

CEC-PIR-20-009

Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Natural Gas Infrastructure in Northern California

ESIG Technical Workshop

10/24/2023

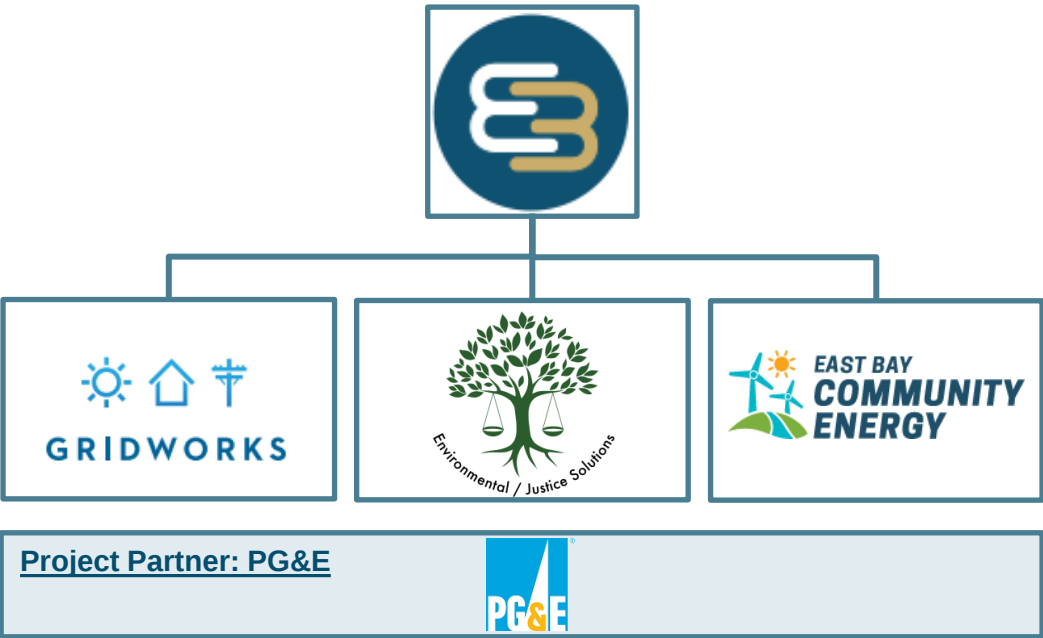


Ari Gold-Parker
Associate Director, E3

CEC Project Overview (CEC PIR-20-009)

Key Question: How can targeted building electrification and gas decommissioning provide emissions reductions and cost savings while promoting equity and meeting the needs of local communities?

Overview of Project Team



Project Objectives

- A. Develop a replicable framework** to identify sites where targeted building electrification combined with tactical gas decommissioning could support gas system cost savings
- B.** Using that framework, **identify proposed pilot sites**, including at least one within a disadvantaged community
- C. Engage local communities** in sharing their perspectives and priorities
- D. Produce deployment plans** for 3 recommended pilot sites
- E. Develop a benefit-cost analysis framework** for targeted electrification and gas decommissioning and evaluate candidate project sites using this framework

The project team recently released an [Interim Report](#) describing progress on this project and our Final Report is under development. Project materials are available at gridworks.org/initiatives/gas-decommissioning/

