# Black Hills Colorado Gas, Inc.
# 2024 – 2028 Clean Heat Plan

**Proceeding No.: 23A-_____G**
**Date: December 29, 2023**

Black Hills Energy
Ready

# Black Hills Colorado Gas, Inc.

## 2024 – 2028 Clean Heat Plan

Prepared for: Black Hills Colorado Gas, Inc. d/b/a Black Hills Energy

Prepared by: ScottMadden Management Consultants, Inc.
Applied Energy Group


# Executive Summary

## Clean Heat Targets and Scope

In 2021, the General Assembly passed Senate Bill 21-264 (SB21-264), requiring Local Distribution Companies (LDC's) to file Clean Heat Plans (CHP's), driving Greenhouse gas (GHG) emission reductions through the reduction of delivery and use of natural gas. This legislation is intended to support Colorado's current statewide emission reduction goals of 26 percent by 2025, 50 percent by 2030, 75 percent by 2040, 90 percent by 2045, and 100 percent by 2050, all below a 2005 baseline. SB21-264 sets ambitious GHG reduction targets, requiring LDC's to reduce customer combustion and natural gas distribution system emissions 4% by 2025 and 22% by 2030, below a 2015 baseline. Black Hills Colorado Gas, Inc. (BHCG) has a safe harbor for 2025, where the Colorado Public Utilities Commission (PUC) cannot require the utility to spend more than 2.5% of annual retail sales, however, this does not apply to the 2030 target.

Table ES-1 outlines statute defined Clean Heat resources, which are approved methods to reduce or displace GHG emissions within CHPs. Recovered methane, which includes renewable natural gas (RNG) and gas system leak repair, is capped at one-fourth (1/4) of total GHG emission reductions in 2025 and five-twenty seconds (5/22) of reductions in 2030.

**Table ES-1: CHP Eligible Resources**

| Clean Heat Resource | Description |
|---|---|
| **Demand side management (DSM)** | Reduction of natural gas usage through the installation of energy efficient measures. |
| **Recovered methane** | In-state renewable natural gas that qualifies under the feedstock specific protocol and distribution gas system leak repair that is incremental to what is already required by current state or federal requirements |
| **Hydrogen** | Green hydrogen produced from electrolysis through water and renewable energy that is injected into the natural gas system |
| **Beneficial electrification** | Conversion of gas end use to electric that results in decreased carbon emissions |
| **Pyrolysis of tires** | Thermochemical decomposition of tires at high temperatures and capture of energy that meets the requirements of a recovered methane protocol |
| **Other technologies approved by the PUC** | |

BHCG's first CHP is due January 1, 2024, with the subsequent CHPs filed no less than every four years. CHPs are required to include the following modeling scenarios for the PUCs consideration:

- A portfolio that uses Clean Heat resources to the maximum practicable extent, that complies with the cost cap, and that may or may not meet the Clean Heat target in the applicable plan period;
- A portfolio that meets the Clean Heat targets in the applicable plan period using only Clean Heat resources and can exceed the cost cap;
- Any other portfolio at the utility's discretion, and;
- Other portfolios as directed by the PUC.

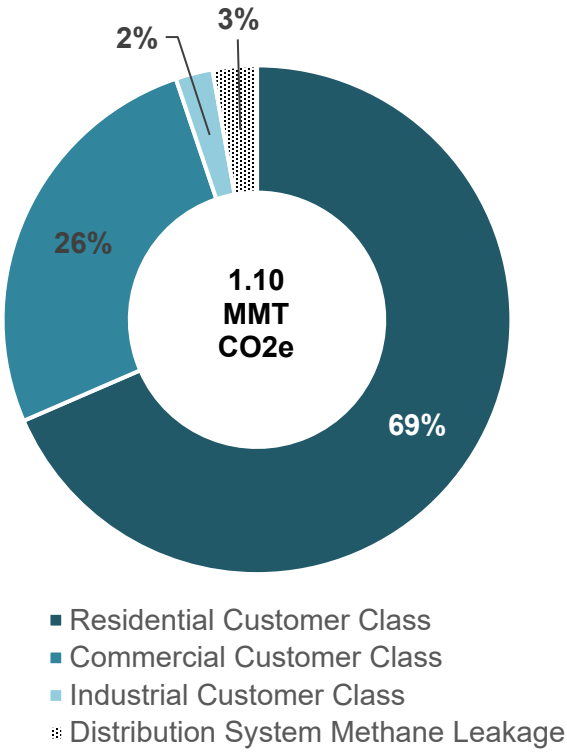
The Colorado Department of Public Health and Environment (CDPHE) developed guidance and a verification workbook to establish the accounting methodologies and evaluate the emission reductions in each Clean Heat portfolio. LDCs are required to include the populated verification workbook, which includes the 2015 baseline and forecasted emissions and associated reductions, for each scenario presented.

## Baseline Emissions and Target Calculation

The 2015 baseline emissions were estimated following the CDPHE CHP guidance and verification workbook methodologies. Baseline customer greenhouse emissions are calculated using non-weather normalized natural gas deliveries by customer class and the Environmental Protection Agency (EPA) Subpart NN $CO_2$ combustion emission factor for natural gas. Gas deliveries to transport customers or downstream LDCs are excluded from the baseline and reduction requirements, following the Clean Heat statute. The distribution system methane emissions are estimated using EPA Subpart W methodologies, which is based on emission factors for miles of distribution pipe and number of distribution services by material type.

BHCG's 2015 baseline emissions are primarily from customer combustion, with approximately 3% of the baseline emissions attributed to distribution system methane leakage. The residential customer class is the largest contributor, accounting for 69% of the baseline emissions, as shown in Figure ES-1.

FIGURE ES-1 TOTAL SYSTEM EMISSIONS, MT $CO_2E$




In alignment with SB 21-264, the Clean Heat targets reduction requirements were calculated for 2025 and 2030. The 2025 target is calculated as a 4% reduction in GHG emissions below the 2015 baseline with a maximum of 1/4 of the emissions reductions from recovered methane resources. The 2030 target is calculated as a 22% reduction in GHG emissions below the 2015 baseline with a maximum of 5/22 of the emissions reductions from recovered methane resources. The 2025 and 2030 emissions target and maximum allowable recovered methane reductions are presented in Table ES-2 below.

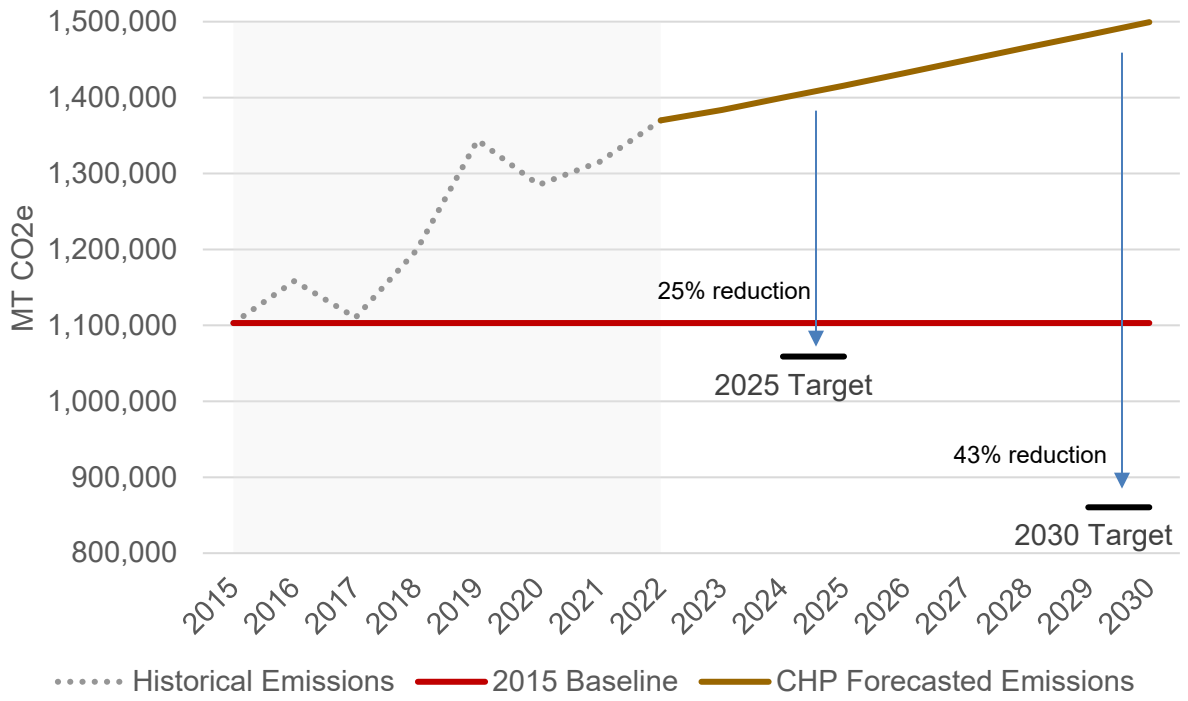
TABLE ES-2. CALCULATION OF CLEAN HEAT TARGETS

| Target Year | 2025 | 2030 |
|---|---|---|
| Reference Forecast (MT $CO_2e$) | 1,381,662 | 1,464,026 |
| System Leakage (MT $CO_2e$) | 34,032 | 35,334 |
| Total Emissions for CHP (MT $CO_2e$) | 1,415,694 | 1,499,360 |
| 2015 Baseline Emissions (MT $CO_2e$) | 1,103,086 | 1,103,086 |
| Target % of Baseline (%) | 4% | 22% |
| Emissions Target (MT $CO_2e$) | 1,058,963 | 860,407 |
| Emissions Reductions Target Including Growth (MT $CO_2e$) (4% and 22% below the baseline) | 356,731 | 638,952 |
| Emissions Reductions Target Excluding Growth (MT $CO_2e$) (4% and 22% from the baseline) | 44,123 | 242,679 |
| Allowable Recovered Methane Emissions Reductions (%) | 1% | 5% |
| Allowable Recovered Methane Emissions Reductions (Metric Tons $CO_2e$) | 89,183 | 145,216 |

## Clean Heat Plan Forecasts and Target Reduction Requirements

Projected natural gas sales emissions and estimated distribution system methane leakage are combined to establish the forecasted CHP baseline. This baseline is shown in Figure ES-2 compared to actual historic emissions. Due to growth and increased gas deliveries by BHCG since 2015, the 4% and 22% reduction are a calculated 25% reduction by 2025 and 43% reduction by 2030, substantially increasing the already aggressive emission reduction targets, demonstrated in Figure ES-2.

**FIGURE ES-2. HISTORIC AND PROJECTED EMISSIONS AND 2025 AND 2030 EMISSIONS TARGETS**




## Clean Heat Plan Core Scenarios

Three core scenarios were modeled in the development of BHCG's preferred plan. In accordance with the Clean Heat rules, at least one scenario achieves the 2030 emissions target, and at least one scenario does not exceed the annual CHP budget. Each scenario excludes budget or modeled savings for CHP-funded resources in 2024, as the Commission's decision on and subsequent approval of BHCG's proposed preferred plan will not be expected well into the 2024 program year. Given similar timing constraints and the expected implementation timelines for each resource, the core scenarios were developed with a focus toward achieving the 2030 emissions target. The core scenarios include:

- The **"Emission Target Achievement"** scenario, which achieves the 22% reduction by 2030, relying on high levels of DSM adoption and likely unavailable quantities of Clean Heat qualifying RNG. This scenario has high-cost impacts to customers, with an annual spend of $397M, exceeding the annual 2.5% cost cap by 67 times.
- The **"Cost-Effective Policy Alignment"** scenario which uses non-qualified Clean Heat recovered methane accounting and sourcing that aligns with other state and federal policies, maximizes emission reductions at a lower cost with a more diverse portfolio of resources. This would be BHCG's preferred plan if the accounting were allowed under Clean Heat rules, with the scenario integrating RNG and AMLD recovered methane credit banking, lifecycle emission accounting, and out-of-state RNG when in-state cost effective RNG availability is limited. This scenario achieves the 2030 target if growth were not counted against progress in reductions, with annual spend marginally above the cost cap at 2.8% of retail sales.
- The "**Clean Heat Preferred Plan**" scenario complies with the Clean Heat rules and utilizes a diverse portfolio of resources including demand side management (DSM), renewable natural gas (RNG), advanced monitoring and leak detection (AMLD), and green hydrogen blending in 2030. This scenario stays within the 2.5% annual retail sales cost cap, minimizing cost impacts to BHCG's customers, and achieves 11% of the 2030 target.

Figure ES-3 compares the utilization of Clean Heat resources, and Figure ES-4 demonstrates the average annual spend and 2030 emission reductions for the three core scenarios.

