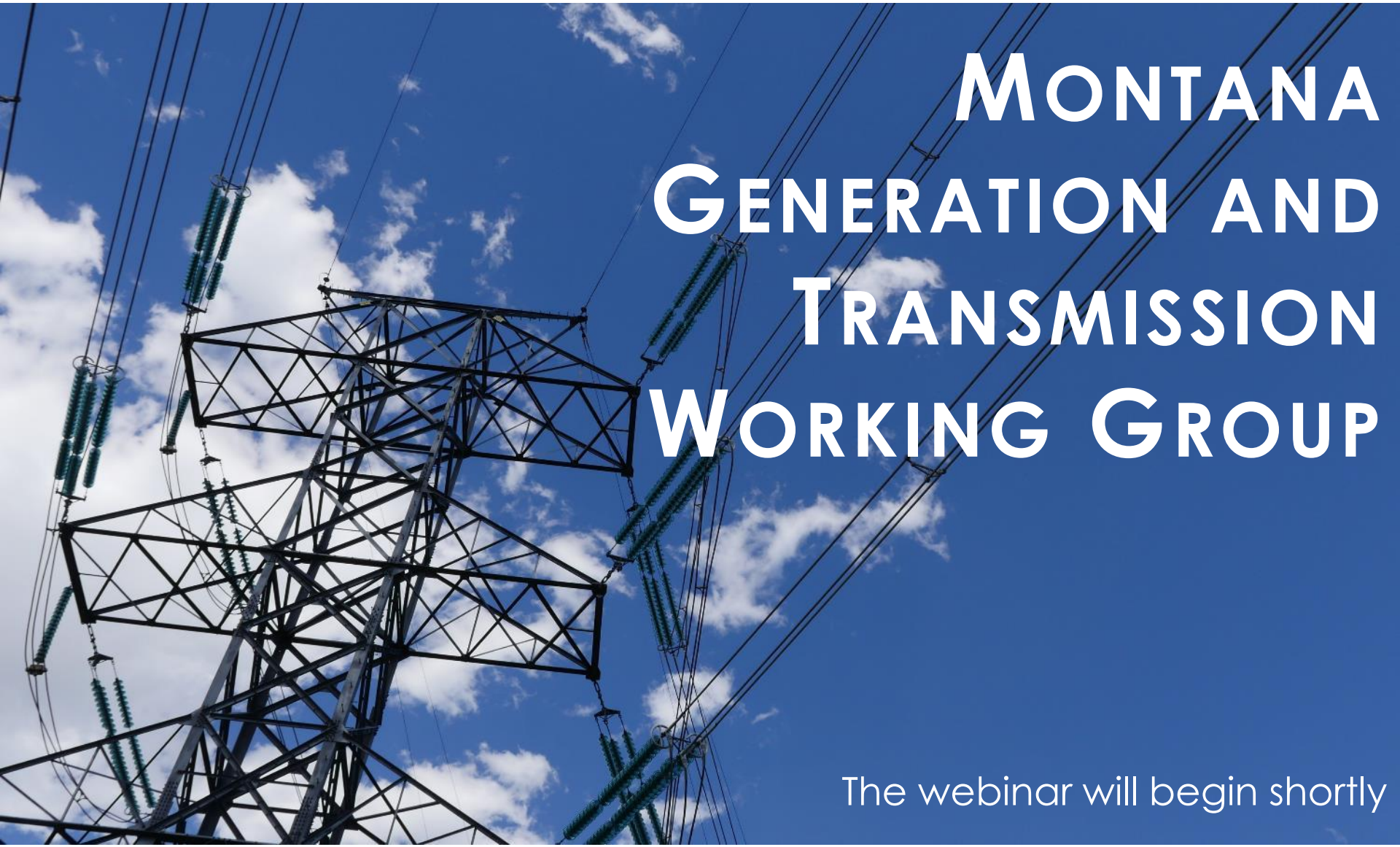

Montana Generation and Transmission Working Group

The webinar will begin shortly

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December 8, 2021

Montana Generation and Transmission Working Group

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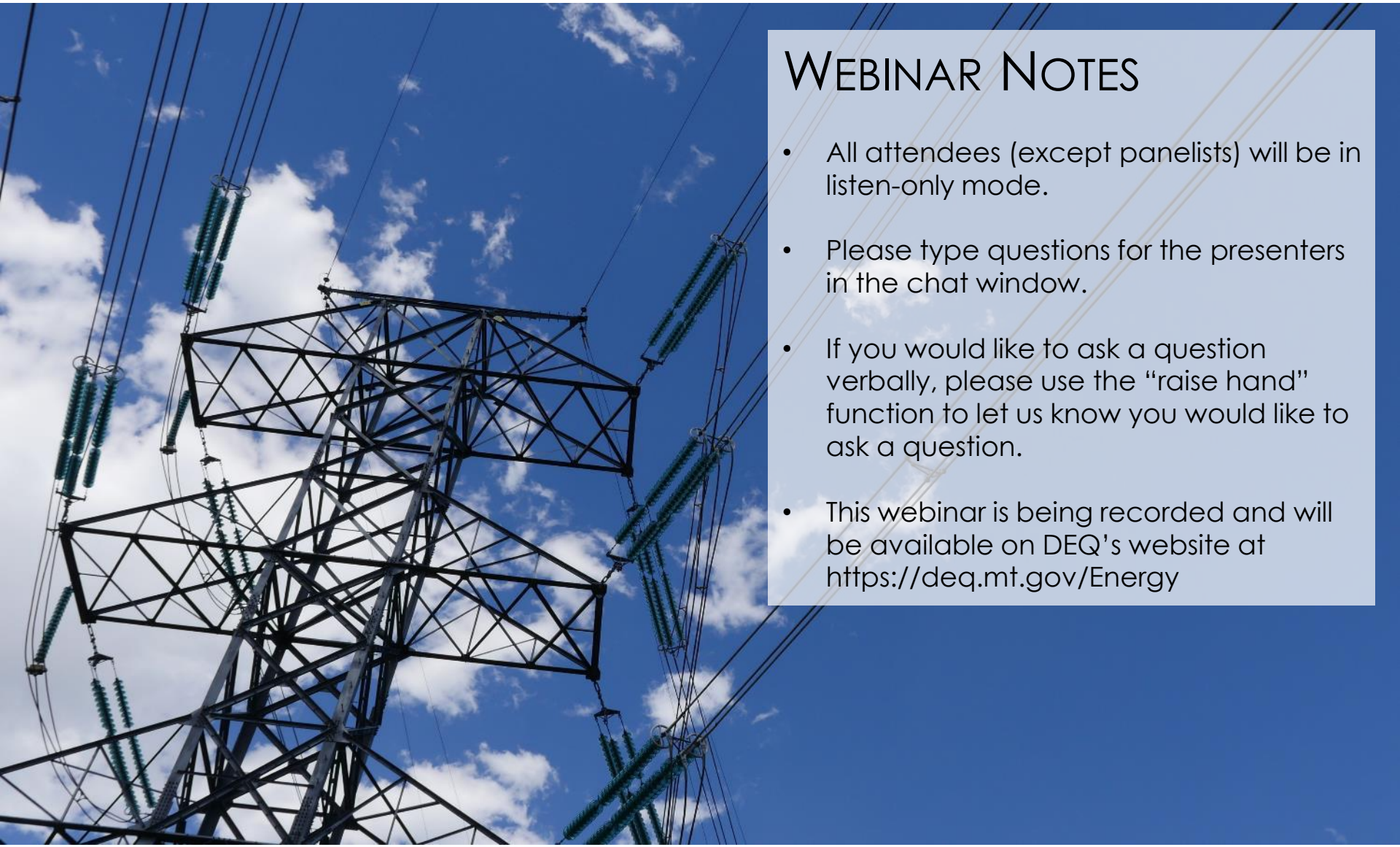

Webinar Notes

- 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

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December 8, 2021

AGENDA

10:00 AM – Opening Remarks
Dan Lloyd, Bureau Chief, Montana Energy Office, Department of Environmental Quality

10:05 AM – State-Led Market Study: Exploring Western Organized Market Configurations
- 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

