The webinar will begin shortly

December 8, 2021
WEBINAR NOTES

• All attendees (except panelists) will be in listen-only mode.

• Please type questions for the presenters in the chat window.

• If you would like to ask a question verbally, please use the “raise hand” function to let us know you would like to ask a question.

• This webinar is being recorded and will be available on DEQ’s website at https://deq.mt.gov/Energy
10:00 AM – Opening Remarks
Dan Lloyd, Bureau Chief, Montana Energy Office, Department of Environmental Quality

• Keegan Moyer, Energy Strategies

10:50 AM – Panel Discussion: Maximizing Market Benefits to Montana
• Commissioner Tony O’Donnell, Montana Public Service Commission
• Robin Arnold, Renewable Northwest
• Andrew McLain, NorthWestern Energy
Facilitated by Jeff Blend, Montana Energy Office

11:40 – Project Spotlight: Heart Butte Community Solar
• Jonnalea Tatsey, Glacier Electric Cooperative
• Mike Tatsey, Superintendent, Heart Butte School District
Facilitated by Kyla Maki, Montana Energy Office
STATE-LED MARKET STUDY
Keegan Moyer, Energy Strategies

December 8, 2021
Overview

• State of Western power markets

• State-Led Market Study
   Study overview
   Market constructs & footprints considered
   Key findings

• Special Energy Market Considerations for Montana
## Western Markets Today

### Active or planned markets:

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-1998</td>
<td>Bilateral market structure</td>
</tr>
<tr>
<td></td>
<td>• Still responsible for bulk of DA trading in West today</td>
</tr>
<tr>
<td>1998</td>
<td>California Independent System Operator (CAISO)</td>
</tr>
<tr>
<td></td>
<td>• Controlled by CAISO BOD</td>
</tr>
<tr>
<td>2014</td>
<td>Western Energy Imbalance Market (WEIM)</td>
</tr>
<tr>
<td></td>
<td>• &gt;75% of Western load will join (22 BAAs total)</td>
</tr>
<tr>
<td>2021</td>
<td>Western Energy Imbalance Service (WEIS)</td>
</tr>
<tr>
<td></td>
<td>• Contains entities within two WAPA BAAs</td>
</tr>
<tr>
<td></td>
<td>• Considering Markets+ (day-ahead)</td>
</tr>
<tr>
<td>2024</td>
<td>Western Resource Adequacy Program (WRAP)*</td>
</tr>
<tr>
<td></td>
<td>• Contains entities within two WAPA BAAs</td>
</tr>
<tr>
<td></td>
<td>• Non-binding showings in 2021-2022</td>
</tr>
</tbody>
</table>

### Prior or ongoing market proposals:

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-1998</td>
<td>IndeGo</td>
</tr>
<tr>
<td>2012-2016</td>
<td>NWPP MC Initiative</td>
</tr>
<tr>
<td>2013-2018</td>
<td>Mountain West Transmission Group</td>
</tr>
<tr>
<td>2018-present</td>
<td>CAISO EDAM</td>
</tr>
<tr>
<td>2000-2006</td>
<td>RTO West/Grid West</td>
</tr>
<tr>
<td>2015-2018</td>
<td>CAISO Regionalization</td>
</tr>
<tr>
<td>2017-2018</td>
<td>Peak/PJM RTO</td>
</tr>
<tr>
<td>2020-present</td>
<td>SPP/RTO West</td>
</tr>
</tbody>
</table>
State-Led Market Study made possible through DOE grant

- The last several years have featured numerous discussions and initiatives related to the formation of coordinated wholesale trading markets in the West
- The Utah Governor’s Office of Energy Development, in partnership with State Energy Offices of Idaho, Colorado, and Montana, applied for and received a grant from the US DOE to facilitate a 2+year state-led assessment of organized market options
- The project is called *Exploring Western Organized Market Configurations: A Western States’ Study of Coordinated Market Options to Advance State Energy Policies*
  - Or “State-Led Market Study”
- The project provides Western States with a neutral forum, and neutral analysis, to independently and jointly evaluate the options and impacts associated with new or more centralized wholesale energy markets and potential footprints
- Stakeholder meetings held throughout multi-year study process, with issuance of final reports on July 30, 2021
Lead Team

