

# **U.S. Experience with Electricity Markets**

**Independent Power Producers Society of Alberta (IPPSA)**

**Annual Conference**

**Banff, Canada**

**March 19, 2018**

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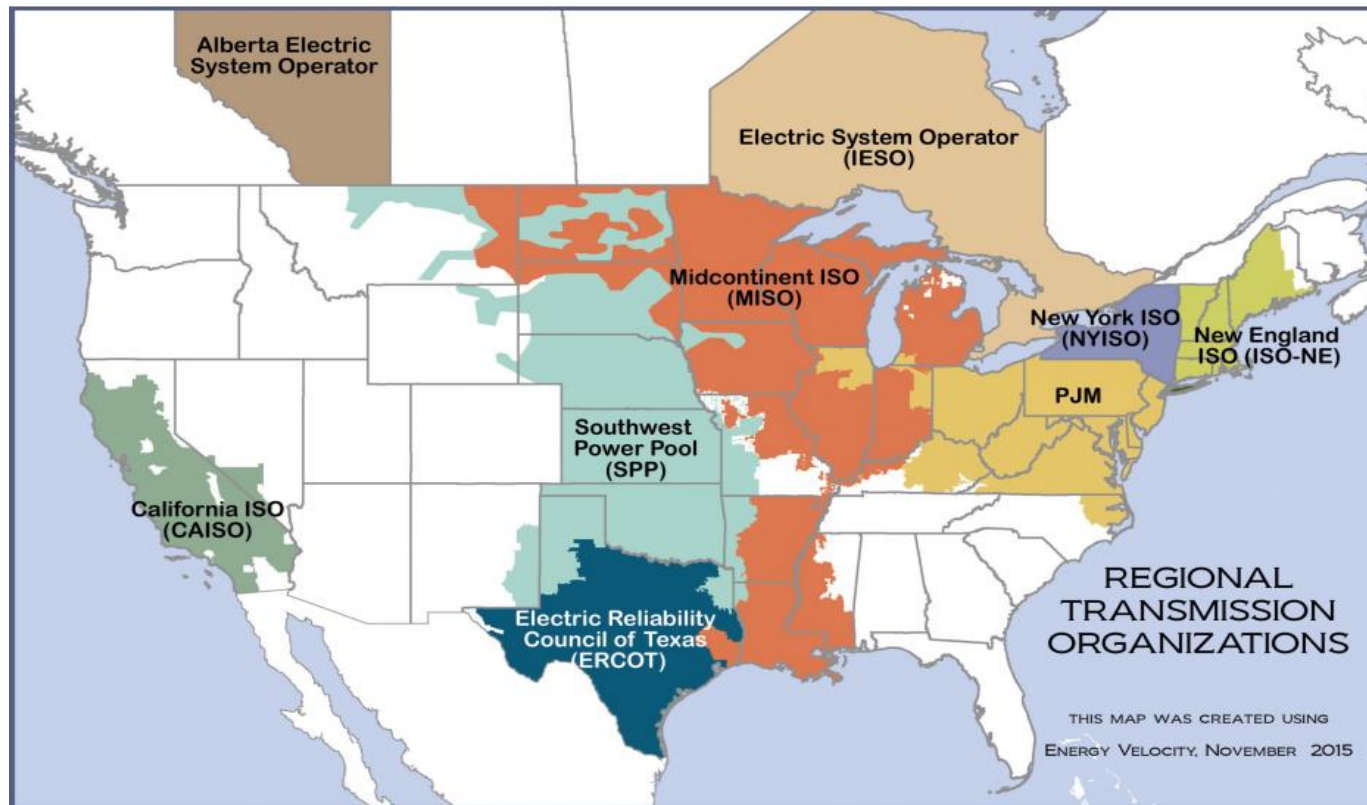
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# 1. Overview of Wholesale Power Markets

- U.S. wholesale power markets include seven RTOs/ISOs, or regional grid operators, that schedule and deliver power through energy markets.