Green = focus of this presentation

Project background and context

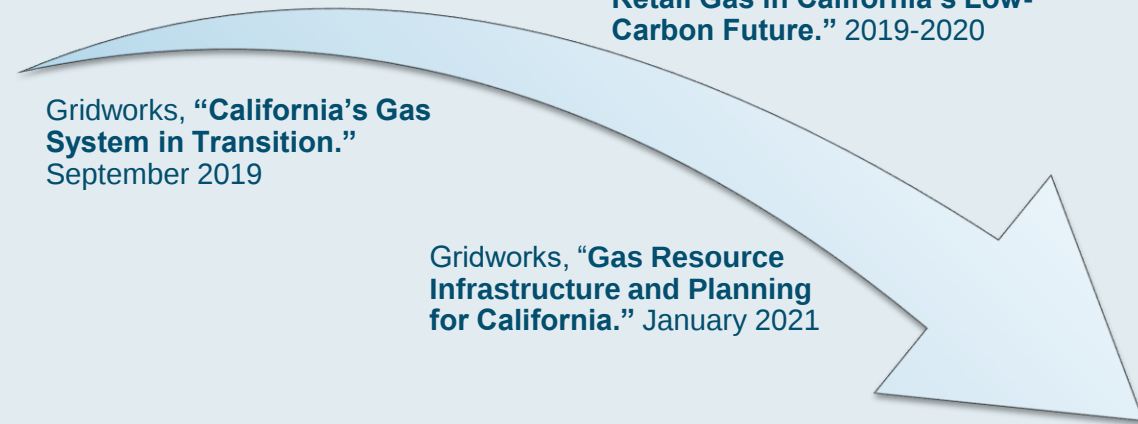
Prior Work

E3/CEC, “**Deep Decarbonization in a High Renewables Future.**”
June 2018

E3/CEC, “**The Challenge of Retail Gas in California’s Low-Carbon Future.**” 2019-2020

Gridworks, “**California’s Gas System in Transition.**”
September 2019

Gridworks, “**Gas Resource Infrastructure and Planning for California.**” January 2021



*Not an exhaustive list of research in this field

Present Day

CPUC: Long-term gas system planning

CEC: Development of a Data-Driven, Actionable Tool and Case Studies to Support Strategic and Equitable Natural Gas Decommissioning

This Project

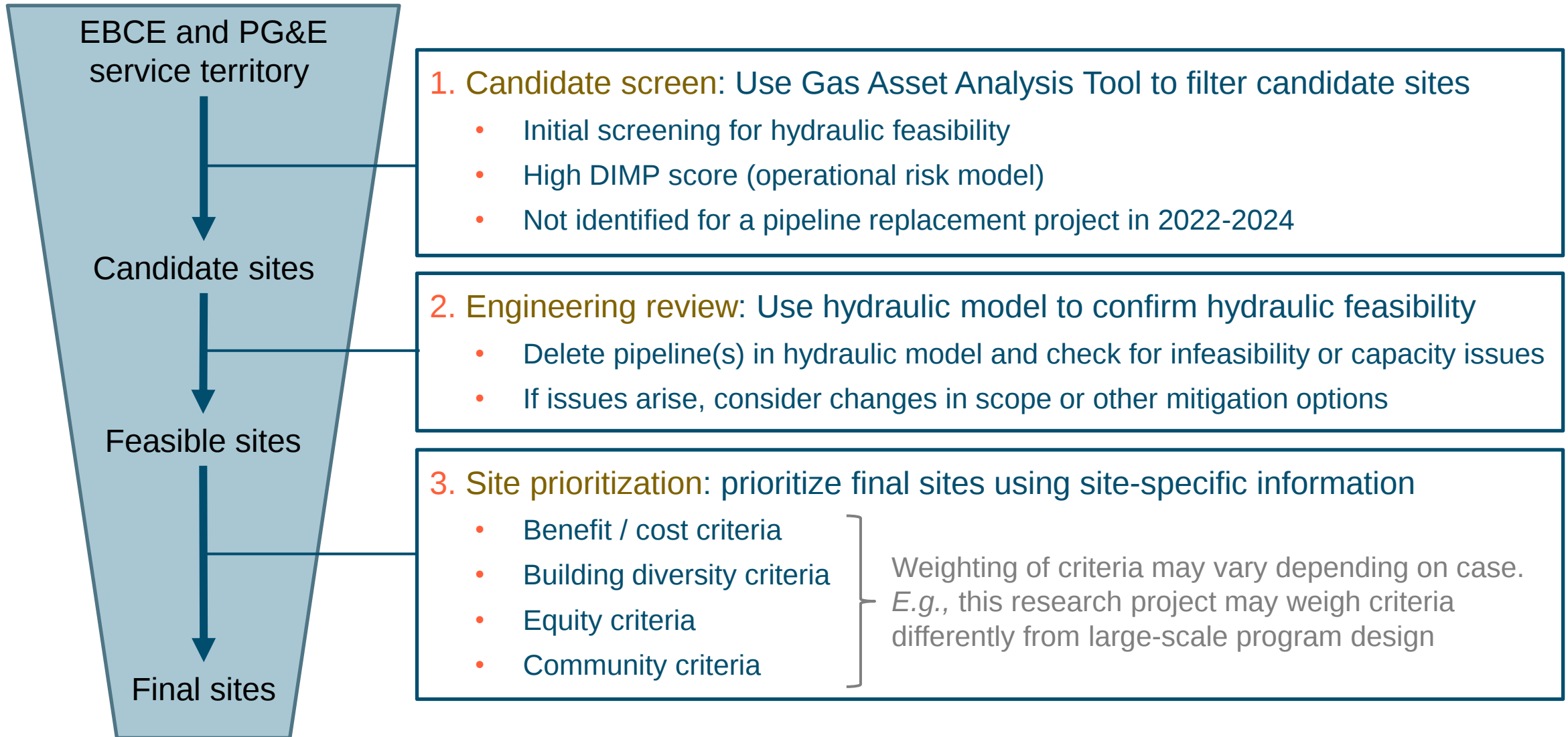
CEC: Strategic Pathways and Analytics for Tactical Decommissioning of Portions of Natural Gas Infrastructure in Northern California



