BEFORE THE PUBLIC UTILITIES COMMISSION OF COLORADO

PROCEEDING NO. 24AL-0275E

IN THE MATTER OF ADVICE LETTER NO. 871 FILED BY BLACK HILLS COLORADO ELECTRIC, LLC DOING BUSINESS AS BLACK HILLS ENERGY TO INCREASE BASE RATES FOR RESIDENTIAL AND SMALL COMMERCIAL CUSTOMER CLASSES, TO BECOME EFFECTIVE JULY 15, 2024

HEARING EXHIBIT 1101

ANSWER TESTIMONY OF MELISSA WHITED

ON BEHALF OF

WESTERN RESOURCE ADVOCATES AND SIERRA CLUB

October 11, 2024

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Q. Please state your name and business address.

A. My name is Melissa Whited, and my business address is 485 Massachusetts Avenue, Suite 3, Cambridge, MA 02139.

Q. By whom are you employed and in what position?

A. I am a Vice President at Synapse Energy Economics, Inc. (Synapse). Synapse is a research and consulting firm specializing in electricity and gas industry regulation, planning, and analysis.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of Western Resource Advocates and Sierra Club.

Q. What is your preferred form of address?

A. I use she/her pronouns and am comfortable being addressed as Ms. Whited.

Q. Please give a brief description of your professional experience and education.

A. I have 13 years of experience in economic research and consulting. At Synapse, I have worked extensively on issues related to utility regulatory models and rate design. I have been an invited speaker in numerous industry conferences, including as a panelist for the National Association of Regulatory Utility Commissioners (NARUC) Subcommittee on Rate Design at the 2021 Winter Policy Summit and the 2018 Annual Meeting.

I hold a Master of Arts in Agricultural and Applied Economics and a Master of Science in Environment and Resources, both from the University of Wisconsin-Madison. My qualifications are listed after the conclusion of my testimony.

Q. Have you previously testified before this Commission and other regulatory bodies?

A. Yes. I previously testified before the Commission on rate design issues in Proceeding No. 20AL-0432E and provided testimony support in Proceeding No. 16AL-0048E. In addition, I have testified before the Massachusetts Department of Public Utilities, the Illinois Commerce Commission, the New Hampshire Public Utilities Commission, the Georgia Public Service Commission, the Rhode Island Public Utilities Commission, the Maine Public Utilities Commission, the California Public Utilities Commission, the Hawaii Public Utilities Commission, the Public Service Commission of Utah, the Public Utility Commission of Texas, the Virginia State Corporation Commission, the Newfoundland and Labrador Board of Commissioners of Public Utilities, the Nova Scotia Utility and Review Board, and the Federal Energy Regulatory Commission.

I. Summary

Q. Please summarize your testimony.

A. My testimony responds to the rate design testimony of Black Hills Colorado Electric, LLC ("Black Hills" or "the Company"). In particular, I find that the rates proposed by Black Hills do not comply with § 40-3.2-110(2), C.R.S. or adequately encourage electrification of heating, which is critical to achieving the state's energy policy goals. I therefore propose two cost-reflective rate designs for residential customers with heat pumps as their primary heating source. Section II provides an overview of the policy context for my proposal. Section III explains my proposed heat

pump rates in detail, including the principles and methodology behind the rate designs, the prices themselves, and how the rates reflect Black Hills' cost structure. Section IV analyzes the impacts of my proposed rate on heat pump customers as well as other residential customers. Finally, Section V discusses data collection and reporting related to heat pump customers.

Q. Please summarize your conclusions.

A. My conclusions are as follows:

- None of Black Hills' proposed residential rates reflect the seasonality of demand-related costs, which are primarily driven by the need to meet customers' summer peak demands. This lack of seasonal differentiation over-allocates costs to heat pump customers during summer months and fails to incentivize beneficial electrification of heating.
- It is necessary to implement a heat pump rate now to improve the economics of heat pump adoption and enable more customers to take advantage of tax credits and Clean Heat Plan incentives before 2027.
- My proposed heat pump rates would reduce the operating costs of heat pumps by approximately $500 per year, which would incentivize more rapid heat pump adoption, thereby helping to achieve the state's decarbonization goals without cross-subsidies from other customers.

