

Chelan PUD

Western Energy Imbalance Market and Regional Market Expansion

Board Update

Note: for discussion; no action required

November 21, 2016

- Overview: expansion of organized markets
- Energy Imbalance Market (EIM)
- Potential Western Regional Independent System Operator (ISO)



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Organized Markets in the West Are Expanding

- Energy Imbalance Market (EIM)
 - Focused on within hour market only
 - Automated dispatch in five minute segments
- Regional Independent System Operator (ISO):
 - Includes optimized hour-ahead and day-ahead market
 - Coordinated planning for transmission and generation reserve margins
 - One consolidated Balancing Area (BA)
 - Less local control



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EIM

- Stated benefits of an EIM
 - Cheaper renewable integration
 - More efficient thermal dispatch
 - More efficient transmission utilization



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EIM

- Western EIM
 - In 2013, an effort began to design a Northwest automated sub-hourly market (effort ended at the end of 2015)
 - California ISO along with PacifiCorp began operating an EIM in October of 2014
 - Added Nevada Energy in 2015
 - Arizona Public Service & Puget Sound Energy participation began in Oct 2016
 - Idaho, Portland General, Balancing Area of Northern California (SMUD), and Seattle City Light have all announced they will join
 - Tucson, SRP, NorthWestern, and LADWP are all studying

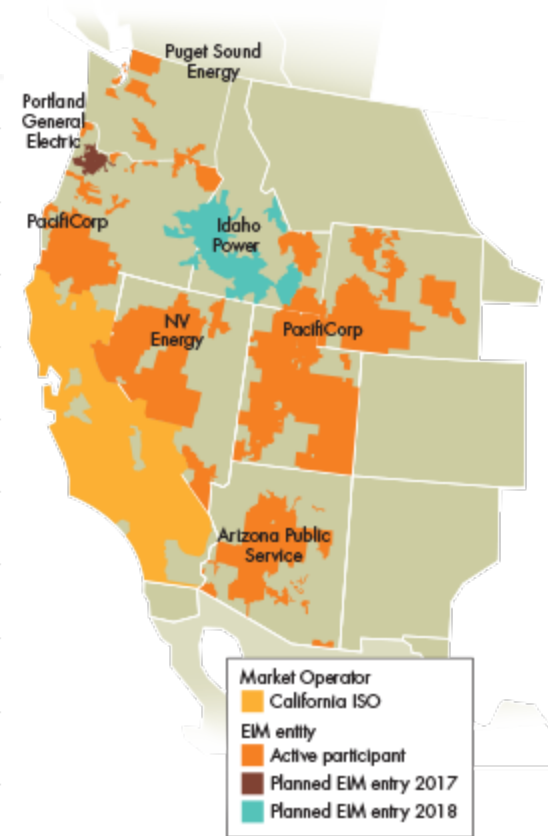
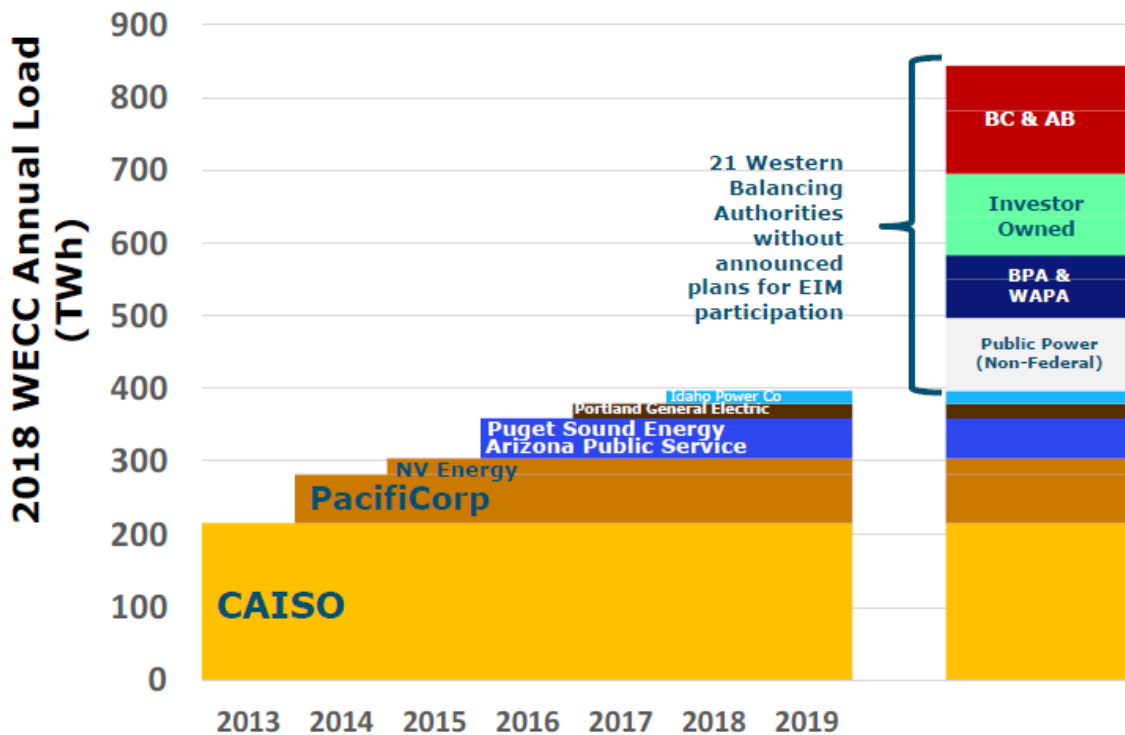


