

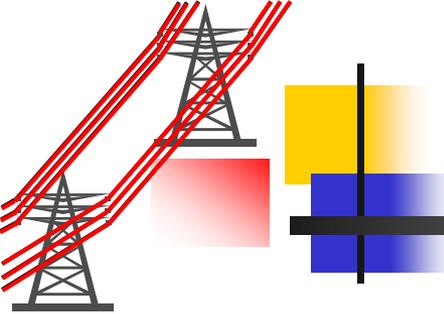
Evolving ISO Market Design: TX, CA, NY & Mexico

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A decorative graphic on the left side of the slide. It features two stylized power line towers with red lines extending from them. Below the towers are two overlapping squares, one yellow and one blue, with a vertical black line passing through them. A horizontal grey line extends from the right side of these squares across the top of the slide.

Outline

- Changing focus towards distributed resources.
- Implications due increasing generation and storage on the distribution system.
- What is needed?



Changing focus

- Independent System Operators (ISOs) were conceived in the traditional paradigm of generation following demand.
- Typically large-scale generation remote from demand-centers dispatched to meet a forecast demand:
 - Some demand response from, eg, industrials.
- Some erosion of that paradigm with large-scale intermittent renewables.



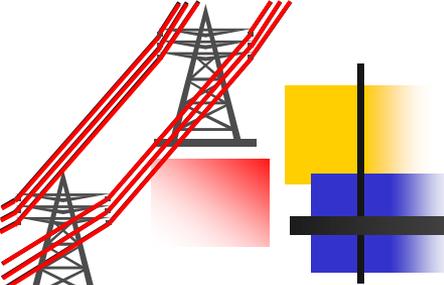
Changing focus

- But the demand-side is also changing.
- From passive consumers to:
 - Prosumers with on-site generation, including renewables,
 - Storage, and
 - Demand-response.
- No longer just a demand to be met, and generation no longer all dispatchable.
- Distributed energy resources (DERs) may require rethink of ISO functionality and reach.



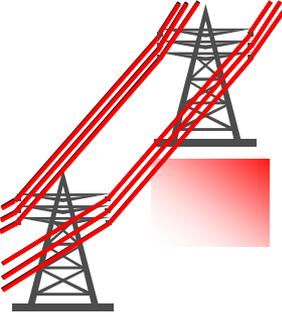
Changing focus

- DERs are on the distribution system:
 - ISOs do not directly monitor.
- DERs may want to be integrated into wholesale markets:
 - Regulatory complexity since consumers mostly interact at retail rates.
- Or, they may prefer regulatory arbitrage:
 - Provide wholesale value, but get paid at retail rates.

A decorative graphic in the top left corner consisting of stylized power lines and towers in red and grey, overlaid on a background of yellow and blue squares with a black crosshair.

Implications of distributed generation and storage.

- Regulatory (retail competition provisions),
- Reliability/markets (dispatch versus passive response)
- Technical (reverse power flow),
- Equity (wholesale-retail arbitrage and paying for the existing transmission and distribution network),
- Emissions (effect of storage on carbon dioxide production).



What is needed?



- Does the ISO need to operate the distribution system?
- Or just greater visibility of distributed resources?
- Do we need a distribution system operator (DSO)?
- Is a DSO necessary when there is retail open access?



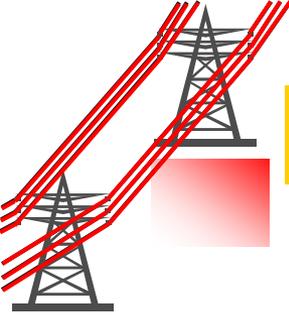
Laura Manz

- Director in the Energy Practice of Navigant Consulting.
- Previous senior roles in operations, planning, and market design at PSE&G, PJM, CAISO, ERCOT, and New Jersey's Basic Generation Service retail backstop.
- Led Engagement Groups with More Than Smart (CA) and New York REV.
- Holds a BS in Electrical Engineering and an MBA.



Dede Hapner

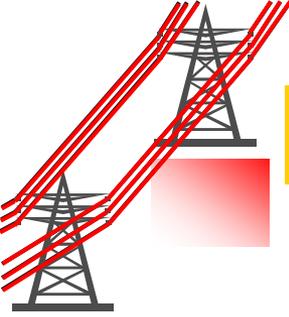
- Officer jobs at PG&E, including Federal and State Regulatory Affairs, Federal Policy and Rates and ISO/FERC Relations.
- Helped restructure the CA electricity industry and served on the original board of CAISO.
- Previously in state and local government in California and led several NGOs.
- Keystone Policy Center Board of Trustees and Co-Chair of Erb Institute Strategic Advisory Committee at the University of Michigan.



Cheryl Mele



- COO at ERCOT since January 2016.
- Prior to that was the COO at Austin Energy where she worked for over 20 years.
- Holds a BS in Mechanical Engineering from Union College in Schenectady NY and is a registered PE in Texas.



José María Lujambio



- Coordinates the energy practice of the law firm Cacheaux, Cavazos & Newton since 2014, including negotiations of PPAs, support for renewables' projects, and advice in hydrocarbons midstream and downstream regulation.
- Previously General Legal Counsel of the Mexican Energy Regulatory Commission, implementing the 2008 reforms on renewable energy and gas.
- Holds an LL.M., with energy concentration, from UT Austin and a Law degree from the ITAM.