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Opening Remarks

Dan Lloyd, Montana Energy Office

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State-Led Market Study

Keegan Moyer, Energy Strategies

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December 8, 2021

Montana DEQ Generation and Transmission Working Group

State-Led Market Study: Exploring Western Organized Market Configurations

December 2021 | Keegan Moyer, Partner | kmoyer@energystrat.com

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:

Pre-1998
Bilateral market structure

- Still responsible for bulk of DA trading in West today

1998
California Independent System Operator (CAISO)

- Controlled by CAISO BOD

2014
Western Energy Imbalance Market (WEIM)

- >75% of Western load will join (22 BAAs total)

2021
Western Energy Imbalance Service (WEIS)

- Contains entities within two WAPA BAAs
- Considering Markets+ (day-ahead)

2024
Western Resource Adequacy Program (WRAP)*

- Contains entities within two WAPA BAAs
- Non-binding showings in 2021-2022

Prior or ongoing market proposals:

1995-1998
IndeGo

2000-2006
RTO West/Grid West

2012-2016
NWPP MC Initiative

2013-2018
Mountain West Transmission Group

2015-2018
CAISO Regionalization

2017-2018
Peak/PJM RTO

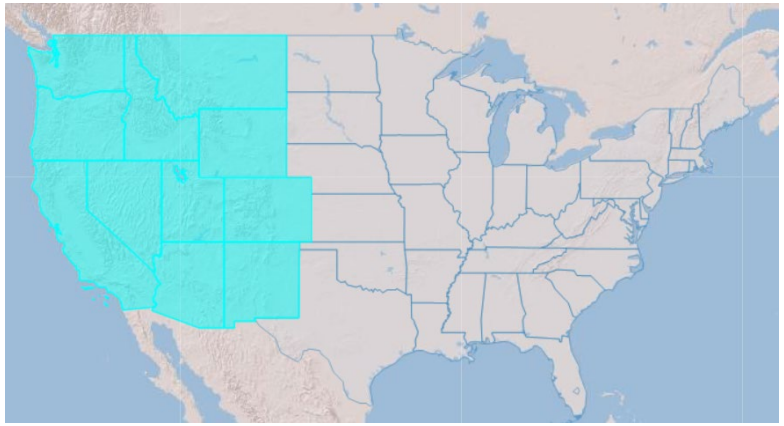
2018-present
CAISO EDAM

2020-present
SPP/RTO West

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**

State representatives from 11 Western States are participating in project



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**

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

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)

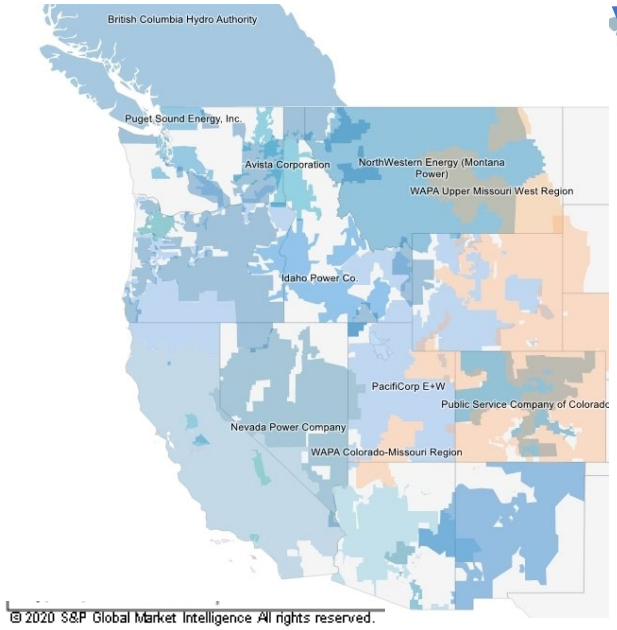
- ✓ Centrally optimized **real-time and day-ahead energy market**
- ✓ **Individual** transmission tariffs
- ✓ Limited transmission **dedicated** to market **at assumed rate** (other transactions must pay tariff rate for transmission)
- ✓ BAA boundaries and associated reliability obligations **retained**
- ✓ 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 contro**l of transmission

Market Constructs + Footprints = “Market Configurations”

