



A Renewable
America

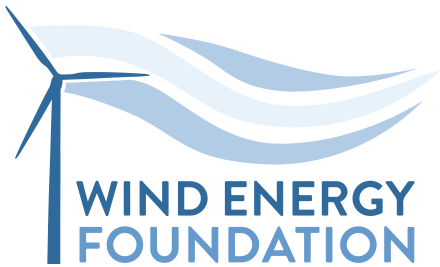
THE GROWING WESTERN EIM:

THE ECONOMIC, ENVIRONMENTAL,
AND ENERGY SECURITY BENEFITS
OF AN EXPANDING MARKET





A Renewable America



A Renewable America A project of the Wind Energy Foundation

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EXECUTIVE SUMMARY

The Western Energy Imbalance Market (EIM) is a wholesale energy marketplace that automates participants' buying and selling energy when needed. As the first real-time, coordinated market in the Western U.S., expanded outside of California, the EIM operates in portions of eight states. It is currently comprised of five utilities: PacifiCorp, NV Energy, Puget Sound Energy, Arizona Public Service, Portland General Electric and the California Independent System Operator. This report explores the reasons why additional utilities are joining the EIM and why continued expansion would serve the public interest.

Since launching in 2014, the Western EIM has enhanced grid reliability and generated cost savings for its participants.¹ The EIM also helps deliver what

The EIM has delivered **\$254.98 million** in gross benefits as of Q3 2017 by reducing the cost of balancing services and finding the most cost-efficient power plants to serve demand.

may have otherwise been surplus renewable energy, which displaces fossil-fueled generating sources and reduces significant carbon emissions. By reducing renewable generation curtailment, the EIM has avoided 214,927 metric tons of carbon emissions since 2015.²

In light of these significant benefits, the EIM continues to expand. The Idaho Power Company and Powerex are scheduled to join the EIM in April 2018. Seattle City Light, the Sacramento Municipal Utility District and the Los Angeles Department of Water and Power are scheduled to join in April 2019. Salt River Project is scheduled to join in April 2020.

In the meantime, more utilities are analyzing the benefits of membership in consideration of participating in the EIM. These utilities include, but are not limited to: the Bonneville Power Association, Tucson Electric Power, El Centro Nacional de Control de Energía, Avista Corporation, and NorthWestern Energy.

This report outlines the benefits of the EIM to date, and provides insight into how further expansion could yield additional benefits to customers, communities seeking the economic development benefits of renewable energy, and enhancing both public health and the environment.



INTRODUCTION

The Western Energy Imbalance Market (EIM) is currently made up of the California Independent System Operator (CAISO), PacifiCorp, NV Energy, Puget Sound Energy (PSE), the Arizona Public Service Electric Company (APS), and Portland General Electric. The EIM operates in portions of eight states in the Western Interconnection, producing economies of scale by dispatching flexible energy resources from all participating entities to help meet imbalances in electricity supply and demand and find the residual lowest-cost energy to serve load. This creates significant benefits such as improved system reliability, cost savings, and reductions in CO2 emissions.³ The EIM market has also facilitated renewable energy integration and the achievement of clean energy goals.⁴ These benefits have grown as more utilities have joined the market, illustrating that expanding the EIM would increase benefits to all.

For example, CAISO and PacifiCorp were the initial EIM market participants, generating \$1.24 million and \$4.73 million in gross benefits, respectively from the time they joined in November 1, 2014 through the end of the year.⁵ NV Energy, PSE, and APS joined the market over the next two years. These additions helped increase the cost savings of existing participants, in addition to creating savings and benefits for the new participants themselves.

By Q2 2017, CAISO has seen more than a ten-fold increase in quarterly gross benefits to \$15.49 million, while PacifiCorp's quarterly benefits had nearly doubled to \$8.81 million as compared to Q4 2014.⁶ Similarly, NV Energy's quarterly gross benefits more than doubled from Q1 2016 (\$1.7 million) to Q1 2017 (\$3.5 million), during which time PSE and APS joined the market.⁷

WESTERN EIM TIMELINE

- **Nov. 2014 (Q4)** - CAISO and PacifiCorp begin trading
- **Dec. 2015 (Q4)** - NV Energy officially joins
- **Oct. 2016 (Q4)** - Puget Sound Energy and Arizona Public Service company officially join
- **Oct. 2017 (Q4)** - Portland General Electric officially joins
- **April 2018 (Q2)** - Idaho Power Company and Powerex officially join
- **April 2019 (Q2)** - Seattle City Light, Sacramento Municipal Utility District, and Los Angeles Dept. of Water and Power officially join
- **2020 (Q2)** - Salt River Project officially joins