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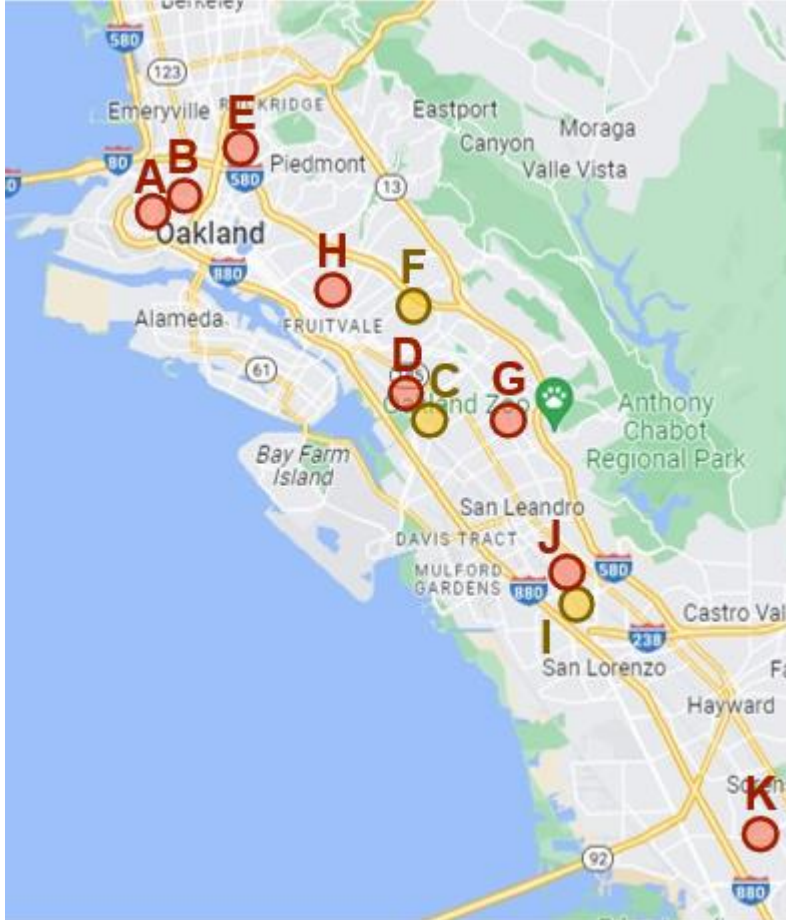
Site Selection Framework

Proposed site selection framework



Deployment plans will subsequently be developed for each site through direct customer engagement and consideration of benefits and costs, bill impacts, community priorities, equity, and other site-specific factors

11 candidate sites



Yellow = prioritized for deployment plans

Site	Multi-Family	CARE	Electric Space Heating	Electric Water Heating	Has AC	Pre-1980 Vintage	Non-Res Sq Ft
	%	%	%	%	%	%	Sq Ft
A	53%	20%	13%	17%	23%	100%	15,000
B	69%	31%	33%	25%	16%	87%	0
C	3%	63%	34%	13%	13%	99%	0
D	60%	87%	26%	20%	28%	100%	0
E	28%	12%	7%	4%	14%	99%	48,000
F	26%	38%	24%	12%	27%	99%	20,000
G	60%	66%	28%	14%	38%	96%	56,000
H	48%	48%	27%	10%	25%	88%	0
I	17%	21%	17%	4%	19%	2%	0
J	0%	18%	15%	8%	13%	24%	0
K	3%	31%	23%	7%	19%	0%	0