Q. What are your recommendations?

A. I recommend that the Commission:

- Direct Black Hills to implement one of my proposed revenue-neutral voluntary heat pump rates.
- Require Black Hills to collect and report on certain data related to heat pump customers and adoption of heat pump rates. This will enable the efficacy of

the rate to be evaluated in the next rate case, and modified subsequently as needed.

II. Policy Context

Q. Please summarize Colorado's greenhouse gas emissions reduction targets and the role of electric and gas utilities in achieving these targets.

A. As described in the testimony of WRA and Sierra Club witness Clare Valentine, Colorado has a statewide goal of 100 percent decarbonization by 2050, with interim targets of a 26 percent reduction in greenhouse gas emissions by 2025 and 50 percent by 2030 relative to a 2005 baseline.[1] Further, Senate Bill 21-264 requires gas distribution utilities to implement programs to reduce greenhouse gas emissions. Pursuant to this bill, gas distribution utilities must develop Commission-approved Clean Heat Plans that meet 2025 and 2030 Clean Heat targets.

Q. What is the role of heating electrification in achieving the state's greenhouse gas emissions reduction goals?

A. It is widely recognized that the electrification of space and water heating will play a key role in achieving the state's climate objectives. For example, in approving the Clean Heat Plan of Public Service Company of Colorado, the Commission found that beneficial electrification technologies are among the most cost-effective Clean Heat resources.[2]

Because of the important role that heating electrification will play, the General Assembly recently passed Senate Bill 24-214, which requires investor-owned utilities to

[1] § 25-7-102(2)(g), C.R.S.
[2] Proceeding No. 23A-0392EG, Decision No. C24-0397, ¶121.

propose rates for residential customers who utilize a heat pump as their primary heating source by August 1, 2027.[3]

Q. What are the requirements of a heat pump rate under SB 24-214?

A. Under SB 24-214, a residential heat pump rate must:

- Be voluntary,
- Be designed to lower monthly bills for residential heat pump customers if cost-justified, and
- Avoid cross-subsidies from other customers.

Q. Do the Company's current rate options satisfy the requirements of SB 24-214?

A. No. Currently, residential heat pump customers can take service under Rate RS-1 or Rate RS-EV, neither of which were designed for or targeted to heat pump customers. Rate RS-1, the standard residential tariff, is a tiered volumetric rate with higher per kWh charges for consumption above 500 kWh.[4] Given that customers with heat pumps tend to have higher than average electricity consumption and Rate RS-1 penalizes higher consumption (by charging a higher rate), this rate disincentivizes heat pump adoption.

Rate RS-EV is a time-of-use (TOU) tariff designed for customers with electric vehicle (EV) charging but is available for all residential customers. This rate includes volumetric charges that are differentiated between off-peak and on-peak periods as well as between summer and non-summer months, with a 3:1 ratio between on-peak and off-

[3] § 40-3.2-110(2), C.R.S.
[4] Black Hills Energy, "Schedule of Rates, Rules and Regulations for Electric Service" (2024) at 11, https://www.blackhillsenergy.com/sites/blackhillsenergy.com/files/coe-rates-tariff.pdf.

peak per kWh charges during summer months and a 2:1 ratio between on-peak and off-peak per kWh charges during non-summer months.[5] Rate RS-EV is a better option for heat pump customers than Rate RS-1, since Rate ES-EV does not penalize higher consumption and since its lower rates in the winter are more favorable for heat pump load, which tends to be concentrated in winter months. However, this rate is only implemented on a pilot basis and does not benefit heat pump customers enough to be considered a heat pump rate. In addition, the Company proposes to replace this rate with a non-seasonal TOU rate.

Q. Do any of the Company's proposed rate options satisfy the requirements of SB 24-214?

A. No. None of Black Hills' proposed residential rates are designed to meaningfully lower bills for heat pump customers. The Company's proposed RS-1 modifies the rate to a flat rate, rather than a tiered rate with the same volumetric charge for all consumption levels.[6] While the proposed rate structure improves upon current Rate RS-1 by eliminating the penalty for higher consumption, it does not account for the seasonality of electricity costs, which are primarily driven by summer peak demands. A truly cost-reflective rate would recover more costs in the summer months to reflect this fact. Because heat pump electricity usage occurs primarily during the winter months, a rate that is not seasonally differentiated over-allocates costs to heat pump customers, under-credits heat pump efficiency during summer months, and fails to incentivize beneficial electrification of heating.