BENEFITS OF THE EIM

ENERGY DIVERSITY BENEFITS: ENHANCED RELIABILITY & SECURITY

The U.S. electric grid's generating resources are becoming more diverse than ever before, which means that the operation of the grid must evolve to continue to provide customers with the low-cost and reliable service.⁸ By providing a platform to pool the energy resources of its multiple participants, the Western EIM is part of the electric system's evolution that enhances energy security and reliability in the region.⁹ Participating entities can access diverse energy resources across the wide geographic region that the EIM covers to meet their individual imbalances in electricity supply and demand.¹⁰ In contrast, utilities not in the EIM are required to use their higher-cost balancing resources more frequently to meet reliability requirements because their resources are not shared, creating unnecessary costs for the electricity consumers they serve.¹¹

Due to the modernization in system software and hardware required to participate in this real-time market, the EIM also increases situational awareness by giving operators modern tools to analyze and respond to challenges throughout the Western Interconnection.¹² These tools foster the proactive identification of solutions to potential reliability

problems among participants through automated re-dispatch, which re-routes energy to address supply and demand imbalances every five minutes.¹³ Moreover, the EIM uses advanced real-time information about system conditions, which helps to maximize transmission use and manage congestion.¹⁴

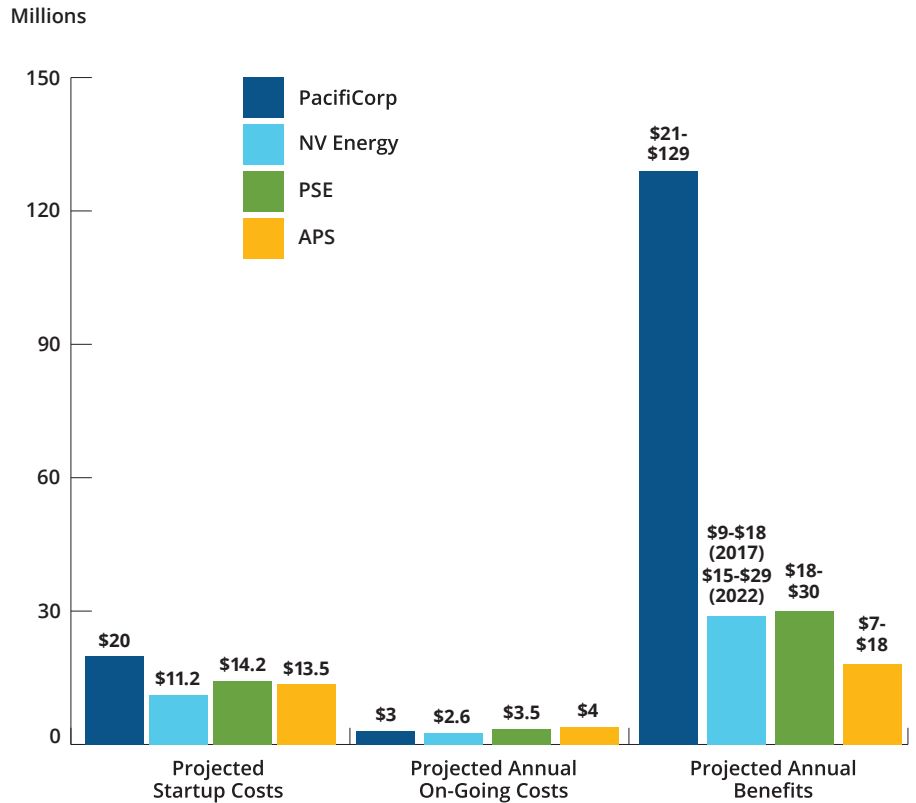
ECONOMIC BENEFITS

The EIM is a voluntary, more efficient way to manage the grid, and participants can choose to leave the market at any time without exit fees.¹⁵ Various studies by the National Renewable Energy Laboratory, the CAISO, the Northwest Power Pool, and the Southwest Power Pool have demonstrated that the benefits to all customers outweigh the costs of participating in a real-time market.¹⁶ The following charts demonstrate how the EIM has resulted in economic benefits for each of the market participants.

