MARKET TRANSFORMATION PORTFOLIO

2024-2028 Clean Heat Plan

Public Service Company of Colorado

Xcel Energy®

CONTENTS

1. INTRODUCTION AND OVERVIEW

The Market Transformation Portfolio proposed and described here is designed to stimulate markets for emission reduction tools and complement the approaches in any of our Clean Heat portfolios. Accordingly, alongside several partners, we have developed both a set of Market Transformation initiatives (initiatives) and innovative fund concepts (concepts) to advance our understanding of proposed emissions reduction options. These initiatives and concepts are designed to be scalable demonstration projects that align with Colorado's and Xcel Energy's emissions reduction goals.

The development of this Portfolio was a collaborative effort developed through months of discussions between the Company and key organizations with interest and expertise in the various initiatives contemplated in the Portfolio. We recognize that the evolution of the gas distribution system will be a team effort. We have worked with the organizations identified in this document to develop this portfolio of initiatives and concepts to gain valuable information about the market, customer adoption, and scalability of all the emissions reduction efforts that will be needed to successfully meet the state's reduction targets.

With this being the very first Clean Heat Plan, none of the emissions reduction measures under consideration have been adopted or implemented at scale, leaving many unknowns about the market. In addition to selecting a Clean Heat portfolio, we believe it is important to get started on initiatives and concepts that not only have the potential to achieve emissions reductions for our customers today, but also bring along key partners that will be needed to execute on this long-term trajectory. We seek to collaboratively develop and use a portfolio of initiatives and concepts to gain valuable information about how to decrease market barriers and scale our emissions reductions efforts over time. Given how early we are in the journey to reduce emissions for natural gas customers, the proposed Market Transformation Portfolio is intended to gain early insights into how to transform the market to gain emissions reductions at the scale needed to achieve the Clean Heat Targets.

These are not one-off pilots, but instead demonstration projects we can use to understand and overcome market barriers, assess business model requirements, increase cost-effectiveness, decrease uncertainties, and ultimately replicate and scale the emissions reduction measures required to meet the 2030 Clean Heat Target.

2. ELECTRIFICATION MARKET TRANSFORMATION INITIATIVES

NEIGHBORHOOD RESIDENTIAL RETROFIT TO REDUCE COSTS

Background and Context: Residential single-family homes consume a significant amount of gas for heating and other appliance load. Therefore, scaling residential retrofits of energy efficiency and beneficial electrification measures will be critical to helping gas LDCs and the state meet their sector specific emission goals. These retrofits have historically been expensive and also challenging to convince customers to implement.

Partners: Colorado Energy Office ("CEO"), Energy Outreach Colorado ("EOC"), City of and County of Denver.

Hypotheses:

- **Beneficial Electrification Deployment – Economies of Scale**: Are there economies of scale (e.g., cost efficiencies and participation improvements) associated with neighborhood recruitment and implementation of energy efficiency and beneficial electrification measures?
- **Community Recruitment**: What engagement strategies result in greatest neighborhood-level participation in energy efficiency and beneficial electrification programs?
    - Are there different implementation pathways for subsets of customers?
- **Energy Distribution System Impacts**: What are the implications associated with the concentrated deployment of beneficial electrification measures on electric and natural gas distribution system infrastructure?
    - Does the concentration of beneficial electrification measures enhance the localized benefits of electricity demand-side management ("DSM") strategies?
    - Does the concentration of beneficial electrification measures enable proactive decommissioning of natural gas distribution lines?

Metrics for Success:

- Outcomes will be analyzed versus comparable DSM programs, to quantify the effectiveness of a neighborhood approach versus an individual single-family home approach
- Achievable penetration rate for a neighborhood approach versus an individual single-family home approach
- Total costs and benefits of pilot and associated cost-benefit analysis metrics (e.g., modified total resource cost ("mTRC")), including the costs and benefits typically

accounted for in the Company's Net Present Cost Benefit Summary in its annual DSM reporting, and:

  - Assessment of associated electric generation, transmission, and distribution costs versus avoided gas transmission and distribution costs
  - Costs per dekatherm avoided, per home retrofitted (normalized by home square foot), and per measure implemented (e.g., cost per ton of cooling/heating capacity)
  - Evaluation of net participant utility cost impacts and changes to participant energy burden

- Speed of implementation
- Secondary metric(s):
  - Marketing and educational effectiveness
  - Participant satisfaction
  - Participant energy use impacts

Customer Classes Impacted: Residential and residential income-qualified ("IQ") customers

Clean Heat Resource Types Implemented:

- Energy Efficiency
  - e.g., Shell Measures (Weatherization) and other low- or no-cost upgrades
- Beneficial Electrification
  - e.g., Heat Pumps (may be all electric or dual fuel), cooking, water heating (demand response ("DR") capable), dryers
- Distributed energy resources ("DERs") and DR

Foundational Requirements:

- **Size:** 100-200 participating single-family homes and 100 single-family control participants
- **Demographics:** 50-100 IQ participants and 50-100 non-IQ customers across all income spectrums
  - IQ customers would receive retrofits and necessary upgrades free of charge. Non-IQ participants would receive DSM/Beneficial Electrification incentives. Enhanced rebates may be used in order to determine the necessary levels of incentives needed to spur customer adoption and contractor/supplier interest.

  - Non-IQ incentives could be enhanced to develop enrollment

- Does not increase energy burden for IQ customers (ideally, would reduce energy burden) and energy burden is minimized for non-IQ customers. Development will explore different opportunities to reduce energy burden, including energy efficiency, Community Solar Garden participation, Solar*Rewards, or other opportunities as available.
- Benefits should accrue to occupants whether they are renters or homeowners

Non-Foundational Requirements:

- Align to an area that has a gas capacity constraint (and therefore may provide some avoided capacity/infrastructure benefits) to the extent possible
  - IQ program would not be confined to only a gas constrained area
- Availability of financing or gap funding for market-rate participation
- Evaluation of contractor capacity and availability to serve large scale needs

Phase I – Selection of Neighborhoods and Outreach to Supporting Stakeholders (e.g., Contractors):

- Timeline: Final Clean Heat Plan Approval plus 6 months
- Identify potential neighborhoods
  - For non-IQ customers, target communities that have expressed an interest in electrification (i.e., Denver, Boulder, Louisville)
  - For IQ participants, work with EOC and others to identify underserved neighborhoods
  - Use the Colorado Low-income Energy Assistance Program ("LEAP") and other tools to target based on income and/or energy burden
  - Develop education and engagement plan
- Identify additional funding (e.g., Inflation Reduction Act ("IRA"), cities, state) – flow through to Phase II budget
- Identify partners for design, engagement, implementation, and funding
  - RFP for implementors and community-based organizations ("CBOs") to provide implementation support
- Identify and define baseline metrics (i.e., cost/Dth) for evaluation
- Identify secondary metrics for evaluation (i.e., customer satisfaction, health and safety, etc.)
  - See also: Non-Foundational Requirements