- Representatives on Lead Team represent interest of their respective states but take all stakeholder input into consideration
- Work coordinated primarily through monthly calls
- Group made decisions by consensus

<table>
<thead>
<tr>
<th>State</th>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ Lead</td>
<td>Steve Olea</td>
<td>Arizona Corporation Commission</td>
</tr>
<tr>
<td>CA Lead</td>
<td>Grace Anderson</td>
<td>California Energy Commission</td>
</tr>
<tr>
<td></td>
<td>Yulia Schmidt</td>
<td>California Public Utilities Commission</td>
</tr>
<tr>
<td>CO Lead</td>
<td>Erin O’Neill</td>
<td>Colorado Public Utilities Commission</td>
</tr>
<tr>
<td></td>
<td>Keith Hay</td>
<td>Colorado State Energy Office</td>
</tr>
<tr>
<td>ID Lead</td>
<td>John Chatburn</td>
<td>Idaho Governor’s Office of Energy and Mineral Resources</td>
</tr>
<tr>
<td>MT Lead</td>
<td>Jeff Blend</td>
<td>Montana Energy Office, Montana Department of Environmental Quality</td>
</tr>
<tr>
<td></td>
<td>Ben Brouwer</td>
<td>Montana Energy Office, Montana Department of Environmental Quality</td>
</tr>
<tr>
<td>NM Lead</td>
<td>Erin Taylor</td>
<td>New Mexico Energy, Minerals and Natural Resources Department</td>
</tr>
<tr>
<td></td>
<td>Anna Linden Weller</td>
<td>New Mexico Energy, Minerals and Natural Resources Department</td>
</tr>
<tr>
<td>NV Lead</td>
<td>Hayley Williamson</td>
<td>Nevada Public Utilities Commission</td>
</tr>
<tr>
<td></td>
<td>David Bobzien</td>
<td>Nevada State Energy Office</td>
</tr>
<tr>
<td>OR Lead</td>
<td>Kristen Sheeran</td>
<td>Oregon Energy and Climate Change Policy Advisory to Governor Kate Brown</td>
</tr>
<tr>
<td></td>
<td>Letha Tawney</td>
<td>Oregon Public Utilities Commission</td>
</tr>
<tr>
<td>UT Lead</td>
<td>Chris Parker</td>
<td>Utah Department of Public Utilities</td>
</tr>
<tr>
<td></td>
<td>Antonio Santos Aguilera</td>
<td>Utah Governor’s Office of Energy Development</td>
</tr>
<tr>
<td>WA Lead</td>
<td>Steve Johnson</td>
<td>Washington Utilities and Transportation Commission</td>
</tr>
<tr>
<td></td>
<td>Glenn Blackmon</td>
<td>Washington State Energy Office at the Department of Commerce</td>
</tr>
<tr>
<td>WY Lead</td>
<td>Bryce Freeman</td>
<td>Wyoming Office of Consumer Advocate</td>
</tr>
</tbody>
</table>
Study analyzed impacts of three “market constructs”

**EIM/Real-Time Market**
- Centrally optimized real-time dispatch – *Day-ahead unit commitment not optimized across market participants*
- Individual transmission tariffs
- Limited transmission dedicated to real-time market
- Balancing Authority Area (BAA) boundaries and associated reliability obligations retained
- Transmission providers retain operational control of transmission

**Day-Ahead Market (DAM)**
- Centrally optimized real-time and day-ahead energy market
- Individual transmission tariffs
- Limited transmission dedicated to market at assumed rate (other transactions must pay tariff rate for transmission)
- BAA boundaries and associated reliability obligations retained
- Transmission providers retain operational control of transmission

**RTO**
- Centrally optimized real-time and day-ahead energy market
- Joint transmission tariff for participants in a given footprint
- Transmission used up to reliability limit
- BAA boundaries and reliability obligations consolidated
- Joint transmission planning and cost allocation
- Transmission providers transfer operational control of transmission
Market Constructs + Footprints = “Market Configurations”

Status Quo

- EIM entities that have announced intent to sign EIM Implementation Agreement (or equivalent)*
- Announcements that were made before the end of 2019 are included in the Status Quo footprint.

