CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

ENERGY RESEARCH AND DEVELOPMENT DIVISION

FINAL PROJECT REPORT

An Analytical Framework for Targeted Electrification and Strategic Gas Decommissioning: Identifying Potential Pilot Sites in Northern California's East Bay Region

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PREFACE

The California Energy Commission's (CEC) Energy Research and Development Division manages the Gas Research and Development Program, which supports energy-related research, development, and demonstration not adequately provided by competitive and regulated markets. These natural gas research investments spur innovation in energy efficiency, renewable energy and advanced clean generation, energy-related environmental protection, energy transmission and distribution and transportation.

The Energy Research and Development Division conducts this public interest natural gas-related energy research by partnering with RD&D entities, including individuals, businesses, utilities and public and private research institutions. This program promotes greater gas reliability, lower costs and increases safety for Californians and is focused in these areas:

- Buildings End-Use Energy Efficiency
- Industrial, Agriculture and Water Efficiency
- Renewable Energy and Advanced Generation
- Natural Gas Infrastructure Safety and Integrity
- Energy-Related Environmental Research
- Natural Gas-Related Transportation

An Analytical Framework for Targeted Electrification and Strategic Gas Decommissioning: Identifying Potential Pilot Sites in Northern California's East Bay Region is the final report for the Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Natural Gas Infrastructure in Northern California project (PIR-20-009) conducted by Energy and Environmental Economics, Gridworks, and Ava Community Energy. The information from this project contributes to the Energy Research and Development Division's Gas Research and Development Program.

For more information about the Energy Research and Development Division, please visit the CEC's research website (www.energy.ca.gov/research/) or contact the Energy Research and Development Division at ERDD@energy.ca.gov.

ABSTRACT

Building electrification 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. Strategies are needed to reduce gas system spending and manage rates for gas customers who have not or cannot make the switch to electric building equipment. This project poses the question: *How can targeted building electrification paired with tactical gas decommissioning provide net gas system savings while promoting equity and meeting the needs of local communities?*

To address this question, the project team:

- Developed a site selection framework for identifying candidate sites for targeted electrification and gas decommissioning, applied this framework to Ava Community Energy's service territory, and identified candidate pilot sites.
- Performed a quantitative analysis of the benefits and costs of potential pilots.
- Conducted community outreach and education within those pilot communities.
- Produced a deployment plan outlining a framework for pilot project implementation.

The project team determined that targeted electrification and gas decommissioning can provide net benefits to the state and both gas and electric ratepayers. If projects like these are successfully implemented, which remains a big "if" given upfront cost barriers, customer preferences, and regulatory challenges, these projects would help to support a managed transition for the gas distribution system. A number of policy and regulatory changes, along with higher levels of community and customer interest and support, will be necessary for targeted electrification and gas decommissioning to achieve the scale needed to provide significant reductions in gas system costs. The California Legislature, state agencies, and utilities collectively need to take action to address key issues like the time horizon for gas system planning, the historic obligation to serve, project funding, and how best to prioritize equity during this transition.

Keywords: Building Electrification, Targeted Electrification, Natural Gas, Gas Decommissioning, Cost-Effectiveness, Community Outreach

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Executive Summary

Background

Electrification of homes and businesses is an essential component of California's mandated charter to ultimately 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 building electrification advances, gas system costs will be spread across fewer customers and lower the volume of gas sales. As a result, remaining customers could face large future increases in their gas rates. There are important social equity implications since low-income homeowners, who cannot afford electric alternatives, and renters, who cannot elect alternatives, will be most vulnerable to gas rate increases. Policymakers and regulators in California are strategically considering how to best pursue a managed transition for the gas system, which will require strategies for both reducing gas system spending and managing gas rates for remaining gas customers.

Project Purpose and Approach

This project was funded by a California Energy Commission (CEC) research grant and posed the question: *How can targeted building electrification, paired with tactical gas decommissioning, provide net gas system savings while both promoting equity and meeting the needs of local communities?* This research project addressed this issue on several fronts, though it did not include funding for implementation of gas decommissioning projects.

To answer this question, the project developed four primary tasks.

1. **Site Selection Framework:** Develop a replicable framework to identify specific locations where targeted building electrification, combined with tactical gas decommissioning, could generate gas system cost savings. Using that framework, the team identified three pilot sites within Ava Community Energy's service territory, including 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 from participants, electric ratepayers, gas ratepayers, and, broadly, all California residents.
3. **Community Outreach and Education:** Engage local communities in sharing their perspectives and priorities related to both 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.

In addition to those tasks, the project team developed educational outreach to stakeholders and policymakers to share project deliverables and motivate action regarding the projects' lessons learned and recommendations for next steps.

Key Results

Potential for Targeted Electrification and Gas Decommissioning in California

The project's benefit-cost analysis showed that targeted electrification and gas decommissioning can provide net benefits to the state and both gas and electric ratepayers. In all 11 modeled projects total benefits exceeded total costs. There remain several key uncertainties in these findings, including the scale of project administration costs and whether customers will require significant financial incentives greater than the cost of electric equipment. If such projects can be successfully and cost-effectively developed, targeted electrification and gas decommissioning would support a managed transition for the state's gas system. The project team's analysis also indicates that these projects will become more cost-effective over time. This will occur as customers adopt more electric equipment and as zero-emission appliance standards become more available to customers who replace their equipment.

The project team also found that the geographic scale for targeted electrification and gas decommissioning will be limited by gas utilities' pipeline replacement rate and by the feasibility of decommissioning sections of the gas system without negatively affecting reliability for remaining customers. Focusing on projects that could avoid capital investments, these factors may limit the scale for targeted electrification and gas decommissioning to approximately 5-10 percent of existing gas distribution main miles. Nonetheless, these projects still reflect an important opportunity to avoid a large share of the capital costs that would be incurred on the gas system over the next two decades.

Changes Needed to Support Targeted Electrification and Gas Decommissioning

The project team found that, without both policy and regulatory reforms and changes in community and customer preferences, targeted electrification and gas decommissioning are unlikely to achieve the scale required to significantly reduce gas system costs. The California Legislature, state agencies, and utilities need to take action to address these policy and regulatory issues. It is expected that some of the following issues will be considered in the California Public Utilities Commission's Long-Term Gas Planning Proceeding (R.20-01-007).

1. Gas pipeline replacement projects are currently planned on 3- or 4-year timelines in gas utilities' respective general rate cases. However, this timeline does not support the identification of sites for gas decommissioning with enough lead times to fully implement alternatives, including electrification. A longer-term planning process could be developed where gas utilities identify and plan pipeline replacement projects on longer timeframes, for example 10-15 years in advance. This would provide time to evaluate alternatives, perform robust community engagement, and allow implementation of alternatives like targeted electrification and gas

decommissioning. Consideration of non-pipeline alternatives such as gas decommissioning could be required for sites where existing gas pipelines need major repair or replacement, or for the subset of these projects that would be hydraulically feasible (able to maintain adequate system operating requirements such as pressure) for decommissioning.

2. The historic obligation to serve (Public Utilities Code Section 451) makes gas decommissioning projects very challenging to develop at any significant scale. Under the current regulatory paradigm, utilities contend that 100-percent customer opt-in is required to decommission gas infrastructure. Removal of the obligation to serve could enable gas decommissioning projects to proceed in locations where cost savings could be achieved.
3. Significant additional funding will be needed to support building electrification for targeted electrification projects and achieve the state's broader building electrification mandates. In the context of targeted electrification and gas decommissioning, it may be possible to redirect savings from avoided gas pipeline replacement costs to fund 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.
4. California lacks a strategic long-term plan for gas customers and gas utilities. Although the state has economy-wide decarbonization targets, there are no clear decarbonization plans or emission reduction mandates for the building sector or for gas utilities. Long-term planning and target-setting could provide a helpful regulatory context that supports advance planning for both specific gas capital projects and the consideration of alternatives.
5. Lastly, there is a need for better data and planning tools to support identification of candidate sites for targeted electrification and gas decommissioning. While Pacific Gas and Electric Company has a very useful tool to support this process, other utilities may not have similar tools. The project team additionally identified key issues of confidentiality concerning pipeline risk data. Finally, the site selection process requires time- and labor-intensive hydraulic engineering reviews by gas utility engineers. Overall, better data and planning tools are needed to support a robust site identification process that is also transparent to both the California Public Utilities Commission and stakeholders.

Considerations for Developing Programs and Pilots

The project team's work indicates that it may be difficult for a single program to simultaneously promote electrification in disadvantaged communities and maximize gas system cost savings. Based on community outreach, promoting electrification in disadvantaged communities will require long-term customer education and outreach, and there is no guarantee that customers will switch to electrification. Furthermore, supporting community priorities requires that some customers may prefer to keep certain gas equipment due to

comfort, familiarity, or bill impacts, and that some customers may prioritize lead, mold, or asbestos remediation before electrification. On the other hand, prioritizing gas system cost savings may require moving quickly to avoid gas pipeline replacements, regardless of customer preferences. The state may realize better outcomes by promoting distinct programs. For example, equity-focused programs could broadly provide customer education and incentives for electrification across disadvantaged communities without constraining incentives for specific neighborhoods that are candidates for gas decommissioning, while separate programs could focus on sites with the greatest potential cost savings and feasibility for rapid implementation, which could be located predominantly in rural or suburban areas.

Based on the project team's community outreach, electrification was not a high priority for many residents. Home electrification concerns included upfront costs, lack of familiarity with electric equipment, and increases in electricity costs. Significant outreach and education, along with upfront funding and potential bill guarantees, will therefore be key to the project's success. Feedback from focus groups showed that messaging focused on affordability, health, and indoor air quality may be effective.

The project team's research suggests that a phased approach may be preferable for larger targeted electrification and gas decommissioning pilots. The project team recommends focusing first on delivering near-term benefits through energy efficiency, remediation, and electrification, based on customer needs. Gas decommissioning would not occur until a later phase after customer trust is built and upgrades are made that support electrification readiness, or perhaps until reforms are made to California utilities' statutory obligation to serve.

For future programs or pilots, the project team recommends building community engagement efforts into the project timeline, scope of work, and budget, and starting engagement efforts as early as possible in that timeline. Allocating funding may not be sufficient to ensure the participation of community-based organizations since factors such as capacity, bandwidth, or the different priorities of local organizations and community members could limit local organizations' abilities to engage in projects, especially within limited timeframes.

Knowledge Transfer and Next Steps

The project team is committed to widely sharing the results from this study among interested stakeholders in California and elsewhere. Throughout the project, the project team met with numerous stakeholders and two different advisory panels to describe the project and share updates with interested parties. The team also conducted 20 informational meetings with local government representatives, community-based organizations, program administrators, and other groups interested in gas decommissioning. The team presented findings at multiple conferences, held public webinars, and delivered briefings both to interested utilities and state agencies in other states. Finally, project materials were posted on the project partners' websites through dedicated landing pages and blog posts, along with several LinkedIn posts.

The team expects this project to influence future research, policies, and pilot projects in California. It is further anticipated that this project will guide future research at the California

Energy Commission in the areas of targeted electrification and gas decommissioning.[1] This work will also likely influence the California Public Utilities Commission's Long-Term Gas Planning Proceeding (R.20-01-007), where a new phase will focus on planning for the transition of California's natural gas system. Policymakers may draw from this research as they consider questions regarding decarbonization of California's building sector and its gas utilities, as well as potential reforms to the obligation to serve. Finally, the team expects that this work will directly inform the development of pilot projects or broader programs for targeted electrification and gas decommissioning.

