Benefit-Cost Analysis of Targeted Electrification and Gas Decommissioning in California's East Bay

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ABSTRACT

Building electrification will be a key strategy to decarbonize residential and commercial buildings. However, widespread building electrification will challenge funding and cost recovery mechanisms for the gas distribution system and may lead to high rates for remaining gas customers. Targeted electrification and gas decommissioning has been proposed as a strategy to avoid gas system investments by electrifying a block or neighborhood where gas system investments would otherwise be needed. In this research, we perform a benefit-cost analysis of targeted electrification and gas decommissioning in 11 candidate sites in the Bay Area that were pre-screened for feasibility and represent 1,500 total utility customers. The analysis considers participant, ratepayer, and total cost perspectives, and we have taken the novel approach of integrating customer usage data from Pacific Gas and Electric Company, building characteristics from tax assessor data, and estimates of the avoidable costs for gas capital projects at each site. We find that targeted electrification and gas decommissioning would be cost-effective in all 11 sites. In addition, we find a significant funding gap for the upfront costs of building electrification, even after accounting for available incentives. One potential option would be to repurpose the savings from avoided gas pipeline replacement to fund the associated building electrification projects. However, this would reduce the savings that accrue to gas ratepayers, potentially undermining the key equity goal of supporting long-term cost reductions for gas ratepayers.

Introduction

Electrification of homes and businesses is an essential component of California's plan to achieve net zero greenhouse gas emissions. However, building electrification will significantly challenge the funding and cost recovery mechanisms for California's gas distribution system. As homes and businesses depart the gas system, the fixed costs of the gas system will be spread across fewer customers and reduced overall gas sales. As a result, remaining customers could face significant increases in their gas rates. Low-income homeowners, who cannot afford electric alternatives, and renters, who may be unable to elect these alternatives, are particularly vulnerable to these potential impacts. Rate increases may be further compounded by escalation in gas infrastructure costs that exceeds inflation, and/or by growing commodity costs as lower-emitting fuels like biogas and green hydrogen are introduced into the pipeline fuel blend (Aas 2020).

Given these challenges, a deliberate "managed transition" is necessary to reduce future gas system spending and manage gas rates for customers. The managed transition will likely require multiple mitigation strategies. Prior work for the California Energy Commission has indicated that targeted building electrification coupled with strategic gas system decommissioning could be one approach to help reduce gas system costs and mitigate cost impacts for remaining gas customers (Aas 2020; Gridworks 2019).

To understand the potential role of targeted electrification and gas decommissioning in managing this transition, it is necessary to develop both an accounting of the benefits and costs associated with these projects and a robust cost-effectiveness framework to evaluate specific proposed projects. In this study, we develop a benefit-cost analysis (BCA) framework to better understand the benefits and costs associated with deploying these strategies and to serve as a blueprint for evaluating future proposals for targeted electrification and gas decommissioning projects. While cost-effectiveness analyses generally consider utility avoided costs estimated as an average across the service territory, this analysis integrates site-specific estimates of gas infrastructure avoided costs into the cost-effectiveness framework. This approach enables a detailed examination of cost-effectiveness for specific example projects.

This study evaluates cost-effectiveness across 11 candidate sites for targeted electrification and gas decommissioning in Ava Community Energy's service territory that were developed as part of this project.[1] The study's findings are applicable to future evaluations of gas decommissioning projects and for the broader development of strategies and long-term plans for targeted electrification and gas decommissioning.

Broader research context

This study is part of a broader research project funded by the California Energy Commission under research grant PIR-20-009. The research project has 4 primary tasks:

1. **Site selection framework**: Develop a replicable framework to identify specific locations where targeted building electrification, combined with tactical gas decommissioning, could support gas system cost savings. Using that framework, identify three pilot sites within Ava Community Energy's service territory, including at least one within a disadvantaged community.
2. **Benefit-cost analysis:** Using site-specific data, evaluate the benefits and costs of targeted electrification and gas decommissioning for all candidate pilot sites. Consider cost-effectiveness from different perspectives including participants, electric ratepayers, gas ratepayers, and all ratepayers.
3. **Community outreach and education**: Engage local communities in sharing their perspectives and priorities related to targeted building electrification and gas decommissioning.
4. **Deployment plan**: Produce a deployment plan for the recommended pilot sites, taking into account feedback received through community and stakeholder engagement.