**FIGURE ES-3. CLEAN HEAT PLAN % EMISSION REDUCTION BY RESOURCE TYPE**

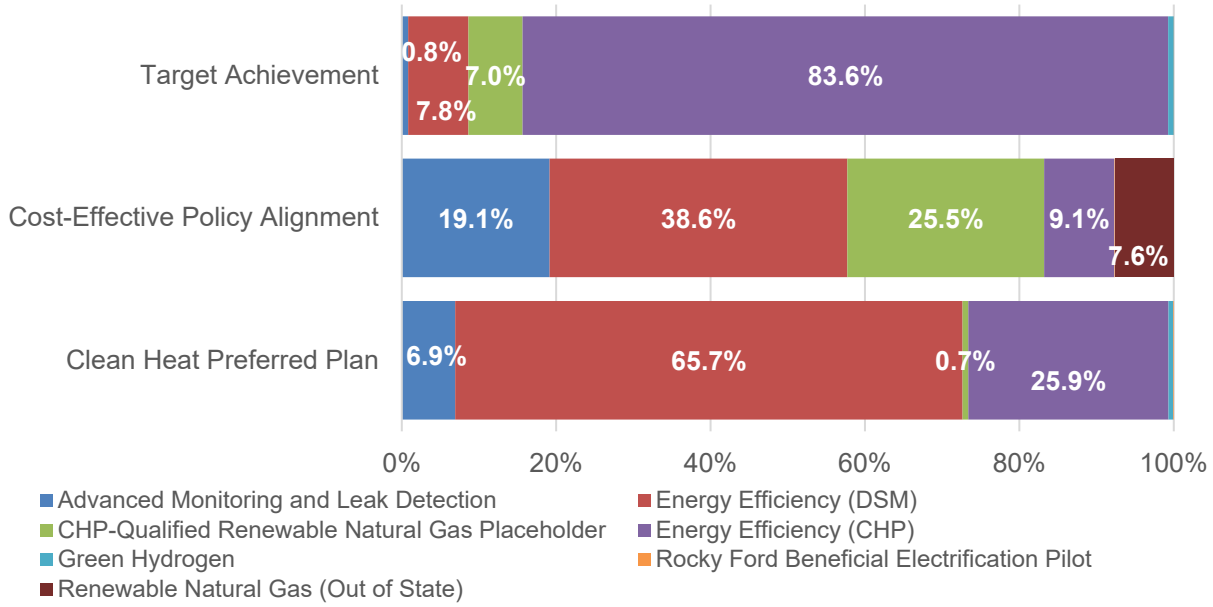
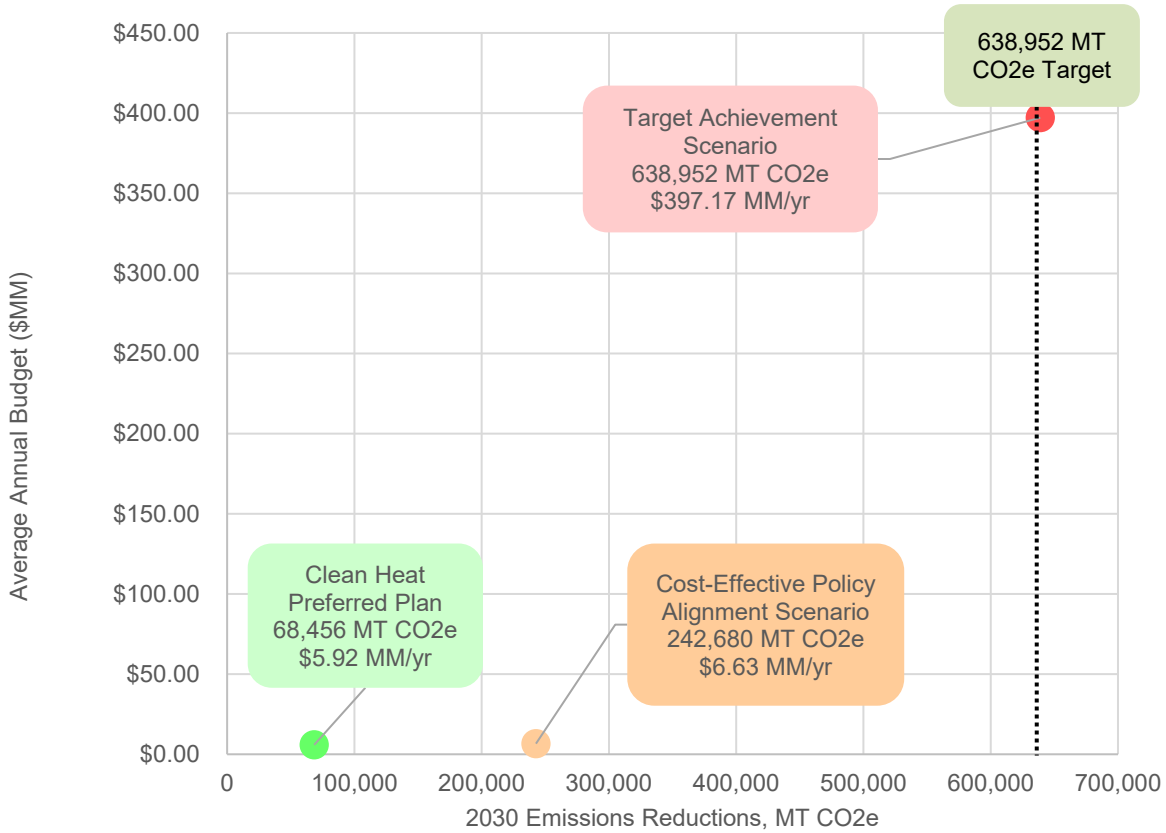



**FIGURE ES-4. CLEAN HEAT SCENARIO ANNUAL AVERAGE BUDGET AND 2030 EMISSIONS REDUCTIONS**



## Clean Heat Preferred Plan

The "Clean Heat Preferred Plan" is BHCG's preferred scenario emerging from careful consideration of the Clean Heat policy requirements, resource availability and cost-effectiveness, and feasibility to implement the proposed portfolio within the annual 2.5% Clean Heat cost cap. This scenario includes high levels of DSM energy efficiency resources in 2025 and 2026 when eligible, cost competitive Clean Heat RNG is limited within the State, and a budget for green hydrogen pilot blending in 2030. The 2025 and 2026 beneficial electrification allocated budget is described in more detail in Section 5.b. The diverse portfolio of resources reduces emissions from both the distribution system and customer combustion, while minimizing cost impacts to BHCG's customers.

Details on the preferred plan's total and resource-level implementation costs and emissions impacts are provided in the tables and figure below.

**TABLE ES-3. CLEAN HEAT PREFERRED PLAN IMPLEMENTATION COSTS**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| Energy Efficiency (CHP-Funded) | $4,707,229 | $4,398,484 | $2,000,000 | $2,000,000 | $2,000,000 | $2,000,000 |
| Green Hydrogen | $0 | $0 | $0 | $0 | $0 | $500,000 |
| Advanced Monitoring and Leak Detection | $728,474 | $1,206,421 | $1,349,871 | $1,488,496 | $1,407,165 | $1,919,690 |
| Rocky Ford Beneficial Electrification Pilot | $40,000 | $40,000 | $0 | $0 | $0 | $0 |
| CHP-Qualified Renewable Natural Gas Placeholder | $0 | $0 | $2,469,465 | $2,510,660 | $2,777,369 | $1,955,950 |
| **Total** | **$5,475,703** | **$5,644,906** | **$5,819,336** | **$5,999,157** | **$6,184,534** | **$6,375,640** |

**FIGURE ES-5. CLEAN HEAT PREFERRED PLAN EMISSIONS FORECAST**

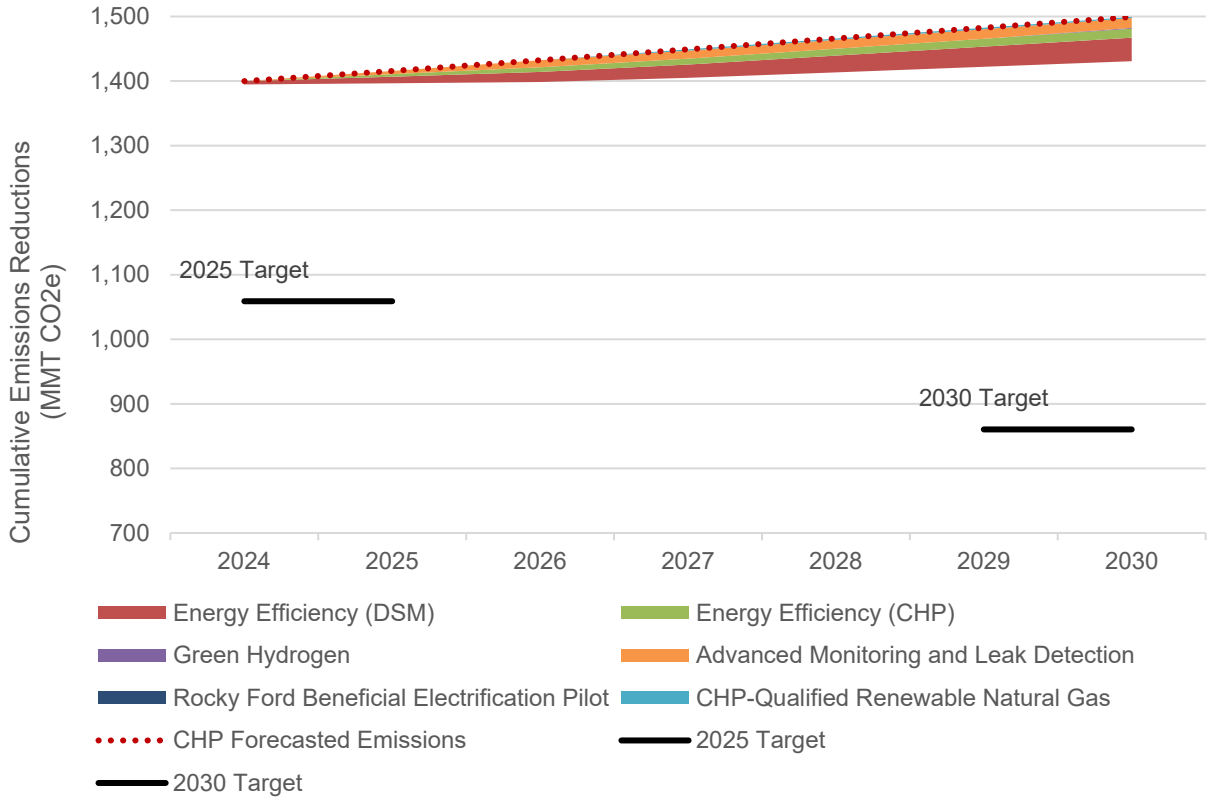



**TABLE ES-4. CLEAN HEAT PREFERRED PLAN EMISSIONS REDUCTIONS**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | 5,181 | 10,362 | 15,543 | 20,723 | 25,904 | 31,085 | 36,266 |
| Energy Efficiency (CHP-Funded) | 0 | 3,838 | 7,425 | 9,055 | 10,686 | 12,317 | 13,948 |
| Green Hydrogen | 0 | 0 | 0 | 0 | 0 | 0 | 1,302 |
| Advanced Monitoring and Leak Detection | 0 | 4,996 | 10,874 | 12,344 | 13,813 | 14,695 | 15,283 |
| Rocky Ford Beneficial Electrification Pilot | 0 | 18 | 36 | 36 | 36 | 36 | 36 |
| CHP-Qualified Renewable Natural Gas | 0 | 0 | 0 | 2,048 | 2,082 | 2,303 | 1,622 |
| **Total** | **5,181** | **19,214** | **33,877** | **44,206** | **52,521** | **60,436** | **68,456** |
| **% of Target Including Growth** | | **5%** | | | | | **11%** |
| **% of Target Excluding Growth** | | **44%** | | | | | **28%** |

## Key Clean Heat Plan Implementation Considerations

BHCG's "Clean Heat Preferred Plan" utilizes the most cost-effective Clean Heat qualified resources available to the Company, building a diverse portfolio of emission reduction strategies. The scenario expands already approved DSM through incremental CHP DSM funding, sources in-state RNG starting in 2027, includes the full deployment of AMLD across BHCG's distribution system, and allocates funding to be used for pilot scale green hydrogen blending starting in 2030. The Company is committed to delivering cost effective energy to its customers, and the "Clean Heat Preferred Plan" holds annual spend within the 2.5% cost cap through 2030.

Due to limited availability of Clean Heat qualified RNG in 2025 and 2026, the "Clean Heat Preferred Plan" relies on high levels of DSM implementation in the short term. Actual DSM funds utilized and associated emission reductions will be dependent on customer adoption, however, BHCG has a long and successful history of DSM deployment within Colorado. DSM is the most cost-effective way for BHCG to reduce emissions and support Colorado in its GHG reduction goals and is a key strategy in each scenario presented.

Clean Heat eligible RNG availability and pricing was informed by a RNG Request for Information (RFI) that BHCG jointly issued with Public Service Company of Colorado, Atmos Energy Corporation, and Colorado Springs Utilities. The RFI results demonstrated high variability in abatement costs between projects and feedstocks using the protocols outlined in the Clean Heat rules, and a lack of confidence from developers on project eligibility and recovered methane credit generation. The pricing and availability of RNG is subject to change, however, BHCG is committed to RNG markets in Colorado, and is requesting an allocation of the CHP funds be dedicated to the purchase of RNG environmental attributes under its preferred plan.

BHCG is committed to operating a safe and reliable gas distribution system, and full deployment of AMLD compliments that priority, while also improving GHG emission measurement and strategic leak detection and repair. Vendor supplied data was used to develop cost impacts and estimate emission reduction potential, however, actual emission reductions will be recognized once deployment occurs and BHCG's baseline emissions are re-established.

Subsequent CHPs will continue to evolve with developing markets, measurement improvements, emerging technology, and customer demands. BHCG's initial preferred plan prioritizes cost-effective emission GHG abatement strategies, targeting reductions from both the distribution system and customer combustion.

## Key Clean Heat Plan Policy Considerations

The Company's "Clean Heat Preferred Plan" addresses several policy issues that should be considered. It is important to recognize that gas LDCs are making significant contributions to lowering statewide carbon emissions. As the population of Colorado grew at a rapid pace since 2010[1] the importance of natural gas is emphasized given that the direct use of natural gas is less carbon intensive than grid electricity generation.[2] Furthermore, the Company's customer count grew by approximately 20% between 2015 and 2022. LDCs should be recognized for this contribution, rather than penalized for the state's growth.

There are several policy considerations related to CHP goal attainment that impact both the current and future CHPs. First, given the structure of how goals are calculated (where growth from 2015 is included in the carbon reduction goal) very aggressive goals become completely unachievable under the cost cap. Second, the cost to achieve the emission reduction goals is over sixty times greater than the cost cap and would cost Colorado ratepayers over $2 billion in portfolio costs through 2030 to achieve (compared to the $35 million cost cap). Third, BHCG does not provide electric service, thus while electrification is an eligible clean heat resource, BHCG is unable to offer electrification programs, thus limiting BHCG's available options. Last, that statute and rulemaking are overly restrictive for renewable natural gas compared to policies that are used in other states. This further decreases the amount of emissions reductions credit BHCG can claim and makes goal attainment more difficult. Each of these factors suggests that adjustments to how CHP goals are developed and how LDCs claim savings against the goals should be considered in future CHPs.

The most cost-effective clean heat resources, energy efficiency and advanced monitoring and leak detection, are the largest emission reduction contributors to the "Clean Heat Preferred Plan". A policy discussion should be had to discuss the importance of cost-effectiveness in CHPs and the relative priority resources should be given based on their cost-effectiveness.[3]

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[1] Population of Colorado grew approximately 14.8% between 2010 and 2022; U.S. Census Bureau QuickFacts: Colorado

[2] National Institute of Standards and Technology, US Department of Commerce, *Gas vs Electric: Sustainability Performance of Heating Fuel Options in the NIST NZERTF*, September 2020.

[3] The statute and regulations do not set parameters around the relative importance of cost-effectiveness compared to other CHP priorities, so a policy discussion on how cost-effectiveness should be weighed compared to other priorities is needed.

