**BEFORE THE NEBRASKA PUBLIC SERVICE COMMISSION**

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| **IN THE MATTER OF THE APPLICATION OF BLACK HILLS NEBRASKA GAS, LLC, D/B/ BLACK HILLS ENERGY, RAPID CITY, SOUTH DAKOTA, SEEKING APPROVAL OF A GENERAL RATE INCREASE** | **)** | **APPLICATION NO. NG-109** |

# DIRECT TESTIMONY AND EXHIBITS OF

# DAVID I. ROSENBAUM, Ph.D.

**ON BEHALF OF BLACK HILLS NEBRASKA GAS, LLC**

Date: June 1, 2020

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## I. INTRODUCTION

**Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

A. My name is David I. Rosenbaum. My business address is 7730 Lowell Ave., Lincoln, NE 68506.

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

A. I am a professor of economics at the University of Nebraska-Lincoln. I also consult and, in this case, I am testifying on behalf of Black Hills Nebraska Gas, LLC d/b/a Black Hills Energy. ("BH Nebraska Gas" or "Company").

**Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.**

A. I earned a Bachelor of Arts degree, majoring in economics, from the University of Maryland-College Park in 1978. I earned a Ph.D. in economics from the University of Wisconsin-Madison in 1985. I have been an Assistant/Associate/Full Professor of Economics at the University of Nebraska-Lincoln since 1985. I was also the consulting economist for the Nebraska Public Service Commission ("Commission") from 1997 through 2017. I have testified before this Commission several times on matters relating to telecommunications. I have also consulted for the Commission on the cost of equity capital in natural gas rate cases.

**Q. PLEASE STATE THE PURPOSE OF YOUR TESTIMONY.**

A. My testimony examines the viability of the High Efficiency Assistance Tool ("HEAT") program currently provided by BH Nebraska Gas in its Rate Area Five (formerly Black

Hills Gas Distribution, LLC).[1] The BH Nebraska Gas HEAT program is intended to assist customers with the costs associated with the purchase and installation of new or replacement natural gas burning space heating and water heating appliances, and to provide BH Nebraska Gas an ability to compete with electricity providers for energy customers.

## II. TESTIMONY OVERVIEW

**Q. PLEASE DESCRIBE YOUR UNDERSTANDING OF THE HEAT PROGRAM.**

A. As described in the approved BH Nebraska Gas Tariff, Sheet No. 147, the HEAT program enables the Company to offer an incentive to jurisdictional residential and commercial customers to attain assistance with the costs associated with the purchase and installation of new, natural gas burning space heating and water heating appliances. The HEAT program is a customer incentive program currently offered by BH Nebraska Gas in its Rate Area Five, which is the service territory served by the former BH Gas Distribution. The HEAT Charge is added to the monthly Customer Charge for all jurisdictional residential and commercial service customers.

**Q. PLEASE SUMMARIZE YOUR TESTIMONY IN THIS PROCEEDING.**

A. In developing my analysis, I review the economics of the proposed revised HEAT program with respect to residential customers. The analysis focuses on four issues related to the HEAT program.

[1] See BH Nebraska Gas Sheet Nos. 11 (HEAT Definition), 105 (HEAT Customer Charge), 145 (HEAT charge discounting), and 147 (HEAT program description).

**1. Benefit to Participants from Converting to Natural Gas from an Alternative Fuel**

I review the extent of benefits that residential customers receive when they elect to participate in the HEAT program by converting from another energy source to natural gas. The incentives to convert to natural gas from an alternative fuel source are estimated under two scenarios. The first assumes that the residential customer has a working furnace and water heater fueled by electricity or propane. The second assumes that a homeowner has to replace equipment that has stopped functioning. I will speak in more detail about my analysis in these scenarios later in my testimony.

