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BDC Comments on Data-Driven Tool to Support Strategic and Equitable Natural Gas Decommissioning

Additional submitted attachment is included below.

California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

July 26, 2021

Re: Staff Workshop: Data-Driven Tool to Support Strategic and Equitable Natural Gas Decommissioning, Docket No.19-ERDD-01

On behalf of the Building Decarbonization Coalition, we respectfully submit this comment in Docket No.19-ERDD-01

About the Building Decarbonization Coalition:

The Building Decarbonization Coalition unites building industry stakeholders with energy providers, environmental organizations and local governments to help electrify California's homes and workspaces with clean energy. Through research, policy development, and consumer inspiration, the BDC is pursuing fast, fair action to accelerate the development of zero-emission homes and buildings that will help California cut one of its largest sources of climate pollution, while creating safe, healthy and affordable communities.

Summary:

The Building Decarbonization Coalition (“BDC”) thanks the California Energy Commission (“Commission”) for hosting an initial workshop and opening Docket No.19-ERDD-01 to inform the creation of a Data Driven Tool to Support Strategic, Equitable Natural Gas Decommissioning. The BDC respectfully submits the attached two reports, “The Flipside Report: A White Paper on Targeted Geographic Electrification in California’s Gas Transition” (“The Flipside Report”)¹, and “A Methodology for Geographically-Targeted Building Electrification for Environmental and Social Justice Communities in California” (“Geographic Electrification Methodology Report”)² for consideration as part of the Commission's investigation into planning and managing an equitable and cost-effective transition for California’s retail gas system. BDC submits the attached reports, which provide initial recommendations and frameworks for trimming and decommissioning in a manner that prioritizes the state’s more vulnerable populations, including environmental justice communities. Yet, we recognize these two reports don’t supplement the need to center and uplift environmental justice and equity voices in this process and future conversations.

¹Common Spark Consulting, “The Flipside Report: A White Paper on Targeted Geographic Electrification in California’s Gas Transition” (2021), https://www.buildingdecarb.org/uploads/3/0/7/3/30734489/the_flipside_report_-_targeted_electrification_for_gas_transition.pdf.

²Hens, Isabelle and Lamon, Emily, “A Methodology for Geographically-Targeted Building Electrification for Environmental and Social Justice Communities in California” (2021), https://www.buildingdecarb.org/uploads/3/0/7/3/30734489/geographically-targeted_building_electrification_for_environmental_and_social_justice_communities_in_california.pdf.

The Flipside Report: A White Paper on Targeted Geographic Electrification in California's Gas Transition

California is decarbonizing its future, and continues to lead the way nationally in aggressive, rapid, and economy-wide emissions reductions. Key stakeholders, advocates, and policymakers are in agreement that electrification is the most cost-effective path for the state to reach our 2050 carbon neutrality goals. In order to fully electrify to meet our state climate goals, we need to swiftly and cost-effectively decommission the existing gas system. Doing so inherently requires that the state take a more localized approach to planning, programs, and investment than we have to date. It requires decommissioning specific sections of existing gas infrastructure, both distribution and transmission, while simultaneously electrifying the customers currently on that system (across residential, commercial, and industrial users). While traditional state clean energy programs have relied largely on broad economic, utility territory, or region-wide metrics for emissions reduction, energy savings, and technology penetration, gas trimming and electrification will require localized interventions. As a result, this work also demands much more thoroughly designed processes to create interventions with affordability and equity considerations at the forefront, meaning community-led policy and program design and implementation.

“The Flipside Report” provides a proposed framework for geographically-targeted electrification that prioritizes that state’s more vulnerable populations. The Flipside Report outlines considerations around alternative gas utility business models and cost recovery, rate structures to ensure affordability for both electrified and remaining gas customers, rent and displacement protections, and a just transition for the gas workforce. It also highlights the opportunities presented by targeted geographic trimming and electrification, including providing a unique opportunity to reverse the state’s historic disinvestment in low-income communities, Communities of Color, Indigenous communities, Environmental Justice communities, and other vulnerable populations across the state.

The Report focuses on three key recommendations for the State:

1. Prioritize Investments in Vulnerable Communities - provide full and comprehensive funding to protect those who are at the highest risk of being left on the system longest with the least ability to absorb the likely costs, and reverse a long history of disinvestment in the health, resilience, and economic opportunity of our state’s Low-Income, Black, Brown, and Indigenous, and otherwise vulnerable communities;
2. Accelerate Investments in Non-Pipeline Solutions - recognize that we need to accelerate decommissioning of existing gas infrastructure, and using avoided gas infrastructure investment to fund non-pipeline alternatives; and
3. Reform the Regulatory Environment - enable and encourage geographic decommissioning of gas pipelines and neighborhood-scale electrification. The report also lays out the policy and regulatory challenges and opportunities to ensure a cost-effective, rapid, and equitable transition off of the gas system through geographically targeted electrification.

A Methodology for Geographically-Targeted Building Electrification for Environmental and Social Justice Communities in California

The Geographic Electrification Methodology Report attached, completed by Graduate Student Researchers at the University of California, Berkeley, provides some initial insight into how we can more

concretely identify the areas of the gas distribution system that are most prime for near-term gas infrastructure trimming and whole-house, whole-neighborhood electrification. In addition to providing additional context around the benefits and approaches for geographic electrification, the report takes a look at existing data and tools from the State of California (including data from CalEnviroScreen) and proposed a strategy to identify and prioritize electrification funding towards communities with a high pollution burden, low-income communities with a high housing burden, and areas that are served by an outer branch of a natural gas distribution pipeline (to facilitate decommissioning of individual branches). The Report includes an initial case study and analysis of venues in both the San Francisco Bay Area, the Central Valley, and Los Angeles Area.

Relevance and Input to Docket No.19-ERDD-01

The Commission requested input and feedback by July 26th to help inform a future solicitation that will strive to create a data-driven tool that:

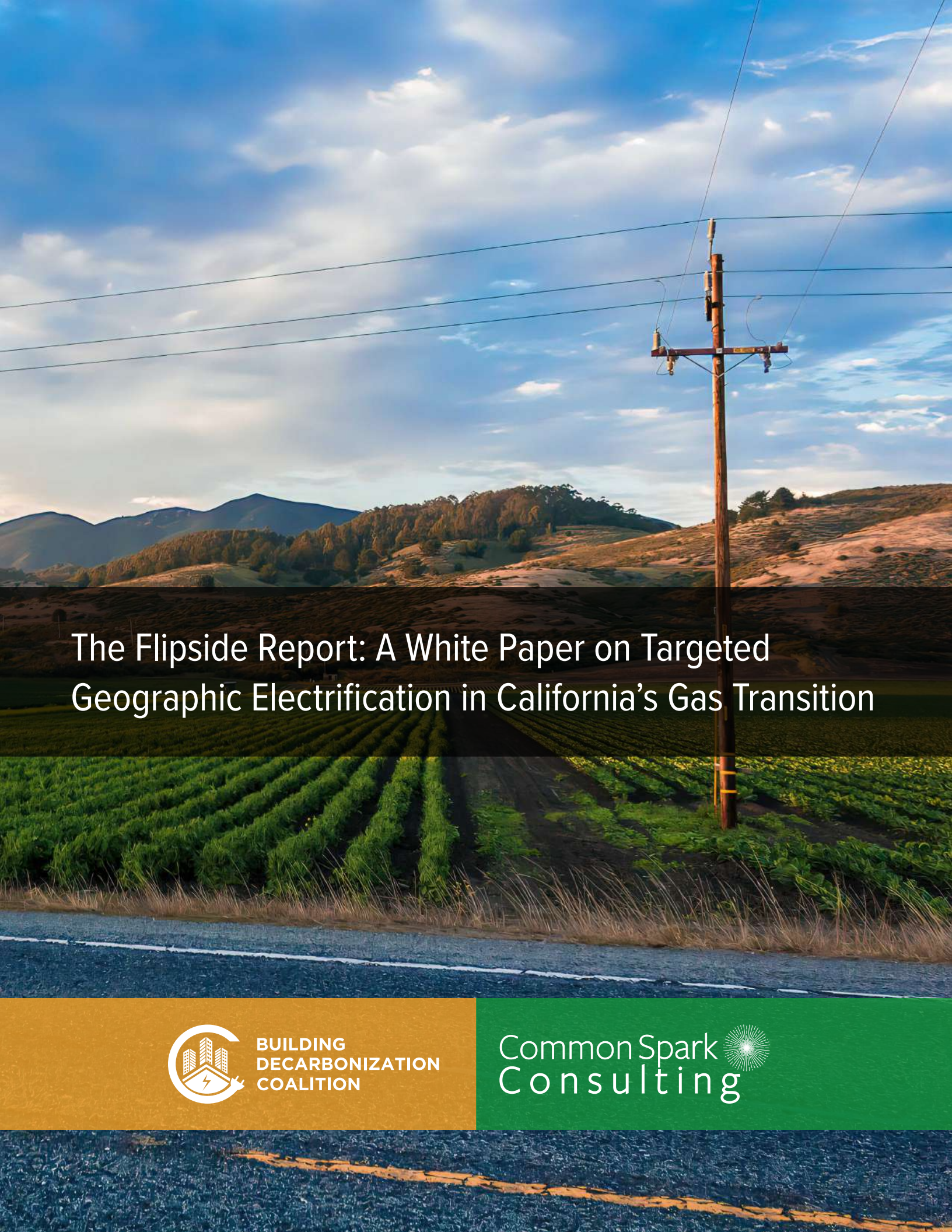
- Offers a systematic framework for identifying promising sites for decommissioning
- Screens for promising sites for decommissioning as a first step for prioritizing more targeted analyses of the technical feasibility
- Evaluates key criteria for site identification of decommissioning
- Leverages data on infrastructure characteristics and conditions that are relevant to inform decommissioning options and impacts.
- Explores how different site identification criteria, time horizons and regulations assumptions may suggest different sites and scale of opportunity

Our hopes are that the two attached reports can provide initial input and draft considerations across each of these objectives, as the Commission develops the solicitation criteria and evaluates solicitation responses. Both reports offer a set of specific criteria that can and should be prioritized in identifying promising sites for decommissioning, including metrics for identifying interventions that prioritize the states most vulnerable communities. We are thrilled and thankful for the leadership at the Commission to manage an affordable, equitable, and strategic retail gas transition.

Dated: July 26, 2021

Respectfully submitted,
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The Flipside Report: A White Paper on Targeted Geographic Electrification in California's Gas Transition



**BUILDING
DECARBONIZATION
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The opinions expressed in this report do not necessarily reflect those of the Coalition, its members, or others that supported or contributed to it. Common Spark Consulting bears sole responsibility for the report's contents.



The Flipside Report: Electrification Strategies for an Equitable Gas Transition

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Executive Summary

California is decarbonizing its future, and natural gas demand is on the decline. To date, this is driven by several key policies and programs—including the passage of Senate Bill 32 in 2016, Senate Bill 100 in 2018, and a statewide cap and trade program, aggressive building codes, transportation electrification targets, and more. Advocates and the state recognize that building electrification is the lowest cost path to building decarbonization—a scenario estimated to be \$20 billion less expensive per year by 2050 than a scenario without building electrification.¹ Simultaneously, electrification provides a critical platform for climate and environmental justice advocates to achieve a cost-effective and equitable path to healthy and safe buildings; it is poised as the primary solution to replace current gas end uses and cost-effectively achieve state climate goals.

As gas demand declines, the costs and risks associated with remaining gas system infrastructure begin to rapidly increase. While gas utilities must continue to invest in the safety and reliability of the system, including mitigating risks of leaks or disastrous explosions, the cost of doing so will continue to increase in relation to customer demand. As the cost per unit of gas rises, more ratepayers will leave the system and seek alternatives, placing these increased costs on fewer homes and businesses.

The solution is a managed approach to reducing gas infrastructure, to relieve ratepayers of escalating costs of stranded assets.² This means halting new investments in future stranded gas assets and decommissioning the gas system sections at a time, removing entire sections of pipeline and disconnecting the buildings and sections of communities currently reliant on them—also known as trimming.

However, to support a cost-effective and equitable gas transition, electrification must happen in a geographically targeted and whole-house approach. Piecemeal electrification, such as appliance-by-appliance retrofits, will make it challenging to decommission sections of pipeline. A single gas use will necessitate the maintenance of costly infrastructure on a shrinking ratepayer base, creating enormous risk for ratepayers. Whole-house electrification aligned to support a managed gas transition can relieve ratepayers of those costs, deliver ratepayer savings, support energy affordability, and improve system efficiency, safety, and resiliency.

1 Energy and Environmental Economics, Inc., California Energy Commission. (2020). [The Challenge of Retail Gas in California's Low-Carbon Future.](#)

2 Environmental Defense Fund. (2019). [Managing the Transition: Proactive Solutions for Stranded Gas Asset Risk in California.](#)



TARGETED ELECTRIFICATION, THE FLIPSIDE TO THE GAS TRANSITION

Successfully delivering targeted electrification to enable strategic trimming of the gas system will require diverse funding and implementation approaches. This paper organizes its recommendations for targeted electrification under three strategies, each addressing unique policy, economic, social, and technical challenges, and opportunities to provide electrification as a solution to achieve an equitable and cost-effective gas transition.

Prioritize Investments in Vulnerable Communities

Vulnerable communities carry the highest risk of being left on the system longest with the least ability to absorb the likely costs. They have disproportionately suffered from the state's reliance on fossil fuels, the resultant poor air quality, and unequal access to clean energy and energy efficiency benefits, including healthy and affordable housing. As a result, they stand to benefit the most from electrification. Recommendations under this strategy ensure these communities are equipped to move out of harm's way and receive the benefits of the transition first and foremost.

Accelerate Investments in Non-Pipeline Solutions

Through a thorough and public planning process, such as that proposed by Gridworks, sections of pipeline could be identified for maintenance, repair, and replacement over their lifetime. For some sections of pipeline, it should be possible to project lifetime costs to maintain the infrastructure, which would help quantify the avoided cost if that pipeline were instead to be decommissioned. Recommendations under this strategy seek to capture avoided costs that can instead be used to invest in a non-pipeline alternative, both supporting and accelerating the decommissioning of portions of the gas system.

Reform the Regulatory Environment

The California Public Utilities Commission's Long-Term Gas Proceeding (R.20-01-007) Phase 2 is scoped to assess rate dynamics that incentivize the transition, encourage investments in electrification market transformation, and establish key policies and drivers that dictate an accelerated move away from gas to electrification. This is the Commission's opportunity to signal and support a managed transition from the gas system, provide guidance around timelines, limit new gas infrastructure investments, and consider cost recovery models for remaining gas assets. Recommendations under this strategy seek to create a new regulated environment that prompts localized electrification efforts and transitions away from the gas system.

Despite significant uncertainty, California is embarking on a journey away from gas. This transition will only be truly cost-effective and equitable if it is led by strategic trimming of the gas system and enabled by targeted whole-house neighborhood electrification.

The Flipside Report lays out the policy and regulatory challenges and opportunities to ensure cost-effective, rapid, and equitable transition off the gas system through geographically targeted electrification. The report is a declaration that all California communities can and should be supported in their transition to electrification. It is a call to action for the state to prioritize investment in, and leadership by, the state's most vulnerable and historically marginalized communities, and to establish regulatory tools and structures to ensure that electrification is both the most cost-effective and equitable solution to a decarbonized future.



Introduction: Gas on the Decline

U.S. natural gas use is on the decline. Production and demand are set to drop for the second consecutive year.³ In California, such a trend is welcomed, as the state's energy supply becomes cleaner and more efficient, and the opportunities to dramatically reduce greenhouse gases through building electrification come within reach. However, simply decreasing gas use in buildings will not deliver an equitable climate solution. The flipside, or how the state replaces gas use with electrification in homes and businesses, will determine if our decarbonized future improves public health, supports local economies, and enhances affordability for all Californians.

California is decarbonizing its future. It is moving away from the use of gas⁴ in homes and businesses, and is promoting electrification of space and water heating, cooking, and laundry. Decarbonization by building electrification is needed to meet state climate objectives including those laid out in the 2018 Executive Order, to achieve carbon neutrality no later than 2045, and in Senate Bill (SB) 32, requiring a reduction in greenhouse gas (GHG) emissions to 40 percent below the 1990 levels by 2030.^{5,6} State agencies, from the California Energy Commission (CEC) to the California Public Utilities Commission (CPUC) have launched proceedings, research, and demonstrations around responsibly managing the changing future of state gas infrastructure.⁷

Significant local and regional momentum across the state around building electrification, including over 40 cities passing all-electric and electric-ready building reach codes and bans on new gas lines, are already impacting residential and commercial new construction.⁸ Regional and local incentives for new efficient electric appliances and technology are growing in tandem. Advocates and the state recognize that building electrification is the lowest cost path to building decarbonization—a scenario estimated to be \$20 billion



3 U.S. Energy Information Administration. (2021). [2021 Short Term Energy Outlook](#).

4 This paper hereon refers to “fossil gas,” also known as “natural gas,” as “gas”.

5 State of California – California Gov. Edmund G. Brown Jr. (2018). [Executive Order B-55-18 to Achieve Carbon Neutrality](#).

6 State of California. (2006). [California Senate Bill 32 SB-32, the California Global Warming Solutions Act of 2006](#).

7 California Public Utilities Commission. (2020). [California Public Utilities Commission \(CPUC\) Long-Term Gas Planning Proceeding \(R.20-01-007\)](#).

8 [California Energy Codes and Standards. \(2021\)](#).

less expensive per year by 2050 than a scenario without building electrification.⁹ Simultaneously, electrification provides a critical platform for climate and environmental justice advocates to achieve a cost-effective and equitable path to healthy and safe buildings; it is poised as the primary solution to replace current gas end uses and cost-effectively achieve state climate goals.

The CPUC Long-Term Gas Planning Proceeding, launched in early 2020, is a momentous juncture in California’s pursuit of a decarbonized future, inviting the visioning and planning work necessary to identify, manage, and outline the state’s reduction of gas infrastructure. It provides a forum to begin to address questions about responsibly managing the decline in gas demand, brought on by market forces (i.e., energy efficiency and performance of new electric technologies) and by policy direction (i.e., new air quality regulations, local building codes, and state climate goals). The Proceeding is spurring dialogue about setting retirement dates for gas infrastructure and structuring the financial recovery of gas assets to “to ensure that gas transmission costs are allocated fairly and that stranded costs are mitigated.”¹⁰

As a practical matter, the gas system will need to shrink by decommissioning sections at a time, trimming, or removing entire sections of pipeline and disconnecting the buildings and sections of communities currently reliant on them. Electrification cannot support this type of decommissioning by happening in a piecemeal manner, appliance-by-appliance in households across the states. Rather, it will require communities, agencies, and advocates to use a whole-house geographically targeted approach to electrify energy services impacted by gas system trimming. A piecemeal approach to electrification would reduce overall gas demand and use but necessitates the existence and ongoing maintenance of the current gas infrastructure delivery system. Such an approach will result in skyrocketing costs to maintain expansive existing infrastructure across a declining customer base. How California approaches building electrification must be driven by the need to strategically decommission entire sections of gas infrastructure in a geographically targeted manner. **That is the ‘flipside’ of the issue.**

Building electrification must respond to the challenge of a gas system being decommissioned section-by-section. Whole-house targeted geographic electrification is necessary, not only to replace energy services for those sections being decommissioned, but such an approach plays a broader role in supporting a managed gas transition and delivering the broad benefits of decarbonization, such as health, safety, resiliency, and economic development, to all California communities. This paper outlines how electrification can support the successful wind-down of the gas system.

Section 1 of this paper will describe the interplay between the state’s gas transition planning and considerations for near-term building electrification. This includes how the two efforts must be designed in tandem to ensure near- and long-term affordability for consumers and the state. Different regulatory structures, rules, and technical limitations need to be addressed to ensure that the move to electrification is done in a smart, cost-effective, and equitable manner.

Section 2 discusses the role and value of whole-house geographically targeted electrification, and how such an approach is required to support a managed gas system transition. Such an approach to electrification, by nature, will depend upon community leadership and local workforce development to be successful and deliver the full benefits of electrification and the gas transition to California communities.

Section 3 proposes three strategies for the state’s near-term, geographically targeted whole-house electrification. These three strategies highlight the different partnerships, programs, and funding and financing needed to pursue system-wide electrification and resulting reduction of the gas system:

- 1) Prioritize Investment in Vulnerable Communities
- 2) Accelerate Investments in Non-Pipeline Alternatives
- 3) Reform the Regulatory Environment

Recommendations are organized under each of the three strategies. Together, the three strategies comprise a comprehensive approach to deliver electrification as a solution for an equitable and cost-effective gas transition.

