Keeping the heat on: Assessing the potential for demand side management to alleviate natural gas shortages during extreme cold.

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ABSTRACT

Apex Analytics and PA Consulting worked with Xcel Energy Colorado (Xcel) to compare the costs and benefits of a gas pipeline expansion project with non-pipeline alternatives (NPAs). The region was already constrained during design day winter conditions, requiring the utility to truck liquid natural gas (LNG) into a mountainous region and inject supplemental supply at the area of constraint. The utility needed a more permanent solution to meet the demand needs of the region.

We conducted modeling to explore multiple scenarios to compare solutions including full electrification, mix of electrification and gas equipment, gas storage solutions, and pipeline replacement. In assessing the cost effectiveness of all solutions, our team included the externality costs of greenhouse gas (GHG) emissions from both gas and electric solutions. We compared various technologies' costs in terms of their total costs to reduce peak gas.

Ultimately, we found that a combination of aggressive electrification, gas efficiency, gas demand response and gas storage could reduce the gas demand enough to avoid pipeline infrastructure upgrades. Not only was the infrastructure avoidable, the NPA was more cost effective than a traditional infrastructure solution. This paper shares findings on this NPA assessment, which is one of the largest NPAs in the United States.

Introduction

An evolving policy landscape in gas regulation has created significant interest in non-pipeline alternative (NPA) solutions to address gas infrastructure needs. NPAs can defer, reduce, or avoid building of traditional gas infrastructure. A Lawrence Berkeley National Laboratory NPA paper (Nelson et al. 2023) identified four main policy trends that are driving national interest in NPAs; 1) State decarbonization targets, 2) State and Federal investment in efficiency and electrification, 3) overall cost effectiveness of NPAs compared to gas infrastructure, and 4) public health concern with indoor gas combustion.

Broadly, NPAs can address three categories of gas network investment: replacement of existing infrastructure, capacity expansion of existing system, and system extension to new customers (Alter et al. 2024). Each of these categories has unique challenges and solutions.

Replacement of existing infrastructure may include pruning branches that are old or leak prone off the end of main gas lines. Historically utilities have had an obligation to serve that would require convincing all customers to agree to removal of the gas line. This becomes difficult to enact projects when a single customer can refuse to electrify and jeopardize the entire project. As of 2024, no utility to has been able to do this for more than five customers (Alter et al. 2024). In California, a passed bill (SB 1221 2024) allows for 30 decarbonization pilot programs where if two-thirds of neighbors agree, the entire community receives free electric appliances to replace gas-powered ones, and the utility is relieved of its obligation to serve.

Capacity expansion can be addressed with a broader and more traditional gas efficiency and electrification rebate approach. By reducing the load of all customers in the system, capacity upgrades can be avoided. This Colorado NPA project falls into this category of NPA.

Lastly, utilities could choose not to provide gas infrastructure for new developments or new construction, which could support both reduced system extension and lower total capacity constraints. Both states and municipalities have experimented with gas moratoriums such as in New York (New York State Legislature 2023) where buildings over seven stories cannot have fossil fuel equipment and in Berkeley, CA where the city banned new gas hookups in 2019, only to be overturned by the ninth circuit court for being in violation of the federal Energy Policy and Conservation Act (EPCA) (City of Berkeley 2019).

Regardless of the type or objectives of the NPA project, there are significant questions for how to address customer choice, how to quantify costs and benefits, equity considerations for impacted customers (both participating and non-participating), and the future of gas. All opinions in this report are those of the authors and not of Xcel.

Background

Xcel's Eastern Mountain Gas System is experiencing an existing and forecasted capacity constraint, where customers are at risk of an outage during cold weather events such as gas system design day conditions due to insufficient system pressure caused by customer gas demand growth and limited supply. The Mountain Gas System serves 65,000 customers and three local distribution companies (LDCs). The system stretches from Boulder, Colorado to approximately Durango, Colorado and includes approximately 975 miles of transmission mains and eight compressor stations. Xcel's Mountain Gas System covers much of the mountainous terrain in Colorado. The Mountain Gas System is generally composed of three hydraulically separate systems on Design Day – the Western, Eastern, and Southern Mountain Gas System. The Eastern Mountain Gas System was the focus of this NPA study.

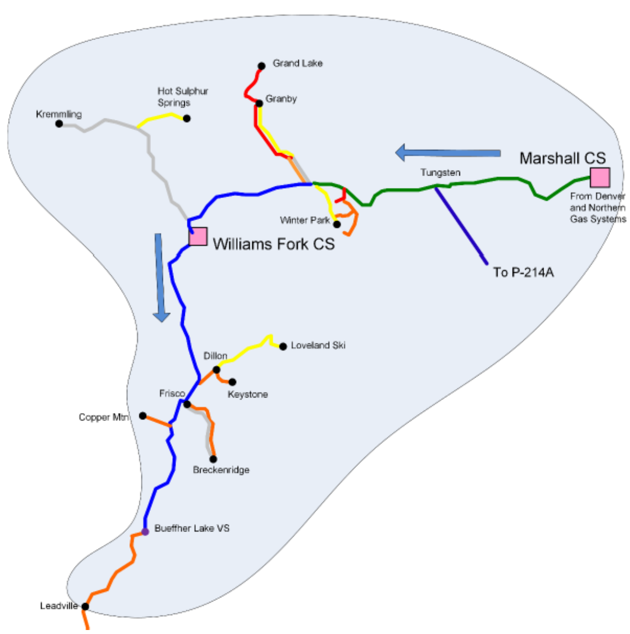

Figure 1. Eastern Mountain Gas System. *source*: Xcel Energy, 2025.

Within the Eastern Mountain Gas System, the Xcel team identified three key constraint points in the system at Breckenridge, Keystone, and Grand Lake. The gas modeling team at Xcel provided our analysis team with the forecasted mscfh peak hour shortfall shown in Figure 2, below. For context, the peak hour consumption of the Eastern Mountain Gas system, excluding local distribution companies (LDCs) is 3,004 mscfh (i.e., the total system needs over a 10% reduction from peak usage to no longer be constrained, before accounting for forecasted increases in peak hour consumption).