**2. Benefit to All BH Nebraska Gas Customers by Reducing Per-Customer Contributions to the Rate Base**

I also review the potential contributions toward the rate base when a customer converts from an alternative fuel source to natural gas. As long as the revenue stream over time of contributions toward the rate base by a new customer covers the initial cost of infrastructure (a service line from the main to the home), a new customer is helping to cover the cost of the overall rate base. This reduces costs for each customer, allowing either lower increases in future rates or extending the period between rate filings. I will speak in more detail about the specifics of this analysis later in my testimony.

**3. Pay Back of HEAT Contribution**

All rate payers contribute a small amount toward the HEAT program, the proceeds of which are used to provide incentives to program users. My analysis indicates that new customers that take advantage of the HEAT incentive contribute back more than the

amount of the incentive. I will speak in more detail about the specifics of this analysis later in my testimony.

**4. Benefits to Participants from Replacing Existing Natural Gas Equipment with New Natural Gas Equipment**

The analysis also examines the incentives for current natural gas customers to replace existing natural gas equipment with new natural gas equipment under the HEAT program. This has important implications for all customers. If these users convert to another fuel source, it would increase the rate base costs for all remaining customers.

**Q. DO YOU SPONSOR ANY PRIMARY EXHIBITS IN CONNECTION WITH YOUR TESTIMONY?**

A. Yes. I am sponsoring the following primary Exhibits, which I prepared or caused to be prepared under my supervision:

Exhibit No. DIR-1: Energy usage for space and water heating by fuel type.

Exhibit No. DIR-2: Equipment costs and current HEAT incentives.

Exhibit No. DIR-3: Rates by fuel source and provider.

Exhibit No. DIR-4: Monthly and annual costs by fuel source and provider.

Exhibit No. DIR-5: Annual savings by fuel source and provider.

Exhibit No. DIR-6: Ten-year net present value of fuel cost savings given existing equipment works.

Exhibit No. DIR-7: Cost of Equipment after Incentive.

Exhibit No. DIR-8: The ten-year net present value of fuel cost savings given equipment must be replaced in any case.

**Q. PLEASE DESCRIBE EXHIBIT NO. DIR-1.**

A. Exhibit No. DIR-1 shows estimated usage amounts for natural gas, propane, and electricity. Natural Gas usage is an estimate of the statewide average of residential customer usage by month for gas priced in Tier I and Tier II, as well as total usage for home and water heating. Propane usage is estimated by converting total therms of natural gas to gallons of propane. Electric kWh usage is a conversion of natural gas therms to kWh.

**Q. PLEASE DESCRIBE EXHIBIT NO. DIR-2.**

A. Exhibit No. DIR-2 shows the cost for equipment and conversion from an alternative energy source to natural gas. To convert from an electric furnace to a 94 percent efficient natural gas furnace, costs average $1,500 for venting and installation and another $2,000 for the furnace itself. A new natural gas water heater costs approximately $1,200 installed with power venting.[2] To convert from propane to natural gas, the same furnace can be used. It does require a new orifice for $300 installed. A new water heater is required, with an installed price of $1,000. Both the furnace and the water heater can be vented through the former propane venting system.

Exhibit No. DIR-2 also shows the incentives under the HEAT program. Whether switching from electric or propane to natural gas, the most common incentives are $300 for a furnace and $150 for a water heater. Actual incentives may vary by the capacity and relative efficiency of the equipment installed.

[2] Sources for the data are in Exhibit No. DIR-2.

Finally, Exhibit No. DIR-2 shows the cost of replacing existing electric or propane furnaces and waters heaters with new electric or propane furnaces and water heaters. For either fuel, that cost with installation is $4,000.

## III. BENEFIT TO PARTICIPANTS OF THE HEAT PROGRAM UNDER EXISTING RATES

**Q. PLEASE EXPLAIN WHAT YOU WILL SHOW IN THIS PORTION OF YOUR TESTIMONY.**

A. I will show that under the current HEAT incentive, households that currently use electricity or propane to heat their homes and water will be financially better off to switch to natural gas.

