

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

PROCEEDING NO. 21A – _____E

IN THE MATTER OF THE VERIFIED APPLICATION OF BLACK HILLS COLORADO ELECTRIC, LLC FOR APPROVAL TO RECOVER GAS COSTS ASSOCIATED WITH THE FEBRUARY EXTREME COLD WEATHER EVENT

DIRECT TESTIMONY AND ATTACHMENTS OF

DONALD E. STAHL

ON BEHALF OF

BLACK HILLS COLORADO ELECTRIC, LLC

NOTICE OF CONFIDENTIALITY

THE FOLLOWING ATTACHMENTS HAVE BEEN FILED UNDER SEAL:

Hearing Exhibit 102, Attachment DES-2C – BHCOE Load Forecast and Actuals
Hearing Exhibit 102, Attachment DES-3HC – Summary Day Ahead and Actual Pricing
Hearing Exhibit 102, Attachment DES-5HC – February 11 Energy Sales

These documents are filed under seal pursuant to 4 CCR 723-1-1100 and 1101
Redacted Versions have been filed publicly

May 18, 2021

SUMMARY OF THE DIRECT TESTIMONY OF DONALD E. STAHL

Mr. Donald E. Stahl is employed by Black Hills Service Company, LLC as Director, Generation Dispatch & Power Marketing (“GDPM”). In this role, Mr. Stahl is responsible for overseeing the GDPM department of Black Hills Energy, which provides the generation dispatch and power marketing services required to fulfill Black Hills Energy’s energy supply obligations. GDPM currently performs these services for Black Hills Energy’s three regulated utilities, including Black Hills Colorado Electric, LLC (“BHCE” or “Company”).

The purpose of Mr. Stahl’s Direct Testimony is to describe GDPM’s weather, load, and market energy price forecasting, as well as its generation dispatch management, for the significant natural gas market event that occurred between February 13 and February 17, 2021 (“February Event”). Mr. Stahl explains how these factors each affect the Company’s gas purchasing and management decisions, which are discussed in more detail by Company witness Mr. Kent Kopetzky. Mr. Stahl further explains how GDPM prudently managed the available data regarding generation dispatch and the energy markets to first ensure safe and reliable service to customers and next maximize cost-effectiveness to the extent possible under the circumstances.

Specifically, Mr. Stahl begins by providing an overview of the February event, highlighting that it was a market gas pricing event rather than a peak load event. He also explains that the Company’s gas supply management is driven by GDPM’s needs for gas to dispatch the five units at Pueblo Airport Generating Station (“PAGS”). Mr. Stahl next describes the Company’s generation resource mix in more detail, noting that when non-dispatchable wind is available, GDPM always relies on wind first. For most of the February Event, the wind was not blowing. Therefore, PAGS was the primary dispatchable resource on which BHCE relied to serve customers.

Part of GDPM's resource planning also involves potential market purchases and sales, which are primarily made on the day ahead market to ensure adequate reliability. Across the industry, energy purchases are typically made earlier than gas purchases. GDPM also maintains a real time desk that regularly updates forecasts of load and market pricing to effectively manage the system. GDPM transacts in the real time market; however, over-reliance on spot purchases would jeopardize reliable service, particularly during volatile supply periods like the February Event.

Mr. Stahl then describes how GDPM's planning to serve its electric load follows a specific set of steps, beginning with weather and load forecasting on a day ahead basis, using reliable, well-established industry models. The weather and load forecasting is used – along with initial gas supply cost estimates, heat rate curves, and forecasted day ahead market energy prices – to determine how to dispatch its available generation resources and where market energy purchases and sales are appropriate. In turn, this dispatch plan results in a determination of gas supply requirements, which GDPM provides to Gas Supply to manage gas purchases and sales.

Finally, Mr. Stahl describes BHCE's increased personnel deployment and ongoing management actions in preparation for and during the February Event. He steps through GDPM's process, and details the information available to BHCE regarding gas and energy market pricing when it was undertaking dispatch planning and making energy purchases. He compares that data to what actually transpired, which were very significantly higher natural gas market prices than forecasts, indices, trading hubs, and other data had predicted. Mr. Stahl also describes the steps GDPM took to manage through the February Event in real time, making prudent decisions and successfully providing electric service to customers throughout the February Event.

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ATTACHMENTS

Hearing Exhibit 102, Attachment DES-1, Pueblo Historical DA Temp Forecasts

Hearing Exhibit 102, Attachment DES-2C, Load Forecasts and Actuals

Hearing Exhibit 102, Attachment DES-2, Load Forecasts and Actuals

Hearing Exhibit 102, Attachment DES-3HC, Summary Day Ahead and Actual Pricing

Hearing Exhibit 102, Attachment DES-3, ,Summary Day Ahead and Actual Pricing

Hearing Exhibit 102, Attachment DES-4, Load and Resource Stack

Hearing Exhibit 102, Attachment DES-5HC, February 11 Energy Sales

Hearing Exhibit 102, Attachment DES-5, February 11 Energy Sales

List of Acronyms

BHC	Black Hills Corporation
BHCE	Black Hills Colorado Electric, LLC
BHSC	Black Hills Service Company, LLC
Company	Black Hills Colorado Electric, LLC
February Event	the extreme weather and natural gas event that occurred across the United States in February of 2021, and particularly from February 13-17, 2021
GDPM	Generation Dispatch & Power Marketing
HL	Heavy load
JDA	Joint Dispatch Agreement
JDA Parties	PSCo, Colorado Springs Utilities, and Platte River Power Authority
LL	Light load
MISO	Midcontinent Independent System Operator
MW	megawatts
NWPP	Northwest Power Pool
PAGS	Pueblo Airport Generating Station
PRT	Pattern Recognition Technology
PSCo	Public Service Company of Colorado
USF	unscheduled flows
WECC	Western Electricity Coordinating Council

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DIRECT TESTIMONY OF DONALD E. STAHL

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Donald Stahl. My business address is 7001 Mount Rushmore Road, Rapid City, South Dakota 57709.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Black Hills Service Company, LLC ("BHSC"), a wholly owned subsidiary of Black Hills Corporation ("BHC"). I am Director, Generation Dispatch & Power Marketing ("GDPM").

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of Black Hills Colorado Electric, LLC ("BHCE" or the "Company") d/b/a Black Hills Energy.

II. STATEMENT OF QUALIFICATIONS

Q. WHAT ARE THE DUTIES AND RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. As Director of GDPM, my current responsibilities include overseeing the GDPM department of Black Hills Energy, which provides the generation dispatch and power marketing services required to fulfill Black Hills Energy's energy supply obligations. GDPM currently performs these services for Black Hills Energy's three regulated utilities along with third-party utilities, and other large customers. GDPM regularly transacts with multiple counterparties in a number of regions, including but not limited to, the Northwest,

1 Southwest, Rockies, Southwest Power Pool, and the Midcontinent Independent System
2 Operator (“MISO”).

3 **Q. PLEASE OUTLINE YOUR EDUCATIONAL AND PROFESSIONAL**
4 **BACKGROUND.**

5 A. My education, employment history and professional experience is provided in Appendix A
6 to my Direct Testimony.

7 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?**

8 A. No.

9

10 **III. PURPOSE OF TESTIMONY**

11 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

12 A. The purpose of my Direct Testimony is to support BHCE’s request to recover the gas
13 commodity purchase costs associated with the extreme weather and natural gas event that
14 occurred across the United States in February of 2021, and particularly from February 13-
15 17, 2021 (the “February Event”). As Director of GDPM, I specifically support the
16 Company’s load and generation forecasting processes and gas needs during this period,
17 comparing them to actuals, as well as the Company’s dispatch decisions. Overall, I explain
18 how the Company’s planning and decision making ensured safe and reliable electric
19 service to our customers, while making reasonable and prudent decisions for our customers
20 under the existing market conditions.