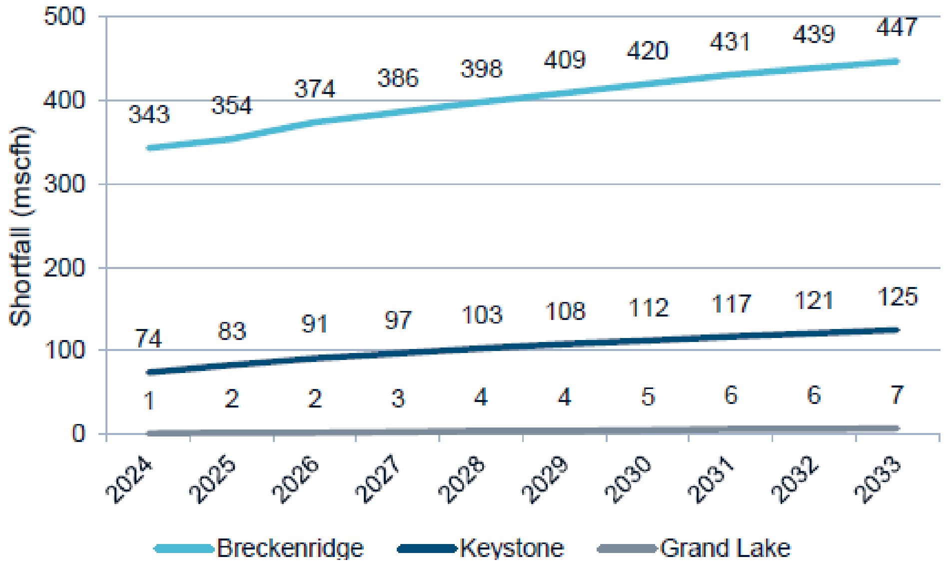

Figure 2. Eastern Mountain Gas System Forecasted Shortfall. *source*: Xcel Energy, 2025.

To address the Eastern Mountain gas system constraint in the near term, Xcel has been conducting temporary mitigation measures, including trucking LNG to the constrained area and injecting the LNG into the system. Ultimately, Xcel needed a more permanent solution which could include 1) traditional gas infrastructure upgrades, 2) localized storage increases, 3) NPAs, or 4) some combination of the prior three options.

Stakeholders had varying opinions on which of these interventions were most favorable based on their individual goals and perspectives. For example, the utility is primarily concerned with safety, keeping the heat on, and following the direction of the public service commission. Environmental stakeholders intervened throughout the project with many seeing NPAs as a possible funding source to support environmental goals and pushed for additional investments in full electrification over gas equipment efficiency with higher total costs and also higher environmental benefits. Local communities advocated for both reliability and efficiency and electrification investment in their communities via equipment rebates. Rate advocates generally were in search of the lowest cost option to provide reliable service.

Throughout the project our team provided the underlying analysis to facilitate an informed discussion between stakeholders and decision-makers. Ultimately, this NPA project had to satisfy the needs of stakeholders as best as possible, while keeping true to the objective of the project, which was to determine which option "best" addressed the gas supply shortfall in the constrained area.

Notably, the constraint is fundamentally a space heating issue, which is discussed further in the end use results section. This means that some equipment, such as dual fuel heat pumps, while a reasonable choice for environmental benefit and customer economics, are not an appropriate equipment choice to address peak gas constraints. Full electrification of heating equipment eliminates peak gas usage but is expensive for customers for both upfront and operating costs and if adopted at scale it will lead to significant and costly upgrades to the electric system. Additionally, customers may have concern with reliability in a climate where ASHRAE design day temperatures are around -15 F and gas system design day temperatures are near -40 F. Efficient gas heating systems are a cost-effective choice for lowering peak consumption, but environmental advocates expressed concern with large rebates that lock in customers to using gas equipment for the lifetime of the rebated gas equipment.

Ultimately, the Colorado PUC approved a settlement from Xcel, a coalition of local mountain community governments, the Colorado Energy Office, the Sierra Club, the Southwest Energy Efficiency Project, and PUC staff (Colorado PUC 2025). The settlement was contested by the Utility Consumer Advocate (UCA). The PUC decision allowed for rebates for electrification, gas equipment, shell upgrades, and demand response. The total spending approved was roughly $155 million for the NPA solution representing estimated savings of $170 million compared to the high end estimated cost of traditional gas infrastructure upgrades.

Methodology

To address the Eastern Mountain Gas System capacity constraint, the research team developed NPA DSM solutions and estimated their potential for alleviating the constraint. The research team conducted primary research in the Eastern Mountain Gas System to better understand specific characteristics of the region, assess barriers to NPA implementation, understand trade partners' readiness to support electrification, understand customer's interest in participating in potential programs, and assess interest at different incentive levels to inform the achievable potential for NPA measures. The steps below show the methodology for developing and evaluating a set of NPA measures and technologies that could be efficient in helping alleviate the current gas system capacity constraint in the Eastern Mountain Gas System as well as selection of a portfolio of solutions that includes supplemental supply solutions.

1. **Determine gas demand**: The analysis team assessed current and projected gas demand by customer class (residential, multifamily, commercial, transport) and end use (space heat, water heat, cooking, snow melt, pool heat, process load), accounting for Design Day peak hour and peak day, informed by data provided by Xcel.
2. **Conduct End Use Analysis:** The team disaggregated monthly consumption (throughput) data from Xcel into heating and non-heating by premise for all premises in the Mountain System. The heating and non-heating loads were then disaggregated further using a combination of results from the residential energy consumption survey (RECS) (EIA 2023a), the commercial building energy consumption survey (CBECS) (EIA 2023b), and professional judgement, to apply estimated breakdowns of heating and non-heating by building type.
3. **Identify potential NPA measures/technologies**: The team developed a list of 70+ potential NPA measures and technologies to evaluate for effectiveness in the Eastern Mountain Gas System. The potential measures include EE, Demand Response (DR), and electrification measure types. Additionally, the team determined the gas saving values and costs associated with each identified measure. The team consulted Xcel's most recent potential study, the technical reference manual (TRM), scanned for

national NPA measures, and accumulated stakeholder feedback to develop the initial measure list.