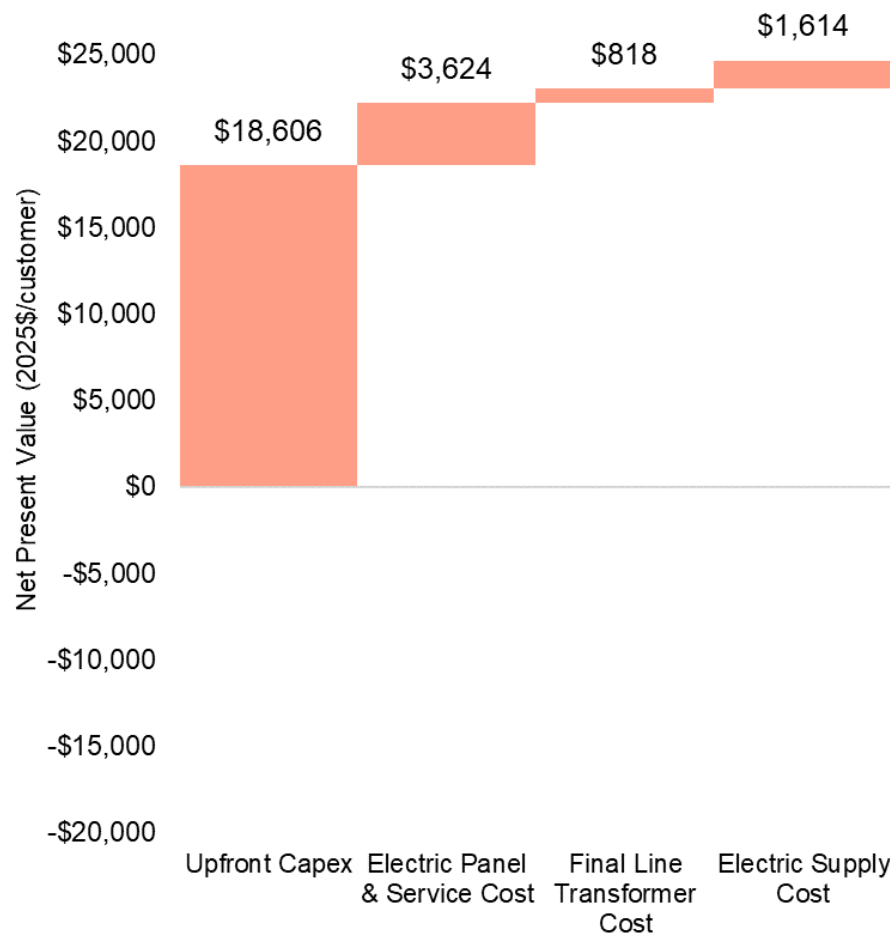
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Benefit-Cost Analysis DRAFT

Benefit-cost analysis: costs

Total Resource Cost test (TRC)