[5] *Id.* at 17.
[6] Hrg. Ex. 110, Attachment DNH-10.

The Company also proposes to replace its existing residential TOU rate (Rate RS-EV) with a permanent Rate R-TOU. Unlike RS-EV, Black Hills' proposed TOU rate is not seasonally differentiated,[7] resulting in higher bills for heat pump customers.

Q. SB 24-214 does not require a heat pump rate until 2027. Why should the Commission approve a heat pump rate now?

A. Failure to implement a heat pump rate now will lead to slower customer adoption of heat pumps and higher costs for these customers over the long-term. Currently, switching from natural gas to an electric heat pump may not be economically attractive for most Black Hills customers, even after accounting for heat pump incentives offered by the gas utilities[8] and the heat pump tax credits made available by the Inflation Reduction Act (IRA).[9] This is due in part to the costs of operating a heat pump, which are generally not addressed by the available incentives and tax credits.

Implementing a heat pump rate now would help customers economically justify switching to a heat pump and enable them to take advantage of the IRA tax credits for heat pumps years sooner. Moreover, significant heat pump incentives are available to many Black Hills customers through Public Service Company of Colorado's 2024-2027 Clean Heat Plan, but it is not guaranteed that similar incentives will remain available after the plan period. Waiting until 2027 to evaluate a heat pump rate would waste

[7] Hrg. Ex. 110, Attachment DNH-8.
[8] Xcel Energy, "Heat Pump Rebates", https://co.my.xcelenergy.com/s/residential/heating-cooling/heat-pumps.
[9] Rewiring America, "25C Residential Energy Efficiency Tax Credit and 25D Residential Clean Energy Tax Credit" (2024), https://assets.ctfassets.net/v4qx5q5o44nj/3FYfJiYMILiXGFghFEUx0D/279f180456183d560d9c68d4de8baa67/factsheet_25C_25D.pdf.

valuable time and the opportunity to align the Company's rates with complementary incentive programs available in the next few years.

In addition, because Black Hills' system is summer peaking, adding load during the winter months will help utilize the existing grid infrastructure more efficiently. By increasing electricity usage in the winter, heat pumps can help spread out the fixed costs of the utility system over more sales, resulting in lower electricity rates for all customers.

The adoption of a residential heat pump rate in the instant proceeding is necessary to ensure progress towards Colorado's ambitious climate and greenhouse gas emissions reduction targets in the near term, while also maximizing benefits for all ratepayers by allowing customers to take advantage of heat pump incentives and putting downward pressure on utility rates through more efficient utilization of grid infrastructure.

III. Overview of Sierra Club/WRA Residential Heat Pump Rate Proposal

Q. What principles did you rely on to guide your proposed rate design?

A. The primary principles guiding my proposed rate design are those enumerated by James Bonbright in his seminal work "Principles of Public Utility Rates," which are widely used in the industry.[10] These principles can be summarized as follows:[11]

1) Sufficiency: rates should yield revenues sufficient to recover utility costs.

[10] James Bonbright. 1960. *Principles of Public Utility Rates*. https://www.raponline.org/knowledge-center/principles-of-public-utility-rates/.
[11] Melissa Whited. 2017. The Ratemaking Process. https://www.synapse-energy.com/sites/default/files/Ratemaking-Fundamentals-FactSheet.pdf.

2) Fairness: rates should fairly apportion costs among different customers and avoid "undue discrimination" in rate relationships.
3) Efficiency: rates should provide efficient price signals and discourage wasteful usage.
4) Customer acceptability: rates should be relatively stable, predictable, simple, and easily understandable.

Aside from these principles, my proposed rates are also designed to help advance public policy goals, namely promoting heat pump adoption while avoiding cross subsidies as stipulated by SB 24-214, and enabling more customers to take advantage of heat pump incentives, such as IRA tax credits and the incentives available through Public Service Company of Colorado's recently approved Clean Heat Plan.