4. **NPA measure qualitative screening process**: Each NPA measure was processed through a series of screens to make it to the next step.
   a. Determine Design Day peak hour gas savings: The team assessed if the measure/technology had measurable impact to the peak hour gas demand.
   b. Relative peak hour/peak day gas demand impact: The team assessed the relative magnitude of peak hour/peak day gas demand impact from the NPA measure/technology.
   c. Qualitative screen: The NPA measure/technology was scored on 1) commercial availability of measure; 2) customer acceptance of solution; 3) availability of contractors; 4) ease of implementation; and 5) GHG impacts.
5. **Conduct interviews/surveys:** The team established customer willingness to adopt NPA measures and technologies and determined the necessary incentive levels required to increase likelihood of customer adoption.
6. **Quantitative Measure Characterization:** For all measures passing the qualitative screen, the team developed a full set of quantitative inputs for estimating peak hour impacts and cost-effectiveness. Where possible, savings, costs, and lifetimes were aligned with current Xcel TRM assumptions. For measures not included in the TRM, the team relied on secondary sources of estimates of savings from other jurisdictions. For measures covering end uses with significantly different baseline premise-level consumption in the Eastern Mountain Gas System, the algorithms from the TRM were used, with usage variables updated to match premise-level usage in the Eastern Mountain Gas System. Savings estimates were calibrated to actual premise-level consumption and peak hour usage in each geographic area to calculate area-specific estimates of impacts. The peak hour estimates are based on a calibrated gas model from Xcel and are based on gas planning design temperatures ranging from -42 to -33 degrees. Quantitative inputs included annual throughput savings (therms/year), peak hour gas demand impacts (peak hour mscfh), lifetime (years), incremental cost (dollars), adoption curves, electricity throughput impacts (kWh), and electricity summer and winter peak demand impacts (kW).
7. **Modeling of NPA measures/technologies:** The team modeled 54 measures across the nine geographies. Measures included gas efficiency, electrification and DR. The team assessed the potential of each NPA measure/technology in three categories:
   a. **Technical potential:** the theoretical maximum amount of energy use that could be displaced. Technical potential is a useful first step in understanding what is theoretically possible, but the results of this step are not discussed in this paper.
   b. **Economic Assessment:** a supply curve showing costs in terms of $/mscfh reduced.
   c. **Achievable potential:** a potential estimate using bass diffusion that limits potential by taking into consideration market or programmatic barriers or constraints such as program budget caps or implementation issues.
8. **Calculate potential savings**: the team used all the inputs from the process to determine the amount of technical and achievable potential gas reductions from EE, DR, and electrification.

9. **Portfolio Analysis**: The portfolio development process considered six portfolio options.
    a. **Electric Only Portfolio:** a portfolio comprised of only customer side solutions (i.e. NPA measures and technologies) including DR, building electrification, and non-equipment gas EE measures for residential and commercial customers, not including transport customers.
    b. **NPA Portfolio 1:** identical to the Electric Portfolio, focusing on customer side NPA solutions, except this portfolio includes incentives for gas consuming appliances.
    c. **NPA Portfolio 2:** identical to NPA Portfolio 1, except includes transport customers.
    d. **Hybrid Portfolio 1:** a portfolio that includes all achievable potential solutions, utilizing gas infrastructure, electrification, and NPA measures and technologies. Hybrid Portfolio 1 includes all NPA measures and incentives from NPA Portfolio 2, in addition to supplemental supply, and near-term use of temporary mitigation measures.
    e. **Hybrid Portfolio 2:** identical to hybrid portfolio 1 except that the portfolio reduces DSM investment once the constraint is alleviated (i.e., fully utilizes supplemental supply resources).
    f. **Traditional Gas Infrastructure:** This scenario was the baseline cost required to upgrade gas infrastructure with traditional capacity expansion measures. A separate analysis team determined the costs for gas infrastructure upgrades.

Results

End-Use Analysis

The team disaggregated the annual throughput and peak hour impacts by building type and customer type for the mountain region, as shown in Figure 3 and Figure 4 below. The results show that single family residential makes up the largest portion of non-LDC, non-transport annual throughput and peak hour usage. Thus, single family residential solutions were identified as the most important building type in development of NPA DSM solutions, with master-metered multifamily and lodging the most important commercial areas for commercial solutions.

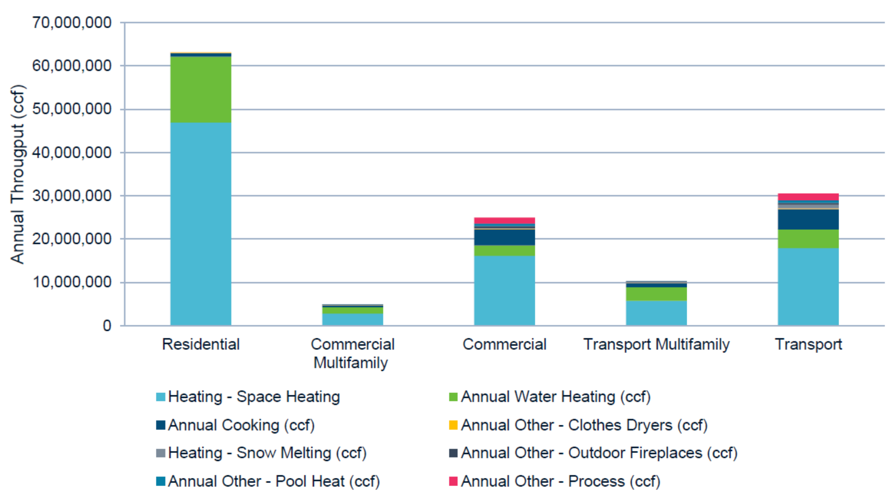

Figure 3. Mountain System End Use Disaggregation of Annual Throughput. *source*: PA Consulting, Apex Analytics analysis of Xcel data.