This report is a call for policymakers, state agencies, program administrators, and advocates to consider the opportunities, imperatives, and barriers to the electrification ‘flipside’ of California’s Long-Term Gas Planning Proceeding. Its recommendations ask for new policies and rules, innovative infrastructure financing tools, prioritized funding, and creative program deployment models that put communities in the driver seat of their own energy future. This report is a call for every stakeholder involved to recognize that electrification can be a broadly beneficial climate solution; a solution that requires a shift from a statewide to localized focus, from market-driven to market-supported community-led initiatives, from piecemeal system-wide approaches to targeted deep interventions. If done in a concerted deliberate way, the benefits of electrification can be the flipside to the long-term gas transition.



9 Energy and Environmental Economics, Inc., California Energy Commission. (2020). [The Challenge of Retail Gas in California’s Low-Carbon Future](#).

10 California Public Utilities Commission. (2020). Rulemaking 20-01-007, [Order Instituting Rulemaking to Establish Policies, Processes, and Rules to Ensure Safe and Reliable Gas Systems in California and Perform Long-Term Gas System Planning](#).

Section 1: Reducing Gas Demand Isn't Enough

All ratepayers are vulnerable to the rising cost of gas infrastructure. As gas demand drops, gas infrastructure must be right-sized to avoid putting Californians at risk. Strategic trimming, or localized decommissioning, of gas infrastructure is the clearest path to managing costs. California's communities, climate, economy, and health depend on it.

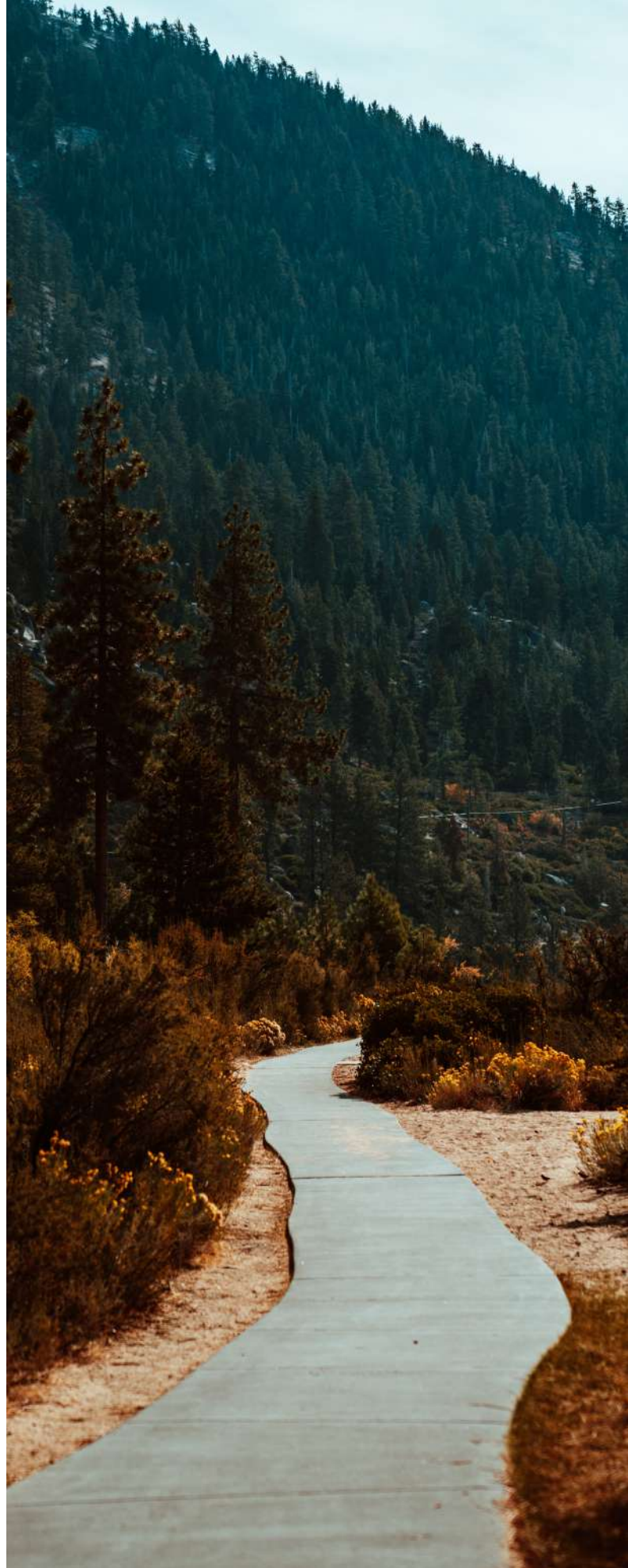
As gas demand declines, the costs and risks connected to gas system infrastructure begin to rapidly increase. Gas and dual-fuel utilities must maintain the safety and reliability of an already risky system to continually mitigate risks of leaks or disastrous explosions. However, the cost of maintaining the system (e.g., monitoring, repairing, and replacing pipelines), will increase in relation to how much the utility is delivering to customers. This means the cost of each gas unit delivered will increase, and potentially very rapidly. As the cost per unit of gas increases, more and more ratepayers will leave the system and seek alternatives, placing these increased costs on fewer homes and businesses. Without support, populations who are already financially vulnerable and energy-burdened will be left to carry the costs of a system in decline.¹¹

This section summarizes: 1) the cost, environmental, health, and equity benefits of geographically targeting gas infrastructure trimming; 2) the driving factors that might determine where to trim gas infrastructure; and 3) the current regulatory barriers to trimming the gas system.

THE CASE FOR STRATEGIC TRIMMING OF THE GAS SYSTEM

Reducing gas demand, electrifying new buildings, and incentivizing communities to pursue electrification retrofits are core to the broader building decarbonization strategy in California. However, strategic trimming of the existing gas system will be an equally critical component to delivering a cost-effective transition that also delivers equity, health, safety, and environmental benefits to all Californians. Historically, the objectives of clean energy and energy efficiency programs have been achieved in a system-wide, piecemeal manner—with success measured by the number of participating households or the total energy saved across a region or statewide. The gas transition, in comparison, will necessitate targeted, strategic trimming and localized decommissioning of gas infrastructure.

¹¹ The Greenlining Institute. (2019). [Equitable Building Electrification: A Framework for Powering Resilient Communities](#).



Strategic trimming will be essential in ensuring customer affordability and reducing ratepayer burden. With geographically targeted electrification, a section or entire neighborhood could be transitioned off the gas system, consequently saving costs by reducing the number of gas distribution pipelines that must be maintained throughout the transition (see Figure 1). Thus, this paper focuses on the value of targeted geographic electrification to trim sections of the distribution system.

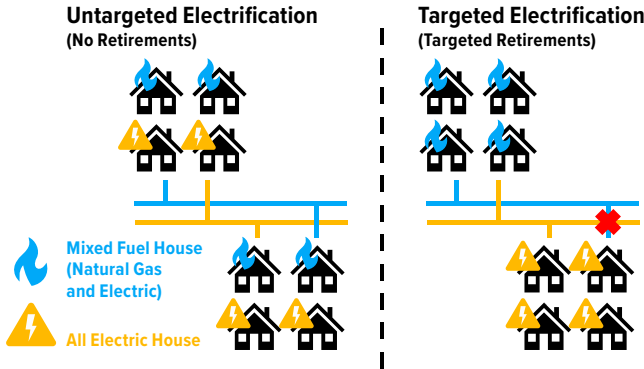


Figure 1: “Two Gas System Futures With and Without Targeted Electrification”. [The Challenge of Retail Gas in California’s Low-Carbon Future](#), Energy and Environmental Economics, Inc., California Energy Commission, April 2020. This paper refers to “untargeted electrification” as “piecemeal” in nature.

Ratepayer Costs

Investments into the gas distribution system are not always prudent investments moving forward. In many cases, investments in replacing or repairing gas pipes will be simply creating additional stranded assets. A new gas pipeline might have an engineering life of up to 80 years, but California has committed to achieving economy-wide carbon neutrality in 30 years.¹² Therefore, new gas assets—and many

existing ones—will likely cease to be “used and useful” before the end of their engineering life and before their cost is recovered from ratepayers.¹³ So, as portions of the gas system come to require repairs or upgrades, utilities should aim to shut down those portions rather than continue investing in what will become an obsolete gas system.

The monetary benefits of such a managed gas transition are well established; for example, the Environmental Defense Fund estimates up to a 500 percent cost difference between a managed and an unmanaged gas transition.^{14,15} Gridworks has identified a suite of policy, investment, and planning needs to manage cost risk of the gas transition.¹⁶ Energy and Environmental Economics, on behalf of the California Energy Commission, has estimated that a managed and targeted approach to gas system retirements will reduce gas system costs by \$4 billion in 2050.¹⁷

Trimming achieves ratepayer savings by reducing gas utilities’ operations and maintenance and capital investment costs. Every year, gas utilities in California spend almost \$3.5 billion in operations and maintenance (O&M) costs plus capital reinvestments to ensure safe and reliable gas service.¹⁸ Reducing these costs would lessen the rate impacts on remaining gas customers.

In addition, whole-house electrification of neighborhoods, providing households with a suite of energy efficiency, renewable energy, demand response, and storage, can provide a cost-effective non-pipeline alternative.¹⁹ Solutions to address harder-to-electrify industrial end uses should be pursued in parallel, so that the little remaining gas infrastructure in California’s future can be prioritized for these sectors until cost-effective alternatives are available.²⁰ Especially where non-pipeline alternatives exist, the state and utilities should partner to trim gas infrastructure in a cost-effective way and invest in electric infrastructure, which will deliver long-term benefits and cost-savings to communities.



12 Payne, Heather. (2020). [The Natural Gas Paradox: Shutting Down a System Designed to Operate Forever](#), Maryland Law Review, 80.

13 Environmental Defense Fund. (2021). [Aligning Gas Regulation and Climate Goals: A Road Map for State Regulators](#).

14 Energy and Environmental Economics, Inc., California Energy Commission. (2020). [The Challenge of Retail Gas in California’s Low-Carbon Future](#).

15 Environmental Defense Fund. (2021). [Aligning Gas Regulation and Climate Goals: A Road Map for State Regulators](#).

16 Gridworks. (2020). [California’s Gas System in Transition: Equitable, Affordable and Decarbonized](#).

17 Energy and Environmental Economics, Inc. (2020). [The Challenge of Retail Gas in California’s Low-Carbon Future](#).

18 Ibid.

19 Definition: Non-pipeline alternatives, or NPAs, “are the gas equivalent of non-wires alternatives in the electric utility context... NPAs fall into two categories: those which address peak-day constraints, such as demand response programs, CNG or LNG and those which address total annual customer demand, such as energy efficiency programs and fuel switching programs like targeted electrification”. [Aligning Gas Regulation and Climate Goals: A Road Map for State Regulators](#), Environmental Defense Fund, p. 20. The California Low-Income Weatherization Program has shown, particularly in multifamily situations, a suite of solutions can provide beneficial bill impacts while electrifying.

20 Environmental Defense Fund. (2021). [Aligning Gas Regulation and Climate Goals: A Road Map for State Regulators](#).

California Gas Ratepayers: Core and Non-Core

California's gas system distinguishes between two main customer groups: 1) core customers, which refers to residential and small commercial customers; and 2) non-core customers, which tend to be industrial and large commercial customers, including electric generation plants using gas.²¹ Core customers depend on their utility for the procurement of fuel and its delivery and transmission to the end use of their business or home. Though greatly outnumbering non-core customers, core customers only consume about 35 percent of the gas delivered by California's gas utilities.²² Non-core customers procure fuel independently but use the utility infrastructure for delivery.²³ Non-core customers consume about 65 percent of the gas delivered by utilities.

It may be difficult to move non-core customers away from their pipeline. Customers that include hard-to-electrify industries, or electric generation, may depend on pipelines longer, which might impact the cost-effectiveness of trimming connected distribution systems. Further, the rate structures and economics for these two customer classes differ greatly, impacting how quickly certain ratepayers may be financially incentivized to move off the pipeline.

Vulnerable Communities

Strategic trimming can also help reduce the risk to communities from the volatile costs expected throughout the gas transition. Whole swaths of customers are already at risk of utility service disconnection, an estimated 800,000 per year according to The Utility Reform Network, and cannot absorb additional anticipated costs from the gas transition.²⁴

Low-income residential customers spend over three times more of their income on energy than non-low-income households and have limited or no disposable income or property ownership position to make the investment of switching from gas to electric.²⁵ Furthermore,

moving off gas often requires more than an appliance switch out. It may require panel and electrical upgrades or other home infrastructure and safety updates. Mitigating costs in the transition of low-income residential customers off the gas system will be critical.

In addition to low-income residents, residents of environmental and social justice communities (ESJ) and disadvantaged communities (DAC) face both economic and financial challenges. These populations carry the added cost and burden of disproportionately higher health and safety impacts from the state's pollution. For these customers, collectively referred to as vulnerable communities in this report, the benefits of gas infrastructure trimming are even more salient, and can be expanded and maximized by geographically targeting electrification. These communities are poised to capture the greatest health, economic, quality of life, and resiliency benefits of departing an energy system set to experience variable and increased costs.

Due to historical disinvestment and social, racial, environmental, and financial discrimination, vulnerable communities will need substantial financial support in this transition. This is critical for addressing long-standing inequity and preventing future harm to these residents and communities, and for achieving state climate goals. One-third of investor-owned utility (IOU) residential customers are enrolled in the California Alternate Rates for Energy (CARE) program, which provides a low-income qualified rate. Given the level of energy burden statewide and the likely cost of the gas transition, more low- and moderate-income residents could experience financial insecurity and should have access to CARE or similar rate assistance. In 2014, CalEnviroScreen reported over 9.3 million Californians lived in communities that were identified as "disadvantaged." If facilitated through early education, investment, and strong partnerships with community-based organizations (CBOs), electrification efforts in these communities can uplift and empower low-income and historically disadvantaged customers to realize the full health and environmental benefits of climate action.



21 Ibid.

22 California Public Utilities Commission. (2020). [Natural Gas and California](#).

23 Gridworks. (2020). [Gas Infrastructure Planning Report](#).

24 The Utility Reform Network. (2021). [Keep the Lights ON! Request to Fund Utility Customer Debt Relief](#).

25 Energy Institute at U.C. Berkeley's Haas School of Business, Next 10. (2021). [Designing Electricity Rates for An Equitable Energy Transition](#).

Vulnerable Communities: Many Communities, Many Definitions

This report uses the term “vulnerable communities” to encompass the intersecting ways in which communities and their members are disproportionately experiencing negative impacts by climate change, economic, social, and energy systems.^{26,27} In using “vulnerable communities,” this report recognizes designations formally used and recognized in existing programs, such as low-income criteria,²⁸ Disadvantaged Communities as identified by the California Environmental Protection Agency pursuant to Section 39711 of the Health and Safety Code,²⁹ and Environmental and Social Justice Communities,³⁰ and “vulnerable community” as identified pursuant to section 71340(d) of the Public Resources Code. As defined by the state, Disadvantaged Communities DACs suffer from a combination of economic, health, and environmental burdens including poverty, high unemployment, air and water pollution, presence of hazardous wastes, and high incidence of asthma and heart disease. Environment and Social Justice (ESJ) communities cover a broader definition, covering most DACs as well as low income, tribal, and environmental justice metrics. This report uses the term, “vulnerable communities”, to recognize those communities and their members that experience the same injustices but may not be recognized by these or any other formal designation.

Environmental, Health and Safety Benefits

Trimming gas infrastructure will deliver critical environmental, climate, health, and safety benefits to all Californians more quickly than reducing overall gas throughput alone.

In terms of environmental impact, trimming gas infrastructure will hasten the reduction in greenhouse gas emissions from California buildings. Recent studies have shown that methane is a greenhouse gas that is both damaging to the environment, as a contributor to climate change, and for communities, in terms of air quality and public safety.³¹ It is expected that the health and air quality impacts of methane leakage can often be even worse than a coal generation plant, and that transitioning California residential and commercial buildings off the gas distribution system will reduce roughly 10 percent of state greenhouse gas (GHG) emissions.^{32,33}

Additional safety concerns related to deteriorating gas infrastructure also include earthquake-related threats and the detrimental health impacts of gas appliances (cooking ranges and space and water heating units), which have been shown to lead to in-home pollutant concentrations that exceed federal and state outdoor air quality standards.³⁴ Retiring gas pipelines and storage areas that might leak gas will advance state climate goals while making communities safer and more resilient.

FACTORS IN PRIORITIZING TRIMMING OF GAS INFRASTRUCTURE

Determinations of where and when to trim gas infrastructure are complex, and additional research and analytics are needed—in coordination with gas, electric, and dual-fuel utilities—to understand where the prime opportunities are for gas infrastructure decommissioning. Several factors can help determine where and how to trim gas infrastructure, including the level of pipe, age and maintenance schedule, customer end uses, and value to existing core customers. Identifying the overlap of feasible decommissioning sites with state vulnerable communities will also be critical.

Level of Pipe: Transmission and Distribution

A primary factor determining the necessity of certain gas infrastructure is whether a pipeline is part of the high-pressure gas transmission system or the lower-pressure gas distribution system. Gas transmission pipelines make up the backbone pipelines that transport gas across the state of California to distribution pipes. Distribution pipelines serve broad swaths of customers on the gas system, run directly to serve large-volume, non-core customers, such as for industrial purposes.

Age and Maintenance Costs

When determining where to begin trimming gas infrastructure, the CPUC and utilities must consider when and where gas transmission and distribution pipes are due for repair or replacement. This information should be publicly disclosed and readily available, to ensure investments are prudent and cost-effective and in line with targeted electrification and gas decommissioning goals. Section 3 discusses these opportunities in more detail, as an important funding pool for the gas transition and electrification could come from the avoided costs of gas infrastructure maintenance and replacement.

26 California Public Utilities Code. PUC § 71340.

27 State of California Governor’s Office of Planning and Research, Integrated Climate Adaptation and Resiliency Program. (2018). [Defining Vulnerable Communities in the Context of Climate Adaptation.](#)

28 California Department of Housing and Community Development. [Income Limits.](#)

29 California Public Utilities Commission. Disadvantaged Communities.

30 State of California Government Code. GOV § 65040.12.e.

31 [Union of Concerned Scientists.](#) (2020). [The Gas Index Report.](#)

Further, natural gas is proving to be a less manageable emission than coal due to methane leakage.

32 [Union of Concerned Scientists.](#) (2014). [Environmental Impacts of Natural Gas.](#)

33 California Air Resources Board. (2020). [2020 Edition: California Greenhouse Gas Emissions for 2000 to 2018.](#)

34 Rocky Mountain Institute, Mothers Out Front, Physicians for Social Responsibility, Sierra Club. (2020). [Health Effects from Gas Stove Pollution.](#)

Customer End-Uses

Gas is piped in and delivered for a myriad of uses in the California economy. Homes use gas for space and water heating, cooking, and clothes drying. Businesses use it for kitchens, laundry units, and space and water heating. Larger enterprises and industries may also pipe in gas for their own on-site power generation. Lastly, large electric power generators use gas to deliver electricity to millions of Californians every day.

In general, it will be much easier to retire sections of gas distribution pipelines serving residential and small commercial customers than for larger enterprises and industrial users, as the latter may not have as many available or cost-effective alternatives to gas. Further, it should be noted that communities, in particular ESJ and DAC communities, impacted by industrial air pollution, may often share a distribution line with or rely on a transmission line that also serves harder-to-electrify commercial or industrial customers.³⁵ This dynamic issue both complicates and necessitates providing a solution that targets and relieves the disproportionate risk that vulnerable communities bear.

Societal and Equity Impacts

Utilities and the CPUC should consider carefully how the long-term planning and management of the gas system is likely to exacerbate historical and ongoing inequities and injustices across California, many caused and upheld by the current energy system.³⁶ The transition of the gas system will have broad and enduring effects. It should be viewed as an opportunity to begin to reverse past injustices and historical divestment of certain communities and build a stronger and more resilient energy system for all California communities. Unmanaged, this transition will do further harm to already struggling communities. Alternatively, ensuring a responsible wind-down of the gas system in conjunction with electrification can provide material health, safety, economic, and resiliency benefits.



EXISTING BARRIERS TO TRIMMING GAS INFRASTRUCTURE

Obligation to Serve

In efforts to motivate utilities to invest in decommissioning lines and replacing energy services with electrification, uncertainty continues to prevail around the gas utilities' "obligation to serve."³⁷ The concept of "obligation to serve," referred to in the Public Utilities Code, requires utilities to serve all customers, and at just and reasonable rates.³⁸ Existing law does not specify that a service must be replaced by the same fuel, and it can be argued that the CPUC and utilities already have the authority to substitute electric service for gas service. However, precedent and practice has not yet proven this pathway.³⁹

Early Replacement Cost-Effectiveness

Utilities should consider the remaining book value of gas pipelines when determining where to trim infrastructure. In general, pipes that have already been fully depreciated in cost, such that utility customers were able to fully benefit from the investment, can be retired earlier. Decommissioning gas pipelines that have a high remaining value presents a funding and financing challenge, as the dwindling remaining gas customer base would have to cover the cost of early decommissioning. To overcome this barrier, the CPUC should work with utilities to identify pipes nearing retirement that can be decommissioned without a loss to the utility and ratepayers. Additional non-ratepayer funding streams will inevitably need to be identified to subsidize some early decommissioning of gas assets.

