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BACKGROUND INFORMATION INFORMATIONAL HEARING

Impacts of Regional Organization of the Grid

Wednesday, June 7, 2017

State Capitol, Room 437
1:30 p.m.

The Electric System and its Operators

Electricity generated at power plants moves through a complex network of electricity substations, power lines, and distribution infrastructure before it reaches customers. This network describes the physical system of the grid—how the poles and wires are connected together—as shown in Figure 1. But the *operation* of the electric system—how and when the electricity flows through those poles and wires—is managed by entities called balancing authorities. (The “control center” in Figure 1.) Like a good waiter in a restaurant, a balancing authority checks what the customers need (system demand) and verifies the order is on the menu (system supply) to ensure its delivery. Even though the grid is interconnected across wide areas, like the entire western United States, this system

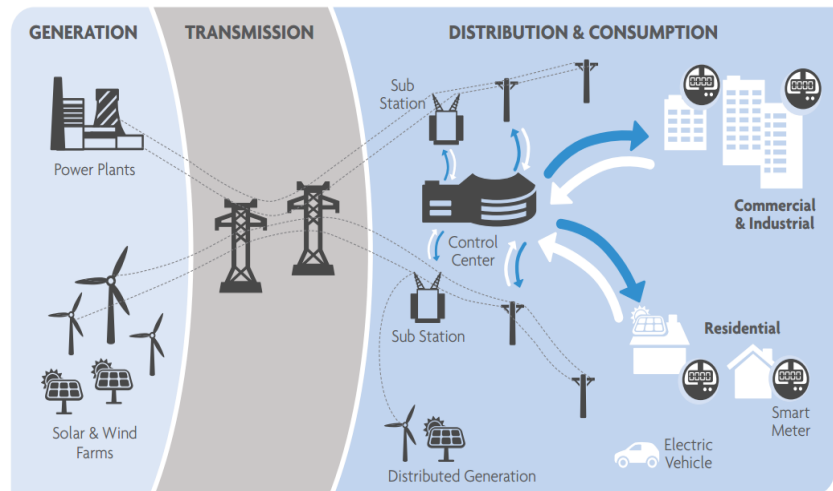


Figure 1: Simplified schematic of an electricity network showing generation, transmission, and distribution. Source: More than Smart

balancing occurs over smaller footprints. Balancing authorities can be electric utilities that balance electricity over their service area (e.g. LADWP¹), or independent entities known as regional transmission organizations (RTOs) or independent system operators (ISOs) that balance over regions they do not own.

In the western grid—stretching from British Columbia to Baja, the Pacific Ocean to the Great Plains—there are over 37 balancing authorities, comprising a large density of operators. Regional density of balancing authorities may create complexities. Recall, the entire western grid is connected; but as energy moves across the grid, the cost of that energy increases as tolls—wheeling, access, and grid management charges—may be applied at each crossing.² As a result, the larger footprint a balancing authority maintains, the larger resources the operators can use to manage the system without incurring additional fees.

Evolution of the Electric System and the Birth of ISOs

During the early 1990s, the United States experienced a slow economic period. As a result, many leaders sought ways to rejuvenate the economy; lowering electricity prices was a popular target. In 1992, the Federal Energy Policy Act (FEPA) was passed which introduced competition to the wholesale side of the electricity market.³

The FEPA allowed for the creation of independent balancing authorities, RTOs or ISOs, to manage the grid. Their creation sought reliable electric service while allowing for increased competition in wholesale energy trading.⁴ In 1996, the California Legislature adopted AB 1890 (Brulte, Chapter 854, Statutes of 1996), which initiated a deregulation of California's electricity market. The deregulation scheme divested ownership of generation from California's

three largest utilities.⁵ This deregulated market sought to break up the utility monopolies, stimulate competition, and drive electricity prices down. The California Independent System Operator (CAISO) was created to manage the new market-based grid.