Q. Please describe your proposed residential heat pump rates.

A. I am proposing two seasonal heat pump rate options (RS-HP and RS-HP-TOU) that are cost-reflective and designed to be revenue neutral with the standard residential rate (RS-1). These rates have volumetric charges that are higher in the summer season to reflect the fact that Black Hills' system is designed to meet summer peak loads. In addition, the RS-HP-TOU rate has an on-peak period of 4:00 p.m. to 8:00 p.m. on non-holiday weekdays during the summer months, which is in alignment with the summer on-peak window proposed by Black Hills for its non-seasonal TOU rate (R-TOU).

To develop these rates, I allocated 40 percent of demand- and energy-related costs to all hours, with the remaining 60 percent of demand and energy-related costs allocated to the summer hours to reflect the fact that system costs are primarily driven

by usage during summer peak hours. The resulting RS-HP rate has a flat volumetric charge of $0.28/kWh in the summer and $0.06/kWh in the winter.

For the RS-HP-TOU rate, I set the summer on-peak rate to 1.5 times the summer off-peak rate, to reflect that the system peak is more likely to occur during on-peak hours. I chose this relatively mild on-peak to off-peak price differential in the interest of gradualism and customer acceptability, as the summer rate is already substantially higher than the non-summer rate. The resulting rate for RS-HP-TOU is $0.39/kWh for the summer on-peak period, $0.26/kWh for the summer off-peak period, and $0.06/kWh for all winter hours. **Table MW-1** below summarizes my proposed rate options.

Table MW-1. Summary of Proposed Heat Pump Rates

	SC/WRA Proposed RS-HP	SC/WRA Proposed RS-HP-TOU
Summer On-Peak	$0.2838	$0.3900
Summer Off-Peak	$0.2838	$0.2621
Non-Summer On-Peak	$0.0595	$0.0595
Non-Summer Off-Peak	$0.0595	$0.0595

Q. Do you have a primary heat pump rate proposal?

A. Yes. Given Black Hills customers' limited experience with TOU rates to date, my proposed non-TOU seasonal heat pump rate (RS-HP) may be most appropriate and most likely to gain customer uptake in the near-term. However, in the near future, I expect Black Hills' rates to move toward more time-varying approaches because of the greater benefits that TOU rates provide in terms of reducing peak demand, while providing customers with greater control of their bills. Sierra Club and WRA remain

interested in parties' input on both of these proposed heat pump rates as this proceeding develops.

Q. How do your proposed heat pump rates align with the rate design principles you enumerated above?

A. First, both of my proposed rates meet the principle of revenue sufficiency by being revenue-neutral to the standard residential rate, RS-1. Second, these rates improve fairness by being more cost-reflective than a non-seasonal rate. Specifically, my proposed seasonal rates recognize that system costs are driven primarily by summer peak demands, and therefore allocate more costs to the summer months and fewer costs to the winter months. Customers who use less electricity during the summer months and more during the winter months will therefore pay less on the seasonal rates than on the Company's non-seasonal residential rates. Third, by more accurately reflecting cost causation, the seasonal rate structure encourages customers to make economically efficient decisions regarding heat pumps, which primarily consume electricity during non-summer months and more efficiently cool during summer months. Fourth, my proposed rates are simple to understand, which facilitates customer acceptance.

Last, my rates are designed to align with the requirements of SB 24-214 by lowering the electric bills for heat pump customers by approximately $500 annually, and by avoiding cross-subsidies by being cost-reflective and revenue neutral.

Q. Are your proposed heat pump rates intended to be limited to customers who install heat pumps?

A. Yes. I propose that customers who wish to enroll in a heat pump rate be required to attest to having a heat pump as their primary heating source.

Q. Have other jurisdictions used self-attestation as a means to determine customer eligibility for technology-specific rates?