Access to Gas Planning Information

Currently, utilities provide mapping data of transmission pipelines, but do not provide the granular data on the location, condition, or status of distribution pipes. It is critical that the CPUC work with utilities to collect more granular gas infrastructure data and share it publicly with stakeholders to provide for a transparent and robust planning process. This includes identifying: the location of local transmission and distribution pipes; the condition of pipes; the timelines by which existing gas assets will be depreciated; where gas pipes are due for repairs or replacements (and at what scale); and which gas pipes serve vulnerable communities.⁴⁰ This information is critical to identify and prioritize gas infrastructure trimming in a cost-effective, efficient, and equitable way.

35 Environmental Justice communities are often burdened by, among other potential variables, poor air quality and pollution levels due to proximity to polluting industrial zones and transportation hubs. We expect that ESJ communities will likely, in many cases, share distribution or transmission line delivery with hard-to-electrify industrial customers as a result. For more information on Environmental Justice and industrial pollution, see: California Environmental Justice Alliance. (2018). [CalEnviroScreen: A Critical Tool for Achieving Environmental Justice in California](#); The Tishman Environment and Design Center at The New School. (2019). [Local Policies for Environmental Justice: A National Scan](#); CALmatters. (2020). ['Trying to breathe'—as CA toasts environmental win, pollution still plagues](#).

36 For more information, see: Tufts University, ScienceDaily. (2019). [Racial inequality in the deployment of rooftop solar energy in the United States, study finds](#); Fournier, E.D., et al. (2020). [On Energy Sufficiency and the Need for New Policies to Combat Growing Inequities in the Residential Energy Sector](#) (including report summary); California Center for Sustainable Communities at UCLA. (2020) [Clean energy revolution may leave disadvantaged communities behind](#); GreenTechMedia. (2020). [What Is the Clean Energy Industry Doing to Confront Racism?](#)

37 Resolution of "obligation to serve" may provide a unique opportunity for dual-fuel utilities to shift investments within the corporation; it would not naturally resolve the disincentive to electrify still experienced by gas-only utility business models.

38 California Public Utilities Code. [PUC § 451](#).

39 Wallace, N., Zerbe, A., Wara, M. & Sivas, D.A., Stanford Law School, Mills Legal Clinic, Environmental Law Clinic. (2020). [Removing Legal Barriers to Building Electrification](#).

40 Gridworks. (2020). [Gas Infrastructure Planning Report](#).

Section 2: Electrification as the Flipside to the Gas Transition

Just as it is costly to simply reduce gas demand and not decommission a pipeline, electrification must be approached as a whole-house endeavor across communities that are good opportunities for strategic gas trimming. The transition must be grounded in community, address local priorities, empower local leadership, and build demand for high-quality jobs. Only then will electrification be a cost-effective and equitable decarbonization solution.

Electrification can provide efficiency, safety, resiliency, and increased level of energy services. To be the most cost-effective and equitable solution in the gas transition, electrification must be: 1) targeted and whole-house, 2) community-led, and 3) supported by local high-road workforce development.

Meeting these criteria and supporting local community organizations will require additional funds and resources. These funds should be justified as community investments that help address historical disinvestment, and that provide the stimulus needed to catalyze the transition. Local workforce development means investing in outreach, training, and providing family-supporting wages. However, a model of electrification that fully incorporates local experience, priorities, and needs will leverage trusted networks and ensure relevance to community members. Such an approach can lead to higher quality installations, strong program coordination, faster roll-out, and ultimately a stronger economy and healthier community.⁴¹ Electrification can either represent an investment that improves whole communities and solves for the challenges of the gas transition, or a solution that fixes only one problem, in isolation of others.

TARGETED WHOLE-HOUSE ELECTRIFICATION

Electrification as the alternative to gas end uses must happen in a geographically targeted whole-house approach. A single remaining gas use, necessitating the use of a section of pipeline, will incur enormous costs on the remaining customer(s). To allow for the decommissioning of a section of pipeline, and removal of the long-term costs associated with maintaining that pipeline, electrification must reach every gas end



41 The Greenlining Institute. (2019). [Equitable Building Electrification](#).

use in every home and building on that section of the system. In other words, no end use on a given section of pipeline gets left “behind.” As such, targeted whole-house electrification challenges the way the clean energy and decarbonization programs are predominantly implemented.

The electrification movement is grounded in the same policies that have formed the foundation of the well-established and successful energy efficiency, conservation, and renewable energy programs. Historically, the objectives of these clean energy and energy efficiency programs are achieved on a system-wide basis, generally valuing a kWh or therm saved or offset, no matter where the location. These programs provide a forceful precedent in the development of electrification efforts, with many similar market transformation tools such as rebates or incentives, workforce development, and education and marketing. These approaches will remain valuable in building the markets that support electrification broadly. However, if electrification is to be the primary alternative to gas end uses, the deployment of electrification must mirror and support the strategic trimming of the gas system.

Implementation models will need to be much more localized and comprehensive in nature, knitting together programs, trades, and practices from across the building industry: heating, cooling, and ventilation practices; weatherization and energy efficiency; electrical and panel upgrades; plumbing modifications; electric distribution grid readiness; and renewable energy. Utility coordination will also be necessary to ensure grid readiness. As gas planning identifies opportunities for trimming, electric utilities can also plan for new electric loads. Few program models and policies support the level of coordination and integration that programs require for achieving whole-house retrofits at scale. Such integration is required for building electrification to meet the localized needs of a managed gas transition.



Impactful Pilots that Deliver Benefits and Data

Pilots are a common approach to testing out and learning new ways of doing things. Pilots present a crucial opportunity to demonstrate immediate value for all stakeholders involved. Pilots should strive to serve three main objectives: (1) directly and immediately benefit participants, (2) provide real-world implementation data, and (3) boost market transformation efforts. The San Joaquin Valley Affordable Energy Pilots are a positive starting point for electrification in disadvantaged communities and will be critical to informing future generations of pilots.

Pilots should immediately benefit participants. If supported properly to cover upfront costs and absorb unforeseen costs, participating households and their residents will unlock the benefits of electrification immediately, without the risk or cost of “going first.” Pilots can subsidize training and hands-on experience for workforce development, additional support to permitting offices, and customer service to resolve any concerns or questions about the installation, operation, or performance of new equipment.

Secondly, pilots can provide real-world implementation data to inform policymakers and other communities in their electrification efforts. Valuable data can include the scopes of work required to achieve whole-house electrification, the hard and soft retrofit costs associated with workforce and labor learning curves, permitting processes and costs, timelines, program and technical issues, and customer experience, including bill impacts, technology performance, and quality of energy services provided by electric equipment. Pilots, ideally, should be conducted on a community-wide scale as an example of electrification that can support trimmings of sections of the gas system, and therefore include a diversity of end uses, from single-family and multifamily housing to small business and commercial entities.

Lastly, pilots help boost market transformation efforts. Pilots in single family and especially in multifamily housing will support sales of residential heat pump space and water heating technology, electric laundry appliances, and electric (in particular, induction) cooktops. Pilots can grow consumer confidence in induction cooking and heat pump technology, develop contractor and installer confidence in emerging technologies, and address other known market transformation challenges. Scaling up pilots quickly and robustly will be critical to meeting state GHG emissions reduction goals by 2045.

For more information on the San Joaquin Valley Pilots, see the [CPUC website on the San Joaquin Valley Proceeding](#).

COMMUNITY-LED

A targeted approach to electrification is inherently a local deployment effort. Following a stakeholder engagement framework and supporting the leadership of vulnerable communities (not just elected officials, but community leadership in the form of trusted community-based organizations) will ensure that community members are welcomed and empowered to guide the process.⁴²

The coordination, resourcing, and implementation of community-wide whole-house electrification will require the support of local stakeholders. A thoughtful and robust community engagement process will allow the community to determine if, how, and when electrification and transitioning off gas can be done in a way that supports local priorities and needs. The Greenlining Institute's Equitable Building Electrification Framework provides a proven set of principles and processes to ensure community priorities and needs are met and recognized through any electrification efforts.⁴³ The San Joaquin Valley Affordable Energy Proceeding and resulting pilots exemplify that putting communities in the driver's seat will result in important trust-building and locally relevant, climate-resilient outcomes.⁴⁴ Through a stakeholder engagement process that partnered with local community-based organizations and brought CPUC Commissioners to the involved communities, eleven of the thirteen communities elected electrification solutions to replace their wood and propane uses.

Finally, resourced community-based organizations and local governments are best positioned to develop and deploy tailored solutions in their communities. Local groups and agencies bring the perspective of being the first line of defense providing support services related to health and safety, rent and displacement, and economic and financial insecurity. They are already trusted in the community, and therefore are the most effective program implementers. Their involvement and leadership will be required to help community members navigate the complex work of whole-house electrification and related health and safety needs likely to be uncovered in the process.

LOCAL HIGH-ROAD WORKFORCE DEVELOPMENT

Finally, targeted electrification provides an opportunity for local economic development and building family-supporting jobs. The electrification work described above will require a workforce made up of many trades, from electricians to plumbers, installers, and energy system consultants. It will require updated training on new technologies, safe handling of refrigerants, and coordination to ensure energy systems work together to deliver a safe and healthy home. Further, it will require a sufficient workforce across California to meet the needs of the gas transition, wherever pipes are set to be replaced by targeted electrification.⁴⁵

The above labor needs present an opportunity for high-road workforce development. This approach means 1) ensuring the local workforce has the updated technical and project skills to meet new market needs; 2) expanding access to job opportunities to local residents and populations underrepresented in the trades; and 3) meaningfully partnering with labor unions and community-based organizations to bolster local benefits to the workforce and its community.⁴⁶ The development of high-road jobs promotes building demand in a way that supports and provides for a highly valued workforce, resulting in higher family-supporting wages, a stronger cycle of local economic growth, and high-quality installations and successful deployment of electrification.

High-Road Workforce Development

A recent report by Inclusive Economics, "High-Road Workforce Guide for City Climate Action," provides an accessible and actionable guide to high-road workforce development. It states:

"High-road workforce development (HRWD) has two objectives: 1) improve the quality of jobs so that they are better able to support worker economic self-sufficiency, upward mobility, and overall welfare; and 2) increase access to jobs for people who need them most and who have been historically excluded from career-track, family-sustaining employment. The goal of HRWD is to pursue progress on both objectives simultaneously."

"Workforce development can transform local economies by delivering several interrelated benefits: more competitive businesses, greater economic mobility for residents, and increased regional economic growth. In the context of climate action, workforce development can contribute to GHG emissions reductions, while simultaneously improving economic opportunities for residents. HRWD is a uniquely powerful tool that can play three critical functions: successful implementation of climate plans, enhanced economic inclusion and equity, and broader community support for climate action."

Excerpt from: "High-Road Workforce Guide for City Climate Action." Inclusive Economics, as prepared for the American Cities Climate Challenge. April 2021.



42 Ibid.

43 Ibid.

44 California Public Utilities Commission. (2019). [San Joaquin Valley Affordable Energy Proceeding](#).

45 Inclusive Economics and the UCLA Luskin Center for Innovation. (2019). [California Building Decarbonization Workforce Needs and Recommendations](#).

46 Inclusive Economics, as prepared for the American Cities Climate Challenge. (2021). [High-Road Workforce Guide for City Climate Action](#).

Section 3: The Flipside— Strategies to Achieve Targeted Electrification

Successfully delivering targeted electrification to enable strategic trimming of the gas system requires diverse funding and implementation approaches. Different scenarios, based on community needs and gas infrastructure factors, afford unique financing and funding opportunities.

As Section 1 highlighted the gas system infrastructure is diverse—from type of pipeline, age and maintenance, customer end uses, to social and environmental justice objectives. These factors define the value, timeline, and cost-effectiveness of trimming certain sections of the gas system and providing electrification in its place. Such diversity requires multiple approaches. This paper organizes its recommendations under three strategies, each addressing unique policy, economic, social, and technical challenges, and opportunities to provide electrification as a solution to achieve an equitable and cost-effective gas transition.⁴⁷

- 4) Prioritize Investments in Vulnerable Communities
- 5) Accelerate Investments in Non-Pipeline Solutions
- 6) Reform the Regulatory Environment

PRIORITIZE INVESTMENT IN VULNERABLE COMMUNITIES

Vulnerable communities carry the highest risk of being left on the system longest with the least ability to absorb the likely costs. They have disproportionately suffered from the state's reliance on fossil fuels, the resultant poor air quality, and unequal access to clean energy and energy efficiency benefits, including healthy and affordable housing.⁴⁸ As a result, they stand to benefit the most from electrification.⁴⁹ This strategy is to ensure these communities are equipped avoid the risks and costs of the gas transition and receive the benefits of electrification first and foremost.

⁴⁷ These three strategies do not connote a sequencing but rather a differentiation of core opportunities (and challenges). The three strategies do not seek to address known and urgent safety threats, which must be addressed on their own timeline.

⁴⁸ The Greenlining Institute. (2019). [Equitable Building Electrification](#).

⁴⁹ For more, see: The Greenlining Institute. (2019). [Equitable Building Electrification](#). California Environmental Justice Alliance. (2018). [CalEnviroScreen: A Critical Tool for Achieving Environmental Justice in California](#).



Decision-makers must ensure that vulnerable communities are moved off the gas system first in a way that addresses community needs and priorities and defends these communities from the anticipated increased cost of gas throughout the transition. This not only begins to repair historical inequities and damages incurred by these communities but represents a critical and long-overdue investment in quality of life, public health, infrastructure, economic development, and environmental quality in these communities. Prioritizing these communities is also directly in line with a growing set of state policy goals, including SB 535 related to Disadvantaged Communities, passed in 2017, which creates tools for identifying and tracking metrics for vulnerable communities to inform proactive and directed policy and program support.

Vulnerable communities will need the most support, technically and financially, to overcome the costs and hurdles associated with targeted whole-house electrification. Resources such as technical assistance, outreach and training for residents and businesses, funding for trusted community-based organizations, strong incentive programs, and direct install programs can support community-led efforts to electrify. A full suite of protections should be tailored to address localized vulnerabilities, including rent and displacement protections. Local agencies and community organizations will need to be resourced for outreach and education tailored to community members' needs, in particular immigrant, non-English speaking, or Black and Indigenous communities. Lastly, it will be crucial to address the 65 percent of low-income Californians that are renters and have not reaped the benefits of clean energy and energy efficiency measures because of landlord-tenant split incentive challenges. Solutions must fit the needs of each locality and provide the most relevant and impactful financial and technical assistance.

Recommendations

Addressing targeted whole-house electrification and supporting the transition of vulnerable communities off the gas system will require financial, programmatic, legal, and regulatory action. The following recommendations constitute a first step for California state agencies, utilities, and program implementers to provide the level of support vulnerable communities will likely need to successfully transition off the gas system.

Provide resources and investment in trusted community-based organizations to lead and support a community-driven transition to electrification. Existing clean energy programs often provide funding for material equipment, technical assistance, and labor and installation, along with a broad education and marketing initiative. This approach ignores localized community priorities and needs within program planning and implementation. Resourcing trusted groups and local leadership makes it possible for communities to represent themselves in the planning and implementation processes of electrification work in their own neighborhoods.

Leverage successful direct install, integrated programs and approaches that provide subsidized comprehensive energy upgrades. For vulnerable communities, the state should be prepared to deliver substantial direct install incentives to cover the costs and navigational challenges of electrifying homes. Direct install efforts should be focused and prioritized to community members with the highest barriers to electrification, including multifamily, very-low income, and other vulnerable community members. To a great extent, these communities may not be able to take advantage of rebate-type incentives that require upfront payments for equipment, nor might they be able to afford appliances at a rebated price. Households will often



need simultaneous safety and health upgrades and panel and electric improvements. To provide bill savings in these instances, electrification will need to be integrated with efficiency, weatherization, and clean energy. Deeper home retrofits will likely be costly but investing in these historically underserved communities is needed to address long-standing inequities. Avoiding or delaying upfront investment will only result in greater public health, safety, and ratepayer costs down the line. The California Low-Income Weatherization Program is an established model for integrating program and funding sources into a comprehensive intervention that is resulting in household bill savings and improved quality of life for household members.

California's Low-Income Weatherization Program: A model for comprehensive programming

The Low-Income Weatherization Program (LIWP) is a successful model resulting in real energy cost savings for participants, providing electrification of low-income households combined with solar photovoltaic, weatherization, and efficiency retrofits. Funded by state greenhouse gas cap and trade funds, the program exclusively serves single family and multifamily low-income households and priority populations, such as disadvantaged communities. To overcome split incentive challenges, the program provides incentives based on greenhouse gas reductions with tenant-impacting improvements and investments garnering a higher level of incentive. The program currently has funding through June 2022, which is enabling investment into their Farmworker Housing Single-Family and Multi-Family program, but additional cap and trade funding has not been allocated since 2019.⁵⁰ Beyond LIWP, few programs have been successful in delivering electrification benefits to low-income and vulnerable communities in a whole-house fashion. Stable funding, such as long-term committed cap and trade funds, are needed to scale this effective approach.⁵¹

Partner with affordable housing and housing rights advocates to establish standard tenant protection and anti-displacement measures that state or local agencies can adopt to limit rent increases and restrict evictions. Making substantial efficiency or electrification investments in properties will inherently increase the property value but may add costs to tenants through rent increases. Especially in the case of whole-house electrification in vulnerable communities, tenant protections and anti-displacement measures must be in place to ensure that such investments do not trigger evictions or rent increases that result in displacement.⁵² Programs and funding to vulnerable communities for electrification should come with these protections—determined by and agreed to in partnership with local tenant and renters' rights advocates. Program criteria could include a statewide standard baseline tenant protection agreement that limits rent increases for a portion of the lifetime of the investment, and language that prohibits evictions for reasons related to the electrification investment.⁵³ While local governments often already have stricter rent controls and protections in place, a standard statewide tenant protection policy tied to all public funding and supported programs can provide more foundational protection. The San Joaquin Valley Pilots include some bill protection funds, and the Commission ordered the pilots to seek assurances from property owners to not increase rents or evict because of the home improvements; a workshop was ordered to further flesh out protections.⁵⁴ Incentive structures and tenant-landlord agreements should support property owner costs such to ensure those costs are not passed on to tenants.

Propose rate reforms that better align baseline energy needs and affordability for low-income and multifamily renter households.

The California Alternate Rates for Energy (CARE) provides discounted rates for qualified low-income households. However, CARE rates or standard all-electric rate options may not offer the same relief to an all-electric low-income or smaller multifamily household with lower energy demand than a standard household.⁵⁵ CARE discounts, in combination with other bill protection (i.e., a temporary limit on



50 California Department of Community Services & Development. (2021). [Low-Income Weatherization Program Fact Sheet](#).

51 California Housing Partnership. (2021). [Prioritizing California's Affordable Housing in the Transition Towards Equitable Building Decarbonization](#).

52 GRID Alternatives. (2019). [Presentation: San Joaquin Valley Pilots Tenant Protection Principles & SOMAH Case Study](#).

53 California Public Utilities Commission. (2018). [Opening Comments of The Greenlining Institute on The Proposed Decision Approving San Joaquin Valley Disadvantaged Communities Pilot Projects](#).

54 California Public Utilities Commission. (2018). Decision 18-12-015. Rulemaking 15-03-010. Order 12e. [Decision Approving San Joaquin Valley Disadvantaged Communities Pilot Projects](#).

55 The new E-ELEC rate in California supports most ratepayers making the switch to all-electric. Analysis shows that this benefit may not materialize for ratepayers on CARE rates or those living in multifamily environments: Sierra Club. (2021). [Efficient Electric Appliances Can Lower Your Energy Bills Today](#).

bill amounts), could also be calibrated to support fully electrified households by increasing the discount on electric rates over time. The CPUC should assess CARE rate discounts based on projected electric and gas bill trajectories, to ensure that any CARE customers who are not electrified upfront are also not burdened by rising gas bills. For any vulnerable customers who are unable to electrify early, the CPUC could increase gas CARE rates from their current 20 percent discount to 30–35 percent (the current electric CARE rate) until those customers are able to transition off gas.⁵⁶ A much more thorough analysis is needed of rate structures overall, and how gas and electric rates can and should interact to ensure rapid electrification as well as affordability.