21 **Q. WHAT ARE THE ATTACHMENTS TO YOUR TESTIMONY?**

22 A. Following is the list of attachments to my testimony:

- 23
- Hearing Exhibit 102, Attachment DES-1, Pueblo Historical DA Temp Forecasts

- 1 • Hearing Exhibit 102, Attachment DES-2C, Load Forecasts and Actuals
- 2 • Hearing Exhibit 102, Attachment DES 2, Load Forecasts and Actuals
- 3 • Hearing Exhibit 102, Attachment DES-3HC, Summary Day Ahead and Actual Pricing
- 4 • Hearing Exhibit 102, Attachment DES 3, Summary Day Ahead and Actual Pricing
- 5 • Hearing Exhibit 102, Attachment DES-4, Load and Resource Stack
- 6 • Hearing Exhibit 102, Attachment DES-5HC, February 11 Energy Sales
- 7 • Hearing Exhibit 102, Attachment DES-5, February 11 Energy Sales

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9 **IV. OVERVIEW OF FEBRUARY EVENT AND GDPM'S ROLE**

10 **Q. PLEASE PROVIDE AN OVERVIEW OF GENERATION DISPATCH AND**
11 **POWER MARKETING FOR BHCE.**

12 A. The Company's GDPM services help ensure reliable and efficient dispatch of owned
13 electric generation resources, contracted power purchase agreements, and market
14 purchases to serve BHCE's nearly 100,000 retail customers in 21 communities, primarily
15 in rural portions of Southern Colorado. In 2020, the Company's annual retail sales were
16 1,911,627 MWh and the system peak was 416 MW. Overall, the Company's energy power
17 supply is comprised of approximately 70% natural gas and 30% renewable energy, which
18 must be dispatched in a way that provides reliable, environmentally-sound, and cost-
19 effective service to BHCE customers.

20 The number one duty and responsibility of GDPM is to ensure, to the best of our
21 ability, the health and safety of Company employees and customers while complying with
22 all governing regulations and laws. GDPM's next priority is system reliability for Black
23 Hills' systems and for the bulk electric system. Following reliability, GDPM strives to

1 provide the most cost-effective available resources to its customers while still meeting its
2 obligation to serve.

3 **Q. WHAT IS THE ROLE OF GDPM IN THE COMPANY'S GAS PURCHASING AND**
4 **USAGE DECISIONS?**

5 A. GDPM's primary responsibilities are to oversee the Company's weather and load
6 forecasting and generation resource utilization, and to manage power purchases and sales,
7 in order to safely, efficiently, and cost-effectively provide electric service to Black Hills'
8 customers. The Company's primary dispatchable generation resource is the Pueblo Airport
9 Generating Station ("PAGS"), consisting of five natural gas units. As a result, the
10 Company's PAGS dispatch decisions, combined with its energy market forecasts,
11 determine how much natural gas the Company needs to purchase on any given day.

12 **Q. HOW DOES GDPM ENSURE IT FOLLOWS INDUSTRY BEST PRACTICES TO**
13 **FORECAST WEATHER, LOAD, AND DISPATCH NEEDS?**

14 A. GDPM uses market-leading systems for forecasting and modeling, as well as industry best
15 practices for determining the effectiveness of its energy transactions. Specifically, GDPM
16 uses tested models to predict future weather, load, and energy prices. The Company also
17 uses production cost models that are generated annually to forecast average system costs.
18 The GDPM team regularly evaluates differences between models and actual results to
19 enhance forecasting accuracy. Finally, GDPM compares its energy trading prices with
20 those at the relevant trading hubs, to confirm that BHCE's prices paid and received for
21 sales and purchases are generally aligned with the broader marketplace.

22 **Q. PLEASE SUMMARIZE THE FEBRUARY EVENT FROM A WEATHER**
23 **PERSPECTIVE.**

1 A. As described in more detail by Company witness Mr. Michael Harrington, Presidents' Day
2 weekend of 2021 presented an unprecedented cold snap across much of the United States
3 that created high demand for natural gas. Beginning on February 13, 2021, record-breaking
4 cold temperatures engulfed much of BHCE's service territory. The City of Pueblo
5 recorded a temperature of -20 degrees Fahrenheit on February 15, 2021.

6 **Q. HOW DID THIS TRANSLATE INTO LOAD FORECASTS FOR THE FEBRUARY**
7 **EVENT?**

8 A. While the February Event was particularly cold for BHCE's service territory, demand
9 increased but did not reach unprecedented levels. The Company's forecasted and actual
10 load did not reach its all-time winter peak – let alone its summer peak which tends to be
11 approximately 100 megawatts ("MW") higher. Rather, the record cold and other
12 circumstances across the middle United States ultimately led to largely unprecedented
13 market prices for gas and energy needed to serve utility customers. As such, in the days
14 leading to the February Event (February 13-17, 2021), BHCE was preparing to ensure it
15 had sufficient resources to reliably serve its load during particularly cold days.

16 **Q. IN LIGHT OF THE HIGHER DEMAND AND MARKET PRICES, HOW WAS**
17 **THE COMPANY ULTIMATELY ABLE TO PROVIDE RELIABLE SERVICE TO**
18 **ITS CUSTOMERS DURING THIS EVENT?**

19 A. BHCE drew on all the tools available to it to manage through these volatile market
20 conditions, and in doing so maintained reliable electric service to its customers during this
21 dangerous cold. Because the wind was largely not blowing during the coldest periods,
22 BHCE could not rely on wind facilities during most of the event. As a result, BHCE's

1 dispatchable natural gas fired units played a critical role in keeping the power on during
2 this timeframe.

3 Specifically, BHCE's reliability during the February Event was primarily supported
4 by: (1) prudent gas procurement for PAGS; (2) the availability of dispatchable resources;
5 (3) economy energy trading; and (4) communications with customers. Company witness
6 Mr. Kent Kopetzky discusses the Company's gas purchasing, and Company witness Mr.
7 Harrington discusses customer communications. I discuss our resource planning and
8 dispatch, PAGS operation, and energy trading. I first discuss BHCE's generation resource
9 mix, and then speak to GDPM's weather and load forecasts that drive our generation needs,
10 particularly during the February Event. Lastly, I discuss the Company's generation
11 resource availability and management during the February Event, which in turn affected
12 the Company's natural gas needs.