- Develop operational plan for implementation
    - Engagement strategies
    - Communication plan
    - Schedule and milestones
    - Governance structure and cadence (both internal and external)

Phase II – Implementation:

- Timeline: Completion of Phase I plus 12 months
- Engage customers through CBOs and neighborhood events
- Implement program and install measures

Phase III – Monitoring and Evaluation:

- Timeline: Completion of individual retrofit project plus 12 months
    - Evaluation will continue for a minimum of 12 months after completion of Phase II, but individual home evaluations will commence upon project completion
- Measure and evaluate energy cost impacts to occupants
- Measure and evaluate impacts to electric distribution grid and gas distribution system, and lessons learned related to mitigating electric distribution grid impacts
- Measure and evaluate barriers for IQ versus non-IQ customers
- Measure and evaluate marketing/education effectiveness (e.g., marketing/education cost per customer, qualitative data about customer experience)
    - Evaluate construction quality and workforce impacts of clustered versus individual construction

Estimated Cost and Budget:

The total cost for the demonstration project is expected to be $10 million through 2027. $4-5 million is anticipated to cover the IQ customer incentives and administrative costs, with an additional $3-4 million for non-IQ customers. An additional $1-2 million is anticipated for measurement and verification and reporting.

Table 1: Neighborhood Residential Retrofit Indicative Budget ($M)

2024	2025	2026	2027
$0.5	$4.0	$5.0	$0.5

ALL ELECTRIC NEW CONSTRUCTION

Background and Context: Electrifying new construction is a cost-effective way to electrify residential customers and avoid greenfield natural gas system investments. However, market adoption has not accelerated at the pace necessary to achieve aggressive emission reduction goals. Barriers to builder and customer adoption exist that will need to be overcome, as well as potential issues with cost-effectiveness and supply chain availability.

Partners: Rocky Mountain Institute

Hypotheses:

This initiative is seeking to determine the market, customer, and supply chain barriers to the widespread deployment of all-electric new construction. Based on feedback from the builder community, current barriers of adoption to all electric new builds include profitability, awareness of the benefits, customer satisfaction and interest, and technology efficacy. This initiative is intended to identify successful strategies to overcome barriers and fundamentally change the new construction ecosystem and scale all-electric new build solutions.

Specific areas to test include:

- The benefits and efficacy of the technology to support an all-electric home, such as cold climate heat pumps and electric water heating and cooking options
- The incremental financial support needed to cover incremental costs to builders
- Customer interest and the need for educational strategies to inform customers of the benefits of all-electric construction
- Whether there is a business model for all-electric new construction that creates net benefits for dual-fuel utilities (and, if so, what needs to be true to support scaling)
- The project delivery and scaling benefits of incorporating advanced/industrialized construction methods
- Ultimately, whether all-electric solutions for residential customers can scale

Learnings will be used to enhance the Company's existing residential and IQ DSM programs, including the Energy Star® New Homes program.

Metrics for Success:

- Market adoption and business models:
    - How many builders will engage and under what circumstances?
    - What changes to programs, incentives, markets are needed to support expansion?
    - How would an expanded program fit with current business models or how would they need to evolve?

  - How do supply chains impact builder/developer/customer interests in all electric homes?
  - Are the identified strategies scalable and allow for declining, long-term subsidization and support? Can these homes be delivered quickly and in ways that are efficiently replicable? What are the key factors that deliver an economic approach to make the approach attractive in the market more broadly?
  - Can the identified strategies be quickly integrated to the market and existing market-support programs?
- Cost-effectiveness:
  - How does the all-electric new build mTRC compare to single/dual fuel cost-effectiveness?
    - Does this differ under greenfield and brownfield scenarios?
  - What are the impacts to distribution system design and cost?
  - What is the impact to builder profitability and business model?
- Customer Impact:
  - What is the impact to participant bills relative to single/dual fuel construction?
  - What is the impact to customer satisfaction and how does that impact willingness by builders to grow the market?
  - What are the best strategies to attract customers?

Customer Classes Impacted: Residential

Clean Heat Resource Types Implemented:

- Energy Efficiency
  - Shell Measures – Airtightness, insulation, high-performance windows, etc.
  - Showerheads, aerators
- Beneficial Electrification – Heat pumps, induction stoves, etc.
- DERs, demand flexibility, and grid integration

Foundational Requirements:

- **Size:** 50-100 electrified single-family homes incorporating the clean heat resource types noted above and delivered via a program that supports testing of key hypothesis areas. A control group of dual fuel homes as a control group.
- **Demographics:** Primarily targeting market-rate homes but will look for opportunities to partner with income-qualified new construction.

Non-Foundational Requirements:

- Greenfield and existing new construction
- Integration of construction ecosystem with the utility business model to ensure a healthy co-existence.

Phase I – Selection of Neighborhoods and Partners:

- Identify potential neighborhoods
- Identify additional funding (e.g., IRA, cities) – flow through to Phase II budget
- Conduct RFP to assess developer interest and potential partners' capacity for delivery of innovative projects, select partners, consider participation across new construction market segments
- Identify and define baseline metrics (i.e., mTRC) for evaluation
- Identify secondary metrics for evaluation (i.e., customer satisfaction, etc.)

Phase II – Implementation:

- Customer marketing and engagement
- Implement initiative and install measures

Phase III – Monitoring and Evaluation:

- Measure and evaluate cost-effectiveness relative to other options
- Measure and evaluate energy cost impacts to occupants
- Measure and evaluate impacts to distribution grid
- Evaluate non-participant barriers and solicit feedback on overcoming those barriers

Estimated Cost and Budget:

The estimated cost for this all-electric new construction project is approximately $5 million for 100 customer demonstrations. This includes approximately $3 million for customer and direct administrative costs, and $2 million incremental costs for monitoring and verification, reporting, and consulting services.

Table 2: All-Electric New Construction Indicative Budget ($M)

2024	2025	2026	2027
$0.5	$2.0	$2.0	$0.5

3. NON-PIPELINE ALTERNATIVE MARKET TRANSFORMATION INITIATIVES

PEARL STREET MALL NON-PIPELINE ALTERNATIVE

Background and Context:

In its May 2023 Gas Infrastructure Plan ("GIP") filing, the Company presented the Pearl Streel Mall capacity expansion and reliability project located in Boulder, CO. The existing gas main and services, consisting of steel and plastic pipelines, are currently ranked as high risk, per the Company's Distribution Integrity Management Program ("DIMP"). Most gas meters along this section of main are located inside buildings. This project will replace the existing gas main and services along the pedestrian walkaway to the alleyways of north and south Pearl Street. All gas meters and customer fuel lines will be rerouted to be outside of the buildings.