**Q. WHAT IS CONTAINED IN EXHIBIT NO. DIR-3?**

A. Exhibit No. DIR-3 contains current rates charged by various utilities. The rates for LES are its 2019 rates.[3] The rates for NPPD are those effective as of 9/1/2018. The OPPD rates are those from its web site as of April 2020. Exhibit No. DIR-3 also shows the cost per gallon for propane. The rates for BH Nebraska Gas are those proposed in this rate filing.

**Q. WHAT DOES EXHIBIT NO. DIR-4 SHOW?**

A. Exhibit No. DIR-4 examines the costs of heating a home and water with alternative fuels from various providers.

**Q. WHAT DOES THE TOP SECTION OF EXHIBIT NO. DIR-4 CONTAIN?**

A. The top section of Exhibit No. DIR-4 shows annual costs to heat a home and water using either electricity or propane, depending on provider. For electricity providers, the exhibit

[3] Sources for rates are shown in Exhibit No. DIR-3.

shows the increment to a bill for heating a home and water with electricity. Hence no customer or facility charges are included as those charges must be paid even if a household does not use electricity to heat their home and water. For example, the incremental cost of heating a home and water using electricity in the LES service area is $1,161 per year. This is the amount a customer's electric bill would be reduced if that customer stopped heating with electricity but continued to purchase electricity for other uses.

**Q. WHAT DOES THE BOTTOM SECTION OF EXHIBIT NO. DIR- 4 SHOW?**

A. The bottom section of Exhibit No. DIR-4 shows the total cost of using natural gas to heat a home and water. It includes the fixed customer cost as it would be incurred if a customer switches from heating their home and water with electricity or propane to heating with natural gas. If a household switches from heating their home and water with electricity to natural gas, under the proposed rates, that household would incur an annual natural gas bill of $675.

**Q. PLEASE EXPLAIN EXHIBIT NO. DIR-5.**

A. Exhibit No. DIR-5 shows the annual cost savings a customer would receive by converting from electricity or propane to natural gas. The first column shows the annual costs as developed in Exhibit No. DIR- 4. The remainder of the exhibit shows the cost savings from converting to natural gas from an alternative fuel from a specific provider. For example, converting from electricity to natural gas in the LES service area saves a customer $486 annually.

**Q. WHAT DOES EXHIBIT NO. DIR-6 SHOW?**

A. Exhibit No. DIR-6 shows the return to a customer from converting from electricity or propane to natural gas. The first set of numbers, for example, shows the return to the

customer related to converting from propane to natural gas. Row (1) contains the customer initial investment in natural gas equipment as developed in Exhibit No. DIR-2. Row (2) indicates the HEAT incentive amount, also developed in Exhibit No. DIR-2. Row (3), calculated as row (1) minus row (2), is the customer investment net of the HEAT incentive. Row (4) contains the annual bill savings as developed in Exhibit No. DIR-5. When converting from propane to natural gas, for example, a customer saves $348 annually. The aggregate returns from year one through year 10 are shown in row (5). Again, considering conversion from propane to natural gas for home and water heating, over ten years, the customer would have a net savings of $2,330. Finally, row (6) shows the same aggregate cost/return as in row (5); only future benefits are discounted at 3.5 percent annually. Even with discounting, the returns associated with converting from propane to natural gas are positive by year four. Over ten years, the present discounted value of a customer's net saving is $1,744.

**Q. WHY DO YOU USE A 3.5 PERCENT DISCOUNT RATE?**

A. When consumers are using the HEAT program, they are essentially investing money into future energy savings. Given that most consumer energy prices are regulated, the risk of investing in future energy savings is moderate. As an alternative, consumers could invest in some other asset with a comparable risk. Ten-year Treasury Constant Maturity Rates averaged about 2.5 percent over the last 10 years. Corporate bonds with a BBB rating averaged a little over four percent over the same time period. Forecasts of future rates are even lower than these averages. A discount rate of 3.5 percent is reflective of returns to investments of comparable risk.