13
14 **V. THE COMPANY'S RESOURCE MIX**

15 **Q. WHAT GENERATION RESOURCES ARE IN THE COMPANY'S RESOURCE**
16 **MIX TO SERVE BHCE LOAD?**

17 A. BHCE's electric generation fleet primarily consists of PAGS, three wind farms (Busch
18 Ranch 1, Busch Ranch 2, and Peak View Wind Energy), and diesel reciprocating engines.
19 Specifically, at PAGS BHCE owns two LMS100 units and an LM6000 unit, while a non-
20 regulated affiliate owns the majority interest in two combined cycle units. The five
21 generating units at PAGS have a total nameplate capacity of 420 MW. Of this amount,
22 approximately 330 MW were available at the time of the February Event (due to a pre-
23 existing outage at one LMS100 unit, unrelated to the February Event). The wind farms

1 together have a combined 149 MW nameplate capacity, and the diesel reciprocating
2 engines offer 28 MW and are located strategically at three different locations throughout
3 the service territory.

4 **Q. FOR WHAT PURPOSES DOES BHCE, AN ELECTRIC UTILITY, PURCHASE**
5 **OR OTHERWISE USE NATURAL GAS?**

6 A. BHCE procures natural gas to operate the generating units located at PAGS. As Company
7 witness Mr. Kopetzky describes in more detail, BHCE procures the natural gas needs for
8 all units operating at PAGS, rather than requiring the owners of these respective units to
9 contract separately and individually.

10 **Q. DOES THE COMPANY ALSO PURCHASE AND SELL ENERGY IN THE**
11 **MARKET FROM TIME TO TIME?**

12 A. Yes. In addition to running its own and contracted generation resources, BHCE may
13 purchase or sell energy in the market to ensure adequate supply to serve its load, provide
14 cost-effective energy for customers, and generate margin for customers. Utilities are
15 responsible to ensure they have adequate capacity to serve their own load. The cost of self-
16 generation and of energy available on the market may vary based on multiple factors, such
17 as weather, fuel costs, generation unit availability, a utility's load variations, and price
18 variations for different kinds of generation. There are times when energy purchases are
19 more cost-effective than self-generation, and times when selling excess self-generated
20 energy offsets costs customers would otherwise have to pay. Thus, it is in customers'
21 interest for utilities to use the energy markets to maximize both reliability and cost-
22 effective use of the utility's resources.

1 **Q. ARE THERE SPECIFIC ENERGY TRADING TIMELINES THAT CAN AFFECT**
2 **MARKET PURCHASING?**

3 A. Yes. Industry-wide, electric energy is traded in the day ahead market. For example, on
4 Mondays energy is traded for Tuesdays, Tuesdays for Wednesdays, Wednesdays for
5 Thursdays, Thursdays for Fridays and Saturdays, and on Fridays for Sundays and
6 Mondays. During Western Electricity Coordinating Council (“WECC”) holidays, such as
7 Presidents’ Day 2021, electric energy is traded in the day ahead market on Wednesdays for
8 Thursdays and Fridays, on Thursdays for Saturdays and Sundays, and on Fridays for
9 Mondays and Tuesdays.¹ However, GDPM also monitors the markets on a 24 hour, seven-
10 days a week basis and trades in the real time market as necessary and appropriate to serve
11 its customers.

12 In contrast, natural gas purchases made on each of Monday, Tuesday, Wednesday,
13 and Thursday are for the next gas day, and purchases (or sales) on Fridays are typically for
14 delivery on Saturdays, Sundays, and Mondays. In the case of holiday weekends (such as
15 Presidents’ Day 2021), gas trading on Friday covers Saturday through Tuesday of the
16 following week.

17 Mr. Kopetzky discusses gas purchases and sales in his Direct Testimony; I identify
18 these timelines here because they illustrate that energy is traded before gas in the day ahead
19 market, and volatile market gas prices may change significantly after energy purchases and
20 sales are made. The energy purchase implications for the February Event are discussed
21 later in my Direct Testimony.

¹ The 2021 WECC Scheduling Calendar is available publicly online at:
<https://www.wecc.org/Administrative/2021%20Preschedule%20Calendar.pdf>

1 **Q. DOES THE COMPANY MAINTAIN ANY OTHER DISPATCH MANAGEMENT**
2 **TOOLS?**

3 A. Yes. The Company also participates in a Joint Dispatch Agreement (“JDA”) with Public
4 Service Company of Colorado (“PSCo”), Colorado Springs Utilities, and Platte River
5 Power Authority (collectively, the “JDA Parties”), whereby “Public Service acts to achieve
6 the most efficient use of the JDA Parties’ generation and power purchase resources in order
7 to meet the Parties’ combined energy needs, taking into account Available Transfer
8 Capability along the transmission paths between the JDA Parties.”² Under appropriate
9 circumstances, PSCo can dispatch units within the hour that the JDA Parties designate as
10 dispatchable in the most economic order to manage the difference between the JDA Parties’
11 generation and load. However, the JDA does not involve capacity rights or the transfer of
12 Renewable Energy Credits between the JDA Parties, and instead requires each JDA Party
13 to maintain sufficient capacity on-line to reliably serve that utility’s capacity requirements.

14 **Q. PLEASE PROVIDE AN OVERVIEW OF HOW THE COMPANY ASSESSES**
15 **WHICH GENERATION RESOURCES TO DISPATCH, VERSUS WHEN TO USE**
16 **MARKET ENERGY, TO SERVE ITS LOAD AT ANY GIVEN TIME.**

17 A. As I noted earlier, GDPM’s priorities are safety and reliability first, and then cost to
18 customers. Within this premise, GDPM follows a well-established process to determine
19 how to provide reliable electric energy on any given day. When it has flexibility to serve
20 load with multiple generation resource options, the Company also manages dispatch and
21 market purchases and sales to maximize cost-effectiveness to the extent possible.

² Proceeding No. 16A-0276E, Decision No. R16-1088 at paragraph 31 (mailed date Nov. 30, 2016).

1 Fundamentally, the energy trading process begins with advance forecasts of
2 weather and load, as well as of the likelihood of wind availability, the forecasted costs of
3 energy self-generation (including the forecasted cost of gas necessary to fuel natural gas
4 power plants), and the forecasted costs of market energy.

5 From a resource “stack” perspective, non-dispatchable wind is always deployed
6 first when it is available. When wind is not available or becomes insufficient to serve the
7 forecasted load, the Company then forecasts the costs to run its own dispatchable
8 generation units as well as market energy prices, generally on a day ahead basis based on
9 eight- (light load (“LL”)) and 16- (heavy load (“HL”)) hour blocks. As noted above,
10 GDPM maintains a 24/7 generation dispatch and power marketing desk and monitors its
11 actual load and resources on a real-time basis. Overall, BHCE continuously monitors the
12 circumstances affecting its customers, load, and resources closely, and makes dispatch,
13 purchase, and sale decisions based on the best information available at the time.

14 **Q. HOW DOES BLACK HILLS USE ITS DIESEL ENGINES TO SERVE LOAD?**

15 A. The diesel reciprocating engines provide operating reserves in order to meet the reliability
16 standards set by the Company’s participation in the Northwest Power Pool (“NWPP”).
17 This is in part due to the requirement for the Company to keep a certain amount of resources
18 in reserve at any given time in case of potential events where reserves are necessary to
19 serve load, and in part due to the typically more expensive cost of operating the diesel
20 engines as compared to other available resources. When not operating, the diesel engines
21 perform an important service, as having them in reserve enables the Company to forego
22 other market purchases or generation purchases or contracts it would otherwise need in

1 order to maintain adequate reserves. I describe the Company's management of these
2 resources during the February Event in Section VII of my Direct Testimony.

