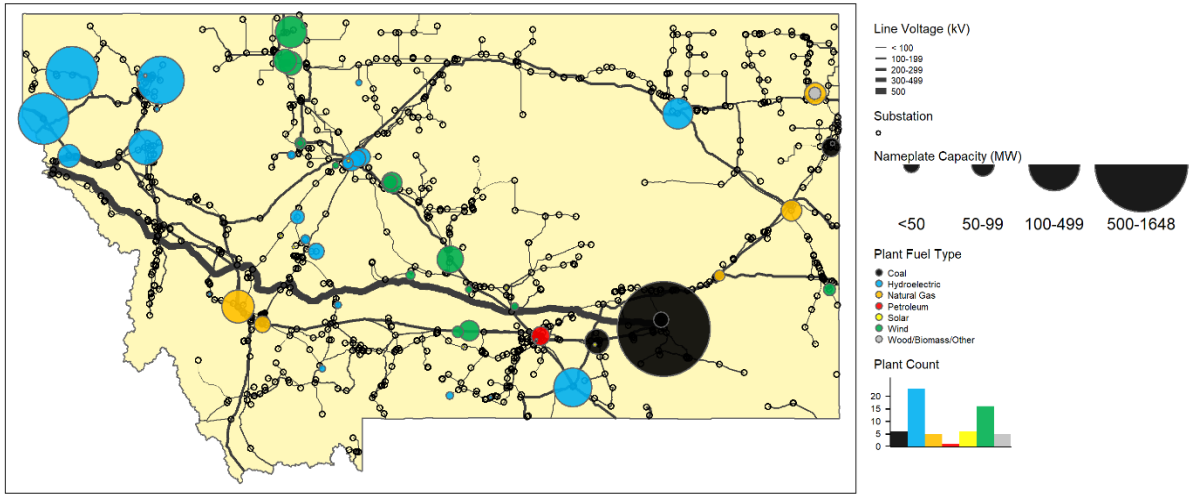

MONTANA'S
ELECTRICITY SUPPLY
Adequate for How Long?
Patrick M. Barkey, Director
Bureau of Business and Economic Research
University of Montana

The Montana Electricity Reliability Initiative (MERIT)

- A first of its kind project – commissioned and conducted entirely by the BBER
- Texas and California power disruptions revealed that too many people were unaware of the profound challenges of electricity reliability
- Project is intended to examine reliability from the perspective of the economy

Goals of MERIT

- Conduct a fresh analysis of reliability that is comprehensible to a lay audience
- Take a statewide perspective
- Use publicly available data
- Make a wider audience aware of the issues facing Montana so that they can be engaged in important debates.

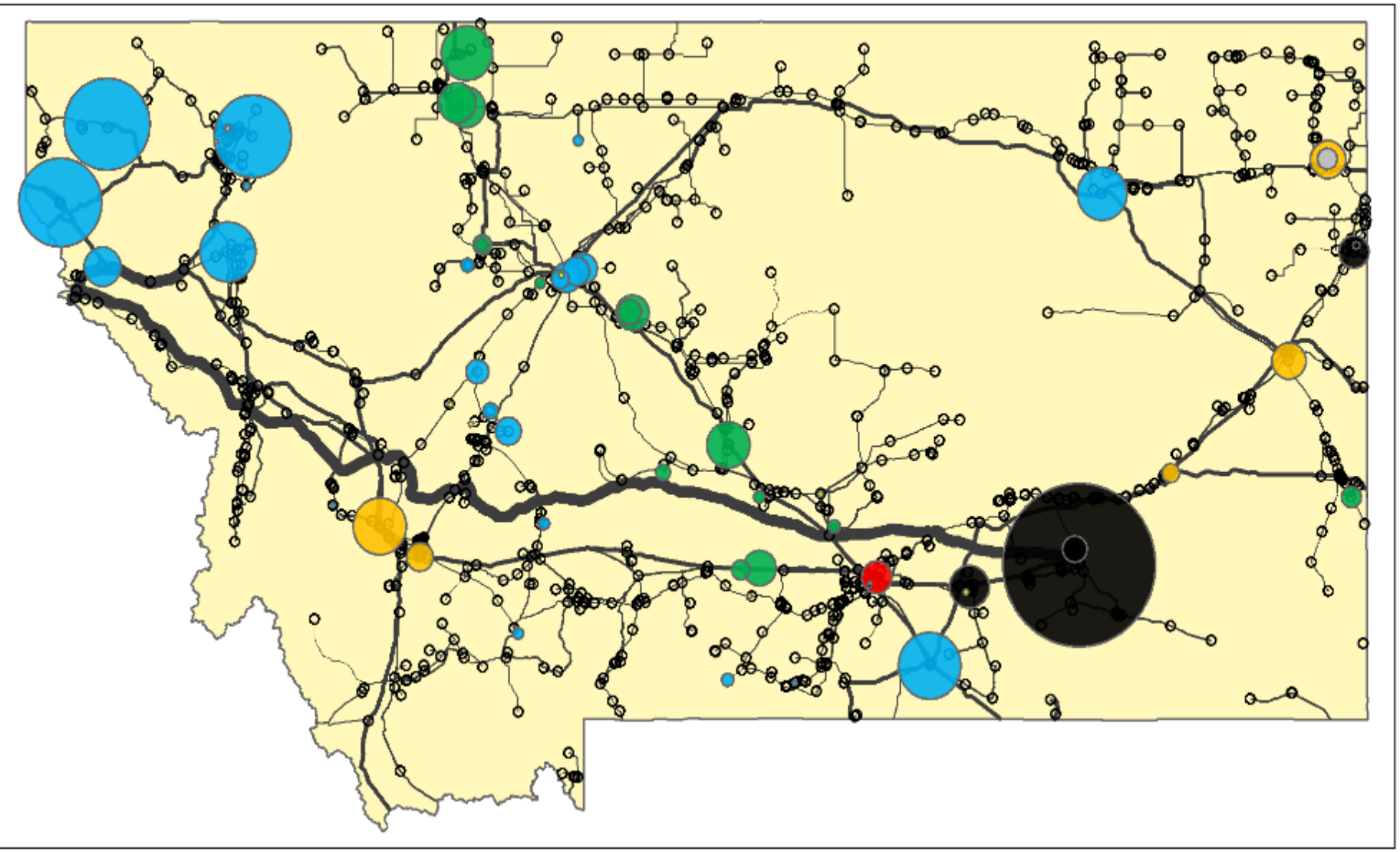


Research Fellow

PETER LARSEN, PhD

Peter Larsen is a Research Fellow at the University of Montana Bureau of Business and Economic Research and Leader of the Electricity Markets and Policy Department at Lawrence Berkeley National Laboratory

Montana's Electricity Supply: Generation and Transmission



Line Voltage (kV)

- < 100
- 100-199
- 200-299
- 300-499
- 500

Substation

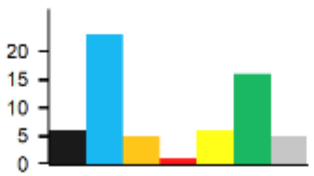
Nameplate Capacity (MW)

<50 50-99 100-499 500-1648

Plant Fuel Type

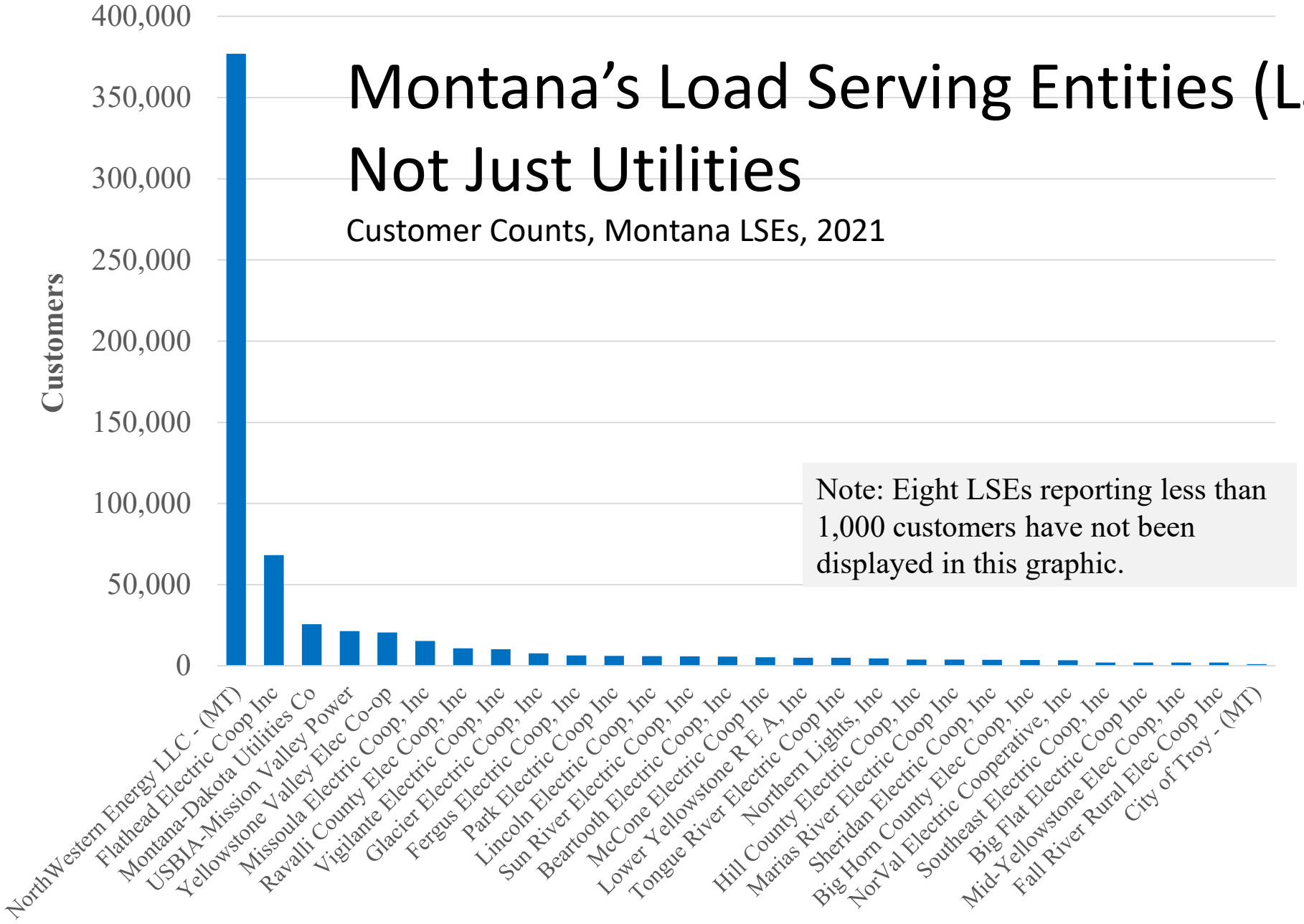
- Coal
- Hydroelectric
- Natural Gas
- Petroleum
- Solar
- Wind
- Wood/Biomass/Other

Plant Count



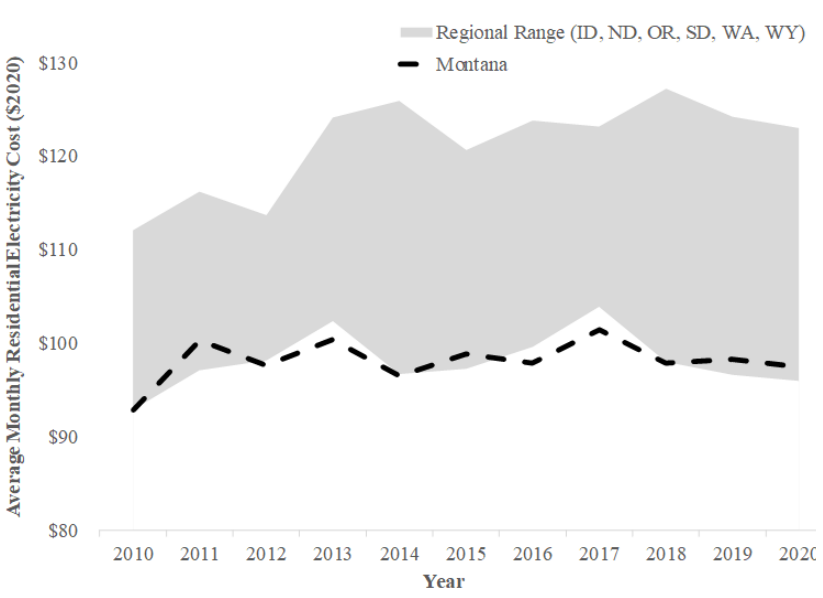
Montana's Load Serving Entities (LSE's): Not Just Utilities

Customer Counts, Montana LSEs, 2021

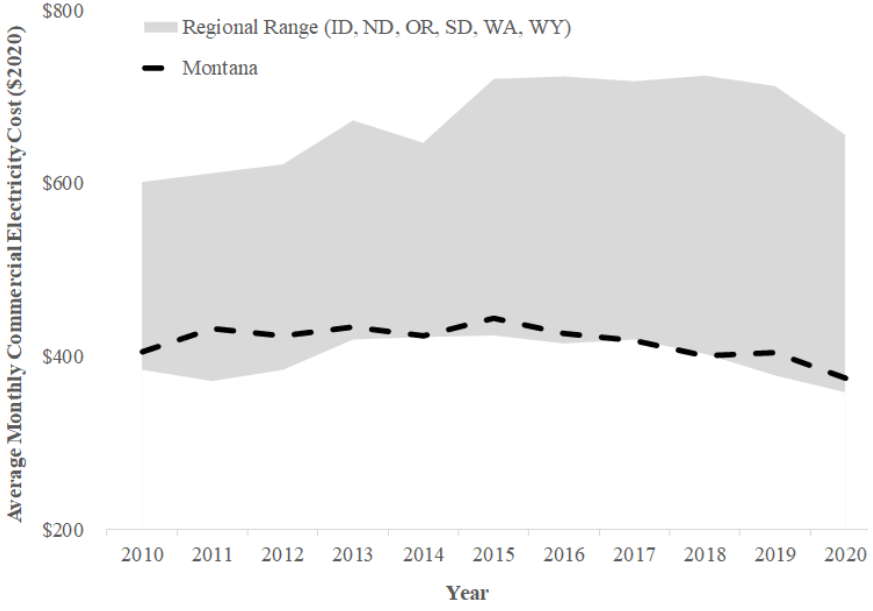


Note: Eight LSEs reporting less than 1,000 customers have not been displayed in this graphic.