[1] Active and upcoming projects include:
- Mindful Decommissioning: A Data-Driven Tool for Prioritizing Strategic Gas Asset Decommissioning
- Advancing Gas Decommissioning Integrated Planning Tool
- Location-Specific Analysis of Decommissioning to Support Long-Term Gas Planning
- Scaled-Up Gas Decommissioning Pilots

CHAPTER 1: Introduction

Achieving California's ambitious environmental mandates will require the decarbonization of all sectors of the state's economy. Prior research for the California Energy Commission (CEC) indicates that building electrification is likely to be the lowest cost and lowest risk option for decarbonizing much of California's building sector (Aas et al., 2020). Although crucial for achieving California's climate goals, widespread building electrification will significantly challenge both the funding and the cost-recovery mechanisms for California's gas distribution systems.

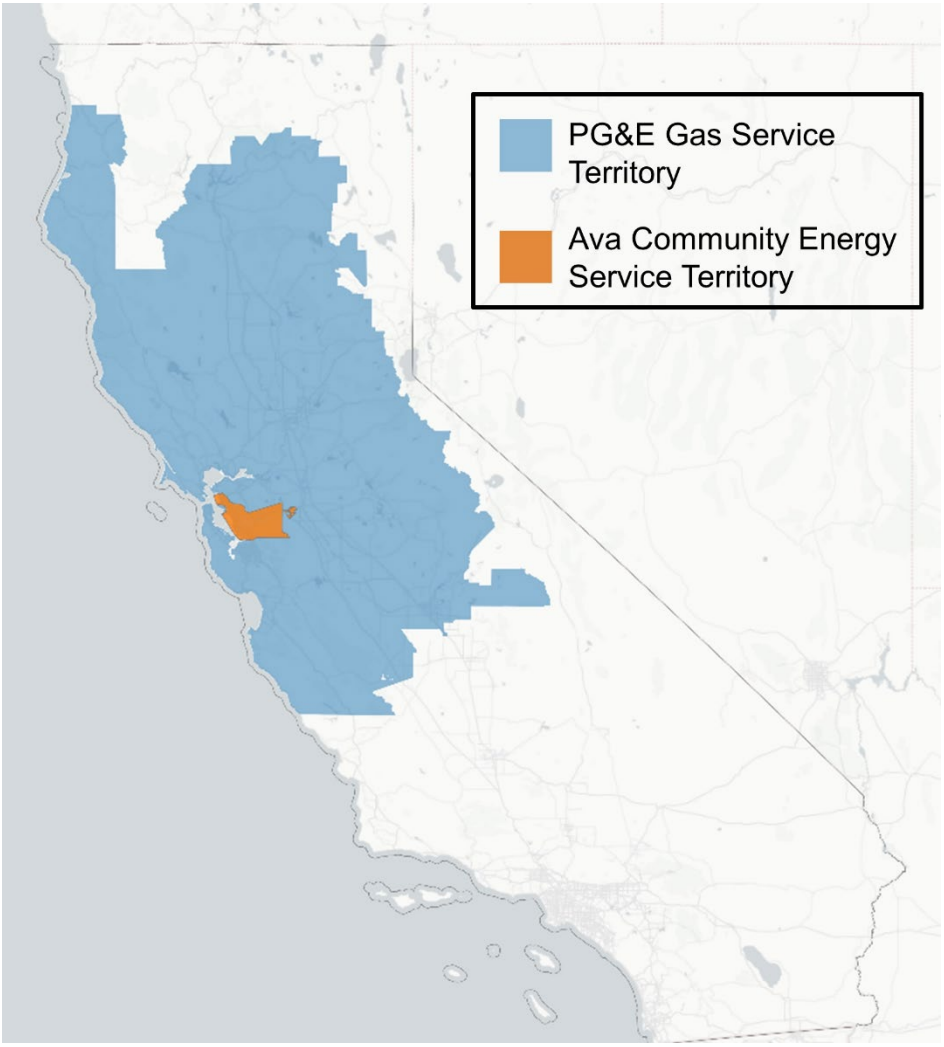
As homes and buildings leave the gas system, the fixed costs of the gas system will be spread across fewer customers and lower overall gas sales. As a result, remaining customers could face significant increases in their gas rates to make up the difference. Low-income homeowners who cannot afford electric alternatives, and renters who cannot elect these alternatives, are particularly vulnerable to gas-rate increases.

Given these challenges, a deliberate "managed transition" will be required to reduce future gas system spending and manage gas rates for customers. Multiple mitigation strategies will be required. Prior work for the CEC indicates that targeted building electrification, coupled with strategic gas system decommissioning, could be an effective approach to reduce gas system costs and mitigate cost impacts for remaining gas customers (Aas et al., 2020; Gridworks, 2019).

This project focused on the following question: *How can targeted electrification paired with tactical gas decommissioning provide net gas system savings while promoting equity and meeting the needs of local communities?*

The project addresses this question by exploring targeted electrification and tactical gas decommissioning within the intersection of Pacific Gas & Electric's (PG&E's) gas service territory and Ava Community Energy's retail electric service territory. Ava Community Energy (Ava), formerly known as East Bay Community Energy, is a community choice aggregator (CCA) based in the East Bay region of the San Francisco Bay Area. PG&E is the gas utility in Ava's service territory and provides gas service to many Ava customers. However, PG&E's full statutory gas service territory is much larger and covers most of Northern California. Figure 1 shows PG&E's gas service territory and Ava Community Energy's service territory on a map of California.

Figure 1: Map of PG&E's Gas Service Territory



Map of California with PG&E's gas service territory shown in blue and Ava Community Energy's territory shown in orange. The scope of this project falls within the overlapping service territories of Ava Community Energy and PG&E.

Source: Energy and Environmental Economics, Inc.

PG&E implements small, targeted electrification and gas decommissioning projects through the Alternative Energy Program, which applies electrification or other measures to avoid gas capital investments and operational costs. Most of these projects involve fewer than five gas customers and focus on the higher-pressure gas transmission system. While PG&E is making strides in exploring projects that reduce gas system expenditures, these efforts have been very small relative to the scale that may ultimately be required to achieve significant cost savings for customers.

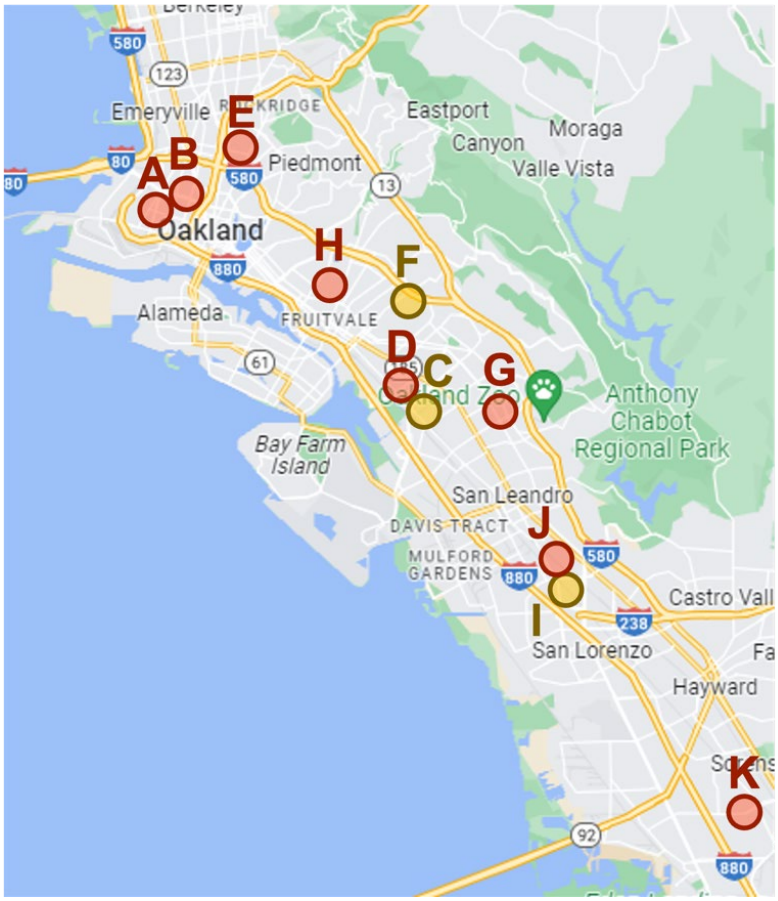
This project explores a new area of research by focusing on strategic gas decommissioning opportunities on PG&E's lower-pressure gas distribution system and exploring larger pilot projects at the scale of 50-200 customers.

The gas distribution system presents the larger opportunity to mitigate cost impacts for retail gas customers rather than the gas transmission system, which serves relatively few large volume, noncore gas customers. Because retail customers are nearly all connected to the distribution system, the potential for gas decommissioning is on the distribution system, so the cost recovery for gas distribution investments is expected to be the main driver of retail gas rates.

The proposed project scale of 50-200 customers reflects an intermediate step between the status quo of very small decommissioning projects and the future paradigm of much larger decommissioning projects, perhaps even encompassing hundreds or thousands of customers, which would require significant policy and regulatory changes. Pursuing very large and complex pilots would likely compromise the success of these projects if implemented before a policy and regulatory framework is in place.

This report describes how the project team identified 11 candidate sites through a site selection framework and ultimately proposed three sites for pilot projects. Figure 2 shows the locations of the 11 sites and highlights the final three pilot sites in yellow. Table 1 shows a number of key characteristics at each site.

Figure 2: Location of 11 Candidate Sites



The final three proposed pilot locations are identified in yellow.

Source: Energy and Environmental Economics, Inc.

Table 1: Key Site Characteristics

Site	Length of Gas Mains	Number of Customer Meters	Disadvantaged Community	Share of Multi-Family Buildings	Enrollment in CARE Bill Discount Program
	Miles	#	Y/N	%	%
A	0.2	39	Y	53%	20%
B	0.3	67	Y	69%	31%
C	0.4	69	Y	3%	63%
D	1.0	336	Y	60%	87%
E	0.3	80	N	28%	12%
F	0.6	106	N	26%	38%
G	1.2	288	N	60%	66%
H	0.5	90	N	48%	48%
I	1.1	187	Y	17%	21%
J	1.3	175	N	0%	18%
K	0.7	96	N	3%	31%

Darker shading indicates a higher number or percentage.

Source: Energy and Environmental Economics, Inc.

Project Performance Metrics

At the beginning of the project, six quantitative metrics were developed to evaluate project success. These metrics are specific to this CEC-funded research project and may not be ideal performance metrics for future pilot project implementation. This section describes how the research project performed on these six metrics.

1. *Assess the site selection framework's applicability and generality*. The project team evaluated 100 percent of Ava's electric service territory using the site selection framework.
2. *Identify potential pilot sites.* The project team identified 3 proposed pilot sites and a broader set of 11 candidate sites.
3. *Track the number of distinct customer groups reached through community outreach.* The project team reached 14 customer groups through community outreach.
4. *Identify potential solutions to community concerns in the pilot deployment plan.* The project team identified 10 potential solutions to community concerns that were raised in the community outreach process.
5. *Support outreach and education through blog posts and publicly accessible communications.* The project team produced 13 public communications including 7 blog posts, 2 public reports, 3 public webinars, and a landing page on Ava's website.
6. *Track the number of policymakers, industry leaders, and other key stakeholders that contributed to project insights.* The project team connected with at least 77 stakeholders who provided insight into the project through workshops, presentations,

and targeted interviews. These stakeholders related to the project through either their work in energy system policy or planning, or through their positions in local governments or community-based organizations (CBOs).