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## List of Acronyms

| | |
|---|---|
| AEG | Applied Energy Group |
| ACR | American Carbon Registry |
| AMLD | Advanced Monitoring and Leak Detection |
| AQCC | Air Quality Control Commission |
| BE | Beneficial Electrification |
| BE Settlement | Unopposed Comprehensive Beneficial Electrification Settlement Agreement |
| CAR | Climate Action Reserve |
| CARB | California Air Resources Board |
| CDPHE | Colorado Department of Public Health and Environment |
| CFS | Washington's Clean Fuel Standard |
| CHP | Clean Heat Plan |
| $CO_2$ | Carbon Dioxide |
| $CO_2e$ | Carbon Dioxide Equivalent |
| COE | Black Hills Colorado Electric, LLC |
| BHCG | Black Hills Colorado Gas, Inc. |
| DI | Disproportionately Impacted |
| DOT | Department of Transportation |
| DSM | Demand Side Management |
| EPA | Environmental Protection Agency |
| ESG | Environmental, Social and Governance |
| GHG | Greenhouse Gas |
| GIS | Geographic Information System |
| IQ | Income Qualified |
| LDC | Local Distribution Company |
| mmBtu | Million British Thermal Units |
| mscf | Thousand Standard Cubic Feet |
| MT | Metric Ton |
| NGIA | Minnesota's Natural Gas Innovations Act |
| NOAA | National Oceanic and Atmospheric Administration |
| PUC | Colorado Public Utilities Commission |
| REC | Renewable Energy Credit |
| RFI | Request for Information |
| RNG | Renewable Natural Gas |
| RPS | Renewable Portfolio Standard |
| SCC | Social Cost of Carbon |
| SCM | Social Cost of Methane |
| ScottMadden | ScottMadden Management Consultants, Inc. |
| TBS | Town Border Station |

## List of Tables and Figures

# 1. Company Background

Black Hills Colorado Gas, Inc. d/b/a Black Hills Energy (”BHCG” or “Company”) is required to file its first Clean Heat Plan (CHP) on January 1, 2024 with the Colorado Public Utilities Commission (“PUC”). BHCG consulted with ScottMadden Management Consultants, Inc. (ScottMadden) and Applied Energy Group (“AEG”) to perform the modeling and cost benefit analysis contributing to the development of the CHP scenarios.

## a. Black Hills Colorado Gas, Inc. d/b/a Black Hills Energy

BHCG is a subsidiary of Black Hills Corporation (“BHC”). BHC is a customer focused, growth-oriented utility company with a tradition of exemplary service and a vision to be the energy partner of choice. Based in Rapid City, South Dakota, BHC serves over 1.3 million electric and natural gas utility customers in 824 communities in Arkansas, Colorado, Iowa, Kansas, South Dakota and Wyoming.

BHCG is privileged to serve as an integral partner to Colorado customers and communities, delivering safe and reliable natural gas to approximately 207,000 customers in approximately 100 communities. The Company serves a diverse territory, primarily made up of small and mid-sized towns, rural areas, and mountain communities.

BHCG’s operations are widely dispersed across the state, responsible for safely operating and maintaining over 9,000 miles of natural gas infrastructure serving customers in eastern Colorado, the Front Range, the Western Slope and parts of southwestern Colorado. Major communities served include La Junta, Burlington and Yuma, the mountain communities of Pagosa Springs, Montrose, Glenwood Springs, and Aspen, and on the southern and northern edges of the Denver Metro area, Woodland Park, Castle Rock, and Frederick.

The customer base is comprised primarily of residential customers and a small number of commercial and irrigation/seasonal customers. The Company also provides gas transportation service to customers who elect to purchase their own natural gas.

## b. ScottMadden Management Consultants, Inc.

ScottMadden is one of the leading management consulting firms in the energy industry today. For 40 years, they have consulted with a wide range of investor-owned utilities, municipals, cooperatives, regional transmission organizations, independent system operators, and related entities in both the United States and Canada. ScottMadden has performed consulting engagements on issues such as decarbonization studies, energy efficiency, regulatory filing, benchmarking, strategic planning, business model development, process improvement, merger integration support, business planning, and organization design.

### c. Applied Energy Group

AEG is a multi-disciplinary technical, economic and management consulting firm, providing leading energy expertise to electric and natural gas utilities, government agencies, and other organizations since 1982. AEG provides a comprehensive suite of solutions in key demand side management (DSM) practice areas, with extensive experience in market assessment and potential studies, data analytics, including evaluation, measurement and verification services, as well as program planning and design. AEG's approach to program planning and cost-effectiveness analysis is grounded in decades of experience developing electric and natural gas DSM portfolios for its utility clients.

## 2. Introduction

### a. Clean Heat Targets and Scope

In 2021, the General Assembly passed Senate Bill 21-264 (SB21-264), requiring Local Distribution Companies (LDCs) to file Clean Heat Plans (CHPs), driving Greenhouse gas (GHG) emission reductions through the reduction of delivery and use of natural gas. This legislation is intended to support Colorado's current statewide emission reduction goals of 26 percent by 2025, 50 percent by 2030, 75 percent by 2040, 90 percent by 2045, and 100 percent by 2050, all below a 2005 baseline. SB 21-264 sets ambitious GHG reduction targets, requiring LDCs to reduce customer combustion and natural gas distribution system emissions 4% by 2025 and 22% by 2030, below a 2015 baseline. BHCG has a safe harbor for 2025, where the Colorado Public Utilities Commission (PUC) cannot require the utility to spend more than 2.5% of annual retail sales, however, this does not apply to the 2030 target.

In March 2023, the PUC adopted rules ordering all gas distribution utilities in the state of Colorado to file a CHP aimed at maximizing carbon dioxide and methane emissions reductions from the distribution and end-use consumption of system natural gas. The Clean Heat rules established emissions targets aligned with the statewide GHG emission reduction goals, with emissions reductions calculated against a baseline level of emissions for calendar year 2015 including annual growth and excluding emissions from customers that report their own GHG emissions to the United States Environmental Protection Agency under federal law.

Emissions reductions may be achieved by deploying any one of a combination of eligible resources, including DSM programs, recovered methane (subject to approved Colorado Department of Public Health and Environment (CDPHE) recovered methane protocols), green hydrogen, beneficial electrification (BE) programs, and pyrolysis of tires. Any other PUC-approved technology can be eligible if deemed cost-effective by the PUC, and the Air Pollution

Control Division (APCD) finds resulting in emissions reductions and meets an approved CDPHE recovered methane protocol.

Consistent with the Clean Heat rules, this technical report presents BHCG's emissions forecasts from natural gas sales and methane leakage from the distribution system, against which its target calculations are based. BHCG also presents three scenarios of Clean Heat resources, with one scenario meeting the Clean Heat target in the applicable plan period, scenario complying with a 2.5% annual retail cost impact cap, and an alternate scenario of Clean Heat resources. The following sections detail the methodology and results of BHCG's gas sales forecast and emissions targets calculations, a forecast of its Clean Heat portfolios compliant with the Clean Heat rules, and a presentation of BHCG's "Clean Heat Preferred Plan".

### b. CDPHE Verification Guidance and Workbooks

The CDPHE guidance and workbook establish the accounting methodologies to evaluate the emission reductions in each Clean Heat scenario in a consistent approach. The workbook is an executable Microsoft Excel workbook that consists of several tabs, which is to serve as a standardized "calculator" for all LDCs.

The workbook starts with historical emission data from the 2015 baseline, then utilizes forecasted gas retail sales and distribution system gas losses to establish a forecasted baseline of emissions from 2022 to 2030. On a separate tab, the Workbook shows reduction achievements for "demand side Clean Heat resources", "supply side recovered methane resources", and "supply side Clean Heat resources". The final "plan summary" tab summarizes if the emission reduction efforts outlined in the portfolio meet the requirements of the Clean Heat statute for both the emission target reductions and recovered methane cap requirements.

The workbook establishes a long-term forecast of emissions based on BHCG's extended gas sales forecast by customer class multiplied by the EPA Subpart NN $CO_2$ combustion emission factor for natural gas. Distribution system emissions are estimated utilizing EPA's Subpart W emission factors and projected distribution system mileage based on material type.

From the forecasted GHG emissions for 2025 and 2030, the workbook then calculates emissions reductions attributable to each Clean Heat resource. For any measure that avoids a dekatherm of natural gas delivered to a customer, such as energy efficiency or electrification, the avoided natural gas is reflected in 2025 and 2030 as a dekatherm savings and converted to metric tons of Carbon Dioxide ($CO_2$) savings using the EPA Subpart NN $CO_2$ combustion emission factor for natural gas. These measures are referred to as "demand side Clean Heat resources" as they reduce customer demand for natural gas. SB 21-264 allows for "recovered methane resources" which must meet all the criteria of the recovered methane protocols passed by the Air Quality

Control Commission (AQCC). The calculation of recovered methane credits occurs outside the workbook, and the total metric tons of Carbon Dioxide equivalent ($CO_2e$) reduced are entered into the workbook. Hydrogen is reflected as a replacement of a dekatherm of natural gas, with the emission savings based on the EPA Subpart NN $CO_2$ combustion emission factor for natural gas being calculated outside the workbook.

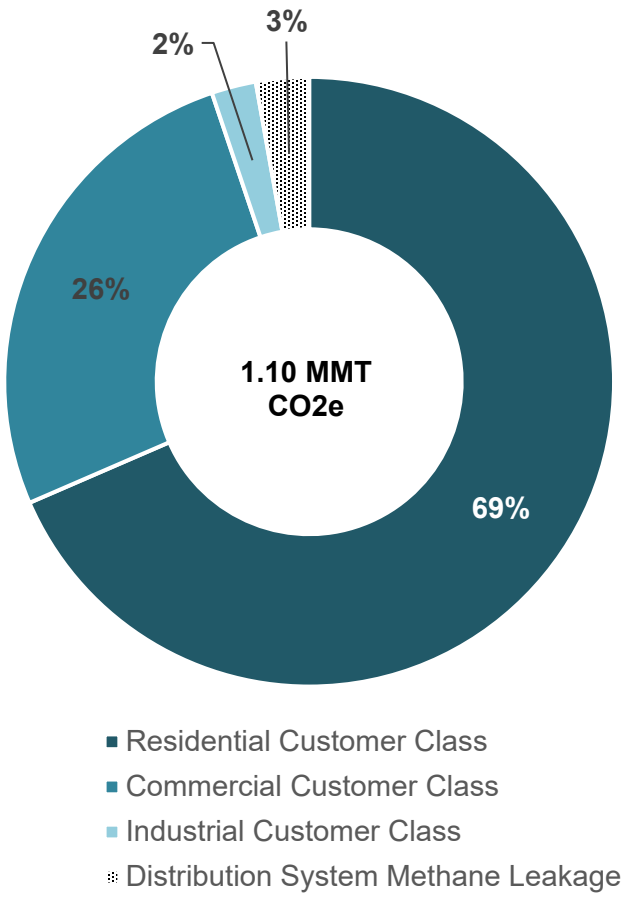
## 3. Baseline Emissions and Reduction Target Development

### a. Baseline Emission Development

The 2015 baseline emissions were estimated following the CDPHE CHP guidance and verification workbook methodologies. Baseline customer GHG emissions are calculated using non-weather normalized natural gas deliveries by customer class and the EPA Subpart NN $CO_2$ combustion emission factor for natural gas. Gas deliveries to transport customers or downstream LDCs are excluded from the baseline and reduction requirements, following the Clean Heat statute. The distribution system methane emissions are estimated using EPA Subpart W methodologies, which is based on emission factors for miles of distribution pipe and number of distribution services by material type. Due to BHCG's acquisition of SourceGas Distribution, LLC in 2016, public data sources were used in establishing the 2015 baseline emissions, which includes the Energy Information Administration Form-176 for reported gas deliveries, EPA Subpart W GHG reports, and the Department of Transportation (DOT) PHMSA annual reports for pipeline mileage information.

BHCG's 2015 baseline emissions are primarily from customer combustion, with approximately 3% of the baseline emissions attributed to distribution system methane leakage. The residential customer class is the largest contributor, accounting for 69% of the baseline emissions, as shown in Figure 1.

FIGURE 1. 2015 TOTAL SYSTEM EMISSIONS, MT $CO_2E$




## b. Emission Reduction Target Development

In alignment with SB 21-264, the Clean Heat targets reduction requirements were calculated for 2025 and 2030. The 2025 target is calculated as a 4% reduction in GHG emissions below the 2015 baseline, including growth consistent with the high case emissions forecast, with a maximum of one-fourth of the emissions reductions from recovered methane resources. The 2030 target is calculated as a 22% reduction in GHG emissions below the 2015 baseline, including growth consistent with the high case emissions forecast, with a maximum of five-twenty seconds (5/22) of the emissions reductions from recovered methane resources. The 2025 and 2030 emissions target and maximum allowable recovered methane reductions are presented in Table 1 below.

Due to growth and increased gas deliveries by BHCG since 2015, the 4% and 22% reduction are a calculated 25% reduction by 2025 and 43% reduction by 2030, substantially increasing the already aggressive emission reduction targets, which is shown in more detail in Section (4)(c). Due to the timing of BHCG's first filing, uncertainty on the timing of PUC's approval of a CHP, and limited implementation time, the focus was placed on the 2030 targets within the modeling.

TABLE 1 . CALCULATION OF CLEAN HEAT TARGETS

| Target Year | 2025 | 2030 |
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| Allowable Recovered Methane Emissions Reductions (%) | 1% | 5% |
| Allowable Recovered Methane Emissions Reductions (Metric Tons $CO_2e$) | 89,183 | 145,216 |

# 4. Forecasted GHG Emissions and Peak Design Day

## a. Forecasted Natural Gas Sales and Emissions

Natural gas sales were forecasted using the methodology outlined below to establish BHCG's forecasted Clean Heat Plan emission baseline through 2050.

### *i. Methodology*

The CHP includes a high, base, and low case forecasting sales through the Clean Heat total period or 2050. The "High Case Forecast" begins with throughput in 2022 (not adjusted for weather normalization) and applies an index factor representative of anticipated growth in throughput for the informational period of 2050. This "business as usual" case assumes population growth in Colorado consistent with State of Colorado Demographics projections, by county through 2050. The high case also assumes usage per customer remains constant through the informational period, based upon 2022 usage per customer. The "High Case Forecast" serves as the natural gas sales forecast baseline within the CHP modeling and verification workbooks.

The "Base Case Forecast" uses the throughputs forecasted in the "High Case Forecast" as a starting point. The "Base Case Forecast" applies a forecasted reduction in throughput based upon projected energy savings resulting from BHCG's DSM Plan from the high case to determine natural gas sales in the base case. The energy savings associated with BHCG's DSM Plan assume increased annual energy savings due to extension of DSM Plans through the informational periods. The increased annual energy savings developed in this case are consistent with the proposed energy savings targets in Proceeding No. 23A-0361G, BHCG's DSM Strategic Issues. Due to the incorporation of increasing DSM energy savings, usage per customer does not remain constant through the informational period in the reference case. The DSM energy savings in the base case are representative of projected savings from BHCG's established 2024 – 2025

DSM Plan and do not include forecasted DSM savings associated with Clean Heat resource implementation.

The "Low Case Forecast" uses throughputs forecasted in the "High Case Forecast" as a starting point in developing the low case. The low case assumes DSM measures are not adopted by customers, rather customers opt to electrify, and displace natural gas throughput. The low case applies a reduction in natural gas throughput associated with electrification to the High Case usage in determining the low case. The reduction in natural gas associated with electrification is derived from figures supported by National Renewable Energy Laboratory[4] and Colorado Energy Office.[5] The incorporation of increasing throughput reductions due to electrification in the low case scenario, usage per customer does not remain constant through the informational period.