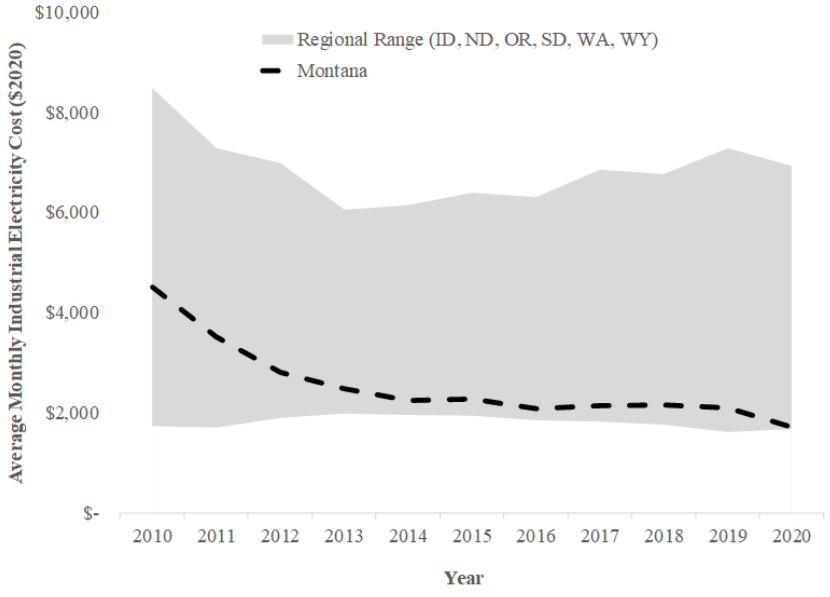
Montana customers spend less on electricity than other states in our region



Residential



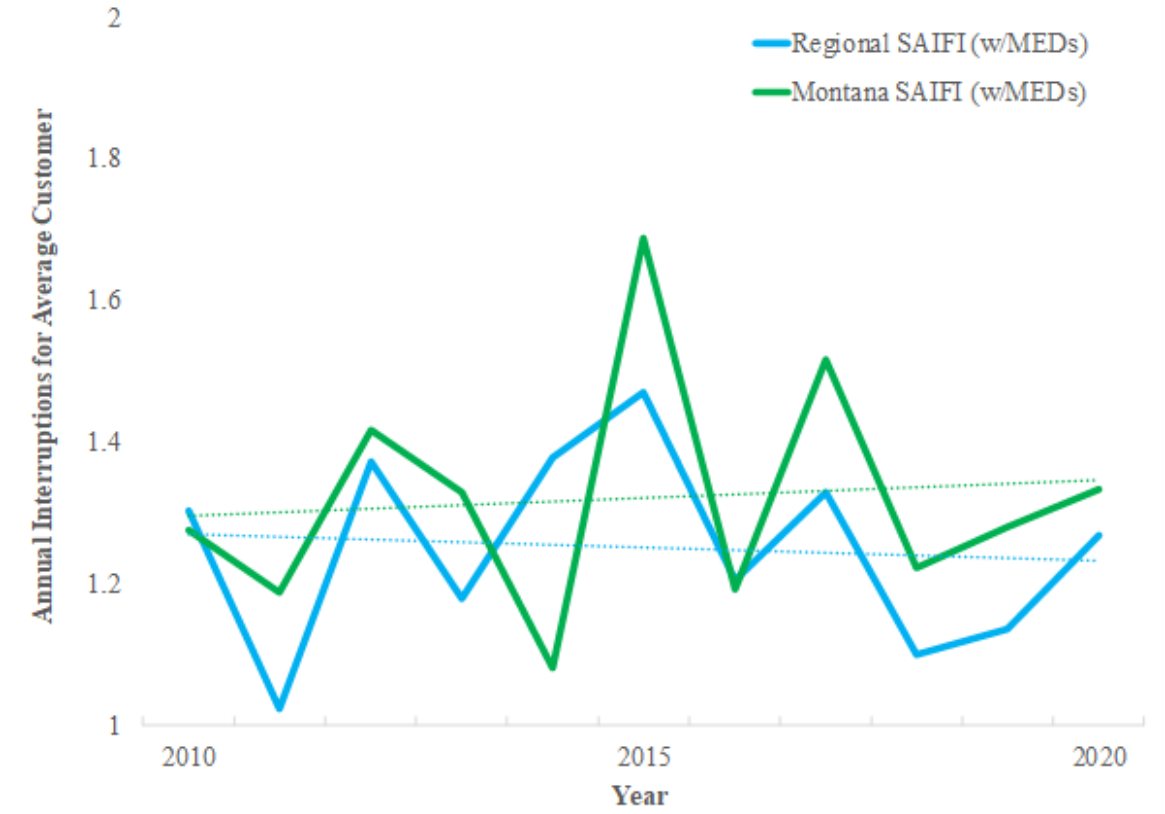
Commercial



Industrial

Source: U.S. EIA (2022)

Montana customers experience more frequent, but shorter power disruptions than our region

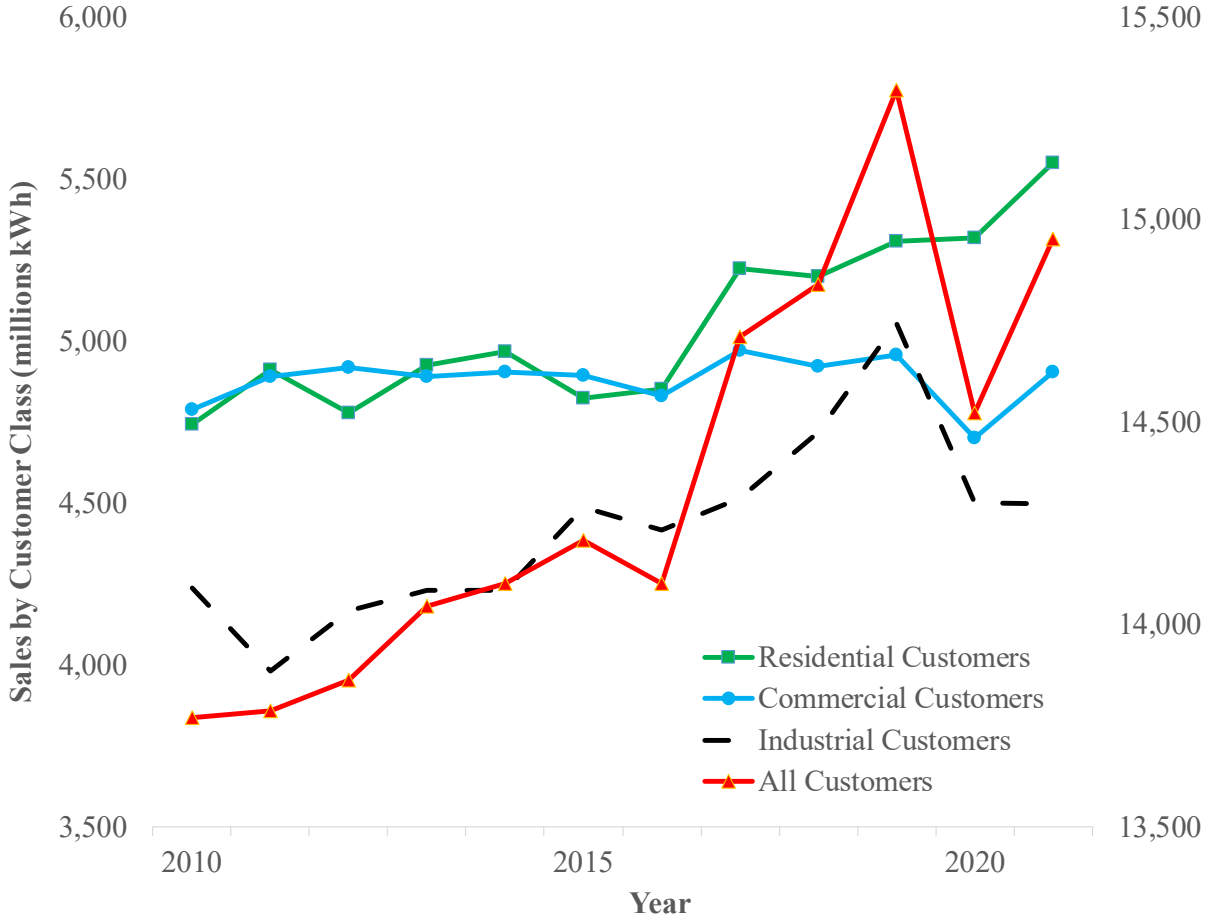


Count of Power Disruptions for Typical Customer

Total Minutes Interrupted for Typical Customer

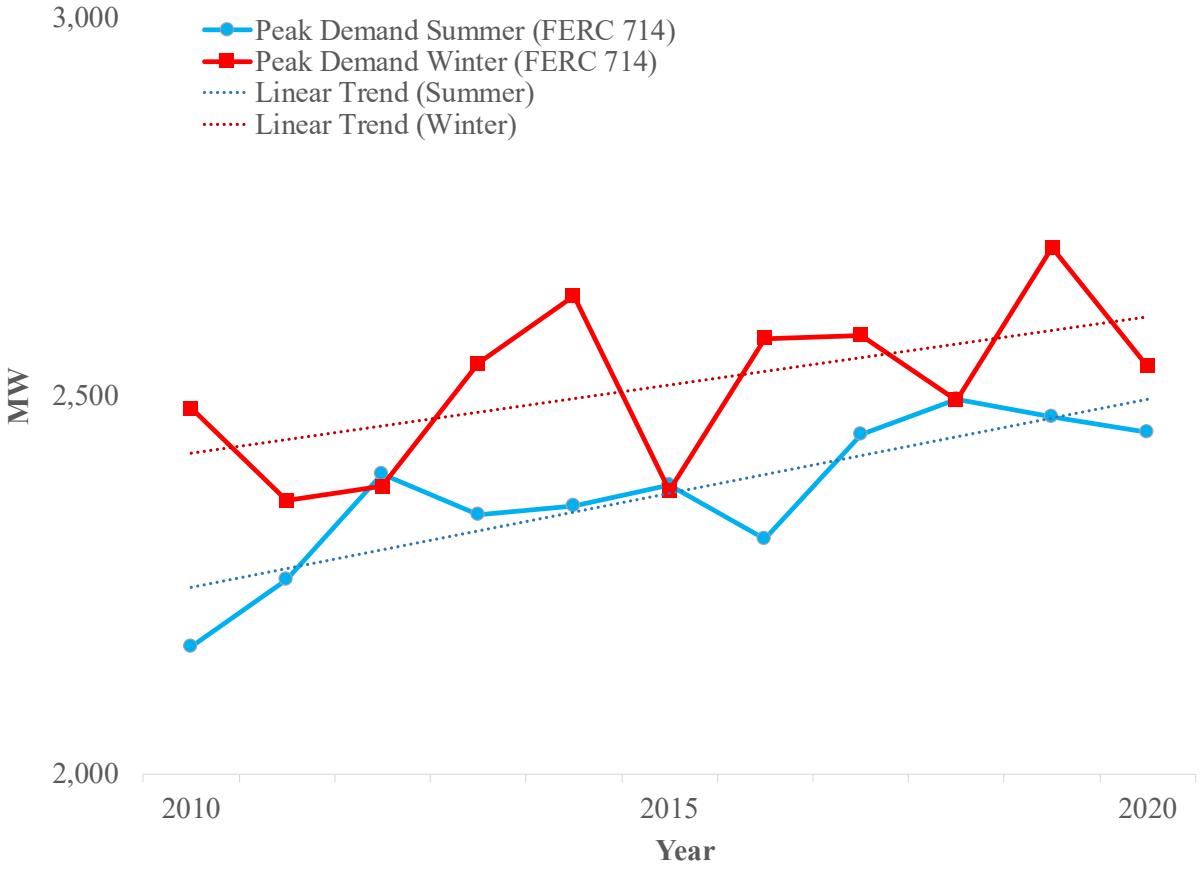
Source: U.S. EIA (2022); Larsen et al. (2020)

