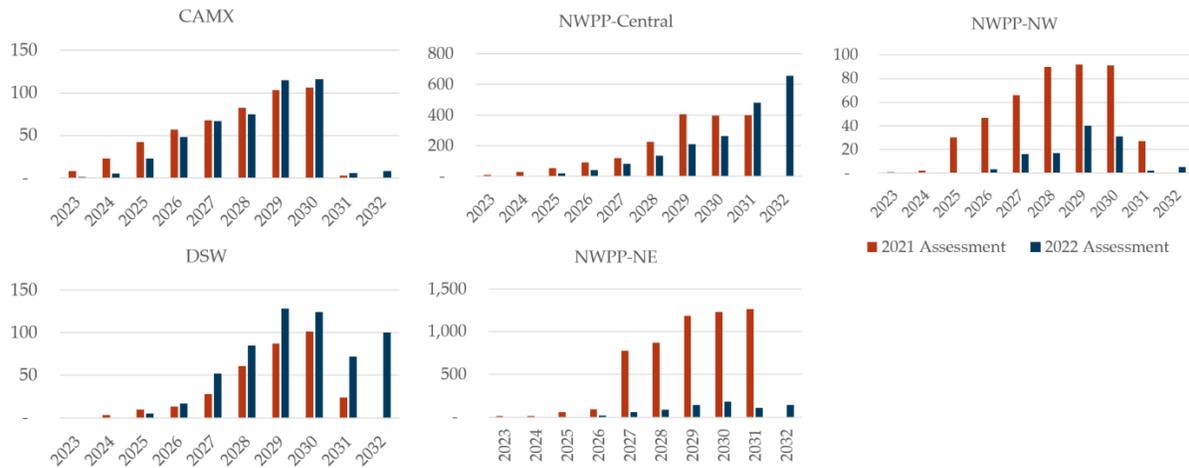
Source: Olsen, E3 workshop presentation December 2, 2022

WECC’s top resource adequacy analyst, Branden Sudduth, further emphasized the need for new resources summarizing the 2022 Western Assessment of Resource Adequacy (WARA): increased variability, driven by behavior of loads and multiple resource types is increasing the uncertainty and range of planning outcomes.¹¹ Mr. Sudduth remarked that “*resource adequacy risk is growing and immediate action is necessary*” and that there are many hours of “demand at risk” in the WI, increasing at a rapid rate through 2032 (Figure 7). Mr. Sudduth also noted that NERC’s November 2022 Winter Assessment shows multiple regions of North America at reliability risk due to a variety of factors.

¹¹ December 2, 2022, IEPR Commissioner Workshop on Western Electricity System Integration [recording](https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTtvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n), https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTtvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n.