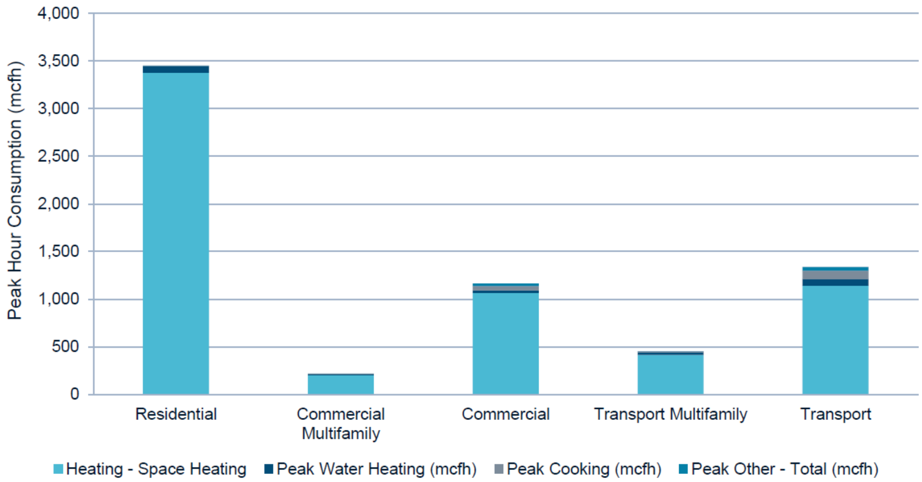

Figure 4. Mountain System End Use Disaggregation of Peak Hour Consumption. *source*: PA Consulting, Apex Analytics analysis of Xcel data.

On peak days, the heating load spikes much higher, while all other loads stay roughly the same. This results in space heating being, by far, the largest contributor to peak hour consumption, as shown above in Figure 4. As a result, space heating became the focus of NPA DSM solution development efforts for inclusion in a portfolio focused on reducing peak hour gas consumption, with a particular focus on residential space heating. This result creates a need for a different set of DSM solutions than a traditional DSM program. Upgrades to gas equipment like heat pump water heaters or dual fuel heat pumps may be a practical choice when reducing annual load, but for peak load reduction in the Colorado mountains, the DSM solution needs to address peak space heating.

Customer Research

To inform the NPA Potential Study, the team conducted primary research to assess customer characteristics and interest in energy efficient and electrification upgrades along with trade partner knowledge and interest in promoting and installing electrification equipment. The team used the information from these surveys and interviews to inform estimates and ramp up time for market adoption, the level of incentives needed to achieve the NPA goals, and the amount of workforce development needed to support any program.

The team conducted primary research among three groups of interviewees, residential customers in the mountain region and front range, commercial customers in the mountain region, and contractors and builders in the mountain region.

Residential Research

The team conducted a survey of a random sample of Xcel's residential gas customers in the affected mountain areas, intended to capture customer demographics in the Eastern Mountain Gas System. For comparison purposes, a sample of customers located on the front range of Xcel's service territory were also surveyed. The team collected 400 surveys in the Mountain region and 295 surveys in the front range.

A key difference in the Colorado Mountain Region is a higher percent of vacant homes compared to the front range, as shown in Table 1, below. This could create program design challenges where owners of vacant homes may have additional barriers to participation.

Table 1. Occupancy for Front Range and Mountain Communities

Occupants	**Front Range**	**Mountain**
You or your family members	40%	27%
Others outside of your family	58%	47%
Vacant	2%	26%

In addition to occupancy differences, the team also found significant differences in heating system equipment types, as shown below in Figure 5. Residents in the mountain region were much more likely to have boilers compared to residents in the front range. This poses an additional challenge for the NPA. Boilers are a more challenging end use to electrify for several reasons. First, these homes typically do not have ductwork and thus a retrofit would require a ductless mini split system or the addition of costly ducts. Second, the operating efficiency of condensing boilers drops when the ambient temperature is low since the boilers operate partially outside of condensing mode (Minnesota Department of Commerce 2017). This indicates that the boiler does not produce the full benefit of heating savings at peak when compared to annual savings benefit. Lastly, air-to-water heat pumps are becoming more readily available but have difficulty supplying water hot enough for a cold climate when used in baseboards (Nadel 2024), though they are better suited to in floor radiant systems.

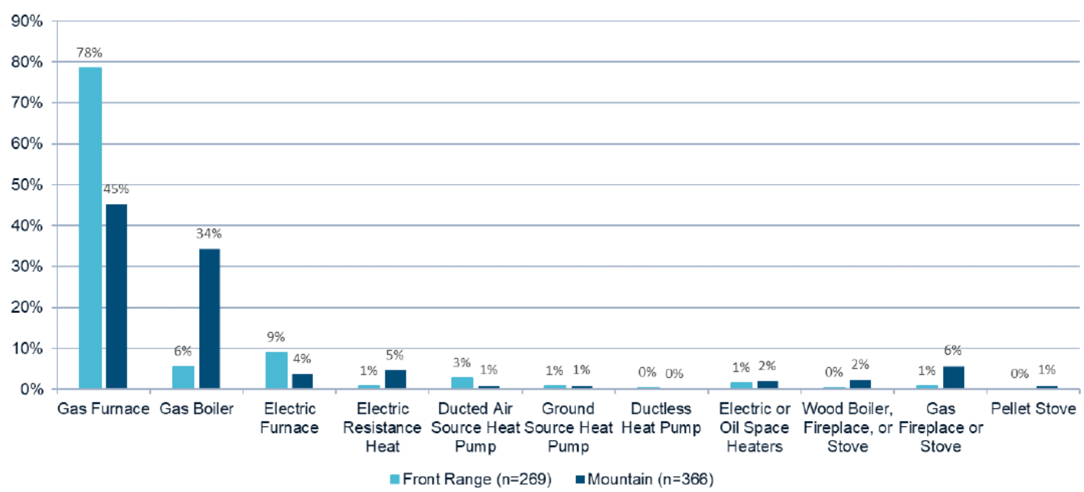

Figure 5. Heating System Types. *source*: PA Consulting, Apex Analytics

Figure 6 shows responses to the question “Xcel Energy offers multiple programs to save natural gas. Please indicate your level of willingness to participate in each of the types of savings opportunities listed below.” For this question, renters with some or a lot of influence were included and asked to respond on behalf of their landlord. The highest interest in both areas was for adding insulation and air sealing, followed by adjusting thermostats.