Report Audience

The project team anticipates that this work will advance future research, regulation, and policy making both inside and outside of California. A diverse audience will benefit from the results of this project, including:

1. Energy policy practitioners including legislators, regulators, and state agency staffs.
2. Local governments including city governments interested in targeted electrification.
3. Gas utilities in California and beyond.
4. Community choice aggregators.
5. Non-governmental organizations and advocacy groups interested in understanding the potential impacts of electrification on local communities and the customer perceptions of local community members.

CHAPTER 2:
Project Approach

This project is the collaborative effort of Environmental Economics (E3), Ava Community Energy (formerly East Bay Community Energy), and Gridworks. These three organizations made up the project team.

Pacific Gas and Electric Company (PG&E) served as a valuable project partner, providing key gas system data, engineering analysis, and staff expertise.

The project team assembled two groups of experienced subject-matter and policy experts to serve as advisors. A policy advisory committee (PAC) included representatives from the CEC and the California Public Utilities Commission (CPUC). A Technical Advisory Committee (TAC) was composed of representatives from the following organizations.

- California Environmental Justice Alliance
- City of Berkeley
- Electrify My Home, an electric appliance installer
- Environmental Defense Fund
- MCE
- Natural Resources Defense Council
- Stanford University
- The Greenlining Institute

The project team also contracted with Environmental/Justice Solutions (E/J Solutions) to support community outreach efforts. E/J Solutions is a Bay Area-based consulting firm specializing in community engagement on environmental and environmental justice issues. E/J Solutions supported the project team in hosting and facilitating focus groups of residents and business owners from the three proposed pilot sites.

The project was divided into four primary tasks.

1. **Site Selection Framework:** Develop a replicable framework to identify specific locations where targeted building electrification, combined with tactical gas decommissioning, would support gas-system cost savings. Using that framework, identify three pilot sites within Ava'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 ultimately all California residents.
3. **Community Outreach and Education:** Engage local communities in sharing their perspectives and priorities regarding both targeted building electrification and tactical gas decommissioning.

4. **Deployment Plan:** Produce a deployment plan for the pilot sites, taking into account the feedback received through community and stakeholder engagements.

In addition to these tasks, the project team provided education and outreach to stakeholders and policymakers within and outside California to explain project deliverables and motivate actions about lessons learned and recommendations for next steps.

This project did not include funding to implement gas decommissioning projects. After the completion of this research phase, the project team or other parties can apply for funding to support a separate implementation phase for one or more projects. Funding for implementation could come from a variety of sources including state programs such as the CEC's equitable building decarbonization program.[2]

This section addresses the high-level approach taken in phases 1-4. More details are both provided in other documents and in Chapter 3 (Results):

Site Selection Framework: Approach

To develop the site selection framework, the project team pursued the following.

- Worked with PG&E, the TAC, and the PAC to define key criteria for identifying potential gas decommissioning sites
- Worked with PG&E to develop data to support the site selection framework

To implement the framework, the project team:

- Leveraged PG&E's gas asset analysis tool to identify candidate sites, based on the site selection framework.
- Worked with PG&E gas engineers to confirm hydraulic feasibility for these sites.

Additional details are provided in the Results section and in the project's Interim Report,[3] published in June 2023.

Benefit-Cost Analysis: Approach

To develop the benefit-cost analysis, the project team:

- Worked with the TAC and PAC to identify a robust list of benefits and costs for targeted electrification and gas decommissioning, considering different perspectives.
- Worked with Ava Community Energy to develop data on customer gas usage, electric usage, and building characteristics.
- Worked with PG&E to develop cost estimates for electric distribution upgrades.
- Developed other key data from sources including the National Renewable Energy Laboratory (NREL) ResStock database, the CPUC's avoided cost calculator, and others

[2] https://www.energy.ca.gov/programs-and-topics/programs/equitable-building-decarbonization-program

[3] https://gridworks.org/wp-content/uploads/2023/06/Evaluation-Framework-for-Strategic-Gas-Decommissioning-in-Northern-California-Interim-Report-for-CEC-PIR-20-009.pdf

including estimates of total resource costs, avoided greenhouse gas emissions, and customer electric and gas appliance loads.

- Developed a Microsoft Excel-based model to evaluate the cost-effectiveness of targeted electrification and gas decommissioning for the 11 candidate sites.

Additional details are provided in the Results section, and in the Benefit-Cost Analysis Report (Gold-Parker, et. al., 2024), which was published in December 2023.

Community Outreach and Education: Approach

To support community outreach, the project team:

- Initially worked to bring CBOs onto the project team through both direct outreach and a public Request for Proposals (RFP).
- Pivoted to an outreach approach that leveraged existing events with the cities of Oakland and San Leandro, plus focus groups with community members from the proposed pilot sites.
- Hosted the focus groups with E/J Solutions, which supported participant recruitment, developed materials and led focus groups.

Additional details are provided in the Results section and in the Outreach Strategies Report (Mejia, 2023), which was published alongside the final project report.

Deployment Plan: Approach

To develop the deployment plan, the project team:

- Worked with the TAC to identify key underlying assumptions for the Deployment Plan regarding the obligation to serve, participant cost share, and project timelines.
- Researched program development and administration for existing energy-efficiency and electrification programs.
- Developed a phased approach where Phase 1 recognizes that 100 percent customer participation would probably not be achieved under the existing regulatory framework.

Additional details are provided in the Results section and in the Pilot Deployment Plan (Lopez, et. al., 2023), which was published alongside this final project report.

CHAPTER 3:
Results

This section includes results from the core project tasks 1-4.

1. Site Selection Framework and Identification of Proposed Pilot Locations
2. Benefit-Cost Analysis
3. Community Outreach and Education
4. Pilot Deployment Plan

Task 1: Site Selection Framework and Identification of Pilot Locations

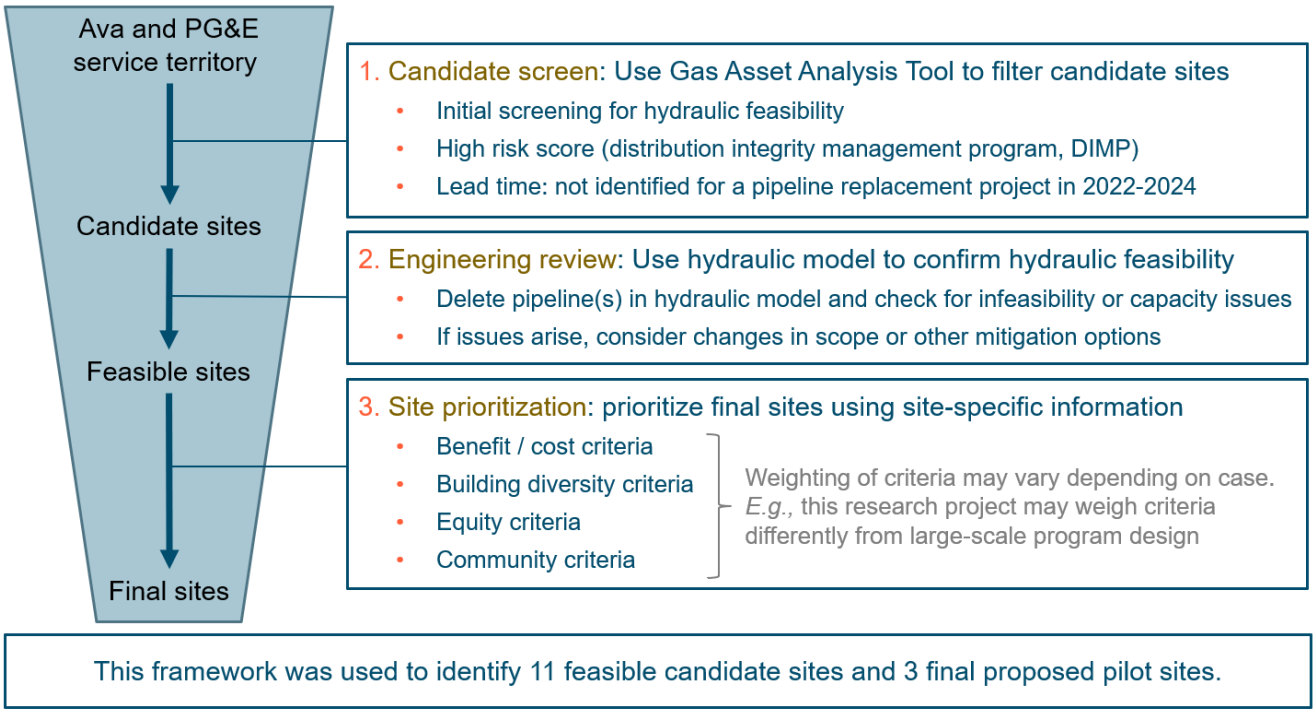
The first phase of the project entailed developing a framework for identifying and prioritizing sites for targeted electrification and tactical gas decommissioning projects, then applied this framework to identify candidate sites within the Ava Community Energy and PG&E's shared service territories. The site selection framework is described in detail in the project team's Interim Report, which was published in June 2023 (Gold-Parker et. al., 2023a).

The site selection framework consisted of three steps:

1. Preliminary candidate screen: This step involved identifying candidate sites where a utility could feasibly avoid a gas pipeline repair or replacement project through gas decommissioning. The project team utilized the geographic information system (GIS)-based gas system data provided by PG&E to conduct this preliminary analysis.
2. Engineering review: The objective of this step was to assess the technical feasibility of decommissioning gas main segments without stranding customers outside of the project's footprint or adversely affecting reliability for remaining gas customers. Collaboration with PG&E's gas engineers was crucial in this step since they used PG&E's hydraulic engineering models to confirm hydraulic feasibility.
3. Site prioritization: The final step in the proposed selection framework entailed using detailed site-specific information to prioritize sites. The weighting of different criteria varied depending on the goals of a particular project or program.

Figure 3 provides a summary of the proposed site selection framework.

Figure 3: Site Selection Framework for Identifying Sites for Targeted Building Electrification and Gas Decommissioning



Source: Energy and Environmental Economics, Inc.

Step 1: Preliminary Candidate Screen

Table 2 shows the results of applying Step 1 of the site selection framework (preliminary candidate screen). Column 1 shows that initial candidate sites were identified in eight municipalities, while other municipalities in Ava's service territory did not have any candidate sites, based on the screening for hydraulic feasibility and high-risk score. While the project team initially limited the screen to "terminal branches" of the gas distribution system, the project team also included non-residential buildings and "networked" sites with non-residential buildings, as shown in Column 2. Networked sites are locations with multiple paths to the distribution system. Column 3 shows the sites filtered to exclude pipeline replacement projects planned through 2026 in order to support adequate time to implement a targeted electrification project. Column 4 shows the building types included among the candidate sites in each municipality. Due to the small size of sites in Berkeley and Livermore (Column 5), the project team ultimately advanced the 14 sites in Oakland, San Leandro, and Hayward, shown in green.