A. Yes. Self-attestation is common for determining eligibility for many utility tariffs designed for customers adopting specific technologies. For example, to enroll in Southern California Edison's TOU-D-PRIME tariff, a customer must attest that they have an electric vehicle, battery, or electric heat pump.[12] As another example, Central Maine Power's Seasonal Heat Pump rate requires customers to affirm that they have a heat pump through a web form but does not require verification.[13]

Q. Do you propose any other requirements for enrollment in a heat pump rate?

A. Yes. In addition to self-attestation to having an eligible heat pump technology, I propose that customers who leave the rate be ineligible to re-enroll in the rate for 12 months. This will prevent customers from enrolling in the rate only for the winter season when the rate is lower than the standard residential rate.

[12] Southern California Edison, Rate Options for Clean Energy Technology, Go Electric with a Great Plan (2024), https://www.sce.com/residential/rates/electric-vehicle-plans.
[13] Central Maine Power, NEW Delivery Rate Options (2024), https://www.cmpco.com/account/understandyourbill/newseasonalheatpumprate.

IV. Rate Design Methodology for Proposed Heat Pump Rates

Q. Do your proposed rate designs reflect the Company's cost structure?

A. Yes. Because most variable energy costs are recovered through the Energy Cost Adjustment Rider, the Company's base rates are primarily comprised of demand-related costs.[14] These costs are directly associated with providing the infrastructure needed to ensure that the Company can meet the peak demands of its customers. The Company's System Load Study shows that the highest system peaks have occurred overwhelmingly in the summer (June through September) for the last decade.[15]

Figure MW-1. Maximum Monthly System Peak 2014-2023 (MW)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	277	285	258	247	300	377	384	361	362	262	285	298
2015	288	294	289	257	248	383	392	381	354	283	293	303
2016	290	299	250	265	277	406	412	395	356	277	287	302
2017	297	288	274	243	293	380	398	363	367	254	283	299
2018	291	279	254	277	332	413	411	366	377	313	291	289
2019	288	277	285	253	279	369	422	408	395	297	291	292
2020	278	273	272	257	320	368	397	401	383	284	266	297
2021	273	296	277	255	275	395	407	401	393	275	267	279
2022	279	296	281	246	317	381	410	402	382	261	279	334
2023	299	294	273	242	278	359	411	398	386	297	271	288

Because the Company must build its system to meet the maximum peak demand of its customers, it is reasonable to implement a seasonal rate to recover a larger portion of demand-related costs during summer months. Further, the Company has identified the hours of 4:00 p.m. to 8:00 p.m. as the hours in which peak demand is most likely to occur.[16] These hours align with the on-peak summer period of my proposed rate RS-HP-TOU.

[14] Hrg. Ex. 110, Attachment DNH-7HC.
[15] Hrg. Ex. 110, Attachment DNH-1.
[16] Hrg. Ex. 110, Hyatt Direct Testimony at 48.

Q. Please describe the methodology you used to develop your proposed flat seasonal heat pump rate (RS-HP).

A. To develop my proposed seasonal heat pump rate (RS-HP), I used a method for allocating demand- and energy-related costs to each season that is similar to the Average and Excess Method commonly used for cost allocation. This method divides the residential demand- and energy-related revenue requirement into two parts: one part is associated with serving the class's average demand and is seasonally allocated based on energy, while the other component is associated with serving demand in excess of the average and is allocated to the season in which peak demands generally occur.

I calculated that the residential class's average hourly demand over the course of the year was 40 percent of the residential class's peak demand. Thus, 40 percent of the energy- and demand-related residential revenue requirement was designed to be collected over all hours of the year in proportion to energy sales, while 60 percent was designed to be collected during the summer months.

Q. What were the results of your seasonal cost analysis?

A. My analysis resulted in a summer volumetric rate of $0.28/kWh and a non-summer volumetric rate of $0.06/kWh.

Q. Please describe the methodology you used to develop your proposed TOU heat pump rate (RS-HP-TOU).

A. To develop my proposed seasonal TOU heat pump rate (RS-HP-TOU), I began with the analysis described above for the seasonal rate (RS-HP). I then increased the proportion of costs allocated to the on-peak hours of the summer (4:00 p.m. to 8:00 p.m.) to create an on-peak to off-peak rate differential of approximately 1.5:1. I selected an

on-peak to off-peak price differential of 1.5:1 in the interest of gradualism and customer acceptability, as the summer rate is already substantially higher than the winter rate. This results in an on-peak summer rate of $0.39/kWh and an off-peak summer rate of $0.26/kWh. All winter hours are priced at $0.06/kWh.