**Q. WHAT DO THE OTHER SETS OF NUMBERS IN EXHIBIT NO. DIR-6 SHOW?**

A. The other sets of numbers in Exhibit No. DIR-6 show the net return to the customer over ten years associated with converting from electricity to natural gas for home and water heating, based on electricity provider. When converting from NPPD, the present discounted value of the net return over 10 years is $2,145. When converting from OPPD, the present discounted value of the net return over 10 years is $1,430. When converting from LES, the present discounted value of the net return over 10 years is negative $208. Under the current incentive, it would take just short of eleven years until LES customers have a positive net present discounted value on the net return from conversion.

**Q. HOW LONG WOULD IT TAKE A HOMEOWNER TO "BREAK EVEN" BY CONVERTING TO NATURAL GAS?**

A. Using net present value figures from Exhibit No. DIR-6, a propane customer would more than break even after four years. An NPPD customer would more than break even after seven years. An OPPD customer would more than break even after eight years. An LES customer would break even after a bit over ten years.

**Q. WOULD THESE PAYBACK PERIODS BE LONG ENOUGH GIVEN THE AVERAGE TENURE IN A HOME?**

A. That depends on when the conversion occurs. The National Association of Home Builders estimates that the average homeowner remains in their home for 13 years.[4] The average lifespan of natural gas appliances is 15 to 20 years and can be longer.

[4] http://nahbclassic.org/generic.aspx?genericContentID=194717.

**Q. WHAT CAN YOU CONCLUDE FROM THIS ANALYSIS?**

A. My conclusion is that with the current HEAT program, propane users, as well as electricity customers from NPPD, OPPD and LES, have an incentive to switch to natural gas as their fuel source for space and water heating.

**Q. DOES THIS ANALYSIS ASSUME THAT A CUSTOMER'S EXISTING ELECTRICITY OR PROPANE EQUIPMENT ARE WORKING AT THE TIME OF CONVERSION?**

A. Yes, it does.

**Q. HOW WOULD YOUR ANALYSIS CHANGE IF A CUSTOMER IS CONSIDERING REPLACING EXISTING EQUIPMENT WITH NEW EQUIPMENT USING EITHER THE SAME FUEL OR A REPLACEMENT USING NATURAL GAS?**

A. It would enhance the financial benefits to consumers that switch from an alternative fuel to natural gas.

**Q. WHAT DOES EXHIBIT NO. DIR-7 SHOW?**

A. Exhibit No. DIR-7 shows the installed cost less incentives of replacing existing propane or electric heating equipment with either equipment of the same type or with natural gas heating equipment. Replacing broken electric equipment with natural gas has a cost after incentives of $4,250. It would cost $4,000 to replace that equipment with new electric equipment. Replacing broken propane equipment with natural gas has a cost after incentives of $3,550. It would cost $4,000 to replace that equipment with new propane equipment.

**Q. WHAT DOES EXHIBIT NO. DIR-8 SHOW?**

A. Exhibit No. DIR-8 shows the return from replacing broken alternative fuel equipment with new natural gas equipment. If a furnace and water heater must be replaced, regardless of the fuel source, it effectively reduces the net investment a customer has to make in natural gas equipment. For example, if a household had to replace a furnace and water heater and could purchase electric replacements for $4,000 (installed) or convert to natural gas for $4,250 (with the HEAT incentive), the incremental investment to convert is only $250. This makes the payback periods almost immediate.

**Q. WHEN NEW CUSTOMERS TAKE ADVANTAGE OF THE HEAT PROGRAM, CAN THIS LOWER AVERAGE RATE BASE COSTS FOR ALL CUSTOMERS?**

A. Yes.

**Q. WILL YOU PLEASE EXPLAIN?**

A. Consider a household that takes advantage of the HEAT program to become a new natural gas customer. The supply line from the nearby main to the customer's home (the service line) is usually installed with no/minimal cost to the customer based on the project feasibility.[5] That supply line becomes a small addition to the overall rate base. Over the time that a new household remains a BH Nebraska Gas customer, this new household will make monthly contributions toward the rate base. The present discounted value of the flow

[5] BH Nebraska Gas' approved Tariff, Sheet No. 69: "Project feasibility shall be determined by using current operating and construction costs, projected revenue and any related income tax impacts of the specific project. The projected rate of return will be determined by the Company. Any projected return deficiency will require an offsetting contribution to assure the project will not cause existing Customers to subsidize new Customers. The project feasibility study will determine whether the investment to serve can be incurred without additional charges to the Customer, subject to the lower of the actual cost or the statewide average investment per Customer referred to above."

of net income toward the rate base more than covers the cost to BH Nebraska Gas of adding a new HEAT participant.