3 **Q. HOW DOES THIS INFORMATION REGARDING THE OVERALL COMPANY**
4 **GENERATION FLEET FACTOR INTO THE COMPANY'S GAS PURCHASES**
5 **DURING THE FEBRUARY EVENT?**

6 A. Any decision that the Company makes to purchase natural gas to fuel the PAGS units is
7 dependent on a variety of other analyses and decisions, starting with weather models that
8 can drive load forecasts that determine generation needs. In turn, the determination how
9 to meet those generation needs depends on both the availability of the generation resources
10 available to the Company (e.g. the wind must be blowing for the wind turbines to function;
11 natural gas generation units must be online) and the relative costs of running generation
12 resources (including the cost of gas for PAGS) versus making economic energy purchases.

13 In the next sections of my Direct Testimony, I first discuss the Company's weather
14 and load forecasting processes and specifically for the February Event, and then discuss
15 the Company's resource availability and management in more detail and specifically for
16 the February Event. Throughout these sections, I focus on the steps that determine BHCE's
17 natural gas supply usage, whereas Mr. Kopetzky discusses gas purchasing itself.

18
19 **VI. WEATHER AND LOAD FORECAST**

20 **Q. HOW DOES ADVANCE WEATHER AND LOAD FORECASTING HELP**
21 **DETERMINE BHCE'S POTENTIAL GENERATION RESOURCE AND GAS**
22 **SUPPLY NEEDS?**

1 A. The GDPM team works to establish weather and load forecasts, which in turn drive electric
2 generation and economical energy purchase needs for the Company. The weather and load
3 forecasts are among the first steps in the energy dispatch and procurement processes. The
4 Company needs a reliable forecast of its likely native energy needs in order to establish
5 generation requirements (and therefore, for BHCE, natural gas supply to fuel PAGS) and
6 potential market purchases or sales.

7 **Q. WHAT IS THE SOURCE OF BHCE’S WEATHER AND LOAD FORECASTING**
8 **DATA USED TO DETERMINE ITS GENERATION RESOURCE NEEDS?**

9 A. BHCE uses a third-party subscription-based service for load and weather forecasting,
10 called Pattern Recognition Technology (“PRT”). PRT is an online, industry-leading, 24/7
11 client-specific load forecasting service that has been in business since 1994. The
12 forecasting tool consists of multiple intelligent system-based models that employ weather
13 data from four weather service providers, as well as various machine-learning algorithms.
14 The load forecast is continually updated every hour using the previous hour’s actual
15 weather and the most current information.

16 The weather forecast extends up to 15 days out. The load forecast extends up to 7
17 days out; however, in order to obtain the most reliable data and facilitate daily gas and
18 power purchases along the timelines noted earlier in my testimony, BHCE relies primarily
19 on the day-ahead forecast for weekdays and two-day ahead forecast for weekends. These
20 forecasts can be extended to three or more days ahead to accommodate holidays. This was
21 the case for the Presidents’ Day 2021 weekend.

22 **Q. PLEASE DESCRIBE THE WEATHER AND LOAD FORECASTING PROCESS IN**
23 **MORE DETAIL.**

1 A. GDPM generates weekly forecasts using PRT. This information provides an idea of
2 potential temperatures for GDPM to use for day ahead energy purchase evaluations.

3 As I discussed earlier, most industry energy purchases occur in the day ahead
4 market. The day before trading, GDPM reviews the PRT temperature and load forecasts
5 and compares them to recent history and previous years. These reviews provide the
6 Company with insight into whether the PRT forecast may need to be adjusted up or down.
7 Energy demand can vary day to day due to weather and changes in customer load patterns.
8 Each morning, the day ahead load forecasts are refreshed to update for the most current
9 information, including a review of the previous day actual loads and comparing forecast to
10 actuals. Reviews and potential updates are also undertaken if there is a big change in
11 weather forecast patterns as well as for any holidays with distinct load patterns, such as
12 Christmas.

13 For the February Event the primary load forecast for Saturday, February 13 and
14 Sunday, February 14 was based on the two-day ahead forecast. Likewise, the forecast for
15 Monday, February 15 and Tuesday, February 16 was based on information from Friday
16 February 12. The forecast for Wednesday, February 17 was based primarily on information
17 from Tuesday, February 16.

18 **Q. DOES BHCE CONDUCT ANY LONGER-TERM FORECASTING?**

19 A. Yes. As Company witness Mr. Kent Kopetzky describes, BHCE has one long-term
20 monthly baseload contract totaling 15,000 Dth per day, and one monthly baseload contract
21 for an additional 7,000 Dth per day. The monthly baseload supply amounts are determined
22 through a collaboration process used by the Gas Supply and the GDPM teams. The GDPM
23 team provides a forecast for the next months' expected daily usage, and the amount of

1 incremental baseload gas is estimated and provided to Gas Supply. Gas Supply then
2 determines the scope of monthly contracts to enter at the beginning of each month.

3 **Q. IS THIS APPROACH TO LOAD AND WEATHER FORECASTING**
4 **CONSIDERED INDUSTRY BEST PRACTICE?**

5 A. Yes. In addition to using a well-known modeling software in the industry, the Company's
6 day ahead forecasting, combined with real time monitoring and updating, result in robust
7 load and weather forecasts based on industry best practices. These practices have also
8 served BHCE and its customers well for many years.

9 **Q. WHAT INFORMATION DID THE COMPANY HAVE ABOUT POTENTIAL**
10 **COLD WEATHER AHEAD OF THE FEBRUARY EVENT?**

11 A. In addition to GDPM's own weather forecasting, beginning around February 9, 2021,
12 Black Hills started receiving cold weather alerts from upstream pipeline operators. GDPM
13 was alerted to these broader pipeline issues by the Gas Supply team and initiated system
14 and personnel preparations for extreme cold and potential impacts to the system and
15 markets. These efforts resulted in substantial additional efforts to ensure system reliability
16 and manage the markets over the February Event period.

17 **Q. WHAT ADDITIONAL MEASURES DID BHCE TAKE TO ENSURE SYSTEM**
18 **RELIABILITY AND OTHERWISE MANAGE THROUGH THE FEBRUARY**
19 **EVENT IN LIGHT OF THE WEATHER FORECASTS?**

20 A. From a systems perspective, the Company ensured additional personnel were monitoring
21 the situation and working throughout the Presidents' Day weekend at PAGS. The PAGS
22 facility normally maintains an operations crew with two operators around the clock. Due
23 to the inclement weather's probability of pushing the operational limits of the equipment

1 and increased importance of maintaining availability, the PAGS facility was staffed with
2 an additional three team members around the clock. These additional staff were able to
3 respond to any issues more quickly and provide extra support to monitor equipment
4 conditions and increase the likelihood escalating problems were flushed out and responded
5 to more expeditiously.