V. Impacts of Proposed Rate Design

Q. How would your proposed rates help to promote the adoption of heat pumps?

A. Under my proposed rates, a typical customer that installs a heat pump would save approximately $500 per year relative to the Company's proposed flat rate (RS-1) or proposed non-seasonal TOU rate (R-TOU). These impacts are shown in the table below. Notably, these savings are approximately equivalent to the incremental annual operating cost for a heat pump relative to a gas furnace, for a customer in Pueblo, as discussed by WRA and Sierra Club witness Clare Valentine.

Table MW-2. Annual Bills for a Heat Pump Customer

	Black Hills RS-1	Black Hills R-TOU	SC/WRA Proposed RS-HP	SC/WRA Proposed RS-HP-TOU
Summer On-Peak	$0.1481	$0.2591	$0.2838	$0.3900
Summer Off-Peak	$0.1481	$0.1295	$0.2838	$0.2621
Non-Summer On-Peak	$0.1481	$0.2591	$0.0595	$0.0595
Non-Summer Off-Peak	$0.1481	$0.1295	$0.0595	$0.0595
Annual Heat Pump Customer's Bill	$2,047	$2,103	$1,525	$1,549
Annual Cost Relative to RS-1		$56	($522)	($498)

Q. How did you calculate these impacts for a heat pump customer?

A. I modeled the bill impacts using a representative load profile for customers in Teller, El Paso, Fremont, Custer, Pueblo, Crowley, and Otero counties. This load profile was developed by Rewiring America using data from the National Renewable Energy Laboratory's (NREL) residential building database (ResStock) for customers with ducted natural gas heat.[17] Rewiring America then modified the load profile to reflect the adoption of an air source heat pump (ASHP).[18] I then calculated a heat pump customer's electric bill under Black Hills' residential rates and my proposed heat pump rates.

Q. How do your proposed heat pump rate designs impact other, non-participating residential customers?

A. Because my proposed rates are revenue-neutral and cost-based, they would not result in cross-subsidies from other customers. Instead, by more accurately reflecting cost causation, my proposed heat pump rates would enhance fairness and reduce cross-subsidies from heat pump customers to customers who use more electricity during summer peak hours. Additionally, because heat pump load is concentrated in winter months, new heat pump load on the system can put downward pressure on rates for all

[17] National Renewable Energy Laboratory. End-Use Load Profiles for the U.S. Building Stock, https://registry.opendata.aws/nrel-pds-building-stock. These data were filtered for occupied single-family housing.

[18] The simulated air-source heat pump has performance characteristics similar to a centrally-ducted heat pump with Seasonal Energy Efficiency Ratio ("SEER") 18, 10 Heating Seasonal Performance Factor. The modeled air-source heat pump uses electric resistance backup, is sized using the Home Energy Rating System methodology, and does not have a setpoint setback. The performance of the heat pump was selected to be similar to heat pumps which would qualify for the Inflation Reduction Act's home energy tax credits in Colorado.

residential customers by helping to spread the fixed costs of the grid across a higher volume of energy consumption.

Q. How do your proposed rate designs encourage load flexibility and efficient grid utilization for customers with both heat pump and EV charging load?

A. By having time-differentiated volumetric charges in the summer, my proposed RS-HP-TOU rate would encourage residential customers with both heat pump and EV charging load to shift load away from summer peak periods. On the other hand, Rate RS-HP, being a flat seasonal rate, would not provide such price signals for customers to shift their EV charging load away from summer peaks. If the Commission approves Rate RS-HP, Black Hills should encourage EV customers on this rate to participate in the Company's Behavioral Charging pilot to ensure that they are incentivized to shift their EV charging load to off-peak hours.