Source: FERC

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## 2. Background on the Development of Competitive Markets

- **FERC began with a restructuring of the natural gas market: Order No. 436 (1985) (promoting nondiscriminatory open access to pipelines); Order No. 636 (1992) (requiring unbundling of pipeline services).**
- **FERC then turned to electricity: Order No. 888 (1998) (requiring nondiscriminatory open access transmission service; “functional unbundling” of power sales and transmission service); Order No. 889 (1998) (standards of conduct and transparency/OASIS); Order No. 2000 (1999) (requirements of RTOs).**
- **By 2000, there were six regional markets: ISO-NE (1997), NYISO (1997), PJM (1997), MISO (1998), CAISO (1998), and ERCOT (1996).**
- **An important early stumble: the Western Power Crisis (2000-01) and manipulation of the electricity market in the West. FERC imposed price caps on June 19, 2001.**

## Standard Market Design (SMD): Notice of Proposed Rulemaking (July 31, 2002)

- **Goal: Competition in wholesale electricity markets across the U.S.**
- **All transmission owners and operators required to join an RTO.**
- **Standardized transmission service and electricity market design.**
- **Day ahead markets and real-time markets.**
- **Locational marginal pricing.**
- **Congestion revenue rights.**

# What Happened

- **Arguments for:** benefits of markets and competition; operational efficiencies; improved reliability; greater transparency.
- **Arguments against:** political concerns based on state sovereignty/jurisdiction; legal concerns regarding FERC's authority; upending the status quo and existing arrangements; implementation costs and fear of markets.
- **One pro-market commentator:** “Time is running out. If the SMD effort succeeds, workable electricity markets can be obtained. If it fails, ...”
- **Outcome:** SMD rulemaking terminated by new Chairman at FERC on July 19, 2005.

## SMD's Legacy

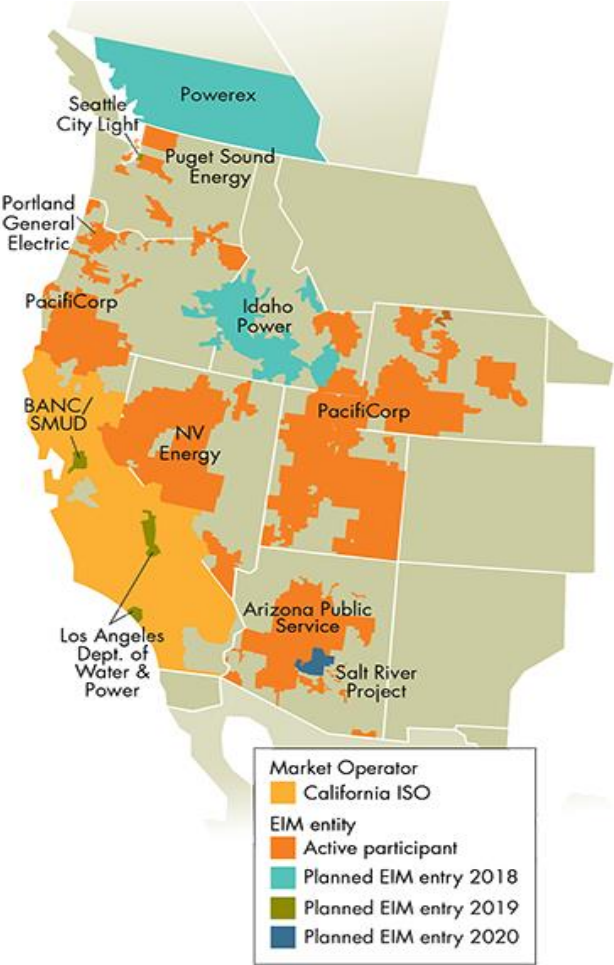
- **Joining an RTO/ISO a voluntary decision by a utility subject to state approval.**
- **Let a hundred flowers blossom.**
- **Regional markets can account for regional differences.**
- **Markets have expanded with greater buy-in from stakeholders. Two-thirds of US now served by RTOs/ISOs with significant benefits to consumers.**
- **General market design is similar across the U.S.**
- **Seven different laboratories for experimentation.**

# Costs

- **The legacy lives on. And what does SMD mean?**
- **1/3 of the U.S. remains in bilateral markets with vertically integrated utilities.**
- **Seams issues reduce operational efficiencies.**
- **Continued difficulty in doing inter-regional transmission planning and cost allocation.**
- **Complicates market oversight of RTOs/ISOs given differences among them.**
- **Less transparency in work of RTOs/ISOs; harder to do an apples-to-apples comparison.**