Initial Non-Pipeline Alternative Analysis:

The Company also performed a non-pipeline alternative ("NPA") analysis to determine if implementing a targeted NPA portfolio could avoid the need for the proposed gas infrastructure project. The Company only proposed and evaluated electrification programs as NPAs. This is because the Pearl Streel Mall project can only be avoided if the entire existing gas demand load served is converted to electric and the existing gas infrastructure is abandoned in lieu of upgrading the gas main, service, and meter/regulation assets, as required by the Pipeline and Hazardous Materials Safety Administration ("PHMSA") Code. If any of the customers directly served by the project remain on gas service, the Company may need to execute the gas infrastructure project to remain compliant with the PHMSA Code, excluding any gas service lines which are no longer receiving gas service.

The initial NPA analysis included modeling of incremental programmatic incentives, specific to the project area, beyond those included in the administration of the currently approved electric and gas DSM Plans to promote annual adoption rates to the levels required to eliminate the need for the Pearl Street Mall project. The initial NPA analysis concluded that the NPA portfolio should be pursued in lieu of the Pearl Street Mall project, which was supported by the results of the Company's cost benefit analysis ("CBA") tool comparing the proposed gas infrastructure project against the NPA portfolio. This would be subject to Commission approval to pursue the NPA portfolio along with supporting electric and/or gas cost recovery for the incremental costs incurred.

The Company is interested in working with partners and key stakeholders (including customers) to explore the feasibility of this NPA which would avoid future gas investment for a specific segment of the Company's system. Given the scope and magnitude of electrification required to achieve the Clean Heat targets, it will be important to understand and test this concept of electrification on diverse customer populations, but geographically targeted portions of the Company's gas system. The Company also recognizes that partnership and collaboration will be integral to the success of this concept and looks forward to partnering with the City and County of Boulder. We have also been in

discussions with the Downtown Boulder Partnership to collaborate on the design and implementation of this project.

Partners: City of Boulder, County of Boulder

Hypotheses:

- Is it feasible to avoid a proposed gas infrastructure project by incentivizing gas end use customers to transition to all electrified end uses?
    - If we are not able to fully transition all gas customers to electric service, are there other options (e.g., other adjacent customer or gas loads) to avoid the proposed gas infrastructure project?
- Are the incentives recommended in the May 2023 GIP filing sufficient to influence full customer participation? What other non-financial barriers may need to be overcome?
- How can additional incentives, including Boulder County's Partners for a Clean Environment ("PACE"), be leveraged to the increase the relative cost-effectiveness of the NPA compared to the traditional infrastructure solution?
- Is it feasible to achieve the annual customer adoption rates of gas demand reduction measures (resulting in Design Day peak hour gas demand reductions) within the traditional infrastructure deferral project timeline?
- Are customers, including commercial customers (e.g., restaurants), willing to electrify their premises in full (e.g., gas cooking)?

Metrics for Success:

- Avoided gas infrastructure investments
- Customer adoption rates
- Determine necessary incentive levels and combination of incentives to facilitate NPA measure adoption (including programmatic Xcel Energy incentives, Boulder County PACE incentives, federal incentives, etc.)
- Reduction in Design Day peak hour gas demand

Customer Classes Impacted: Commercial/Residential

Clean Heat Resource Types Implemented:

- Electrification (heat pumps, cooking, etc.)
- DSM (Shell measures/weatherization)

Foundational Requirements:

- **Size:**
    - Number of customers eligible for NPA portfolio:
        - Approx. 66 (total design day peak hour gas demand approx. 12.1 million standard cubic feet per hour ("MSCFH"))
    - Required number of NPA portfolio participants:
        - Approx. <5 Residential (amount of design day peak hour gas demand reduction approx. 0.1 MSCFH)
        - Approx. 61 Commercial (amount of design day peak hour gas demand reduction approx. 12 MSCFH)

Non-Foundational Opportunities:

Expansion of electrification program of businesses in Downtown Boulder beyond the NPA deferral area. Customers not on impacted gas line may want to join in on electrification efforts.

How does the proposal align with the following principles?

- **GHG Emissions.** Initial estimates of approximately 3,386,410 pounds of CO2 emissions will be avoided.
- **Gas Demand.** System-wide reduction of approximately 12.1 MSCFH design day peak hour gas demand.
- **DI/IQ Benefits.** Not targeted towards DI/IQ communities.
- **Innovative/novel**. The program will test adoption of customer programs including commercial customers with significant non-heating gas load.
- **Scalability**. Yes, it is scalable, and results are applicable to other customers with gas loads that are traditionally viewed as hard to electrify.
- **Strategic Partnerships.** Partnership opportunity with the City and Country of Boulder**.** Project may attract the attention of additional strategic groups interested in clean heat transitions, specifically within the realm of restaurants.
- **Affordability**. A successful NPA would avoid proposed gas infrastructure investment, including future operating and maintenance expenses.
- **Cost sharing**. Potentially, to be discussed with strategic partners.

Phase I – Document and Assess Key Decision Points for Impacted Customers and Identification of other Key Stakeholders:

The first Phase of this project will be designed to comprehensively identify, engage with, and better understand the key decisions points that may influence customer decisions to transition from gas to electric service. Phase I will serve as a critical stage gate before proceeding to Phase II. The Company expects that it would work with its key partners and

customers to apprise the Commission (likely through an informational notice) of the results of the Phase I process before proceeding to Phase II.

The key components and outputs of the Phase I process are identified below:

1. **Customer Identification and Archetype Development**
    - Identify customers directly impacted or served by the proposed gas infrastructure project and establish points of contact for future engagement
    - Develop an understanding of current gas end uses and associated customer energy costs by specific demographic (e.g. NAICS codes or similar). The goal would be to develop an "archetype" or "customer journey" for similar customer demographics to inform more detailed analysis prior to any implementation in later stages of the project.
    - **Key Outputs/Deliverables of Customer Identification and Archetype Development:**
        - Inventory of gas appliances in building
        - Heating appliances versus appliances used directly in business (i.e., gas stoves, brewing machinery, etc.)
        - Analysis of non-heating gas load for each business
2. **Customer Survey and Willingness to Participate**
    - Given the relatively low number of impacted customers, the Company proposes to conduct a survey that would cover, at a minimum, all 66 customers. The purpose of the survey would be to gauge customer willingness to electrify and to better understand any potential barriers to doing so (e.g., financial, technical, or operational).
3. **Supporting Stakeholder Identification**
    - Identify strategic partners who have experience with electrifying non-heating loads, specifically restaurants and cooking with electricity
        - Work with Downtown Boulder Partnership to identify "Electrification Champions"
    - Identify other potential customers who could join in electrification efforts that are served by adjacent gas lines.
    - Identify other key stakeholder that may be critical to the success of the project (e.g., energy auditors, implementer, equipment wholesalers, etc.)