One Market

- Studied in 2020 and 2030 timeframe

Two Market A

- Only studied in 2030 timeframe

Two Market B

- Only studied in 2030 timeframe

*Announcements that were made before the end of 2019 are included in the Status Quo footprint.
### Summary of Market Modeling Assumptions

<table>
<thead>
<tr>
<th>Assumption</th>
<th>EIM Markets</th>
<th>Day-ahead Markets</th>
<th>RTO Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-time intra-market trading costs</td>
<td>No cost for market transactions</td>
<td>$3/MWh for market transactions above EIM-levels (which are $0/MWh)</td>
<td>No cost for all transactions</td>
</tr>
<tr>
<td>Day-ahead intra-market trading costs</td>
<td>Tariff rate + $4</td>
<td>$3/MWh for market transactions</td>
<td>No cost for all transactions</td>
</tr>
<tr>
<td>Real-time trading costs for market exports and out-of-market transactions</td>
<td>Tariff rate + $2</td>
<td>Tariff rate + $2</td>
<td>Tariff rate + $2 (exports only)</td>
</tr>
<tr>
<td>Day-ahead trading costs for market exports and out-of-market transactions</td>
<td>Tariff rate + $4</td>
<td>Tariff rate + $4</td>
<td>Tariff rate + $4 (exports only)</td>
</tr>
<tr>
<td>Transmission available for market transactions</td>
<td>~15% of inter-area transfer capability for real-time transactions</td>
<td>~70% of inter-area transfer capability for day-ahead transactions, 15% for real-time</td>
<td>100% of inter-area transfer capability for day-ahead and real-time transactions</td>
</tr>
<tr>
<td>CAISO export limit</td>
<td>Real-time: 7000 MW Day-ahead: 2000 MW</td>
<td>Real-time: No limit Day-ahead: No limit, except for 2 Market A which has 7,000</td>
<td>Real-time: No limit Day-ahead: No limit, except for 2 Market A which has 7,000</td>
</tr>
<tr>
<td>Operating reserves</td>
<td>BA and reserve sharing group obligations retained</td>
<td>BAAs consolidated and reserves held across market footprint</td>
<td></td>
</tr>
<tr>
<td>Flexibility reserves</td>
<td>BA-level constraint based on sub-hourly demand and wind/solar volatility and forecast error</td>
<td>BAAs consolidated and reserves held across market footprint</td>
<td></td>
</tr>
</tbody>
</table>
Study considers limited set of market benefits and costs in state-level analysis

Market benefits and costs:

✓ Production cost savings, which capture:
  - More efficient trade due to reduced transmission wheeling
  - Optimized unit commitment and dispatch
  - Reduced operating and flexibility reserves
  - Reduced curtailment

✓ Capacity savings
  - Reduced capital investment due to load diversity

✓ Market start-up/administrative costs

× Other market efficiencies: transparency, independence, transmission planning savings
× Policy-driven resource procurement savings
× Reliability benefits
× Transmission cost allocation
× Many unquantifiable factors

Balancing area-level benefits/costs are estimated then allocated to each applicable state

Other results incorporated into market analysis:
- Generation dispatch, by type and state (and WECC-wide)
- Congestion and utilization of transmission paths
- GHG emissions by state
Study uses Adjusted Production Cost as to Estimate Operational Savings

- Adjusted production cost (APC) estimates the net costs for a given area to produce, buy, and sell power
  - Calculated APC on a balancing authority basis and then allocated APC to each state on a load ratio share basis
- Automatically corrects and internalizes economic benefit associated with opportunities to export (and increase revenues) or import (and avoid running local generation)
- Captures impacts to pricing

### APC Example

- Production Costs of Generation
- Power Sales
- Purchases
- Load

### Fuel

- Start-up costs

VOM

- Cost of Purchases

- Power Sales Revenues

- Excludes carbon costs and emission import revenues
Capacity benefits methodology includes a range of estimated achievable benefits for each market construct