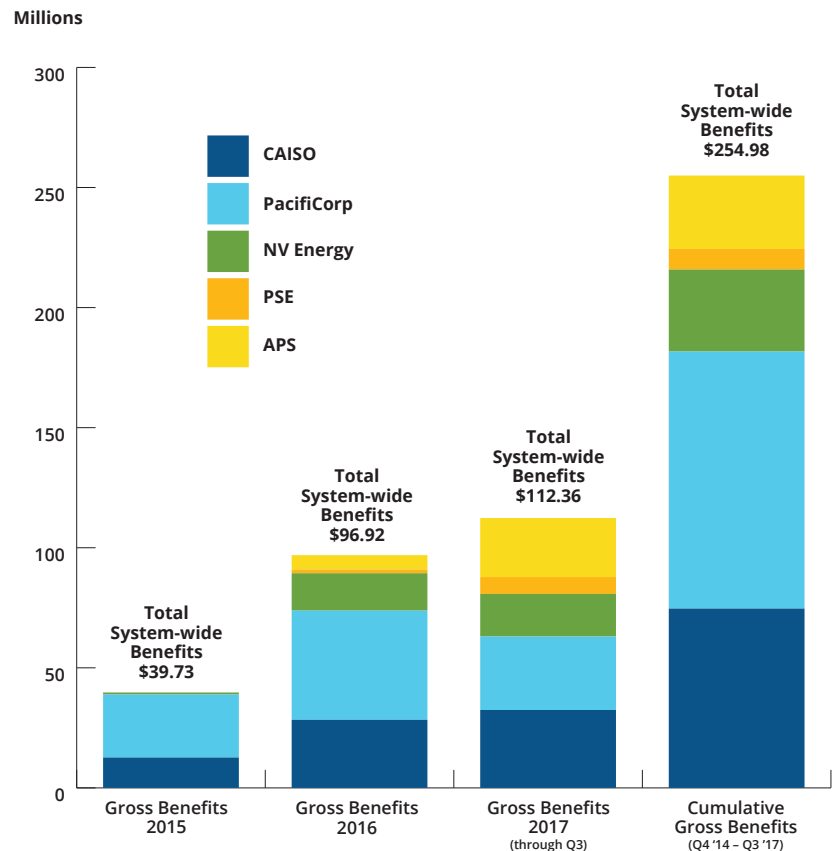
Reduced costs are a significant factor in how the economic benefits are calculated. The EIM gives utilities access to lower cost electricity and reduces the dispatch of costly reserves. When a utility has excess supply, they can offer it to another utility instead of curtailing the generator. Similarly, if a utility experiences a sudden increase in consumer demand, they can procure the least-cost electricity from another utility in the EIM rather than activating their own more expensive flexible ramping resources if they are more expensive.¹⁷

Furthermore, the EIM enables better management of transmission congestion, resulting in a more efficient use of the regional high-voltage transmission system.¹⁸ The EIM reduces, if not eliminates, inefficient sub-hourly transactions of energy transfers between the participants and replaces manual practices like finding replacement power providers, identifying transmission availability, and obtaining E-tag approvals.¹⁹

PROJECTED COSTS AND BENEFITS OF EIM PARTICIPATION BY UTILITY²⁰



ACTUAL GROSS BENEFITS ON AN ANNUAL BASIS²¹



The EIM gross benefits increased **144 percent** from 2015 to 2016. Gross benefits are on pace to increase at least **55 percent** in 2017.

REDUCED CO2 EMISSIONS

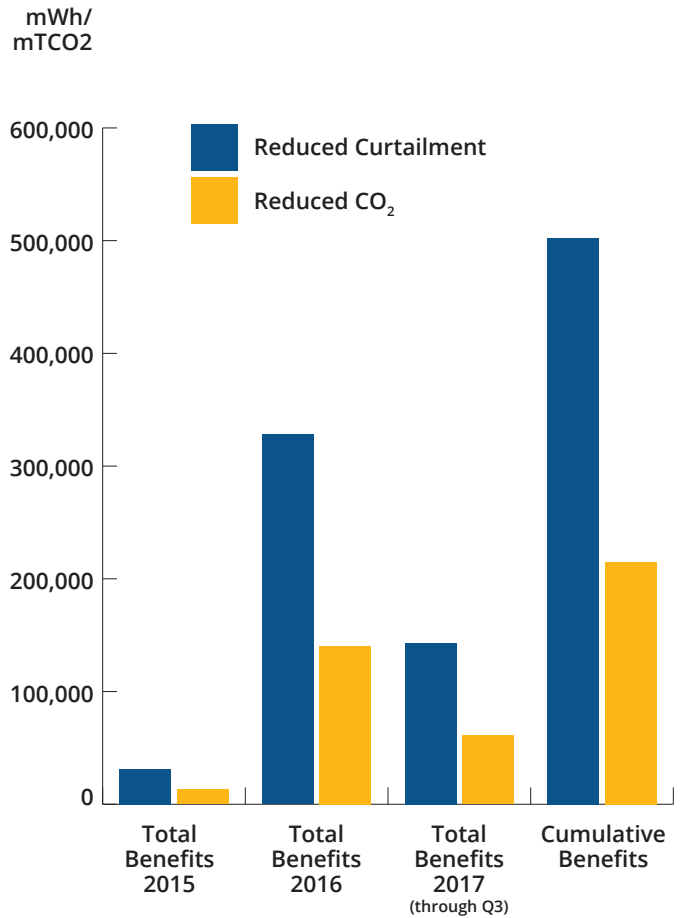
When one of the EIM participants is experiencing oversupply, their excess wind or solar can help meet demand for any of the other four participants that otherwise may be met by coal or gas generation.²² By reducing renewable curtailment, the EIM displaced over 214,927 metric tons of CO₂ emissions from January 2015 to September 2017. The avoided emissions is equivalent to taking 43,008 cars off the road for a year.²³ The following chart demonstrates the annual totals of reduced renewable curtailment and the resulting carbon emission reductions as a result of the EIM.²⁴