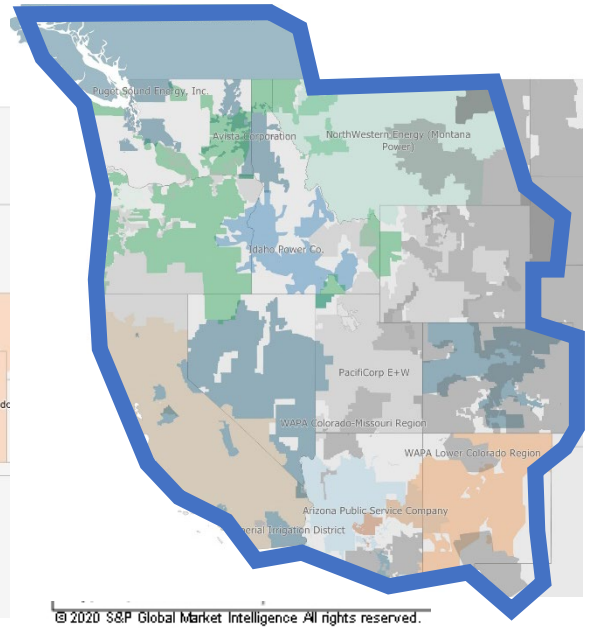
Status Quo



EIM entities that have announced intent to sign EIM Implementation Agreement (or equivalent)*

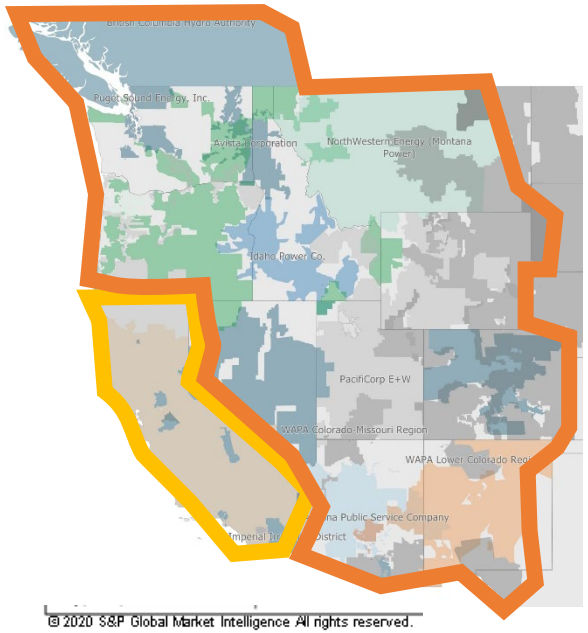
*Announcements that were made before the end of 2019 are included in the Status Quo footprint.

One Market



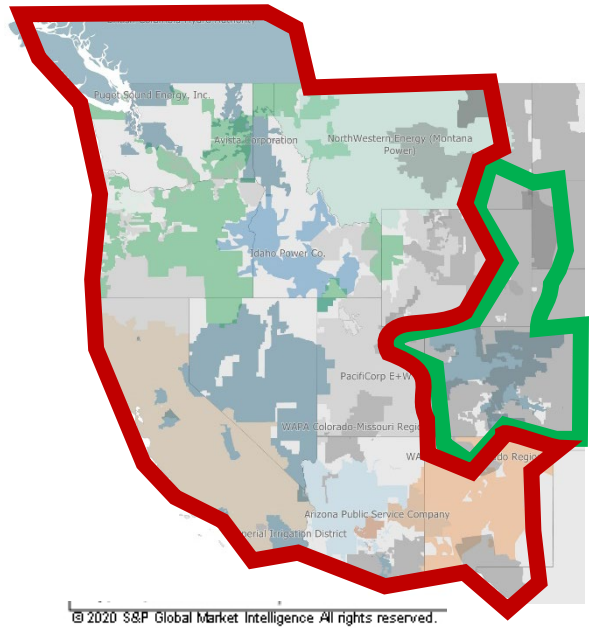
Studied in 2020 and 2030 timeframe

Two Market A



Only studied in 2030 timeframe

Two Market B



Only studied in 2030 timeframe

Summary of Market Modeling Assumptions

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

Study considers limited set of market benefits and costs in state-level analysis

Market benefits and costs:

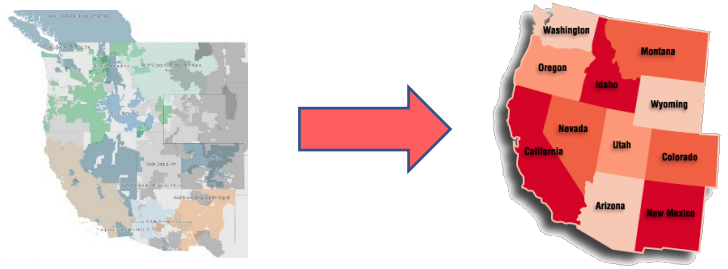
Estimated in study

- ✓ **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**

Not estimated in study

- × **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



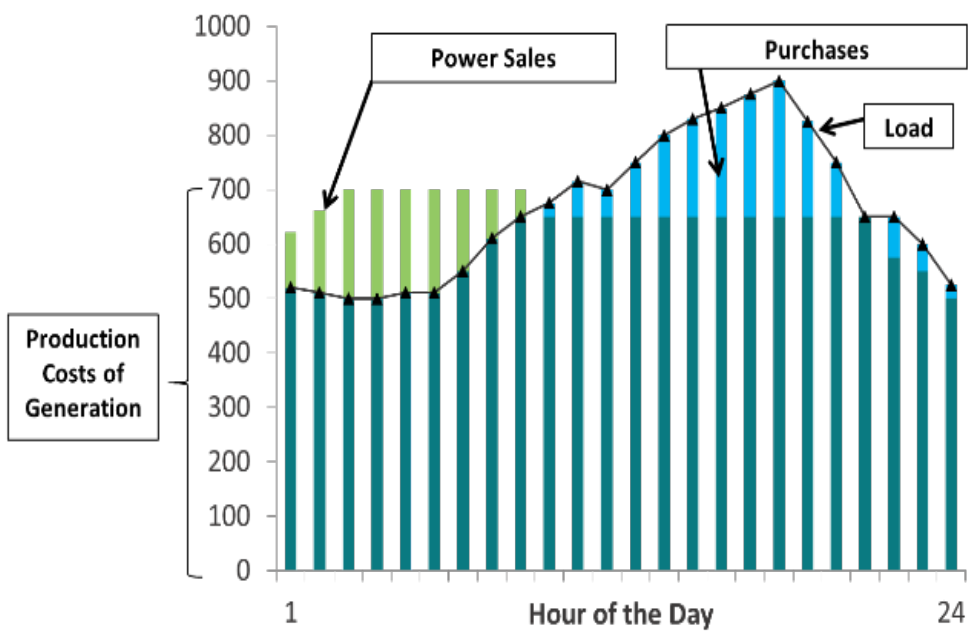
Other results incorporated into market analysis:

- ❖ 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 — Fuel, Start-up costs, VOM

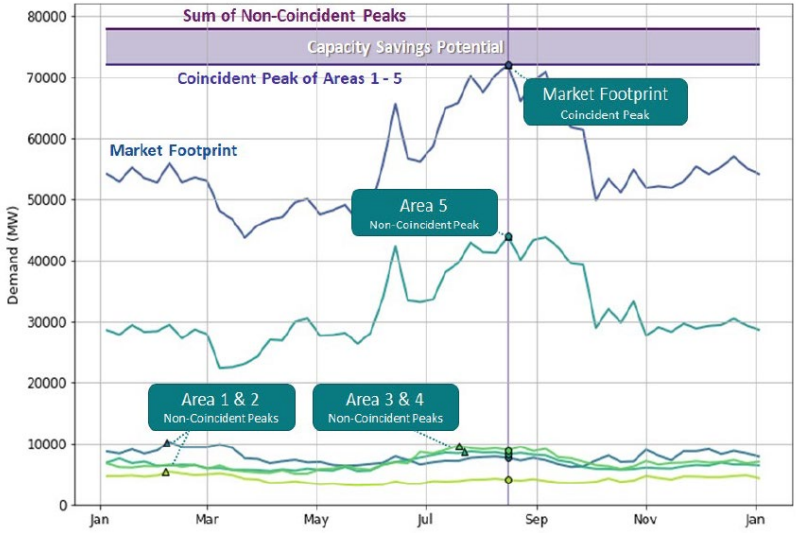
\+ Cost of Purchases

− Power Sales Revenues

= Adjusted Production Cost — 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 results in significant capacity savings, therefore we assume they can achieve only **0-10% of load diversity benefits**