- Assumes that in RTO scenarios, 100% of calculated load diversity benefits can be realized
- Assumes that day-ahead market scenarios result in realized savings of 0-50% of calculated load diversity benefit, recognizing:
- Real-time only markets are unlikely to result in significant capacity savings, therefore we assume they can achieve only 0-10% of load diversity benefits

<table>
<thead>
<tr>
<th>Achievable Benefits as a % of Calculated Load Diversity Savings</th>
</tr>
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<tr>
<td></td>
</tr>
</tbody>
</table>

Approach bounds range of capacity benefits provided by various markets such that stakeholders can draw their own conclusions about what level of benefits is most appropriate.
“Market & Regulatory Review” designed to address qualitative aspects of the Request from the Lead Team

- Evaluation of how **different potential wholesale market structures** might facilitate achievement of each **state’s energy policy objectives** and how the market constructs may impact **state jurisdiction** in key area
- Complements technical study by focusing on qualitative factors

**Overview of Market & Regulatory Review**

- Identify state policy objectives
- Identify metrics to score markets
- Research markets and collect input
- Develop scorecards

- Increased use of clean energy technologies
- Reliable, affordable provision of energy to consumer
- Retain state authority on key jurisdictional elements
Summary of Findings

1. New day-ahead markets could result in $642 million per year of savings if existing market footprints are retained and market services are expanded
   - Crucial that load diversity benefits and associated capacity savings be achieved under the market’s design
   - Regarding footprints, a west-wide day-ahead market results in $747 million of annual benefits, which is $247 million per year greater than a scenario in which California and the rest of the West operate in two parallel day-ahead markets.

2. A west-wide RTO provides even greater savings, estimated by the study at ~$2 billion of gross benefits per year, which exceeds the high-end benefits of a west-wide day-ahead market by roughly $1.3 billion per year
   - Results also demonstrate that significant benefits are possible regardless if one or two RTO footprints materialize.
   - However, a single-market system drives between $187-569 million greater savings than the two-market configurations of an RTO.
   - The technical portion of this study does not consider a host of other benefits that may be maximized by a consolidated RTO footprint (such as transmission planning, public policy resource access, etc.).
   - The RTO scenario with the lowest benefits considered in this study was the one in which California operated a single-state RTO and the rest of the West operated in parallel with a separate RTO. This scenario still produced $1.4 billion in annual gross benefits.
3. Results suggest that significant operational savings and capacity benefits occur even under scenarios in which two Western markets operate in parallel
   - However, modeling of market-to-market seams present in these scenario may be optimistic as practical experience suggests that “unmodelable” interaction between markets could limit benefits realized by each market.
   - Additionally, this effort did not quantify other types of market benefits (e.g., public policy resource access) that may be maximized by a larger market footprint.

4. The RTO framework led to meaningful reductions in curtailments and emissions
   - Based on the 2020 and 2030 study results, the ability of new or expanded markets to help reduce system-wide emissions and better integrate renewables is growing.

5. While modeling did indicate that RTO benefits are lower with a west-wide carbon price in place, the most substantial category of benefits – capacity savings – was not impacted and the RTO market configurations still produced significant savings on the order of $1.1 – 1.7 billion per year
   - The west-wide carbon price had substantial impact on total carbon emissions, driving them down by 17-22%.
5. New transmission capacity enhanced the performance and economic benefits of new and expanded energy markets

- In all cases, economic benefits increased by $81-107 million per year when a larger 2030 transmission buildout was assumed.
- Note that this study is not seeking to perform a transmission benefits analysis and did not assess other categories of benefits that may be provided by transmission expansion.
State-Led Market Study: Considerations for Montana

- **Gross savings for Montana estimated in all market scenarios**
  - Savings exceeded estimated market administrative cost in all but one scenario

- **Savings for Montana are impacted by both the market construct and footprint**
  - Highest savings ($2.77/MWh) achieved via single-system RTO – scenario slightly outperformed Two Market B RTO
  - State had lowest savings under “Two Market A” footprints for both DA and RTO constructs
  - No material difference between Status Quo and One Market footprints in DA construct