Key Deliverable: Customer and Stakeholder Inventory and Archetype / Journey Mapping

Phase II – Customer Archetype Engineering and Financial Analysis

The second phase of the project will entail a sampling of technical, engineering, and financial analysis and clarify incentive needs before potentially moving into an actual implementation phase. The Company is proposing to conduct a sampling based upon the customer archetypes identified in Phase I.

Phase II will consist of the following objectives:

- Perform customer archetype specific electrification engineering study
    - Identify what appliance options are available to eliminate customer gas demand for specific customer archetypes and end uses
    - What are the corresponding infrastructure impacts of these options?
        - What are the Company infrastructure impacts (e.g., Distribution System upgrades)?
        - What are the customer infrastructure impacts (e.g., Panel and Service upgrades)?
        - What are the operational costs (e.g., cost of electricity versus gas)?
    - Delineate costs between Company, customer, city, county, etc.
- At the completion of the Engineering and Financial Analysis, the Company proposes to reconvene with individual customers to begin more formal customer recruitment and enrollment into the NPA.

Incentive Analysis: The Company plans to use the output of this Phase to inform incentive levels for conversion.

Key Deliverable: Indicative Customer Archetype Engineering and Financial / Operational Analysis and Detailed Incentive Analysis

Phase III - Customer Recruitment / Enrollment

- Specific discussions with individual customers (or groups of customers with similar electrification paths/business types) around what needs to be done, what the costs will be and who will bear the costs
    - Work with business owners and potential outside service providers to come up with building specific roadmap with steps to complete electrification
    - Ensure customers know timeline of installs and how this might impact their operations (i.e., having to close business for X amount of time to complete installs)
- Public Outreach

Key Deliverable: Non-binding commitments from customers (go or no decision)

Phase IV – NPA Measure Implementation:

- Implement program and install measures
    - Electrification, shell measures/weatherization
- Pre-determine best pathway for installs, what businesses should be grouped together and worked on concurrently to minimize adverse effects to businesses such as needing to close for installs

  System Wide Infrastructure Upgrades Engineering / Construction
- Based upon non-binding customer commitments in Phase III, the Company will in aggregate determine the required gas and/or electric distribution infrastructure upgrades required to support the transition of customers from gas to electric service.
- Detailed Engineering
    - Issued for Approval
    - Issued for Review
    - Issued for Bid
    - Issued for Construction
- Construction Management

  Project Closeout
- Retire high-risk gas pipeline

Phase V – Monitoring/Evaluation/Reporting, etc.:

- Measure and evaluate cost-effectiveness relative to original proposed gas infrastructure project
- Measure and evaluate impacts to electric distribution grid (e.g. incremental realized distribution system impacts and load diversity)
- Measure and evaluate marketing/education effectiveness
    - Solicit customer feedback on project and process

Estimated Cost and Budget:

The estimated budget for the Pearl Street Mall NPA is provided below.

Table 3: Pearl Street Mall NPA Indicative Cost and Budget ($M)

Year	2023	2024	2025	2026	2027	2028
Electric Distribution System Upgrades			$2.5 - $3			
NPA Portfolio Implementation Cost		$0.35 - $0.5*	$0.35 - $0.5*			
Project Management and Reporting		$0.15	$0.15	$0.1	$0.1	
Total	$3.7 - $4.5					

**Assuming a minimum per customer incentive level of $10,000. For Commercial customers, we expect the incentive level may need to be increased. This is reflected in the estimate in the NPA Portfolio Implementation Costs above.*

F-3 REINFORCEMENT NON-PIPELINE ALTERNATIVE

Background and Context: In the May 2023 Gas Infrastructure Plan ("GIP") filing, the Company presented the F-3 Reinforcement capacity expansion project located in Aurora, CO. The project was proposed to meet the forecasted growth in peak hour load demand in this gas system which exceeds the available system capacity by the 2025-2026 heating season. The Company also performed an non-pipeline alternative ("NPA") analysis to determine if implementing a targeted NPA portfolio could avoid, reduce, or delay the need for the proposed gas infrastructure project. The NPA portfolio also included incremental incentives, specific to the project area and each NPA technology/measure, beyond those included in the administration of the currently approved electric and gas DSM Plans to promote annual adoption rates to the levels required to eliminate the need for the F-3 Reinforcement project. The NPA analysis concluded that the NPA portfolio should be pursued in lieu of the F-3 Reinforcement project, which was supported by the results of the Company's cost benefit analysis ("CBA") tool comparing the proposed gas infrastructure project against the NPA portfolio. This would be subject to Commission approval to pursue the NPA portfolio along with supporting electric and/or gas cost recovery for the incremental costs incurred.

Hypotheses:

- Is it feasible to avoid a proposed gas infrastructure project via a targeted NPA portfolio?
- Are the incentives recommended in the May 2023 GIP filing sufficient to influence customers participation?
- Is it feasible to achieve the annual customer adoption rates of gas demand reduction measures (resulting in Design Day peak hour gas demand reductions) within the traditional infrastructure deferral project timeline?

Metrics for Success:

- Avoided gas infrastructure investment
- Customer adoption rates
- Determine necessary incentive levels to facilitate adoption
- Reduction in Design Day peak hour gas demand

Customer Classes Impacted: Residential and Commercial customers

Clean Heat Resource Types Implemented:

- Energy Efficiency
    - High Efficiency Natural Gas Furnace
    - Attic Insulation
    - Wall Insulation
    - Air Sealing

  - Commercial New Boiler
  - Ancillary Boiler Efficiency Measures
- Electrification
  - Ground Source Heat Pump ("GSHP")
  - Electric Heat Pump Water Heaters ("HPWH")
  - Air-Source Heat Pump ("ASHP") with Electric Resistance Backup

Foundational Requirements:

- **Size:**
  - Number of customers eligible for NPA portfolio:
    - Approx. 26,500 customers (total design day peak hour gas demand approx. 1900 MSCFH)
  - Required number of NPA portfolio participants:
    - Approx. 1450 Residential (amount of design day peak hour gas demand reduction approx. 13.6 MSCFH)
    - Approx. 150 Commercial (amount of design day peak hour gas demand reduction approx. 4.9 MSCFH)
- **Demographics:** Disproportionally impacted communities, high penetration of rental properties

Non-Foundational Requirements:

- Expansion of NPA programs beyond the NPA deferral area

How does the proposal align with the following principles?

- **GHG Emissions.** Initial estimates indicate savings of approximately 92,329,864 pounds of CO2 emissions
- **Gas Demand.** System-wide reduction of approximately 18.5 mscfh design day peak hour gas demand
- **DI/IQ Benefits.** Yes
- **Innovative/novel**. The program will test adoption of customer energy efficiency and electrification programs
- **Scalability**. Yes, it is scalable, and results are applicable to other gas capacity constrained communities
- **Affordability**. A successful NPA would avoid proposed gas infrastructure investment.
- **Cost sharing**. Potentially, to be discussed with strategic partners.

- **Enhanced customer experience/preserve customer choice**. Yes, provides customers the option to electrify or gas service.