VI. Data Collection and Reporting

Q. Why is it important for the Company to collect data on heat pump customers?

A. Customers with heat pumps often have different load profiles compared to other residential customers and generally have higher consumption and demand during winter months when heating need is the greatest. These different electricity consumption patterns mean that heat pump customers have different impacts on Black Hills' system, with potential implications for system planning and cost recovery. While heat pump adoption in the Company's service territory in the next few years is not

expected to significantly affect system-wide demand or peak demand, higher levels of heat pump adoption over a longer period can result in substantial increases in winter peak demand. It is important for the Company to understand heat pump customers' load profiles so that the Company can effectively plan for increased winter load and develop future rate options that ensure fair cost recovery.

Additionally, when paired with smart thermostats or other demand management strategies, heat pumps can be a flexible and cost-saving resource for the grid. Data on customer load patterns can inform effective program design to encourage load shifting and demand response, which can help lower costs for all ratepayers.

Q. What data should the Company collect on heat pump customers?

A. I recommend that the Company collect and annually report the data below in a filing to the Commission.

1) Data related to customer acceptance and effectiveness of marketing:
    a) The number of customers who enroll or disenroll in a heat pump rate, by month;
    b) For customers who disenroll in the rate, the reason for disenrolling in a heat pump rate;
    c) For new customers, how the customer learned about the heat pump rate.
2) Data that will assist Black Hills anticipate future peak demand and load growth from heat pumps:
    a) Hourly energy consumption for residential heat pump customers on a heat pump rate;
    b) Energy consumption by season, on-peak vs off-peak periods for customers enrolled on a heat pump rate;
    c) Coincident and non-coincident peak demand for customers enrolled in a heat pump rate;

d) Weather data (heating degree days and cooling degree days) to enable the Company to better forecast heat pump load during summer and winter peaks.

Data regarding customer enrollment will assist the Company, the Commission, and other stakeholders understand customer willingness to adopt a heat pump rate and inform potential modifications to the rate in the future. Customer load data will help facilitate planning for future winter load growth, as well as inform cost allocation decisions.

VII. Conclusion

Q. Please summarize your conclusions and recommendations.

A. Black Hills' residential rate options fail to adequately incentivize beneficial electrification of heating. The Company's proposed rates lack seasonal differentiation, which over-allocates costs to heat pump customers, unreasonably increasing the cost of heat pump adoption and slowing Colorado's progress to meeting its climate goals. To address this, Black Hills should implement a heat pump rate now to improve the economics of heat pump adoption and enable more customers to take advantage of tax credits and Clean Heat Plan incentives before 2027.

I recommend that the Commission adopt one of my proposed heat pump rates, which would reduce the operating costs of heat pumps by approximately $500 per year. I also recommend that Black Hills collect and report on certain data related to heat pump customers and adoption of heat pump rates, so that the Company can better plan for and address increases in winter peak demand.

Does this conclude your testimony?

A. Yes.

Melissa Whited, Vice President

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Cambridge MA. *Vice President,* April 2023 – Present; *Senior Principal,* May 2022 – April 2023, *Principal Associate,* 2017 – May 2022*, Senior Associate,* 2015 – 2017*, Associate*, 2012 – 2015

Consult and provide analysis of rate design proposals, alternative regulation, and other topics including distributed energy resources and electric vehicles. Develop expert witness testimony in public utility commission proceedings. Author reports on topics at the intersection of utility regulation, customer protection, and environmental impacts.

University of Wisconsin - Madison, Department of Agricultural and Applied Economics, Madison, WI. *Teaching Assistant – Environmental Economics*, 2011 – 2012

Developed teaching materials and led discussions on cost-benefit analysis, carbon taxes and cap-and-trade programs, management of renewable and non-renewable resources, and other topics.

Public Service Commission of Wisconsin, Water Division, Madison, WI. *Program and Policy Analyst - Intern*, Summer 2009

Researched water conservation programs nationwide to develop a proposal for Wisconsin's state conservation program. Developed spreadsheet model to calculate avoided costs of water conservation in terms of energy savings and avoided emissions.

Synapse Energy Economics, Cambridge, MA. *Communications Manager*, 2005 – 2008

Developed technical proposals for state and federal agencies, environmental and public interest groups, and businesses. Edited reports on energy efficiency, integrated resource planning, greenhouse gas regulations, renewable resources, and other topics.