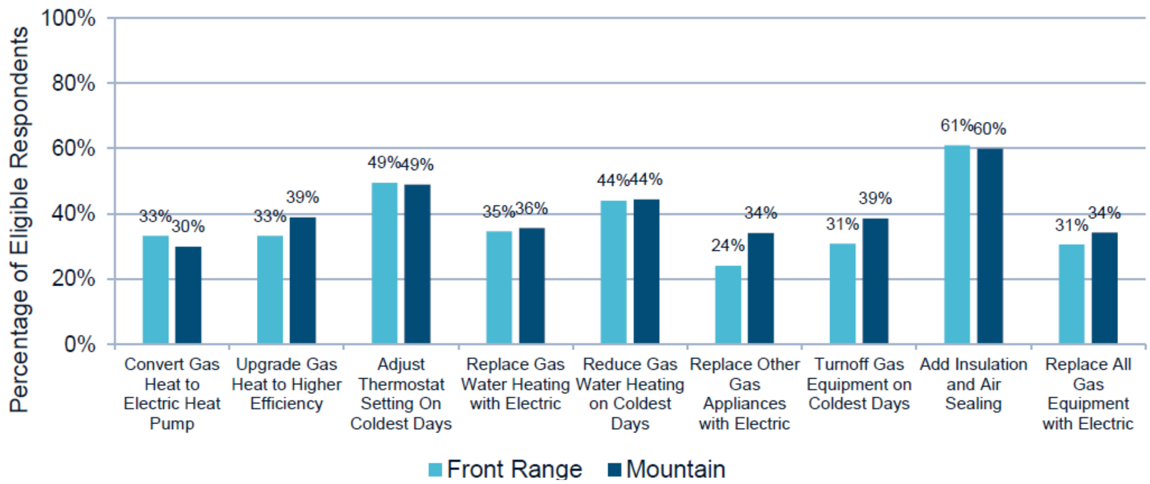

Figure 6. Interest in Upgrades. *source*: PA Consulting, Apex Analytics

The survey asked customers that indicated they were very or possibly interested in a particular upgrade about different price levels at which they would be likely to participate in an incentive program. Figure 7 and Figure 8 contain these results. For these questions, the survey tested different levels of incentives to assess how participation would be impacted at different incentive levels. In each case we provided survey respondents with estimated costs and possible incentives in dollars to give customers a sense of the magnitude of the purchase price while assessing a range of incentives between 30% and $2,000 over 100% of the incremental cost. Note that these questions were only asked to those interested in participating, shown as the % eligible at the bottom of the figures.

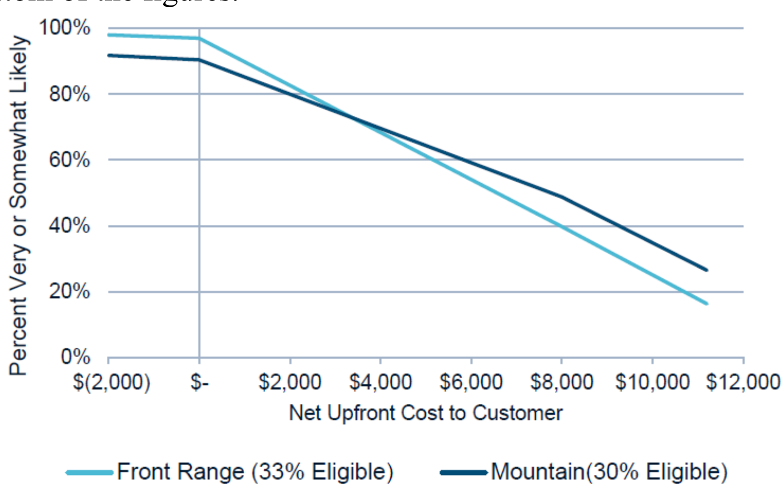

Figure 7. Likelihood to Convert to Heat Pump with Same Operating Cost *source*: PA Consulting, Apex Analytics

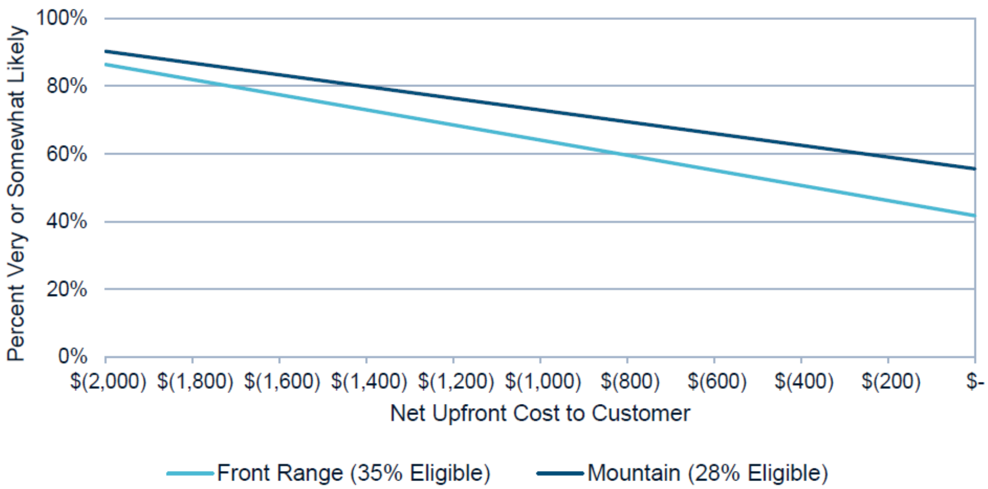

Figure 8. Likelihood to Convert to Heat Pump with $1,000 Increase in Operating Cost *source*: PA Consulting, Apex Analytics

When asking about upgrading existing gas heating systems to a higher efficiency gas heating system, we tested three incentive levels ranging from 50% to 100% of costs. Figure 9 shows the likelihood of upgrading a gas heating system to a higher efficiency version, assuming savings of $250 per year on the gas bill with nearly 100% interested at 100% incentives and under 40% interested at 50% incentives.