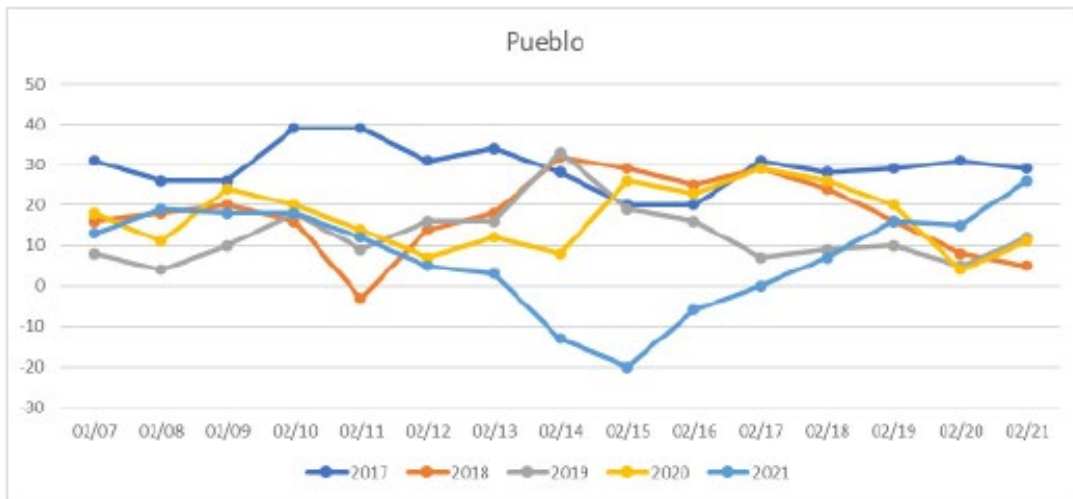
6 Additionally, while the GDPM trading desk is open at all times even under normal
7 circumstances, the Company was aware of the potential for cold weather, higher demand,
8 and potential market impacts and was ready to respond to events as they unfolded. The
9 GDPM staff is set up to perform power marketing support from home. Department
10 personnel were ready and capable of performing this task whenever they were called into
11 action. I personally checked in on real-time operations for updates several times a day
12 through the weekend, physically visited in the desk twice over the holiday weekend, and
13 was available at all times should an emergency arise.

14 GDPM was also in contact with plant personnel prior to the event to confirm the
15 status of all systems and convey the importance of the availability of the units for the
16 upcoming event. Further, a “no-touch” generation status was declared for the BHCE
17 generation facilities. This “no-touch” declaration instructs the generation facilities to
18 forego any maintenance that is not required for continued operation of the unit. It also
19 instructs the facilities to be especially proactive in communicating any potential issues that
20 may cause a unit outage. I was in direct contact with the plant manager at PAGS prior to
21 and throughout the event. The communications included discussion of proactive measures,
22 regular updates of unit status, and alerts to pending issues or concerns.

1 **Q. WHAT WERE THE COMPANY'S WEATHER FORECASTS FOR THE**
2 **FEBRUARY EVENT?**

3 A. As noted above, Attachment DES-1 to my Direct Testimony includes the Company's day
4 ahead temperature forecasts in the Pueblo area for the February Event. Below, the figure
5 includes actual temperatures in Pueblo for this same period, demonstrating the abnormal
6 cold experienced and providing the five-year recorded temperatures in Pueblo.

7 **Figure DES-1:**
8 **Pueblo Five-Year Recorded Daily Low Temperatures**



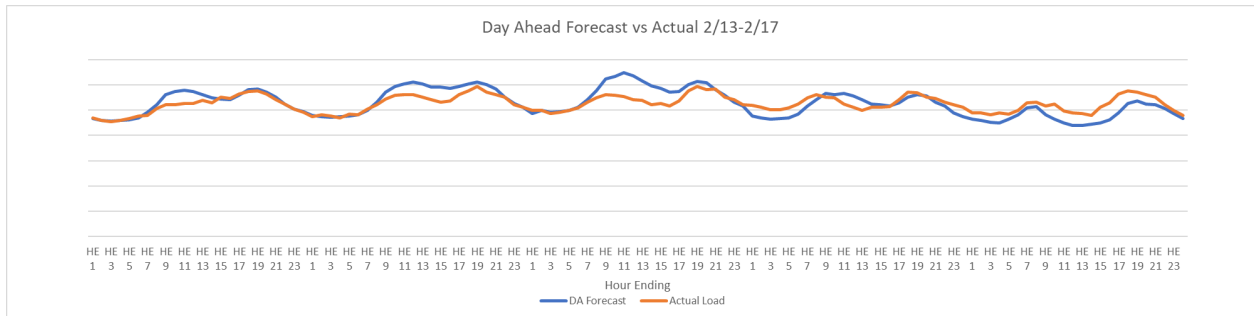
9
10 **Q. WHAT WERE BHCE'S DAY AHEAD AND REAL TIME LOAD FORECASTS**
11 **FOR FEBRUARY 13-17, 2021?**

12 A. Attachment DES-2 to my Direct Testimony provides the BHCE load forecast in MWh for
13 the time period from February 13-17, 2021. This Attachment includes both day ahead and
14 real time forecasts. As I noted earlier, these unusually low temperatures did not translate
15 to a new winter peak load requirement, let alone the higher summer peak. While customer
16 demand was well above average during this period, BHCE was preparing for a busy, high
17 demand weekend from a load perspective, rather than an extreme natural gas pricing event.

1 **Q. HOW ACCURATE WERE THESE LOAD FORECASTS?**

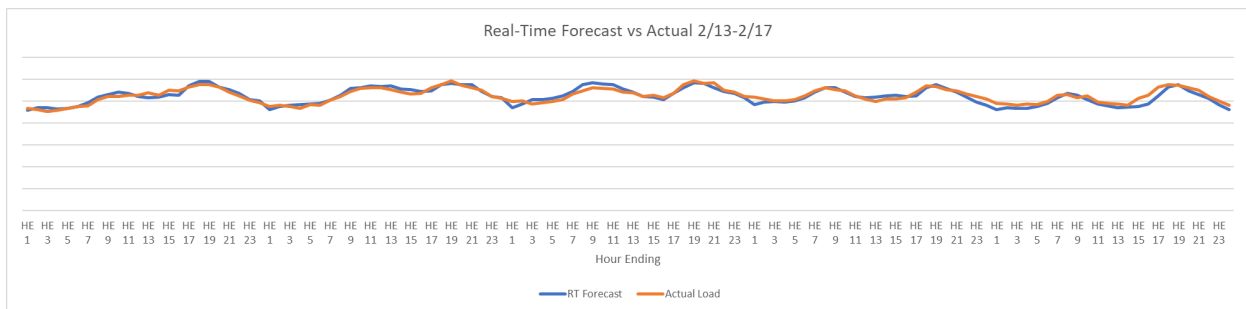
2 A. They were very accurate. Figure 2 below shows that the Company's day ahead load
3 forecast tracked very closely to its actual load on each day of the February Event. Overall,
4 on average during this period forecasted load was within 5.0% of actual load.