ACCELERATE INVESTMENTS IN NON-PIPELINES ALTERNATIVES

Through a thorough and public planning process, such as that proposed by Gridworks, sections of pipeline could be identified for maintenance, repair, and replacement over their lifetime.⁵⁷ For some sections of pipeline it should be possible to project lifetime costs to maintain the infrastructure, which would help quantify the avoided cost if that pipeline were instead to be decommissioned. This strategy seeks to capture avoided costs that can instead be used to invest in a non-pipeline alternative, both supporting and accelerating the decommissioning of portions of the gas system.

With some runway, there is an opportunity to plan and provide neighborhood electrification as a non-pipeline alternative, by a certain date, to facilitate a planned decommissioning process. Certainty of date and investment (and investment savings) will provide both gas utilities and communities the opportunity to work toward the common outcome: strategic trimming of the gas system and targeted electrification (and the associated grid and circuit preparation). Assuming these timelines would be ample, as most planning processes look several years out, this can provide a runway to gather community, technical, and workforce resources for the transition.

Near-term regulatory support for a robust planning process that calculates the extent of the avoided cost, decommission costs, and electrification costs will be crucial. Further, utilities, particularly gas-only utilities, will need to be compensated and likely incentivized to support

such a process. Whether finding a way to provide anticipated return on investment, providing greater return on alternative investments, or providing an incentive to offset the loss of long-term returns from infrastructure investments, gas utilities will require support for their cooperation in pursuing the state's decarbonization goals.

Recommendations

Supporting and encouraging frameworks for utilizing avoided costs to invest in non-pipeline alternatives will require clear and robust regulatory action. It will involve changing the way gas assets and targeted electrification are identified, quantified, and proposed by the CPUC, and providing a clear incentive path to de-risk and properly mobilize utilities.

Non-Pipeline Alternative Proposal in ConEd

ConEd, a dual-fuel utility in New York, is thinking boldly about shifting its assets from gas to electric infrastructure. In a recent non-pipeline alternative (NPA) proposal, ConEd proposes that 100-percent of rate-based gas investments moving forward, including new safety and maintenance investments, must be evaluated against NPAs, including electrification. ConEd's framework proposes to recover costs associated with NPA deployment over a 20-year amortization period, treating these investments as regulatory assets. The 20-year period generally aligns with the lifetime of key alternative measures and allows customers to contribute to these costs through the electric rate base as the benefits of the investments are realized. ConEd proposes a very detailed plan for identifying gas infrastructure projects that can be deferred or replaced by alternatives. Examples of easy projects to be deferred would include those proposed just for load relief (which can be alleviated through electrification, demand response, and efficiency measures), regulator station upgrades (if evaluated against predicted declines in demand), and pipelines that are already targets for replacement due to leakage or other major maintenance. Additional grid and societal benefits can be assessed as part of valuing the NPA itself, as ConEd proposes, including coincidence with peak load, workforce impacts, coincidence with environmental or social justice communities, and more.⁵⁸



56 Velez, K., The Building Decarbonization Coalition. (2021). [California's Building Transition - Recommendations for Gas Transition Regulatory Proceedings at the California Public Utilities Commission.](#)

57 Gridworks. (2021). [Gas Infrastructure Planning Report.](#)

58 State of New York Public Service Commission. Case 19-G-0066, Proposal for Use of a Framework to use Non-Pipeline Alternatives to Defer or Eliminate Capital Investment in Certain Traditional Natural Gas Distribution Infrastructure, Consolidated Edison.

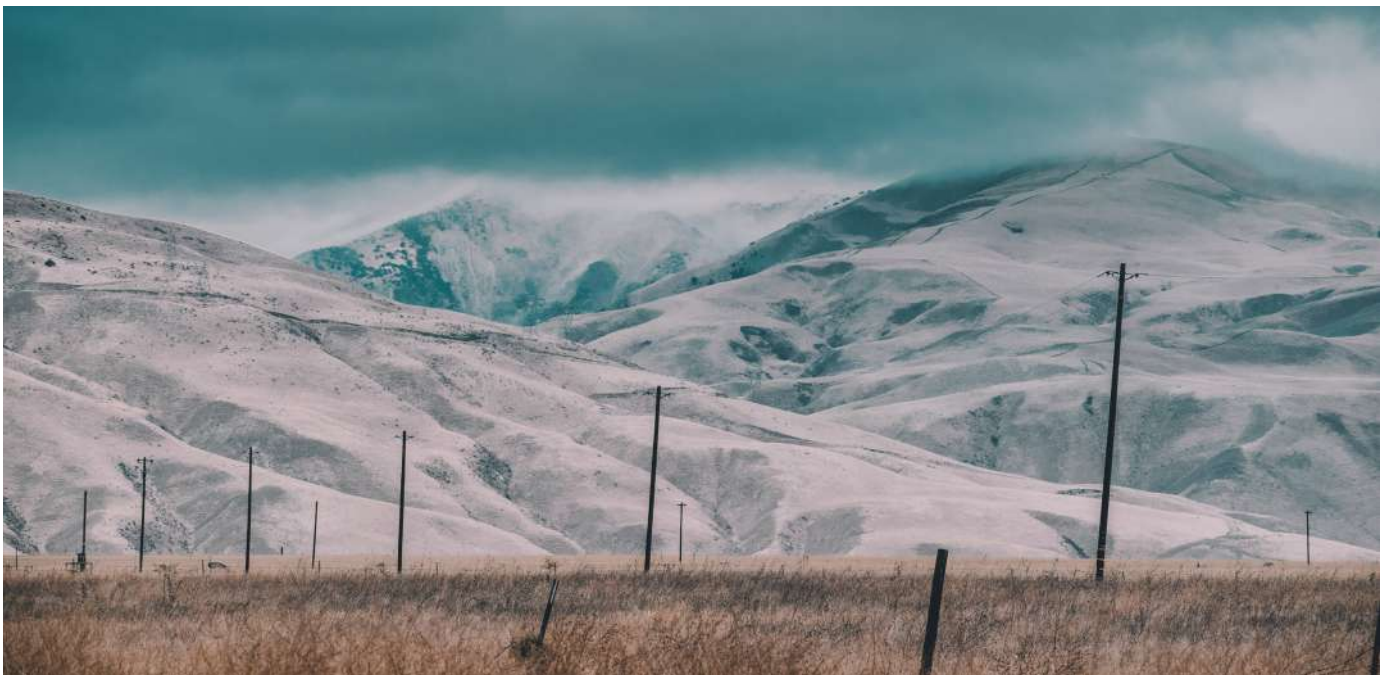
Initiate an interagency planning process to identify the long-term cost of maintaining, operating, and replacing sections of pipeline, and evaluate the total avoided cost that could be allocated toward non-pipeline alternatives. Avoided safety and maintenance investments should be tracked and repurposed as funding to cover the electrification retrofits in the neighborhood served by the decommissioned infrastructure.⁵⁹ Harnessing these avoided costs will require rethinking the way in which gas utilities recover costs for remaining assets and system costs. If deferred investments into gas infrastructure and proactive electrification are considered as a non-pipeline alternative (NPA), the state could allow utilities to earn a rate of return on other investments—such as their operational management of industrial efficiency or electrification measures—added to their rate base. Drawing from new research and early examples in other states such as New York, California could and should take a holistic approach to evaluating avoided costs of gas investment and use that deferred capital cost as a budget to fund electrification.⁶⁰

Revise utility incentive models to motivate gas utilities to support non-pipeline alternatives, invest responsibly in the transition, and to compensate them for their role in a successful transition. There are few, if any, successful working models that translate avoided infrastructure operation and maintenance costs into behind-the-meter investments. The California Integrated Distributed Energy Resources (IDER) proceeding sought to develop an incentive framework (Distribution Investment Deferral Framework) for electric utilities to defer grid investments in lieu of energy efficiency, renewable energy, storage, and demand response investments. The results have been mixed at best, but the lessons learned should be evaluated to support NPA frameworks.⁶¹

Any new incentive and investment structure will need to result in substantial early earnings opportunities for utilities, to overcome perceived risk and organizational change costs and to reward the continual effort to achieve the desired outcome (which could take years). Kicker or bonus incentives for achieving milestones—such as meeting or beating deadlines, providing additional community engagement and resources, or making substantial workforce development investments—may also smooth the transition. On the other end, penalties for missing multiple deadlines, or time limits on return of investment of infrastructure to be decommissioned, may also be required to ensure the transition happens promptly. More broadly, reform of the utility business model toward performance-based returns could help de-emphasize the dependence on infrastructure investment. Whatever the approach, a compelling incentive (and/or penalty) should be provided if the utilities are to see a benefit in even trying out the NPA strategy.⁶²

REFORM THE REGULATORY ENVIRONMENT

The California Public Utilities Commission's Long-Term Gas Proceeding (R.20-01-007) Phase 2 is scoped to assess rate dynamics that incentivize the transition, encourage investments in electrification market transformation, and establish key policies and drivers that dictate an accelerated move away from gas to electrification. This is the Commission's opportunity to signal and support a managed transition from the gas system, provide guidance around timelines, limit new gas infrastructure investments, and consider cost recovery models for remaining gas assets. This strategy seeks to create a new



59 Environmental Defense Fund. (2021). [Aligning Gas Regulation and Climate Goals: A Road Map for State Regulators](#).

60 Ibid.

61 Greentech Media. (2020). [California Struggles to Find Path for Solar and Batteries to Take Place of Traditional Grid Investments](#).

62 The incentive structure may be differentiated between dual-fuel and gas-only utilities, and that thoughtful solutions will be required to properly allocate costs and benefits between gas-only and electric utilities gaining new load.

regulated environment that prompts localized electrification efforts and transitions away from the gas system by aligning regulation and policy signals to support market evolutions and community-wide movement away from the gas system in line with state climate goals.

RECOMMENDATIONS

The following recommendations call on regulators and legislators to provide the clear guidance and direction for a long-term managed transition from the gas system to clean electricity.

Establish clear limits on gas infrastructure expansion and investments. The Environmental Defense Fund and Gridworks provide clear regulatory suggestions around drawing a “bright line” or a deadline after which no new unnecessary gas investments can be included in the rate base, and defining the criteria for investments to maintain a safe and reliable energy system.^{63,64} Regulatory guidance on such limitations sends a strong signal about the value of gas infrastructure, including informing how the CPUC evaluates ‘used and useful’ determinations after the “bright line” date. Such a policy would necessitate an end to all ratepayer-funded incentives that support installation of gas end-uses, such as gas efficiency measures, and be supported by any mandates ending the purchase of fossil fuel appliances.

Adopt accelerated gas infrastructure depreciation schedules. Recalibrating depreciation and cost-recovery schedules to better align with the remainder of a pipeline’s actual useful life (rather than an engineering estimate) will indicate when and if the operation and maintenance costs will exceed the investment in a non-pipeline alternative. Establishing decommissioning dates for existing assets will give both utilities and ratepayers certainty in their investments. Clarifying an end-date for the use and value of sections of the gas system will define the cost of maintaining the gas asset through the rest of its “adjusted” useful life, and therefore also the value of a non-pipeline alternative such as electrification investments.

Clarify obligation to serve policy coupled with a clear statement toward service that supports state policy objectives. Obligation to serve reform at the Legislature can be helpful to assuage some of the legal ambiguity. The Legislature could clarify utilities’ obligation to serve by granting the CPUC broad authority to 1) manage the transition, 2) reduce gas service territories, and/or 3) approve substitution of electric service for gas service, and 4) establish a process to identify and implement gas trimming opportunities. Alternatively, they could clarify that utilities’ obligation to serve refers to end-use services, regardless of the type of energy that supplies them. Addressing CPUC and utility concerns around “obligation to serve” and clear authorization and funding for more proactive, policy-driven electrification are needed to encourage and support utilities in managing the gas transition.

Establish pathways for creative finance, such as state-backed securitization. Securitization is an especially important tool for communities that might be ready to transition off gas before a scheduled decommissioning. Securitization would provide an opportunity to convert a utility’s remaining debt into much lower-interest ratepayer-backed bonds issued by the state. This provides utilities with guaranteed capital recovery, lowers costs for ratepayers, and minimizes shareholder exposure (low interest rates to bondholders, as opposed to high utility rate of return on the full asset value). Legislation would be needed to authorize utilities to charge ratepayers a fee to recover costs associated with the stranded assets.⁶⁵

Continue funding support for successful whole-house electrification models⁶⁶ as well as existing upstream, midstream, and downstream programs that provide market transformation value and workforce development. Resources and funding should shift to prioritize electrification efforts that fully electrify homes, particularly in communities set to be impacted by gas system decommissioning. Traditional programs, such as appliance- or technology-specific incentives, while piecemeal, are still valuable to drive market transformation and expand consumer adoption. Such programs can contribute to lowering the cost of eventual whole-house and neighborhood-wide electrification.



63 Environmental Defense Fund. (2021). [Aligning Gas Regulation and Climate Goals: A Road Map for State Regulators.](#)

64 Gridworks. (2021). [Gas Infrastructure Planning Report.](#)

65 Environmental Defense Fund. (2019). [Managing the Transition: Proactive Solutions for Stranded Gas Asset Risk in California.](#)

66 California Department of Community Services & Development. (2021). [Low-Income Weatherization Program Fact Sheet.](#)

Conclusion

Despite significant uncertainty, California is embarking on a journey away from gas. It is even clearer that the transition will only be truly cost-effective and equitable if it is led by strategic trimming of the gas system, enabled by targeted whole-house neighborhood electrification. This paper is an invitation to advocates, policymakers, and stakeholders advancing electrification efforts to align their efforts to support an equitable and managed transition away from the gas system.

All California communities can and should be supported in their transition to electrification. To achieve this, the state must prioritize funding resources for vulnerable communities and establishing regulatory tools and structures to pave the way for electrification investments to replace pipelines. This paper calls on the California Public Utilities Commission, the California Energy Commission, the Air Resources Board, and the Governor's Office to provide the regulatory reforms, financial resources, and leadership to ensure that electrification is both the most cost-effective and equitable solution to a decarbonized future.





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A Methodology for Geographically-Targeted Building Electrification for Environmental and Social Justice Communities in California

Prioritizing vulnerable communities in the transition away from natural gas

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List of Abbreviations

| | |
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| AB 1550 | California Assembly Bill 1550 |
| AEA | Association of Energy Affordability |
| AHSC | Affordable Housing and Sustainable Communities |
| CARE | California Alternate Rates for Energy |
| CCI | California Climate Investments |
| CDLAC | California Debt Limit Allocation Committee |
| CEC | California Energy Commission |
| CPUC | California Public Utilities Commission |
| CSE | Center for Sustainable Energy |
| CSGT | Community Solar Green Tariff |
| CSI | California Solar Initiative |
| DAC-GT | Disadvantaged Communities – Green Tariff |
| DAC-SASH | Disadvantaged Communities – Single-family Solar Homes |
| EPA | Environmental Protection Agency |
| ESAP | Energy Savings Assistance Program |
| ESJ | Environmental and social justice |
| HCD | California Department of Housing and Community Development |
| HUD | United States Department of Housing and Urban Development |
| LIFT | Clean Energy Low-Income Family and Tenants |
| LIHEAP | Low-Income Home Energy Assistance Program |
| LIHTC | Low-Income Housing Tax Credit |
| LIWP | Low-Income Weatherization Program |
| MASH | The Multifamily Affordable Solar Housing |
| MCE | Marin Clean Energy |
| NOAH | Naturally Occurring Affordable Housing |
| NPA | Non-pipeline alternative |
| NRDC | Natural Resources Defense Council |
| OEHHA | Office of Environmental Health Hazard Assessment |
| PG&E | Pacific Gas and Electric |

| | |
|----------|--|
| PM | Particulate matter |
| PSPS | Public safety power shutoff |
| RNG | Renewable natural gas |
| SASH | Single-family Solar Affordable Solar Housing |
| SCE | Southern California Edison |
| SDG&E | San Diego Gas and Electric |
| SoCalGas | Southern California Gas Company |
| SOMAH | Solar on Multifamily Affordable Housing |
| TCAC | Tax Credit Allocation Committee |
| TCC | Transformative Climate Communities |
| USDA | United States Department of Agriculture |

Introduction

This report proposes a geographical decision framework for the transition of buildings away from on-site natural gas combustion to all-electric infrastructure. Geographical electrification allows for a targeted retirement of the gas distribution infrastructure, i.e. decommissioning entire communities or distribution pipelines rather than individual households (Figure 1).¹ If a geographical approach is implemented in a cost-effective and equitable way, it can reduce utility expenditures on operations, maintenance, and replacement of aging infrastructure^{2,3} while also alleviating the financial and pollution burdens of environmental and social justice (ESJ) communities.⁴

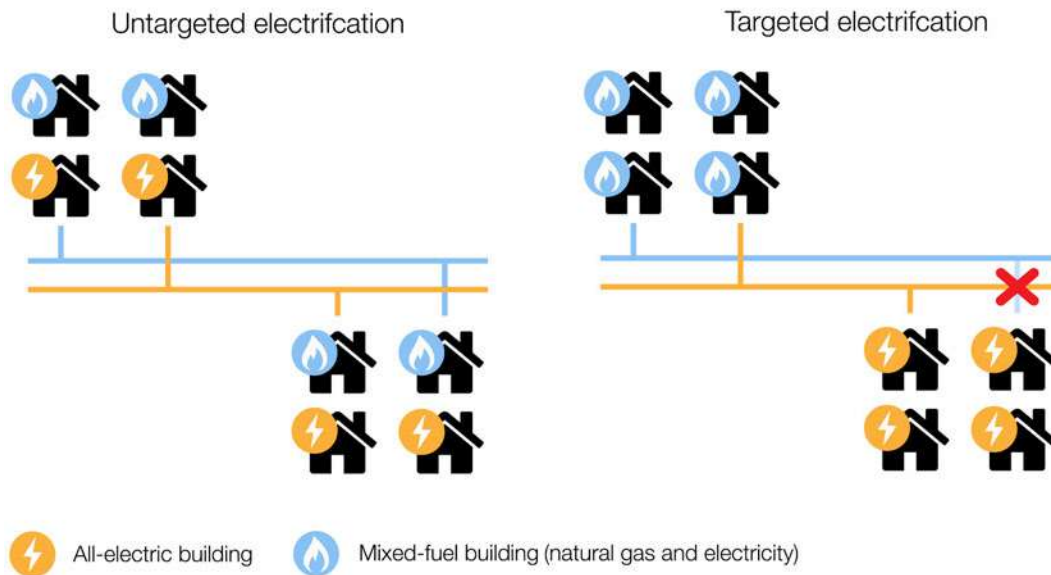


Figure 1: Untargeted vs targeted electrification (figure based on California Energy Commission, 2020).⁵

What is building electrification and why is it important?

California's building stock is responsible for 25% of the state's greenhouse gas emissions.⁶ In 2018, California established a goal for carbon neutrality by 2045.⁷ Because California's electricity supply is among the cleanest in the country, decarbonization experts agree that building electrification is one of the most viable and cost-effective strategies to achieve carbon neutrality.⁸ So far, 42 cities in California have adopted

¹ Common Spark Consulting (2021). *The Flipside Report: A White Paper on Targeted Geographic Electrification in California's Gas Transition*.

² California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

³ Sierra Club (2019). *Building Electrification Action Plan for Climate Leaders*.

⁴ Sierra Club (2019). *Building Electrification Action Plan for Climate Leaders*.

⁵ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

⁶ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

⁷ World Green Building Council (n.d.). *Climate champion California joins the Net Zero Carbon Buildings Commitment*.

⁸ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

building codes to limit natural gas use in new construction projects, including cities such as Berkeley and San Jose.⁹ However, these regulations do not address existing California residential properties, nearly 80% of which are currently connected to the natural gas system.¹⁰

In order to meet California's carbon reduction goals, the state will need to make significant investment in retrofitting existing housing stock. Many construction challenges are present in electrification retrofits, including the availability of all-electric equipment, construction and installation expertise, and the existing electrical infrastructure capacity in many California homes.¹¹ Electrical breaker panels often do not have sufficient amperage to run an entire home on electricity. In addition, homes built before 1978, when Title 24 came into effect, have a lower chance of being able to support the 240 volt electrical requirements of large appliances such as ovens, stovetops, water heaters, and clothes dryers.¹² When a natural gas appliance breaks down and the owner needs to replace it, these electrical infrastructure upgrades make an electric appliance replacement much less financially attractive than a natural gas appliance replacement. When an appliance breaks down, it is often time sensitive to find a replacement and to get the system operating again as normal. It is not always feasible to wait for electrical infrastructure upgrades to be carried out before getting a new appliance. The construction challenges associated with electrification retrofits require the state to plan ahead. Not replacing gas equipment upon failure slows down the transition to electricity and might cause expensive early retirement in the future when climate goal deadlines are much closer.¹³

Why do we need to focus on environmental and social justice communities?