Table 2: Results of the Preliminary Candidate Screen

City	1 Initial candidate sites *Terminal branch + high DIMP operational risk score*	2 Updated candidate sites *Also includes "networked" non-residential sites with high DIMP score*	3 Final Candidate Sites *Excludes sites where a pipeline replacement project is planned through 2026*	4 Building Types	5 Buildings per Site
Oakland	8	12	**11**	SF, MF, Non-Res	5-300
San Leandro	2	2	**2**	SF	5-200
Hayward	2	2	**1**	SF	5-100
Berkeley	2	2	1	SF, MF	≤5
Union City	2	2	-	SF, MF	10-400
Tracy	2	2	-	SF, Mobile Home	10-200
Livermore	1	1	1	SF	≤5
Fremont	1	1	-	SF, Non-res	10-20

Green sites progressed to PG&E engineering review.
No candidate sites were identified in Albany, Dublin, Newark, Piedmont, Pleasanton, or unincorporated Alameda County.

DIMP is the distribution integrity management program, SF is single-family, MF is multi-family, and Non-Res is non-residential.

Source: Energy and Environmental Economics, Inc.

Step 2: Gas Engineering Review

In the gas engineering review, PG&E's gas engineers used hydraulic modeling software to confirm hydraulic feasibility for each candidate site. The project team interviewed PG&E gas planning experts to learn how PG&E uses the Synergi Gas hydraulic modeling software in the context of gas decommissioning. Gas engineers reviewing a site for gas decommissioning performed the following steps:

1. In the model, engineers removed the pipelines under consideration for decommissioning.
2. Engineers re-ran the model.
3. Engineers checked for two concerns:
    a. Infeasibility (specifically, stranded customers outside of the decommissioning project).
    b. Capacity issues (specifically, pipelines falling below minimum pressure ratings).

If neither (a) nor (b) occurs, the project is considered hydraulically feasible. If either (a) or (b) occurs, PG&E indicated that the scope of the decommissioning project may be modified, or that mitigation strategies could be implemented such as the installation of new infrastructure to maintain system capacity.

Table 3 shows the results of PG&E's engineering review conducted for the 14 candidate sites in Oakland, San Leandro, and Hayward. Eleven out of the 14 sites were deemed viable with either no change to scope or minor changes in scope (specifically, adding or removing small amounts of gas main from the proposed decommissioning project). Three sites, all located in

Oakland, were not recommended for gas decommissioning, each for a different reason (see "Notes").

Table 3: Results of Gas Engineering Review

		# of sites	Notes
Total	All candidate sites evaluated	14	
Viable	No changes to scope	9	
	Minor changes to scope	2	Small amounts of gas main added to or removed from scope
Not recommended	Major changes to scope needed	1	Would require decommissioning significant additional pipeline segments with low replacement likelihood
	Mitigations needed	1	Would require installing new pipelines to maintain gas capacity for surrounding areas
	Other	1	This site is on a 16" distribution "rib." PG&E does not recommend decommissioning these "ribs," as this could affect reliability or limit decommissioning opportunities in the future

Source: Energy and Environmental Economics, Inc.

Step 3: Site Prioritization

For purposes of this project, the scope required that the team identify three proposed pilot sites, including one in a disadvantaged community. In the future, if targeted electrification and gas decommissioning fully evolve into a major part of the state's plan for reducing gas system costs, all feasible candidate sites may be able move forward to implementation. However, in the near term, budgets and planning capacity for gas decommissioning projects are likely to be limited, so formal processes for site prioritization will likely be needed.

The criteria used for site prioritization vary depending on the goals of a particular project or program. For example, a large-scale gas decommissioning program that captures the greatest cost savings may exclusively use cost-effectiveness criteria for prioritization. Alternatively, programs focused on electrifying customers in disadvantaged communities may instead focus on equity criteria and community criteria. Research projects that develop a range of different pilots may seek different building types such as multi-family or non-residential buildings to learn the specific challenges and solutions associated with integrating these properties into targeted electrification projects. For this project, based on feedback from the PAC and TAC, the project team chose to emphasize building-type diversity, equity in disadvantaged communities, and recommendations from city governments.

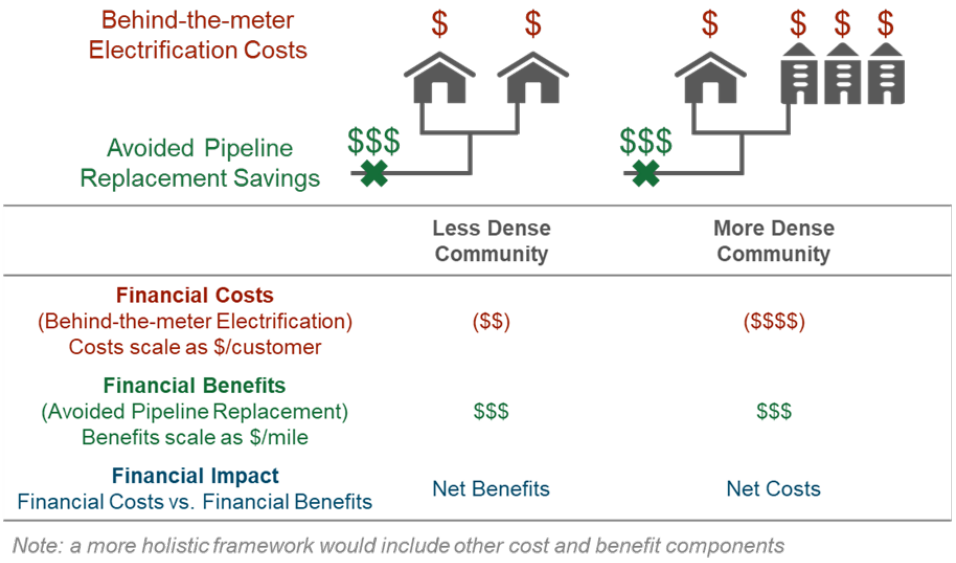
Benefit and Cost Criteria

In considering benefit and cost criteria, a key finding was that the cost-effectiveness of gas system decommissioning may be more favorable in sites with lower customer density: for example, fewer customers per mile of gas main. This is because the total number of gas customers to be electrified drives project costs, while the total number of pipeline miles to be decommissioned drives project savings.

Figure 4 explains the "density hypothesis," illustrating the primary costs and benefits of gas decommissioning for two illustrative pilot sites — one with two customers and one with four customers, but both with the same length of gas mains to be decommissioned. While both

sites have the same total financial benefit (avoided gas main replacement), the less dense site would have only half of the costs (customer electrification costs). Although this simple schematic does not include other components that would factor into a benefit cost-analysis, these were shown to have the largest benefit and cost components. While the team expects this trend to broadly apply across the service territory, there may be sites or instances where it does not.

Figure 4: Schematic Comparing Costs and Benefits in a Less Dense Community and a More Dense Community



Source: Energy and Environmental Economics, Inc.

Table 4 provides a comparison of gas customer density between the 11 candidate sites and the broader service territory. Average customer density across Ava Community Energy's service territory is 124 customers per mile of main, while PG&E's broader gas service territory is less dense, with 105 customers per mile of main. Across the 11 candidate sites identified in this project, customer density ranged from 133 to 343 gas customers per mile of gas main. While there was a wide range in density among the 11 candidate sites, all 11 sites had a higher density than the average for both Ava's and PG&E's respective service territories. This indicates that projects in less dense regions of the service territory may be more cost-effective than these candidate sites.

Table 4: Gas Customer Density for PG&E's Gas Service Territory, Ava Community Energy's Service Territory, and the 11 Candidate Pilot Sites

Region	Gas Customer Density (Gas Customers per Mile of Main)
PG&E Gas Service Territory	105 (average)
Ava Community Energy Territory	124 (average)
11 Candidate Pilot Sites	133-343

Source: Energy and Environmental Economics, Inc.

PG&E has high customer density relative to other gas distribution utilities in the United States. Data from the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) provide a different but related metric for customer density: gas services per mile of gas distribution main (DOT, 2022). Under this metric, PG&E is the fifth densest gas utility out of the roughly 200 gas distribution utilities in the PHMSA database. California's other large gas utilities are also very dense: Southern California Gas Company is the 3rd densest and San Diego Gas and Electric Company is the sixth densest of the utilities in the database.

Other factors aside from density will influence cost-effectiveness, including electrification upfront costs, gas pipeline replacement costs, among others. However, based on density alone, this finding indicates that less dense gas utilities in other parts of the United States may see improved cost effectiveness for targeted electrification and gas decommissioning relative to California's gas utilities.

Selecting the Final 3 Proposed Pilot Locations

After discussing the density findings, the TAC encouraged the project team to not pass on urban sites, especially in disadvantaged communities since customers in urban disadvantaged communities are at risk for being left behind in the future decarbonization transition. For site prioritization, the project team focused on building-type diversity, equity in disadvantaged communities, and recommendations from city government. Based on these criteria, the project team recommended the following three pilot locations. Figure 2, in Chapter 1: Introduction, shows all eleven candidate sites and identifies the three proposed pilot sites.

- **Site C:** Havenscourt/Coliseum, Oakland: Urban Single Family; disadvantaged community
- **Site F:** Allendale, Oakland: Mixed building types (single-family, multi-family, and non-residential)
- **Site I:** Halcyon/Foothill, San Leandro: Suburban Single Family; disadvantaged community

Task 2: Benefit-Cost Analysis

This section describes the results of the benefit-cost analysis. E3 published a Benefit-Cost Analysis Report in December 2023 with more information on the methodology and results (Gold-Parker, et al., 2023b).

For this analysis, E3 evaluated benefit-cost tests that consider the impacts of electrification on participating customers, gas ratepayers, electric ratepayers, and, broadly, all California residents. This cost-effectiveness evaluation was performed for the 11 candidate sites and was not limited to the final three proposed pilot locations.

This analysis was performed using data specific to the 11 candidate sites and the 1,500 customers across these sites, including:

- PG&E gas system infrastructure data.
- PG&E estimates of electric distribution upgrade needs and associated costs.

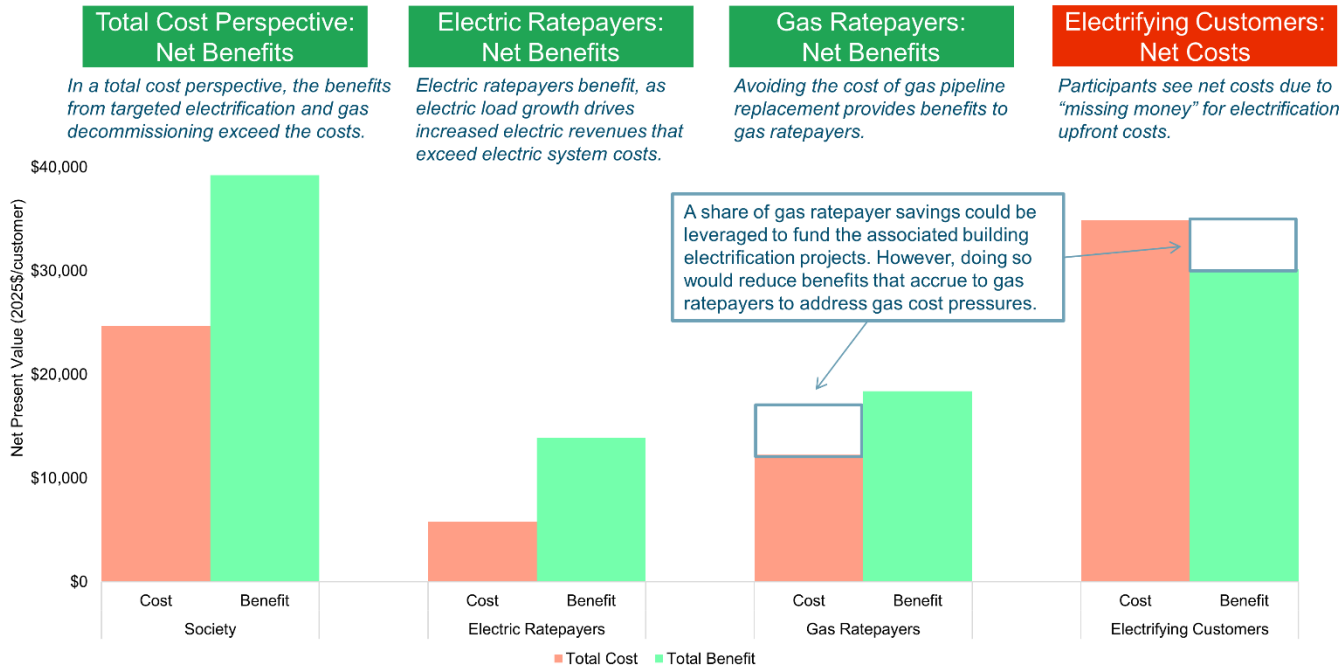
- Historical customer electric and gas electric billing data and usage data.
- Building data including building type, vintage, and square footage.
- Customer data including enrollment in the CARE bill discount program.