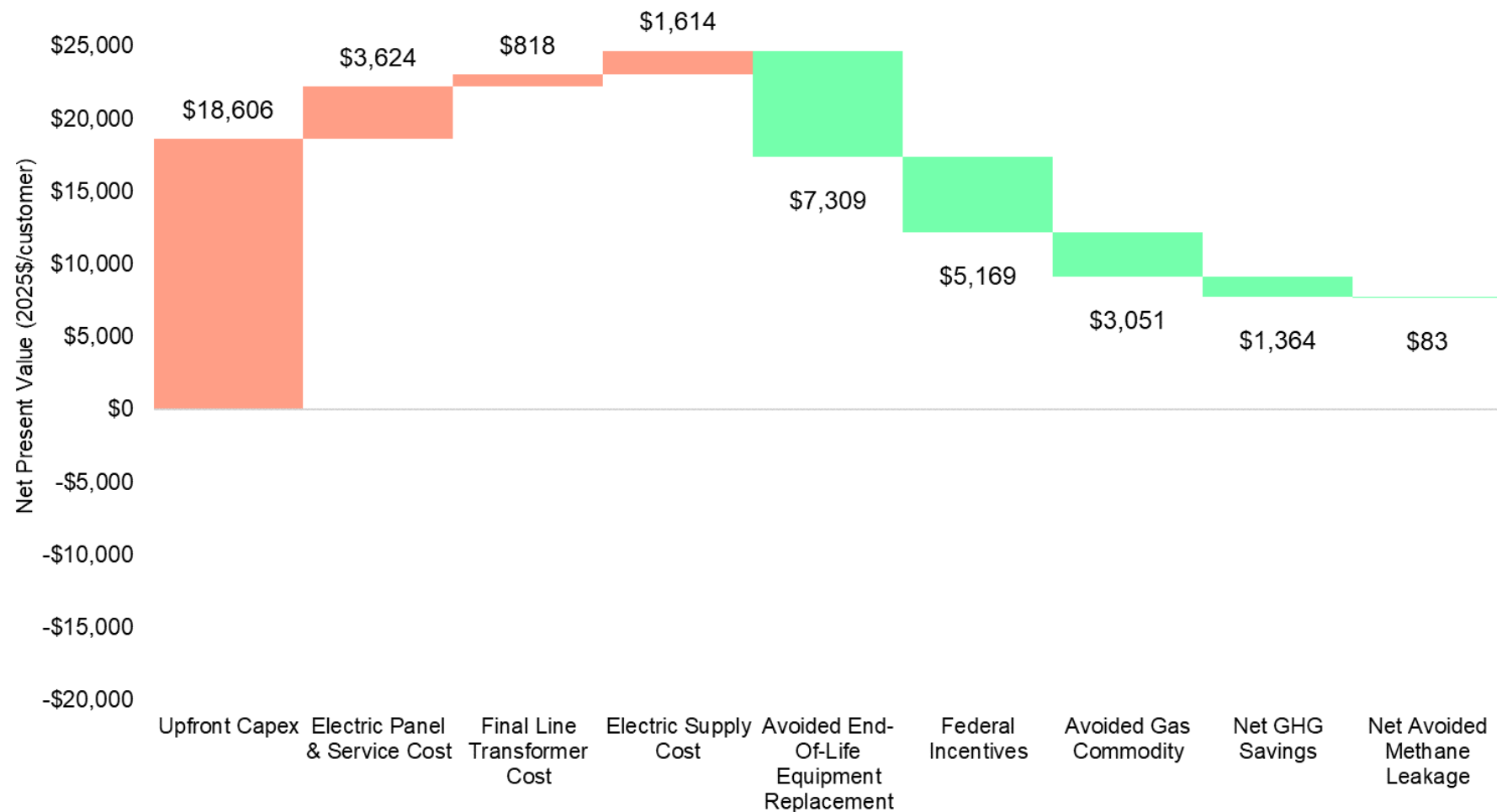
Average Lifecycle Costs and Benefits Per Customer Across 11 Candidate Sites (1,500 Customers)



Benefit-cost analysis: costs & benefits (excl. gas avoided costs)

Total Resource Cost test (TRC)