The California Public Utilities Commission defines environmental and social justice (ESJ) communities as “communities where residents are: predominantly people of color or living on low incomes; underrepresented in the policy setting or decision-making process; subject to disproportionate impact from one or more environmental hazards; and likely to experience disparate implementation of environmental regulations and socioeconomic investments”¹⁴. According to The Greenlining Institute, “these communities, often largely composed of renters, have largely been left out of California’s push toward clean energy solutions”.¹⁵ Low-income ESJ communities might be exposed to financial risks caused by the costs of building upgrades and increased electricity rates in market rate affordable housing. In addition, ESJ communities are

⁹ Matt Gough (2021). *California's Cities Lead the Way to a Gas-Free Future*. Sierra Club.

¹⁰ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

¹¹ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

¹² NRDC, Olivia Ashmoore (2020). *Policy Pathways to Zero-Emissions Buildings*.

¹³ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

¹⁴ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

¹⁵ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

disproportionately exposed to public health risks due to higher pollution burdens, caused by historic decisions around locating shared infrastructure such as highways and power plants.

Environmental justice and community advocates have warned that landlords may pass on the cost of building upgrades to tenants, therefore making housing less affordable and furthering gentrification in communities. There is currently no regulatory or statutory protection to prevent building owners from evicting current tenants in order to rent to more affluent tenants.¹⁶ The split incentive problem, in which building owners pay for improvements but renters get the benefit of reduced utility bills, is exacerbated by California's housing crisis, where demand surpasses supply.¹⁷ In addition, the UCLA Institute of the Environment and Sustainability found that "whole house electrification programs are likely to exacerbate daily peak electricity loads and increase total household expenditures on energy", and states that "low-income residents of disadvantaged communities, who have the least flexible work schedules, the least access to high-efficiency appliances and energy management systems, and inhabit the most poorly insulated housing stock, will be most adversely affected by these changes".¹⁸

According to The Greenlining Institute, in 2019, 45% of Californians were renters and about 25% of Californians were renters living on low to extremely low incomes.¹⁹ Renters and low-income households might experience additional financial burdens due to limited agency over when and how their households transition to electricity.²⁰ If electrification drives down demand for natural gas, ESJ communities could become some of the last remaining customers served by the gas utility and could end up bearing the burden of large utility bills to cover the high fixed costs of the natural gas infrastructure.²¹ Equitable electrification policies must be put into place to protect low-income households from high and unpredictable utility bills as infrastructure transitions from natural gas to electricity.

A final factor to take into account when designing equitable electrification policies is the potential impact on public health, including outdoor and indoor air pollution. Burning natural gas indoors in an equipment closet or on a stovetop releases nitrogen oxides and particulates, which can have long-term health effects (especially for children and the elderly) such as triggering asthma attacks, decreasing overall lung function, and increasing chances of serious respiratory illness.²²

¹⁶ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

¹⁷ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

¹⁸ Eric Daniel Fournier (2020). *Implications of the timing of residential natural gas use for appliance electrification efforts*. Environmental Research Letters.

¹⁹ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

²⁰ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

²¹ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

²² The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

According to the Natural Resources Defense Council (NRDC), “gas appliances in rental housing are older than appliances in owned housing and many are far older than their predicted life expectancy”.²³ For example, half of space heating appliances in rental housing are 20 years old or older, while we assume a usable life of 15-20 years.²⁴ Heat pumps have advantages in terms of comfort, safety, and health, so buildings with old gas equipment are good targets for electrification.²⁵ The California Public Utilities Commission (CPUC) developed an Environmental and Social Justice Action Plan in 2019, which lists among its goals to improve local air quality and public health for ESJ communities.²⁶ Prioritizing ESJ communities for electrification could have a positive impact on community health, as well as indoor and outdoor air pollution.

Why a geographically-targeted approach?

A geographically-targeted approach addresses exactly those communities who are most vulnerable to financial risks and pollution. In addition, targeted electrification has well established cost benefits. For an example targeted strategy, the California Energy Commission projects a reduction in gas system costs by \$4 billion annually in 2050 and by \$25 billion cumulatively in net-present value terms.²⁷ Geographical decommissioning and subsequent electrification reduces operation and maintenance costs of existing gas infrastructure and reduces investments in new and replacement infrastructure that will result in stranded assets.

Existing Energy Programs for Low-Income Households

There are many programs that address energy efficiency and building upgrades through financial incentives for low-income households and affordable housing developments. These programs are critical in providing financial support for vulnerable communities to deploy energy efficiency upgrades and to transition from natural gas to electricity. Below is a non-exhaustive overview of programs in California, which illustrates the plethora of programs at different levels with similar goals.

The **Low-Income Weatherization Program (LIWP)** is “the state’s first energy efficiency program that includes electrification designed specifically for Californians with low-incomes living in disadvantaged communities”.²⁸ It delivers greenhouse gas emission reductions and health, safety, and comfort upgrades.²⁹

The **California Solar Initiative (CSI)** was closed on December 31, 2016 because California did not deem it necessary anymore to provide direct incentives because a drop of equipment prices had transformed the

²³ NRDC, Olivia Ashmoore (2020). *Policy Pathways to Zero-Emissions Buildings*.

²⁴ NRDC, Olivia Ashmoore (2020). *Policy Pathways to Zero-Emissions Buildings*.

²⁵ AEA, Nick Dirr & Sheetal Chitnis (2020). *Multifamily Clean Heating Pilot: Summary of Project-level Analysis and Findings*.

²⁶ CPUC (2019). *Environmental and Social Justice Action Plan*.

²⁷ California Energy Commission (2020). *The Challenge of Retail Gas in California’s Low-Carbon Future*.

²⁸ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

²⁹ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

solar market.³⁰ However, CSI subprograms continue to provide incentives to low-income customers to install solar PV systems and to all utility customers to install solar water heating systems. The California Solar Initiative, along with the California Energy Commission's New Solar Homes Partnership (NSHP) and various solar programs offered through publicly owned utilities are part of Go Solar California.³¹ The CSI subprograms consist of several components which are grouped into two funding streams, depending on whether they use solar PV to reduce electricity consumption from the grid or solar thermal to reduce natural gas consumption.³²

PV solar programs include the following. The Single-family Solar Affordable Solar Housing (SASH) Program provides solar incentives to single-family low-income housing (administered through a statewide Program Manager, GRID Alternatives). The Multifamily Affordable Solar Housing (MASH) Program provides solar incentives to multifamily low-income housing (administered by Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and the Center for Sustainable Energy (CSE), in San Diego Gas and Electric's (SDG&E) service territory). The Disadvantaged Communities – Single-family Solar Homes (DAC-SASH) Program offers incentives for solar installations on owner-occupied, single-family homes. Other programs within this category are the Solar on Multifamily Affordable Housing (SOMAH) Program, the Disadvantaged Communities – Green Tariff (DAC-GT) Program, and the Community Solar Green Tariff (CSGT) Program. The thermal program for low-income households is called the CSI-Thermal Low-Income Program and provides incentives for solar thermal technologies to multifamily and single-family residential customers in PG&E, Southern California Gas Company (SoCalGas), and SDG&E service territories.

The **Energy Savings Assistance Program (ESAP)** provides “no-cost energy efficiency services and no-cost direct installation energy efficiency measures to income-eligible households via ratepayer funding”.³³

The **Low-Income Home Energy Assistance Program (LIHEAP)** is “a federally funded program that provides assistance to eligible low-income households with the goal of managing and meeting their energy costs and immediate home heating and/or cooling needs”.³⁴

The **Clean Energy Low-Income Family and Tenants (LIFT) Pilot Program** by Marin Clean Energy (MCE) combines health, habitability, and energy upgrades. In combination with MCE's existing Multifamily Energy Savings program, property owners can have up to 80 percent of the total project costs covered through the combined rebates.

³⁰ CPUC (n.d.). *California Solar Initiative*. <https://www.cpuc.ca.gov/general.aspx?id=6043>

³¹ CPUC (n.d.). *California Solar Initiative*. <https://www.cpuc.ca.gov/general.aspx?id=6043>

³² CPUC (n.d.). *California Solar Initiative*. <https://www.cpuc.ca.gov/general.aspx?id=6043>

³³ Southern California Gas Company (2019). *Energy Savings Assistance (ESA) Program: Impact Evaluation Program Years 2015-2017*.

³⁴ California Department of Community Services & Developments (n.d.). *Programs*. <https://csd.ca.gov/programs/>

The **California Alternate Rates for Energy (CARE) Program** provides low-income utility customers with a 30-35% discount on their electricity bill and a 20% discount on their natural gas bill. The program is available for customers of PG&E, SCE, SDG&E, SoCalGas, and other smaller utility companies.³⁵ According to Common Spark Consulting, bill protection programs like CARE should be expanded to address near-term rate impacts, and should increase the discount on electric rates over time to better support fully-electrified households, and should increase the discount on gas rates over time to protect customers unable to transition to electricity early.³⁶

According to The Greenlining Institute, many of these programs receive limited funding and the lack of program alignment creates a confusing landscape.³⁷ For example, LIWP has no guaranteed funding from the Greenhouse Gas Reduction Fund from year to year. In addition, LIWP is not coordinated with the utility-administered ESAP, which makes it almost impossible to combine both sources of funding on a single project.³⁸ The disconnect between energy and health programs that treat homes is a missed opportunity, as homes that need energy upgrades often also have other problems that need to be resolved before they can be treated. A referral loop among programs would assist owners in managing complex project timelines and requirements.³⁹

Existing Decarbonization and Electrification Frameworks

A number of organizations have put forward frameworks to support ESJ communities through the transition from natural gas infrastructure to electrified systems, including the Energy Research and Development Division of the California Energy Commission (CEC), The Greenlining Institute, RMI, and Common Spark Consulting. These frameworks provide crucial context to this report, as they illustrate the broad range of considerations when designing electrification policies with a focus on equity. While this report focuses on a few sub-strategies and guidelines of these frameworks, all considerations in these frameworks should be incorporated into equitable policy design.

California Energy Commission - The Challenge of Retail Gas in California's Low-Carbon Future

In *The Challenge of Retail Gas in California's Low-Carbon Future*, the CEC evaluated two scenarios that achieve an 80% reduction in California's greenhouse gas emissions by 2050 from 1990 levels: a high building

³⁵ CPUC (n.d.). *CARE/FERA Programs*. <https://www.cpuc.ca.gov/lowincomerates/>

³⁶ Common Spark Consulting (2021). *The Flipside Report: A White Paper on Targeted Geographic Electrification in California's Gas Transition*.

³⁷ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

³⁸ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

³⁹ The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

electrification scenario and a no building electrification scenario. In their study, they focus on three areas: technology options to decarbonize the natural gas system, implications for natural gas customers, and outdoor air quality and public health.⁴⁰ While the first area is out of the scope of this paper, we will also discuss the implications of electrification on natural gas customers (specifically low-income communities) and outdoor air quality and public health (specifically for areas vulnerable to public health risks). The CEC concluded that “building electrification is likely to be a lower-cost, lower-risk long-term strategy compared to renewable natural gas” and that “electrification across all sectors, including in buildings, leads to significant improvements in outdoor air quality and public health”.⁴¹

Based on their evaluation of the two scenarios, the CEC developed a set of eight strategies, divided into gas transition mechanisms and cost allocation mechanisms, which are laid out below. This paper will expand on strategies three and four because they are closely related to considerations of how we manage the transition from natural gas to electricity and which communities should transition first.

Gas transition mechanisms:

- 1) Reduce barriers to electrification. Current barriers include difficulty receiving permits and lack of experience installing heat pumps among contractors. Strategies to address these barriers include market transformation initiatives to lower costs and initiatives to enable low-income homeowners and renters to adopt electric equipment.
- 2) Avoid gas system expansion. By building communities without gas, we prevent adding additional obligations that will increase the cost of gas service for remaining customers.
- 3) Shut down uneconomic gas infrastructure to serve building loads. Targeted retirement of the gas distribution system saves costs in operations, maintenance, and replacement of aging infrastructure. It is difficult to identify geographies that are ripe for retirement and to successfully target electrification efforts.
- 4) Reduce costs of the existing gas system while ensuring safety and reliability. This can be achieved with geographically targeted electrification and gas system retirement. Derating of infrastructure (operating segments at lower pressures) can save costs in operation, maintenance, and reinvestment.

Cost allocation mechanisms:

- 5) Accelerated depreciation to recover investments in a shorter period of time. This can be justified because depreciation schedules should reflect the useful life of an asset, which is shortened as utilization decreases. The advantage is that this strategy reduces the remaining costs of the gas

⁴⁰ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

⁴¹ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

system by recovering investments sooner than the traditional useful lifetime. A disadvantage is that it increases near-time gas rates and gas utility revenue collection. Therefore, it needs to be combined with reduction in gas system expenditures and a long-term gas transition plan.

- 6) Change cost allocation. Increasing rates for remaining gas customers might make gas uncompetitive.
- 7) Recover gas system costs on the bills of electric ratepayers. This can be justified because the gas system was built for a stable long-term customer base. Customers that switch to all electric do no longer contribute to the system that was built on their behalf. Potential strategies are an exit fee or a competitive transition charge that is applied to the bills of all electricity customers. While this strategy promotes equity, it might discourage electrification, especially in the case of a lump sum exit fee.
- 8) Get additional funds from outside the gas system. Funding sources can be cap-and-trade revenues, state general funds, or decreased returns for utility shareholders.

The Greenlining Institute - Equitable Building Electrification

The Greenlining Institute developed a five-step framework for equitable building electrification focused on ESJ communities. This framework includes the following steps:⁴²

- 1) Assess the communities' needs, identify indicators, and set goals;
- 2) Establish community-led decision making;
- 3) Develop metrics and a plan for tracking clean energy benefits and community benefits;
- 4) Ensure funding and program leveraging;
- 5) Improve outcomes by setting up a continuous feedback loop and considering adjustments.

For each of these steps, The Greenlining Institute identifies a set of questions that policymakers should ask and lays out recommendations. To assess the communities' needs, identify indicators, and set goals, they also explain how to set goals that are strategic, measurable, ambitious, realistic, time-bound, and equitable. This framework provides important steps in addition to the framework developed in this report.

RMI - eLab Accelerator 2020

RMI is a nonprofit organization that works with businesses, policymakers, communities, and other organizations to decarbonize energy systems.⁴³ Their eLab (Electricity Innovation Lab) convenes energy practitioners to discuss energy transition problems.⁴⁴ The eLab Accelerator is a bootcamp where project

⁴² The Greenlining Institute (2019). *Equitable Building Electrification: A Framework for Powering Resilient Communities*.

⁴³ RMI (n.d.). *Get to Know Us*. <https://rmi.org/about/>

⁴⁴ RMI (n.d.). *ELab: Electricity Innovation Lab*. <https://rmi.org/our-work/electricity/elab-electricity-innovation-lab/>

teams bring their challenges and potential solutions to the table.⁴⁵ In 2020, the topic of the eLab Accelerator was electrification and natural gas decommissioning in Berkeley.⁴⁶ The team included leaders and scientists from the City of Berkeley, PG&E, the California Energy Commission, the California Public Utilities Commission, the California Housing Partnership, and the Natural Resources Defense Council. The team “developed draft criteria and methodology for identifying and prioritizing pilot locations with equity, emissions, safety, health, and economic considerations in mind”.⁴⁷ The pilot resulting from the bootcamp will include a focus on low-income households, the utility’s obligation to serve, and financial barriers created by regulatory constraints.⁴⁸

First, the pilot will include at least one low-income neighborhood that best serves to identify financial and nonfinancial costs, benefits, and barriers. The pilot will address the community buy-in process, create transparency around regulatory financial barriers, and identify multiple funding mechanisms to scale. Second, the pilot aims to address the limitations of decommissioning specific gas distribution lines due to the utility’s obligation to serve, because it is not guaranteed that customers in decommissioned zones will not want to resume service. Therefore, the team is considering a “No Reconnect Ordinance” for buildings that have discontinued gas service. In addition, the city of Berkeley intends to work with the California Public Utilities Commission to modernize the concept of “obligation to serve” to prioritize adequate service, instead of obligation to provide both electricity and gas. Third, the team aims to identify where resources and funding streams are misaligned due to regulations that prevent utilities from paying for electrification projects with gas capital investments.⁴⁹ As one of the first efforts in the United States to address the decommissioning of gas distribution infrastructure and multi-building electrification,⁵⁰ this multidisciplinary boot camp serves as a great example of the potential challenges and solutions in designing a geographical electrification approach.

Common Spark Consulting - The Flipside Report

Common Spark Consulting is an independent firm that provides consulting services in public and stakeholder engagement, policy research and advocacy, and organizational development and strategy.⁵¹ Common Spark Consulting developed *The Flipside Report: A White Paper on Targeted Geographic Electrification in California’s Gas Transition* for Building Decarbonization Coalition, an organization that “unites building industry stakeholders with energy providers, environmental organizations and local governments to help electrify California’s homes and workspaces with clean energy”.⁵² The Flipside Report focuses on the flipside

⁴⁵ RMI (n.d.). *ELab Accelerator*. <https://rmi.org/our-work/electricity/elab-electricity-innovation-lab/elab-accelerator/>

⁴⁶ RMI (n.d.). *ELab Accelerator 2020: Berkeley Electrification and Natural Gas Decommissioning Pilot*.

⁴⁷ RMI (n.d.). *ELab Accelerator 2020: Berkeley Electrification and Natural Gas Decommissioning Pilot*.

⁴⁸ RMI (n.d.). *ELab Accelerator 2020: Berkeley Electrification and Natural Gas Decommissioning Pilot*.

⁴⁹ RMI (n.d.). *ELab Accelerator 2020: Berkeley Electrification and Natural Gas Decommissioning Pilot*.

⁵⁰ RMI (n.d.). *ELab Accelerator 2020: Berkeley Electrification and Natural Gas Decommissioning Pilot*.

⁵¹ Common Spark Consulting (n.d.). *What We Do*. <https://www.common-spark.com/>

⁵² Building Decarbonization Coalition (n.d.). <https://www.buildingdecarb.org/>

of gas decommissioning—the need to proactively map out and manage an aligned, equitable, and cost-effective framework for targeted geographic electrification. The report proposes a three-phased approach for geographically targeted electrification:

- 1) Phase 1: Vulnerable communities. These communities should be prioritized, even if they overlap with the criteria of phases 2 and 3 or if they share distribution lines with industrial and large commercial customers.
- 2) Phase 2: Urgent safety and need-to-repair threats. In this phase, priority should be placed first on fully or nearly depreciated gas assets, then on assets with imminent and high-cost repairs and high priority safety replacement. An example of infrastructure that would be decommissioned in this phase is distribution lines that serve only residential and small commercial customers and that need mitigation of earthquake risk or methane leaks.
- 3) Phase 3: Viable and cost-effective ways to trim infrastructure. In this phase, the avoided cost of early decommissioning and discontinued maintenance should outweigh the upfront cost of proactive electrification.

The approach should be guided by four core principles:⁵³

- a) Providing vulnerable communities with financial support for building upgrades, engaging them in the decision making process, protecting them from eviction, and ensuring high performance of new appliances.
- b) Develop pilots that are cost-effective in the immediate future to quickly reduce ratepayer burdens, that demonstrate their value as market transformation opportunities, and that help grow consumer confidence in emerging technologies.
- c) Develop a methodology to collect and analyze quantitative and qualitative data to inform future programs.
- d) Engaging upfront with labor unions and workforce advocates for a just transition of the gas workforce and for full utilization of pilots as opportunities for training and workforce development.

Proposed Geographical Electrification Framework

In this report, we propose a methodology for the prioritization and selection of neighborhoods for a geographically-targeted electrification approach. There are many challenges to creating a geographical decision framework, including how to determine which neighborhoods should transition first, what neighborhood characteristics or data will be used to select communities, how to identify distribution

⁵³ Common Spark Consulting (2021). *The Flipside Report: A White Paper on Targeted Geographic Electrification in California's Gas Transition*.

branches of the natural gas system that are strong candidates for retirement,⁵⁴ and how to successfully achieve electrification projects in the selected areas.⁵⁵ Our geographically-targeted framework draws upon the physical natural gas transmission and distribution infrastructure, community health risk and pollution burden, and low-income communities.

Key Considerations

In order to identify neighborhoods for prioritized electrification, we consider the physical infrastructure of the investor-owned utility natural gas system and community characteristics such as pollution burden and income level. We will use gas utility's transmission and distribution pipeline maps, the California Housing Partnership Affordable Housing map, and CalEnviroScreen to identify areas that are vulnerable to health risks and financial impacts.