The results from Task 1, the site selection framework, are described in our Interim Report (E3, Gridworks, and EBCE 2023). This paper is focused on Task 2, the benefit-cost analysis, with additional details on methodology provided in our Benefit-Cost Analysis Report for the Energy Commission (Gold-Parker et al. 2023). Detail on Tasks 3 and 4 will be provided in our

[1] Ava Community Energy is the Community Choice Aggregator, *i.e.*, non-profit electric retailer, in the East Bay region of the San Francisco Bay Area. Ava Community Energy was formerly known as East Bay Community Energy.

Final Project Report, which we expect to be published by the Energy Commission in Spring or Summer 2024.

11 Candidate Sites for Targeted Electrification and Gas Decommissioning.

Application of our site selection framework led to the identification of 11 candidate sites in Ava Community Energy’s service territory. These sites were pre-screened for two important characteristics. First, we used PG&E data to identify sites with a high likelihood of a near-term gas pipeline replacement project, as these sites would represent the best opportunities to avoid gas system costs. Second, we worked with PG&E gas engineers to identify sites that were hydraulically feasible for gas decommissioning, meaning that the gas pipelines could be removed from service without impacting reliability for the broader gas system.

Error! Reference source not found. shows a map of the 11 sites, located in Oakland, San Leandro, and Hayward, and labeled with letters A-K. As the final step in the site selection framework, the three sites C, F, and I were prioritized as proposed pilot sites based on the objectives of identifying a diverse mix of pilot sites within Ava Community Energy’s service territory, prioritizing sites in disadvantaged communities, and being responsive to feedback from community-based organizations and city staff. However, this report evaluates the benefit-cost analysis framework for all 11 candidate sites.

Table 1 provides an overview of some key characteristics of the 11 candidate sites. The sites have diverse characteristics in terms of size, building stock, low-income program enrollment, and presence of gas vs. electric equipment. Oakland sites (sites A-K) are seen to generally reflect older buildings with a greater share of multi-family homes, while the sites in San Leandro (sites I & J) and Hayward (site K) are primarily single-family homes built after 1980.

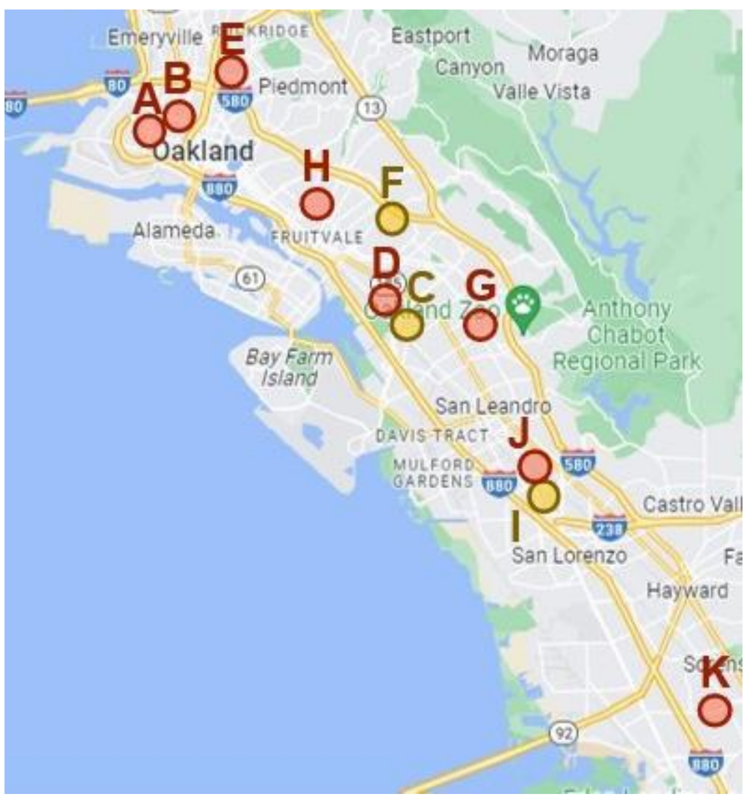

Figure 1: Location of 11 candidate sites A-K. Three sites in yellow (C, F, and I) were prioritized for proposed pilot projects.

Table 1: Key site characteristics. Column descriptions are provided below.