Figure 7: Resource Adequacy Challenges in the West

Subregional Demand-at-Risk Results

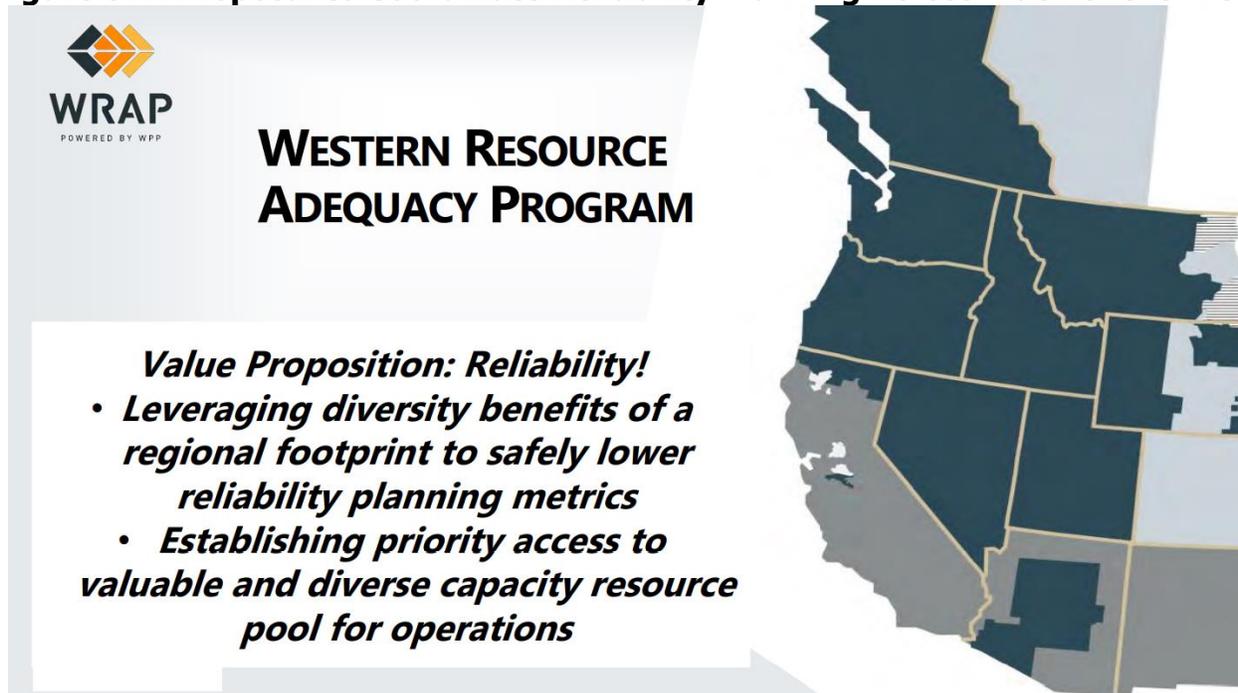


Source: Sudduth WECC workshop presentation December, 2, 2022.

Western Power Pool CEO Sarah Edmonds addressed the interconnection adequacy challenge, bringing good news of a well-advanced institutional solution, the Western Resource Adequacy Program (WRAP). Ms. Edmonds noted, *"WRAP is the first West-wide regional reliability planning and compliance program in the history of the West. It addresses resource adequacy and ensures reliability through collaboration, taking advantage of operating efficiencies, diversity, and sharing pooled resources."*¹² This voluntary initiative, extending across the west, has attracted major participants. It will require entities making a forward showing to demonstrate that they own or have acquired rights to adequate resources to meet their expected loads plus a planning reserve (Figure 8).

¹² Personal correspondence from Sarah Edmonds to Grace Anderson. November 27, 2022.

Figure 8: A Proposal to Coordinate Reliability Planning Across Much of the West



Source: Edmonds Western Power Pool workshop presentation December 2, 2022.

The WRAP Program Operator (WPP awarded SPP a contract for this function) then directs and oversees sharing amongst WRAP participants in shortages and times of system stress (caused by extreme weather, outages, or underperformance of variable resources). Recognizing the changing regional landscape (and the scarcity described by WECC and E3), WRAP will arm participants and the region with guidance and modeling to ensure that the transition can be made while maintaining reliability standards. The diversity and dispatch efficiencies of the large footprint will enable economic savings and a lower planning reserve margin when planned collectively, than if done on a stand-alone basis. (This may seem counter-intuitive given the message from WECC that increasing variability is driving the need for increased reserves in all the sub-region footprints, and the western energy emergency experienced in September 2022 highlighted the challenge.) Perhaps the most critical takeaway offered by Ms. Edmonds is, *"WRAP will change resource adequacy availability and decision-making throughout the West; it is critical that [resource adequacy] programs in the West understand one another and to seek opportunities for collaboration and cooperation."*¹³

One implication could be that resources historically available to meet emergency conditions causing "needle peaks" may not be available outside the WRAP footprint. Maury Galbraith, Executive Director of WIEB reiterated that cooperation among states is essential for any one state to move forward. WIEB filed comments in support of WRAP at FERC. Mr. Galbraith suggests an *"Opportunity Cost of not joining markets study should be undertaken."*¹⁴

13 Personal correspondence from Sarah Edmonds to Grace Anderson. November 27, 2022.

14 December 2, 2022, IEPR Commissioner Workshop on Western Electricity System Integration [recording](https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTtvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n), https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTtvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n.