Gas Infrastructure

To achieve a geographically-targeted approach to electrification, natural gas branch infrastructure needs to be identified that could be decommissioned independently of the natural gas system at large. We are targeting natural gas distribution branches that serve dedicated neighborhoods or areas, and that do not provide a through-path to other portions of the city. This approach is also called pruning, trimming, or zoning of the gas infrastructure. Branches that meet this criterion are identified as good candidates for independent decommissioning.

There are two types of gas pipelines: transmission lines and distribution lines. The crucial distinction between these two types of pipelines is the type of customers they serve. Transmission lines are high-pressure pipelines that mostly deliver gas to large-volume, noncore customers, such as electric generators, industrial customers, and large commercial customers. These transmission lines supply gas to distribution lines, which are lower-pressure pipelines that deliver gas to noncore customers who are not served by the transmission network, and to core customers, such as residential and small commercial customers.⁵⁶

Noncore customers are often more difficult to electrify than core customers. These “hard-to-decarbonize” sectors might benefit from the use of renewable natural gas (RNG), a resource that will likely remain too limited and expensive to decarbonize the building sector.⁵⁷ Therefore, initial efforts to decommission gas infrastructure are likely to be focused on distribution lines rather than transmission lines. However, limited data is publicly available on the distribution infrastructure of PG&E and SoCalGas.

⁵⁴ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

⁵⁵ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

⁵⁶ CPUC (n.d.). *Natural Gas and California*. https://www.cpuc.ca.gov/natural_gas/

⁵⁷ RMI, Mina Lee & Sherri Billimoria (2021). *Eight Benefits of Building Electrification for Households, Communities, and Climate*.

While the San Francisco Bay Area in Northern California is served by PG&E, a utility company that provides both gas and electric service, the Los Angeles Area in Southern California is served by SoCalGas, a utility that provides exclusively gas service. As a result, both areas might experience different levels of adoption or resistance from the utilities as efforts start to shift towards gas infrastructure decommissioning and subsequent electrification, and therefore, they will require different strategies.

Public Health

This methodology considers communities with high health risks due to vulnerabilities caused by outdoor air pollution. Communities with high exposure to outdoor pollutants will likely also experience increased levels of air pollutants indoors, due to the direct connection between outdoor and indoor air quality.⁵⁸ The CalEnviroScreen pollution burden metrics are used to identify communities with significant pollution burdens. Targeted funding for identified areas in support of the transition to electricity will reduce the production of combustion pollutants in the outdoor and indoor environments, improving air quality and resulting in positive impacts on community health.

Low-Income Communities

Additional funding needs to be provided to support low-income communities through the transition from natural gas to all-electric infrastructure to prevent these communities from being the last remaining customers served by the natural gas system. We are proposing to use CalEnviroScreen to identify qualified communities.

Methodology

In this section, we will outline our methodology to identify priority neighborhoods during the electrification transition. Our process includes the following steps:

- 1) Use CalEnviroScreen to identify areas of interest. This can be based on the overall CalEnviroScreen results or specific indicators, such as prevalence of asthma, concentration of ozone and PM2.5, and housing-burdened low-income households.
- 2) Use natural gas pipeline maps to identify branches that serve only a small, dedicated area and thus could be decommissioned independent of the larger system.
- 3) Use the Affordable Housing Map to understand the locations of affordable housing developments and prioritize the electrification of these tenants to prevent risk of high natural gas utility bills in the future.

⁵⁸ EPA (n.d.). *Report on the Environment: Indoor Air Quality*. <https://www.epa.gov/report-environment/indoor-air-quality>

- 4) Use the Affordable Housing Map to identify the vintage of an affordable housing development. Give priority to older developments which may have older, less-efficient appliances resulting in increased energy costs to tenants and higher risk of indoor air pollutants.

Input Parameters

We used the following input parameters to identify neighborhoods for priority electrification: natural gas pipeline maps from two large investor-owned utility gas providers in California, Pacific Gas and Electric (PG&E) and Southern California Gas Company (SoCalGas), the Affordable Rental Housing Benefits Map from the California Housing Partnership, and CalEnviroScreen.

PG&E - Gas Pipeline Map

Pacific Gas and Electric (PG&E) is the company that delivers natural gas and electric service to approximately 16 million people in a 70,000-square-mile service territory throughout northern and central California, from Eureka to Bakersfield.⁵⁹ This report uses a map of PG&E's gas transmission pipelines.⁶⁰ While PG&E has a map with electric distribution circuits that indicates the number of residential, commercial, and industrial customers for each circuit,⁶¹ we could not find similar data on PG&E's gas distribution infrastructure.

SoCalGas - Gas Pipeline Map

Southern California Gas Company (SoCalGas) is the company that delivers natural gas to approximately 21.8 million people in a 24,000-square-mile service territory throughout central and southern California, from Visalia to the Mexican border.⁶² This report uses a map of SoCalGas' gas transmission pipelines and high-pressure distribution pipelines⁶³ to locate current gas infrastructure in that area. The SoCalGas map does not include low-pressure distribution lines, which would give a more detailed picture of how gas is transported to individual homes.

California Housing Partnership - Affordable Rental Housing Benefits Map

The California Housing Partnership is a private nonprofit organization that acts as a trusted advisor for nonprofit and local government partners as well as elected officials to create and preserve sustainable affordable housing.⁶⁴ The Affordable Rental Housing Benefits Map is a tool that provides "quantitative estimates of social and economic benefits of affordable housing for individual residents and families,

⁵⁹ PG&E (n.d.). *Company Profile*. https://www.pge.com/en_US/about-pge/company-information/profile/profile.page

⁶⁰ PG&E (n.d.). *Explore our Natural Gas Transmission Pipeline Map*.

⁶¹ PG&E (n.d.). *Solar Photovoltaic (PV) and Renewable Auction Mechanism (RAM) Program Map*.

⁶² SoCalGas (n.d.). *Company Profile*. <https://www.socalgas.com/about-us/company-profile>

⁶³ SoCalGas (n.d.). *Gas Transmission Pipeline Interactive Map*.

⁶⁴ California Housing Partnership (n.d.). *About Us*. <https://chpc.net/about-us/>

taxpayers, and the local economy”.⁶⁵ Affordable housing for low-income households is defined as housing for which the cost is no more than 30% of the gross household income. The California Department of Housing and Community Development defines low-income households as households who make less than 80% of the area median income.⁶⁶

The map contains detailed information on affordable housing with funding from the United States Department of Housing and Urban Development (HUD), the United States Department of Agriculture (USDA), and Low-Income Housing Tax Credit (LIHTC). The map also contains CalEnviroScreen 3.0, a Tax Credit Allocation Committee (TCAC) and California Department of Housing and Community Development (HCD) Opportunity Map, Federal Opportunity Zones, and California Assembly Bill 1550 (AB 1550) Low-Income Communities. At the time of writing, the property-level data was last updated on September 1, 2020.⁶⁷

CalEnviroScreen

CalEnviroScreen is a mapping tool developed by the California Public Utilities Commission that uses environmental, health, and socioeconomic information to help identify California disadvantaged communities. CalEnviroScreen defines disadvantaged communities as “areas throughout California which most suffer from a combination of economic, health, and environmental burdens”.⁶⁸

The tool uses data from state and federal government sources to produce scores for every census tract. Scores are determined for two groups of indicators, population characteristics and pollution burden, and higher scores indicate a higher prevalence of a given parameter.^{69,70} Population characteristics scores consist of sensitive population indicators such as occurrence of asthma, cardiovascular disease, and low-birth-weight infants; and socioeconomic factor indicators such as educational attainment, housing-burdened low-income households, linguistic isolation, poverty, and unemployment.⁷¹

Population characteristics related to biological traits, health status, and community can result in increased vulnerability to pollution.⁷² The pollution burden scores consist of indicators for exposure to ozone, particulate matter (PM) 2.5, diesel particulate matter, drinking water contaminants, pesticide use, toxic releases from facilities, traffic density, hazardous waste, and solid waste among others.⁷³

⁶⁵ California Housing Partnership (n.d.) *Affordable Housing Benefits Map*.

⁶⁶ Housing and Community Development (n.d.). *Income Limits*. <https://www.hcd.ca.gov/grants-funding/income-limits/index.shtml>

⁶⁷ California Housing Partnership (n.d.) *Affordable Housing Benefits Map*.

⁶⁸ CPUC (n.d.). *Disadvantaged Communities*. <https://www.cpuc.ca.gov/discom/>

⁶⁹ OEHHA (n.d.). *Maps & Data: CalEnviroScreen 3.0 Maps*. <https://oehha.ca.gov/calenviroscreen/maps-data>

⁷⁰ OEHHA (n.d.). *About CalEnviroScreen*. <https://oehha.ca.gov/calenviroscreen/about-calenviroscreen>

⁷¹ CalEPA & OEHHA (2017). *Update to the California Communities Environmental Health Screening Tool*.

⁷² OEHHA (n.d.). *Maps & Data: CalEnviroScreen 3.0 Maps*. <https://oehha.ca.gov/calenviroscreen/maps-data>

⁷³ OEHHA (n.d.). *CalEnviroScreen Overall Results and Individual Indicator Maps*.

In addition to looking at the overall pollution burden and overall population characteristics, this report focuses on three health indicators related to natural gas and two income characteristics related to low-income housing. The health indicators are asthma (nitrogen oxides and particulates released indoors due to burning of natural gas can cause asthma attacks), ozone (volatile organic compounds from the natural gas chain contribute to the formation of ozone)⁷⁴, and PM 2.5 (particulate matter is released when natural gas is burned). The income indicators are poverty (which means that the total income before taxes is less than the poverty level defined by the U.S. Census Bureau)⁷⁵ and housing burden (which means “households that are both low-income and highly burdened by housing costs”).⁷⁶

There are multiple definitions used by different utility and state government incentive programs to identify low-income communities for investment. Some programs use CalEnviroScreen, others identify low-income communities by the average area income. CalEnviroScreen has limitations and critiques, including the high-level nature of the data presented and the non-capture of “hyperlocal impacts”⁷⁷, the observation that the tool “may deprioritize rural and tribal lands”⁷⁸, the tool “does not incorporate climate impacts and resilience considerations”⁷⁹, and the tool omits “race and ethnicity indicators”.⁸⁰ Perhaps most importantly, some critics feel that the tool was developed without sufficient stakeholder engagement and discussion. This has caused some communities to feel “left out or insufficiently prioritized” by the tool if their community has not been identified as a qualified region for state investment.⁸¹

However, CalEnviroScreen is commonly used to allocate federal and state funds throughout the state of California, including the reinvestment of proceeds from the cap-and-trade market through the California Climate Investments (CCI) program broadly and the Transformative Climate Communities (TCC) program specifically.⁸² Because of its widespread use in California, and its use as a template for a federal mapping tool that the Biden administration is developing,⁸³ CalEnviroScreen was deemed the appropriate classification system to use for this study.

At the time of writing, CalEnviroScreen 4.0 was in the draft stage, so CalEnviroScreen 3.0 was used for the analysis. CalEnviroScreen 4.0 will contain more recent data, improved calculations of some indicators to

⁷⁴ Lesley Fleischman (2019). “How Does Natural Gas Production Contribute to Ozone Pollution?”. Clean Air Task Force.

⁷⁵ OEHHA (n.d.). *CalEnviroScreen Overall Results and Individual Indicator Maps*.

⁷⁶ OEHHA (n.d.). *CalEnviroScreen Overall Results and Individual Indicator Maps*.

⁷⁷ Aimee Barnes (2021). *Mapping Environmental Justice in the Biden-Harris Administration*. Center for American Progress.

⁷⁸ Aimee Barnes (2021). *Mapping Environmental Justice in the Biden-Harris Administration*. Center for American Progress.

⁷⁹ Aimee Barnes (2021). *Mapping Environmental Justice in the Biden-Harris Administration*. Center for American Progress.

⁸⁰ Aimee Barnes (2021). *Mapping Environmental Justice in the Biden-Harris Administration*. Center for American Progress.

⁸¹ Aimee Barnes (2021). *Mapping Environmental Justice in the Biden-Harris Administration*. Center for American Progress.

⁸² Aimee Barnes (2021). *How the Biden Administration’s Environmental Justice Mapping Tool Can Identify and Target Benefits to Disadvantaged Communities*. Legal Planet.

⁸³ Aimee Barnes (2021). *How the Biden Administration’s Environmental Justice Mapping Tool Can Identify and Target Benefits to Disadvantaged Communities*. Legal Planet.

better reflect environmental conditions or pollution vulnerability, and a new indicator for children’s lead risk from housing.⁸⁴

Analysis of San Francisco Bay Area and Adjacent Central Valley

This section looks at the overall CalEnviroScreen results, the pollution burden, asthma, ozone, PM 2.5, the population characteristics, poverty, and housing burden for the San Francisco Bay Area and the adjacent Central Valley region. Figure 2 shows the overall results of CalEnviroScreen, where red areas represent the highest percentiles of the overall score (indicating the most disadvantaged areas) and green areas are the lowest percentiles. The dots indicate affordable housing units funded by HUD, USDA, and LIHTC. Blue dots indicate units that have been placed in service and grey dots indicate units that have not been placed in service. The dark blue lines indicate the locations of PG&E’s natural gas transmission pipelines.

This map shows that disadvantaged areas are concentrated around the San Francisco Bay Area and in the Central Valley, and affordable housing is mostly located around the San Francisco Bay Area. To identify areas of interest, we can study indicators related to public health and income.

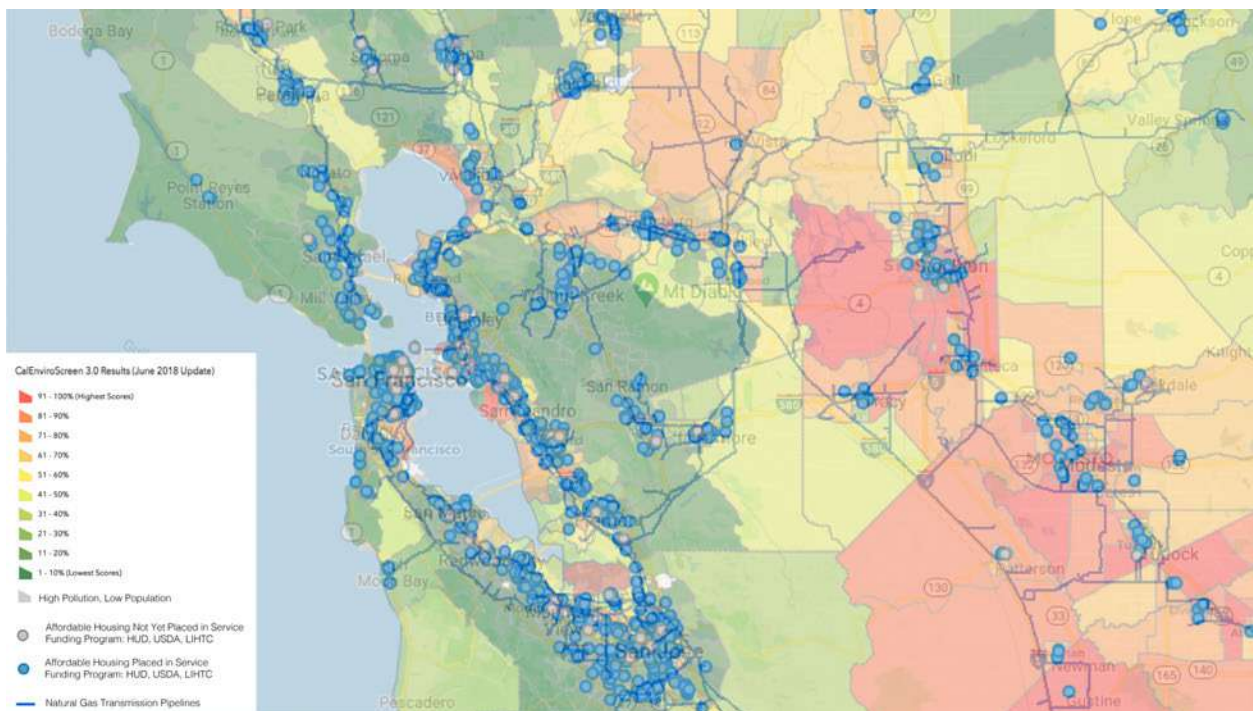


Figure 2: CalEnviroScreen **overall results**, affordable housing with funding from HUD, USDA, and LIHTC, and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.

⁸⁴ OEHA (n.d.). *Draft CalEnviroScreen 4.0*. <https://oehha.ca.gov/calenviroscreen/report/draft-calenviroscreen-40>

Public Health

Figures 3, 4, 5, and 6 show the CalEnviroScreen pollution burden, asthma occurrence, ozone concentration, and PM 2.5 concentration. On all maps, the darkest areas are regions most burdened by a particular indicator, and PG&E transmission pipelines are indicated by dark blue lines. In addition, Figure 4 shows the location of emergency departments and Figures 5 and 6 show the location of monitors used to measure ozone and PM 2.5 concentrations.

The pollution burden is highest for many of the same areas which have the highest overall CalEnviroScreen scores (Figure 2). However, asthma occurrence is more concentrated in the East Bay (Berkeley, Oakland, San Leandro, Hayward) and the northern Central Valley (from Vallejo in the west to Stockton in the east). Ozone and PM 2.5 concentrations are highest around Stockton, Modesto, and Turlock. This indicates that the Central Valley should not be overlooked in electrification efforts.

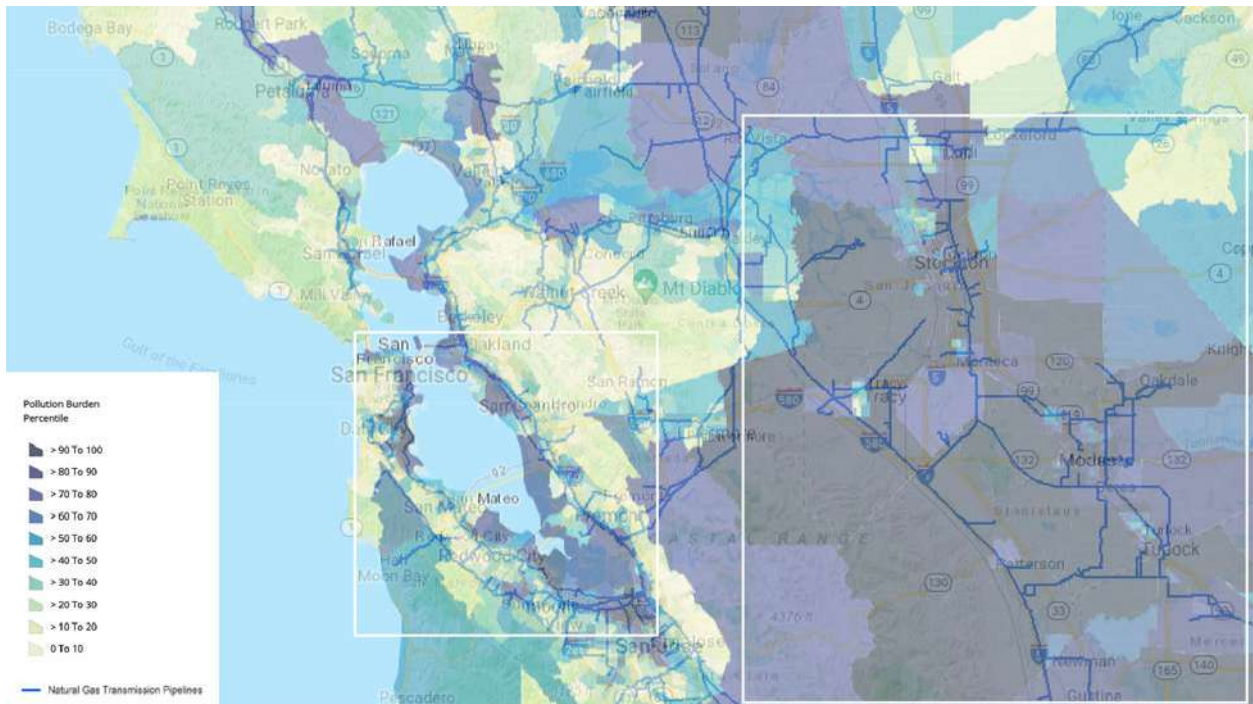


Figure 3: CalEnviroScreen **pollution burden** and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.