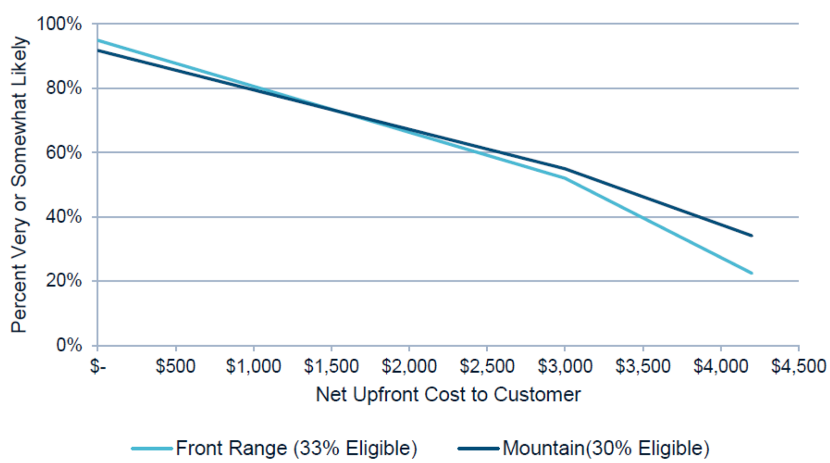

Figure 9. Likelihood to Upgrade Heating System to High Efficiency *source*: PA Consulting, Apex Analytics

Since annual savings of a higher efficiency system can vary due to specifics of equipment purchased and replaced and variable gas costs, we also assessed likely participation if annual savings were higher. The likelihood of upgrading a heating system to a higher efficiency version, assuming savings of $1,200 per year on the gas bill are similar to those interested with lower annual savings indicating that uncertainty around annual savings does not significantly affect interest.

The survey asked about participation in insulation and air sealing with four incentive levels ranging from 50% to 100%. Figure 10 shows the shares of those indicating likelihood to participate in a program to add insulation and air sealing saving $120 per year which are over 90% at 100% of costs and drop to about 40% at 50% of costs.

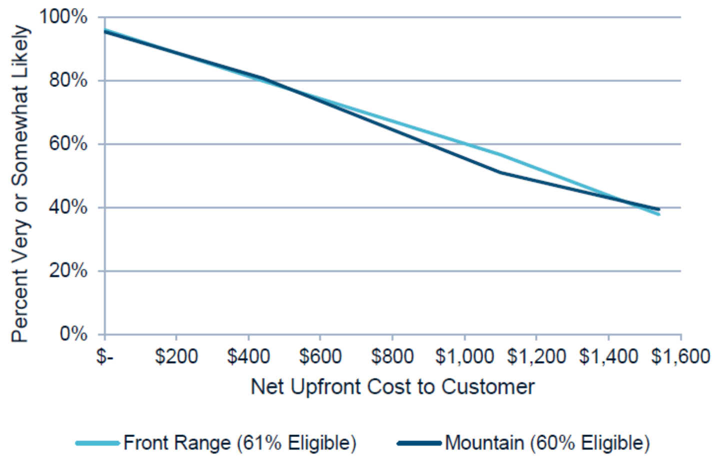

Figure 10. Likelihood to Add Insulation and Air Sealing Saving $120 a Year *source*: PA Consulting, Apex Analytics

Commercial Research

The team conducted a survey of a random sample of Xcel's commercial customers, segmented by gas usage (high and low categories) and area as defined as the Primary NPA area (Breckenridge, Keystone, and Grand Lake) and Secondary NPA area (remaining affected mountain areas). We designed the survey to assess business characteristics, use of gas fueled equipment, and interest in equipment upgrades and different incentive levels. We received a total of 66 responses.

We asked respondents about their primary heating source. Figure 11 shows the distribution of primary heat source for each respondent. The overwhelming majority are types of gas systems, with the most common heating system being gas boilers. Next, the team asked whether the respondent would be very or possibly interested in participating in different types of programs to reduce gas use. Figure 12 shows the results of these initial interest questions for a variety of equipment options.