The verification workbook establishes a long-term forecast of emissions based on BHCG's gas sales forecast by customer class multiplied by the EPA Subpart NN $CO_2$ combustion emission factor for natural gas.

[4] https://www.nrel.gov/docs/fy18osti/71500.pdf ; Pg xvi
[5] https://energyoffice.colorado.gov/press-releases/colorado-energy-office-releases-research-on-beneficial-electrification-potential-in#:~:text=Several%20key%20findings%20emerged%20from,2021%2D2030%20decade%20and%20beyond.&text=Electrifying%20propane%20use%20is%20more%20cost%20effective%20than%20natural%20gas ; "Beneficial Electrification in Colorado Market Potential Study 2021-2023"; Pg 25.

### *ii. Natural Gas Sales and Emissions Forecasts*

High, base, and low case forecasted dekatherm sales from 2024 through 2050 are shown in Figure 2 and summarized in Table 2 below.

**FIGURE 2. NATURAL GAS SALES FORECASTS, DTH**

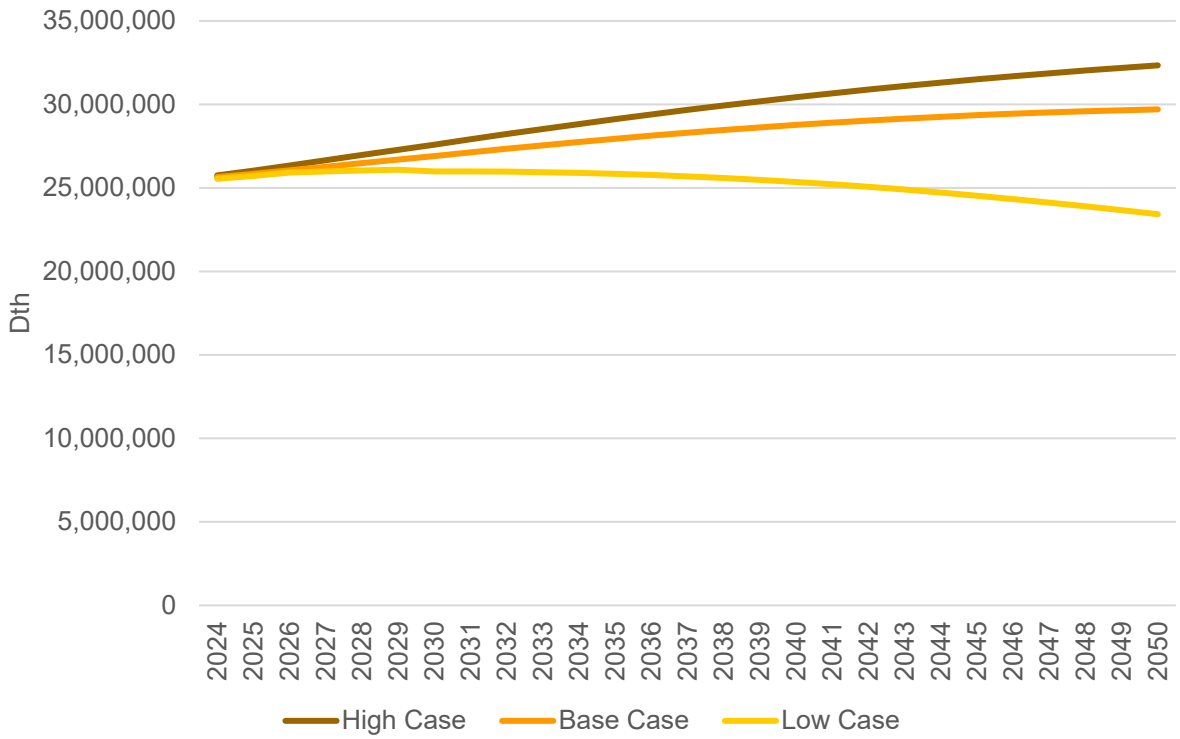



**TABLE 2. NATURAL GAS SALES FORECASTS, DTH**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| High Case | 25,747,214 | 26,034,528 | 26,345,039 | 26,656,818 | 26,969,876 | 27,278,263 | 27,586,498 | 30,430,692 | 32,338,562 |
| Base Case | 25,649,592 | 25,839,284 | 26,052,173 | 26,266,329 | 26,481,766 | 26,692,530 | 26,903,143 | 28,771,115 | 29,702,763 |
| Low Case | 25,541,236 | 25,722,114 | 25,923,518 | 25,985,066 | 26,042,113 | 26,088,931 | 25,986,481 | 25,354,136 | 23,424,532 |

High, base, and low case forecasted MT $CO_2e$ emissions from 2024 through 2050 are shown in Table 3 below.

**TABLE 3. NATURAL GAS EMISSIONS FORECASTS, MT $CO_2E$**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| High Case | 1,366,414 | 1,381,662 | 1,398,141 | 1,414,687 | 1,431,301 | 1,447,668 | 1,464,026 | 1,614,968 | 1,716,219 |
| Base Case | 1,361,233 | 1,371,300 | 1,382,598 | 1,393,964 | 1,405,397 | 1,416,582 | 1,427,760 | 1,526,894 | 1,576,337 |
| Low Case | 1,355,483 | 1,365,082 | 1,375,771 | 1,379,037 | 1,382,065 | 1,384,549 | 1,379,112 | 1,345,553 | 1,243,149 |

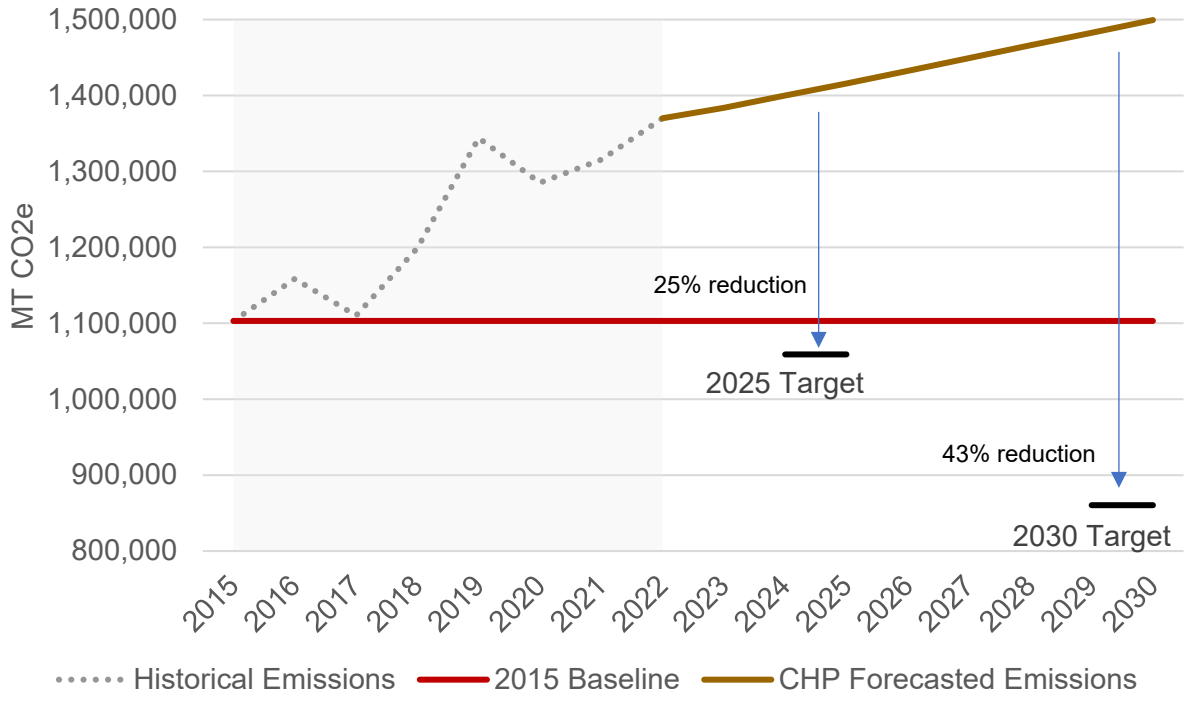
### b. Forecasted Distribution System Emissions

Miles of distribution main and number of services by material type were projected through 2050 by analyzing past growth patterns in the Department of Transportation (DOT) Annual Report Form F7100 to project future infrastructure buildout. Distribution system emissions were estimated utilizing EPA's Subpart W emission factors based on material type and projected distribution system mileage and counts of distribution services.

### c. Actual Reduction Requirements against Historic and Projected Emissions

Projected emissions from the "High Case Forecast" for natural gas sales and forecasted distribution system methane leakage are combined to establish a CHP baseline. This baseline is shown in Figure 3 compared to actual historic emissions. Due to growth and increased gas deliveries by BHCG since 2015, the 4% and 22% reduction are a calculated 25% reduction by 2025 and 43% reduction by 2030, substantially increasing the already aggressive emission reduction targets.

**FIGURE 3.** Historic and Projected Emissions and 2025 and 2030 Emissions Targets




### d. Peak Design Day Forecasts

Projected peak design day forecasts for BHCG's distribution system are not included in the CHP verification workbooks or modeling but is presented for information purposes as required by PUC Clean Heat rulemaking. To perform the Colorado statewide peak design day forecast by

customer class BHCG utilized data from customer meters, monthly billing, town boarder station (TBS) throughput, and National Oceanic and Atmospheric Administration (NOAA) weather records.

To estimate the monthly usage by customer class, meter data gathered through BHCG's Geographic Information System (GIS) system was used to associate meter class to the meter identification numbers in the monthly billing data. Using the monthly usage data for every customer with associated customer class, a total monthly gas usage by customer class and system was calculated and was used to approximate each system split by month between the various customer classes.

The peak design day forecast is generated utilizing daily TBS gas throughput paired to a daily average heating degree day. NOAA records for minimum, maximum, and average daily temperatures and average wind speed are obtained from nearby weather stations for each system. If average temperature data is available, this record is used to calculate the average daily heating degree day. When average temperature data is not available, the daily minimum and maximum temperatures are used to estimate the average daily temperature. Wind speeds above 8 miles per hour are used to apply a wind correction factor to the average daily heating degree day. Daily TBS gas throughput and average heating degree day values are paired for a given forecast period and the data is analyzed to plot the peak design day using the maximum average daily heating degree day within the last 30 years. The calculated percent split by customer class referenced above is applied to approximate the peak design day forecast by customer class.

Peak design day forecasted million British thermal units (MMBtu) per day from 2024 through 2050 are shown in Figure 4 and summarized in Table 4 below.

FIGURE 4. TOTAL PEAK DESIGN DAY GAS SALES FORECAST

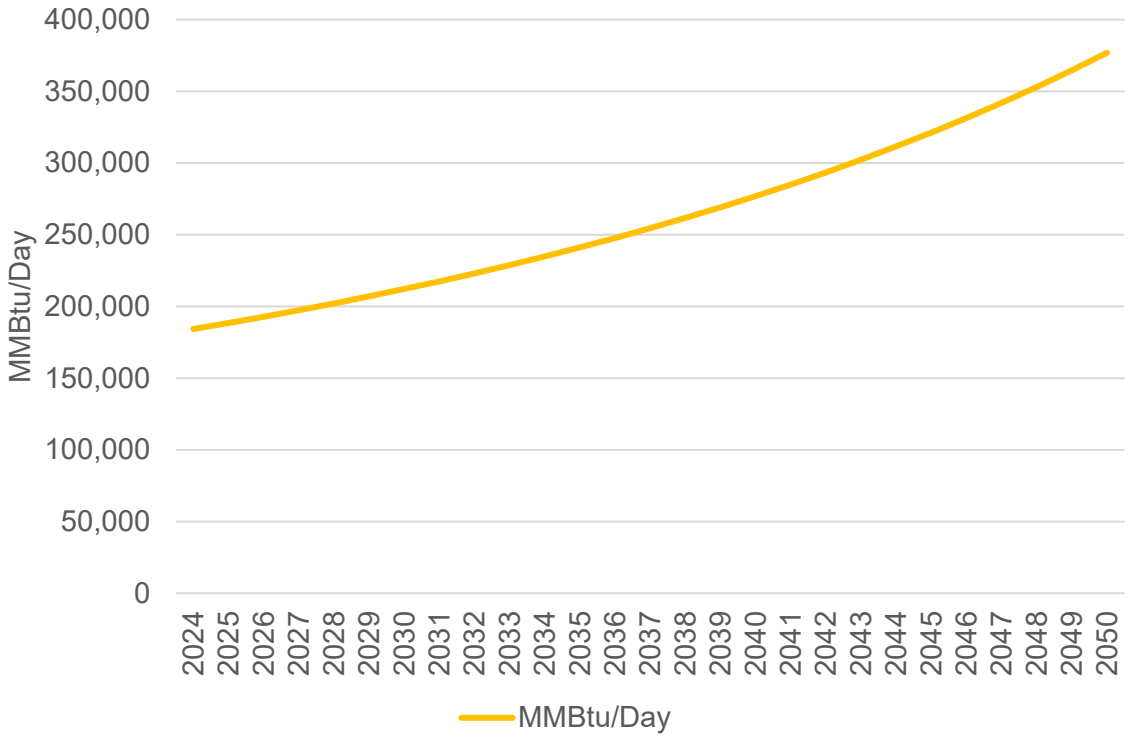



TABLE 4. TOTAL PEAK DESIGN DAY GAS SALES FORECAST

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| MMBtu/Day | 184,307 | 188,492 | 192,850 | 197,389 | 202,115 | 207,037 | 212,163 | 276,921 | 376,929 |

## 5. Portfolio Development Process

In the development of BHCG's CHP, BHCG evaluated a variety of eligible resources consistent with the Clean Heat rules, including energy efficiency, BE, RNG, green hydrogen, and AMLD. Descriptions of each resource are detailed below.

### a. Energy Efficiency

Energy Efficiency consists of two main components: 1) energy efficiency funded through BHCG's filed 2024-2025 Demand-Side Management (DSM) Plan, and 2) additional funding for energy efficiency through BHCG's Clean Heat budget. The Company's DSM Plan in Proceeding No. 23A-0361G is still pending PUC approval. The DSM Plan consists of a comprehensive energy efficiency portfolio of Residential and Non-Residential programs, as well as Special programs targeting income-qualified customers and students within BHCG's service area. The DSM Plan

includes a two-year total budget of $10,295,870 and a two-year total 195,244 dekatherm energy savings goal. For the CHP, DSM Plan-funded energy efficiency includes all planned lifetime natural gas savings across all DSM programs through the 2024-2025 planning cycle, converted to MT $CO_2e$ to count toward the 2025 and 2030 Clean Heat emissions targets.