- **Study is clear that each state/utility should continue to perform their own analysis to inform local decisions – the State-Led Study was focused on evaluating regional and broad implications of regionalization**

### State-Led Study 2030 Gross Market Benefit Results: Montana

<table>
<thead>
<tr>
<th>Market</th>
<th>Footprint</th>
<th>Savings ($M/year)</th>
<th>Savings ($/MWh load)</th>
<th>Admin Costs ($/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day-ahead</td>
<td>Status Quo</td>
<td>$19</td>
<td>1.15</td>
<td>$0.15-0.45</td>
</tr>
<tr>
<td></td>
<td>One Market</td>
<td>$19</td>
<td>1.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two Market A</td>
<td>$1</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>RTO</td>
<td>One Market</td>
<td>$46</td>
<td>2.77</td>
<td>$0.33-0.80</td>
</tr>
<tr>
<td></td>
<td>Two Market A</td>
<td>$14</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two Market B</td>
<td>$42</td>
<td>2.53</td>
<td></td>
</tr>
</tbody>
</table>

- Montana 2030 Load forecast: 14,027 GWh

Other Important Market Considerations for Montana Not Considered in State-Led Study Technical Analysis

- Resource Access/Procurement Benefits
- Transmission Planning Benefits
- Cost Shifts from Joint Tariff
- Cost Allocation of New Transmission
- Governance
Please type questions for the presenters in the chat window.

If you would like to ask a question verbally, please use the "raise hand" function to let us know you would like to ask a question.
Panel Discussion
Commissioner Tony O’Donnell, MT PSC
Robin Arnold, Renewable Northwest
Andrew McLain, Northwestern Energy

December 8, 2021
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Robin Arnold, Renewable Northwest
Andrew McLain, Northwestern Energy

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December 8, 2021
PROJECT SPOTLIGHT
Jonnalea Tatsey, Glacier Electric Co-op
Mike Tatsey, Heart Butte School District

December 8, 2021
HEART BUTTE COMMUNITY SOLAR PROJECT

Jonnalea Tatsey
Manager of Member Services
Glacier Electric Cooperative
We currently have 7,798 meters, majority are residential, some agricultural, and only a handful of industrial (oil fields, hospitals, and water treatment plants). We service four counties and two Canadian Border crossings. Our service area covers the east part of Glacier National Park and the Blackfeet Indian Reservation. We have two offices in both Browning and Cut Bank, MT. Our cooperative has 9 board members and 33 employees.
ENTITIES INVOLVED

Glacier Electric Cooperative
Bonneville Environmental Foundation
Heart Butte School District
Blackfeet Community College
Grid Alternatives
Blackfeet Tribal Council
ABOUT THE PANELS

There are currently 456 Sunpower 350-watt solar ground mounted panels.

Project took around 8 weeks to complete with Grid Alternatives.

Panels were turned on September 14th, 2021.

1st month (Sept.) average was around $671
2nd month (Oct.) average $464
3rd month (Nov.) average $317 to date

Estimated monthly will be 14520 kWH or $450.12
Heart Butte Community has around 150 meters

BENEFITS TO THE COMMUNITY
Heart Butte Community has around 150 meters
• We are able to assist 20 households for a full calendar year.
• The benefit will vary from $10-$28 a month.
• The school receives 25% of the total output and the other 75% goes to the 20 selected households.
• In our initial outreach there are 79 households who meet the qualifications.
• If they all submit an application they will see a benefit every 4 years.
• Unlike some programs this is a no sign up fee program.
SUMMARY

We are excited about the future of this project and the benefit to our members who live in one of our most rural tribal areas. The HBCSP will benefit both the school and community members for years to come.
Project Spotlight
Jonnalea Tatsey, Glacier Electric Co-op
Mike Tatsey, Heart Butte School District

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Thank you!

Send follow-up questions or Generation & Transmission topics to: Ben Brouwer, bbrouwer@mt.gov

December 8, 2021