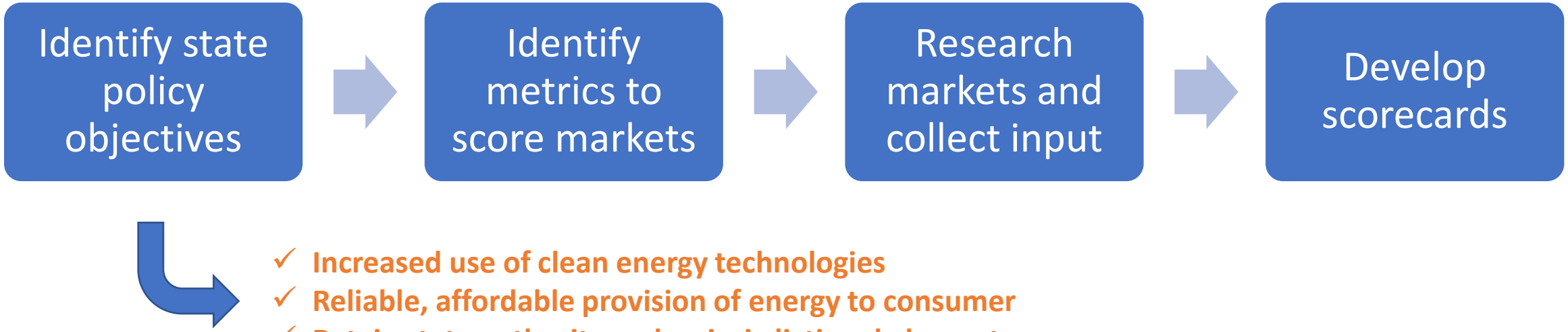
Achievable Benefits as a % of Calculated Load Diversity Savings

RTO	**100%**
Day-ahead	**0-50%**
Real-time	**0-10%**

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.

Overview of Market & Regulatory Review

- "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



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.

Summary of Findings (cont.)

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%.

Summary of Findings (cont.)

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 tha 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

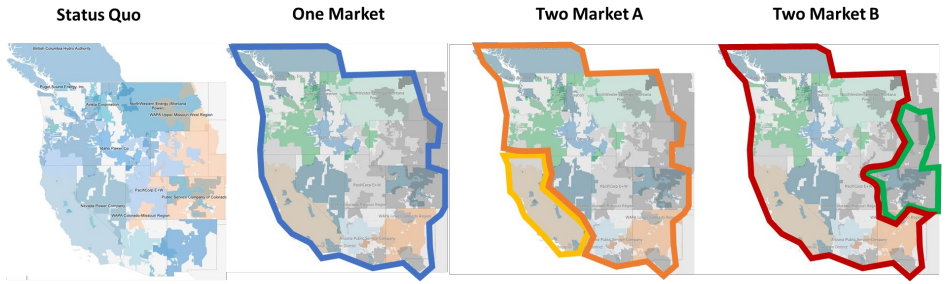
Market	Footprint	Savings ($M/year)	Savings ($/MWh load)	Admin Costs ($/MWh)
Day-ahead	Status Quo	$19	1.15	$0.15-0.45
	One Market	$19	1.15	
	Two Market A	$1	0.06	
RTO	One Market	$46	2.77	$0.33-0.80
	Two Market A	$14	0.84	
	Two Market B	$42	2.53	

- 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

Market Footprint Key



State-Led Market Study

Keegan Moyer, Energy Strategies

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Panel Discussion

Commissioner Tony O'Donnell, MT PSC
Robin Arnold, Renewable Northwest
Andrew McLain, NorthWestern Energy