Site	Length of Mains	# of Cust.	DAC	Multi-Family	CARE	Electric Space Heating	Electric Water Heating	AC Present	Pre-1980 Vintage	Non-Res Sq Ft
	Miles	#	Y/N	%	%	%	%	%	%	Sq Ft
A	0.2	39	Y	53%	20%	13%	17%	23%	100%	15,000
B	0.3	65	Y	69%	31%	33%	25%	16%	87%	0
C	0.4	69	Y	3%	63%	34%	13%	13%	99%	0
D	1.0	337	Y	60%	87%	26%	20%	28%	100%	0
E	0.3	80		28%	12%	7%	4%	14%	99%	48,000
F	0.6	106		26%	38%	24%	12%	27%	99%	20,000
G	1.2	288		60%	66%	28%	14%	38%	96%	56,000
H	0.5	90		48%	48%	27%	10%	25%	88%	0
I	1.1	187	Y	17%	21%	17%	4%	19%	2%	0
J	1.3	175		0%	18%	15%	8%	13%	24%	0
K	0.7	96		3%	31%	23%	7%	19%	0%	0

Table 1 column descriptions:

- **Length of Mains**: Miles of gas distribution main that would be decommissioned
- **# of Cust.**: Number of gas meters at the site
- **DAC**: Is the site in a disadvantaged community based on CalEnviroScreen? (Yes/No)
- **Multi-Family**: Share of residential meters that are in multi-family buildings
- **CARE**: Share of customers enrolled in the California Alternative Rates for Energy bill discount program
- **Electric Space Heating**: Share of customers modeled currently using electricity for space heating
- **Electric Water Heating**: Share of customers modeled currently using electricity for water heating
- **AC Present**: Share of customers modeled with air conditioning
- **Pre-1980 Vintage**: Share of customers in a pre-1980 vintage building
- **Non-Res Sq Ft**: Total non-residential building square footage in each site

Methodology Overview

To support this analysis, we were able to access customer data provided by Ava Community Energy. These data reflect 1,500 customers across the eleven candidate sites. This dataset included key data for each customer, such as historical monthly electric usage, historical monthly natural gas usage, building type (single-family, multi-family or non-residential), building vintage, square footage, electric rate schedule, and enrollment in the CARE bill discount program (California Affordable Rates for Energy). Our analysis also utilized device adoptions levels from the California Energy Commission's 2019 Residential Appliance Saturation Study (DNV 2020) and load profiles developed using NREL's ResStock building simulations database (Wilson et al. 2022). Avoided cost components for electricity and gas were based on the California Public Utilities Commission's 2022 Avoided Cost Calculator (CPUC 2023). Finally, electric and gas rates were based on publicly available tariff data from PG&E's website.

This analysis focused on electrification of gas space heating, water heating, cooking, and clothes drying, and did not consider the presence of or need for natural gas backup generation. Most of the buildings in the 11 candidate sites are residential buildings and small commercial buildings, although the sites also include two large schools. These sites did not include any critical facilities such as fire stations or hospitals where gas decommissioning could pose challenges for backup generation. Jurisdictions such as New York City have recognized that full electrification of facilities such as hospitals will be especially challenging and will need further study (New York City 2019).

In this analysis, we evaluated different benefit-cost tests to consider the impacts of electrification on participating customers, gas ratepayers, electric ratepayers, and all ratepayers. Changes to cost-effectiveness evaluation may be needed to support achievement of economy-wide net zero goals. However, this report focuses on existing cost-effectiveness tests that are used by public service commissions for evaluation of energy efficiency programs, other demand-side programs, and, increasingly, for electrification measures.

The cost tests are:

1. **Participant Cost Test (PCT)**. This cost test reflects the perspective of customers who participate in a targeted electrification and gas decommissioning project.
2. **Gas Ratepayer Impact Measure (Gas RIM)**. This cost test reflects the perspective of gas ratepayers.
3. **Electric Ratepayer Impact Measures (Electric RIM)**. This cost test reflects the perspective of electric ratepayers.
4. **Total Resource Cost test (TRC)**. This cost test reflects the perspective of all IOU ratepayers, including benefits and costs to both participants and nonparticipants.