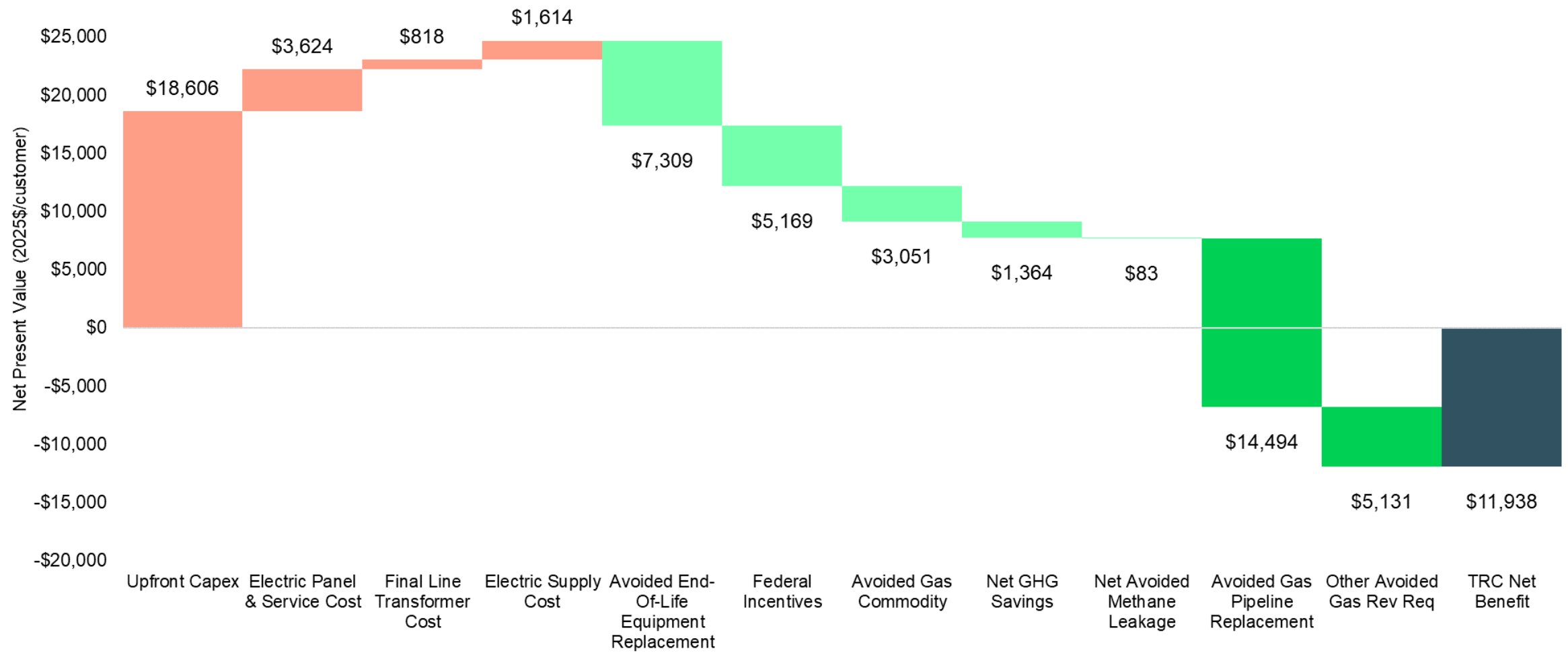
Average Lifecycle Costs and Benefits Per Customer Across 11 Candidate Sites (1,500 Customers)



Benefit-cost analysis: costs & benefits (incl. gas avoided costs)

Total Resource Cost test (TRC)

Average Lifecycle Costs and Benefits Per Customer Across 11 Candidate Sites (1,500 Customers)



Electric panel and service costs have high uncertainty

+ Electric panel and service upgrades may add significant costs to an electrification project. However, there is a huge degree of uncertainty:

1. Very wide cost ranges. Per PG&E:
 - Panel: ~\$3000 up to \$15,000 where major construction work is needed to repair walls
 - Service: \$10,000 up to \$60,000 where underground lines require trenching
2. Poor data on which customers would need upgrades
 - Many customers will already have adequate capacity for building electrification
 - Site visits may ultimately be required to understand where upgrades are needed

Our modeling approach: customer panel and distribution service upgrades

Upgrades needed

Pre-1980 home **AND** no AC nor Elec. Res. heat

No upgrades needed

Post-1980 home **OR** AC or Elec. Res. heat

+ On average, we estimate **\$3600 per customer in panel and service upgrade costs**

- Very wide range among pilot sites based on building stock and current equipment
- Average includes many customers who *do not* need upgrades at all