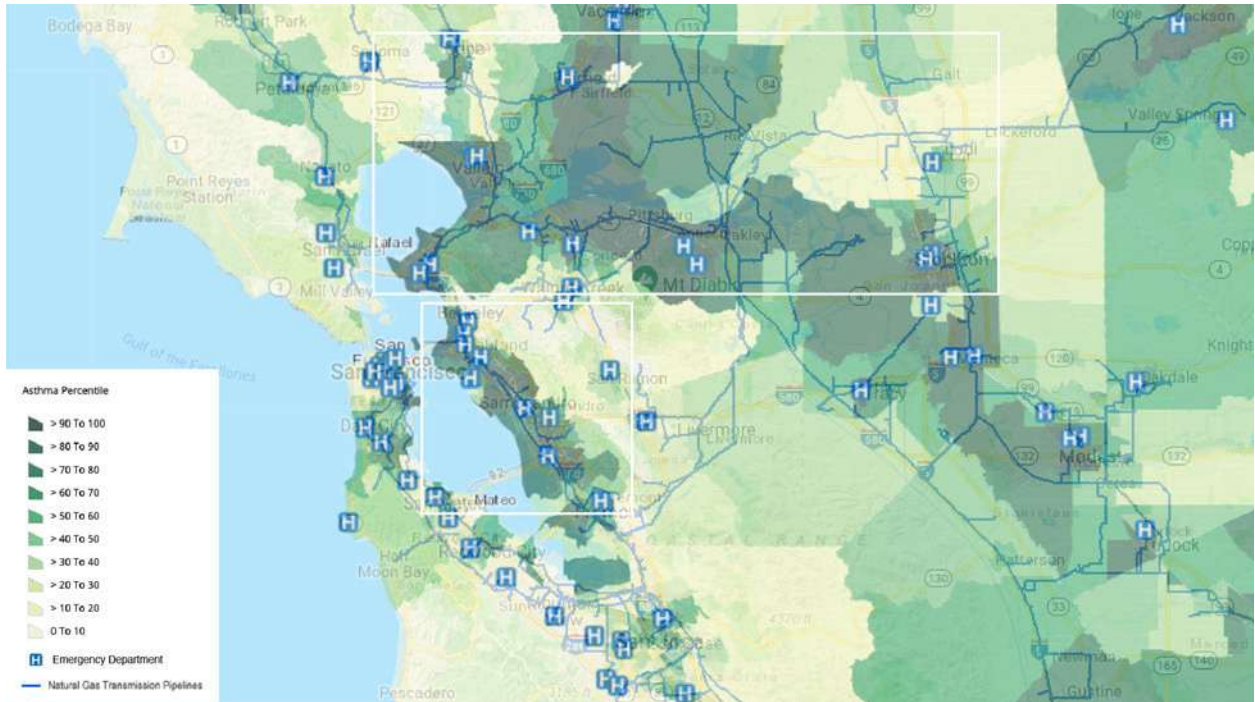


Figure 4: CalEnviroScreen **asthma** and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.



Figure 5: CalEnviroScreen **ozone** and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.

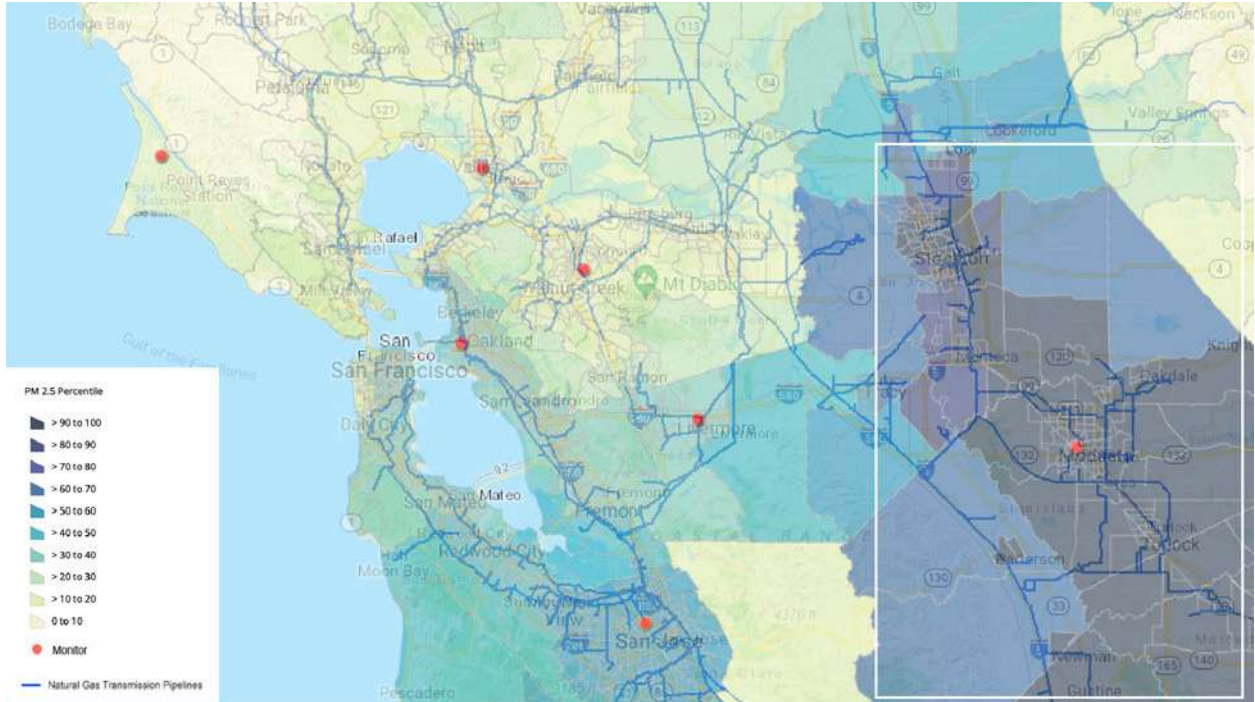


Figure 6: CalEnviroScreen **PM 2.5** and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.

Low-Income Communities

Figures 7, 8, and 9 show the CalEnviroScreen population characteristics, poverty, and housing burden. On all maps, the darkest areas are regions most burdened by a particular indicator, and PG&E transmission pipelines are indicated by dark blue lines.

The population characteristics again show that the most disadvantaged communities are located around the San Francisco Bay and in the Central Valley. However, the poverty and housing burden maps help us focus on communities that are particularly disadvantaged in terms of income and housing. Figure 8 shows a concentration of poverty around Stockton, Modesto, and Turlock in the Central Valley. Figure 9 shows that the housing burden is largest for people living in a few concentrated areas, including Oakland, San Jose, Stockton, and Modesto.

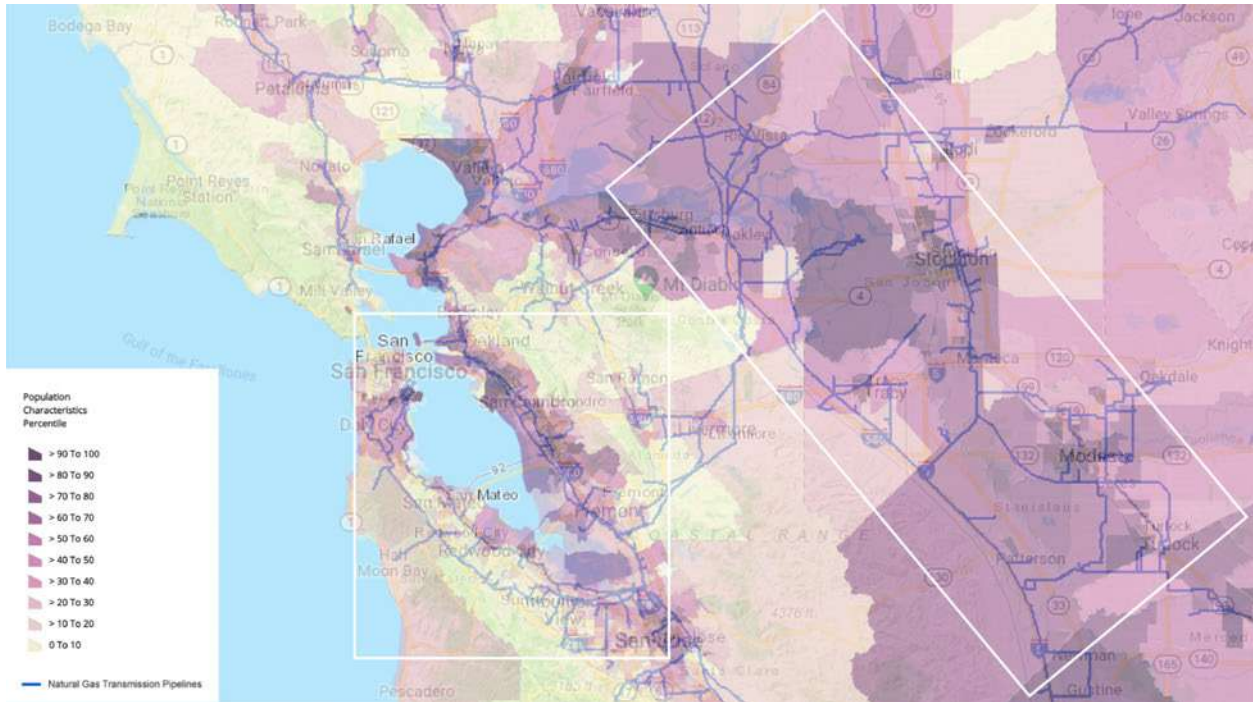


Figure 7: CalEnviroScreen **population characteristics** and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.

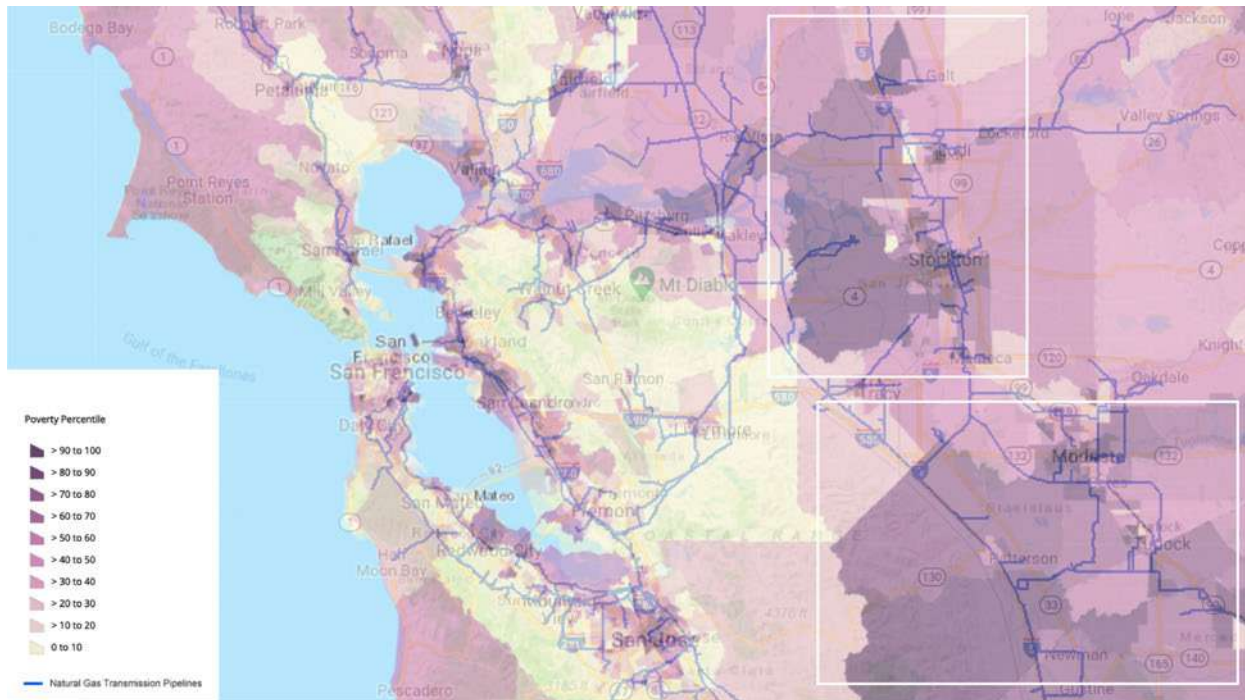


Figure 8: CalEnviroScreen **poverty** and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.

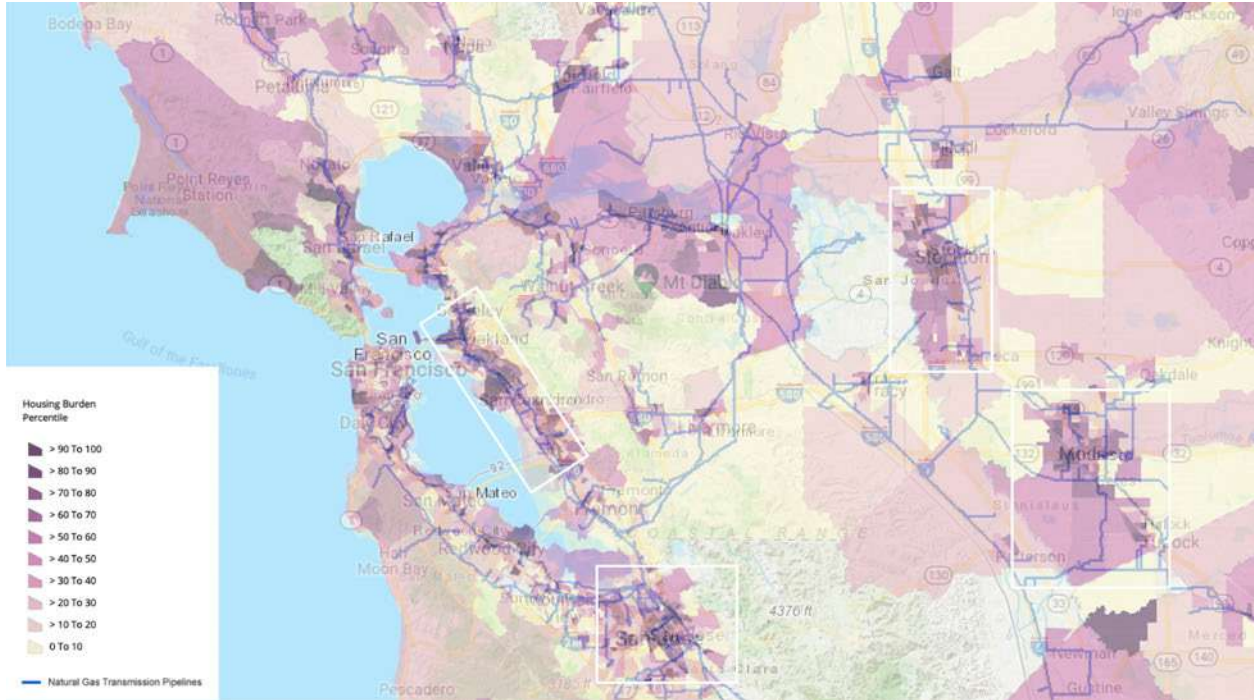


Figure 9: CalEnviroScreen **housing burden** and PG&E gas transmission pipelines in the San Francisco Bay Area and the adjacent Central Valley.

Case Study Central Valley: Stockton

Figure 10 uses Stockton as a case study of a geographically-targeted approach for electrification. Red areas are in the highest percentiles of the overall score (indicating the most disadvantaged areas) and green areas are the lowest percentiles. The dark blue lines are PG&E's gas transmission pipelines. The dots indicate affordable housing units funded by HUD, USDA, and LIHTC. Blue dots indicate units that have been placed in service (with the year they have been placed in service) and grey dots indicate units that have not been placed in service. While some older units are located on the periphery of Stockton, there is a clear concentration of affordable housing units in the center of the city, with years placed in service ranging from 1972 to 2019. This area has been indicated as a priority zone for electrification.

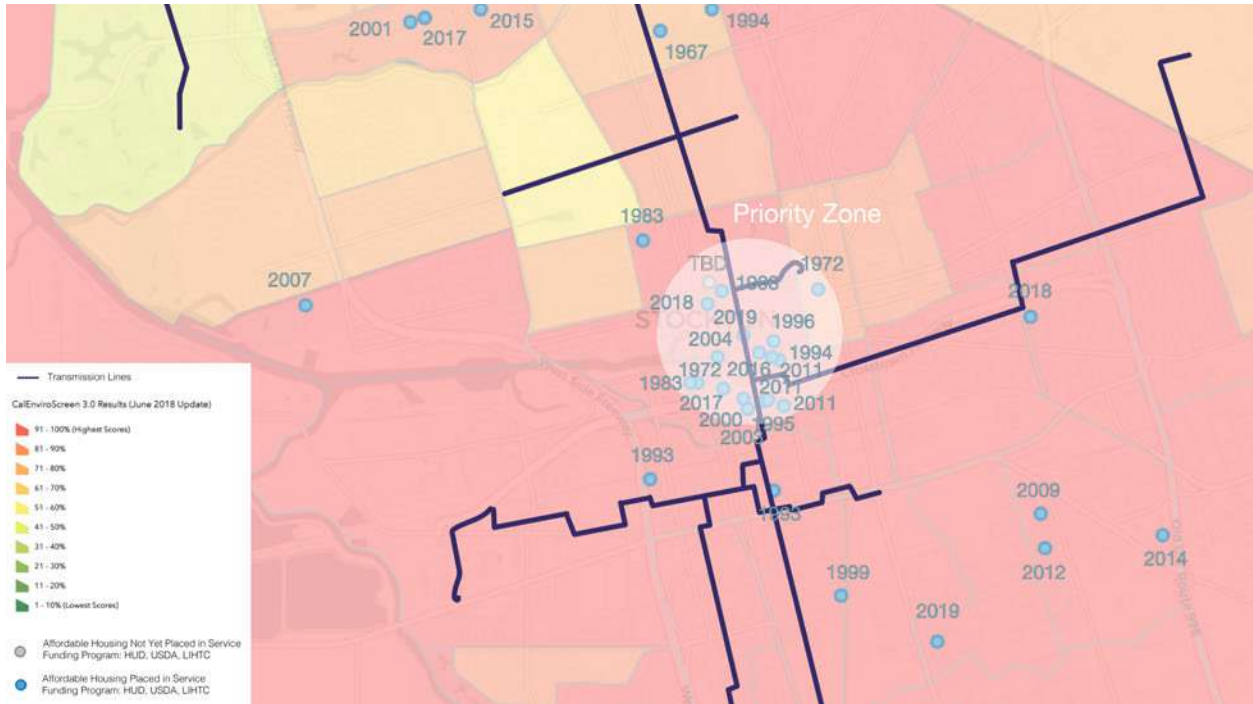


Figure 10: CalEnviroScreen overall results, affordable housing with funding from HUD, USDA, and LIHTC (the year indicates when the unit was placed in service), and PG&E transmission pipelines in **Stockton**.

Case Study Bay Area: Oakland

Figure 11 uses Oakland as a case study of a geographically-targeted approach for electrification. Affordable housing in Oakland is much more scattered, so we identified four priority zones based on clustering of units.

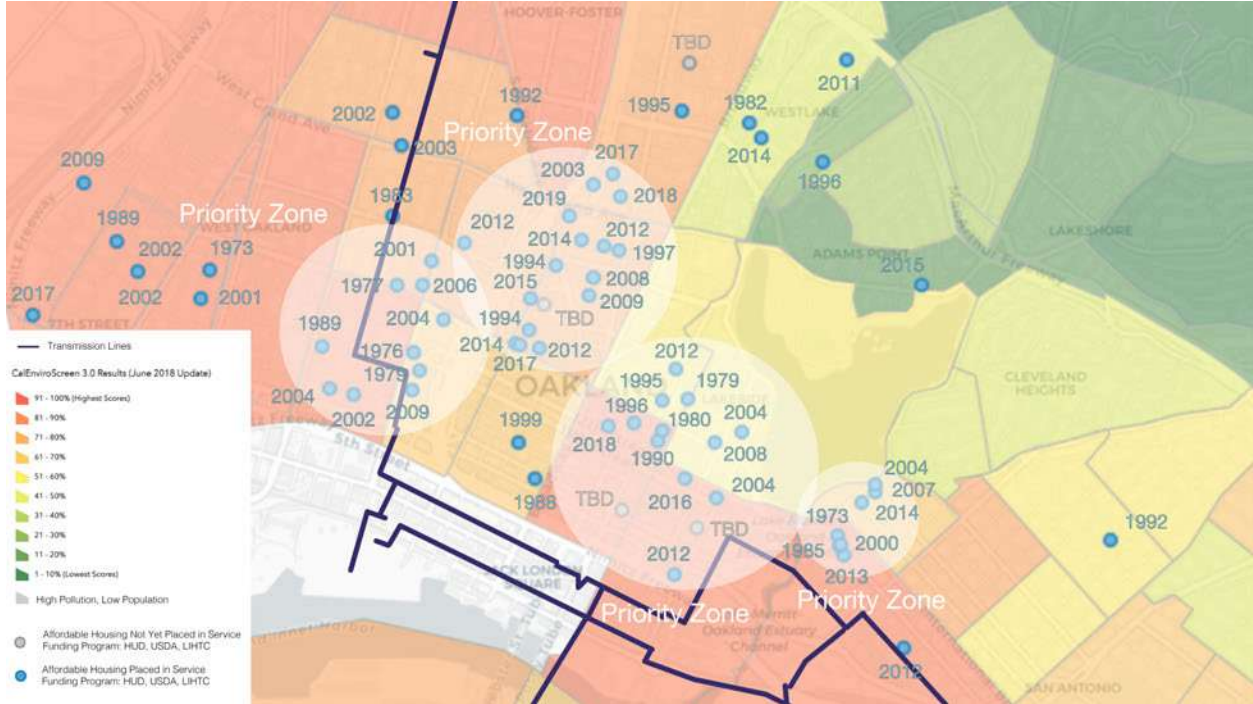


Figure 11: CalEnviroScreen overall results, affordable housing with funding from HUD, USDA, and LIHTC (the year indicates when the unit was placed in service), and PG&E transmission pipelines in **Oakland**.