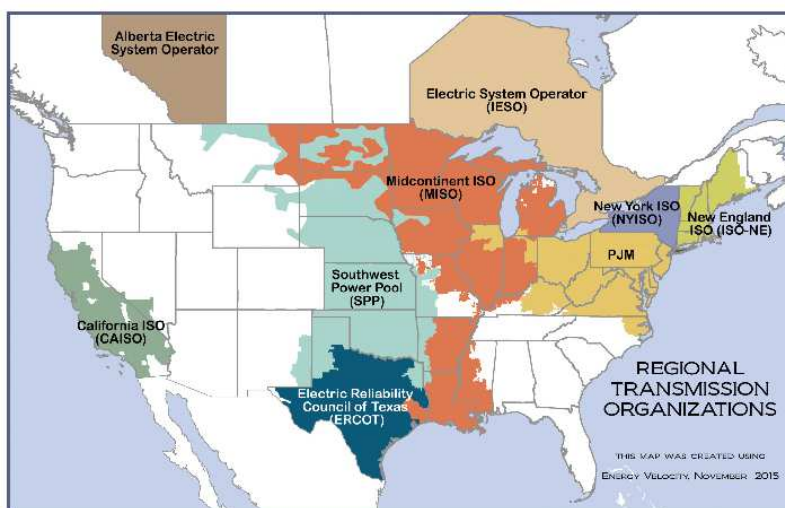


Figure 2: Map of US ISOs/RTOs. Source: FERC

¹ Los Angeles Department of Water and Power

² *CAISO Settlement Guide*; "Wheeling Charges"; CAISO; May 2nd 2005; <https://www.caiso.com/Documents/WheelingCharges.pdf>

³ Brown, M. *California's Power Crisis*. Nat. Conf. State Leg.: Denver. March 2001.

⁴ These operators grew out of FERC Order Nos. 888/889 and 2000. Order No. 2000 delineated 12 characteristics and functions that an entity must satisfy in order to become an RTO or ISO. See: <https://www.ferc.gov/legal/maj-ord-reg/land-docs/RM99-2A.pdf>

⁵ Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E)

CAISO, a nonprofit public corporation, operates California's transmission systems accounting for 80% of the state's load.⁶ These transmission systems are the high-voltage, long-distance power lines largely owned by the investor-owned utilities (IOUs).⁷ During deregulation, ownership of the transmission systems stayed with the participating utilities; municipal utilities could participate in CAISO as they chose.⁸ Like all balancing authorities, the CAISO acts as the control center for the power grid, matching buyers and sellers of electricity and ensuring enough power is on hand to meet demand; but unlike utility-run balancing, CAISO has no ownership in the system it manages. CAISO schedules electricity on a day-ahead, hour-ahead, 15 minute-ahead and five minute-ahead market. CAISO is regulated by the Federal Energy Regulatory Commission (FERC).

CAISO is the only ISO within the western grid, as shown in Figure 2. It is led by a five-member board of governors that are appointed by the Governor of California, and confirmed by the State Senate. Board members hold three year, staggered terms. The board appoints all executive officers to CAISO, including the president who fulfills the day-to-day management.⁹ Until recently, CAISO oversaw the electric transmission and market systems only within California. In 2013, CAISO expanded into a small sliver of western Nevada; and in 2014, it created the voluntary Energy Imbalance Market (EIM) to expand opportunities to sell and purchase electricity outside of California. Other areas of California are managed by other balancing authorities, including the Balancing Authority of Northern California (BANC), the Los Angeles Department of Water and Power (LADWP), and the Imperial Irrigation District (IID); all shown as white space within the CAISO region in Figure 2.

The Energy Imbalance Market (EIM)

If CAISO finds there is an imbalance between the supply and demand of electricity, the CAISO buys electricity in what is known as the "imbalance market." The EIM is a real time (i.e. 5-15 minute) voluntary market that dispatches least-cost energy between CAISO and participating western states. It allows participating balancing authorities to buy and sell the final few megawatts of power to satisfy demand within the hour it is needed. This makes the EIM different from CAISO's normal management. The EIM is small, quick, and voluntary, while normal CAISO operation occurs on a day ahead schedule and requires more long-term coordination and control. With the EIM, excess energy in CAISO can be transferred to other regions. EIM territory includes authorities in Washington, Oregon, Idaho, Wyoming, Utah, Nevada, Arizona, and most recently, British Columbia.¹⁰ Entry into the EIM does not cede jurisdiction to CAISO; long term planning decisions still reside with individual balancing

⁶ According to the ISO website, "ISO manages the flow of electricity across the high-voltage, long-distance power lines that make up 80 percent of California's and a small part of Nevada's grid." See: <https://www.caiso.com/about/Pages/OurBusiness/Default.aspx>

⁷ Chiefly PG&E, SCE, and SDG&E as well as some municipal lines. See: <http://www.caiso.com/participate/Pages/ResourceInterconnectionGuide/UtilityDistributionCompanies.aspx>

⁸ The largest California municipal utilities, LADWP and SMUD, chose not to participate initially; although both LADWP and SMUD have recently joined the CAISO EIM.