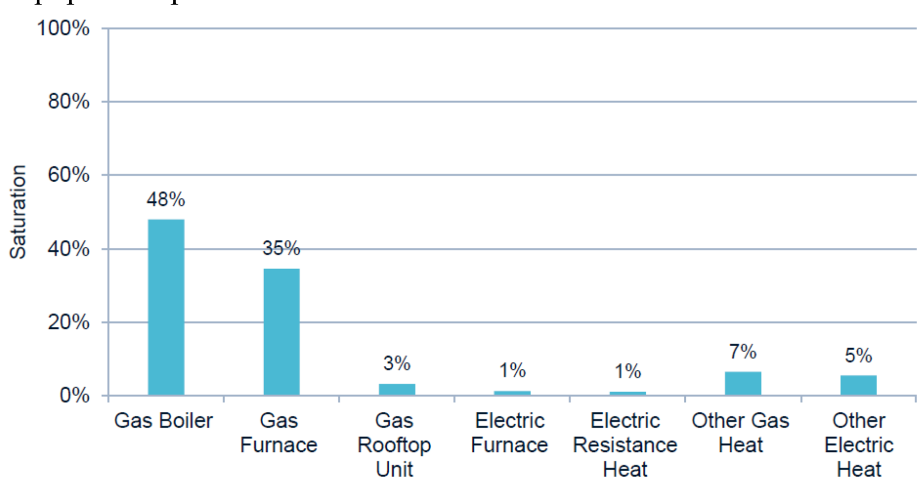

Figure 11. Primary Source of Heat (n=66) *source*: PA Consulting, Apex Analytics

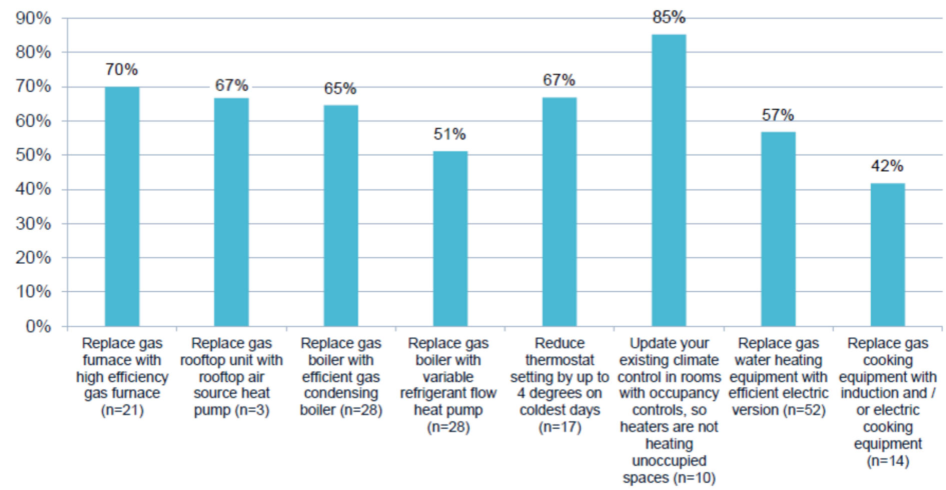

Figure 12. Interest in Participating in Efficiency Upgrade *source*: PA Consulting, Apex Analytics

When converting gas equipment to electricity, the change in operating costs is uncertain and dependent on operation characteristics and the relative price of fuels which can vary significantly. For this reason, we tested the heating system conversion at different operating costs. We asked the respondents how likely they would be to convert their gas heating equipment to electric if annual operating costs increased by 5%. With customers paying 75% of market equipment costs, 70% of customers would consider upgrading, at 50% of market equipment costs roughly 80% would participate, and 100% of respondents said they would participate if the equipment were fully rebated (i.e., free).

Builder and Contractor Research

For builders, the team asked questions around familiarity with electric technologies for heating and water heating, the challenges in building all-electric homes, role of incentives, and the role of marketing. For contractors, we asked questions to understand the contractor's current knowledge and engagement with heat pumps, identify shared traits among customers that decide to use electric equipment, understand the customer decision and contractors' influence in adoption of new technologies, and identify incentive needs and opportunities if Xcel were to pursue a program to convert gas equipment to electricity. Our key findings include:

- 2/3 residential builders believe there are no heat pump alternatives to boilers.
- 6/10 interviewees were concerned that heat pumps won't work at low temperatures, fear of customer complaints, maintenance, and longevity unknowns.
- 6/10 interviewees state that customers want gas, decision already made, or customer needs to replace like for like.
- 7/10 interviewees report having seen customer interest increase over the past three years.

Measure Economics

To evaluate the economic viability of measures, the team estimated cost-effectiveness and modeled overall potential at each constraint point for each geography for each measure with incentives set equal to incremental costs. The team chose to evaluate cost effectiveness using a modified Ratepayer Impact Test (RIM) test, "ERIM", that included the economic value of carbon reduction in addition to the standard elements in a RIM test. The standard ratepayer impact measure (RIM) evaluates the impact of intervention on utility rates. As Xcel provides both gas and electricity, it includes avoided costs for both the gas and electric system, program overhead, incentives, and lost revenue. This cost testing acknowledges that the goal of the project is to develop cost effective infrastructure, while also including the societal benefit of reduced GHG emissions.

The supply curve for included measures for the Breckenridge constraint is shown below in figure 13. This shows the large variability in ERIM net costs across the different measures, with residential envelope, gas equipment, and DR all having large potential at cost of thousands of dollars per mscfh-year, while electrification measures have large potential at costs of tens of thousands of dollars per mscfh-year. The higher costs of electrification measures are driven partially by the high costs of additional electrical capacity required to serve these new loads. Even when including the emission reductions benefit, gas efficiency still performed better than electrification for cost-effective peak gas reduction. The authors note, however, that if the objective were cost-effective GHG reductions alone, the supply curve may look more favorable for electrification measures.

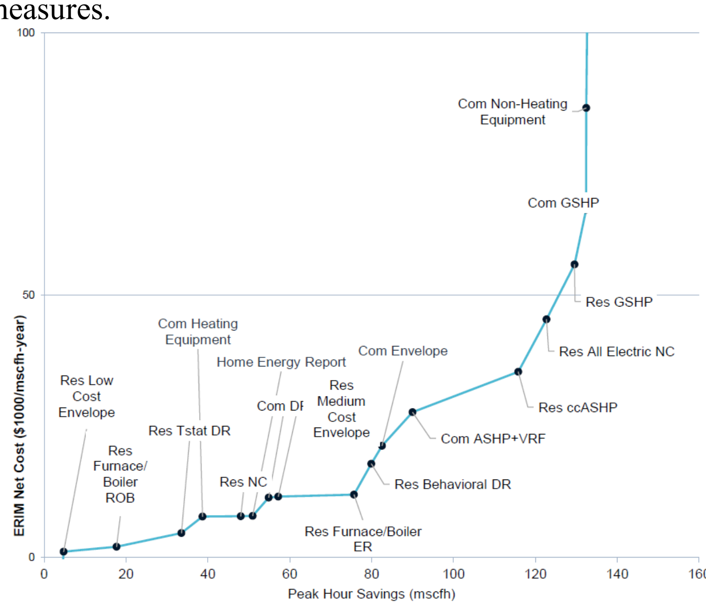

Figure 13. Breckenridge Economic Supply Curve Showing High Impact Measures *source*: PA Consulting, Apex Analytics

Achievable Potential

Achievable potential represents the amount of peak hour demand reduction that could be achieved given limitations on customer acceptance and technology diffusion. Achievable potential is calculated by year, reflecting the expected rate of market adoption of different measures and available stock of opportunities each year. Given the magnitude of the capacity shortfall, the team modeled uptake when customers were given 100% of incremental costs for technologies that reduced their peak load. The survey showed a steep increase in willingness to adopt up to 100% incentives, with little change beyond 100% incentives.