In addition, E3 leveraged many additional data sources including PG&E's filings in the CPUC Long-Term Gas Planning proceeding, building simulations done by the National Renewable Energy Laboratory, and others. Detailed methodology is available in the Benefit-Cost Analysis Report.[8]

Key Findings

Figure 5 shows the average cost-effectiveness across all 11 candidate sites from the perspectives of total cost, electric ratepayers, gas ratepayers, and participants. This figure shows that targeted electrification and gas decommissioning were cost-effective from the first three perspectives but were not cost-effective for participants due to the high upfront costs of electrification. A share of the savings from avoided pipeline replacement could be used to fund the associated electrification projects, but this would reduce the benefits that accrue to gas ratepayers.

Figure 5: Average Cost-Effectiveness Across 11 Candidate Sites From 4 Perspectives



Source: Energy and Environmental Economics, Inc.

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 the analysis, all 11 modeled projects saw total benefits that exceeded total costs. This study focused on the economics of these projects and did not consider challenges related to customer opt-in under the obligation to serve. The results indicate that, **if these projects were**

successfully implemented, considerable cost savings could be achieved even after paying for building electrification.

- **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 unlikely to be cost-effective from a 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.** This funding approach for building electrification could be prioritized in disadvantaged communities to support geographically-targeted equity and environmental justice outcomes. In the long term, significant additional funding from federal, state, local, or utility sources would be needed to both achieve widespread building electrification and enable those projects to return avoided gas system costs to gas ratepayers.
- **Targeted electrification projects would be more cost-effective in less dense sites, specifically sites with fewer customers per mile of gas main.** PG&E's gas service territory includes both less dense rural and suburban communities and 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.
- **In a high-electrification future scenario where customers are required to electrify space and water heating at device end-of-life, targeted electrification projects would be considerably more cost-effective, from a lifecycle cost perspective.** Existing and proposed appliance standards may require customers to electrify space and water heating once their gas equipment reaches end-of-life. Under these standards, customers would eventually need to electrify even without a targeted electrification project, and this would improve the lifecycle cost-effectiveness of targeted electrification projects. However, the upfront customer cost barrier is likely to remain challenging and customers may require additional financial support for both business-as-usual and high-electrification future scenarios.
- **High program administration costs would have a large negative impact on cost-effectiveness.** Administration costs, specifically, the non-incentive costs to run a program, may be significant for targeted electrification and gas decommissioning projects since they are complex and require substantial customer engagement. These costs may be especially high for early pilots that will require significant support for meaningful community engagement efforts.

- **Electrification rates, such as PG&E's Electric Home Rate Plan (E-ELEC) rate, already help support bill reductions for electrifying customers. However, after accounting for rate increases in 2024, more than half of customers modeled saw first-year utility bill increases of between $1 and $30 per month after full building electrification.** Pairing electrification with energy efficiency upgrades could help to mitigate these bill impacts. In addition, modeling indicates that electric ratepayer funding could support bill guarantees for customers participating in a targeted electrification project, while still maintaining net benefits for electric ratepayers. Finally, electric rate reforms that lower the volumetric component of electric rates would help support greater bill savings from these projects.

E3-PG&E study on the potential scale for targeted electrification and gas decommissioning in PG&E's service territory

Background and Goals

In a separate simultaneous project, E3 and PG&E performed a high-level analysis of targeted electrification and gas decommissioning across PG&E's 70,000 square-mile service territory. The goals for this project were:

1. To develop a simple model to explore the feasibility and cost-effectiveness of targeted electrification in PG&E's service territory, given modeled constraints on hydraulic feasibility and the amount of pipeline that PG&E would target for replacement.
2. To evaluate how the cost-effectiveness of targeted electrification may change over time as customers adopt electric equipment due to economics, appliance standards, or other policies.
3. To explore the potential scale for targeted electrification across PG&E's service territory over the period from 2025-2045.

The study did not evaluate PG&E's ability to implement these projects. Issues such as financing, customer acceptance, and obligation to serve could hinder execution and require policy and regulatory reform prior to implementation.

Methodology

To support an evaluation of PG&E's 70,000 square-mile service territory, the E3-PG&E study evaluated targeted electrification at the census tract level, leveraging gas system data that PG&E shared publicly in the long-term gas planning proceeding. The study considered a simplified cost-effectiveness screen, comparing the savings from avoided pipeline replacement (benefit) to the upfront costs of electrifying customers, including the cost of panel and service upgrades (cost). Table 5 compares the methodology of the CEC research project with the E3-PG&E study.

Table 5: Methodology Comparison Between the CEC Research Project and the E3-PG&E Study

	CEC: Targeted Electrification and Gas Decommissioning	E3-PG&E: Service Territory Targeted Electrification Study
Level of Analysis	11 candidate pilot sites (~150 customers each)	3,400 census tracts (~1,350 customers each)
Key Data Inputs	• Gas system: site-specific data from GIS-based Gas Asset Analysis Tool • Customer data: detailed usage and billing data from Ava Community Energy and PG&E	• Gas system: public data from the long-term gas planning proceeding • Customer data: primarily public data from CEC and NREL sources, supplemented with customer data
Cost-effectiveness Perspective(s)	• Participant, Gas Ratepayer, Electric Ratepayer, Total Resource Cost, and Societal	• Simple cost-effectiveness screen: o Benefit: avoided gas pipeline replacement o Cost: upfront capex + panel and service upgrades
Pipeline Replace-ment; Hydraulic Feasibility	Site-specific data, gas hydraulic engineering models	High-level estimates using best available data and assumptions

Source: Energy and Environmental Economics, Inc.

Key Findings

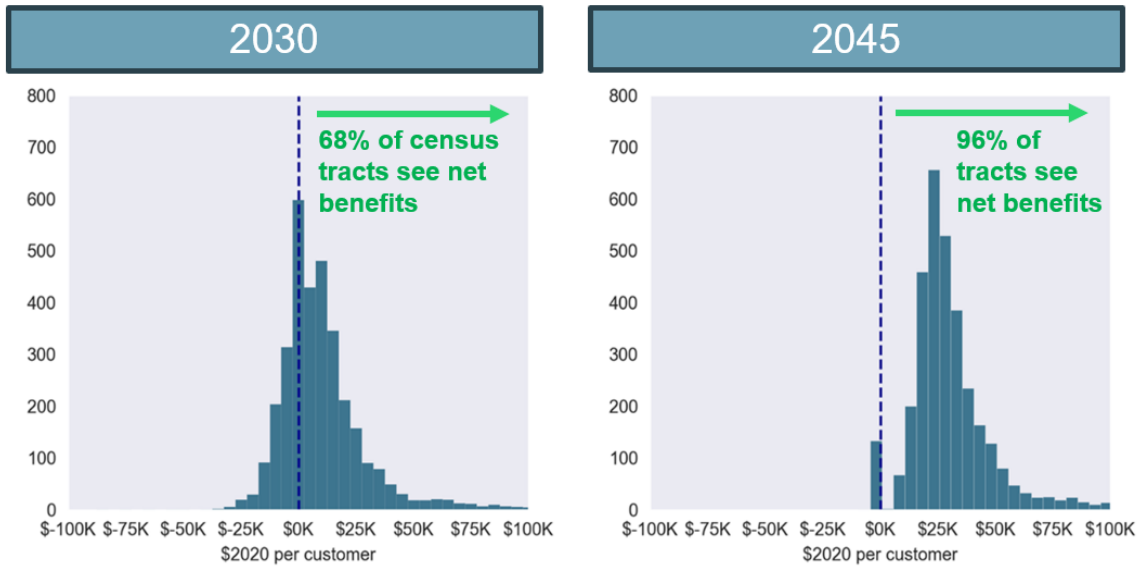
The project team identified the following key findings from the E3-PG&E study.

1. Using the simple cost-effectiveness screen, by 2030 the savings from avoided gas pipeline replacement would exceed the costs of electrifying customers in the majority of census tracts. The study did not evaluate PG&E's ability to implement these projects. Issues such as financing, customer acceptance, and the obligation to serve could hinder execution or require policy and regulatory reform to enable implementation.
2. This study supports the density hypothesis from the CEC research project. Looking across the 3,400 census tracts in PG&E's service territory, there is a strong negative correlation between cost-effectiveness and density; specifically, census tracts with lower density (fewer customers per mile of gas main) see greater cost-effectiveness. This finding holds even when accounting for the variation in $/mile pipeline replacement costs by PG&E's distribution planning division, which reflects higher $/mile costs in urban regions and lower $/mile costs in rural regions.
3. Modeling indicates that the cost-effectiveness of targeted electrification will improve over time as some customers adopt electric equipment due to economics, appliance

standards, or other factors. As building electrification progresses throughout the service territory, it will become less costly to implement targeted electrification projects since there will be fewer remaining gas customers and devices to electrify. Figure 6 illustrates how the cost-effectiveness was modeled from 2030 to 2045.

4. Regarding the potential scale of targeted electrification and gas decommissioning, the project team looked narrowly at projects that could avoid gas pipeline replacement projects. Although gas decommissioning may also be pursued in areas where there is not a need to replace the pipeline, those circumstances would require both additional investigation and additional funding to execute. In the narrow focus on projects that could avoid gas capital projects, the project team found that two factors are likely to determine the potential scale for targeted electrification: the pipeline replacement schedule, as funded in PG&E's general rate case; and hydraulic feasibility. Cost-effectiveness is not as significant a factor for targeted electrification that avoids a gas replacement project. Figure 7 illustrates how these factors may impact the potential scale for targeted electrification and gas decommissioning.