Phase I – Recruitment and/or Selection of Sites/Technologies/Incentives etc. and Partners:

- Stakeholder Outreach / Targeted Marketing
    - Identify strategic partners
    - Identify customers directly impacted or served by the proposed gas infrastructure project and establish points of contact
    - Identify potential contractors for implementation phase
- Customer Surveys
    - Gauge customers willingness to implement energy efficiency / electrification measures and the necessary incentive level for participation
    - Perform customer specific energy efficiency / electrification study
        - Will inform costs and implementation/construction timeline
- Conceptual Engineering
    - Determine impacts to gas and electric infrastructure resulting from customer surveys / electrification data

Phase II –Implementation/Construction:

- Customer Recruitment / Enrollment
- Implementation / Construction
    - Implement program and install measures
- Public Outreach
- System Wide Infrastructure Upgrades Engineering / Construction
    - Determine required gas and/or electric distribution infrastructure upgrades to support program
    - Detailed Engineering
        - Issued for Review
        - Issued for Bid
        - Issued for Construction
        - Issued for Approval
    - Construction Management
- Project Closeout

Phase III – Monitoring/Evaluation/Reporting:

- Measure and evaluate cost-effectiveness relative to original proposed gas infrastructure project
- Measure and evaluate impacts to electric distribution grid
- Measure and evaluate marketing/education effectiveness
  - Solicit customer feedback on project and process

Estimated Cost and Budget:

The estimated budget for the F-3 Reinforcement NPA is provided below.

Table 4: Estimated Budget for F-3 Reinforcement NPA ($M)

Year	2023	2024	2025	2026	2027	2028
NPA Portfolio Implementation Cost	-	$0.4	$2.8	$1.6	$1.5	$1.2

4. RECOVERED METHANE MARKET TRANSFORMATION INITIATIVES

SOUTHERN UTE COALBED METHANE

Coal bed methane ("CBM") is methane that is found in coal seams. It is formed during coalification, the process in which plant material is transformed into coal. CBM has been an important resource in the natural gas sector for the last several decades as exploration and production companies developed and improved technologies and techniques for extracting this energy resource from previously uneconomic deposits. The Fruitland Formation is the primary target for the CBM production operations in and around the Southern Ute Indian Reservation (the "Reservation"). The Fruitland Formation outcrops near existing oil and gas infrastructure on the western side of the Reservation creating a pathway by which some desorbed methane naturally migrates along the strata to the outcroppings where it becomes fugitive methane.

Using an innovative horizontal drilling technology for a shallow outcropping that is located on the Southern Ute Indian Reservation, the project objectives are to achieve emission reductions because methane, which would otherwise continue to travel up the coal seam to the outcropping and be emitted to the atmosphere, will be intercepted by the vent wells. The intercepted methane will be collected, compressed, treated for hydrogen sulfide, water and CO_2 removal, and then injected into a natural gas transmission pipeline. From there, it will be distributed to end users and combusted.

An initial pilot program with vertical interceptor wells was conducted from 2008-2018 where approximately 420,000 metric tons of CO_2e were captured. An enhanced version of this project with fit-for-purpose facilities and horizontal wells has the ability to intercept methane over larger areas along the outcrop with the highest seep rates. If successful, this project prevents methane emissions from seeping to the atmosphere and displaces the use of conventional natural gas. The project aims to capture and deliver approximately 350 mcf of CBM per day into the natural gas transmission pipeline, thereby reducing emissions by approximately 57,000 mtCO2e per year.

Timeline:

Sites have been selected and new, horizontal pilot wells are anticipated to begin drilling this summer, which will tell us more about the CBM availability and methane concentration. The project is expected to start operations in early 2024 upon completion of drilling and construction activities.

Project Partners:

The Company would like to support the Southern Ute Indian Tribe's project as a long-term off-taker of the CBM at a price that will ensure economic viability of the project. The Company recognizes and respects the importance of Tribal sovereignty and the Tribe's government-to-government relationship with the State of Colorado (including its agencies).

The project has received a DOE grant through the fiscal year 2022 federal appropriations omnibus bill which was supported by US Senators Bennet and Hickenlooper. The Southern Ute Indian Tribe is collaborating with the Payne Institute at the Colorado School of Mines on data analysis and projections. The Company has also discussed this project with CEO.

Estimated Cost and Budget:

The project is estimated to capture approximately 127,000 MMBtu per year of naturally seeping CBM. Approximately $2.7 million per year is needed to purchase the CBM including the associated environmental attributes.

The below table provides an estimated annual budget.

Table 5: Southern Ute Coalbed Methane Indicative Budget ($M)

2023	2024	2025	2026	2027	2028
-	$2.7	$2.7	$2.7	$2.7	$2.7

5. LEAK DETECTION TRANSFORMATION INITIATIVE

ADVANCED MOBILE LEAK DETECTION

Background and Context: The advanced mobile leak detection ("AMLD") initiative utilizes highly sensitive detection equipment which is mounted on a vehicle and detects methane passing through its path. This is different than our current leak survey methods which require us to take the detection device to the leak, primarily on foot. The AMLD method of leak detection will allow us to cover a larger area with the same crews thus reducing the time that a leak is active without detection.

Hypotheses: The Company hypothesizes that the identification and repair of LDC methane leaks using AMLD will result in more effective emission reductions. This project will help us answer if we can further reduce fugitive methane emissions from our mains and services.

Metrics for Success:

- Number of leaks found in test area relative to current leak survey approach
- Reduced emissions attributable to increased frequency of leak detection and repair
- $/ton abatement cost relative to current practices and/or other Clean Heat resources

Customer Classes Impacted: The demonstration is not specific to customer classes and would apply all customer classes in the test area.

Foundational Requirements:

- Phased approach looking at cost of advanced leak detection equipment as well as the associated costs to perform leak survey and leak repair
    - First Phase – Initial Deployment and Implementation of two AMLD units in test area
    - Second Phase – Calculate emissions reductions and effectiveness
    - Supplemental phases – phased expansion to current 3-year leak survey areas (annual survey of entire system)

How does the proposal align with the following principles?

- **GHG Emissions.** We anticipate a significant reduction in GHG emissions on our mains and services once this AMLD effort is fully implemented across the LDC gas system.
- **Innovative/novel**. This technology has had limited implementation and as such firm information on costs and emission reductions are not available. Our hypothesis is that we can reduce fugitive methane emissions at a reasonable cost using this technology.
- **Scalability**. Yes, this is scalable. The Company is proposing to begin with an initial demonstration of two AMLD units in a designated test area. If proven successful,

the Company would plan to purchase an additional six units that would allow us to cover the entirety of our LDC systems on a more frequent cadence.

- **Affordability**. $/ton abatement cost will be evaluated relative to current practices and/or other Clean Heat resources
- **Cost sharing**. None that have been identified
- **Enhanced customer experience/preserve customer choice**. By reducing the emissions from our system we are able to meet state GHG reduction goals as well as our own GHG reduction goals for the gas distribution system.