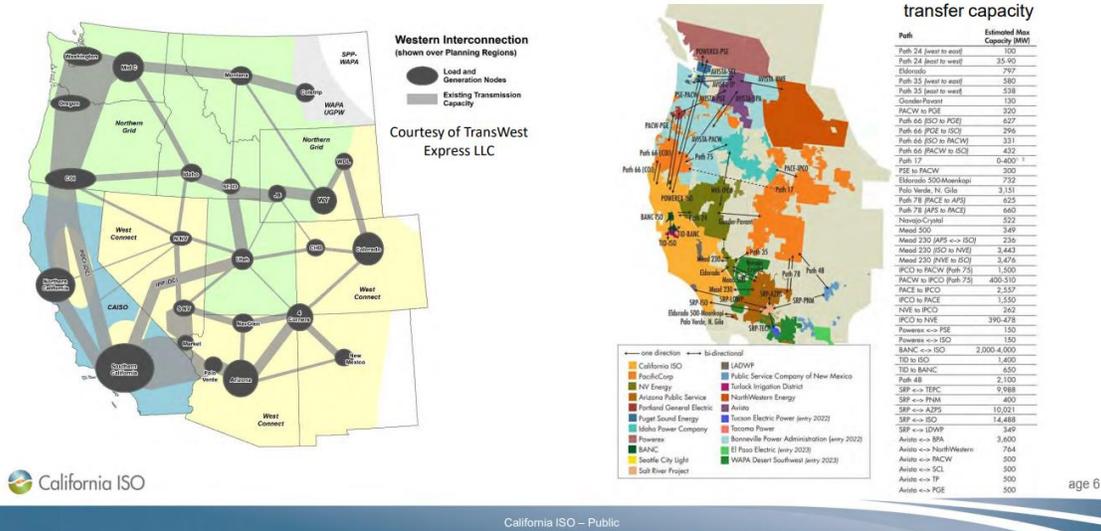
Transmission the Enabler

Neil Millar, Vice-President for Infrastructure and Operations Planning at the California ISO, opened the discussion of this key third pillar of integration, the pressing need for new WI transmission. With facilitation by CPUC Commissioner Cliff Rechtschaffen, all participants in the workshop agreed that transmission is the essential ingredient to achieving maximum benefit from other integration pillars. *"Transmission lifts all boats",* stated Mr. Moyer, *"there is no need to wait to build until markets are established."* Spencer Gray of NIPPC reiterated this, *"The increasing scarcity of transmission across the West makes transmission reforms — either coupled with or in parallel to market evolution — at least as important, particularly for transmission-dependent entities..."*

Describing the recent California ISO *20-Year Transmission Outlook*¹⁵ on transmission needs to achieve carbon reduction, (Figure 9) Mr. Millar emphasized that major ready-to-go projects, such as TransWest Express and SunZia are both important options for near-term development. His many important takeaways included (1) maximizing resilience through reliance on diversity — resources, loads, weather, time zones, and geography — will require new transmission investment; and, (2) interregional transmission planning must be coordinated with resource planning, *"We can't wait until resources are developed to build enabling infrastructure."*¹⁶

Figure 9: Growing and Strengthening Connections

The connectivity in the West is critical both to long term planning and to real time energy imbalance market opportunities



Source: Millar California ISO workshop presentation December 2, 2022

15 California ISO. May 2022. [20-Year Transmission Outlook](http://www.aiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf), <http://www.aiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf>.

16 December 2, 2022, IEPR Commissioner Workshop on Western Electricity System Integration [recording](https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n), https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n.

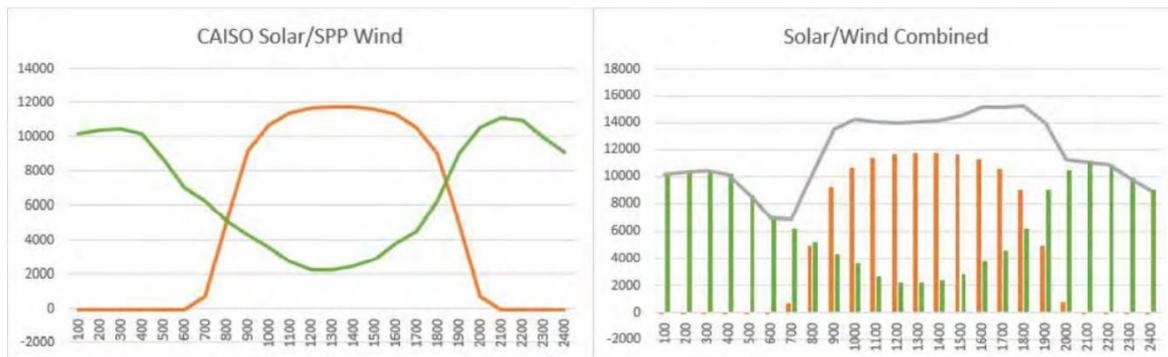
Representatives of two major projects, David Smith of TransWest and Fernando Martinez, Executive Director of the New Mexico Renewable Energy Transmission Authority, described their infrastructure additions. These lines are fully permitted and accessing innovative financing mechanisms to deliver wind from Wyoming and New Mexico to interior and coastal states. The TransWest Express (TWE) project developer is applying to become a California ISO Participating Transmission Owner using a novel, new Subscriber model, that allows for revenue recovery directly from subscribed resources rather than through the California ISO Transmission Access Charge. The TWE Project and subscribed wind generation is within the California ISO Balancing Authority and capacity will be offered to increase size and number of economic transactions within existing and future regional market frameworks.¹⁷