Additional energy efficiency, which is in addition to the 2024-2025 DSM Plan, consists of additional funding for existing DSM programs, incremental funding for measures that are not included in the 2024-2025 DSM Plan, and funding for new pilot programs. Funding for existing DSM programs is above the filed budget levels that will be supplemented with CHP funds. The funding will support additional participation and contractor incentives for multiple programs including the Income Qualified program, Residential Prescriptive and New Construction programs, and Non-Residential Prescriptive, Custom, and New Construction programs. Incremental funding for measures that are not included in the 2024-2025 DSM Plan are for new measures that were considered for inclusion in the DSM Plan, but ultimately not included in the DSM Plan. The additional measures, which will be funded with CHP budget, will be included in the Non-Residential Prescriptive program and Residential Prescriptive and New Construction programs, with enhanced incentives for Income Qualified customers. These measures did not pass cost-effectiveness criteria for the DSM-portfolio but did meet cost-effectiveness criteria from a $CO_2e$ abatement perspective. Lastly, BHCG assessed potential new pilot programs to fund through the CHP, including non-residential carbon capture incentives and industrial methane and refrigerant leak reduction options.

### b. Beneficial Electrification

Black Hills Colorado Electric, LLC (BHCE), an affiliate of BHCG, filed a Beneficial Electrification Plan (BE Plan) in Proceeding No. 22A-0304E, which resulted in an Unopposed Comprehensive BE Settlement Agreement (BE Settlement). As part of the BE Settlement the parties agreed that the BE Plan will include a Whole Home Electrification Pilot that committed BHCE to work with the Colorado Energy Office to educate customers on utility, state and federal incentives that can help customers reduce their overall energy costs. This Pilot will serve dual-fuel customers in the Rocky Ford area, where BHC's subsidiaries are both the electric and gas utility provider. The Rocky Ford BE Pilot Project will be launched within six months of federal or state funding (expected in early 2024) either through a 60-day Notice or in the next BE Plan filing.

The BE Settlement commits BHCE having a not to exceed budget of $40,000 annually for two consecutive years to cover administrative expenses, customer recruitment and education. The BE Settlement also committed BHCG to request Commission approval for a budget of $40,000 annually for two consecutive years to also cover administration, customer recruitment and

education in the CHP. Acknowledging that the BE Plan and this CHP may not align, BHCG is committed to working with BHCE to come to a mutually agreeable length for the Pilot. BHCG will be credited for any gas DSM and BE emission reductions from the Pilot to be put towards Clean Heat targets. BHCG requests approval for $40,000 for two consecutive years as part of this CHP, which is included in the modeling for all scenarios. Consistent with the BE Settlement, the CHP-funded portion of the Pilot consists of budgeting for internal Black Hills labor and administrative costs, marketing and promotion costs, and program tracking and evaluation costs. These costs are not inclusive of direct incentives or costs to program participants.

With BHC's limited electric and natural gas overlapping service territory in Colorado, electrification in the CHP modeling was limited to the Rocky Ford BE Pilot Project.

### c. Renewable Natural Gas

#### *i. Clean Heat Statute Definition of RNG*

Renewable natural gas, defined as "recovered methane" within the Clean Heat statute, is an allowable Clean Heat resource if it is sourced from within the state of Colorado and meets the qualifications defined in the feedstock specific protocols defined by the Air Quality Control Commission (AQCC) within 5 CCF 1001-26, Part C. RNG environmental attributes, or "recovered methane credits" must also be quantified using the applicable protocol:

- **I.C.2 Biomethane from manure management systems**: The "Compliance Offset Protocol Livestock Projects" adopted by the California Air Resources Board (CARB) on November 14, 2014
- **I.C.3 Methane derived from municipal solid waste**: Version 2.0 of the "Landfill Gas Destruction and Beneficial Use Projects" methodology (April 2021; Errata & Clarification October 25, 2022), issued by the American Carbon Registry (ACR)
- **I.C.4 Methane derived from wastewater treatment**: Version 2.1 of the "Organic Waste Digestion Protocol" (January 16, 2014; Errata and Clarifications November 1, 2018) issued by the Climate Action Reserve (CAR)
    - I.C.4.b.(iii) Where the project baseline includes existing control or capture and utilization of recovered methane, credits for the recovered methane will only be issued for emission reductions resulting from the recovered methane displacing geological gas for an end use that would otherwise be serviced by a gas distribution utility, municipal gas distribution utility, or small gas distribution utility according to the methodology in Section I.C.4.b.(iv).

- I.C.4.b.(iv) Emission reductions shall be calculated using the applicable calculation methodology for local LDCs described in Subpart NN of 40 CFR Part 98 at Section 98.403(a), and the volume of natural gas supplied in the calculation will be the volume of recovered methane that has displaced geological gas.

- **I.C.5 Coal Mine Methane**: Version 1.1 of the "Capturing and Destroying Methane from Coal and Trona Mines in North America" methodology issued by the ACR in August 2022

The protocols consider the environmental benefits of the RNG to be the avoided GHG emissions resulting from the RNG project. This is calculated by establishing the baseline scenario emissions (emissions that would have occurred in the absence of the RNG project) and deducting any emissions from the RNG project activity.

The PUC issued final rules for CHP state that recovered methane can be used for one-fourth (1/4) of the emission reductions required to meet the 2025 emission target and five-twenty seconds (5/22) of the emission reduction required to meet the 2030 emission target. This constraint was applied to the "Clean Heat Preferred Plan" and "Emission Target Achievement" scenario as the maximum amount of RNG allowable.

### *ii. Renewable Natural Gas Request for Information*

BHCG issued an RNG Request for Information (RFI) jointly on July 17 with Public Service Company of Colorado, Atmos Energy Corporation, and Colorado Springs Utilities to determine RNG markets for CHPs. The Colorado LDCs acknowledge that collaboration and joint offtake agreements will likely be required based on Clean Heat cost caps and project sizes.

RFI responses were due September 1, and the results were used to inform the scenario modeling regarding RNG availability, project eligibility for CHPs, RNG volumes and associated recovered methane credits, and pricing. Developers were generally unfamiliar with the feedstock specific protocols, resulting in a lack of confidence in determining if projects qualified for CHPs and the number of recovered methane credits generated. The RFI submissions were used for informative purposes only and are subject to change.

Within the issued RFI, Colorado LDCs stated the gas off-taker would have first rights to the environmental attributes, and the remaining attributes (if any) would be allocated to the other LDCs using a ratio based on customer counts. As a constraint within the modeling, all in-state RNG projects were capped at BHCG's ratio of customer counts, meaning approximately 10% of the attributes from the projects would be available to BHCG. Actual availability would be determined through the negotiation process if a joint agreement is pursued.

*iii. In-State Renewable Natural Gas*

The Clean Heat statute requires RNG to be sourced within the state of Colorado, and the "Emissions Target Achievement" and "Clean Heat Preferred Plan" scenarios use in-state RNG exclusively. The RFI results were used for in-state RNG pricing and available modeling inputs, which included cattle feedlot, wastewater and dairy feedstocks. Partial RFI responses were also received for food waste and co-digestion feedstocks, however, these projects were not included as modeling data inputs as project eligibility, pricing, and recovered methane credit generation are undetermined at this time.

*iv. Out-of-State Renewable Natural Gas*

The "Cost-Effective Policy Alignment" scenario allows for out-of-state RNG sourcing only when in-state cost effective RNG availability is limited (2025 – 2026). Market RNG pricing and availability by feedstock type were used for out-of-state RNG data inputs within the model.

### d. Green Hydrogen

Green hydrogen, or hydrogen produced by electrolysis from renewable energy and water, is the only hydrogen generation process allowed under the statute for CHPs. Hydrogen was constrained at a 3% by volume maximum system blending rate within the model for all scenarios, as several gas utilities in the United States have successfully piloted hydrogen at low blending rates.

### e. Advanced Monitoring and Leak Detection

In 2022, BHC developed an internal team to evaluate AMLD technologies and providers across our service territory. Data collected from vendors informed the CHP scenario modeling for AMLD, including associated costs and projected distribution system emission reductions.

The three core scenarios include the same proposal and implementation plan for AMLD. Based on the size of BHCG's Colorado distribution system, two AMLD units are proposed for full system coverage every three years. The phased implementation plan includes operating in super-emitter mode in year 1 (2025) and operating in super-emitter and compliance mode in year 2 (2026). Super-emitter mode focuses on large leaks (beginning at ≥ 5 scf/h) to prioritize detection and repair, while compliance mode replaces current compliance-based leak surveys.

Conservatively, projected emission reductions are quantified as recovered methane credits within the verification workbooks and are included within the recovered methane cap. However, it is anticipated that when AMLD is implemented, the 2015 baseline emissions would be re-established, and actual distribution system emissions reported moving forward. This means the process of generating and retiring recovered methane credits may not be necessary. All projected

emission reductions are estimates only based on vendor specific data and the current 2015 baseline emissions, and are subject to change based on actual implementation and measurement. The reporting and recovered methane credit generation requirements would require continued stakeholder input and a new iteration of the CDPHE verification workbook.

### f. Cost-Effectiveness Metrics

BHCG assessed the cost-effectiveness of the eligible CHP resources using two approaches: 1) net benefits analysis, and 2) a lifetime $CO_2e$ abatement cost metric. BHCG's net benefit analysis, similar to traditional DSM benefit-cost tests (Modified Total Resource Cost Test), considers the net present value of full costs and the associated benefits attributable to CHP investments, and was conducted at the measure, resource, and total portfolio levels.

The net benefit analysis was performed with distinct boundaries appropriate for each resource in order to effectively capture their respective economic impacts. For example, energy efficiency resources were evaluated within the traditional DSM cost-effectiveness framework. Alternatively, given the nuances of CHP-funding toward the Rocky Ford Beneficial Electrification Pilot, the benefits attributable to the CHP are proportionate to the program costs funded by the CHP. Supply side resources, such as RNG, AMLD, and green hydrogen, were evaluated in terms of utility costs to implement and procure the resources compared to wholesale system gas savings and the avoided social costs of carbon and methane were claimed.

The lifetime $CO_2e$ abatement cost metric, expressed in \$/MT $CO_2e$, was designed to evaluate the investment cost required to achieve reductions toward the CHP emissions targets. The metric is applied at the measure level, e.g., for energy efficiency resources, at the project level, e.g., for the various RNG feedstocks considered, and at the total CHP resource level. The metric was used to compare the cost-effectiveness of eligible Clean Heat resources to inform the decision-making process in developing BHCG's preferred scenario.

Cost-effectiveness is measured at each level (measure/project, resource, and overall scenario), but the cost-effectiveness for each scenario is determined at the scenario-level. A scenario is determined to be cost-effective if the benefit-cost ratio is greater than 1.0, i.e. if the benefits are greater than the costs. In order to have a balanced scenario that includes a diverse portfolio of resources, measures and resources that have a benefit-cost ratio less than 1.0 can be included in the scenario where the overall scenario can still be cost-effective even if some resources are not.

### g. Modeling Process

The Company contracted with ScottMadden and AEG to perform various analyses. The ScottMadden and AEG teams modeled the BHCG Clean Heat portfolio across three core scenarios, using a custom-built Excel-based tool compatible with the CDPHE CHP verification workbook required for the Clean Heat filings. The model was designed to assess each eligible Clean Heat resource in terms of system gas savings, emissions impacts, resource costs, and cost-effectiveness under the net benefits analysis approach and the lifetime $CO_2e$ abatement cost metric. Eligible resources are bundled into core portfolios and verified for compliance across a number of Clean Heat requirements, including annual cost cap compliance, emissions reductions toward 2025 and 2030 targets, and maximum allowable recovered methane credits. The project teams assessed the eligible resources for cost-effectiveness, bundled the resources into core portfolios dependent on cost-effectiveness and resource availability, and calibrated each portfolio to meet the Clean Heat scenario requirements. Each of the core Clean Heat scenarios are described in the following sections of this report.

# 6. Clean Heat Scenarios

Three core scenarios were modeled in the development of BHCG's preferred plan. In accordance with the Clean Heat Rules, at least one scenario achieves the 2030 emissions target, and at least one scenario does not exceed the annual CHP budget. Each scenario excludes budget or modeled savings for CHP-funded resources in 2024, as the Commission's decision on and subsequent approval of BHCG's proposed preferred plan will not be expected well into the 2024 program year. Given similar timing constraints and the expected implementation timelines for each resource, the core scenarios were developed with a focus toward achieving the 2030 emissions target. The core scenarios include:

- The **"Emission Target Achievement"** scenario, which achieves the 22% reduction by 2030, relying on high levels of DSM adoption and likely unavailable quantities of Clean Heat qualifying RNG. This scenario has high-cost impacts to customers, with an annual spend of $397M, exceeding the annual 2.5% cost cap by 67 times.
- The **"Cost-Effective Policy Alignment"** scenario which uses non-qualified recovered methane accounting and sourcing that aligns with other state and federal policies, maximizes emission reductions at a lower cost. This scenario achieves the 2030 target if growth were not counted against progress in reductions, with annual spend marginally above the cost cap at 2.8% of retail sales.
- The "**Clean Heat Preferred Plan**" scenario complies with the Clean Heat rules and utilizes a diverse portfolio of resources including DSM, RNG, AMLD and green hydrogen blending in 2030. This scenario stays within the 2.5% annual retail sales cost cap, minimizing cost impacts to BHCG's customers, while achieving 11% of the 2030 target.

Figure 5 shows the average annual spend and utilization of Clean Heat resources, with the following sections providing additional details on each scenario.