Montana's electricity sales and peak demand have been increasing



Sales

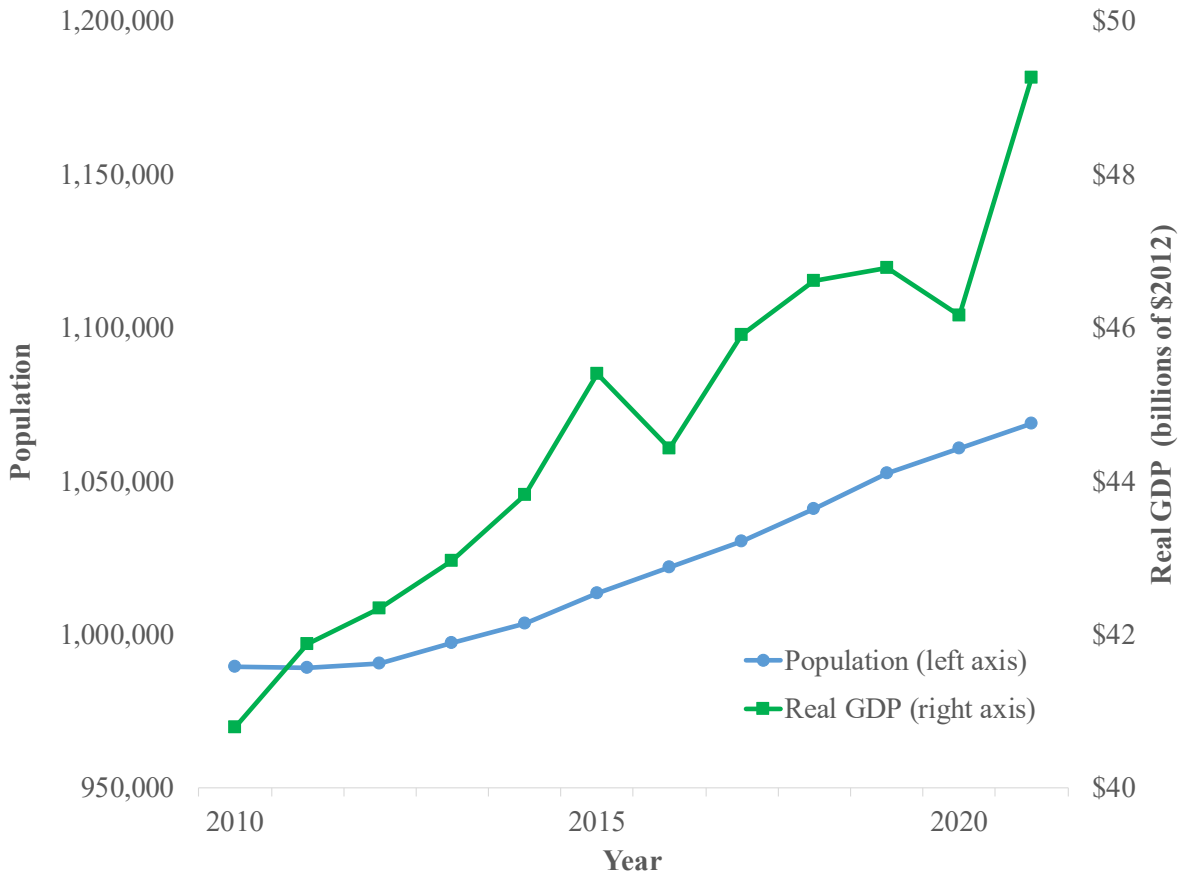
Source: U.S. EIA (2021)



Peak Demand

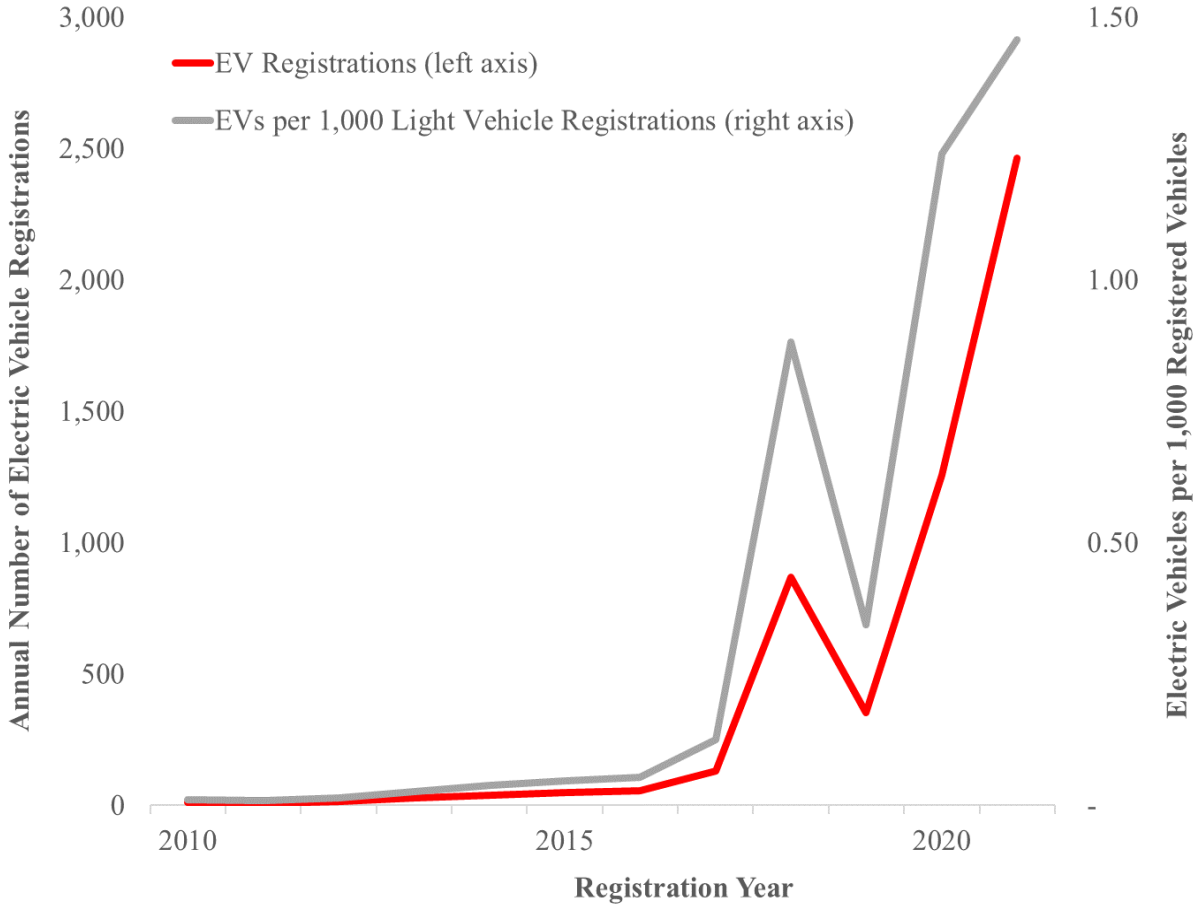
Source: U.S. FERC (2021)

Some drivers of demand point to long-term growth



GDP and Population

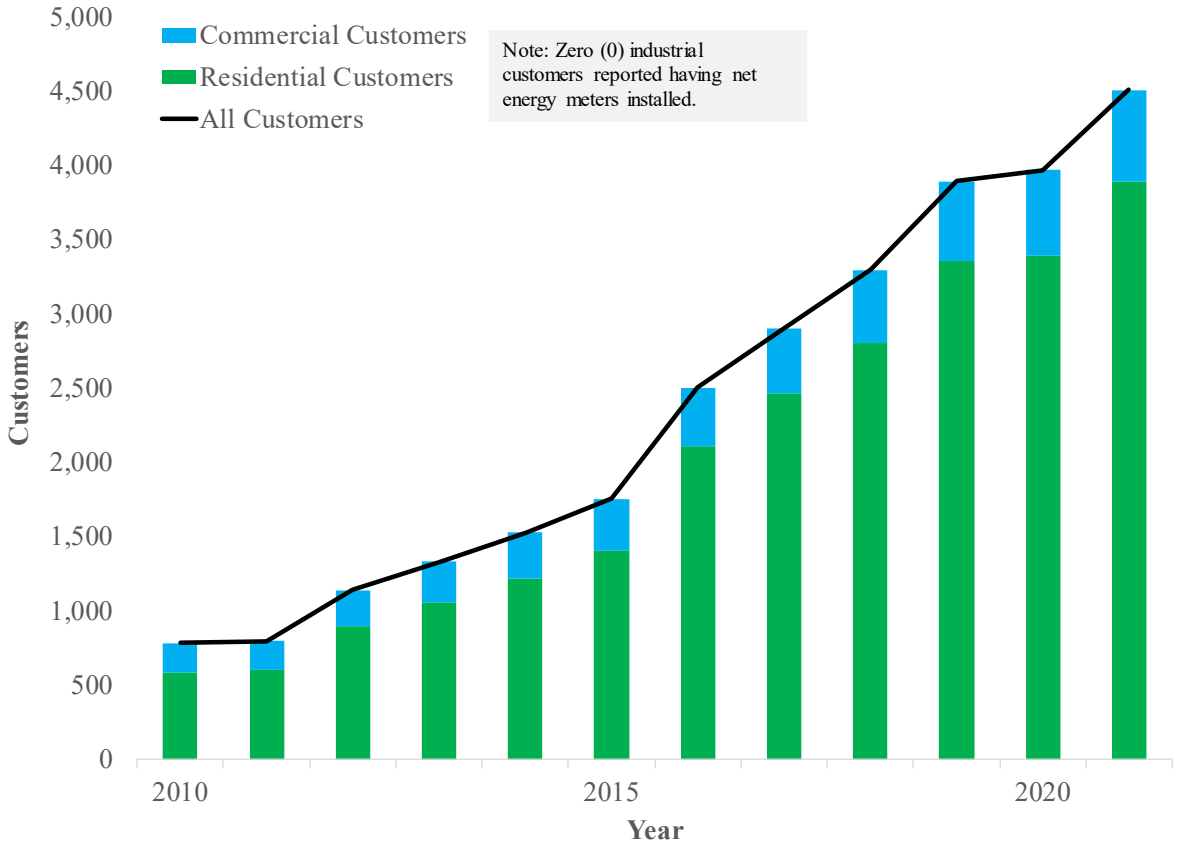
Source: U.S. Census Bureau (2021); U.S. BEA (2021)



Electric Vehicles

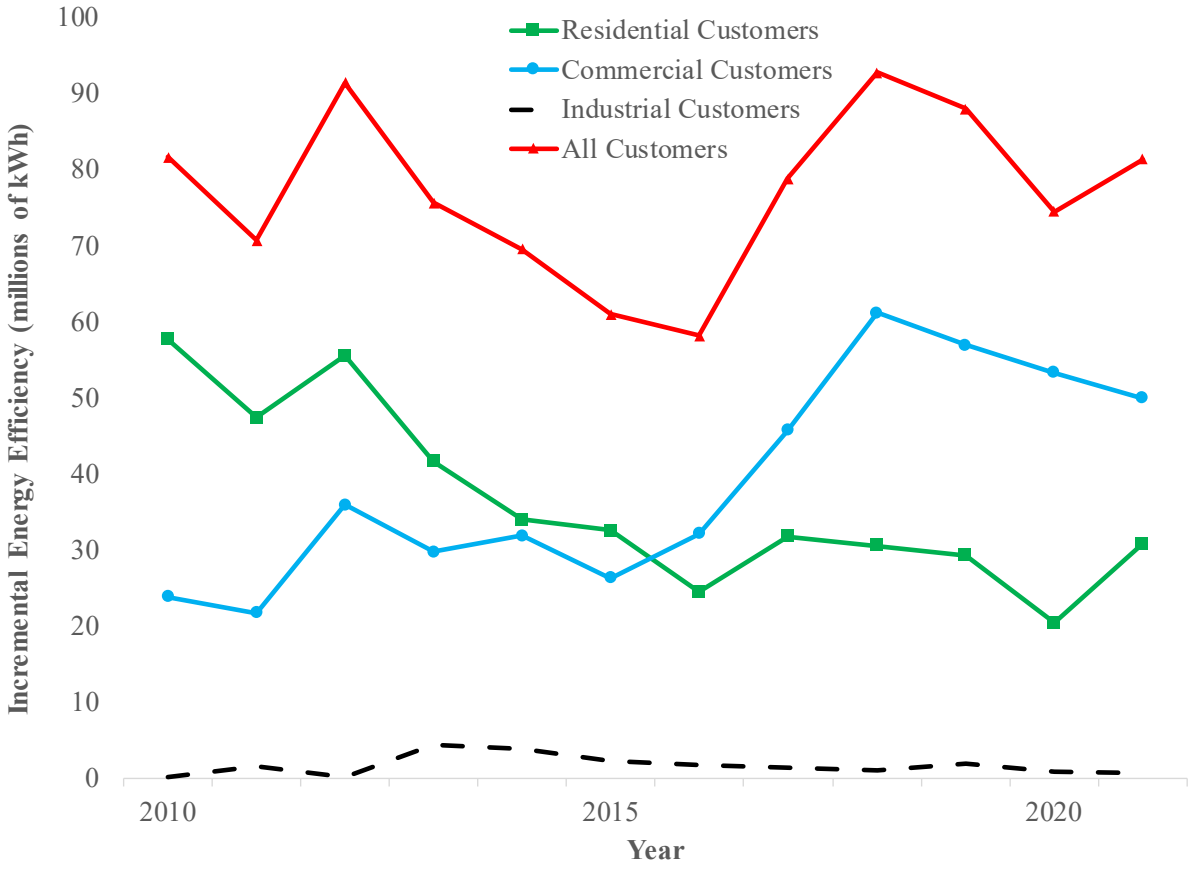
Source: E.V Hub (2022); MVD (2022)

Customer-sited renewable energy and commercial energy efficiency programs are driving demand lower



Customer Installations of Renewable Energy

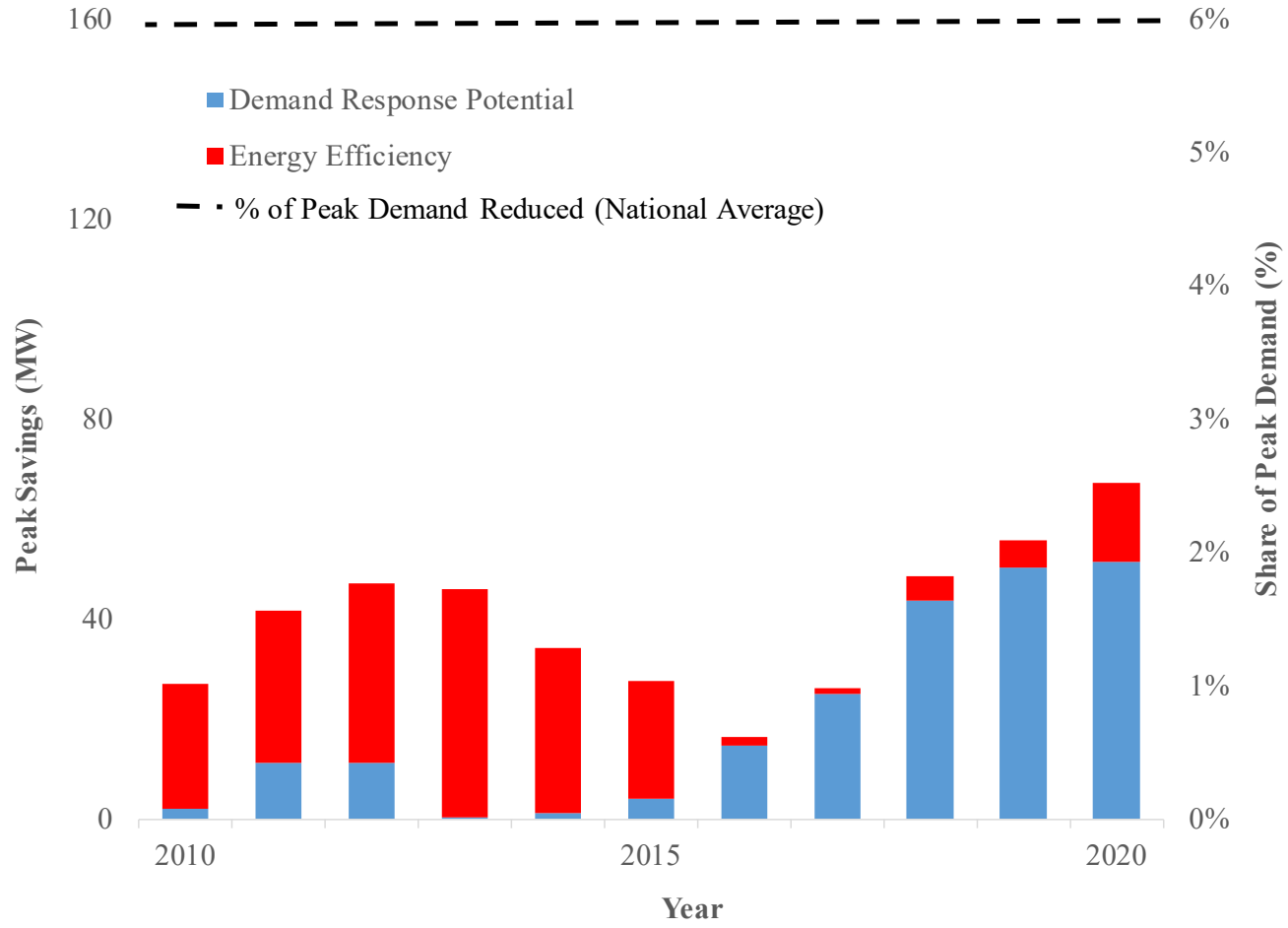
Source: U.S. EIA (2022)



Energy Efficiency Program Savings

Source: U.S. EIA (2022)

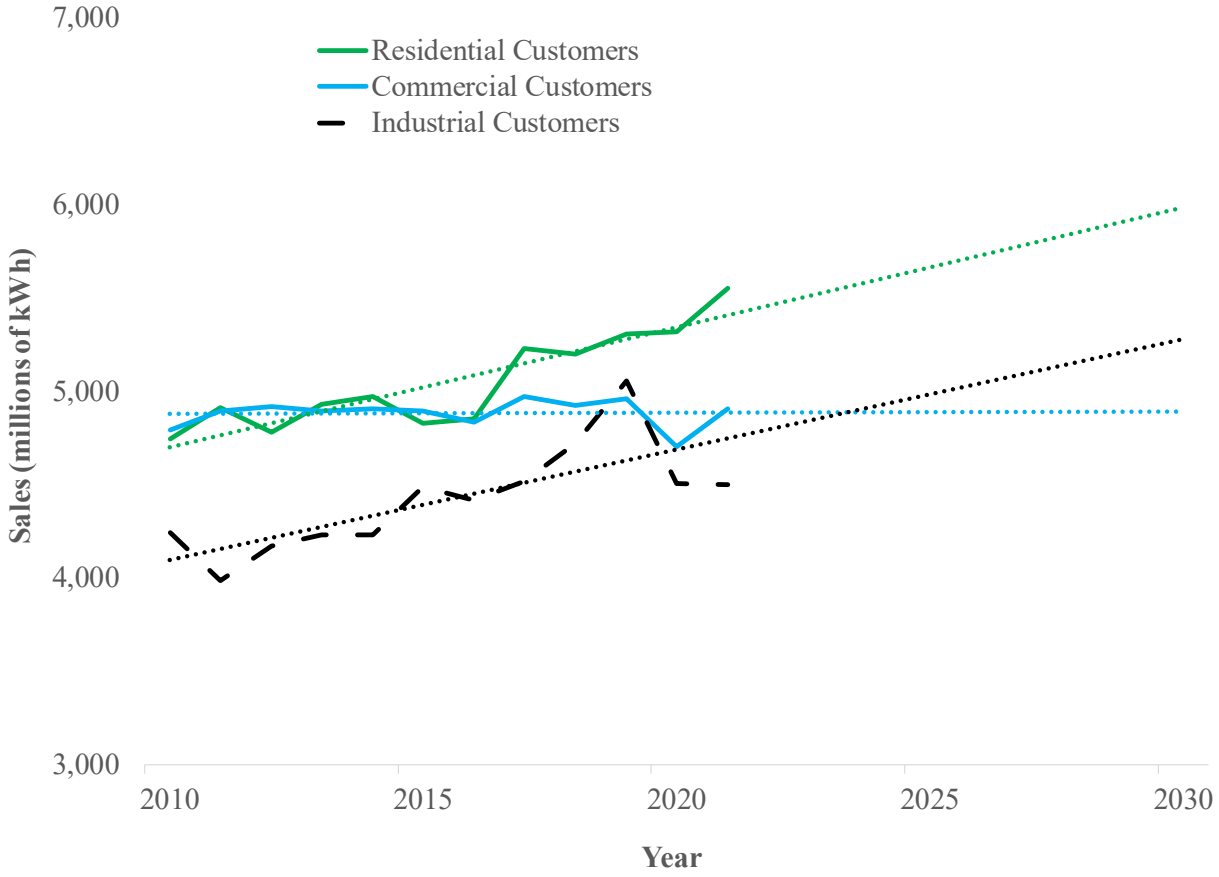
But participation in demand side management programs is limited



Energy efficiency and demand response peak savings

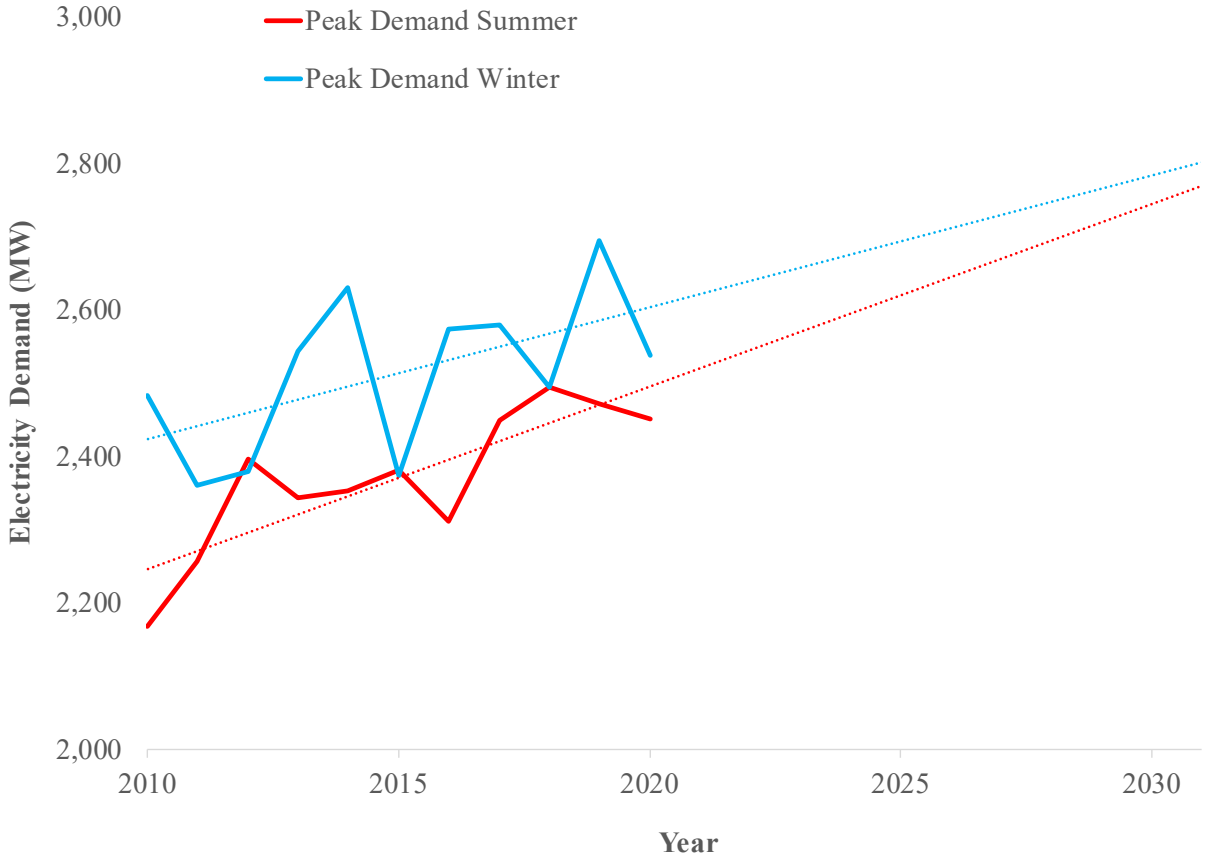
Source: U.S. EIA (2021)

Overall, peak demand and electricity sales suggest growth into the future



Sales

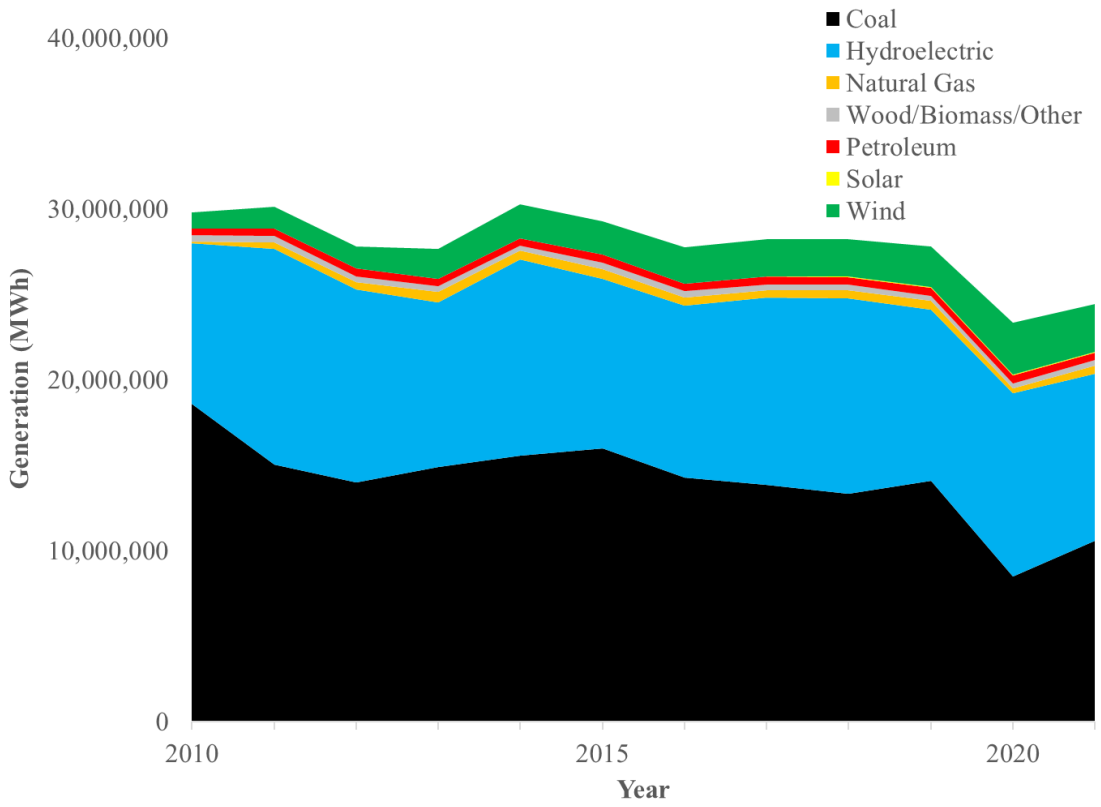
Source: U.S. EIA (2021); BBER Est. (2022)



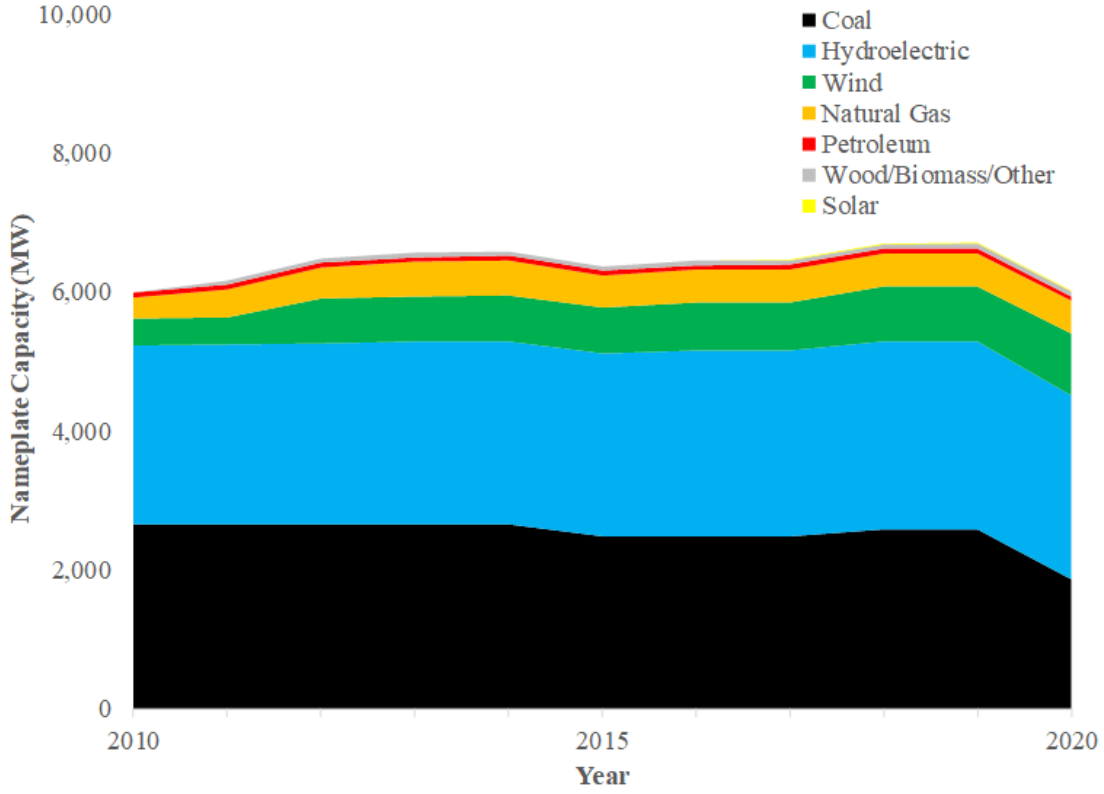
Peak Demand

Source: U.S. FERC (2021); BBER Est. (2022)

Electricity generated by Montana's power plants is decreasing and little new capacity of utility-scale generation has been built



Generation by Fuel Type

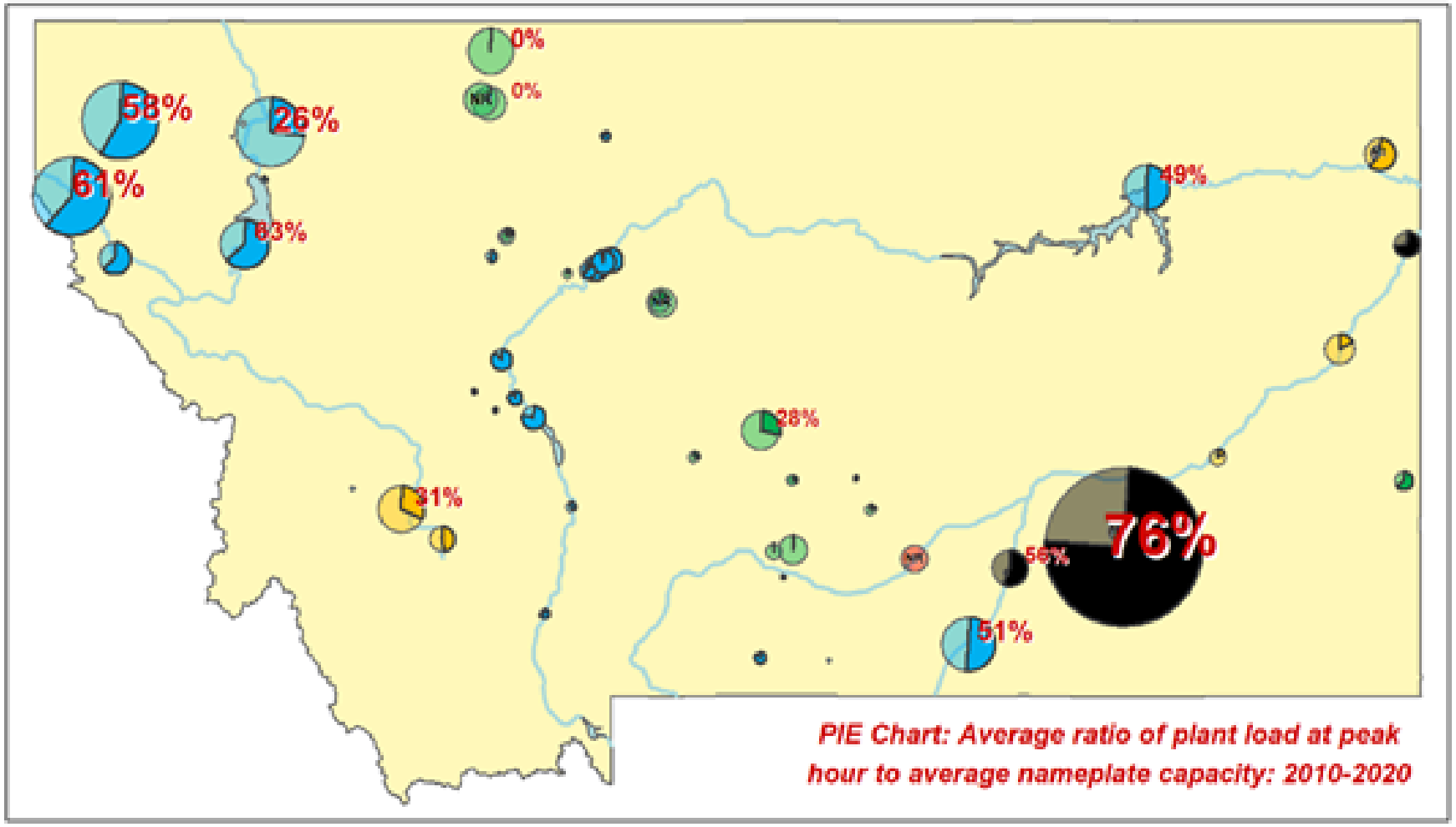


Capacity by Fuel Type

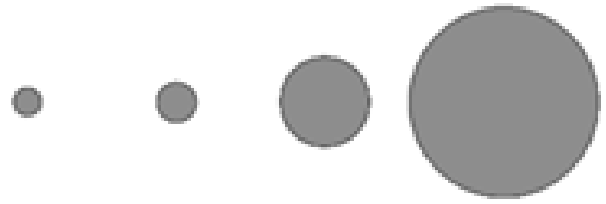
Source: U.S. EIA (2021)

Some resources provide little supply during times of peak demand

Net Plant Load at Peak Hours



Average Nameplate Capacity (MW): 2010-2020

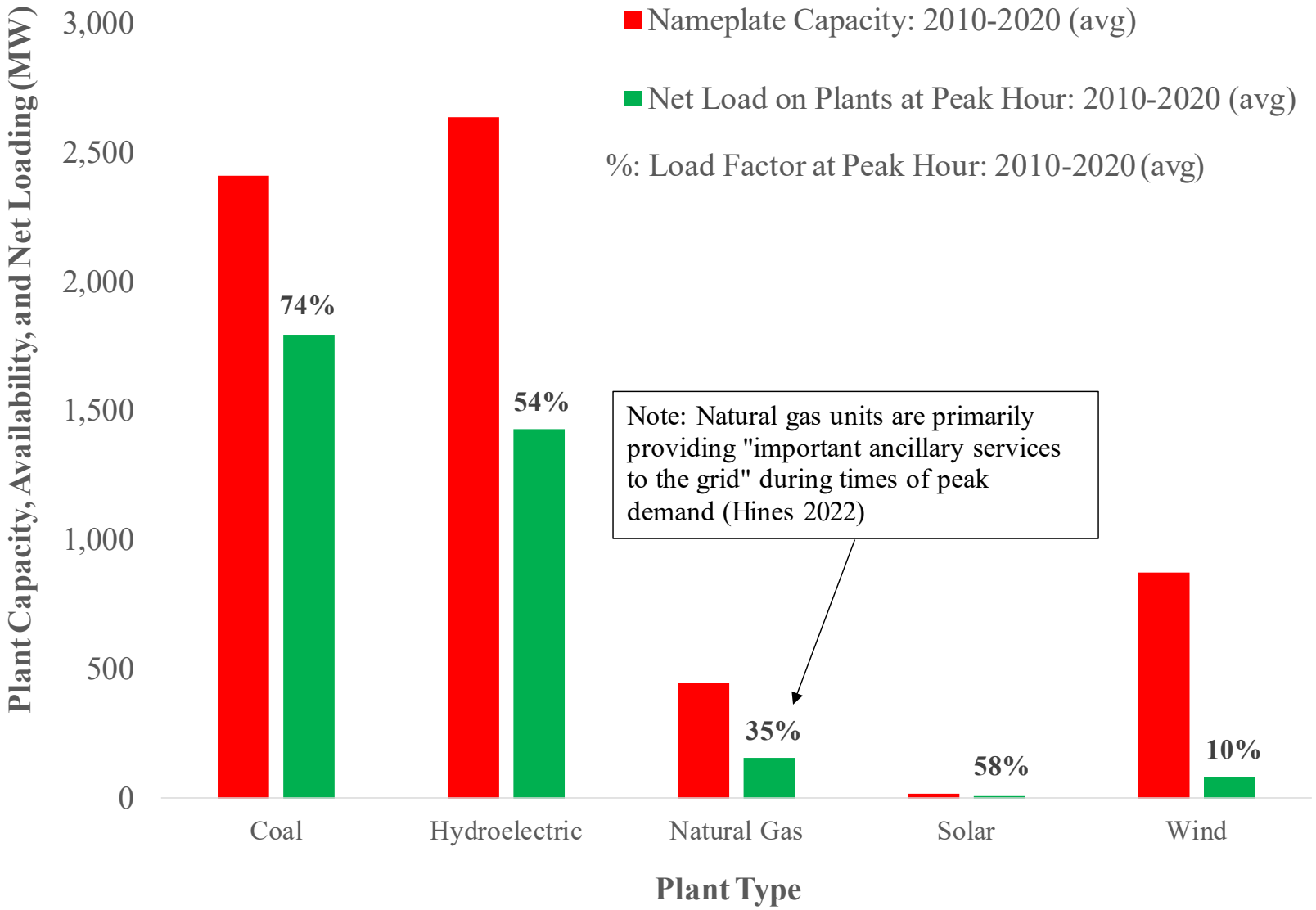


Plant Fuel Type

- Coal
- Hydroelectric
- Natural Gas
- Petroleum
- Solar
- Wind
- Wood/Biomass/Other

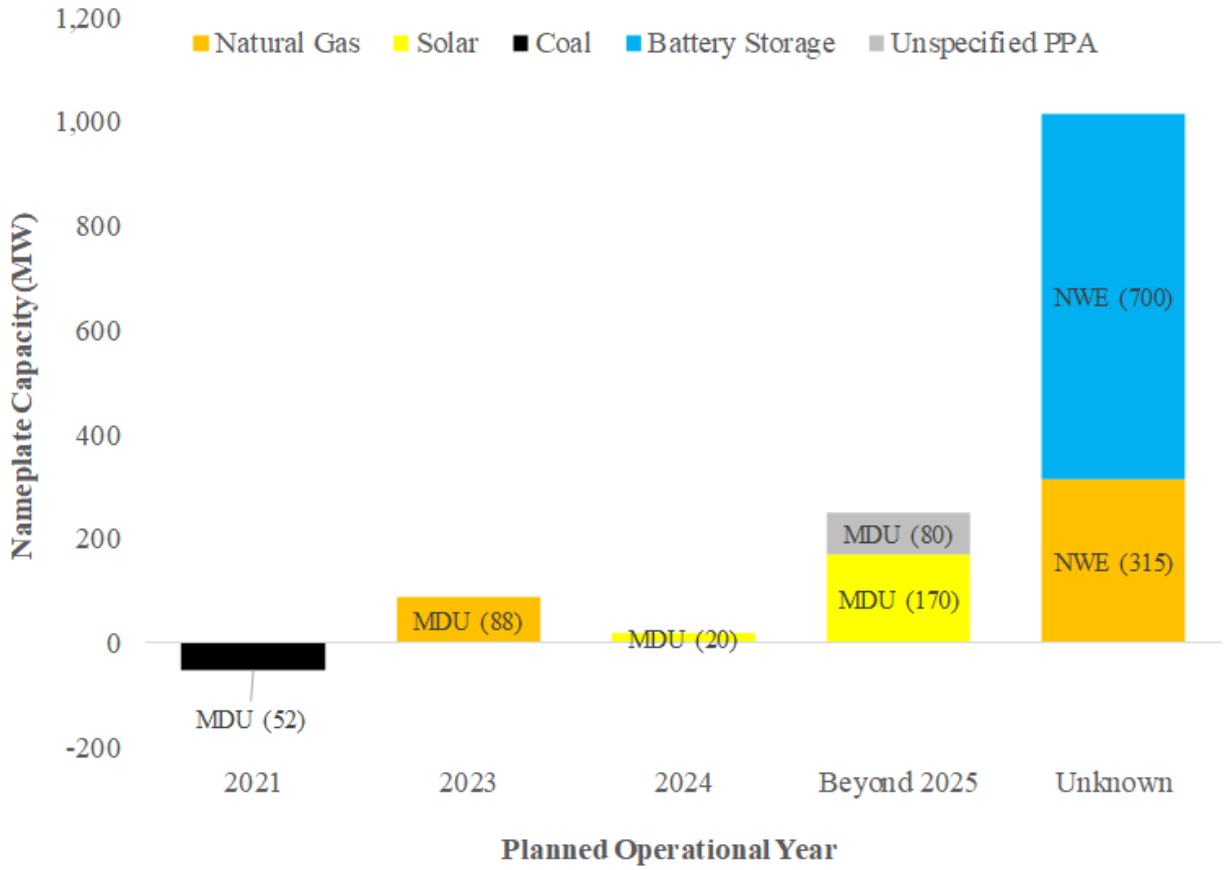
Source: U.S. EIA (2021); U.S. FERC (2022)

Capacity and Loading at Peak Hour, 2010-20



Source: U.S. EIA (2021); U.S. FERC (2022)

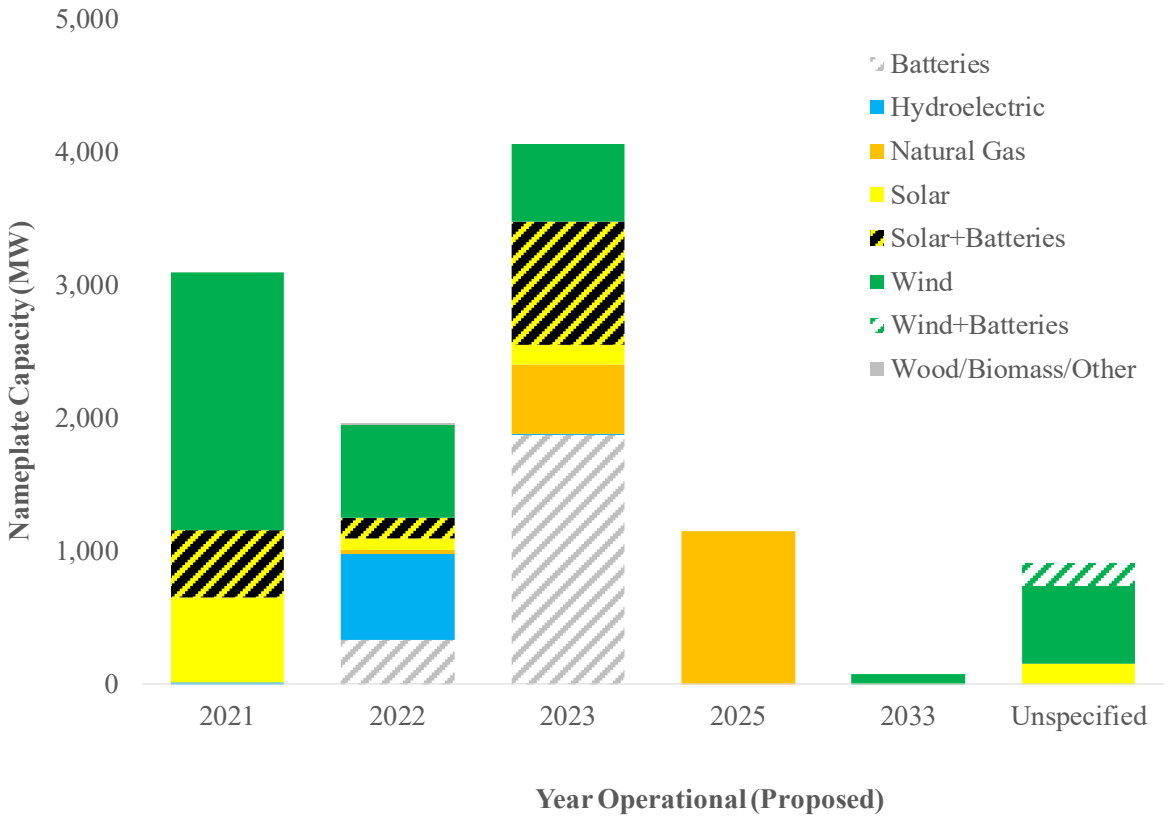
Investor-owned utilities (IOUs) identify significant resource needs, but it is unclear if/when these resources will be built…



Planned Retirements and Resource Needs Identified by Major IOUs

Source: NWE (2020); MDU (2021)

Independent power producers (IPP) are proposing a significant amount of new capacity, but past proposals are often withdrawn…



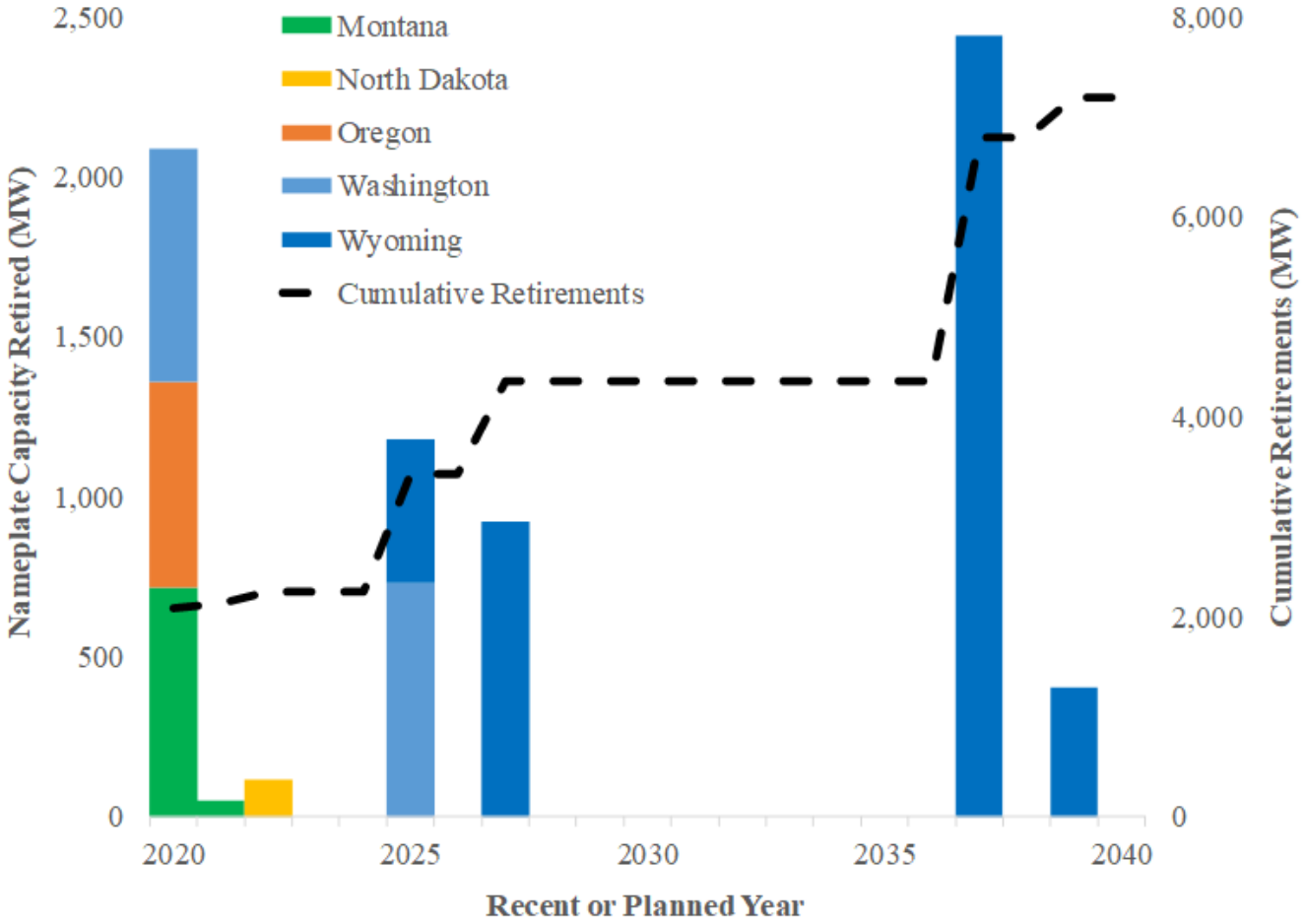
IPP Proposed Generation and Storage

Generator Type	Montana		Region	
	Total Queue (MW)	% Capacity Withdrawn	Total Queue (MW)	% Capacity Withdrawn
Wind	350	91%	38,701	94%
Natural Gas	127	33%	1,489	81%
Petroleum	2	0%	17	0%
Solar			925	100%
Wood/Biomass/Other			28	73%
Coal			257	36%
Total	479	76%	41,417	93%

Withdrawn Proposals

Source: U.S. EIA (2021); Rand et al. (2021)

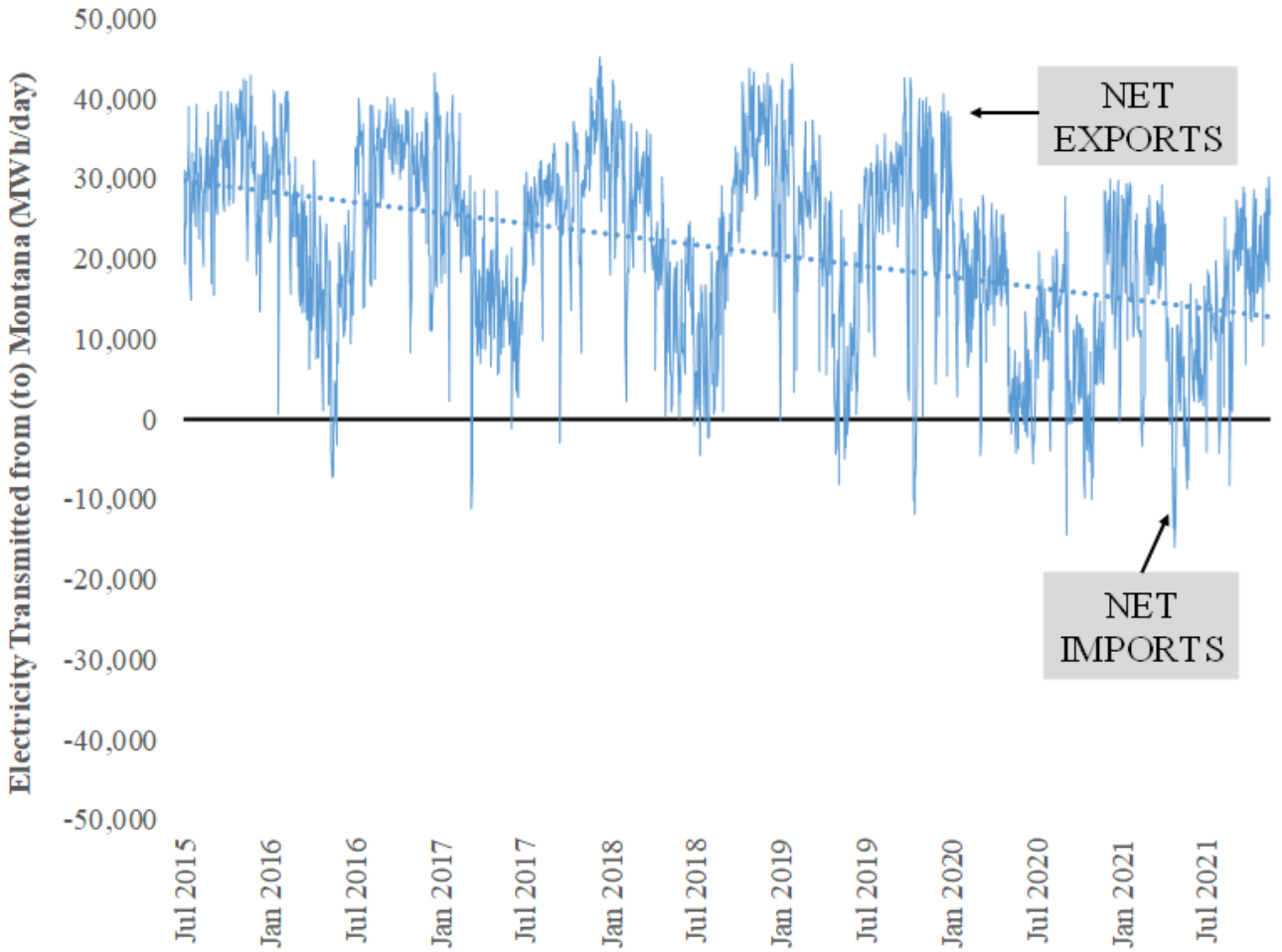
Over 7,000 MW of region's coal-fired generation could retire within next two decades



Planned Retirements of Coal-fired Power Plants

Source: U.S. EIA (2021)

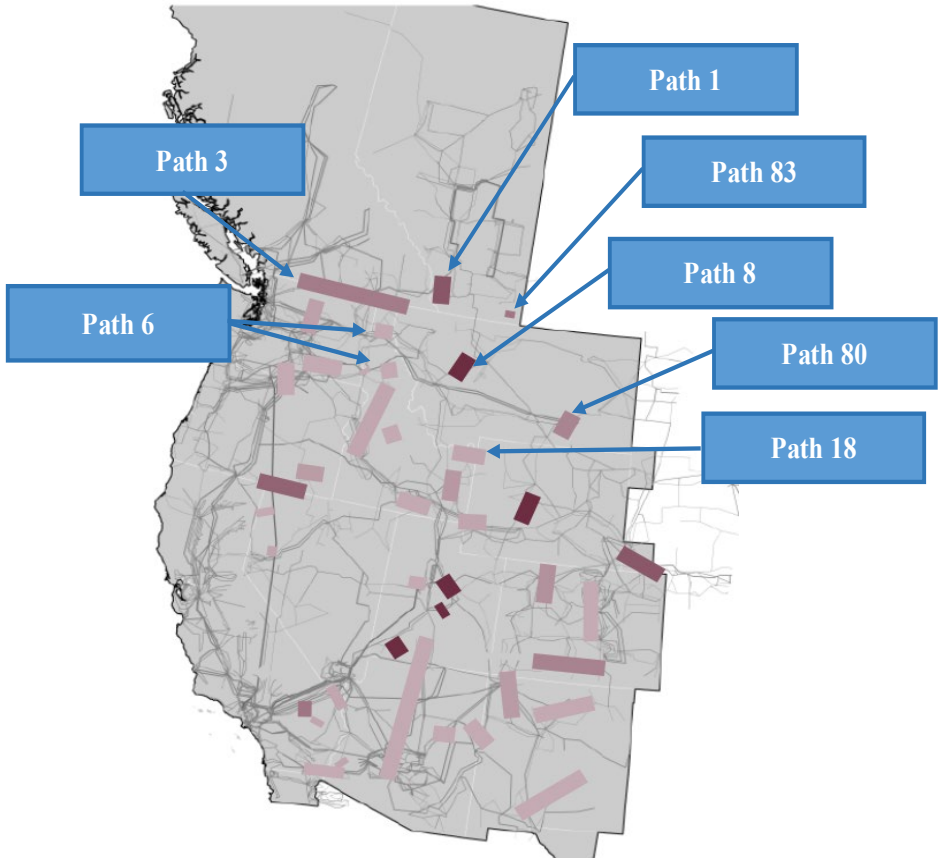
Montana is trending towards becoming a net *importer* of electricity…



Electricity Sent from (to) Montana

Source: U.S. EIA (2021)

Most transmission pathways serving Montana already show signs of being congested throughout the year…



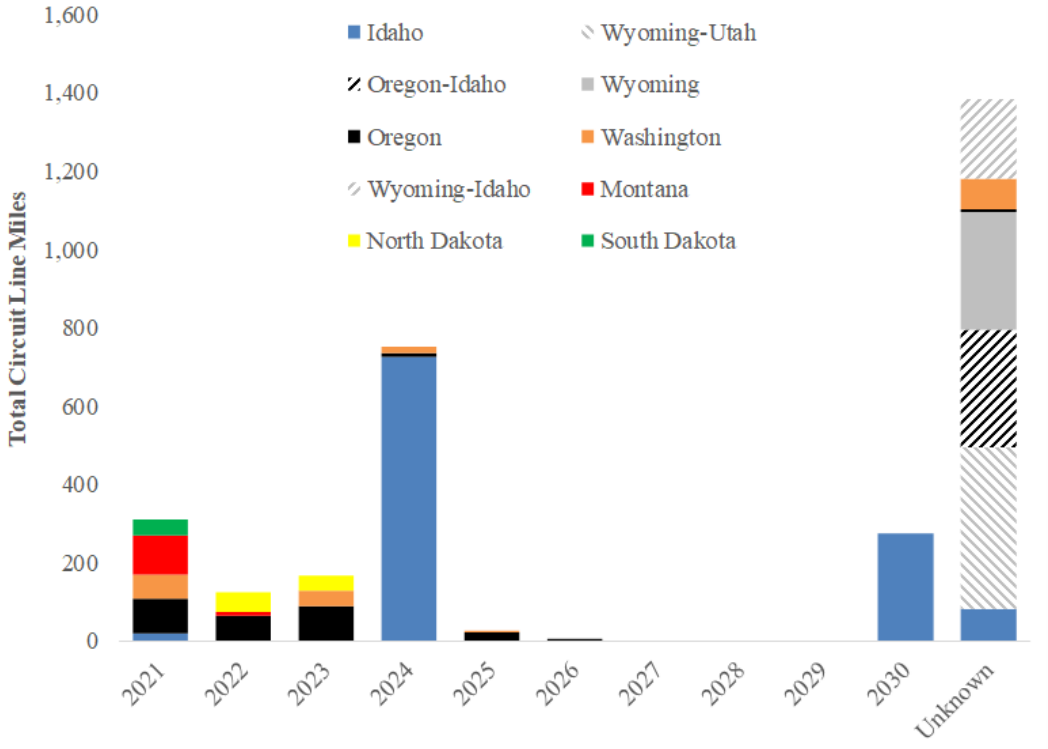
WECC Transmission Pathways

Percentage of Time Energy Flow Above 75% of Pathway Operating Limit				
Path	Winter	Spring	Summer	Fall
1	19.3%	31.9%	14.0%	12.0%
3	8.1%	6.0%	2.5%	6.7%
6	0%	0%	0%	0%
8	10.6%	0%	1.0%	30.3%
18	9.7%	15.4%	10.2%	0.5%
80	1.0%	0.1%	3.9%	5.4%
83	11.1%	36.9%	12.8%	7.4%
WECC Average	6.9%	5.8%	6.9%	4.4%

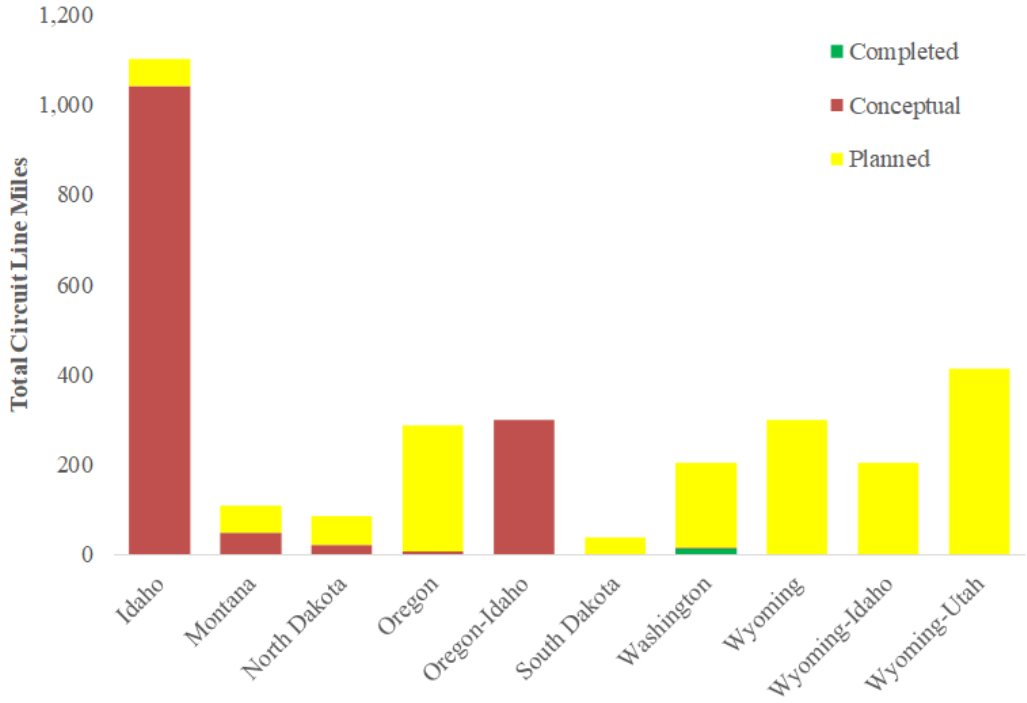
Likely Congestion on Pathways Serving Montana

Source: WECC (2018)

The proposed amount of new transmission lines will not keep pace with Montana's needs…



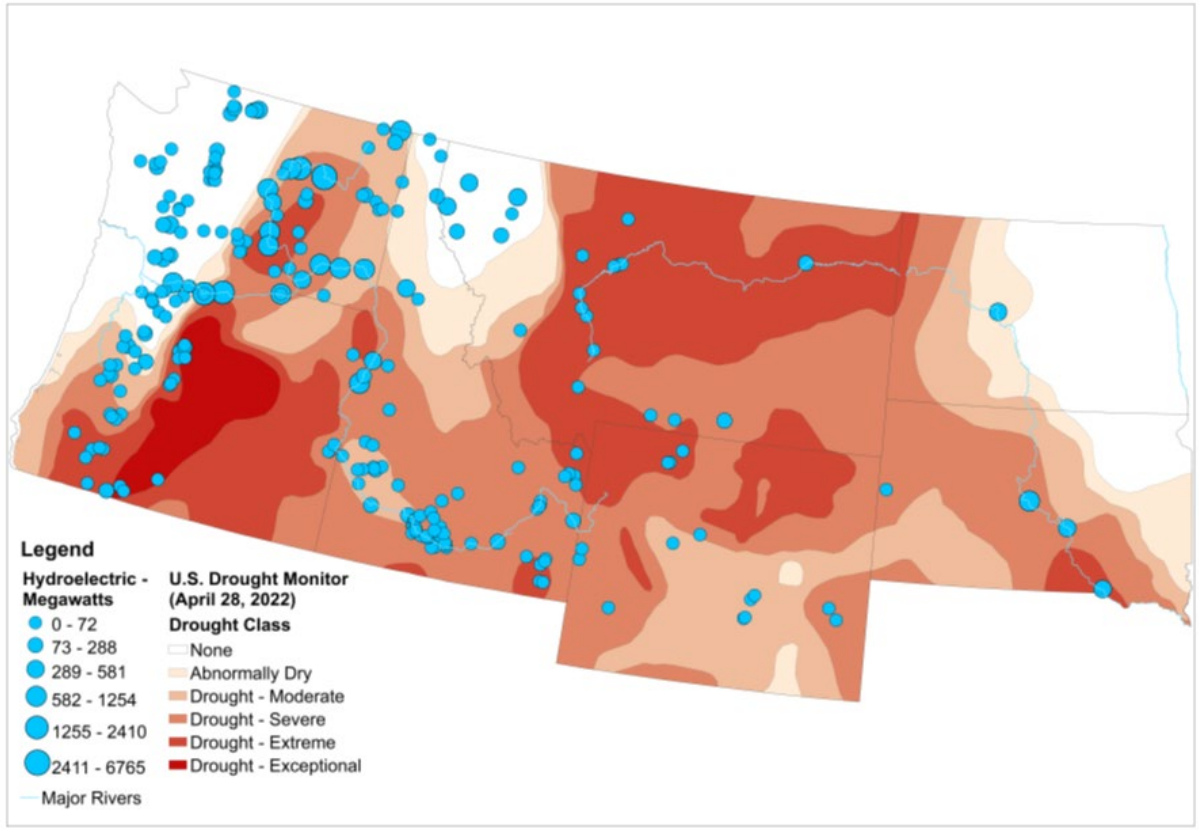
Planned Transmission by Year



Planned Transmission by State

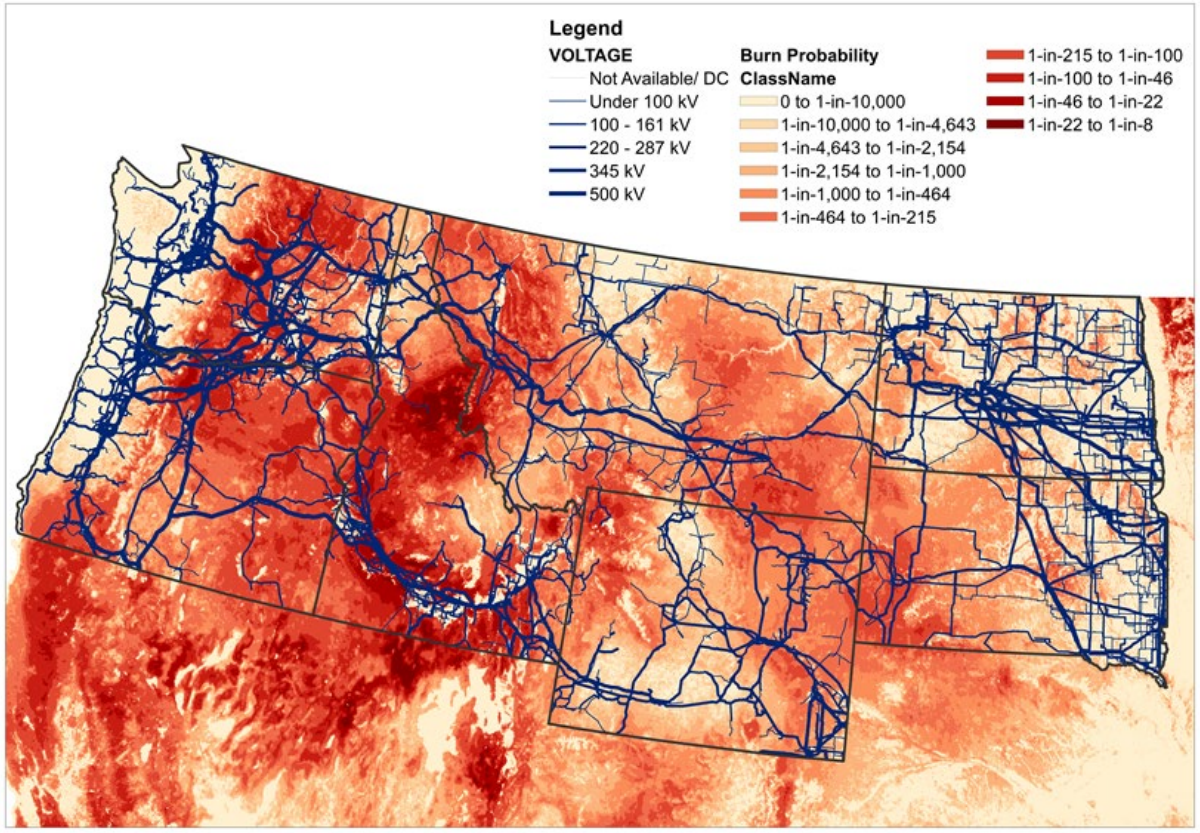
Source: NERC (2020)

Emerging threats…



Drought Conditions Reduce Hydroelectric Capacity

Source: U.S. EIA (2021); NOAA (2022)



Burn Likelihood and Transmission Lines

Source: Scott et al. (2020); U.S. EIA (2021)

Additional emerging threats…

Cyber and Physical Attacks on Grid Infrastructure

Source: ABC News (2022); GW Group (2022)