Depending on the cost test perspective, each benefit and cost component may be categorized as a cost, a benefit, or have no impact. Table 2 provides a list of the benefit and cost components included in this analysis and whether they are considered a benefit or cost for each test, or if they are not included in that test.

Table 2. Benefit and cost components analyzed for each benefit-cost test.

Example Cost	c
Example Benefit	b

Category	Component	PCT	Gas RIM	Electric RIM	TRC
Funding and Incentives	Upfront electrification costs	c			c
	Avoided end-of-life device replacement	b			b
	Program administration costs			c	c
	Electric ratepayer-funded incentives	b		c	
	Gas ratepayer-funded incentives*	b	c		
	Program incentives	b			
	State incentives	b			b
	Federal incentives	b			b
Electric System	Electric supply costs			c	c
	Final line transformer cost			c	c
	Electric panel and service costs	c**		c**	c
Gas System	Avoided gas pipeline replacement		b		b
	Avoided other gas rev. req.		b		b
	Avoided gas commodity costs	b			b
Bill Impacts	Incremental electric bills	c		b	
	Reduced gas delivery bills	b	c		
Environmental Impacts	Net GHG savings				b
	Net avoided methane leakage				b
	Outdoor air quality benefits				b

*Gas ratepayer-funded incentives reflect repurposing some or all of the savings from avoided gas pipeline replacement to support the associated electrification projects.

**The electric panel and service cost component is shared between participants and electric ratepayers.

Results

Total Cost Perspective

We first evaluated the total resource cost test (TRC), considering lifecycle benefits and costs from a total cost perspective. Figure 2 illustrates the average value of each benefit and cost component under the total resource cost test, averaged across all 1,500 customers in our analysis. Benefits and costs are presented as lifecycle values on a net present value $/customer basis. This figure illustrates that, given assumptions used here, full building electrification across the 11 sites would not be cost-effective on average under the TRC without the added benefits from gas decommissioning. Before including gas decommissioning, the analysis shows net costs of $3,900 per customer on average. Once gas pipeline avoided costs and other avoided gas revenue requirement benefits are factored in, the TRC reflects $14,500 per customer on average in net benefits. This illustrates the potential of gas decommissioning to support cost-effective building electrification where gas pipeline replacement projects can be avoided.

Note that this analysis does not include program administration costs (*i.e.*, non-incentive costs). Large-scale targeted electrification and gas decommissioning programs have never been executed before, so these costs are highly uncertain. However, if administration costs are large, this could have a significant negative impact on the cost-effectiveness of these projects.

Figure 2: Waterfall chart showing lifecycle benefits and costs of targeted electrification and gas decommissioning for the total cost perspective. Benefits and costs are shown on a $/customer basis across the 1,500 customers in the 11 candidate sites.

We find that all 11 candidate sites see net benefits under the TRC, with benefit-cost ratios ranging from 1.04 to 2.23. The site with the lowest TRC score incurs high upfront electrification costs associated with electrification of a large school at the site. The high cost of electrifying large non-residential facilities may drive noticeably lower benefit-cost ratios for targeted electrification and gas decommissioning.

Our analysis also finds that the cost-effectiveness of targeted electrification and gas system decommissioning will be more favorable in sites characterized by lower customer density, *i.e.*, sites with fewer customers per mile of gas main. This trend emerges because the primary financial benefit of gas decommissioning, avoided pipeline replacement costs, is proportional to the miles of avoided gas main replacement. Conversely, the primary cost of targeted electrification lies in customer electrification costs, which scale approximately with the number of customers to be electrified.

Figure 3 provides an illustration of this density finding. While two targeted electrification and gas decommissioning projects with the same length of gas mains will have the same savings from avoided gas pipeline replacement, the costs of implementing a gas decommissioning project would be higher in a site with more dense development (*i.e.*, with more customers to electrify).

	Less Dense Community	More Dense Community
Financial Costs (Behind-the-meter Electrification) Costs scale as $/customer	($$)	($$$$)
Financial Benefits (Avoided Pipeline Replacement) Benefits scale as $/mile	$$$	$$$
Financial Impact Financial Costs vs. Financial Benefits	Net Benefits	Net Costs

The Benefit-Cost Analysis considers many other cost and benefit components, although these are the largest.

Figure 3: Schematic illustrating the “density finding” that less dense sites are likely to see better overall cost-effectiveness for targeted electrification and gas decommissioning.