**FIGURE 5 CLEAN HEAT RESOURCE UTILIZATION BY SCENARIO**

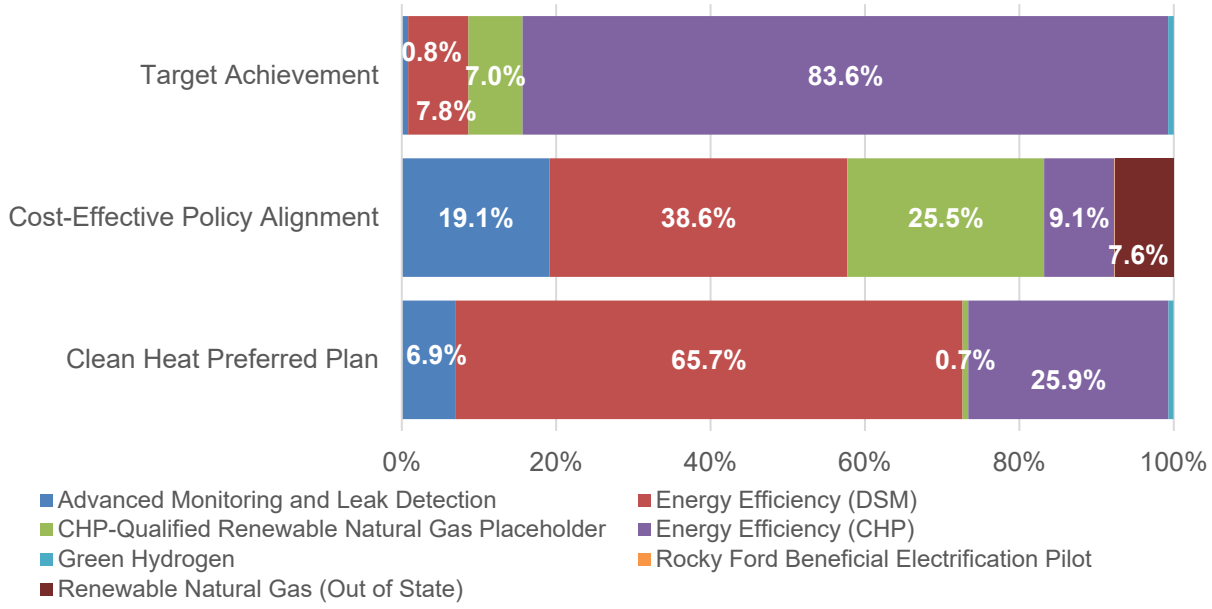
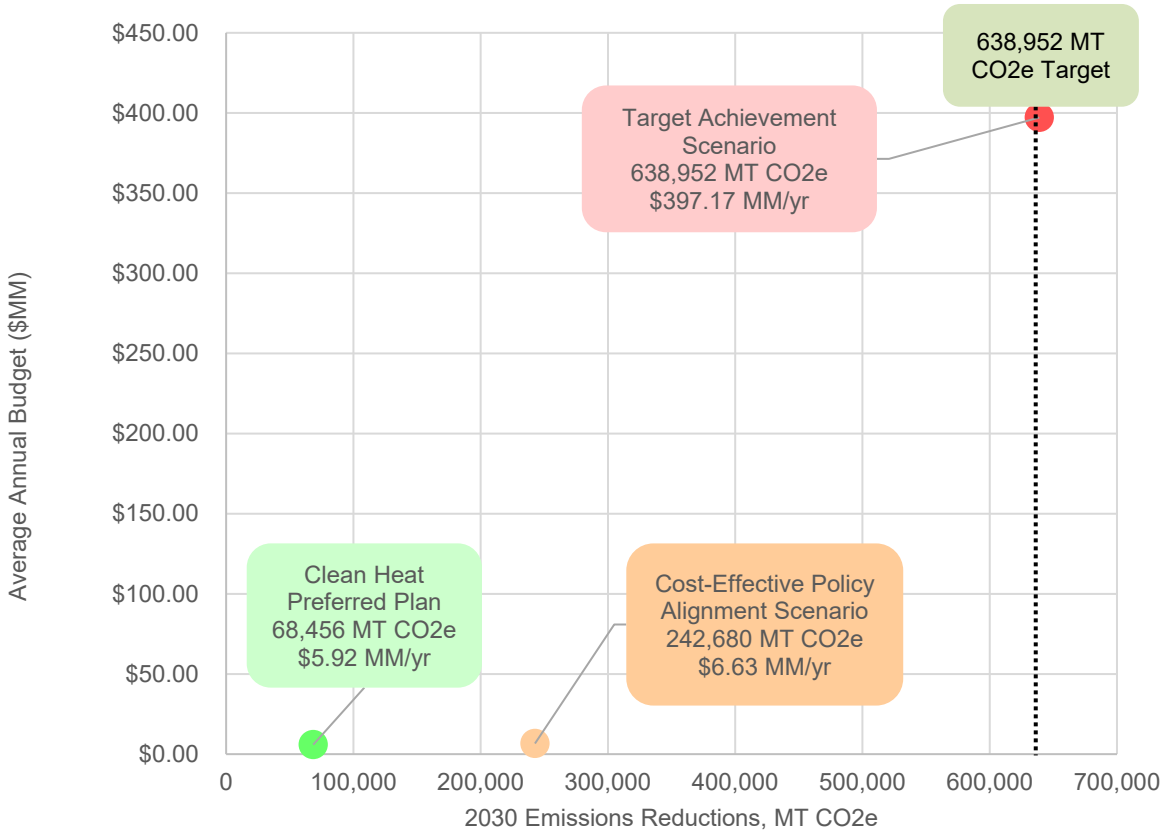



**FIGURE 6 CLEAN HEAT SCENARIO ANNUAL AVERAGE BUDGET AND 2030 EMISSIONS REDUCTIONS**



### a. Emission Target Achievement Scenario

The “Emission Target Achievement” scenario demonstrates the resource mix and total program costs required to achieve the 2030 emissions target within the parameters of the Clean Heat rules. The portfolio relies significantly on DSM energy efficiency savings potential, while maximizing the estimated availability of RNG, with fixed budget allocations toward BE and AMLD. Green Hydrogen was limited to a conservative 3% system blending ratio. Recovered methane resources, including RNG and AMLD, were modeled up to the 2030 recovered methane credit limit, exceeding the total State’s availability of Clean Heat qualified RNG projected to be available in 2030 based on the RNG RFI.

Given the limited scalability of non-DSM resources, the scenario models energy efficiency up to a theorical level of savings in order to meet the 2030 target, well beyond the annual Clean Heat budget limit and technical savings potential consistent with BHCG’s 2021 DSM Potential Study. To account for increasing levels of cost to achieve incremental emissions reductions, energy efficiency investments funded through the CHP budget are modeled under a three-tiered approach, consistent with the 2021 DSM Potential Study’s levels of savings potential.

The first tier corresponds to savings as a percentage of retail sales under the Potential Study’s realistic achievable potential scenario. The cost to achieve savings in the first tier (on a $/therm saved basis) is consistent with the filed 2024-2025 DSM Plan. Incremental savings beyond the first tier correspond to savings up to the percentage of retail sales under the economic potential scenario in the 2021 DSM Potential Study. The cost to achieve savings in this second tier is modeled to cover the full incremental measure cost of installed measures. The incremental savings beyond the second tier surpass technically achievable savings in the 2021 DSM Potential Study in order to meet the 2030 target. The cost to achieve incremental savings in this third tier are modeled to pay for the full equipment and labor costs of installed measures.

The “Emission Target Achievement” scenario is being included as required by statute, however, the adoption rates for DSM would be exceedingly challenging to achieve, and the scenario exceeds the annual cost by 67 times in 2030, heavily impacting customer bills. This scenario is not a preferred or recommended approach to comply with the Clean Heat targets.

### *i. Annual and Total Implementation Costs*

Annual and total implementation costs are summarized in Table 5 below.

**TABLE 5** Emissions Target Achievement Scenario Implementation Costs

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| Energy Efficiency (CHP-Funded) | $335,302,954 | $335,502,954 | $335,702,954 | $335,902,954 | $336,102,954 | $336,302,954 |
| Green Hydrogen | $0 | $0 | $0 | $0 | $0 | $5,143,733 |
| Advanced Monitoring and Leak Detection | $728,474 | $1,206,421 | $1,349,871 | $1,488,496 | $1,407,165 | $1,919,690 |
| Rocky Ford Beneficial Electrification Pilot | $40,000 | $40,000 | $0 | $0 | $0 | $0 |
| CHP-Qualified Renewable Natural Gas Placeholder | $0 | $0 | $55,726,809 | $62,646,398 | $75,965,987 | $160,516,563 |
| **Total** | **$336,071,428** | **$336,749,375** | **$392,779,634** | **$400,037,848** | **$413,476,106** | **$503,882,939** |

### *ii. Annual and Total Income Qualified Implementation Costs*

Annual and total Income Qualified implementation costs are summarized in Table 6 below.

**TABLE 6** Emissions Target Achievement Scenario Income Qualified Implementation Costs

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | $580,688 | $613,463 | $613,463 | $613,463 | $613,463 | $613,463 | $613,463 |
| Energy Efficiency (CHP-Funded) | $0 | $68,091,924 | $68,132,539 | $68,173,154 | $68,213,769 | $68,254,385 | $68,295,000 |
| Rocky Ford Beneficial Electrification Pilot | $0 | $40,000 | $40,000 | $0 | $0 | $0 | $0 |
| **Total** | **$580,688** | **$68,745,387** | **$68,786,002** | **$68,786,617** | **$68,827,232** | **$68,867,847** | **$68,908,462** |

### *iii. Annual and Cumulative GHG Emission Reductions*

Annual and cumulative GHG emission reductions are summarized in Figure 7 with detailed resource-level reductions presented in Table 7 below.

**FIGURE 7. EMISSIONS TARGET ACHIEVEMENT SCENARIO EMISSIONS FORECAST**

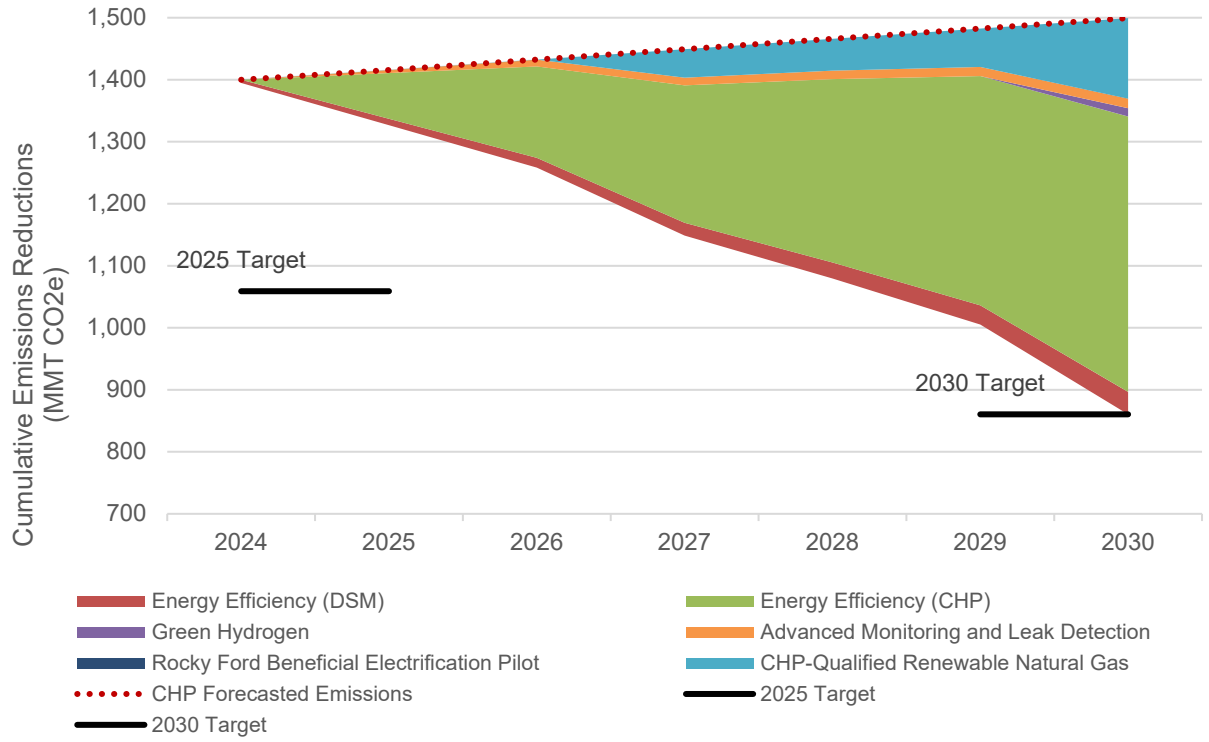



**TABLE 7. EMISSIONS** Target Achievement Scenario Resource-Level Emissions Reductions

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | 5,181 | 10,362 | 15,543 | 20,723 | 25,904 | 31,085 | 36,266 |
| Energy Efficiency (CHP-Funded) | 0 | 73,710 | 147,539 | 221,486 | 295,552 | 369,738 | 444,042 |
| Green Hydrogen | 0 | 0 | 0 | 0 | 0 | 0 | 13,393 |
| Advanced Monitoring and Leak Detection | 0 | 4,996 | 10,874 | 12,344 | 13,813 | 14,695 | 15,283 |
| Rocky Ford Beneficial Electrification Pilot | 0 | 18 | 36 | 36 | 36 | 36 | 36 |
| CHP-Qualified Renewable Natural Gas Placeholder | 0 | 0 | 0 | 45,932 | 51,259 | 61,893 | 129,934 |
| **Total** | **5,181** | **89,086** | **173,991** | **300,521** | **386,565** | **477,446** | **638,952** |
| **% of Target Including Growth** | | **25%** | | | | | **100%** |
| **% of Target Excluding Growth** | | **202%** | | | | | **263%** |

### *iv. Benefit-Cost Analysis*

Lifetime $CO_2e$ abatement cost metric results and net benefits analysis ratios are shown in Table 8 below.

**TABLE 8. EMISSIONS TARGET ACHIEVEMENT SCENARIO COST-EFFECTIVENESS RESULTS**

| Resource | $/MT $CO_2e$ | Benefit-Cost Ratio |
|---|---|---|
| Energy Efficiency (DSM-funded) | $74 | 1.56 |
| Energy Efficiency (CHP) Tier I[1] | $86 | 1.67 |
| Energy Efficiency (CHP) Tier II[1] | $119 | 1.22 |
| Energy Efficiency (CHP) Tier III[1] | $333 | 0.43 |
| Green Hydrogen | $384 | 0.48 |
| Advanced Monitoring and Leak Detection | $190 | 1.56 |
| Rocky Ford Beneficial Electrification Pilot[2] | $156 | 1.03 |
| CHP Qualified Renewable Natural Gas Placeholder[3] | $1,235 | 0.15 |
| **Scenario Total** | **$459** | **0.42** |

[1] *Energy Efficiency Tier I represents the DSM savings below the Company's realistic achievable savings potential, Energy Efficiency Teir II represents the DSM savings above the Company's realistic achievable savings potential and below the Company's economic savings potential, and Energy Efficiency Tier III represents the DSM savings above the Company's economic savings potential.*

[2]*Beneficial electrification pricing includes administration costs only to BHCG as part of the Beneficial Electrification Plan settlement, with this program relying on state and federal incentive funding. Pricing does not include incentive costs, direct costs to customers, or electric grid upgrades. Typical electrification abatement costs range from $250/MT $CO_2e$ - $552/MT $CO_2e$.*[6]

[3]*CHP-qualified RNG pricing was informed by the RNG RFI and conservative place holder assumptions were made by BHCG. Updated information is expected from developers in early 2024. CHP qualified RNG is expected to range from approximately $50/MT $CO_2e$ - $1,500/MT $CO_2e$, depending on the feedstock and project practices, as indicated in peer Colorado utility CHP filings and RFI results.*

### *v. Annual Retail Cost Impacts*

Total annual retail cost impacts are consistent with the total portfolio and resource-level implementation costs, summarized in Table 9 below.