Phase I – Initial Deployment and Implementation of two AMLD units:

- Solicit RFP for technology vendor
- Purchase two AMLD units
- Leak survey test areas including both annual and select three-year survey areas (also referred to herein as the test area)
- Investigate leak indications and grade all leaks found
- Leak repair

Phase II – Calculate emissions reductions and effectiveness:

- Use actual experience to calculate leak survey, investigation and repair costs using AMLD and otherwise evaluate effectiveness of AMLD
- Use emissions measurements gathered from initial AMLD units to determine reduced emissions due to increased frequency of leak detection
- Determine $/ton abatement cost relative to current practices and/or other Clean Heat resources

Supplemental Phases – Phased Expansion to 3-year leak survey areas (not being requested at this time):

- Dependent on Phase I and Phase II results; may be brought forward in the next Clean Heat Plan or other appropriate regulatory pathway
- Preliminary structure:
    - Three-year minimum phase-in replacement of current three-year leak-survey cycle with AMLD
    - Purchase and use an estimated 6 additional AMLD units over time to transition to annual survey of the entire LDC system

Estimated Cost and Budget:

A specific vendor has not been selected and a RFP process will be utilized to select a vendor. All costs are estimates subject to further refinement, and the Leak Survey & Repair Costs may continue beyond 2025.

Estimated costs for Phase I and II are provided below.

Table 6: Advanced Mobile Leak Detection Indicative Costs for Phase I & II

Cost Category	2024	2025
AMLD Implementation Costs	$3,170,000	
Leak Survey & Repair Costs		$ 953,000
Total	$3,170,000	$ 953,000

6. CLEAN FUELS MARKET TRANSFORMATION INITIATIVES

HYDROGEN BLENDING DEMONSTRATION

Background and Context: The Company is interested in demonstrating the use of hydrogen as a fuel to reduce emissions from its gas LDC system as part of achieving the State's greenhouse gas emission goals. The Company's modeling, conducted with E3, indicates that hydrogen is a costeffective Clean Heat resource. Additionally, the Company is in the process of pursuing funding through a multi-state Department of Energy funding opportunity for hydrogen production. Given these ongoing initiatives and the broader support for exploring hydrogen in the State of Colorado, the Company is proposing to conduct an estimated 24-month project that would demonstrate the ability to safely deliver and inject hydrogen gas blended with natural gas into its gas system to achieve emission reductions, as a first step to a potential future broader scale deployment of blended hydrogen.

Hypotheses: The hydrogen demonstration project is intended to demonstrate that the Company is able to safely and reliably blend hydrogen into its existing gas infrastructure and deliver it to customers. There are four major categories of technical considerations that the Company is evaluating through the project: hydrogen supply and storage, hydrogen blending and control, pipeline operations, and customer end-use. The Company will be further evaluating, and updating for scalability considerations, all safety, technical, engineering, operational, and reliability considerations respective to these four categories based on the demonstration project.

Metrics for Success:

First and foremost, our highest imperative is to conduct all aspects of this demonstration project safely, in a manner that will continue to provide safe and reliable service to the project area we propose. In terms of the objectives for the project, we will observe, and gain information needed to evaluate and update our required procedures and standards to facilitate the potential future broader use of hydrogen blended natural gas in our system. The project will also allow us to identify any changes in materials and tools that broader scale hydrogen blending would require. This effort will also include voluntary field appliance studies which will test customer appliances at various blends of hydrogen to ensure that appliances are working as expected.

The overarching metric for success is to safely complete the project, and thereby demonstrate that the Company will be able to consider introducing hydrogen blending more broadly in its system, applying lessons learned from the demonstration project.

Customer Classes Impacted: Residential customers

Clean Heat Resource Types Implemented:

- Green or Blue Hydrogen is the preferred hydrogen for the project. At this time, the Company is exploring the source and type of hydrogen to procure.

Foundational Requirements:

- System selection for the demonstration was based on meeting a series of requirements:
    - Non-integrated gas system
    - 100-1,500 meters
    - Residential and/or small commercial
    - Mains and services are primarily polyethylene pipe
    - The project location in unincorporated Adams County, Colorado, was selected because it met the abovementioned criteria, specifically consisting of approximately 230 residential customers that were served by a gas pipeline system of polyethylene pipe constructed after the 1980s.

Non-Foundational Requirements:

- The surrounding area had available land to host this proposed facility.

How does the proposed project align with the following principles?

- **GHG Emissions.** The replacement of natural gas with the indicated percentages of low-carbon hydrogen blending is calculated to reduce CO2e over the course of the demonstration.
- **Gas Demand.** This demonstration of hydrogen blending does not change the gas demand of the customers in the demonstration area.
- **DI/IQ Benefits.** This demonstration project is not in a DI/IQ customer area.
- **Innovative/novel.** Through this small-scale demonstration project, the Company is seeking to broaden its operational experience and knowledge of hydrogen beyond consultation with experts and peer utilities. Creating operational data based on the Company's actual system and customer usage is a first step to a potential future broader scale deployment of blended hydrogen.
- **Scalability.** Yes. However, the hydrogen blending ratio may differ based on the attributes of the existing gas system infrastructure.
- **Strategic Partnerships.** N/A
- **Affordability.** At this time the cost of the hydrogen blended gas on its own is higher than natural gas, but tax incentives and continued innovation and implementation by the industry to incorporate this technology can result in cost reductions.
- **Cost sharing.** N/A
- **Enhanced customer experience/preserve customer choice**. The Company believes that this demonstration can provide a source of a low carbon hydrogen-blended gas that can provide emission reduction benefits, without modification to customer behavior or requiring customers to change appliances or otherwise incur

personal expenses. It can help the Company meet state GHG reduction goals as well as our own GHG reduction goals for the gas distribution system.

Phase I – System Evaluation:

- Site Location Selection
- Preliminary Engineering & Design
- Preliminary Land Acquisition and Permitting
- Customer Outreach
- Preliminary Site/County Permitting

Phase II – Construction:

- Finalize Engineering and Design
- Material Acquisition
- Finalize and Final Permit for Approval
- Finalize and Obtain Permit for Construction
- Hydrogen Blending Site Construction and Commissioning

Phase III – Anticipated Blending and Monitoring (24-Months):

- 2% blending ratio for 8 months
- 5% blending ratio for 8 months
- 10% blending ratio for 8 months
- Ongoing Appliance Survey

Estimated Cost and Budget:

Estimated costs for Phase I, Phase II, and Phase III are provided below.