5 **Figure DES-2: Day Ahead Forecast Compared to Actual**



6
7 The Company's real time load forecasting was even more accurate, as set forth in
8 Figure 3 below. On average, the Company's real time forecast was within 2.3% of actual
9 load.

10 **Figure DES-3: Real Time Forecast Compared to Actual**



11
12
13 **Q. WHAT DOES THIS INFORMATION IN THIS SECTION OF YOUR TESTIMONY**
14 **INDICATE ABOUT BHCE'S INFORMATION AND PLANNING AHEAD OF THE**
15 **FEBRUARY EVENT?**

1 A. GDPM understood that severe weather was coming, and it had accurate data regarding the
2 likely weather and load implications. The Company therefore put additional personnel in
3 place in a way that ultimately provided reliable service and ensured system integrity. This
4 accurate data also enabled GDPM to make the best decisions possible regarding unit
5 dispatch and energy purchases, which I describe in more detail next.

6
7 **VII. RESOURCE AVAILABILITY AND MANAGEMENT**

8 ***A. Resource Dispatch Planning***

9 **Q. HOW DOES THE GDPM TEAM TRANSLATE ITS LOAD FORECAST INTO**
10 **GENERATION DISPATCH PLANNING?**

11 A. The GDPM team uses the PRT load forecasts as the starting point to determine what
12 generation resources will be needed. Additionally, the Company uses Global Weather
13 Corporation for its wind availability forecasting. As each load forecast update becomes
14 available, the Company must next determine how to dispatch available resources to serve
15 that load.

16 **Q. HOW DOES GDPM DETERMINE WHICH RESOURCES TO DISPATCH AND**
17 **TO WHAT EXTENT TO ENSURE RELIABLE SERVICE?**

18 A. GDPM examines the day ahead load forecast to determine how much overall need is likely
19 to exist in each hour of the day. After accounting for wind availability (or lack thereof)
20 since wind is always dispatched first, GDPM then uses an estimated day-ahead gas price
21 provided by Gas Supply, along with heat rate curves and variable operation and
22 maintenance costs for each of its owned and contracted generation units. This provides an
23 estimate of the cost to run each unit. The Company also uses day ahead forecasting

1 information from trading hubs, as well as conversations with potential trading counter-
2 parties, to assess likely day ahead market energy pricing during the same period. This
3 analysis provides a baseline to determine the most economical dispatch. GDPM will then
4 either schedule its own or contracted generation resources or use market purchases to meet
5 load obligations. Based on a comparison of anticipated resource availability and cost, the
6 Company plans its generation dispatch and economic energy purchases or sales starting
7 with the least cost resource and moving to more expensive resources as necessary to serve
8 the Company's load.

9 Once the day-ahead generation dispatch is determined, the GDPM team then
10 forecasts the amount of natural gas that is needed. As discussed by Mr. Kopetzky, the gas
11 forecast is provided to the Gas Supply team, which purchases gas based on the provided
12 gas forecast.

13 **Q. WHY DOES GDPM TYPICALLY CONDUCT A SIGNIFICANT PORTION OF ITS**
14 **PLANNING AND ENERGY TRADING ON A DAY AHEAD BASIS?**

15 A. To help assure system reliability and service to customers, it is important to be prepared to
16 serve customer needs ahead of time. Longer-term contracts and the day ahead market help
17 serve this purpose, providing proactive rather than solely reactive planning. It would not
18 be prudent for the Company to be primarily dependent on a real time market, as this would
19 pose untenable risks that BHCE could not access energy or gas when needed.

20 **Q. DOES GDPM FORECAST RESOURCE AND GAS NEEDS SOLELY ON A DAY**
21 **AHEAD BASIS?**

22 A. No. Although the bulk of purchases and sales are made through the day ahead market to
23 ensure adequate energy and capacity for the subsequent day, the purchasing function moves

1 to real time in an effort to maximize price-effective purchases and match purchases to load
2 as close to real time as possible. This real time process is intended to help account for
3 sudden, unexpected changes – such as an owned or contracted generation unit going
4 offline, requiring an alternative dispatch or economic energy purchase to serve load.

5
6 ***B. Generation Dispatch and Market Activity for the February Event***

7 **Q. PLEASE DISCUSS THE COMPANY’S DAY AHEAD GENERATION DISPATCH**
8 **AND MARKET PURCHASE PLAN FOR FEBRUARY 13-17, 2021.**

9 A. Based on its subscription with Global Weather Corporation and the anticipated weather
10 leading into the February Event, GDPM anticipated little to no wind generation during this
11 period. Increased wind generation was forecasted to and did come in starting the night of
12 February 15 and through the morning of February 16. However, the majority of the hours
13 of the February Event included little to no wind generation. While the Company’s wind
14 resources were functional, as is common, the wind was largely not blowing when it was
15 particularly cold. This made BHCE, like many companies, anticipate being more
16 dependent on dispatchable resources and market purchases during the extreme cold.

17 On February 11, 2021, when the Company planned for February 13-14; and on
18 February 12, when the Company planned for February 15-16, day ahead PAGS generation
19 unit cost estimates (based on then-forecasted gas prices), were anticipated to be lower than
20 the day ahead energy market prices. This was based on the weather, load, market power
21 and gas price data available at that time. As a result, during the energy market trading
22 period and ahead of gas trading, the Company’s dispatch plans indicated that self-
23 generation was likely to be the least cost option.

1 A summary of the Company’s anticipated and actual unit and gas costs for this
 2 period are summarized in Attachment DES-3 to my Direct Testimony. This attachment
 3 provides high-level pricing information available to GDPM when it made resource dispatch
 4 and energy trade decisions in relation to the February Event. It also compares the day
 5 ahead pricing information to subsequent actual costs.

6 **Q. PLEASE EXPLAIN HOW THE GDPM TEAM TRANSLATED ITS DISPATCH**
 7 **PLANS INTO GAS FORECASTS FACILITATING THE PURCHASE OF**
 8 **NATURAL GAS.**

9 A. As the Company was conducting day ahead dispatch planning on February 11 for February
 10 13-14 and on February 12 for February 15-16, it factored in heat rates for its owned and
 11 contracted generation units to determine how much gas was likely to be needed. The
 12 Company identified the following forecasted gas load for electric generation during this
 13 period.

14 **Table DES-1**
 15 **Forecasted Gas Load for Electric Generation (Dth)**
 16

Calendar Day	Sat. Feb. 13	Sun. Feb. 14	Mon. Feb 15	Tues. Feb. 16	Wed. Feb. 17
Thurs, Feb. 11 Forecast	51,000	47,000			
Fri., Feb. 12 Forecast			52,000	42,000	
Tues., Feb. 16 Forecast					22,000

17 Mr. Kopetzky explains how these gas load forecasts were translated to gas purchases and
 18 associated cost for the same period.
 19

1 **Q. AS THE PRICE OF GAS CLIMBED SO STEEPLY, WAS THE COMPANY ABLE**
2 **TO TAKE ANY STEPS TO MITIGATE COSTS FOR CUSTOMERS WHILE**
3 **STILL PROVIDING RELIABLE SERVICE?**

4 A. Yes. With the extreme cold weather, very high load forecasts, and record pricing, the
5 Company continued to monitor the situation and looked for opportunities to ensure costs
6 were kept as low as possible while ensuring adequate energy for customers. By way of
7 example, on Wednesday morning, Feb. 17, actual loads started coming in above forecast
8 and it appeared that prescheduled imports would be curtailed due to unscheduled flows
9 (“USF”). Initial projections indicated that there would be a significant gas shortage at
10 PAGS for the day.