A final, intriguing commentary on transmission came from Steven Johnson of SPP, who emphasized the remarkable diurnal complementarity of the wind resources in the Midwest, as part of the eastern interconnection, and solar in the southwest, as part of the WI. If accessed through a new DC tie across the interconnection boundary, net peak challenges could be mitigated (Figure 10). New transmission can achieve this, independent of creation of markets or an RTO.¹⁸

Figure 10: Creative Partnerships Can Enhance the Value of Natural Resources Across Regions

STRATEGIC OPPORTUNITY

- Midwest wind and southwest solar are extremely complimentary, especially with time zone diversity



August 5th, 2020



Source: Johnson Southwest Power Pool workshop presentation December 2, 2022

17 December 2, 2022, IEPR Commissioner Workshop on Western Electricity System Integration [recording](https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n), https://energy.zoom.us/rec/share/7dpGPKSe1T47OIqTQwgtuz3GTTvna9EA8K0rgHVldknSp8EguowT_NqfHN2A5jU.71GPcHu1jRT5jC1n.

18 Ibid.

California Assembly Concurrent Resolution (ACR) 188

Closing out the workshop, Phil Pettingill, Director, Regional Integration of the California ISO, presented on ACR 188 (Holden, Chapter 138, Statutes of 2022). ACR 188 is a requirement to update the California Legislature on energy markets and regional transmission efforts in California and the West to assess what can be done to realize the benefits of regional coordination. The statute requires the California ISO, in consultation with the California Balancing Authorities, to produce a report summarizing six main topics:

- (1) Recent studies on the impacts of expanded regional cooperation on California.
- (2) Key issues to advance the state's energy and environmental goals.
- (3) Impact of regionalization on transmission costs and reliability for California ratepayers.
- (4) Updates to transmission development and resource diversity estimates.
- (5) Engagement on and discussions of regional transmission organizations in Colorado, Nevada, and other western states.
- (6) Collaboration between states on energy policies to maximize consumer savings while respecting state policy autonomy.

The California ISO engaged the NREL to author the report on relevant studies to be delivered to the California Legislature on February 28, 2023.

Concluding Observations and Next Steps

The West has already come far on the integration journey, and the rewards have been excellent — reliability coordination, sharing resources, and energy imbalance markets are returning far more than expected in efficiency and reliability benefits. There is not one destination, but history and intuition demonstrate the West is much stronger together than its regions can be if acting alone. Moreover, the Inflation Reduction Act is a sea-change for the development of clean energy and climate action. The 10-year extension of tax credits for clean energy, storage, and other technologies is crucial; the authority given to federal agencies to partner with states and utilities to build new transmission lines can transform western grid options.

Continuing roll out of western markets will best succeed when existing frameworks are used as the foundation. With collaboration and attention to consensus, a voluntary day-ahead market will be functioning in mid-2024 (and, potentially a second in 2026). Markets, Clean Firm resources, energy storage, distributed solar/fuel cells, transmission, and expanded energy efficiency/demand response are central elements of western integration and reliability.

With respect to potential next steps, participants acknowledged the energy transitions the nation is currently undertaking requires out of the box and beyond the boundaries thinking, not previously envisioned in the West. By engaging in a passionate discussion together, the West can achieve far more together than possible if each state or utility acts on its own. The

three C's— coordination, collaboration, and consensus — can be the watchwords as broad western interests work together to develop and select items on a menu of potential western next steps. Options to be considered with leadership of states and western initiatives include:

- Enhance collaboration among western states with a goal of cooperatively identifying potential “western next steps” on Integration. Increase staffing at all levels (technical and policy) and support options for other states to build technical capability.
- Focus intent review and identification of implications of boundaries between markets and adequacy programs; identify solutions to the seams challenges revealed.
- In partnership with interested states, propose and seek funding for a seminar series hosted by an existing independent forum to further explore the three pillars of integration. These would serve the purpose of seeking more depth and breadth of understanding of technical, policy and planning questions.
- Establish a partnership for Department of Energy (DOE) and state research and development investment, with the objective of bringing two clean firm generation technology/fuels into commercial deployment by 2030–2035, to enhance reliability across the interconnection and implement policy goals at lower cost.
- Pursue detailed review of DOE and other congressional incentive/funding alternatives to achieve integration benefits; develop project grant proposals co-led by interested western states, including a focus on western transmission coordination and investment.
- Support incremental voluntary approaches to resource adequacy and real-time /day ahead markets that build on those already well into implementation.
- Continue consideration of integration options such as those outlined in the ACR 188 report to better understand longer term paths; pursue collaborative conversations with interested western states.
- Support evaluation of potential opportunity costs of not joining wholesale markets.
- Monitor deliberations of the Western Energy Industry Leaders and the Western Markets Exploration Group and engage if warranted at appropriate times.