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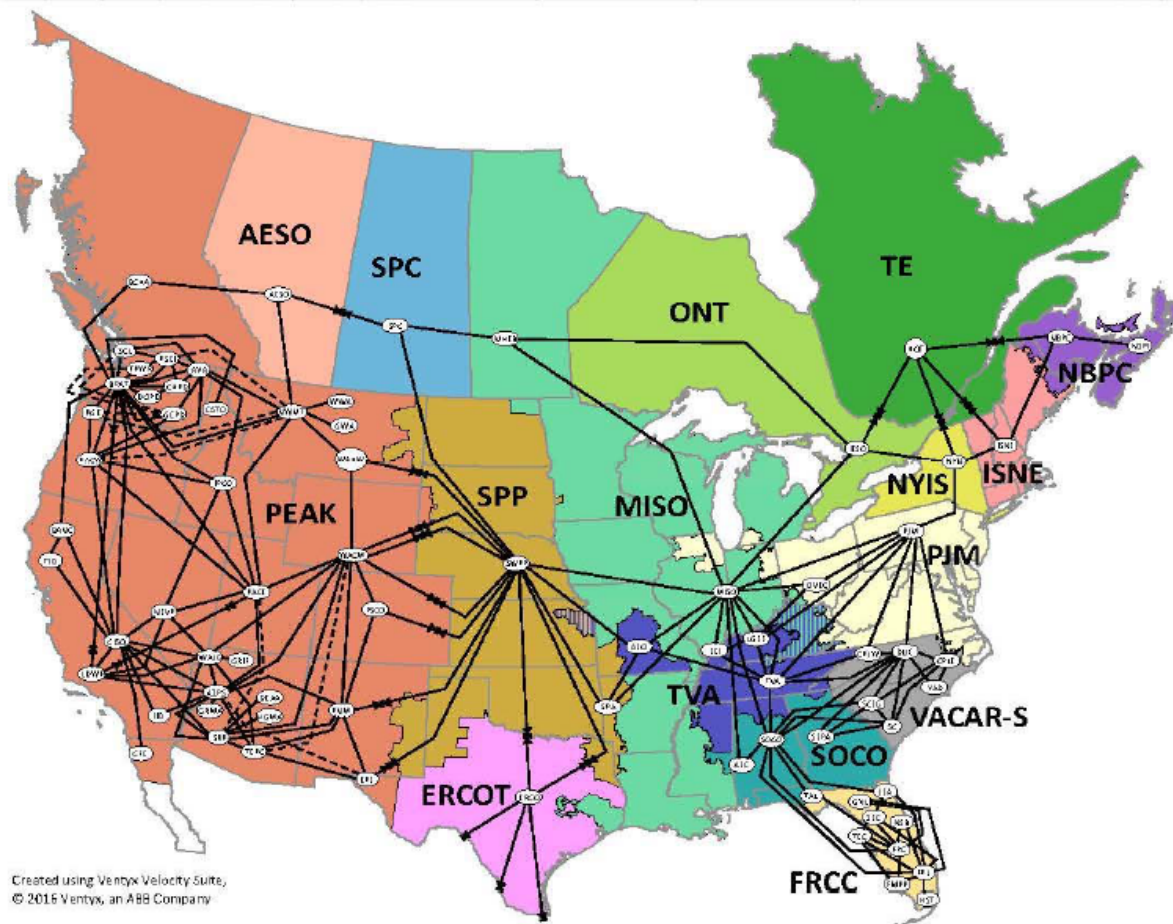
Increased EIM Footprint



Western Operations Today



- Most utilities run their own BA
 - Responsible for grid reliability within their BA boundaries
 - Reserve transmission for utility customer service first
 - Each BA must balance its load and generation
- ISO in California and Alberta





NERC Balancing Authorities

As of October 1, 2015

-  Dynamically controlled generation
-  Back-to-Back DC Converter

Submit changes to balancing@nerc.com

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Why is Regionalization Being Discussed Now?

- Renewable integration
 - Large penetration of intermittent renewable resources
 - Ramping requirements
 - Concerns over curtailment
- Increased efficiency with hour-ahead and day-ahead generation optimization



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Regional ISO

- April of 2015, PacifiCorp and the California ISO announce the intent to fully integrate markets
 - Consolidate BAs
 - Full market participation (day ahead and hour ahead)
 - Joint transmission planning
 - Common market rules
 - Complex process with six states (California, Oregon, Washington, Idaho, Utah, and Wyoming)



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Chelan Activity

- District actively participated in the Northwest EIM effort that ended last year
 - Supported regional governance and working with neighboring BAs
- Early analysis showed relatively small benefit relative to the estimated costs
- Continue to actively monitor and analyze the EIM and the changing landscape
 - EIM Governance Board does have a broader regional representation than previously contemplated



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Chelan Activity (cont.)

- Increasing amount of renewable generation continues to change the market dynamics
- Additional study work has been done over the last year related to the impact of hydro
- Potential impacts on liquidity due to more entrants into the CAISO EIM
- Chelan has been a proponent for opening the CAISO EIM to external resource participation
 - Working with PGP and engaging at FERC



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Questions?



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