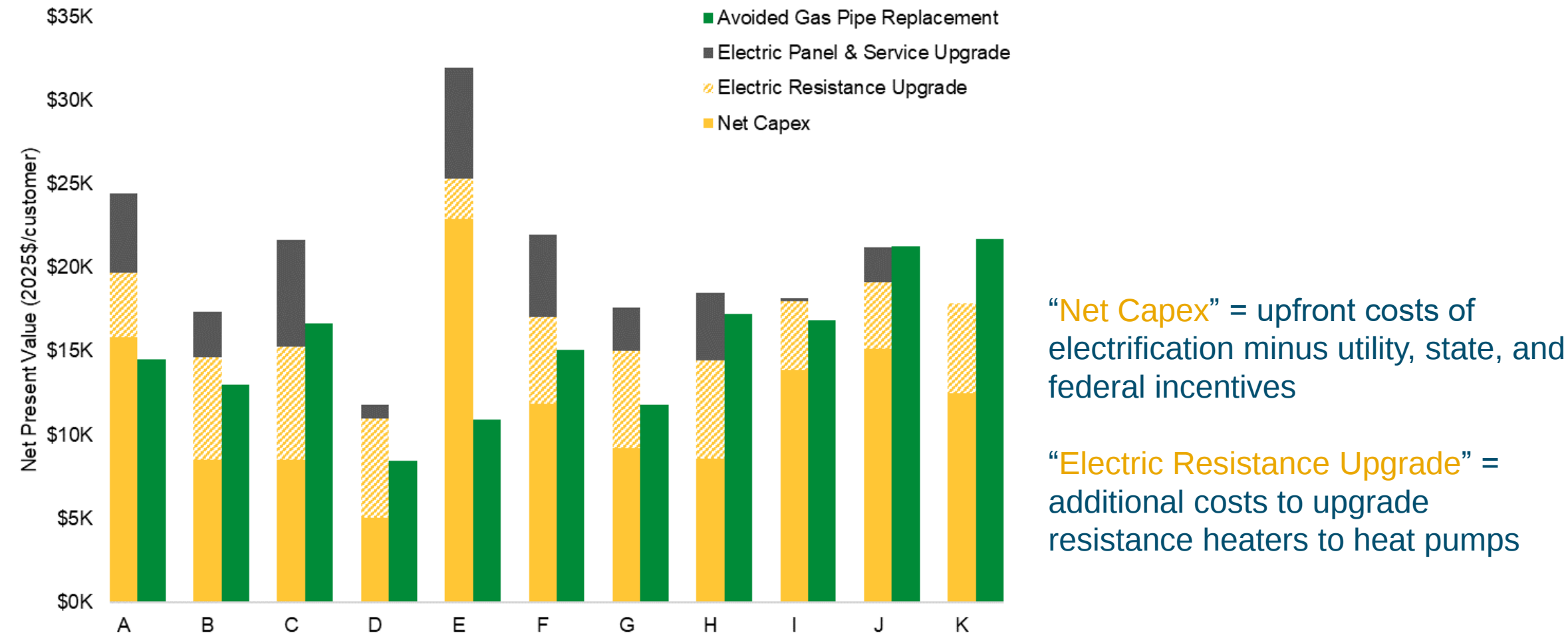
Final Line Transformer Costs; Primary Distribution Costs

- + PG&E engineers evaluated three of the eleven candidate sites for distribution cost impacts