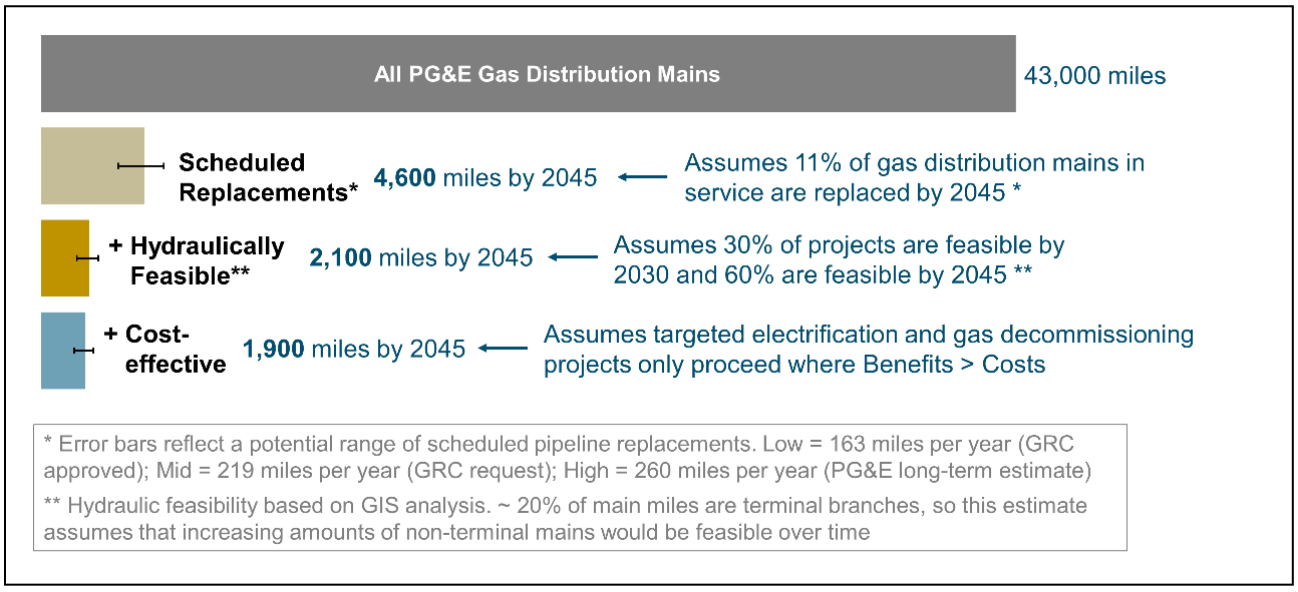
Figure 6: Histogram of Net Benefits (or Net Costs) of Targeted Electrification Across all Census Tracts in PG&E's Gas Service Territory



Net costs and benefits were evaluated using a simple cost-effectiveness screen.

Source: Energy and Environmental Economics, Inc.

Figure 7: Factors that Could Impact the Potential Scale for Targeted Electrification and Gas Decommissioning on PG&E's Gas Distribution System, Relative to the 43,000 Miles of Gas Distribution Main



Source: Energy and Environmental Economics, Inc.

Task 3: Community Outreach and Education

Initial Approach

During the preliminary stages of this project, Ava Community Energy developed a community outreach plan that reflected a local approach to community engagement, to be led by local CBOs. This strategy was based on best practices Ava developed through its work with community groups on several program offerings and was derived from feedback from the project's TAC members, environmental justice organizations, and local governments. The plan was based on the premise that local organizations would best understand the unique needs of local communities and the circumstances and conditions for specific pilot sites.

The project team set aside financial resources for contracting with up to three CBO partners or community champions, seeking to ensure that local organizations were compensated for their efforts. Ava also conducted compensated interviews with two CBOs and several TAC members to gather feedback on the team's initial community outreach strategy. Considering feedback from these interviews, the project team developed and released a public RFP to formally engage CBOs and individual community organizers in supporting the project.

The project team designed an RFP that required relatively little effort to respond to and offered interested parties a high degree of flexibility in their proposals. CBOs and local organizers could apply to support between one and three pilot locations, with financial support of up to $40,000 per location. The scope of work in the RFP included tasks with 190 hours of projected work per pilot site from January to June 2023. The primary role for CBOs or local organizers would be to develop a site-specific community outreach strategy for the community served, implement that strategy, and summarize the outreach results. The RFP additionally

offered the ability to propose modifications to the scope as needed to align with either a CBO or with individual needs and capabilities.

The RFP was open for approximately one month through E3's website. Ava promoted this solicitation by directly communicating with CBOs through meetings and email lists and reached over 100 organizations. Additional follow-up emails highlighting the RFP and an informational webinar were shared with a smaller group of CBOs identified as potential partners. Ultimately, no organizations attended the informational webinar and the solicitation received zero responses.

Revised Approach

Following the solicitation, the project team decided to pursue an alternative community outreach approach to reach residents, drawing on lessons learned through developing the initial engagement plan and the RFP. The team's revised community outreach plan followed a two-pronged approach that focused on existing partnerships, events, and opportunities in the cities of Oakland and San Leandro to raise awareness of these topics; and gathered community feedback through focus groups for residents who live in the pilot locations. The team worked with city government staff and E/J Solutions, an environmental justice consultant based in the region, to gather feedback from community members. This new approach began with a series of public community events, then transitioned to focus groups to hold deeper discussions with constituents living in the three selected pilot locations.

Community Events

The first portion of the revised engagement plan entailed partnering with city governments to host community events that provided public education on building electrification. The primary intention of participating in these community events was to provide educational materials on building electrification, gas decommissioning, and related topics while answering questions from the communities. It was also an opportunity for the project team to more fully understand attendees' interests in implementing building electrification in both their communities and in their homes.

The project team identified the City of Oakland as a partner in the project's outreach since the city was concurrently working on its Building Electrification Roadmap. The project team, represented by Ava Community Energy, participated in six community events in Oakland. Ava staff were on hand to provide information about building electrification, programs available to customers, and information on how this research project creates a pathway for gas decommissioning. The project team also developed educational flyers with general information about all-electric buildings in three different languages, to distribute at the events. These flyers linked to an Ava webpage with general information about all-electric buildings, information on upcoming events, frequently asked questions, and a place to submit feedback on the project. The City of Oakland also provided live induction cooking demonstrations, with a cooktop borrowed from Ava's lending program.

In addition, the City of Oakland and the project team co-developed a post-event survey to gather feedback from attendees. The project team gave a $15 gift card to each attendee who completed the survey to compensate them for providing their feedback.

The project team met with the City of San Leandro's sustainability staff to explore how to best support education for community members in San Leandro. Staff provided context since not many community members were familiar with building decarbonization and suggested that the project team engage in existing community events such as festivals and farmers markets. Given the timeline for this CEC project and the events hosted by the city during that time, Ava Community Energy was only able to attend one event in the City of San Leandro. Ava staffed a community event where they shared information on Ava's various programs including this project, answered questions, and gauged the level of interest from community members on related energy topics.

Focus Groups

The project team partnered with E/J Solutions, a Bay Area-based consulting group that supports development and implementation of environmentally just, sustainable, and socially equitable policies. E/J Solutions supported the project team in focus group participant recruitment and outreach and facilitated focus groups consisting of residents and business owners from the three selected pilot sites in May 2023. Direct in-language outreach in the immediate area of each site was performed both digitally (email) and physically (paper flyers in neighborhood) to ensure that focus group recruitment included community members living within the pilot sites.

The project team provided the following services and incentives in the flyers and emails to encourage participation.

- $15 gift card stipend for participation
- Translated materials and live interpretation services in several languages
- Food and beverages from local vendors
- Events were held outside of working hours (9am-5pm), with one event hosted on a weekend
- Childcare services
- COVID-19 testing before entering

While the team hosted 30 total RSVPs for each focus group, there was a significant drop in participants who attended on the day of the events. The following number of individuals participated in the focus groups:

- Site C: Havenscourt/Coliseum, Oakland: 17
- Site F: Allendale, Oakland: 13
- Site I: Halcyon/Foothill, San Leandro: 14

The 90-minute focus groups centered around conversations about all-electric buildings and integrated many discussion questions and educational materials. The focus groups explored participants' perceptions about the challenges and opportunities of building electrification in the pilot locations. These conversations presented the opportunity for community members

directly impacted by these projects to hear one another's opinions, concerns, and needs while considering what all-electric homes and businesses could mean to them. Providing a facilitated discussion at well-known community resource centers provided a place for residents to raise their concerns, ask questions, and receive information.

Key Findings

Key findings from the team's community outreach were summarized. These included results from conversations with community members and organizations, the project team's involvement in the City of Oakland's building electrification outreach and surveys, and from focus groups hosted in partnership with Environmental Justice Solutions (E/J Solutions).

1. Data gathered through a survey conducted by the City of Oakland, which received 4,500 responses, indicated that most customers surveyed prioritized mold, lead, and asbestos remediation before weatherization, energy-efficiency improvements, and electrification. The survey included roughly 25 percent renters and 75 percent homeowners.
    a. This survey also identified the top three deterrents or concerns regarding home electrification: the upfront cost of the project (including permitting, appliances, and installation); lack of familiarity with electric equipment; and increases in electricity costs.
    b. A separate survey developed by the City of Oakland and the project team for Home Energy Resource Fair attendees listed the top concerns from attendees about electrification as the cost of the project, high electricity rates, and not having the authority to retrofit.
2. The team found that printed materials, in addition to digital, were helpful for distributing information to friends and neighbors, and especially helpful if available in multiple languages. Many of the venues offered space to leave flyers and informational brochures for community members, which helped spread information throughout the community.
3. Despite hosting six Home Energy Resource Fairs at various community centers, with support from various service providers including representatives from PG&E, Bay Area Regional Energy Network (BayREN), Grid Alternatives, and others, the events had fairly low attendance. A total of 63 exit surveys was collected across all events, which accounted for most attendees. Low attendance could be attributed to the nature of the topic or may signify the need for a different outreach approach.
4. At the San Leandro's Cherry Festival, the Ava Community Energy programs and topics that generated the most interest included (in order of most frequent interest, to least):
    - Price/cost (how to lower their bills)
    - Solar programs
    - Efficient washers and dryers
    - Efficient refrigerators

- Incentives for and logistics around operating electric vehicles
- Heat pump water heaters

5. Focus group participants expressed the need for additional education efforts and resources about building electrification before they can feel comfortable and safe with the transition to all-electric homes. Participants were supportive of the idea of developing an all-electric demonstration home in their neighborhood to show the viability of electrification.
6. Only a minority of focus group participants found climate change to be a compelling reason for electrifying their homes and businesses. While many residents want to make changes and do the right thing for the planet, they also felt that the climate crisis is driven primarily by large corporate polluters rather than at individual levels. Based on feedback from participants in the focus groups, the messaging that was most persuasive to make the switch to all-electric focused on affordability and cost-free upgrades for participants, and about improved health and indoor air quality (especially in families with young children).

Task 4: Deployment Plan

The project team proposes one overall deployment plan framework. The team made the decision to provide a single framework instead of three separate plans for each pilot site. The nascency of gas decommissioning initiatives, unique barriers across different communities, and the lack of data for these sites underscored the need for a high-level, adaptable framework. The deployment plan, as written, was designed to be iterative so the approach could be updated based on findings from initial implementation. Because each utility territory throughout the state has its own unique challenges and considerations, the deployment plan is meant to provide high-level project guidance without being overly prescriptive.

The framework for the deployment plan was created from feedback received from various stakeholders including CBOs, program administrators, contractors, city representatives, customers, and members of the project's TAC.

Underlying Assumptions Guiding the Deployment Plan

This document uses a few key assumptions to ensure pilot objectives are aligned with the intended outcomes of tactical gas decommissioning. The assumptions are as follows:

1. **Obligation to Serve:** Based on the California Public Utilities Code, 100 percent of customers within a pilot site need to agree to no longer receive gas service from an independently owned utility (IOU). If all but one customer agrees to electrify, decommissioning of the targeted gas system will not be possible. This pilot therefore strove for 100-percent customer opt-in. If the policy is modified during implementation, the pilot should still strive for the highest level of opt-in.
2. **Cost-Free Building Transformation Pilots:** The plan assumes that customers do not bear any of the costs associated with building electrification including basic

remediation and energy efficiency upgrades, panel upgrades, installation costs, and equipment costs. Eliminating participant costs serves two purposes:

a. **Encourages Opt-in:** A no-cost program will encourage maximum participation.

b. **Equity:** Some customers would not be able to participate if all costs are not covered.