Participant Perspective

The participant cost test (PCT) evaluates the costs borne by customers who are directly involved in targeted electrification projects. The two main components of the participant cost test are bill impacts and upfront costs.

Based on customer usage data, we used a machine learning modeling approach to estimate which customers currently use gas for space heating and water heating. For gas cooking and gas clothes drying, we used regional data for gas device penetration based on the California Energy Commission’s 2019 Residential Appliance Saturation Survey (DNV 2020). We then evaluated bill impacts for all 1,500 customers, assuming the electrification of gas space heating, water heating, cooking, and clothes drying, where present. Our analysis accounted for differences in efficiency between gas and electric equipment, as well as seasonal and hourly profiles for each end use.

All customers see the full elimination of their gas bill. For calculating the change in electric bill, we assumed for simplicity that all residential customers are currently on PG&E's default "E-TOU-C" tariff, which is a two-tier time-of-use rate with no customer charge. Post-electrification, we calculated bills both on the E-TOU-C tariff as well as the optional "E-ELEC" electrification rate, which was designed to support electrification by removing the tiered structure and by adding a $15/month customer charge that reduces volumetric rate levels. In our modeling, 84% of customers would see a benefit in switching to E-ELEC, and thus are modeled to do so.

Figure 4 shows the importance of the E-ELEC electrification rate on supporting favorable bill impacts from building electrification. If all customers were to remain on the default rate, 84% of customers would see a bill increase. However, if customers switch to electrification rates (E-ELEC) where beneficial, then 46% of customers see a bill increase, generally from $1-$30/month.

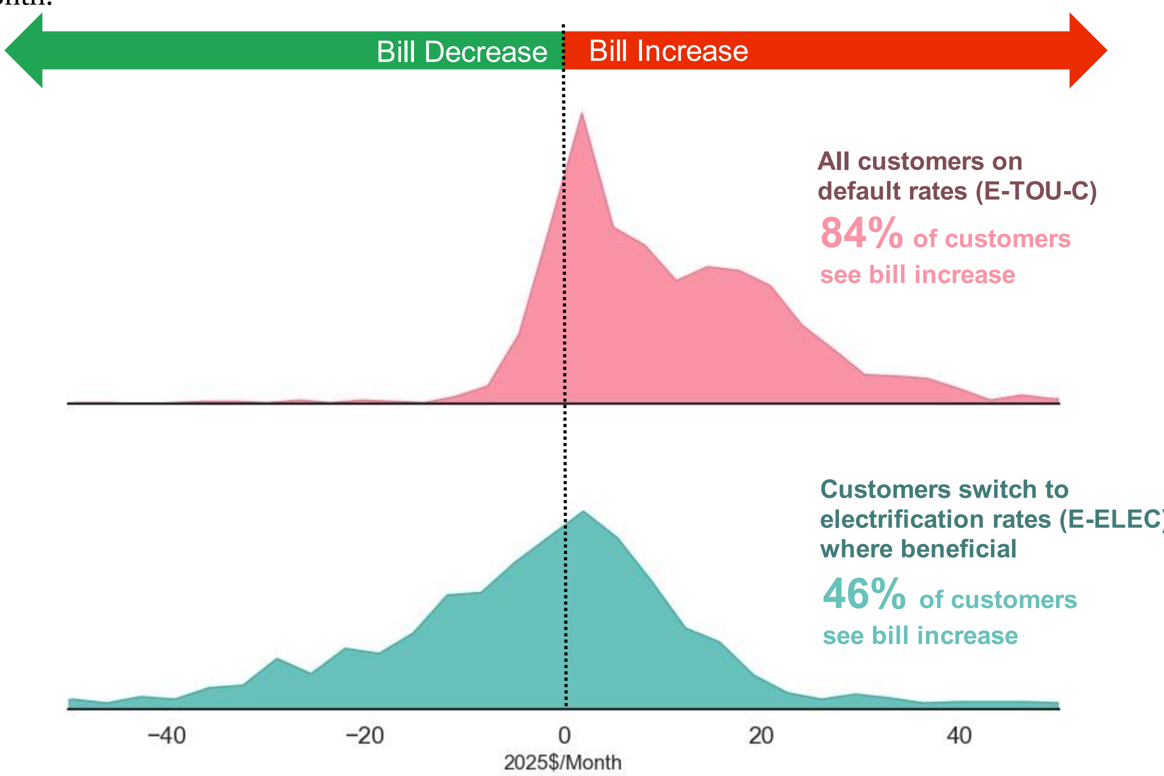

Figure 4: Distribution of first-year bill impact among all customers under two electric rate options.