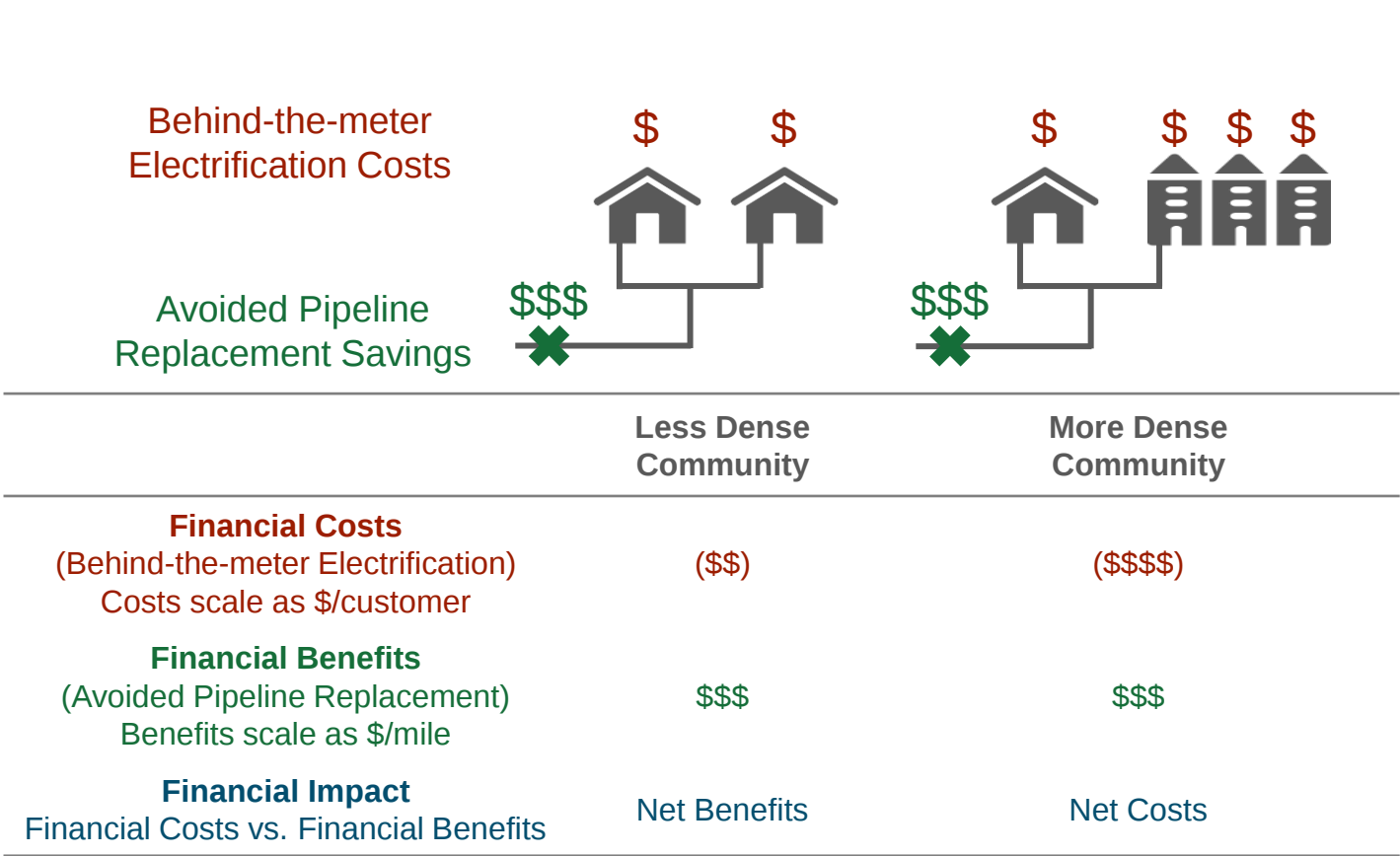
- + **Final Line Transformer Costs:**
 - Average cost ~ \$1000/customer across the three sites

- + **Primary Distribution Costs (Substation, Feeder, Circuit)**
 - PG&E found zero primary distribution costs for these three sites
 - Not entirely surprising:
 - These sites (~150 customers) are small relative to primary distribution systems
 - While specific portions of CA's distribution system may be winter-peaking, the bulk grid is summer peaking. Much of the primary distribution system is likely also summer-peaking
 - Note: this result may be linked to CA's summer-peaking grid and mild winters in the Bay Area

Avoided gas pipeline replacement costs can generally cover “net capex” after incentives



Targeted electrification is more cost-effective in less dense areas



Note: a more holistic framework would include other cost and benefit components

Geography	Customer Density (Customers per mile of distribution main)
11 candidate sites	202
EBCE territory	124
PG&E territory	100

Cost-effectiveness may be **even better** in parts of PG&E’s service territory that are less dense than the candidate sites we have studied.



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Key Findings

Key Findings

1. Targeted electrification and gas decommissioning is found to be a cost-effective strategy to implement building electrification while avoiding gas system investments at these sites.
2. Savings from avoided gas pipeline replacement could be used to fund the associated building electrification projects; however, this would reduce the savings that accrue to gas ratepayers.
3. Modeling indicates that less dense sites, *i.e.*, sites with fewer customers per mile of gas main, will likely see better overall cost-effectiveness.
4. Significant regulatory and policy changes are needed for gas decommissioning to be identified, planned, and implemented at a scale that would support California's emissions reductions goals and help mitigate impacts to remaining gas ratepayers.



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Appendix: Site selection

Results of Step 1: Candidate Screen

City	1 Initial candidate sites <i>Terminal branch + high DIMP operational risk score</i>	2 Updated candidate sites <i>Also includes “networked” non-residential sites with high DIMP score</i>	3 Final Candidate Sites <i>Excludes sites where a pipeline replacement project is planned through 2026</i>	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.

Results of Step 2: 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." Though technically feasible in this case, PG&E does not recommend decommissioning distribution ribs.



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Appendix: Benefit-Cost Analysis DRAFT

Participant perspective: PG&E “E-ELEC” electrification rate leads to bill savings *on average*