The plan also acknowledges that, even with all costs covered, the pilot will still encounter numerous challenges associated with electrifying entire communities of customers.

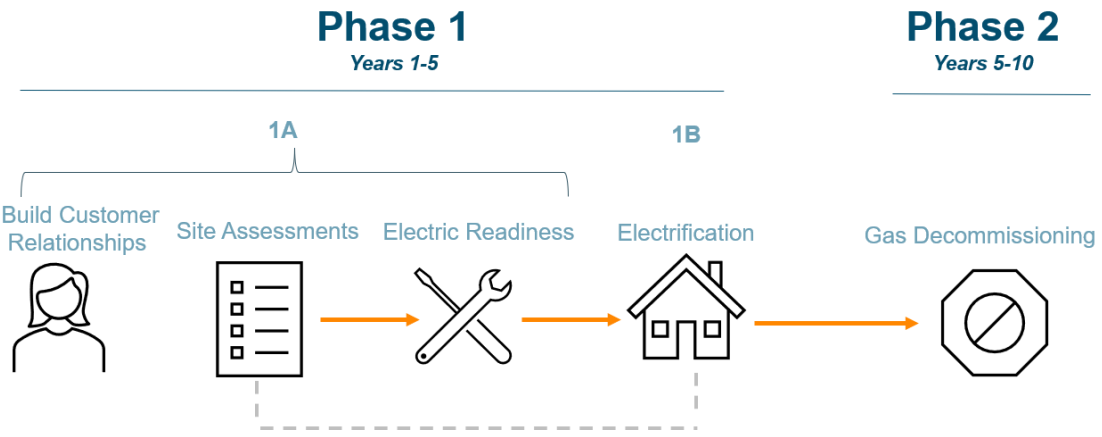
3. **Timeline for Implementation**: The plan assumes the estimated timeline for gas pipeline replacement to be approximately 10 years. The pilot sites therefore have 10 years to achieve complete electrification and gain consensus to discontinue gas service to avoid investment in gas system repairs. Note that the actual timeline for gas pipeline replacement is not known, as there are not projects planned at these sites within a 3- to 4-year planning cycle.

These assumptions guided the proposed phased approach to gas decommissioning pilot project implementation. The phased approach focuses on first addressing the needs of customers, then provides tangible benefits and overall satisfaction with the program before moving towards more comprehensive electrification projects and eventual gas decommissioning.

Phased Approach

The deployment plan seeks to fully electrify and decommission gas service within 10 years, with the more immediate goal to gain lessons learned and insights by fully electrifying as many buildings as possible within the first few years. Figure 8 illustrates a potential phased approach for pilot implementation.

Figure 8: Proposed Phased Approach for the Deployment Plan



Source: Ava Community Energy and Gridworks

Phase IA: Electric Readiness

The initial focus for pilot implementation was to build relationships and trust with customers by understanding their current home or building needs and providing energy-efficiency upgrades that improve comfort, bill savings, health, and safety. Customer needs and individual building needs will be captured through site energy assessments, identifying opportunities for energy improvements that will provide customers with direct benefits, and opportunities to upgrade infrastructure necessary for electrification. Site assessments will result in building treatment plans tailored to each customer and will serve as a comprehensive guide for the eventual full transition to electrification.

Phase IB: Electrification Projects

Once the immediate needs of customers are addressed, the program will proceed with implementing electrification measures as outlined in the building treatment plan. All recommendations for eligible electrification projects will be presented to the customer, and customers will have the flexibility to choose which measures they want to pursue, at which time.

Phase II: Full Electrification and Gas Decommissioning

The focus of Phase II is on encouraging remaining customers to fully electrify and formally take steps to discontinue their gas service. Phase II will involve additional education, outreach, and potentially incentives to motivate customers to decommission voluntarily. The program administrator will work with the gas utility to obtain formal agreements required to decommission gas, and the gas utility will be responsible for capping lines once 100 percent of customers in the pilot site have agreed to terminate their gas service.

Program Costs

Implementing the phased approach will be time-consuming and potentially expensive. The total budget for each pilot will vary based on the number of customers and building types. In addition, there are key uncertainties in project costs:

1. **Customer Electrification Costs:** Prior to doing site assessments in Phase 1A, it is uncertain which upgrades will be needed by which customers. For example, some customers may already have some electric equipment. In addition, the actual cost of needed upgrades will be evaluated on a customer-specific basis as part of the site assessments.
2. **Panel and Service Upgrade Needs and Costs:** The electric panel is the customer's breaker box, and the electric service is the electrical line connecting a customer premise to the electric grid. The need for panel and service upgrades will not be known prior to the site assessments.
3. **Energy Efficiency and Remediation Needs:** Similarly, the measures and costs of remediation will be determined through the site assessments.

4. **Administration Costs:** Targeted electrification and gas decommissioning programs have not been previously implemented. The project team can estimate administration costs using data from other programs, but detailed costs will not be known until pilot projects are actually undertaken.

To support the development of project budgets, Table 6 provides an estimate of upper-end project costs on a per-building basis, including the net electrification costs of existing incentives (net capex), panel upgrade costs, service upgrade costs, energy-efficiency and remediation costs, and administration costs.

Table 6: Conservative (Upper-End) Estimated Project Cost by Customer Type ($2025/Customer)

Cost Type	Single-family	Multi-family	Commercial
Electrification Net Capex	$15.1 k	$9.5 k	$133.9 k
Panel Upgrade Costs	$4.3 k	$2.7 k	$0.0 k
Service Upgrade Costs	$10.0 k	$1.7 k	$0.0 k
EE & Remediation	$5.0 k	$5.0 k	$10.0 k
Administration Costs	$19.6 k	$9.2 k	$89.3 k
Total costs per customer	$54.0 k	$28.0 k	$233.2 k

Source: Energy and Environmental Economics, Inc. and Ava Community Energy

The following are descriptions of each cost component.

- **Electrification Net Capex** represents upfront costs of electrification minus available incentives. The upfront electrification costs include equipment costs and labor costs to electrify gas space heating, water heating, cooking, and clothes drying. Incentives modeled include incentives from the federal government (Inflation Reduction Act), the state of California (TECH Clean California), BayREN, and Ava.
- **Panel Upgrade Costs:** Customers on a 100-amp panel may need to upgrade their electric panels and service. Panel upgrade costs used in this analysis were sourced from TRC's 2016 Palo Alto Electrification Report, which reports panel upgrade costs of $4,256 for single-family and $2,744 for multi-family customers (TRC, 2016). Note that this table reflects the costs if each customer required a panel upgrade, a highly conservative assumption.
- **Service Upgrade Costs:** PG&E estimated that electric service upgrade costs would range from $10,000 to $60,000 per building. The low end of this range would apply when overhead electric services are short and with minimal connections. This table reflects $10,000 per single-family home, with lower costs for multi-family since several meters may share the same service line. Again, this table reflects the cost if each customer needs a service upgrade, which is highly conservative.
- **Energy Efficiency and Remediation Costs:** Providing energy efficiency and remediation improvements are a key part of Phase 1A. This estimate for all non-panel

or service-related electrification readiness work is based on costs from similar direct-install pilots (Rasmussen et al., 2022).

- **Administration Costs:** Program administration costs entail costs to manage program funding, interface with customers, support community engagement, manage relationships with contractors, and support other project needs. Administration costs are expected to be 40 percent of infrastructure, measure, and installation costs. The 60:40 ratio of direct project costs to administration costs is based on the CPUC's Energy Efficiency Program Manual (CPUC, 2020) and is used here as a rule of thumb.

While these costs are affected by the benefit-cost analysis, this table reflects conservative or upper-end costs, while the benefit-cost analysis aimed to develop average or expected costs. The following estimates are provided on a per-building basis, but the program budget can be designed to be both adaptable and fluid; if a particular customer requires additional resources, the budget can be shifted accordingly. For the specific 11 sites chosen in this project, which included both residential and non-residential buildings, the total electrification costs ranged from $20,000 to $40,000 per customer.

CHAPTER 4: Conclusion

This section summarizes the potential for targeted electrification and gas decommissioning in California, describes key changes needed to enable targeted electrification projects to achieve meaningful scale, and suggests considerations for developing pilots and programs.

Potential for Targeted Electrification and Gas Decommissioning in California

- **Targeted electrification and gas decommissioning can provide net benefits to the state, gas ratepayers, and electric ratepayers.** In the team's benefit-cost analysis, all 11 modeled projects saw total benefits that exceeded total costs. There remain several key uncertainties in these findings, including the scale of project administration costs and whether customers will require financial incentives that exceed the cost of electric equipment. If such projects can be successfully and cost-effectively implemented, targeted electrification and gas decommissioning can help support a managed transition from the gas system.
- **These projects will become more cost-effective over time.** As more customers adopt electric equipment over time, targeted electrification projects will become cheaper to implement since there will be fewer remaining gas customers and devices to electrify as part of any project. In addition, zero-emission appliance standards, such as those under consideration by the California Air Resources Board, would improve the cost-effectiveness of targeted electrification and gas decommissioning by requiring the electrification of space and water heating regardless of whether a gas decommissioning project is considered.
- **The geographic scale for targeted electrification and gas decommissioning will be limited by the pipeline replacement rate and hydraulic feasibility.** Focusing on projects that could avoid capital investments, these factors may limit the scale for targeted electrification and gas decommissioning to approximately 5-10 percent of gas distribution main miles. Nonetheless, these projects still reflect an important opportunity to avoid a large share of the capital costs that would have been incurred on the gas system over the next two decades.

Changes Needed to Support Targeted Electrification and Gas Decommissioning

- **The current planning process does not support the identification of sites for gas decommissioning with enough lead time to implement electrification or other alternatives.** Gas pipeline replacement projects are currently planned on the 3- or 4-year timelines of a gas IOU's general rate cases. A longer-term planning process could be developed where gas utilities identify and plan pipeline replacement projects

on longer timeframes, such as 10-15 years. This would provide the time to evaluate alternatives, perform robust community engagement, and allow implementation of alternatives like targeted electrification and gas decommissioning. In addition, the consideration of non-pipeline alternatives such as gas decommissioning could be required for sites where existing gas pipelines need replacement or other major repair, or for the subset of these projects that would be hydraulically feasible for decommissioning. This alternatives analysis would need to be performed several years in advance to provide the time needed to implement alternatives like targeted electrification.