PRESERVED AUTONOMY

The EIM has provided participants with the autonomy associated with a vertically integrated utility, as well some of the efficiencies that can coincide with regionalization. The EIM improves system efficiency and flexibility, while preserving the autonomy of utility interests in two essential ways.

First, the EIM has its own independent governance structure distinct from the CAISO board.²⁵ The EIM governing body is selected from a diverse, well-qualified group to represent all perspectives, and to ensure that no one entity or interest is elevated over another.²⁶ Participation in the EIM does not change the entities FERC jurisdictional status.

Second, EIM participants preserve operational control in their balancing areas. Obligations to provide ancillary services and reliability compliance, and facilitate physical scheduling rights and bilateral trades do not change while joining the EIM.²⁷ For example, there is no requirement for utilities to offer their generators in the market. They can use their discretion to approve or deny requests from other participants and even set parameters for the energy they provide. These two qualities help EIM participants make objective, cost-effective decisions, limiting the political and economic risks of regionalization.²⁸



EFFICIENT USE AND INTEGRATION OF RENEWABLE ENERGY

The increasing diversity of our energy mix, particularly renewable energy, calls for changes in how we manage and operate the grid. The EIM addresses the variability of renewables in two distinct ways. First, it aggregates the variability of wind and solar across the eight-state footprint by creating a single "virtual balancing authority" for real-time balancing purposes.²⁹ This results in lower net imbalance and less commitment and use of expensive balancing reserves. Second, when an imbalance does occur, the EIM can re-dispatch the available generation, on a least cost basis, to any of the five participants, reducing the risk of one utility running out of balancing reserves.³⁰

Portland General Electric (PGE), which joined the EIM in October 2017, is a good example of how utilities can



benefit from joining the market. PGE has an increasingly flexible and diverse resource mix with over 27 percent of their owned and contracted generation coming from renewables. By 2040, 50 percent of their energy mix must come from renewables, with all coal generation eliminated from their portfolio by 2035. PGE sees joining the EIM as a way to cost-effectively meet these goals.³¹ The utility also benefits from owning just under 20 percent of the California-Oregon Intertie, a transmission line that links the two states and connects generation and the customers they serve.³² Due to its changing resource mix and proximity to advantageous transmission lines, PGE illustrates how joining the EIM can provide a low-cost option for similarly positioned utilities looking to reliably integrate portfolios of increasing amounts of variable generation.

NorthWestern Energy (NWE), a utility serving large parts of South Dakota and Montana, could also see similar benefits. Like PGE, NWE uses hydro and wind to serve over a quarter of its customers' energy needs.³³ NWE is also directly interconnected to existing EIM participants, PacifiCorp and Idaho

Power via five major transmission lines.³⁴ Thanks to this transmission connectivity, NWE has good access to the EIM and could benefit from it.

Furthermore, NWE's South Dakota territory, is expected to have excess energy through early 2019.³⁵ Thereafter, they are projecting a need to acquire additional generation capacity throughout the 2020s.³⁶ Given their current capacity surplus combined with future capacity needs NWE would likely benefit from joining a marketplace that could help sell their excess energy and allow for future purchases to meet their projected demand.