⁹ *Amended & Restated Bylaws of CAISO*; http://www.caiso.com/Documents/ISOCorporateBylaws_amendedandrestated_.pdf

¹⁰ Powerex Corp. a subsidiary of BC Hydro, headquartered in Vancouver, B.C.; announced on May 30th it will begin participating in the EIM starting in April 2018. Powerex is the first non-U.S. participant to join the EIM.

authorities. CAISO estimates that the EIM has saved participants over \$173 million since its launch in 2014.¹¹ If not for the EIM, the California Energy Commission (CEC) estimates that CAISO would have had to curtail—i.e. shut off—272 gigawatt hours (GWh) of renewable energy in the first two quarters of 2016.¹²

However, the EIM is limited. It is designed to allow members to purchase power in small increments to quickly correct for forecast errors in their normal schedules. As a result, the EIM only comprises 1-3% of CAISO's total wholesale energy costs.¹³ The EIM also does not allow CAISO to coordinate transmission planning across the western grid. Even so, many of the balancing areas outside of CAISO territory—BANC¹⁴ and LADWP¹⁵—have recently signed on to EIM. The EIM in this way is like a toe in the water for a regional ISO: allowing increased transparency and sharing while limiting risk, by trading energy in small bursts while maintaining the long-term authority of the participating balancing authorities.

A Proposal to Expand CAISO

Following the creation of the EIM, PacifiCorp—a utility that serves customers and balances load in portions of Oregon, Washington, California, Utah, Wyoming, and Idaho—expressed interest in allowing CAISO to manage its transmission system. In April 2015 CAISO and PacifiCorp executed a memorandum of understanding (MOU) to explore adding PacifiCorp as a full participating transmission owner in CAISO.¹⁶ Under such an arrangement CAISO would assume jurisdiction over PacifiCorp's transmission infrastructure, just as it did for California's IOUs and some municipalities after deregulation.

On October 7, 2015, Governor Jerry Brown signed SB 350, the Clean Energy and Pollution Reduction Act of 2015 (De León, Chapter 547, Statutes of 2015). The act states that “it is the intent of the Legislature to provide for the transformation of CAISO into a regional organization” in the western states. This CAISO-transformation could occur through additional transmission owners joining CAISO, but would not be in effect until the Legislature approves CAISO governance changes. SB 350 also required CAISO to conduct studies on the environmental and economic impacts of a regional grid and to submit a proposal to the Governor of the expanded CAISO governance before the end of 2017.

In the summer of 2016, CAISO, the CEC, the California Air Resources Board (CARB), and the California Public Utilities Commission (CPUC) held workshops discussing the

¹¹ *News Release* “Powerex will join western Energy Imbalance Market”, CAISO; May 30 2017.

¹² *Tracking Progress: Resource Flexibility*; CEC; Dec. 15 2016;

http://www.energy.ca.gov/renewables/tracking_progress/documents/resource_flexibility.pdf

¹³ Based on estimates of ~\$7.4 billion total wholesale from CAISO's *2016 Annual Report on Market Issues & Performance* and the quarterly EIM benefits reports for all of 2016. See:

<http://www.caiso.com/Documents/2016AnnualReportonMarketIssuesandPerformance.pdf> &

<https://www.caiso.com/Pages/documentsbygroup.aspx?GroupID=5180B3C9-2B88-4678-B6AD-2A6B55CE8DEB>

¹⁴ http://www.caiso.com/Documents/May18_2017_LetterOrderAcceptingEIMImplementationAgreement-BANC_SMUD_ER17-1300.pdf

¹⁵ http://clkrep.lacity.org/online/docs/2017/17-0312_misc_2_03-22-2017.pdf

¹⁶ *News Release* “PacifiCorp agrees to explore full participation in California ISO”; CAISO; April 14 2015.

<https://www.caiso.com/Documents/PacifiCorpAgreesToExploreFullParticipationInCaliforniaISO.pdf>

governance proposal and the impact assessment asked for in SB 350. On August 8, 2016, Governor Jerry Brown issued letters¹⁷ directing his staff and the agencies to continue

working with stakeholders, because “there remain some important unresolved questions that would be difficult to answer in the remainder of California’s current legislative session.” The Governor concluded the letters hoping the Legislature would have a proposal to consider in January of 2017. In October 2016, CAISO submitted a second revised proposal in light of extensive stakeholder feedback.¹⁸ The SB 350 regionalization intent language will be repealed on January 1, 2019, if a law implementing CAISO’s governance modifications does not take effect on or before that date. To date, no such legislation has been introduced.