- **The obligation to serve will make gas decommissioning projects very challenging to implement at any significant scale.** Under current state regulations, utilities require 100 percent customer opt-in to decommission gas infrastructure. This requirement means that for large sites with many customers it may prove difficult or impossible to implement gas decommissioning, and even small sites may require substantial financial incentives to achieve 100 percent opt-in. For targeted electrification and gas decommissioning projects to provide meaningful support for a managed gas system transition, state legislators will need to change the obligation to serve. Any change should ensure that customers would have the time, resources, knowledge, and funding needed to transition to non-gas energy sources.
- **There is a large funding gap for building electrification.** Significant additional funding will be needed to support building electrification, both for targeted electrification projects and to achieve the state's broader building electrification goals. In the context of targeted electrification and gas decommissioning, it may be possible 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. This funding approach for building electrification could be prioritized in disadvantaged communities to support geographically targeted equity and environmental justice outcomes. In the long term, significant additional funding from federal, state, local, 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.
- **The state lacks a strategic long-term plan for gas customers and gas utilities.** Although the state has economy-wide decarbonization targets, there are no clear decarbonization plans or emissions reduction targets for the building sector or for gas utilities. Long-term planning and target-setting could provide helpful regulatory context to support advanced planning for specific capital projects. The CPUC's Long-Term Gas Planning proceeding may direct gas and dual-fuel utilities to develop gas transition scenarios in the upcoming Phase 3 (CPUC, 2024).

- **There is a need for better data and planning tools to support the identification of candidate sites for targeted electrification and gas decommissioning.** PG&E's GIS-based Gas Asset Analysis tool was instrumental in developing and implementing the project team's site-selection framework. However, many utilities may not have a similar tool available. In addition, future data improvements to PG&E's tool and to other tools could include a representation of electric distribution headroom and upgrade costs, longer-term forecasts of gas pipeline replacement projects, and more granular estimates of gas pipeline replacement costs. The team also identified key issues with data confidentiality, specifically regarding pipeline risk data. Utilities, regulators, and other stakeholders will need to balance the need to make pipeline replacement schedules available to support site identification against sensitivities regarding the publication of pipeline risk data. Finally, the current site selection process requires hydraulic engineering review by gas utility engineers, which is time- and labor-intensive. Overall, better data and planning tools will be needed to support a robust site identification process that is transparent to the CPUC and other stakeholders.

Considerations for Developing Programs and Pilots

- **It may be difficult for a single program to simultaneously promote electrification in disadvantaged communities and maximize gas system cost savings.** These two objectives will support equity in different ways. Based on the team's community outreach, promoting electrification in disadvantaged communities will require long-term customer education and outreach, and there is no guarantee that customers will opt for electrification. Furthermore, supporting community priorities requires recognizing that some customers may prefer to keep certain gas equipment due to comfort, familiarity, or bill impacts, and that some customers may prioritize lead, mold, or asbestos remediation before electrification. On the other hand, prioritizing gas system cost savings may require moving quickly to avoid gas pipeline replacements, as well as working to achieve 100 percent electrification (or at least 100 percent removal of gas) regardless of customer preferences. The state may realize better outcomes by promoting distinct programs for these two objectives. For example, equity-focused programs could provide customer education and incentives for electrification broadly across disadvantaged communities without constraining incentives to specific neighborhoods that are candidates for gas decommissioning, while separate programs could pursue targeted electrification and gas decommissioning by focusing on sites with the greatest potential cost savings and feasibility for rapid implementation.
- **Based on the team's community outreach, building electrification may not be a high priority for residents.** In addition, residents have concerns regarding home electrification including upfront costs, lack of familiarity with electric equipment, and increases in electricity costs. Significant outreach and education, along with upfront funding and potentially bill guarantees, will be key to project success. Feedback from focus groups indicates that messaging focused on affordability, health, and indoor air quality may be most effective.

- **A phased approach to larger pilots could recognize that some electrification could be achieved in the near term, with gas decommissioning unlikely until a later phase after the obligation to serve has been reformed.** Very small gas decommissioning projects undertaken today (2-5 customers) generally begin by seeking approval from customers to remove their gas service. The project team recommends a different approach for the larger projects under consideration here (70+ customers). This approach focuses first on delivering near-term benefits through energy efficiency, remediation, and electrification, based on customer needs. This supports building trust with customers and overcoming apprehension around fuel switching and would allow for the collection of data and other information needed to craft later phases of work. Gas decommissioning would not occur until a later phase, potentially after changes are potentially made to the obligation to serve.
- **Significant effort, lead time, and budget will be needed for community out-reach and education.** For future programs or pilots, the project team recommends building community engagement efforts into the project timeline, scope of work, and budget, and starting engagement efforts as early as possible in the project's timeline. Allocating funding alone may not prove sufficient to ensure the participation of CBOs, as factors such as capacity, bandwidth, or different priorities of local organizations and community members may limit local organizations' abilities to engage in a project, especially within a limited timeframe.

GLOSSARY AND LIST OF ACRONYMS

Term	Definition
Ava	Ava Community Energy
BayREN	Bay Area Regional Energy Network
CARE	California Alternate Rates for Energy (Bill Discount Program)
CBO	community based organization
CCA	community choice aggregator
CEC	California Energy Commission
CPUC	California Public Utilities Commission
DIMP	Distribution Integrity Management Program, an operational risk assessment for gas pipeline safety and integrity
Synergy Gas Model	Gas system hydraulic modeling software used by PG&E
E3	Energy and Environmental Economics
EE	energy efficiency
E-ELEC	PG&E's Electric Home Rate Plan
E/J Solutions	Environmental / Justice Solutions
Gas Decommissioning	The deliberate removal or abandonment of natural gas pipelines
GIS	Geographic Information System
IOU	independently owned utility
NREL	National Renewable Energy Laboratory
PAC	policy advisory committee
PG&E	Pacific Gas and Electric Company
PHMSA	U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration
RFP	Request for Proposals
TAC	Technical Advisory Committee

References

Aas, Dan, Amber Mahone, Zack Subin, Michael Mac Kinnon, Blake Lane, and Snuller Price. 2020. *The Challenge of Retail Gas in California's Low-Carbon Future: Technology Options, Customer Costs and Public Health Benefits of Reducing Natural Gas Use*. California Energy Commission. Publication Number: CEC-500-2019-055-F. Available at https://www.energy.ca.gov/sites/default/files/2021-06/CEC-500-2019-055-F.pdf

CPUC (California Public Utilities Commission). 2024. "Assigned commissioner's ruling scheduling phase 3 prehearing conference and providing joint agency staff gas transition white paper and draft phase 3 scope and schedule for party comment." Rulemaking 20-01-007. https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M526/K067/526067752.PDF

CPUC. 2020. *Energy Efficiency Policy Manual*, Version 6. Available at https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/e/6442465683-eepolicymanualrevised-march-20-2020-b.pdf

Gridworks. 2019. *California's Gas System in Transition*. Available at https://gridworks.org/wp-content/uploads/2019/09/GW_Calif-Gas-System-report-1.pdf

Rasmussen, Tami, Martha Wudka, Jesse Emge, Sara Rosenbrock, Liandra Chapman, and Ross Donaldson. 2022. *SJV DAC Pilot Projects Process Evaluation Final Report*. Evergreen Economics. Available at https://www.calmac.org/publications/SJV_DAC_Process_Evaluation_Final_Report_102022.pdf

TRC. 2016. *Palo Alto Electrification Final Report*. Available at https://www.cityofpaloalto.org/files/assets/public/v/1/development-services/advisory-groups/electrification-task-force/palo-alto-electrification-study-11162016.pdf

DOT (U.S. Department of Transportation). 2022. "Gas Distribution, Gas Gathering, Gas Transmission, Hazardous Liquids, Liquefied Natural Gas (LNG), and Underground Natural Gas Storage (UNGS) Annual Report Data." Pipeline and Hazardous Materials Safety Administration (PHMSA). Available at https://www.phmsa.dot.gov/data-and-statistics/pipeline/gas-distribution-gas-gathering-gas-transmission-hazardous-liquids.

References to Project Deliverables

Gold-Parker, Aryeh, Jared Landsman, Fangxing Liu, Dan Aas, and Amber Mahone. 2023a. Benefit-Cost Analysis of Targeted Electrification and Gas Decommissioning in California. Energy+Environmental Economics, Inc. Available at https://www.ethree.com/wp-content/uploads/2023/12/E3_Benefit-Cost-Analysis-of-Targeted-Electrification-and-Gas-Decommissioning-in-California.pdf

Gold-Parker, Ari, Fangxing Liu, Dan Aas, Amber Mahone, Allison Lopez, Helen Mejia, JP Ross, Beckie Menten, Sarina Soor, Claire Halbrook, Mathew Tisdale. 2023b. *Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Natural Gas*

Infrastructure in Northern Californiav. Outreach Strategy Report. Energy+Environmental Economics, Inc. Available at https://res.cloudinary.com/diactiwk7/image/upload/v1705532965/Outreach_Strategy_Report_2023-09-28_w-cover-page_lqcgaj.pdf

Gold-Parker, Aryeh, Claire Halbrook, Helen Mejia, Allison Lopez, Fangxing Liu, Dan Aas, and Amber Mahone. 2023c. *Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Gas Infrastructure in Northern California*. Interim Report. Energy+Environmental Economics, Inc. Available at https://gridworks.org/wp-content/uploads/2023/06/Evaluation-Framework-for-Strategic-Gas-Decommissioning-in-Northern-California-Interim-Report-for-CEC-PIR-20-009.pdf

Lopez, Allison, Ari Gold-Parker, Fangxing Liu, Amber Mahone, Helen Mejia, JP Ross, Sarina Soor, Claire Halbrook, Mathew Tisdale. 2023. *Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Gas Infrastructure in Northern California*. Proposed Pilot Deployment Framework. Ava Community Energy. Available at https://res.cloudinary.com/diactiwk7/image/upload/v1705704432/Deployment_Plan_-_Final_-23_1_ahv5iw.pdf

Project Deliverables

The project team has produced four key publicly available deliverables.

- **Interim Report:** In June 2023, the project team released an interim report that describes the development and implementation of the site selection framework for targeted electrification and gas decommissioning. The interim report also compares the proposed site selection framework to the CPUC's Staff Proposal on Gas Distribution Infrastructure Decommissioning Framework in Support of Climate Goals, developed as part of the Long-Term Gas Planning proceeding. Finally, the interim report recommended steps that utilities, regulators, state agencies, and the legislature can take to support the viability of targeted electrification and gas decommissioning as an approach to reduce gas system costs at scale. The interim report is available on Gridworks' website: https://gridworks.org/wp-content/uploads/2023/06/Evaluation-Framework-for-Strategic-Gas-Decommissioning-in-Northern-California-Interim-Report-for-CEC-PIR-20-009.pdf
- **Benefit-Cost Analysis:** In December 2023, the project team released a report on the team's benefit-cost analysis of targeted electrification and gas decommissioning. This report evaluates the benefits and costs of targeted electrification and gas decommissioning for the 11 candidate sites, considering different perspectives including those of participants, electric ratepayers, gas ratepayers, and society at large. The benefit-cost analysis report is available on E3's website: https://www.ethree.com/wp-content/uploads/2023/12/E3_Benefit-Cost-Analysis-of-Targeted-Electrification-and-Gas-Decommissioning-in-California.pdf
- **Community Outreach Report:** The project team finalized the outreach strategy report in October 2023. This report documents the development and implementation of the approach for community outreach and education. The report also documents key learnings from implementing this approach on the three proposed pilot sites. The outreach strategy report is available on Ava Community Energy's website: https://res.cloudinary.com/diactiwk7/image/upload/v1705532965/Outreach_Strategy_Report_2023-09-28_w-cover-page_lqcgaj.pdf
- **Pilot Deployment Plan:** The project team finalized the project's deployment plan in December 2023. This plan provides a framework for entities interested in pursuing targeted electrification and gas decommissioning pilot projects. The plan is available on Ava Community Energy's website: https://res.cloudinary.com/diactiwk7/image/upload/v1705704432/Deployment_Plan_-_Final_-23_1_ahv5iw.pdf