**Q. WILL THE ADDITION OF A NEW CUSTOMER BENEFIT ALL CUSTOMERS?**

A. Yes. A new customer contributes more toward the rate base than that new customer costs in initial supply line costs. As a result, future rate base costs are lower for all customers. This allows BH Nebraska Gas to either propose lower increases in future rates or extend the period between rate filings.

## IV. PAY BACK OF HEAT CONTRIBUTION

**Q. WHAT ARE THE IMPLICATIONS TO THE HEAT PROGRAM?**

A. All customers make a small monthly contributions toward the HEAT program. These payments are used to fund the HEAT incentives. My analysis shows that when a new customer receives an incentive and converts to natural gas, over a reasonable amount of time, that customer contributes enough revenue to more than offset the initial rebate payment.

## V. REPLACING NATURAL GAS EQUIPMENT WITH NEW NATURAL GAS EQUIPMENT

**Q. CAN EXISTING BH NEBRASKA GAS RESIDENTIAL CUSTOMERS USE THE HEAT PROGRAM TO REPLACE THEIR OLD GAS FURNACES/WATER HEATERS WITH NEW ONES?**

A. Yes.

**Q. WOULD DOING SO BE COMPETITIVE VERSUS OTHER FUELS?**

A. Yes. Let me explain. Exhibit No. DIR-8 shows the savings a customer would experience by converting from an alternative fuel to natural gas. If a customer converted from natural

gas to an alternative fuel, that customer would lose those savings. Converting from natural gas to propane, for example, costs a customer $3,344 in additional present discounted costs over ten years. Converting from natural gas to NPPD costs a customer $6,145 in additional present discounted costs over ten years.

The analysis in Exhibit No. DIR-8 assumes the conversion occurs when the existing equipment is no longer functional. If a customer has working natural gas equipment and is considering converting to an alternative fuel, the costs would be even higher than in Exhibit No. DIR-8.

**Q. BY RETAINING EXISTING CUSTOMERS DOES IT HELP ALL BH NEBRASKA GAS CUSTOMERS?**

A. Yes. By retaining customers, BH Nebraska Gas is able to keep its rate base charges as low as possible. The loss of customers to alternative fuels would spread the rate base over fewer customers, and thereby increase the cost per customer. This benefit is similar to that which is realized by all customers when a new customer is added.

## VI. SUMMARY

**Q. PLEASE SUMMARIZE YOUR TESTIMONY.**

A. I have shown four important conclusions related to the HEAT rebate program. First, the current incentive offers financial benefits for residential customers of OPPD, LES, and NPPD who currently heat their homes and water with electricity or customers who use propane to convert to natural gas. Second, by inducing customers to switch to natural gas, it lowers the rate base costs for all customers. Third, revenues from new customers more than cover the cost of the HEAT incentive program. Fourth, the HEAT program helps retain existing natural gas customers and keeps rate base charges as low as possible.

**Q. DOES THAT CONCLUDE YOUR TESTIMONY?**

A. Yes, it does.

STATE OF NEBRASKA )

) SS

COUNTY OF LANCASTER )

I, Dr. David Rosenbaum, being first duly sworn on oath, depose and state that I am the witness identified in the foregoing prepared testimony and I am familiar with its contents, and that the facts set forth are true to the best of my knowledge, information and belief.

David Rosenbaum

Dr. David Rosenbaum

Subscribed and sworn to before me this 27th day of May, 2020.

(SEAL)


Christina L. Ellis

Notary Public

My Commission Expires: