

U.S. Experience with Electricity Markets

Independent Power Producers Society of Alberta (IPPSA)

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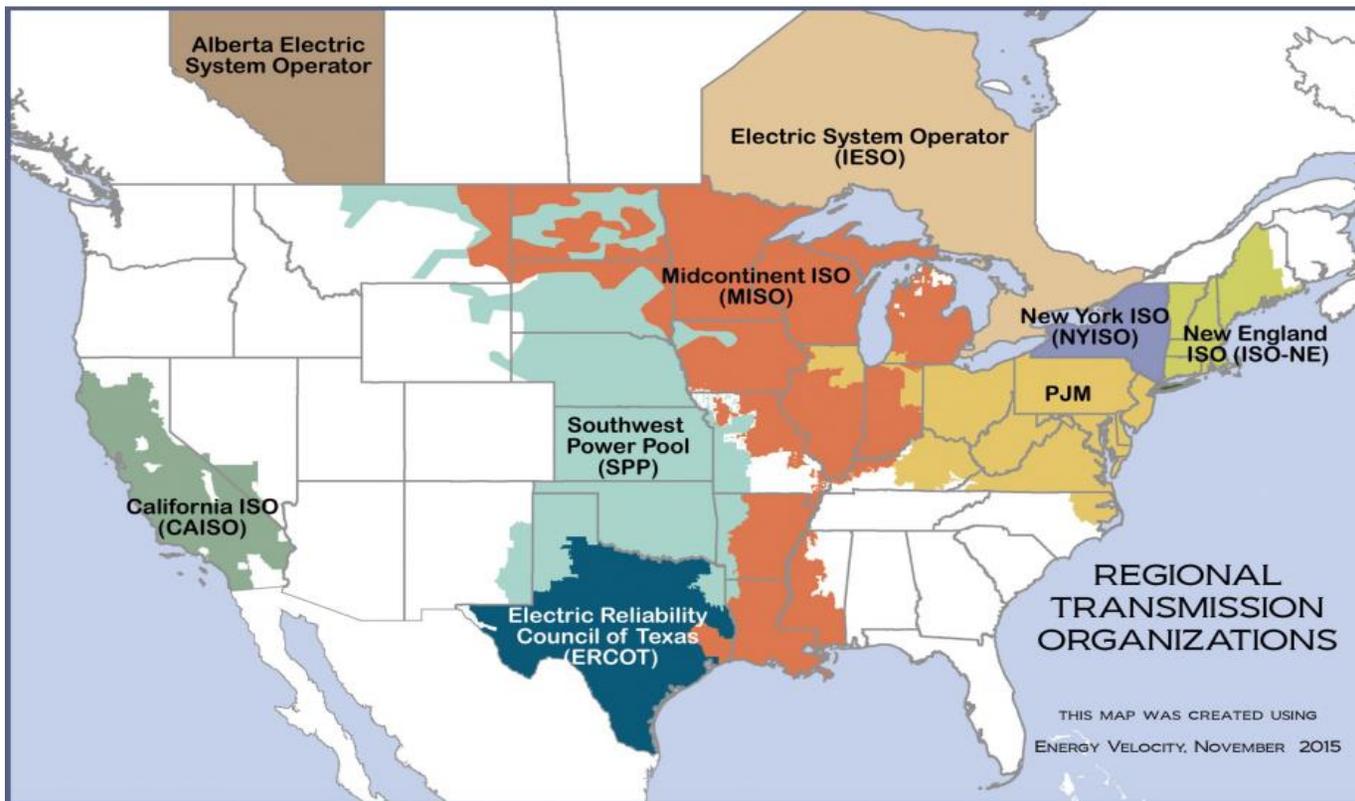
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1. Overview of Wholesale Power Markets

- 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

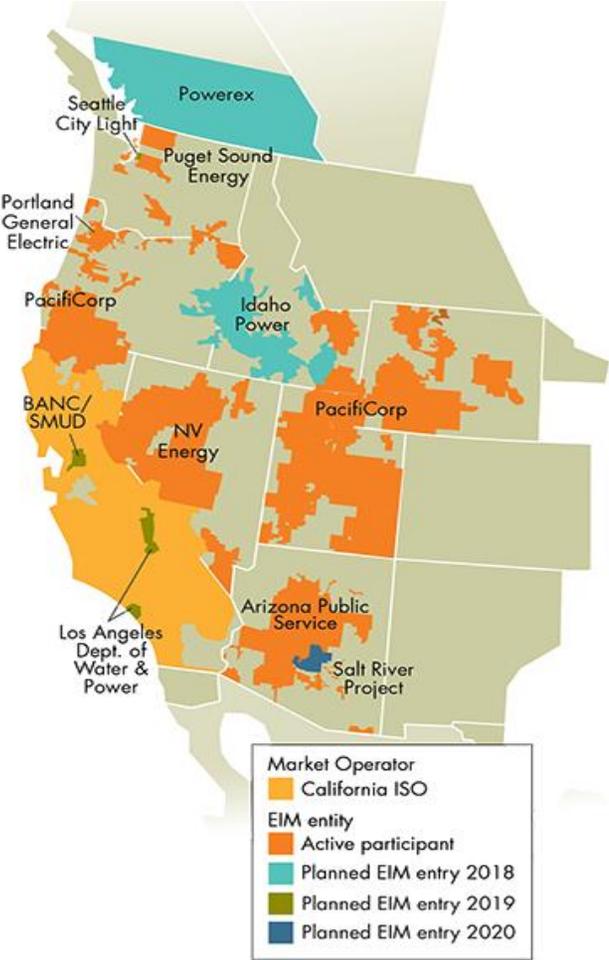
- **Joining an RTO/ISO a voluntary decision by a utility subject to state approval.**
- **Let a hundred flowers blossom.**
- **Regional markets can account for regional differences.**
- **Markets have expanded with greater buy-in from stakeholders. Two-thirds of US now served by RTOs/ISOs with significant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

Costs

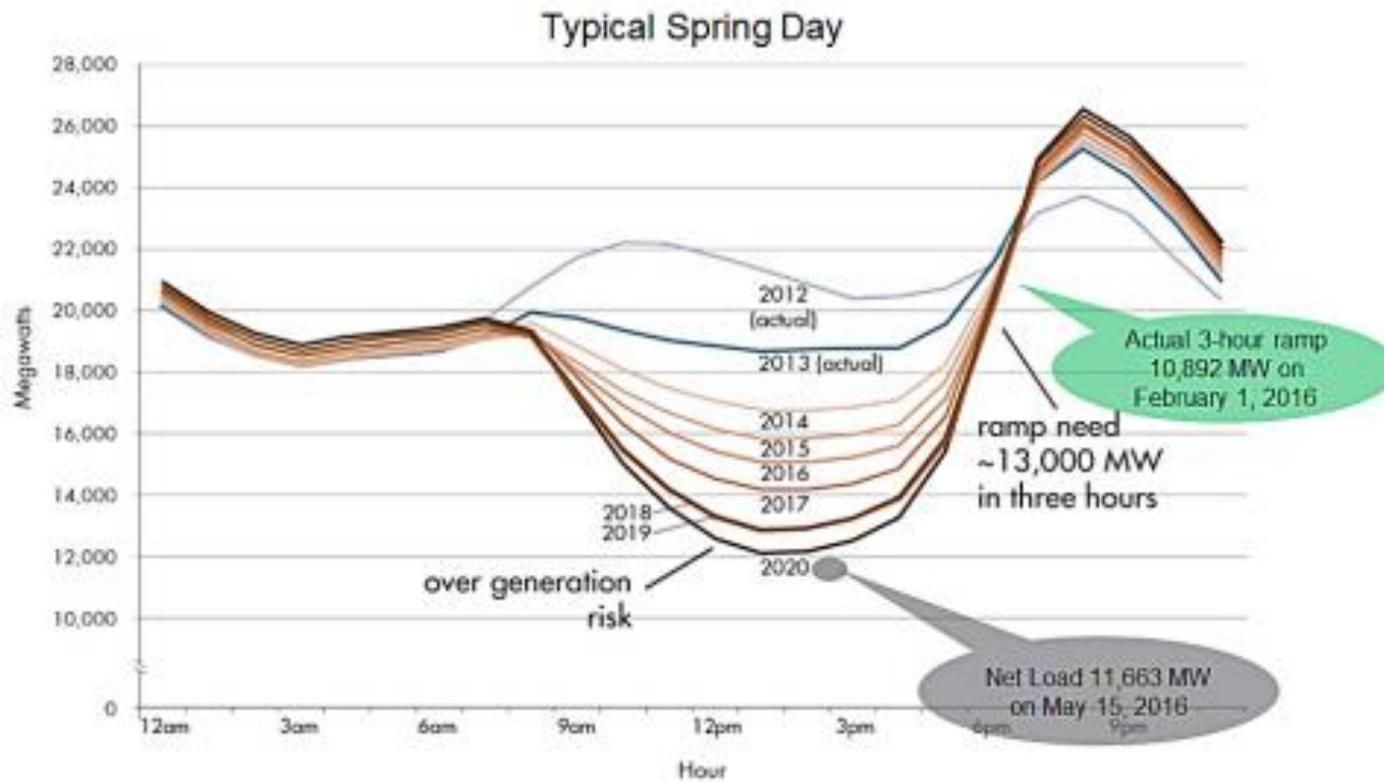
- **The legacy lives on. And what does SMD mean?**
- **1/3 of the U.S. remains in bilateral markets with vertically integrated utilities.**
- **Seams issues reduce operational efficiencies.**
- **Continued difficulty in doing inter-regional transmission planning and cost allocation.**
- **Complicates 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

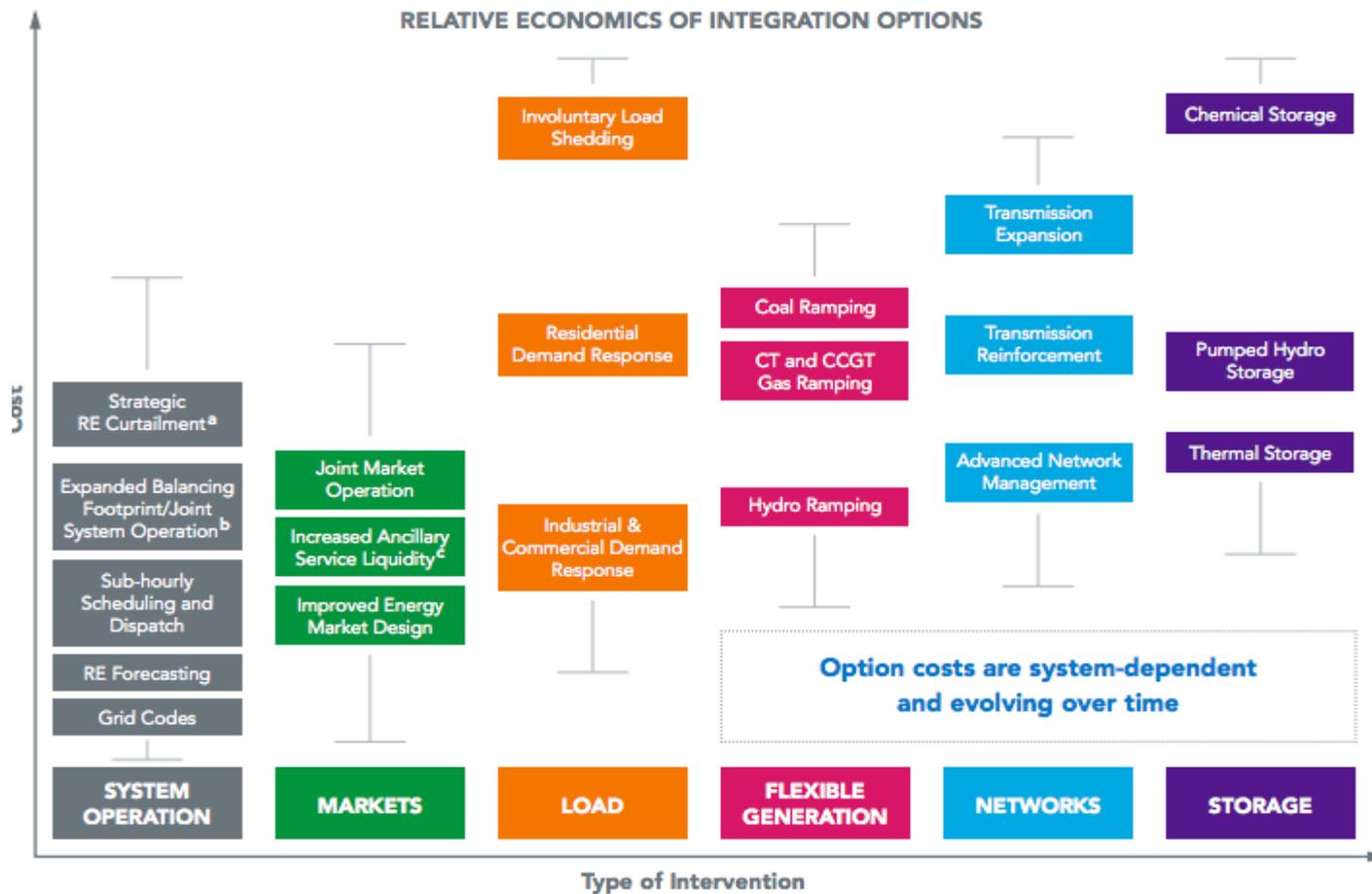
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Benefits of EIM

- **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 |
| PARTICIPANT BY PLANNING AREA |  Colorado Springs Utilities |
|  Platte River Power Authority |  Public Service Co of Colorado |
| PARTICIPANT BY MEMBERSHIP AREA | WESTERN AREA POWER ADMINISTRATION |
|  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.**