11 Consequently, the real time desk contacted Gas Supply to determine whether
12 purchasing intraday gas was a viable option for managing the PAGS gas supply. However,
13 Gas Supply reported that a February 17 intraday gas purchase price would be
14 approximately \$285/Dth, compared to an index price of \$92.60 for the Cheyenne Hub.
15 Market indicators suggested that purchased power would be a cheaper and more feasible
16 option, so GDPM managed the potential gas shortage by importing purchased power and
17 reducing generation at PAGS. The USF curtailments on prescheduled imports also ended,
18 mitigating that contingency and reducing the amount of gas required. BHCE, on behalf of
19 customers, avoided significantly higher gas prices during that period.

1 **Q. PLEASE SUMMARIZE HOW THE NEED TO MATCH RESOURCES TO LOAD,**
2 **AND TO COMPLETE ENERGY PURCHASES AND SALES AHEAD OF GAS**
3 **SALES, AFFECTED BHCE'S ABILITY TO AVOID SPIKING GAS PRICES.**

4 A. The Company's forecasting of weather and load and energy trading for February 13-16
5 was undertaken before the gas price spike occurred on February 12. As I noted earlier in
6 my testimony, the Company knew of cold weather warnings well ahead of the February
7 Event, and it planned accordingly to ensure adequate gas for PAGS, as well as overall
8 adequate resources to support the anticipated load. The Company's weather and load
9 forecasting were, in turn, very accurate, meaning the Company could in turn be fairly
10 accurate in planning for the quantity of resources to serve that load. However, at the time
11 the Company was planning for its energy needs and energy trading schedule, industry
12 expectations indicated by the Gas Supply team placed gas prices in the range of \$4-\$5/Dth,
13 or possibly as high as \$20/Dth. On February 12, for gas purchases required over the holiday
14 weekend, prices climbed into triple digits per dekatherm.

15 **Q. WAS THE COMPANY NONETHELESS ULTIMATELY ABLE TO PROVIDE**
16 **SUFFICIENT RESOURCES TO RELIABLY SERVE ITS LOAD DURING THE**
17 **FEBRUARY EVENT?**

18 A. Yes. Operating reserve is the generation and market purchases available to the utility to
19 meet customer demands in excess of obligation (load + sales). As shown in the chart below,
20 BHCE's operating reserve was such that there was sufficient supply and capacity to deliver
21 to customers to meet their energy demands.

1
2
3

**Figure DES-4:
 Load and Operating Reserves (MW)**

Load																								
	HE 1	HE 2	HE 3	HE 4	HE 5	HE 6	HE 7	HE 8	HE 9	HE 10	HE 11	HE 12	HE 13	HE 14	HE 15	HE 16	HE 17	HE 18	HE 19	HE 20	HE 21	HE 22	HE 23	HE 24
2/13/2021	234	230	227	229	233	238	239	253	260	261	263	263	269	264	275	273	282	287	288	282	270	262	252	246
2/14/2021	237	241	238	234	242	241	252	261	272	279	280	280	276	271	266	268	281	288	296	286	281	275	260	256
2/15/2021	249	250	243	246	249	254	266	274	281	279	277	271	269	260	263	258	268	288	296	290	292	275	270	261
2/16/2021	259	255	251	251	254	262	274	281	276	274	262	255	249	255	255	257	271	285	284	276	273	266	261	255
2/17/2021	245	244	241	244	242	249	264	265	258	262	248	245	243	240	256	264	282	288	286	280	275	261	250	240
Operating Reserves																								
	HE 1	HE 2	HE 3	HE 4	HE 5	HE 6	HE 7	HE 8	HE 9	HE 10	HE 11	HE 12	HE 13	HE 14	HE 15	HE 16	HE 17	HE 18	HE 19	HE 20	HE 21	HE 22	HE 23	HE 24
2/13/2021	46	41	142	41	16	73	66	57	20	36	38	90	83	105	93	115	65	59	58	65	77	86	96	85
2/14/2021	99	100	124	128	112	77	66	70	46	37	36	86	100	110	121	124	61	53	45	55	60	144	160	89
2/15/2021	95	85	91	38	70	80	95	34	26	91	89	71	72	134	130	136	124	54	48	50	48	66	72	82
2/16/2021	86	89	93	93	89	80	71	63	69	71	81	89	95	89	89	87	73	58	62	68	71	109	141	147
2/17/2021	183	183	216	213	105	103	85	95	171	168	178	181	220	238	284	239	245	137	141	145	150	165	176	187

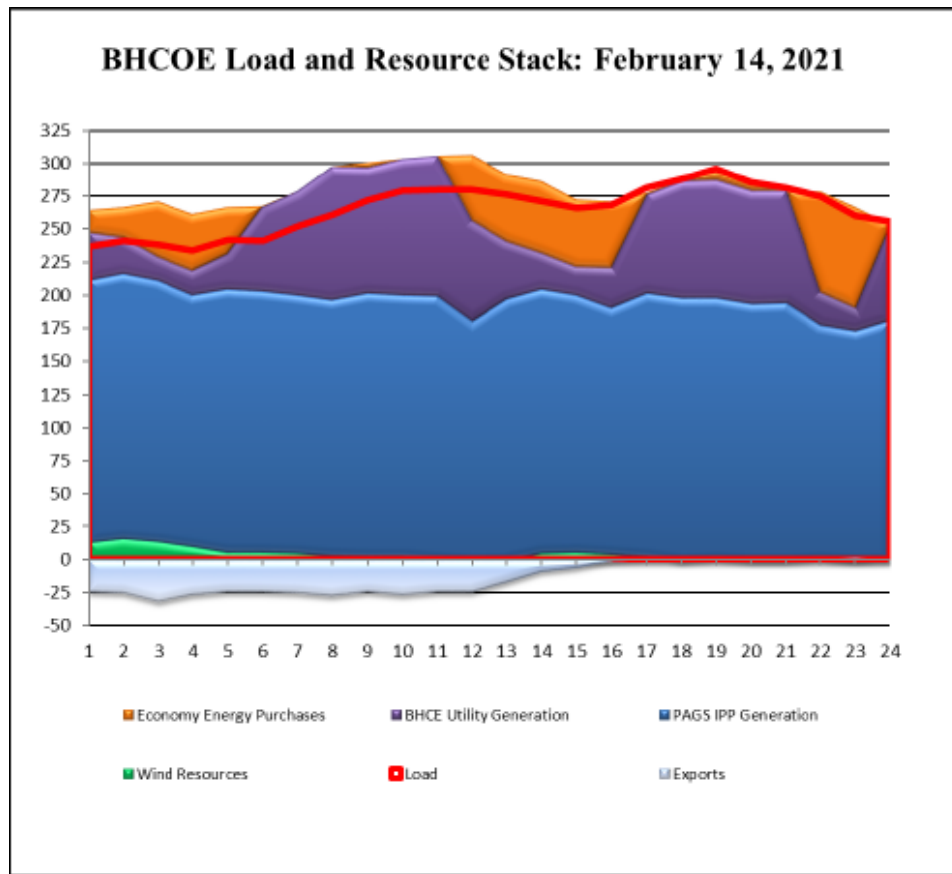
4

5 **Q. CAN YOU ILLUSTRATE HOW GDPM USED ITS RESOURCES AND ITS**
 6 **MARKET PURCHASES TO SERVE ITS OBLIGATION DURING THIS**
 7 **FEBRUARY EVENT?**

8 **A.** Yes. Attachment DES-4 to my Direct Testimony shows the actual load requirements and
 9 resources serving that obligation during each hour of the February Event. Additionally,
 10 this attachment illustrates the Company’s market purchases and sales during the February
 11 Event. By way of a specific example showing how the Company served its obligation, the
 12 figure below depicts the resources used to meet customer needs on February 14, the coldest
 13 day in Pueblo during the February Event.