Upfront costs are the second major category of participant impacts from whole-home electrification. We first consider the total upfront cost of electrification, including equipment costs and labor costs. We find a bi-modal distribution of costs, where customers who currently have electric resistance heating would incur ~$8,000 on average to electrify remaining gas equipment, while customers with gas space heating would incur nearly $18,000 on average to electrify their gas equipment.

Our analysis finds that available incentives are often insufficient to cover the upfront capital costs of electrification and that there is "missing money" to fund these projects. Overall, we find that this missing money has an average of about $9,000 per customer.

Finally, we considered that customers on a 100-amp panel may need to upgrade their electric panel and service. Research indicates that customers may be able to fully electrify on a 100A panel using technology options such as smart splitters and smart panels, 120V heat pump water heaters, heat pump clothes dryers (vs. electric resistance), and others (Redwood Energy; Rewiring America). In this study, we assume that all customers on a 100A panel face the costs of panel and service upgrades. However, these alternative technologies should certainly be considered, especially where panel and service upgrades would be especially costly.

In our analysis, we assume that customers would need to upgrade their panel and service if they live in pre-1980 homes and have neither air conditioning nor electric heating. Based on interviews with PG&E and data from TRC's 2016 report Palo Alto Electrification, we estimate the total panel and service upgrade costs to be approximately $13,000, where needed (TRC 2016). Based on PG&E electric line allowance rules, roughly $3000 of the cost would be covered by electric ratepayers, with the rest borne by the participant.

Overall, we find that participants will, on average, see net costs in the participant cost test (PCT), driven primarily by the high upfront cost of building electrification.

Ratepayer Perspective

We also evaluated the Ratepayer Impact Measure (RIM) for both gas and electric ratepayers. Under the RIM test, costs are all components that would lead to an increase in rates; and benefits are any components that would lead to a decrease in rates. On average, we find that targeted electrification and gas decommissioning would see net benefits for both the gas RIM and the electric RIM. In other words, these projects would support downward rate pressure for both gas and electric ratepayers.

For gas ratepayers, the reduction in gas utility revenues reflects a cost to gas ratepayers. However, on average, this is outweighed by the savings from avoided gas pipeline replacement.

For electric ratepayers, the electric load growth drives significant additional utility revenue that exceeds the marginal cost of serving the new loads. For these sites, we find that the marginal costs are low because the electrification loads are not aligned with summer peak hours. In addition, based on analysis from PG&E's electric distribution engineers, none of these projects would trigger expensive electric distribution upgrades at the circuit or substation level. This finding is aligned with research indicating that building electrification is likely to have only minor impacts on California's distribution grid due to the state's summer-peaking electric loads, whereas electric vehicle charging is expected to have more significant impacts on the distribution system (Kevala 2023). Note that electric grid marginal costs from building electrification may be significantly higher in winter-peaking electric systems.

Figure 5 shows the average cost-effectiveness across all 11 candidate sites from the total cost perspective, electric ratepayer perspective, gas ratepayer perspective, and participant perspective. This figure illustrates that targeted electrification and gas decommissioning is found to be cost-effective from the first three perspectives but is not cost-effective for participants due to the high upfront costs of electrification.

We find that a share of the savings from avoided pipeline replacement could be used to fund the associated electrification projects, enabling both ratepayers and electrifying customers to see net benefits. This would be similar to what PG&E has proposed in their application for a targeted electrification and gas decommissioning project at CSU Monterey Bay (PG&E 2022). While this proposed approach is still unproven, it reflects a viable methodology for repurposing some or all of the avoided gas pipeline replacement costs to support the associated building electrification projects that may not otherwise have adequate funding.

However, this approach would reduce the savings that would accrue to gas ratepayers, potentially undermining the long-term equity goal of providing long-term gas cost savings. While this approach may be pursued in the near term, other sources of funding should be identified to support targeted electrification projects in the long term and enable the return of gas system avoided costs to gas ratepayers to mitigate long-term gas cost pressures.