**TABLE 9. EMISSIONS TARGET ACHIEVEMENT SCENARIO RETAIL COST IMPACTS**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| **Total** | **$336,071,428** | **$336,749,375** | **$392,779,634** | **$400,037,848** | **$413,476,106** | **$503,882,939** |
| **% of Annual Cost Cap** | **6138%** | **5966%** | **6750%** | **6668%** | **6686%** | **7903%** |

[6] GTI Energy, *Assessment of Natural Gas and Electric Decarbonization in State of Colorado Residential Sector*, May 2023.

### b. Cost-Effective Policy Alignment Scenario

The Company's "Cost-Effective Policy Alignment" scenario considers recovered methane accounting and sourcing that aligns with other established state and federal programs, such as the EPA RFS, California LCFS and Oregon CFP, as well as emerging programs under Minnesota's Natural Gas Innovations Act (NGIA) and Washington's Clean Fuel Standard (CFS). The approach for RNG in the "Cost-Effective Policy Alignment" scenario include:

- Utilizing lifecycle RNG accounting and CI scores.
- Permitting "book-and-claim" RNG accounting, which does not restrict RNG sourcing to a geographical boundary. Out of state RNG is leveraged from 2025-2027 only, while in-state Clean Heat qualified RNG availability is limited. For subsequent years preference is given to in-state cost competitive RNG.
- Removing the recovered methane cap.
- Allowing for RNG and AMLD recovered methane credit banking from 2025-2029, which is counted towards the 2030 emission reduction target. This is similar to Colorado's Renewable Portfolio Standard (RPS), where electric utilities were initially permitted to bank renewable energy credits (RECs) towards the RPS clean energy targets.

By removing accounting and sourcing constraints on RNG, the Company achieves higher RNG emission reductions and utilizes a more diverse portfolio of Clean Heat resources within the planning period (2024 – 2028). The "Cost-Effective Policy Alignment" scenario achieves 22% of the 2015 baseline (excluding growth) and does so with annual spend marginally above the cost cap at 2.8% of retail sales. This scenario would be BHCG's preferred plan if this scenario's accounting and sourcing of RNG were allowable under the Clean Heat statute, increasing 2030 emission reductions by 94% while only increasing annual spend 12%, as compared to the Clean Heat Preferred Plan.

Total and resource-level implementation costs, emissions impacts, benefit-cost analysis results, and retail cost impacts from 2024-2030 for the "Cost-Effective Policy Alignment" scenario are provided in the following sections.

### *i. Annual and Total Implementation Costs*

Annual and total implementation costs are summarized in Table 10 below.

**TABLE 10. COST-EFFECTIVE POLICY ALIGNMENT SCENARIO IMPLEMENTATION COSTS**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| Energy Efficiency (CHP-Funded) | $2,000,000 | $2,000,000 | $2,000,000 | $2,000,000 | $2,000,000 | $2,000,000 |
| Advanced Monitoring and Leak Detection | $728,474 | $1,206,421 | $1,349,871 | $1,488,496 | $1,407,165 | $1,919,690 |
| Rocky Ford Beneficial Electrification Pilot | $40,000 | $40,000 | $0 | $0 | $0 | $0 |
| CHP-Qualified Renewable Natural Gas Placeholder | $0 | $0 | $2,469,465 | $3,284,460 | $4,379,280 | $4,379,280 |
| Renewable Natural Gas (Out-of-State) | $2,707,229 | $2,398,484 | $0 | $0 | $0 | $0 |
| **Total** | **$5,475,703** | **$5,644,906** | **$5,819,336** | **$6,772,957** | **$7,786,446** | **$8,298,970** |

### *ii. Annual and Total Income Qualified Implementation Costs*

Annual and total Income Qualified implementation costs are summarized in Table 11 below.

**TABLE 11. COST-EFFECTIVE POLICY ALIGNMENT SCENARIO INCOME QUALIFIED IMPLEMENTATION COSTS**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | $580,688 | $613,463 | $613,463 | $613,463 | $613,463 | $613,463 | $613,463 |
| Energy Efficiency (CHP-Funded) | $0 | $406,152 | $406,152 | $406,152 | $406,152 | $406,152 | $406,152 |
| Rocky Ford Beneficial Electrification Pilot | $0 | $40,000 | $40,000 | $0 | $0 | $0 | $0 |
| **Total** | **$580,688** | **$1,059,614** | **$1,059,614** | **$1,019,614** | **$1,019,614** | **$1,019,614** | **$1,019,614** |

### *iii. Annual and Cumulative GHG Emission Reductions*

Annual and cumulative GHG emission reductions are summarized in Figure 8 with detailed resource-level reductions presented in Table 12 below.

**FIGURE 8. COST-EFFECTIVE POLICY ALIGNMENT SCENARIO EMISSIONS FORECAST**

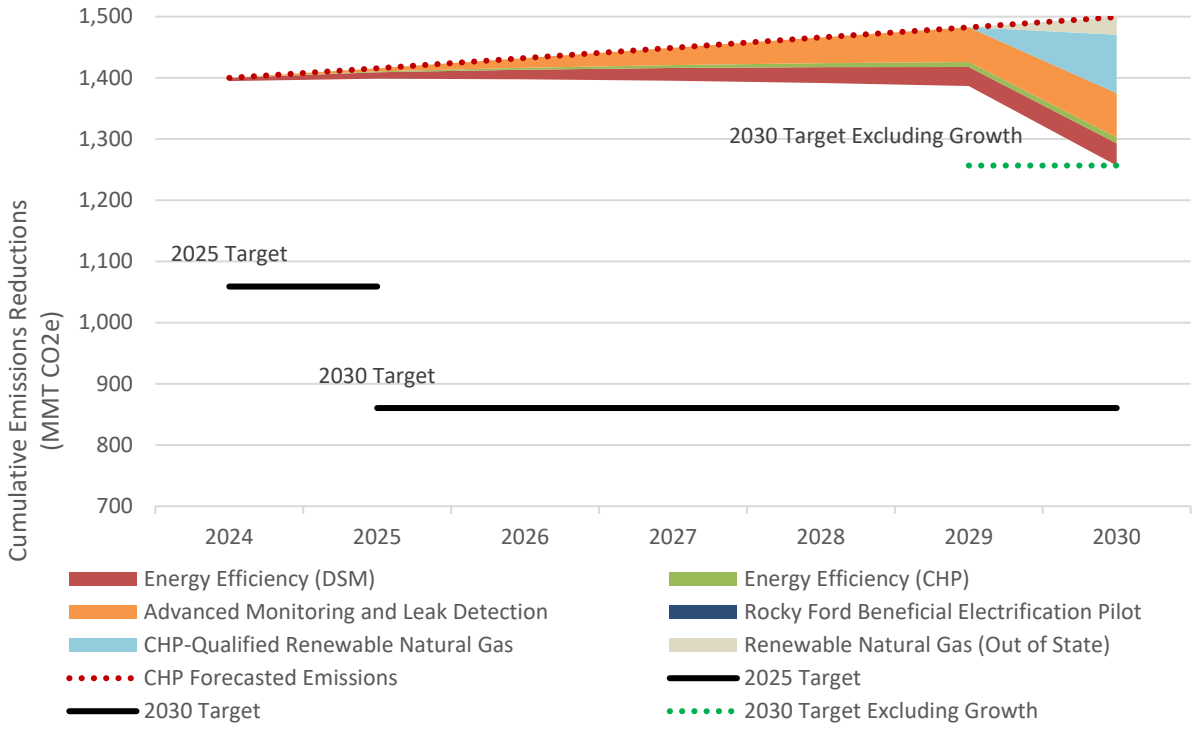



**TABLE 12. COST-EFFECTIVE POLICY ALIGNMENT SCENARIO EMISSIONS REDUCTIONS IN MT $CO_2E$**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | 5,181 | 10,362 | 15,543 | 20,723 | 25,904 | 31,085 | 36,266 |
| Energy Efficiency (CHP-Funded) | 0 | 1,631 | 3,262 | 4,892 | 6,523 | 8,154 | 9,785 |
| Advanced Monitoring and Leak Detection | 0 | 4,996 | 15,871 | 28,214 | 42,028 | 56,723 | 72,006 |
| Rocky Ford Beneficial Electrification Pilot | 0 | 18 | 36 | 36 | 36 | 36 | 36 |
| CHP-Qualified Renewable Natural Gas Placeholder | 0 | 0 | 0 | 0 | 0 | 0 | 95,874 |
| Renewable Natural Gas (Out-of-State) | 0 | 0 | 0 | 0 | 0 | 0 | 28,715 |
| **Total** | **5,181** | **17,007** | **34,710** | **53,866** | **74,491** | **95,997** | **242,680** |
| **% of Target Including Growth** | | **5%** | | | | | **38%** |
| **% of Target Excluding Growth** | | **39%** | | | | | **100%** |

### *iv. Benefit-Cost Analysis*

Lifetime $CO_2e$ abatement cost metric results and net benefits analysis ratios are shown in Table 13 below.

**TABLE 13. COST-EFFECTIVE POLICY ALIGNMENT SCENARIO COST-EFFECTIVENESS RESULTS**

| Resource | $/MT $CO_2e$ | Benefit-Cost Ratio |
|---|---|---|
| Energy Efficiency (DSM-funded) | $74 | 1.56 |
| Energy Efficiency (CHP-funded) | $86 | 1.67 |
| Advanced Monitoring and Leak Detection | $190 | 4.64 |
| Rocky Ford Beneficial Electrification Pilot[1] | $156 | 1.03 |
| CHP-Qualified Renewable Natural Gas Placeholder | $151 | 1.13 |
| Renewable Natural Gas (Out-of-State) | $178 | 0.78 |
| **Scenario Total** | **$112** | **1.84** |

[1]*Beneficial electrification pricing includes administration costs only to BHCG as part of the Beneficial Electrification Plan settlement, with this program relying on state and federal incentive funding. Pricing does not include incentive costs, direct costs to customers, or electric grid upgrades. Typical electrification abatement costs range from $250/MT $CO_2e$ - $552/MT $CO_2e$.*[7]

[2]*CHP-qualified RNG pricing was informed by the RNG RFI and conservative place holder assumptions were made by BHCG. Updated information is expected from developers in early 2024. CHP qualified RNG is expected to range from approximately $50/MT $CO_2e$ - $1,500/MT $CO_2e$, depending on the feedstock and project practices, as indicated in peer Colorado utility CHP filings and RFI results.*

### *v. Annual Retail Cost Impacts*

Total annual retail cost impacts are consistent with the total portfolio and resource-level implementation costs, summarized in Table 14 below.

**TABLE 14. COST-EFFECTIVE POLICY ALIGNMENT SCENARIO RETAIL COST IMPACTS**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| **Total** | $5,475,703 | $5,644,906 | $5,819,336 | $6,772,957 | $7,786,446 | $8,298,970 |
| **% of Annual Cost Cap** | 100% | 100% | 100% | 113% | 126% | 130% |

[7] GTI Energy, *Assessment of Natural Gas and Electric Decarbonization in State of Colorado Residential Sector*, May 2023.

## c. Clean Heat Preferred Plan

The "Clean Heat Preferred Plan" is BHCG's preferred scenario emerging from careful consideration of the Clean Heat policy requirements, resource availability and cost-effectiveness, and feasibility to implement the proposed portfolio within the annual 2.5% Clean Heat cost cap. This scenario primarily deploys DSM energy efficiency resources, renewable natural gas, and AMLD, with a budget for green hydrogen blending starting in 2030. The diverse portfolio of resources reduces emissions from both the distribution system and customer combustion, while minimizing cost impacts to BHCG's customers.

Total and resource-level implementation costs, emissions impacts, benefit-cost analysis results, and retail cost impacts from 2024-2030 for the Clean Heat Preferred Plan Scenario are provided in the section. As BHCG's preferred plan, additional details are also shown below, including resource-level air quality, environmental, and health benefits, labor cost estimates, net of capital costs, and labor standards and job impacts.

### *i. Annual and Total Implementation Costs*

Annual and total implementation costs are summarized in Table 15 below.

**TABLE 15. CLEAN HEAT PREFERRED PLAN IMPLEMENTATION COSTS**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| Energy Efficiency (CHP-Funded) | $4,707,229 | $4,398,484 | $2,000,000 | $2,000,000 | $2,000,000 | $2,000,000 |
| Green Hydrogen | $0 | $0 | $0 | $0 | $0 | $500,000 |
| Advanced Monitoring and Leak Detection | $728,474 | $1,206,421 | $1,349,871 | $1,488,496 | $1,407,165 | $1,919,690 |
| Rocky Ford Beneficial Electrification Pilot | $40,000 | $40,000 | $0 | $0 | $0 | $0 |
| CHP-Qualified Renewable Natural Gas Placeholder | $0 | $0 | $2,469,465 | $2,510,660 | $2,777,369 | $1,955,950 |
| **Total** | **$5,475,703** | **$5,644,906** | **$5,819,336** | **$5,999,157** | **$6,184,534** | **$6,375,640** |

billion

### *ii. Annual and Total Income Qualified Implementation Costs*

Annual and total Income Qualified implementation costs are summarized in Table 16 below.

**TABLE 16. CLEAN HEAT PREFERRED PLAN INCOME QUALIFIED IMPLEMENTATION COSTS**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | $580,688 | $613,463 | $613,463 | $613,463 | $613,463 | $613,463 | $613,463 |
| Energy Efficiency (CHP-Funded) | $0 | $955,924 | $893,226 | $406,152 | $406,152 | $406,152 | $406,152 |
| Rocky Ford Beneficial Electrification Pilot | $0 | $40,000 | $40,000 | $0 | $0 | $0 | $0 |
| **Total** | **$580,688** | **$1,609,387** | **$1,546,688** | **$1,019,614** | **$1,019,614** | **$1,019,614** | **$1,019,614** |

### *iii. Annual and Cumulative GHG Emission Reductions*

Annual and cumulative GHG emission reductions are summarized in Figure 9 with detailed resource-level reductions presented in Table 17 below.