1

Figure DES-5: Pueblo Load and Resources



2

3 The above illustration shows where the Company made strategic energy market purchases
4 (larger areas of orange) to support more cost-effective operations than would be possible
5 from simply continuing to run PAGS. As the figure above illustrates, the Company neared
6 its peak load and had declining reserves during the evening of February 14 (Hours 19-21).
7 The Company was able to make a real time economic purchase that allowed PAGS to serve
8 a reserve function, ensuring BHCE had adequate reserves overnight. This is an example
9 of GDPM responsiveness to load and market conditions in real time.

10 **Q. MORE SPECIFICALLY, HOW DID THE COMPANY MANAGE ITS**
11 **DISPATCHABLE GENERATION RESOURCES DURING THE FEBRUARY**
12 **EVENT?**

1 A. BHCE successfully managed PAGS and its diesel reciprocating engines to ensure adequate
2 power supply to customers. With wind largely not generating, PAGS generation and
3 purchased power served the large majority of the Company's obligations. The diesel
4 reciprocating engines continued to provide operating reserves throughout the event. While
5 operating the diesel engines may have been less expensive solely on a cost per MW basis
6 during the February Event, Company loads were high enough during this same timeframe
7 that there were only a few hours each day when output from the diesel engines may have
8 been sufficient to take one of the operational gas units at PAGS offline. Running diesel
9 engines for the remaining hours would have made it necessary to back down the gas units,
10 forcing them to run less efficiently.

11 In addition, weather conditions merited conservative operations. Weather-related
12 gas unit outages were possible during this time, and there was an operational risk of failed
13 or delayed starts if the PAGS units were shut down. Shutting down a combustion turbine
14 on PAGS Units 4 or 5 would have reduced the available capacity by 50 MW until the unit
15 could be restarted, which would have been at least 40-60 minutes. This would have
16 reduced efficiency at best and jeopardized reliability at worst.

17 **Q. DID THE COMPANY MAKE ANY SALES OF ENERGY DURING THIS PERIOD?**

18 A. Yes. On February 11, before the price spike occurred, day ahead unit pricing was based
19 on forecasted gas prices of approximately \$5/Dth. The Company sold approximately
20 25 MW into the market on February 11 on a day ahead basis for all of February 13 and a
21 portion of February 14. When gas prices rose dramatically on February 12, the higher gas
22 prices led to generation unit prices increasing. The resulting difference in pricing totaled

1 approximately \$867,000 over this day and a half period. Attachment DES-5 provides the
2 details of this transaction.

3 **Q. TO WHAT EXTENT DOES THIS MARKET DYNAMIC AFFECT BHCE**
4 **CUSTOMERS?**

5 A. As discussed by Mr. Harrington, BHCE's electric service tariff recognizes that market
6 purchases and sales are not without risk, and therefore specifies that market sales of energy
7 are netted for the year as a whole. The net margins are then shared with customers on a
8 90% customer / 10% company basis. Customers are not impacted by losses in marketing
9 margin when they occur.

10 **Q. DOES BLACK HILLS HAVE ANY BASIS TO DETERMINE WHETHER ITS**
11 **COSTS DURING THE FEBRUARY EVENT WERE REASONABLE IN**
12 **COMPARISON TO WHAT OTHERS WERE PAYING?**

13 A. Yes. GDPM's activity in the real time market and communication with trading
14 counterparties confirmed our costs were reasonable in comparison with others costs to
15 generate. Furthermore, energy settled through the JDA was relatively comparable to
16 BHCE's cost to generate. This indicates that BHCE's cost to generate was in line with the
17 other JDA participants.

18 **Q. PLEASE SUMMARIZE WHY GDPM'S WEATHER AND LOAD FORECASTING,**
19 **AS WELL AS ITS RESOURCE MANAGEMENT, WERE REASONABLE AND**
20 **PRUDENT THROUGHOUT THE FEBRUARY MARKET EVENT.**

21 A. As I describe throughout my testimony, GDPM was prepared and active in advance of and
22 throughout the February Event to ensure weather and load forecasts were as accurate as
23 possible, and to plan for generation dispatch and market energy purchases and sales that

1 managed costs to the greatest extent possible. The Company was ultimately able to provide
2 safe and reliable electric service to its customers and ensure adequate energy during this
3 February Event despite severe temperatures, multiple supply risks, and market volatility.
4 Overall, we made prudent decisions based on the best information and options available to
5 us at the time.

6

7

VIII. CONCLUSION

8 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

9 A. Yes.

Appendix A

Statement of Qualifications

Donald E. Stahl

I received a Bachelor of Science degree in Mechanical Engineering from the South Dakota School of Mines & Technology in 2004. I then spent three years at Oklahoma Gas & Electric Company, where I held positions of Plant Engineer and Maintenance Engineer at coal and natural gas fired power plants. I then joined General Electric Company, where I held the positions of Mechanical Technical Advisor and Site Manager on project teams installing and commissioning gas turbine power plants for power companies. I moved to Black Hills Energy in 2010 during the initial construction of Pueblo Airport Generating Station as the Maintenance Manager, and later as the Plant Manager once the facility reached commercial operation. I also held the position of Manager, Generation Engineering prior to my current position of Director, Generation Dispatch & Power Marketing.

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

PROCEEDING NO. 21 – ___E

IN THE MATTER OF THE VERIFIED APPLICATION OF BLACK HILLS COLORADO ELECTRIC, LLC FOR APPROVAL TO RECOVER GAS COSTS ASSOCIATED WITH THE FEBRUARY EXTREME COLD WEATHER EVENT

State of South Dakota)
) SS. Affidavit Adopting
County of Pennington) Direct Testimony and Attachments

Donald Stahl being duly sworn, states that he is the Donald Stahl whose Direct Testimony and Attachments in the above-captioned proceeding accompany this Affidavit.

Donald Stahl further states that such Direct Testimony is a true and accurate statement of his answers to the questions contained therein, and that he does adopt those answers as his sworn Testimony in this proceeding. Donald Stahl further states that such Attachments that accompany his Direct Testimony are true and accurate.



Donald Stahl

Subscribed and sworn to before me this 14 day of May, 2021.



Notary Public

My Commission Expires: 12/19/2025