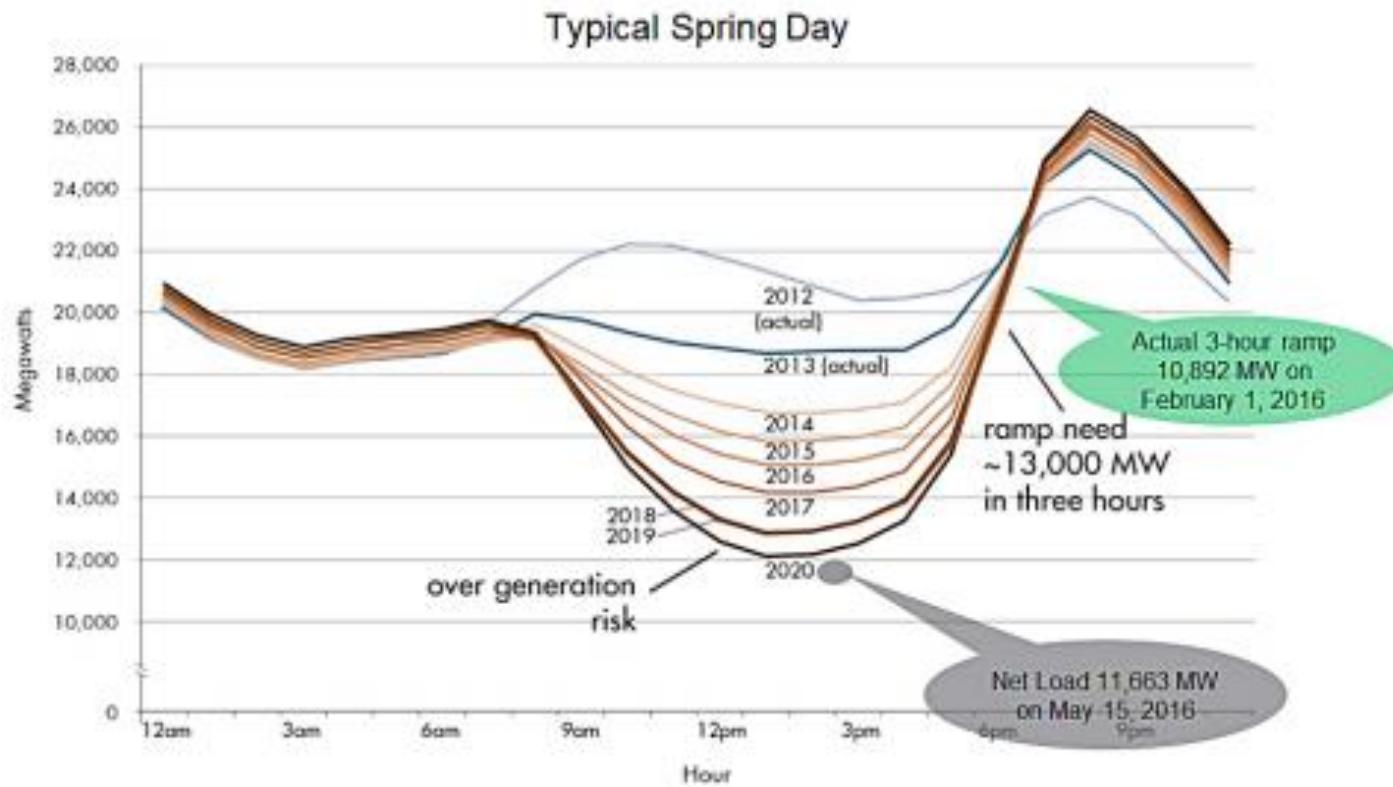
# 3. The Expansion of Markets

## Western Energy Imbalance Market (EIM)





# Why the EIM Matters (the “Duck Curve”)



Source: CAISO

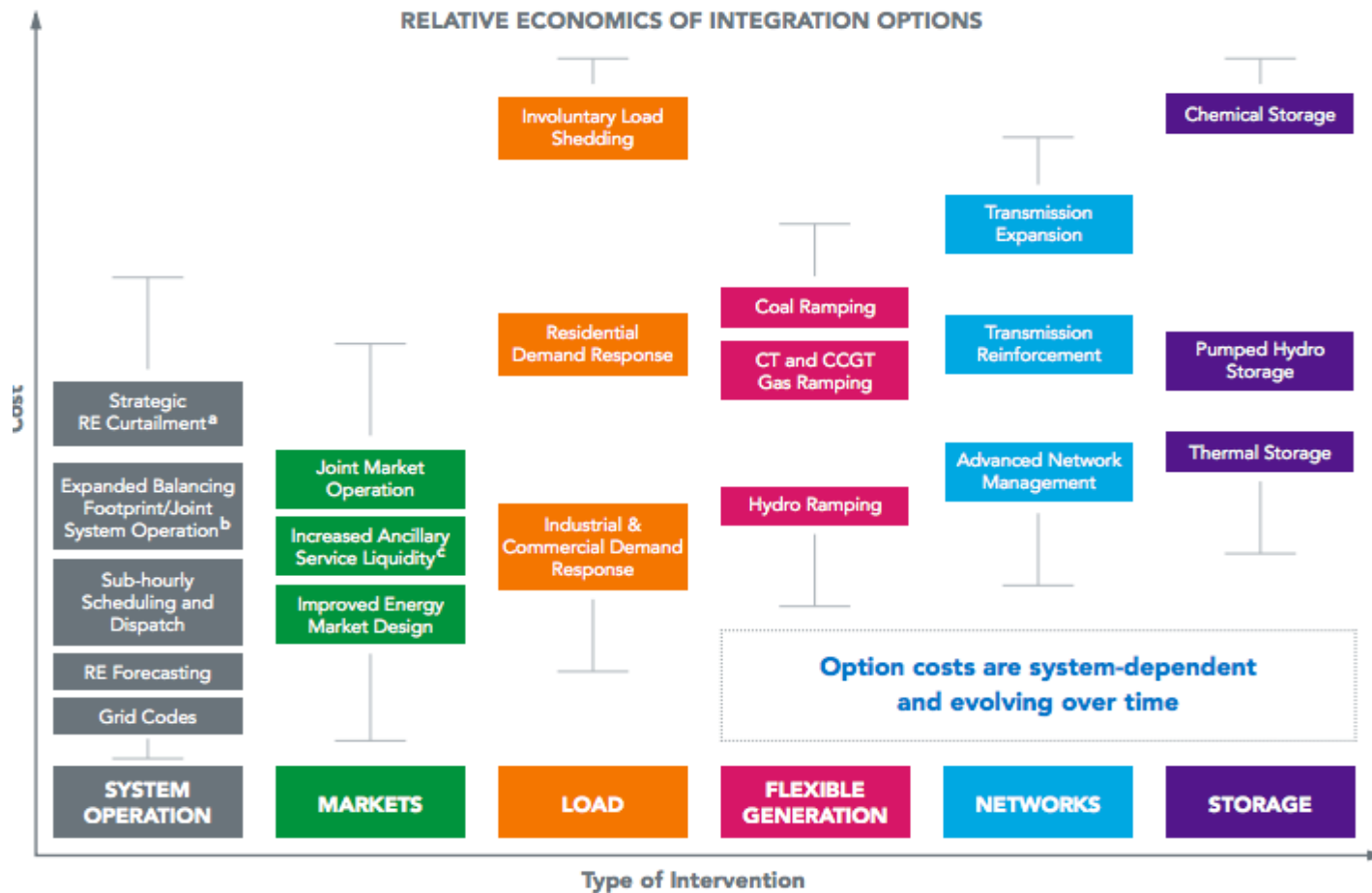
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# Benefits of EIM

- **More efficient dispatch.**
- **Reduced renewable energy curtailment.**
- **Reduced flexibility ramping reserves needed in all balancing authority areas.**
- **Estimated benefit of \$288.4 million since November 2014.**

Source: Western EIM (Jan. 30, 2018)

# Another Benefit of Markets: Integrating Renewables



Source: National Renewable Energy Laboratory

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# Another Development in the West: Mountain West Transmission Group and SPP



**Mountain West Transmission Group**

- |   |  |
|---|--|
|  Mountain West Footprint             |  Black Hills Companies  |
| <b>PARTICIPANT BY PLANNING AREA</b>   |  Colorado Springs Utilities   |
|  Platte River Power Authority        |  Public Service Co of Colorado  |
| <b>PARTICIPANT BY MEMBERSHIP AREA</b>   | <b>WESTERN AREA POWER ADMINISTRATION</b>   |
|  Basin Electric Power Cooperative    |  Loveland Area Projects and Colorado River Storage Project Transmission |
|  Tri-State Generation & Transmission |  |

## 4. A Few Lessons Based on the U.S. Experience

- **Timing matters, as does building stakeholder support.**
- **Be mindful of political concerns (state sovereignty or jurisdiction).**
- **The market operator must be independent with a fair, transparent stakeholder process.**
- **Even regional markets can provide significant benefits.**
- **Market design is critical.**
- **Keep the playing field level: oversight and enforcement are necessary to ensure the integrity of the market, especially to prevent the exercise of market power and manipulation.**
  - **An independent market monitor.**
  - **A regulator with the authority, resources, data, and expertise.**
- **Harmonize or standardize to the greatest extent possible market design, products, and operational practices. Minimize “seams” issues.**
- **Markets can enable innovation and help further important public policies, including the integration of renewables and decarbonization.**