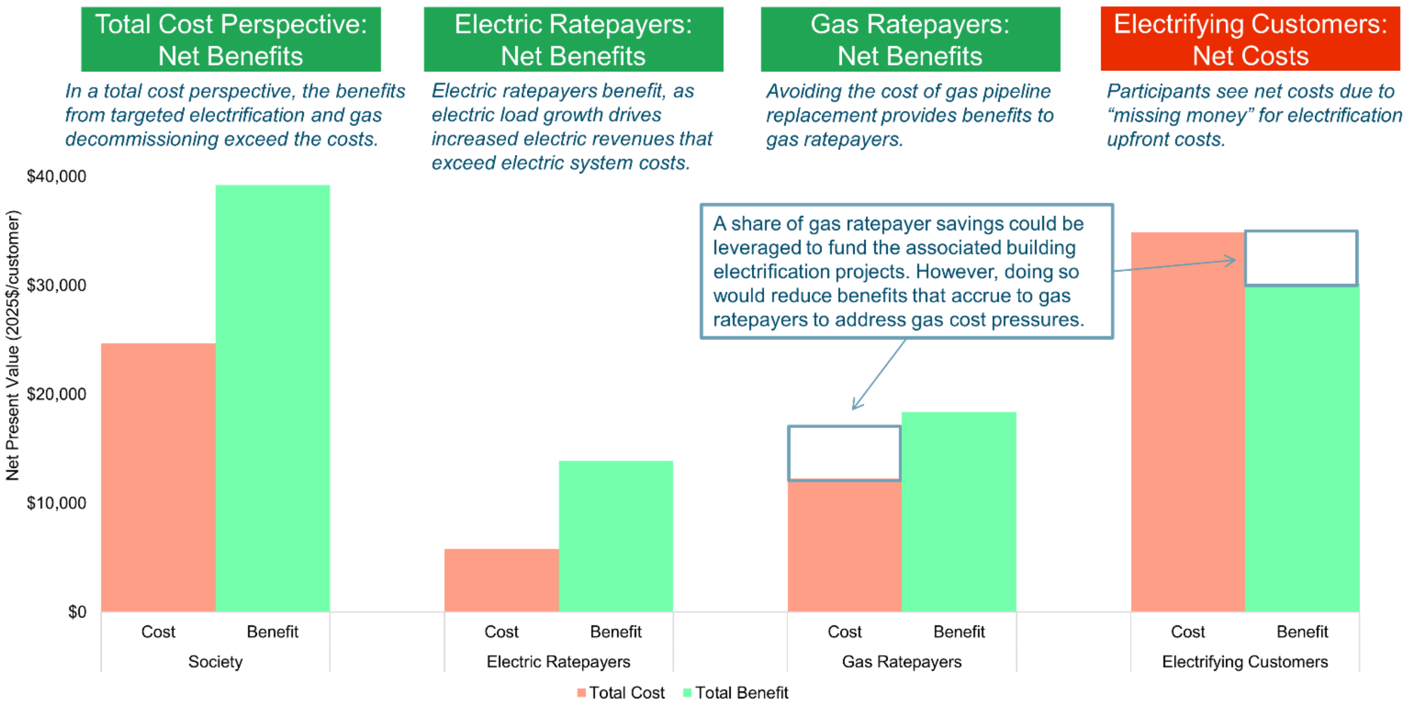

Figure 5: Average cost-effectiveness results under four different benefit-cost perspectives.

Additional details on this study are available in our Benefit-Cost Analysis Report for the California Energy Commission (Gold-Parker et al. 2023).

Conclusions

The benefit-cost analysis revealed several key findings:

- **Targeted electrification and gas decommissioning can provide net benefits to the state, gas ratepayers, and electric ratepayers.** In our analysis, all 11 modeled projects see total benefits that exceed total costs. This study focuses on the economics of these projects and does not consider challenges related to customer opt-in under the obligation to serve. **The results indicate that, if these projects could be successfully implemented, considerable cost savings could be achieved even after paying for building electrification.**
- **Targeted electrification projects will likely be more cost-effective in less dense sites, *i.e.*, sites with fewer customers per mile of gas main.** PG&E's gas service territory

includes less dense rural and suburban communities as well as dense urban communities. To the extent that many disadvantaged communities are located in the state's higher-density urban environments, this finding suggests that it may be more expensive to implement targeted electrification and gas decommissioning projects in these communities than in suburban or rural regions.