PGE's experience and reasons for joining the EIM are very similar to the current market participants. Prior to the EIM, the risk of the costs associated with balancing energy created an economic impediment to wind and solar development. Now, utilities can export or reduce imports of renewable energy generation when they would normally be economically curtailed.³⁷ By efficiently and effectively using renewable energy, the EIM facilitates further renewable energy development which translates to capital investments, jobs, and tax benefits to local communities.

FUTURE OF THE EIM

As demonstrated in the prior sections, the current economic benefits of the EIM are significant, and have only increased as the market has expanded. As a result, additional utilities are considering joining the market. In late 2016, Seattle City Light announced that they would join the market starting in April 2019.

Meanwhile, other utilities such as the Bonneville Power Administration, Avista, and NorthWestern Energy are considering joining the EIM but have not yet committed. Given the demonstrated benefits of joining the EIM, their consumers, at the very least, deserve to see a cost-benefit analysis illustrating what the EIM would potentially deliver.

The EIM is just one small example of the benefits that can be realized through greater regional cooperation³⁹. Implementing a full ISO/Regional Transmission Operator (RTO) in the Western Interconnection is a much bigger question. The idea has been discussed for over a decade and has gained significant traction in recent years.⁴⁰

In 2015, the California state legislature passed a bill to study the potential benefits to ratepayers of a regional ISO. The study found that in addition to reduced air pollution, improved transmission planning, significant jobs and economic development, that by 2030, California energy customers could save \$1 to \$1.5 billion per year with a regional ISO, as well as reductions in air pollution, improved transmission planning, and significant economic development.⁴¹ However, a complete move to regionalization raises concerns for some market participants. Concerns over transmission cost allocation and transmission rights, lingering issues from the 2001 energy crisis, a desire to remain independent from California and FERC's oversight, and the differing goals of CAISO and other participants in the Western Interconnect have hindered full integration.⁴² In September 2017, California lawmakers introduced a bill that would have created a process to begin transferring grid authority from CAISO to an independent commission that would then develop a governing plan to expand the grid to five Western states. It was ultimately withdrawn, but according to the bill's author, CAISO regionalization will likely be revisited next year.⁴³

“Seattle City Light has preliminarily evaluated the Energy Imbalance Market from an environmental, commercial, and reliability perspective and I believe City Light’s participation can deliver benefits to our customers in all three areas,” City Light General Manager and CEO Larry Weis said.
“Participation in the Energy Imbalance Market is the best use of our resources and our employees’ expertise to extend our support for a clean energy economy across the west. This is the first in a number of steps to better integrate large-scale renewable resources in the west, and a new tool in our ‘tool belt’ to address climate change and set the foundation for a cleaner energy future.”³⁸



CONCLUSION

The U.S. electric grid is undergoing major changes with the additions of large amounts of low-cost renewable power. To fully capture the benefits for ratepayers, community economic development, public health, and the environment, electric utilities may need to change the way they manage their assets. The three years of experience with the Western EIM have shown that utilities joining this regional market are better realizing the costs saving potential of renewable power, improving the ability of communities to tap into renewable power's economic development benefits, and achieving significant health and environmental benefits from reduced CO₂ emissions and other pollution. Moreover, forming the Western EIM has helped improve system reliability. These benefits will only increase as others join. The Western EIM is a success story of how expanded cooperation among utilities and advances in technology can yield significant economic and environmental benefits.



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Pg 4: Wild Horse Wind and Solar Project

Photo Courtesy of AWEA

Pg 5: PacifiCorp Goodnoe Hills Project

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Pg 6: PacifiCorp Goodnoe Hills Project

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Pg 7: Puget Sound Energy Hopkins Ridge Project

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Pg 10: Baker River Hydroelectric Project

Photo Courtesy of Puget Sound Energy

Pg 11: Puget Sound Energy Wild Horse Project

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Pg 12: Puget Sound Energy Hopkins Ridge Project

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ABOUT THE ORGANIZATIONS

A RENEWABLE AMERICA

A project of the Wind Energy Foundation, a 501c3 nonprofit organization, A Renewable America provides education on the economic benefits of expanding renewable energy. For more information visit: www.arenewableamerica.org.

WIND ENERGY FOUNDATION

The Wind Energy Foundation is a 501c3 nonprofit organization dedicated to raising public awareness through of wind and other renewable energy technologies as clean, domestic sources of energy through research and public education. For more information, visit www.windenergyfoundation.org.

RENEWABLE NORTHWEST

Renewable Northwest is the Pacific Northwest's leading non-profit focused exclusively on advocating for new, clean, sustainable, renewable resources. For more information, visit www.rnp.org.

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