Considerations for a Western Regional ISO

If all necessary legislative, regulatory, and FERC approvals are achieved, the expanded CAISO would become a western regional ISO. The CAISO report required by SB 350 examined the impacts of a regional ISO on: 1) ratepayer costs; 2) greenhouse gas (GHG) emissions; 3) the economy and workforce; 4) California’s disadvantaged communities; and 5) system reliability. The CAISO analysis of these impacts found annual net financial benefits to California ratepayers, annual decreases to CO₂ emissions, and the creation of thousands of additional jobs within the state if CAISO were expanded. Many of these findings, however, have been the subject of much debate, as the assumptions inherent to the analysis are questioned. Despite a year having elapsed since the SB 350 regionalization report was public,¹⁹ the central question for many stakeholders is not how and when to regionalize CAISO but if it bears pursuing at all. The sentiments swirling around stakeholders seem to shift from optimism around regionalization to caution against actions which may expose Californians to uncertain levels of risks and costs.

Additionally, the question of governance lingers. In essence, will California and California ratepayers be giving up too much authority in allowing a regional ISO to manage their transmission lines. The governing principles for the regional ISO have been vigorously debated. The October 2016 revised proposal establishes both a Transitional Committee that will determine the framework and governing structure of the regional ISO board, as well as a Western States Committee that acts as a representative of the participating states to the ISO.²⁰ It is within the Western States Committee that the focus of how individual states can influence decisions within multistate jurisdictions is centered.²¹

The purpose of today’s hearing is to understand the discussion begun over two years ago with CAISO and PacifiCorp’s MOU. Chiefly, what is the regional ISO? How would an expansion unfold and how would it affect California ratepayers? How would it enhance or

¹⁷ http://www.energy.ca.gov/sb350/regional_grid/documents/2016-07-26_ltrs_from_gov_brown.php

¹⁸ *Principles for Governance of a Regional ISO*. CAISO. Second Revised Proposal. Oct 7 2016.

<https://www.caiso.com/Documents/PrinciplesForGovernanceofaRegionalISO-Clean.pdf>

¹⁹ On June 3rd and 10th, 2016 the CAISO released the detailed analytical inputs, assumptions, calculations, and results of the report for stakeholder review.

²⁰ [http://docketpublic.energy.ca.gov/PublicDocuments/16-RGO-](http://docketpublic.energy.ca.gov/PublicDocuments/16-RGO-01/TN213926_20161007T124539_Principles_for_Governance_of_a_Regional_ISO.pdf)

[01/TN213926_20161007T124539_Principles_for_Governance_of_a_Regional_ISO.pdf](http://docketpublic.energy.ca.gov/PublicDocuments/16-RGO-01/TN213926_20161007T124539_Principles_for_Governance_of_a_Regional_ISO.pdf)

²¹ CAISO is not the first balancing authority to consider forming a regional ISO. For example, both the Midcontinent Independent System Operator (MISO) and the Southwest Power Pool (SPP) have formed multi-state ISOs. Both have state-representative committees with FERC filing rights, OMS and RSC respectively, which operate in tandem to the governance of the ISO.

hinder California's environmental goals, especially its ambitious GHG emission reductions? Is this expansion necessary, or the least-cost alternative, for achieving these goals?

Regional Organization Studies + Information

- SB 350 (De León, Chapter 547, Statutes of 2015) study on “The Impacts of a Regional ISO-Operated Power Market on California”
 - Executive summary: <https://tinyurl.com/y9dqtg3v>
 - Full report: <https://tinyurl.com/ybx94bj9>
 - All: <https://tinyurl.com/y7p48rl3>
- CAISO overview website:
<https://www.caiso.com/informed/Pages/RegionalEnergyMarket.aspx>
- Yale Study on “Enhanced Western Grid Integration”:
https://law.yale.edu/system/files/area/clinic/document/yaleepc_enhanced_western_grid_integration_may_2017.pdf
- CEC overview website: http://www.energy.ca.gov/sb350/regional_grid/
- July 2016 letters from Gov. Jerry Brown discussing proposed regional ISO:
http://www.energy.ca.gov/sb350/regional_grid/documents/2016-07-26_ltrs_from_gov_brown.php
- CEC Docket for regional ISO proceeding 16-RGO-01:
<https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=16-RGO-01>