- **High program administration costs would have a negative impact on cost-effectiveness.** Administration costs, *i.e.*, the non-incentive costs to run a program, may be significant for targeted electrification and gas decommissioning projects, as these are complex projects that require substantial customer engagement. These costs may be especially high for early pilots that will need significant support for meaningful community engagement efforts.
- **Electrification rates, such as PG&E's E-ELEC rate, are instrumental in supporting bill reductions for electrifying customers. However, nearly half of customers modeled still see first-year utility bill increases in the range of $1-30/month after full building electrification, even if they adopt electrification rates.** Pairing electrification with energy efficiency upgrades could help to mitigate these bill impacts. Electric rate reforms that lower the volumetric component of electric rates would help support greater bill savings from these projects.
- **There is a significant funding gap for the upfront costs of electrifying buildings, even after accounting for existing incentives.** This means that, without additional funding or incentives, targeted electrification is not likely to be cost-effective from the participant's perspective.
- **One option to address this funding gap is to repurpose the savings from avoided gas pipeline replacement to fund the associated building electrification projects. However, this funding approach would reduce the savings available to gas ratepayers to mitigate long-term gas cost pressures, potentially undermining the long-term equity goal of alleviating gas rate pressures for low- and middle-income gas customers and renters.** In the long term, significant additional funding from federal, state, local, and/or utility sources will likely be needed to achieve widespread building electrification and enable these projects to return avoided gas system costs to gas ratepayers.

Considerations for Other Jurisdictions

While this study has explored targeted electrification and gas decommissioning in one specific region of California, regulators and policymakers will likely be interested in understanding the applicability of these results to other jurisdictions. A number of key regional characteristics may affect the cost-effectiveness of targeted electrification and gas decommissioning in other jurisdictions.

- **Customer Density**. As described in our key findings, our research indicates that cost-effectiveness is likely to be better in sites with lower customer density, *i.e.*, fewer customers per mile of gas main. The Bay Area has relatively high customer density. In this regard, other regions with lower density may see improved cost-effectiveness.
- **Gas Infrastructure Costs**. California is a high-cost state and is likely to have relatively high gas infrastructure costs relative to other jurisdictions. While other high-cost regions may also see gas pipeline replacement costs on the order of $4-5 million per mile, much of the country might see considerably lower gas infrastructure costs. In jurisdictions with

lower gas pipeline replacement costs, targeted electrification and gas decommissioning may be less cost-effective.

- **Climate.** There are a few different ways that climate may impact the cost-effectiveness of targeted electrification and gas decommissioning.
    - **Upfront capex.** The costs of electrifying HVAC are likely to be more expensive in colder climates, as cold-climate heat pumps with larger capacities would be needed to cost-effectively serve space heating needs. Compared to the Bay Area's mild climate, colder regions may see higher upfront capex costs.
    - **System peak impacts.** Electric grids that peak in the summer are unlikely to see significant generation capacity or transmission capacity impacts from building electrification. Conversely, winter-peaking grids may face significant capacity costs associated with electrifying space heating. While our modeling shows very little generation or transmission capacity costs would be incurred in California, these costs may be considerable in other regions. In addition, some grids may shift from summer to winter peaking depending upon the volume of electrification that occurs (Specian 2021).
    - **Electric panel/service upgrade needs**. Newer homes, as well as homes with air conditioning, are unlikely to need electric panel and service upgrades, as they would already have adequate electric capacity to support electrification of gas end uses. This may lead to lower costs in regions with high AC adoption. The sites modeled here include many older homes without AC and, as a result, some sites have fairly high modeled costs for electric panel and service upgrades.
- **Thermal Energy Networks.** In cold climates and/or in sites with a mix of heating and cooling needs, thermal energy networks, such as geothermal district heating systems, could be an alternative approach to electrify HVAC and hot water for a portion of a project site or an entire project site.
- **Customer choice.** Building electrification and gas system decommissioning have become polarizing topics in some regions due to the implications for customer choice.
- **Existing incentives for electrification.** The State of California is a leader in developing customer incentives and rebates for electric equipment. Customers in other jurisdictions with fewer available incentives may see higher net capex (upfront costs after incentives).

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