**FIGURE 9. CLEAN HEAT PREFERRED PLAN EMISSIONS FORECAST**

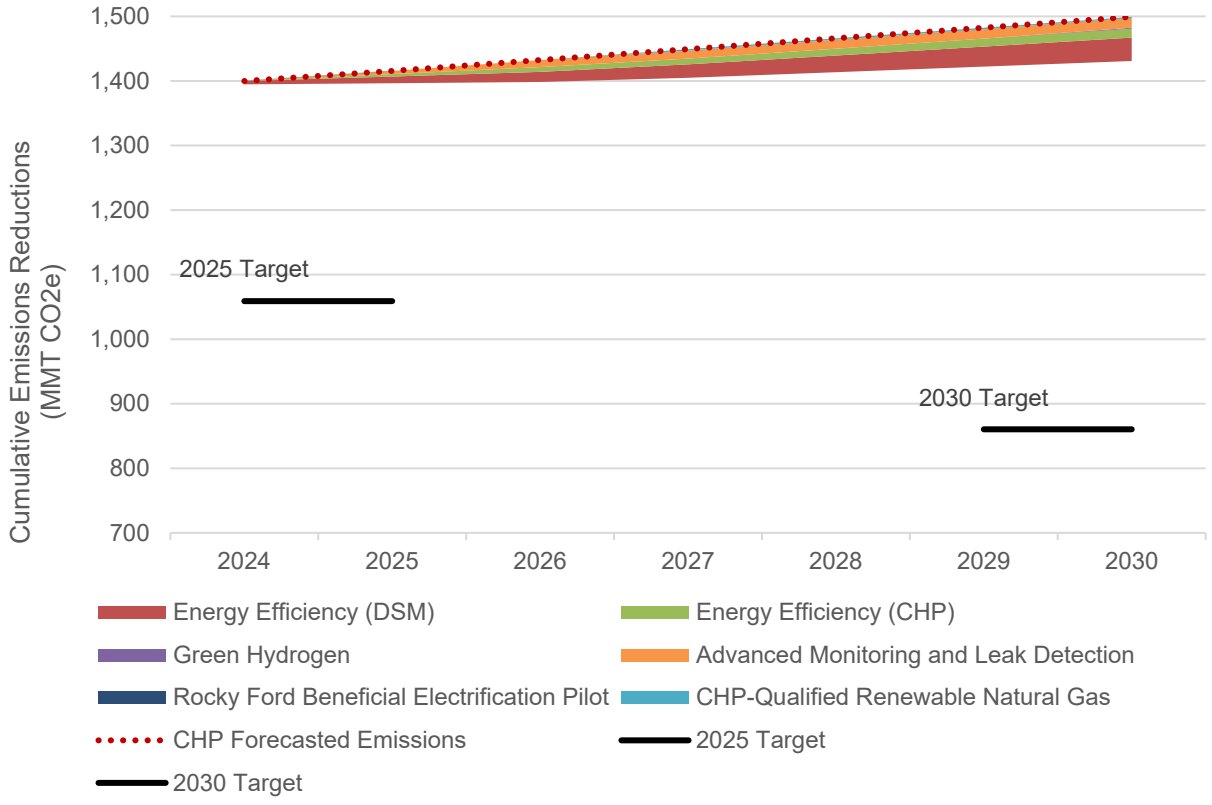


**TABLE 17. CLEAN HEAT PREFERRED PLAN EMISSIONS REDUCTIONS**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | 5,181 | 10,362 | 15,543 | 20,723 | 25,904 | 31,085 | 36,266 |
| Energy Efficiency (CHP-Funded) | 0 | 3,838 | 7,425 | 9,055 | 10,686 | 12,317 | 13,948 |
| Green Hydrogen | 0 | 0 | 0 | 0 | 0 | 0 | 1,302 |
| Advanced Monitoring and Leak Detection | 0 | 4,996 | 10,874 | 12,344 | 13,813 | 14,695 | 15,283 |
| Rocky Ford Beneficial Electrification Pilot | 0 | 18 | 36 | 36 | 36 | 36 | 36 |
| CHP-Qualified Renewable Natural Gas Placeholder | 0 | 0 | 0 | 2,048 | 2,082 | 2,303 | 1,622 |
| **Total** | **5,181** | **19,214** | **33,877** | **44,206** | **52,521** | **60,436** | **68,456** |
| **% of Target Including Growth** | | **5%** | | | | | **11%** |
| **% of Target Excluding Growth** | | **44%** | | | | | **28%** |

### *iv. Benefit-Cost Analysis*

Lifetime $CO_2e$ abatement cost metric results and net benefits analysis ratios are shown in Table 18 below.

**TABLE 18. CLEAN HEAT PREFERRED PLAN COST-EFFECTIVENESS RESULTS**

| Resource | $/MT $CO_2e$ | Benefit-Cost Ratio |
|---|---|---|
| Energy Efficiency (DSM-funded) | $74 | 1.56 |
| Energy Efficiency (CHP-funded) | $86 | 1.67 |
| Green Hydrogen | $384 | 0.48 |
| Advanced Monitoring and Leak Detection | $190 | 1.56 |
| Rocky Ford Beneficial Electrification Pilot[1] | $156 | 1.03 |
| CHP Qualified Renewable Natural Gas Placeholder[2] | $1,206 | 0.15 |
| **Total** | **$257** | **1.32** |

[1]*Beneficial electrification pricing includes administration costs only to BHCG as part of the Beneficial Electrification Plan settlement, with this program relying on state and federal incentive funding. Pricing does not include incentive costs, direct costs to customers, or electric grid upgrades. Typical electrification abatement costs range from $250/MT $CO_2e$ - $552/MT $CO_2e$.*[8]

[2] *CHP-qualified RNG pricing was informed by the RNG RFI and conservative place holder assumptions were made by BHCG. Updated information is expected from developers in early 2024. CHP qualified RNG*

[8] GTI Energy, *Assessment of Natural Gas and Electric Decarbonization in State of Colorado Residential Sector*, May 2023.

*is expected to range from approximately $50/MT $CO_2e$ - $1,500/MT $CO_2e$, depending on the feedstock and project practices, as indicated in peer Colorado utility CHP filings and RFI results.*

### *v. Annual Retail Cost Impacts*

Total annual retail cost impacts are consistent with the total portfolio and resource-level implementation costs, summarized in Table 19 below.

**TABLE 19. CLEAN HEAT PREFERRED PLAN RETAIL COST IMPACTS**

| | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|
| **Total** | $5,475,703 | $5,644,906 | $5,819,336 | $5,999,157 | $6,184,534 | $6,375,640 |
| **% of Annual Cost Cap** | 100% | 100% | 100% | 100% | 100% | 100% |

### *vi. Air Quality, Environmental, and Health Benefits*

Air quality, environmental, and health benefits are calculated as the avoided social cost of carbon and avoided cost of methane consistent with Rule 4528, demonstrated in Table 20 and Table 21 below.

**TABLE 20. CLEAN HEAT PREFERRED PLAN AVOIDED SOCIAL COST OF CARBON**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | $412,327 | $837,217 | $1,274,672 | $1,724,691 | $2,187,274 | $2,665,847 | $3,154,128 |
| Energy Efficiency (CHP-Funded) | $0 | $310,123 | $608,908 | $753,630 | $902,307 | $1,056,297 | $1,213,063 |
| Green Hydrogen | $0 | $0 | $0 | $0 | $0 | $0 | $113,224 |
| Advanced Monitoring and Leak Detection | $0 | $403,698 | $891,822 | $1,027,306 | $1,166,353 | $1,260,240 | $1,329,180 |
| Rocky Ford Beneficial Electrification Pilot | $0 | $1,444 | $2,931 | $2,974 | $3,018 | $3,065 | $3,108 |
| CHP-Qualified Renewable Natural Gas Placeholder | $0 | $0 | $0 | $170,422 | $175,789 | $197,510 | $141,062 |
| **Total** | **$412,327** | **$1,552,482** | **$2,778,334** | **$3,679,024** | **$4,434,741** | **$5,182,958** | **$5,953,765** |

**TABLE 21. CLEAN HEAT PREFERRED PLAN AVOIDED SOCIAL COST OF METHANE**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | $42,838 | $86,983 | $132,434 | $179,192 | $227,373 | $276,907 | $327,958 |
| Energy Efficiency (CHP-Funded) | $0 | $32,220 | $63,263 | $78,301 | $93,797 | $109,720 | $126,131 |
| Green Hydrogen | $0 | $0 | $0 | $0 | $0 | $0 | $11,773 |
| Advanced Monitoring and Leak Detection | $0 | $41,942 | $92,657 | $106,735 | $121,245 | $130,904 | $138,205 |
| Rocky Ford Beneficial Electrification Pilot | $0 | $150 | $305 | $309 | $314 | $318 | $323 |
| CHP-Qualified Renewable Natural Gas Placeholder | $0 | $0 | $0 | $17,706 | $18,274 | $20,516 | $14,667 |
| **Total** | **$42,838** | **$161,295** | **$288,659** | **$382,243** | **$461,003** | **$538,365** | **$619,057** |

### *a. Cost Estimates, Net of Avoided Capital Costs*

Labor cost estimates, net of avoided capital costs, at the resource and total portfolio level are shown in Table 22 below.

**TABLE 22. CLEAN HEAT PREFERRED PLAN LABOR COST ESTIMATES**

| | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|
| Energy Efficiency (DSM-Funded) | $1,347,328 | $674,903 | $674,903 | $674,903 | $674,903 | $674,903 | $674,903 |
| Energy Efficiency (CHP-Funded) | $0 | $570,939 | $533,491 | $242,580 | $242,580 | $242,580 | $242,580 |
| Green Hydrogen | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Advanced Monitoring and Leak Detection | $0 | $287,200 | $104,000 | $108,160 | $112,486 | $116,986 | $121,665 |
| Rocky Ford Beneficial Electrification Pilot | $0 | $7,600 | $7,600 | $0 | $0 | $0 | $0 |
| CHP-Qualified Renewable Natural Gas | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| **Total** | **$1,347,328** | **$1,540,642** | **$1,319,995** | **$1,025,643** | **$1,029,969** | **$1,034,469** | **$1,039,148** |

## *vii. Labor Standards and Job Impacts*

BHCG will utilize Colorado based labor, and contractors participating in apprenticeship programs as reasonably practicable through implementing Clean Heat resources. With respect to AMLD, existing internal Company labor and one additional employee located in Colorado will be responsible for AMLD implementation. Company gas technicians will be administering the AMLD in which employees go through an extensive training program to progress and become fitters,

providing industry career skills. Energy-efficiency is exclusively implemented by in-state external contractors as well as in-state Company employees. BHCG vets its energy-efficiency contractors and coordinators to ensure proof of W-9 for taxing purposes, proof of insurance, certificate of liability, proof of workman's compensation, and any other types of certifications necessary to be in good standing with the State of Colorado. BHCG is cognizant of the requirement that utilities shall make use of a certified contractor list maintained by the Colorado Department of Labor in implementing DSM measures for which customers apply for a rebate directly with the utility. However, BHCG is unaware of a "certified contractor list" from which to validate use of contractors. Notwithstanding the absence of a certified contractor list, BHCG will continue to vet its energy-efficiency contractors as specified above.

### *viii. Green Hydrogen*

1. Reliability and Safety

Infrastructure impact studies, pilot scale projects and full-scale system blending have demonstrated that hydrogen can be blended with natural gas creating a lower carbon fuel that can be reliably and safely delivered to customers. Hydrogen blending up to 20% by volume has been successfully implemented on select gas distribution systems in Europe.[9] In the United States, industry is still working to understand hydrogen blending capabilities and develop cost competitive clean hydrogen markets.

Hydrogen molecules have a density of 0.00009 g/cm$^3$, and existing natural gas distribution systems in the United States are tested with nitrogen or natural gas at a density of 0.00125 g/cm$^3$. Hydrogen has an atomic radius roughly half the size of nitrogen and a quarter the size of methane (the primary constituent of natural gas)[10], which can be a cause for concern regarding system leakage when high hydrogen blending rates are implemented. Prior to pursing full-system hydrogen blending in the distribution network, BHCG would first conduct a pilot-scale demonstration project to evaluate the cost of integration, safety, reliability, and impacts to infrastructure and customer appliances.

[9] UK pilot demos hydrogen in gas grid - reNews - Renewable Energy News, German gas operator says 20% hydrogen blending trial in 100 homes has been '100% trouble-free' after six months | Hydrogen news and intelligence (hydrogeninsight.com).

[10] https://material-properties.org/

2. Quantity of Hydrogen, Competitive Solicitation Proposal

BHCG's "Clean Heat Preferred Plan" includes hydrogen blending starting in 2030 (outside the 2024 – 2028 planning period) with a $500,000 budget, which equates to a volume of 90,853 thousand standard cubic feet (mscf), or a 0.3% blending rate system-wide, however it is anticipated that this would target a smaller scale hydrogen blending demonstration project. The timing and scale of hydrogen blending for BHCG will ultimately depend on federal and state level funding for clean hydrogen, technology developments, hydrogen market pricing, and customer demand.

3. Competitive Solicitation Proposal and Developer Identification

Since BHCG's "Clean Heat Preferred Plan" includes hydrogen blending outside the 2024 – 2028 planning period, a competitive solicitation proposal has not been developed, and developer has not been identified.

### *ix. Advanced Monitoring and Leak Detection Effects on Safety and Reliability*

AMLD proposed in BHCG's preferred plan, improves customer safety by facilitating faster and more comprehensive detection of leaks and prioritization of leak repair. Using more sensitive equipment increases efficiency in conducting survey activities, allowing gas system operators to conduct more survey activities and find leaks quicker, thereby reducing the opportunities and range for gas to migrate. Early detection and repair of leaks also results in less intrusive repair methods and fewer interruptions of service.

### *x. Income Qualified Budget and Mapping*

Clean Heat resources prioritizing disproportionately impacted (DI) communities and income qualified (IQ) customers will be implemented as appropriate within the scope of specific resources. Clean Heat funded DSM is anticipated to be allocated towards Income Qualified communities proportional to those amounts proposed in BHCG's DSM SI Proceeding No. 23A-0361G, in which 25% residential funds are allocated to Income Qualified customers. The other resources employed, green hydrogen, AMLD, and RNG will not take a targeted approach to benefit specific DI communities or Income Qualified customers. Rather DI communities and IQ customers will be the beneficiaries of such resources proportionate to the customer mix throughout BHCG's service territory.

### *xi. Cost Recovery Proposal*

Costs of administering the CHP will be recovered through a "Clean Heat Rider", subject to cost cap limits defined in Rule 4731(b)(I)(A). A regulatory asset account will be established to account for deferred expenses associated with administering the program. Program recoveries

will similarly be accounted for in the regulatory asset account to track the recoveries and expenses separate and apart from other utility operations. Retail customers will be assessed a 2.5% surcharge on the subtotal of all other billing items to recover the costs associated with implementing the CHP.

## 7. Conclusion

BHCG modeled three scenarios, with the "Clean Heat Preferred Plan" and "Cost-Effective Policy Alignment" scenarios resulting in cost-effective portfolios. Although the "Clean Heat Preferred Plan" is being proposed for implementation by BHCG and is fully compliant with all Clean Heat legislation, the "Cost-Effective Policy Alignment" scenario would result in the highest carbon emission reduction while still being cost-effective at the lowest $/MT $CO_2e$. This technical report recommends that the Commission approve and adopt the "Clean Heat Preferred Plan" scenario, while considering CHP recovered methane accounting and sourcing presented in the "Cost-Effective Policy Alignment" scenario that aligns with other state and federal policies in the next rulemaking session. This would allow LDCs filing CHPs to maximize emission reductions and reduce cost impacts to Colorado customers.