EDUCATION

University of Wisconsin, Madison, WI
Master of Arts in Agricultural and Applied Economics, 2012
Certificate in Energy Analysis and Policy
National Science Foundation Fellow

University of Wisconsin, Madison, WI
Master of Science in Environment and Resources, 2010
Certificate in Humans and the Global Environment
Nelson Distinguished Fellowship

Southwestern University, Georgetown, TX
Bachelor of Arts in International Studies, *Magna cum laude,* 2003.

ADDITIONAL SKILLS

- Econometric Modeling – Linear and nonlinear modeling including time-series, panel data, logit, probit, and discrete choice regression analysis
- Nonmarket Valuation Methods for Environmental Goods – Hedonic valuation, travel cost method, and contingent valuation
- Cost-Benefit Analysis
- Input-Output Modeling for Regional Economic Analysis

FELLOWSHIPS AND AWARDS

- Winner, M. Jarvin Emerson Student Paper Competition, Journal of Regional Analysis and Policy, 2010
- Fellowship, National Science Foundation Integrative Graduate Education and Research Traineeship (IGERT), University of Wisconsin – Madison, 2009
- Nelson Distinguished Fellowship, University of Wisconsin – Madison, 2008

PUBLICATIONS

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Shenstone-Harris, S., A. Zeng, L. Metz, M. Whited. 2024. *On the Road to Fleet Electrification: A Framework for Estimating Distribution System Impacts of Medium- and Heavy-Duty Vehicle Electrification.* Synapse Energy Economics for Advanced Energy United.

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New York Public Service Commission (Case 17-E-0238): Direct and rebuttal testimony of Tim Woolf and Melissa Whited regarding Earnings Adjustment Mechanisms proposed by National Grid. On behalf of Advanced Energy Economy Institute. August 25 and September 15, 2017.

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Federal Energy Regulatory Commission (Docket No. EC13-93-000): Affidavit regarding potential market power resulting from the acquisition of Ameren generation by Dynegy. On behalf of Sierra Club. August 16, 2013.

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Missouri Public Service Commission (Case No. ER-2014-0370): Direct and surrebuttal testimony on the topic of Kansas City Power and Light's rate design proposal. On behalf of Sierra Club. April 16, 2015 and June 5, 2015.

Wisconsin Public Service Commission (Docket No. 05-UR-107): Direct and surrebuttal testimony of Rick Hornby regarding Wisconsin Electric Power Company rate case. On behalf of The Alliance for Solar Choice. August 28, 2014 and September 22, 2014.

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Whited, M. 2021. "Evolution of Net Metering in Hawaii." Presentation to the NARUC Winter Policy Summit. February 4.

Biewald, B., M. Whited. "Evaluating and Shaping the Impacts of EVs on Customers: Tools for Consumer Advocates." Presentation at the NASUCA Mid-Year Meeting, June 19, 2019.

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Whited, M. 2016. "Energy Policy for the Future: Trends and Overview." Presentation to the National Conference of State Legislators' Capitol Forum, Washington, DC, December 8.

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Whited, M. 2016. "Performance Based Regulation." Presentation to the NARUC Rate Design Subcommittee. September 12.

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Resume updated May 2023

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

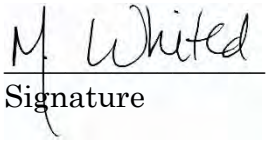
PROCEEDING NO. 24AL-0275E

IN THE MATTER OF ADVICE LETTER NO. 871 FILED BY BLACK HILLS COLORADO ELECTRIC, LLC DOING BUSINESS AS BLACK HILLS ENERGY TO INCREASE BASE RATES FOR RESIDENTIAL AND SMALL COMMERCIAL CUSTOMER CLASSES, TO BECOME EFFECTIVE JULY 15, 2024

AFFIDAVIT OF MELISSA WHITED

COMES NOW Melissa Whited, of proper age and duly sworn, and states that the attached Testimony in the above-captioned matter was prepared by her or under her supervision and control and that it is true and correct to the best of her knowledge and belief, and would be the same if given orally under oath.

Melissa Whited
Vice President
Synapse Energy Economics
485 Massachusetts Avenue, Suite 3
Cambridge, MA 02139



Signature

10/11/2024
Date

Signature of Counsel