Table 7 Hydrogen Blending Demonstration Indicative Costs

Cost Category	Phase I	Phase II	Phase III
Engineering & Design Consultants	$1,300,000	$200,000	$150,000
ROW Acquisition and Permitting	$250,000		
Materials	$50,000	$2,300,000	$50,000
Mechanical Construction		$1,400,000	
Ancillary Construction		$300,000	$300,000
Total Estimated Costs	**$1,600,000**	**$4,200,000**	**$500,000**

HIGH-QUALITY CERTIFIED (DIFFERENTIATED) NATURAL GAS EMISSIONS MEASUREMENT

Background and Context: Fugitive emissions from upstream production and supply of natural gas has significant global warming potential. Despite early efforts across the industry, there are a variety of certification processes and practices which aim to measure and verify natural gas being supplied from wells at a lower emissions rate. The Company is proposing to partner with a leading midstream company (Williams) and a data tracking and reporting company (Context Labs) to help drive the CNG certification process to a more rigorous standard.

Partners: Williams Energy will provide the gas supply and work with Context Labs to perform the emissions measurement, calculation, and tracking.

Metrics for Success:

- Was the contract quantity provided reliably every day of the period?
- Did the project providers adequately identify specific emission reduction efforts at production facilities and relate those efforts to reduced emissions? Can we isolate the monitoring and measurement at a granular enough level to see the impact of emission mitigation measures?
- Did the program contribute to the development and advancement of emissions reduction claims standards?
- Were there any gaps in the continuous measurement and reporting periods?
- Were the emission reduction claims properly quantified and verified?
- Can our verified emissions reduction claims be transparently replicated?

Customer Classes Impacted: All retail LDC sales customers

Clean Heat Resource Types Implemented:

Proposed as a supplemental option to the Clean Heat Program requirements.

Foundational Requirements:

- Identify supplier (Williams)
- Deploy technology
- Demonstrate that the gas supply is reliably delivered
- Prove the emission measurement and reduction claims meets generally accepted industry requirements

Non-Foundational Requirements:

- Certified gas with no less than 0.25% methane intensity

- Standardization of a transparent emissions reduction calculation
- Standardization of a transparent, independent emissions verification
    - Appropriate location of associated certificate
- Public access to registries
- Demonstrated connection between producer's actions and emission reductions claims

How does the proposal align with the following principles?

- **Reduce GHG Emissions.** Yes
- **Reduce Gas Demand.** No
- **DI/IQ Benefits.** Program targeted for all firm sales customers. DI/IQ communities will benefit, along with all firm sales customers in contributing to emission reductions.
- **Innovative/novel**. Certification of differentiated gas emissions reductions is in its infancy. We expect the market and nascent industry to mature, and our project will promote those actions.
- **Scalability**. Yes, the project is scalable. The Company's goal is to purchase 100% of future gas supply needs as differentiated gas.
- **Strategic Partnerships.** Yes
- **Affordability**. The Company's modeling has shown that CNG is a cost-effective resource that can contribute to economy-wide GHG emissions, despite the small premium for environmental certificate.
- **Cost sharing**. No
- **Enhanced customer experience/preserve customer choice**. The project will improve customer choice as it will provide an alternative gas supply that promotes reduced carbon emissions.

Phase I – Identify Providers:

- Williams Energy will provide gas supply.
- Context Labs will provide measurement, calculation and tracking.
- Third-party accounting firm will verify.

Phase II – Implementation (estimated to be summer 2024 – summer 2025):

- After the Commission issues an order in the Clean Heat docket, Williams and PSCo will enter into a gas supply deal for differentiated gas.

- Emissions related to the differentiated gas production will be measured and monitored by Context with third-party verification.
- Emission reductions claims will be calculated and tracked based on the measured data by Context.

Phase III – Monitoring/Evaluation/Reporting:

- Williams will provide continuous emissions monitoring during the project.
- Williams will provide quarterly emissions reports to PSCo.
- PSCo will evaluate the effectiveness of the emissions measurement and monitoring and determine whether the technology can be scaled up.
- PSCo will track emission certificates and retire them to claim reduction credits.
- PSCo will submit a report to the Commission at the end of the one-year project detailing production information, emission reductions, and total cost of the certificates. The report will also indicate whether the Context Labs technology or other platforms satisfy the emissions reduction calculation and tracking so that PSCo could continue purchasing differentiated gas.

Estimated Cost and Budget:

No cost for Phase I or Phase III. The differentiated gas certificates will cost roughly $1 million on an annual basis.

Estimated costs are provided in the table below.

Table 8 High-Quality Certified Natural Gas Indicative Budget ($M)

2024	2025	2026	2027	2028
$0.5	$0.5			

7. INNOVATION FUND CONCEPTS

INTRODUCTION OF THE INNOVATION FUND CONCEPT

In addition to the market transformation initiatives, we are proposing an innovation fund that can be used to develop and execute new, innovative concepts to drive scale in emissions reduction efforts. As part of that fund, we are proposing several initial concepts listed below. We anticipate that additional concepts may be identified and considered as part of the fund process. The Company is proposing a program adjustment mechanism with a 60/90-Day Notice process like that used in the Company's Transportation Electrification Plan and DSM programs. The Company and stakeholders have successfully used this mechanism in other contexts, and we believe it will create efficiencies for adding, modifying, or discontinuing programs within the approved Clean Heat Plan.

COMMUNITY GROUND SOURCE THERMAL ENERGY

Under the Market Transformation Innovation Fund, we are seeking funding to conduct site assessments for community ground source heating. This is a first step towards meeting the requirements of House Bill 23-1252, the transformative Thermal Energy legislation passed during this year's legislative session, which requires the Company to propose a Thermal Energy pilot project on or before September 1, 2024.[1] While the location, size, and other details of the pilot are yet to be determined, the Company intends to use that project as a technology demonstrator to study the challenges and opportunities for bringing Thermal Energy onto the Company's system. That project will begin during the action period for the current Clean Heat Plan. House Bill 23-1252 also makes Thermal Energy a Clean Heat Resource and allows for its inclusion in the Company's next Clean Heat Plan filing. The Company anticipates that the pilot project will assist with modeling the capabilities and pricing of Thermal Energy for inclusion in the next plan. The Company will seek approval of its Thermal Energy pilot project in a separate proceeding but includes it in the Market Transformation Portfolio for this Clean Heat Plan in light of its potential to accelerate the development of Thermal Energy in Colorado as part of the Company's strategy for gas LDC emissions reductions. We anticipate the costs to contract with a vendor to provide a siting analysis and process for customer acquisition to be around $500,000.

STRATEGIC PARTNERSHIP PROJECTS

In our initial outreach, we understand that many of our customers and communities are also seeking pathways to reduce emissions from their gas usage and exploring innovative ways to upgrade or advance new developments with a lower emissions footprint. We also know that these partnerships and the actions of our customers is the key to achieving the clean heat plan targets overall. Under this concept, we could continue to work with customers and communities on innovative projects that reduce emissions with a focus on new infrastructure developments. This could include a variety of innovative programs above and beyond our current DSM or BE rebate offerings, including electrification

[1] § 40-4-121(3)(a), C.R.S., enacted in Section 5 of House Bill 21-1252.

programs, efficiency, alternative fuel programs or resiliency projects that could enable all-electric builds. Based on initial conversations, the Denver International Airport ("DIA") has signed a letter of support to continue to explore options for additional projects to reduce DIA's Scope 1 emissions, including fuel switching and electrification. We understand our communities are also looking for support as they work on extensive development plans. We look forward to using this concept to work with strategic, high impact customers to identify opportunities for deployment of Clean Heat resources beyond existing DSM and Beneficial Electrification program available today.