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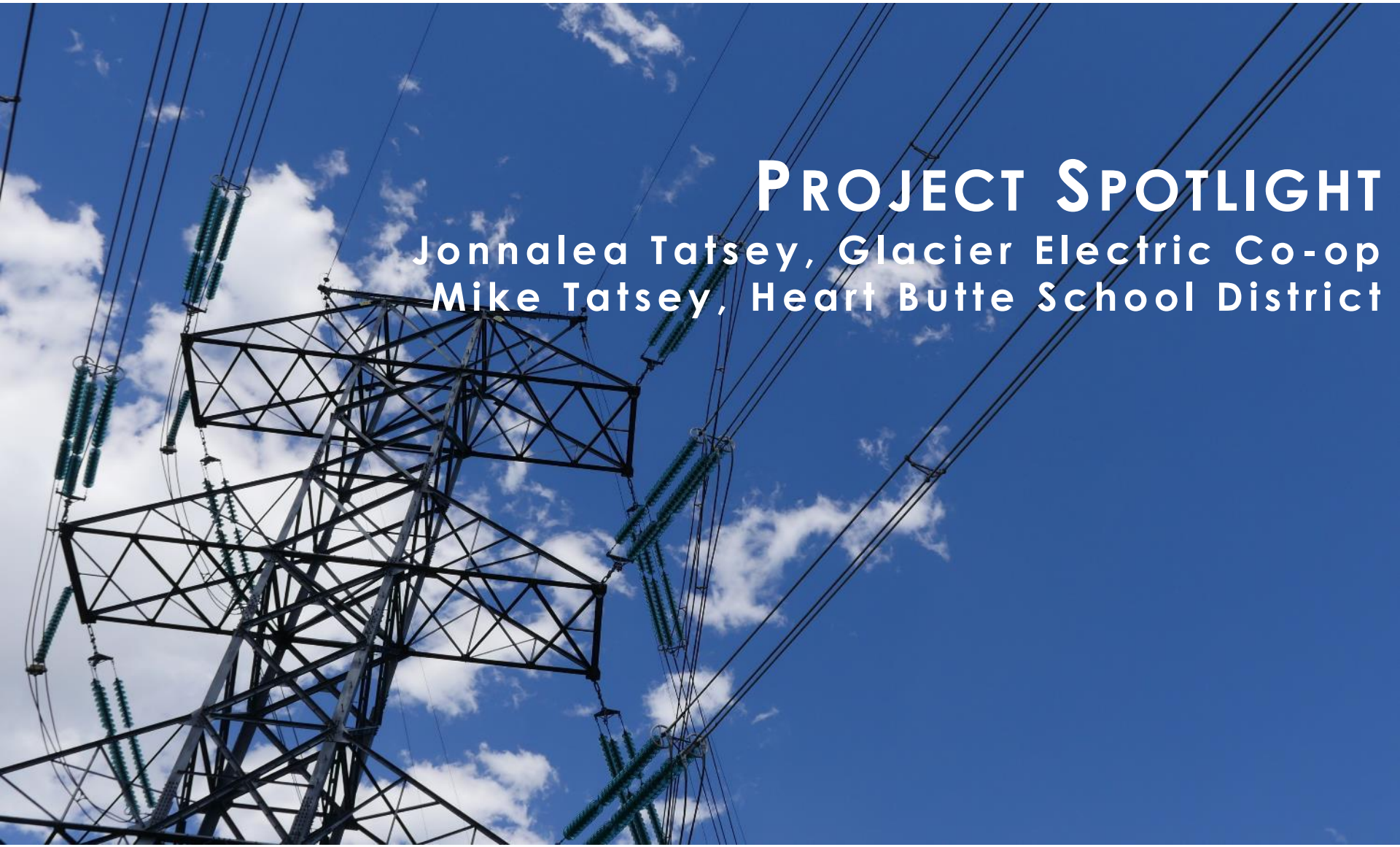

Project Spotlight

Jonnalea Tatsey, Glacier Electric Co-op
Mike Tatsey, Heart Butte School District

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HEART BUTTE COMMUNITY SOLAR PROJECT

Jonnalea Tatsey

Manager of Member Services

Glacier Electric Cooperative

ABOUT 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

BENEFITS TO THE COMMUNITY

Heart Butte Community has around 150 meters

PROGRAM BENEFITS

- 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.