Figure 14 shows the total achievable potential by measure type and building sector in Breckenridge against the supply shortfall. The overall relationships for the other constrained areas are similar. We expect beneficial electrification to grow significantly over time, but gas equipment, efficiency, and DR will play a significant role in the near term.

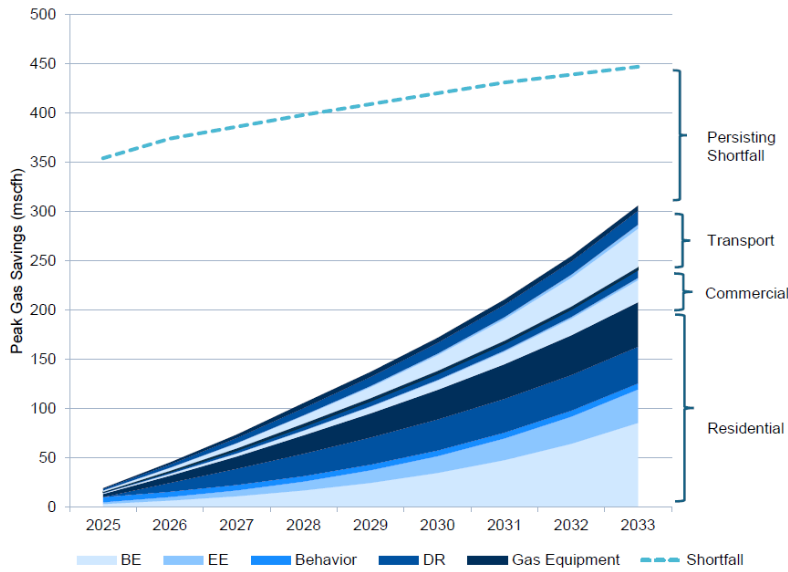

Figure 14. Cumulative Achievable Potential by Sector and Measure Type Delivered to Breckenridge compared to supply shortfall. *source*: PA Consulting, Apex Analytics

Hybrid Portfolio

As shown in the figure above, the shortfall in Breckenridge (and in Keystone) remained under all NPA-only scenarios. Given that each of the NPA-Only Portfolios resulted in a persistent capacity shortfall in Breckenridge and Keystone over the next ten years, the analysis team and Xcel determined that NPA-only solutions were insufficient to eliminate the shortfall in those areas, though in the Grand Lake area, the NPA solution was sufficient. The team analyzed the addition of a modular LNG site in Breckenridge and a modular CNG site in Keystone. Figure 15 shows the comparison of all evaluated portfolios. All NPA portfolios were unable to reliably address the capacity shortfall. Hybrid portfolio 1 and 2 both addressed the shortfall, but hybrid portfolio 1 was significantly more expensive since it included the continuation of enhanced DSM programming after the shortfall was eliminated.

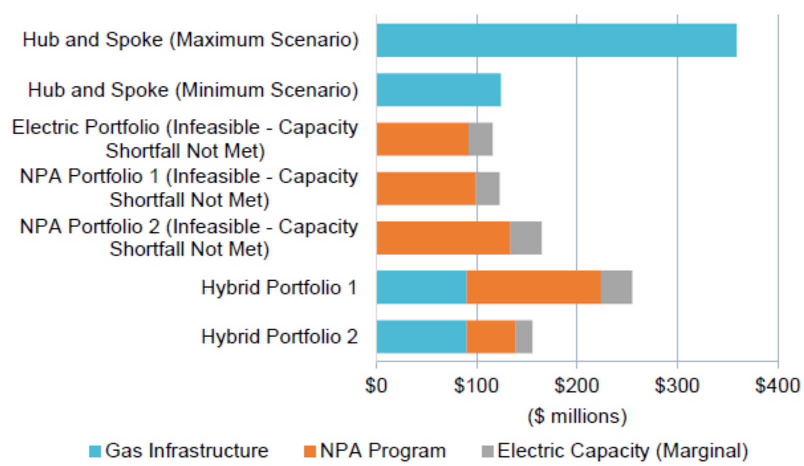

Figure 15. 10-Year Long Term Plan Cost Estimates *source*: PA Consulting, Apex Analytics, Xcel Energy

Conclusion

In our analysis of an NPA project in the mountains of Colorado, our team, along with Xcel, was able to find a hybrid solution that avoided significant costs for traditional gas infrastructure upgrades. The estimated savings to Xcel Energy rate payers was roughly $170 million. This project required broad coalition building with a joint settlement proposed by Xcel, a coalition of local mountain community governments, the Colorado Energy Office, the Sierra Club, the Southwest Energy Efficiency Project, and PUC staff.

In cold climates, space heating is by far the highest consuming end use. While higher efficiency gas equipment is more cost effective than full electrification, some environmental advocates had concerns about incentivizing and locking in gas equipment. This presented a difficult trade-off where decision makers need to make a choice about what the role of NPAs are in addressing environmental concerns vs. reducing infrastructure costs. Because of these challenges, the authors recommend a modified RIM test that includes GHG emission reductions as a benefit.

Of additional importance to policy makers, utility commissioners, and utilities is the equity of these programs. Traditional DSM programming allows for broad participation, where an NPA is inherently geographically focused, though it is funded by all rate payers. This makes the use of a Total Resource Cost (TRC) test less appropriate since the transfer of funding from all rate payers to only those allowed to participate could be seen as inequitable. This creates a burden for utilities to prove that the cost of the NPA is lower than traditional infrastructure (including reduced GHG emissions, which benefit all rate payers). This supports the use of a modified RIM test since the cost of infrastructure upgrades are traditionally shared across all rate payers. Thus, if an NPA proves to be a more cost-effective solution than an infrastructure only solution, the solution will be beneficial to rate payers.

NPA solutions should be explored in other jurisdictions with constrained gas infrastructure using multiple cost-effectiveness lenses to fully understand opportunities where new gas infrastructure can be avoided.

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