COMMERCIAL FLUE GAS CAPTURE

Emissions associated with direct use natural gas are released from millions of different sites in customer homes and businesses. Some of these sites, particularly larger commercial businesses or operations with consistent and critical demand, will need solutions that work with their existing infrastructure and requirements. Especially in the early years, these loads may be very difficult to electrify and may require some use of natural gas. For these types of end-uses, we have been hearing of new developments in the Carbon Capture Utilization and Storage space that would allow for carbon capture on commercial-sized gas appliances, presenting an opportunity reduce emissions without a major disruption to operations or expensive retrofits. Carbon capture on commercial furnaces can reduce energy consumption and reduce emissions with a short payback period of as little as 5-10 years.

Clean O2 is the technology vendor selling this type of technology and is seeking to find new markets for deployment. Since the technology has been proven in the field, we plan to focus on adoption and scale. In this concept, the idea is to partner with market participants in our service territory, including Ball Arena, along with technology vendors (subject to further discussions) to deploy several technologies at key sites and test business model and market infrastructure questions to understand how to deploy this technology at larger scale.

UNIVERSAL WEATHERIZATION EXPANSION

Scaling weatherization (i.e., building envelope air sealing and insulation) measures will not only increase gas savings and reduce GHG emissions, they are also complementary measures to mitigate the impacts and investments to the electric grid from electrification. For example, as deployment of air source heat pumps grows, the electric distribution grid will require significant upgrades to accommodate the increased load, in addition to transmission and generation at certain adoption levels. Weatherization, including air sealing and insulation, can mitigate these load impacts while saving customers money and further reducing GHG emissions from energy consumption. This concept would explore ways to expand traditional DSM measures to a new level of scale to encourage increased investments in weatherization, both as a standalone energy efficiency measure and as a complement to electrification of space and water heating. We will explore new incentive structures and geo-target programs to scale weatherization measures and focus them on the areas of greatest impact while creating opportunities for customers to save money and expand resources (financial and technical) that can overcome barriers to creating jobs in this physically and technically demanding field.

RECOVERED METHANE COAL MINE STUDY

The Clean Heat Program explicitly recognizes the benefits of capturing fugitive methane emissions from active and inactive coalmines by including methane capture and injection into the gas distribution pipeline as an eligible Recovered Methane ("RM") source. This position is aligned with the prior inclusion of coalmine methane in the Colorado Renewable Energy Standard as an eligible energy resource. Currently, there are around 100 inactive underground coalmines and five active coalmines within Colorado.

Injecting coalmine methane as RM poses economic and logistical challenges that have resulted in coalmine operators being hesitant to explore the development of such projects. This highlights the importance for more nuanced studies into the viability and applicability of potential projects. We believe it is important to work with an organization or individual who has a wide network among coalmine operators, is knowledgeable about coalmine methane operations, and is trusted by operators.

A coalmine RM study would identify suitable active or inactive mines based on criteria such as the available coalmine gas with sufficient methane content that is eligible for RM credits under the State's Protocol. The study would further identify ballpark cost parameters for coalmine methane refining, compression, and transportation between coalmines and customers, as well as potential large natural gas customers who may be interested in direct injection of coalmine methane in their thermal heating systems. Finally, the study would also opine on potential environmental attribute ownership issues and propose resolutions.

BIOMASS GASIFICATION WITH BIOCHAR STUDY

Methane derived from biomass pyrolysis is in the Clean Heat legislation as an eligible source of RM and hydrogen is as an eligible Clean Heat Resource. This study analyzes the viability of a project that would aim to utilize a pyrolysis technology to produce carbon neutral hydrogen by using waste wood biomass from forestry thinnings as feedstock. The resulting hydrogen would be injected into the Xcel Energy gas distribution system as a Clean Heat Resource. In addition to hydrogen, this project would also create solid biochar that could be applied back to the forested land. Biochar is a solid product that consists of pure carbon and is capable of sequestering carbon over a long period of time. Biochar can absorb moisture, thereby making the forested land more resilient against catastrophic wildfires.

This study would help identify a pyrolysis technology that could generate carbon neutral hydrogen and create biochar from forestry waste wood, in an economically feasible manner. This study would identify suitable technology providers and would propose a timeline for the development of the project as well as provide estimates for the capital and operational expenses as well as the hydrogen and biochar yield in order to confirm the economic viability and scalability of the project.

DIRECT AIR CAPTURE FOR SYNTHETIC NATURAL GAS PRODUCTION

This concept is a demonstration of the use of direct air captured carbon and low/zero carbon hydrogen to produce synthetic natural gas ("SNG"). The primary application for

SNG, also known as Power to Methane or Power to Gas (“PtG”), is for direct blending and use in the natural gas distribution system. The benefit is that the process can be used to store renewable energy – turning the gas system into a large battery – and is a lower carbon direct substitute for traditional natural gas. SNG is made through a two-step process. The first step of is using electrolysis to produce green hydrogen. This process uses electricity, grid or carbon-free, to split water into hydrogen (H2) and oxygen (O2). This process can allow the renewable energy to be stored in the H2. For the second step, the H2 is combined with CO2 to convert to CH4, or SNG, using methanation technology. In this case, we are proposing to use CO2 from Direct Air Capture facilities. This process creates a methane with a lower carbon footprint on a lifecycle basis.

We are proposing this Power to Methane project as proof of concept for Xcel Energy to test the ability and costs to produce SNG and then deliver into our gas grid without any major infrastructure change. This project will also prove that by employing Direct Air Capture technology, we can capture CO2 from the air (in this case approximately 1000 MT/yr), and furthermore by injecting SNG into gas grid will reduce CH4 emissions (in this case approximately 888 MT/yr).

HIGH QUALITY CARBON OFFSETS STUDY

To date, less than 1% of all U.S.-issued carbon offsets have been generated from Colorado based projects. In this concept, we seek to significantly build up a Colorado pipeline of carbon offset projects in order to meet the demand for carbon offsets. This study would explore the potential for a pipeline of high-quality carbon offsets, focusing on land- based project types such as improved forest management and avoided grassland conversions, as well as carbon sequestration projects that meet our carbon offset standards. The study aims to identify actual projects that can be developed in the near-term with the objective of generating high-quality carbon offsets before 2030. The study also provides general cost estimates and indicative offset prices for each project as well as estimated offset volumes and development timelines.