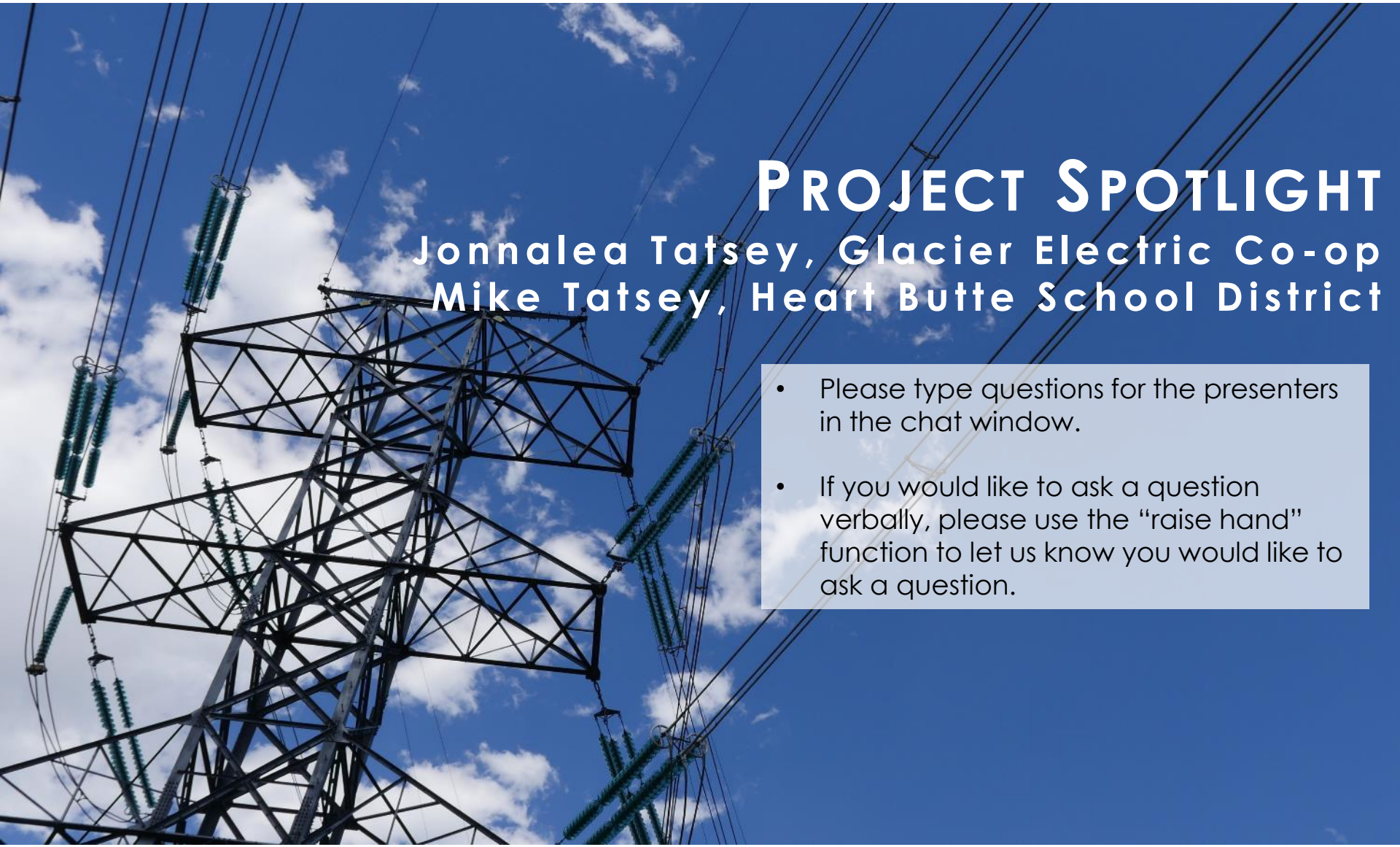
PROGRAM BENEFITS

- 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.



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December 8, 2021

Thank you!

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

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