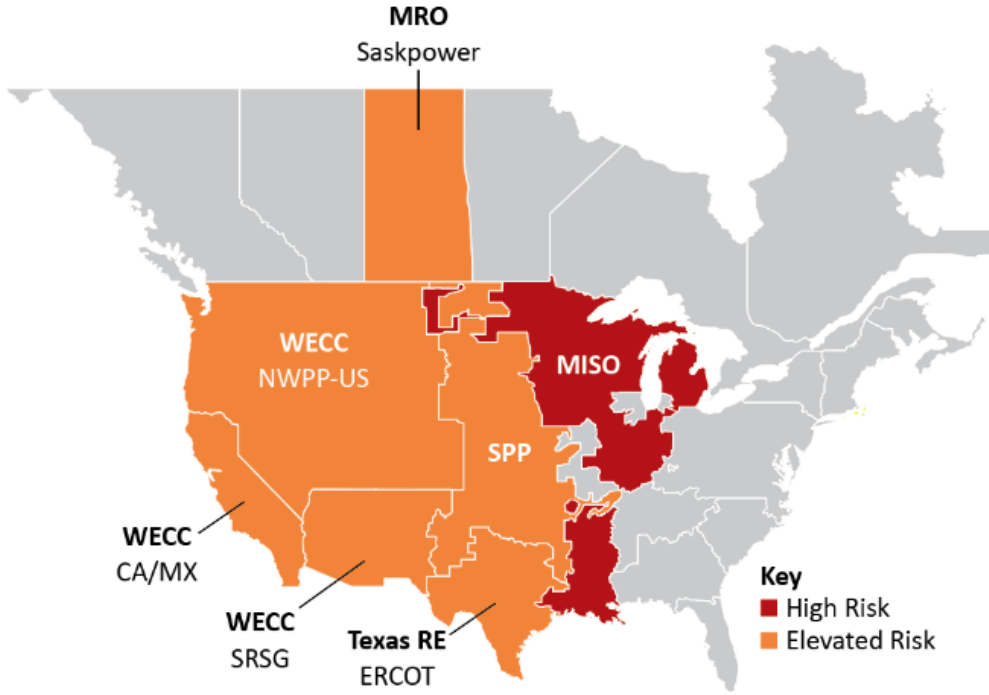


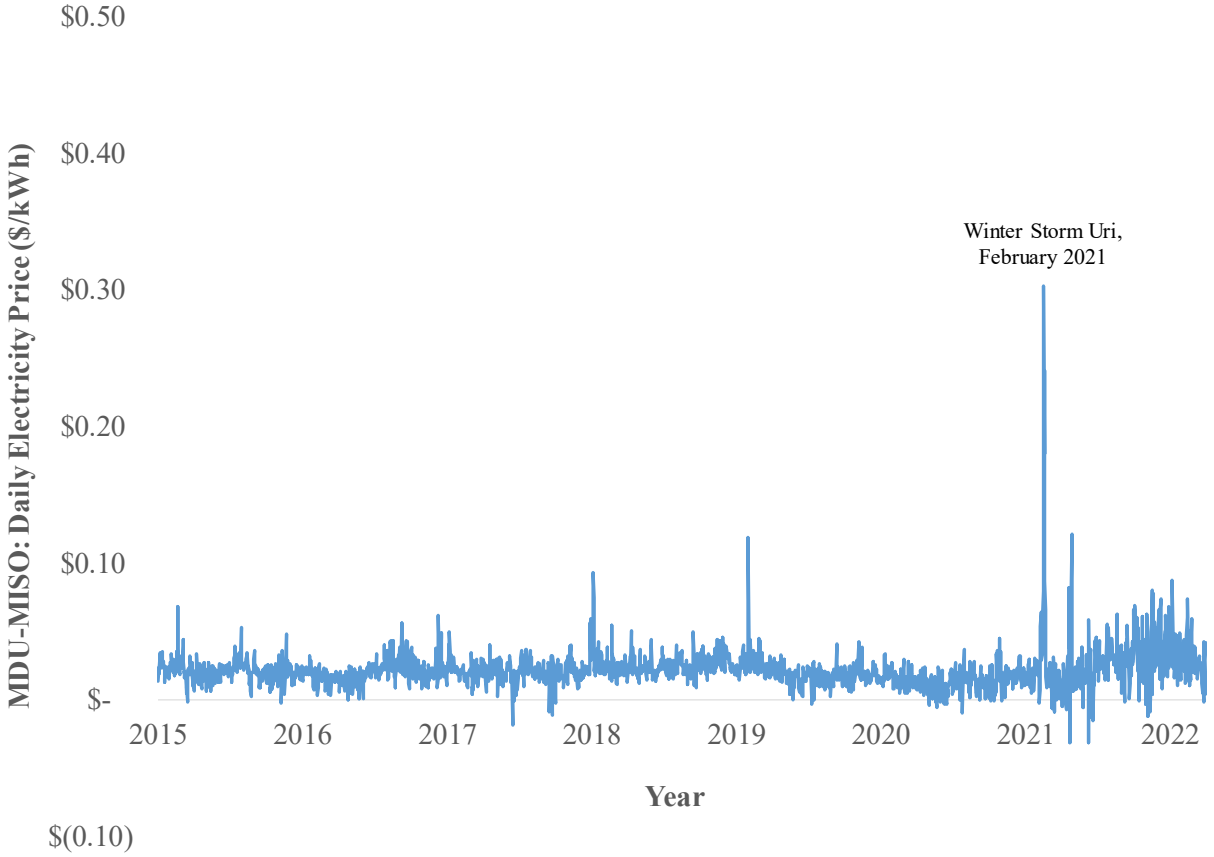
Figure 1: Summer Reliability Risk Area Summary

Seasonal Risk Assessment Summary	
High	Potential for insufficient operating reserves in normal peak conditions
Elevated	Potential for insufficient operating reserves in above-normal conditions
Low	Sufficient operating reserves expected

Electricity Shortages Across Regional Markets

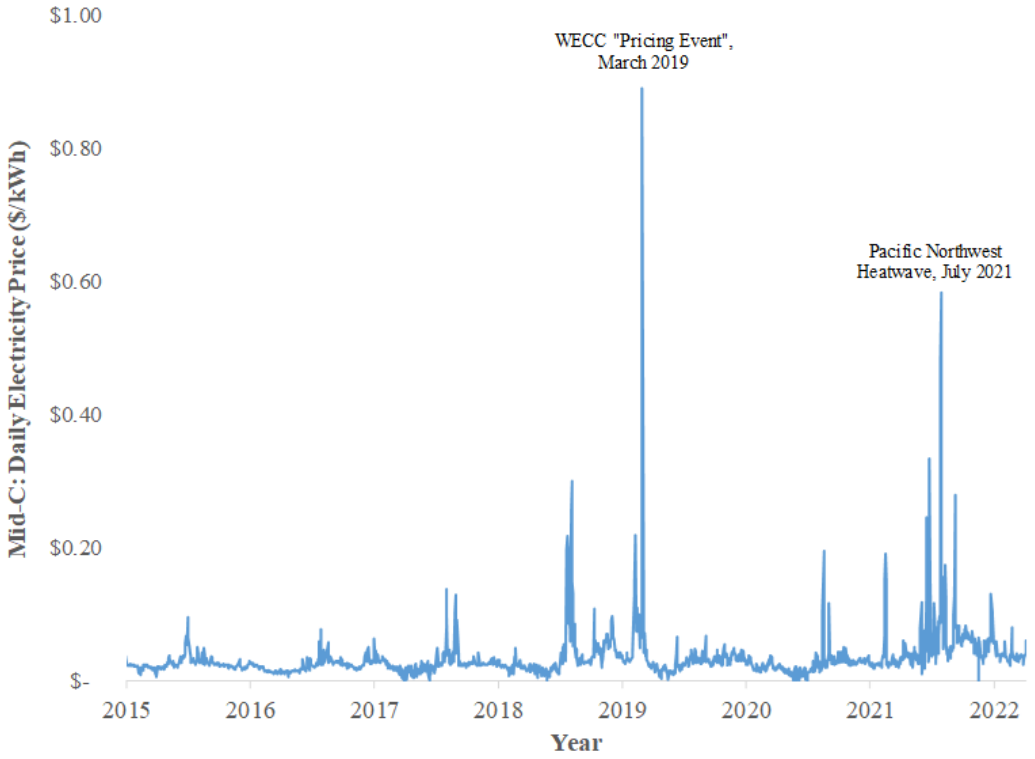
Source: NERC (2022)

Purchasing power from regional markets increases the risk of high electricity prices…



Daily Prices at MISO-MDU Trading Zone

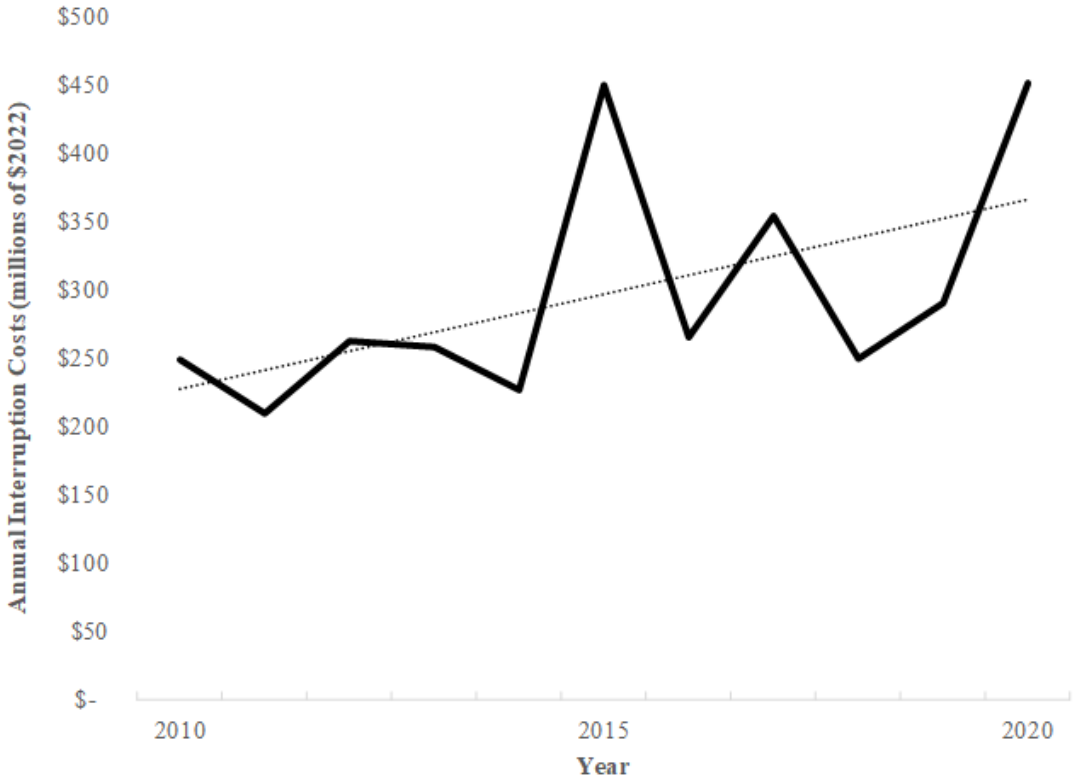
Source: MISO (2022)



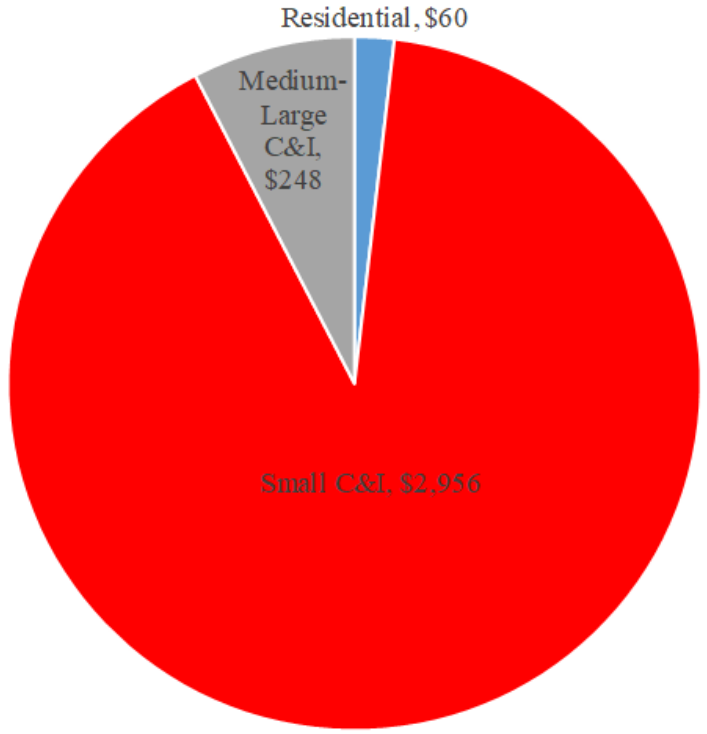
Daily Prices at Mid-C Wholesale Market

Source: U.S. EIA (2022)

Inability to deliver electricity from out-of-state could lead to costly power disruptions…



Annual Power Interruption Costs for Montana



Interruption Costs by Customer Type: 2010-2020

Source: ICE Calculator (2022); U.S. EIA (2022); Larsen et al. (2020)

A new threat to electric resource adequacy?

- Mercury and Air Toxics Standard (MATS) Revision
- Revoked 2020 rule
- Lowers mercury emissions from coal-fired power plants by 90 percent
- Could be implemented by 2027

- New greenhouse gas emission rules for fossil-fuel burning power plants
- Revokes Trump Administration rule
- Requires 90 percent reduction in GHG emissions by 2040
- EPA says Carbon Capture and Storage and hydrogen fuel switching are economic to achieve standards

Thank You!

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