Analysis of Los Angeles Area

This section looks at the overall CalEnviroScreen results, the pollution burden, asthma, ozone, PM 2.5, the population characteristics, poverty, and housing burden for the Los Angeles Area. Figure 12 shows the overall results of CalEnviroScreen, where red areas are in the highest percentiles of the overall score (indicating the most disadvantaged areas) and green areas are the lowest percentiles. The dots indicate affordable housing units funded by HUD, USDA, and LIHTC. Blue dots indicate units that have been placed in service and grey dots indicate units that have not been placed in service. The dark blue lines are SoCalGas' gas transmission pipelines and the light blue lines are its high-pressure distribution pipelines. With the exception of a few areas around Beverly Hills, Santa Monica, and Huntington Beach, disadvantaged areas are widespread, so it is even more important to focus on specific indicators to identify areas of interest.

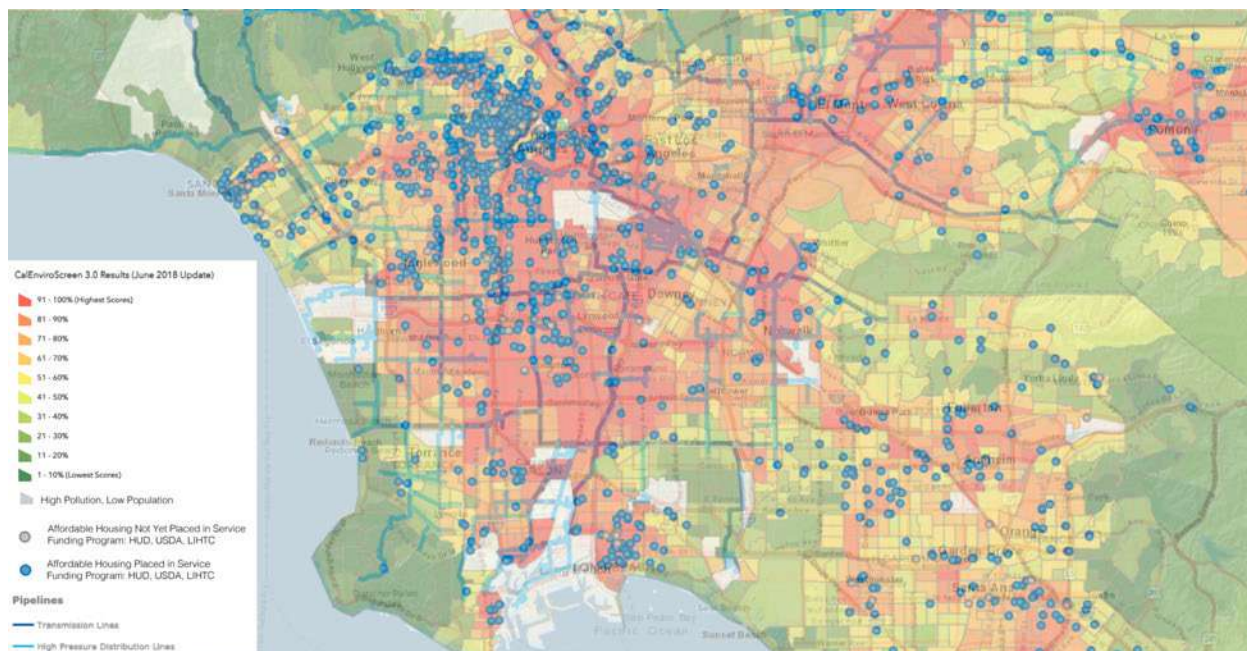


Figure 12: CalEnviroScreen **overall results**, affordable housing with funding from HUD, USDA, and LIHTC, and SoCalGas pipelines in the Los Angeles Area.

Public Health

Figures 13, 14, 15, and 16 show the CalEnviroScreen pollution burden, asthma occurrence, ozone concentration, and PM 2.5 concentration. On all maps, the darkest areas are the most burdened areas, SoCalGas transmission pipelines are indicated by dark blue lines, and high-pressure distribution pipelines are indicated by light blue lines. In addition, Figure 14 shows the location of emergency departments and Figures 15 and 16 show the location of monitors used to measure ozone and PM 2.5 concentrations.

The pollution burden is high for an area even larger than the disadvantaged area indicated by the CalEnviroScreen overall results. With the exception of Rancho Palos Verdes by the coast and some small areas in the east, most of the Los Angeles area belongs to the highest percentiles in terms of pollution burden. Asthma occurrence is slightly more concentrated in the area between Downtown Los Angeles and Compton. Ozone concentration on the other hand is smallest by the coast and increases gradually more inland, with the highest percentiles location around Pomona. PM 2.5 concentration is high in most of the Los Angeles area. Overall, an analysis of the health indicators does not contribute to identifying priority areas.

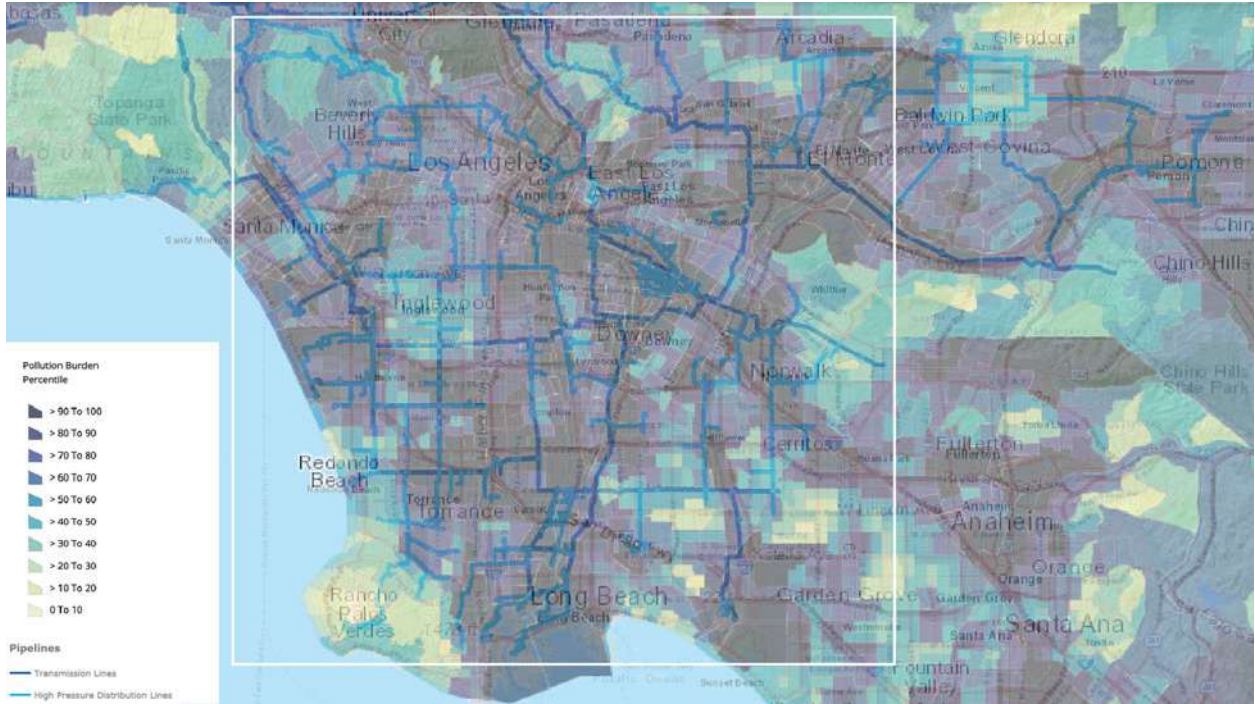


Figure 13: CalEnviroScreen **pollution burden** and SoCalGas pipelines in the Los Angeles Area.

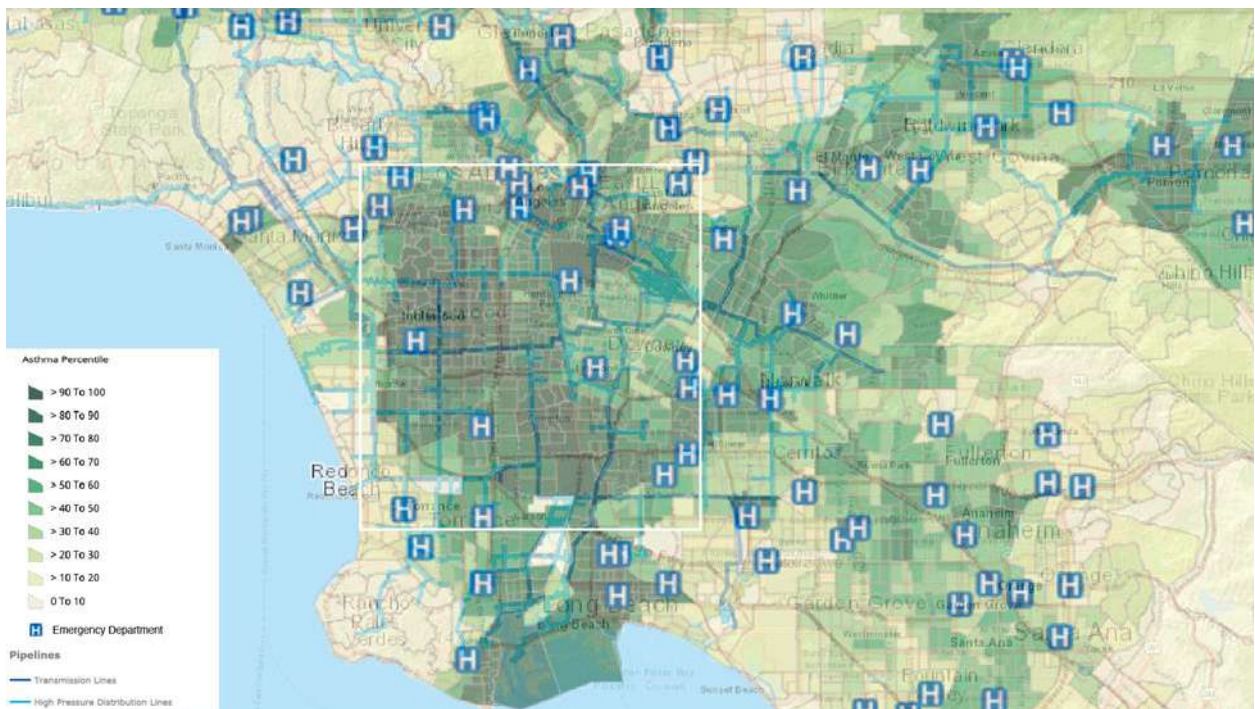


Figure 14: CalEnviroScreen **asthma** and SoCalGas pipelines in the Los Angeles Area.

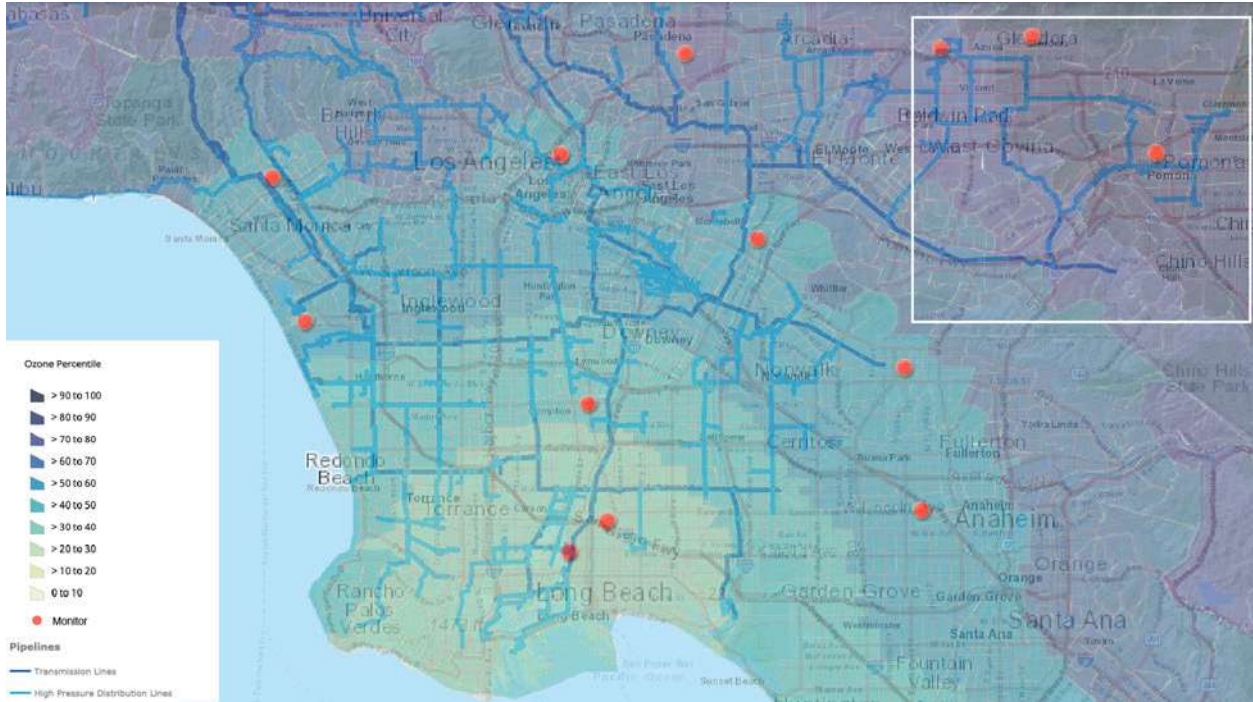


Figure 15: CalEnviroScreen **ozone** and SoCalGas pipelines in the Los Angeles Area.

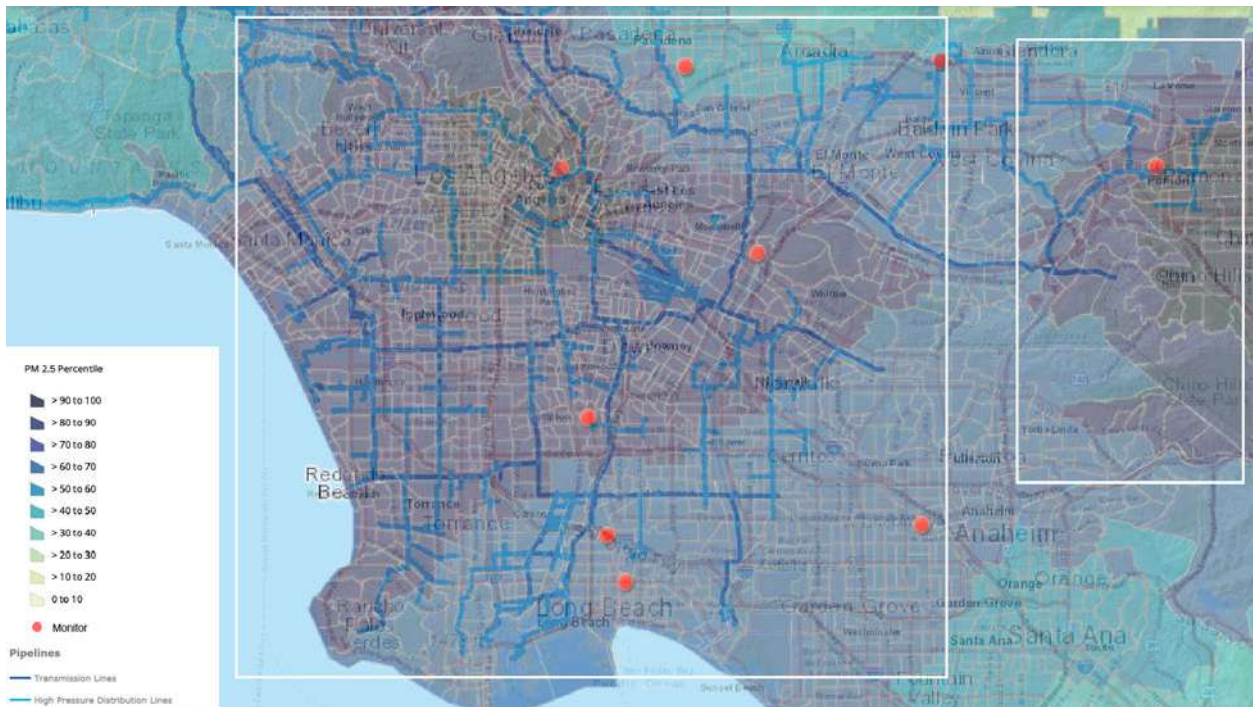


Figure 16: CalEnviroScreen **PM 2.5** and SoCalGas pipelines in the Los Angeles Area.

Low-Income Communities

Figures 17, 18, and 19 show the CalEnviroScreen population characteristics, poverty, and housing burden. On all maps, the darkest areas are the most disadvantaged areas, SoCalGas transmission pipelines are indicated by dark blue lines and high-pressure distribution pipelines are indicated by light blue lines.

The population characteristics show a concentration of disadvantaged communities between downtown Los Angeles in the north and Compton in the south, and Inglewood in the west and Downey in the east. Poverty and housing burden are concentrated in the same region and further help narrow down the priority area.

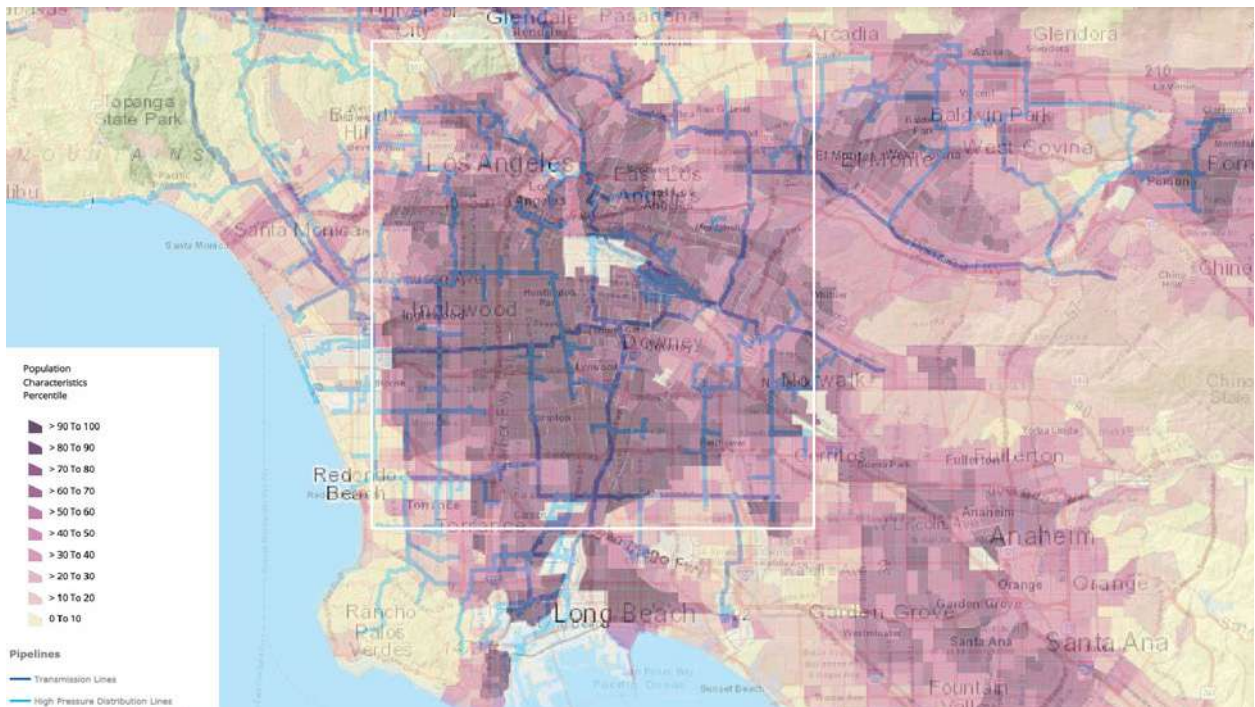


Figure 17: CalEnviroScreen **population characteristics** and SoCalGas pipelines in the Los Angeles Area.

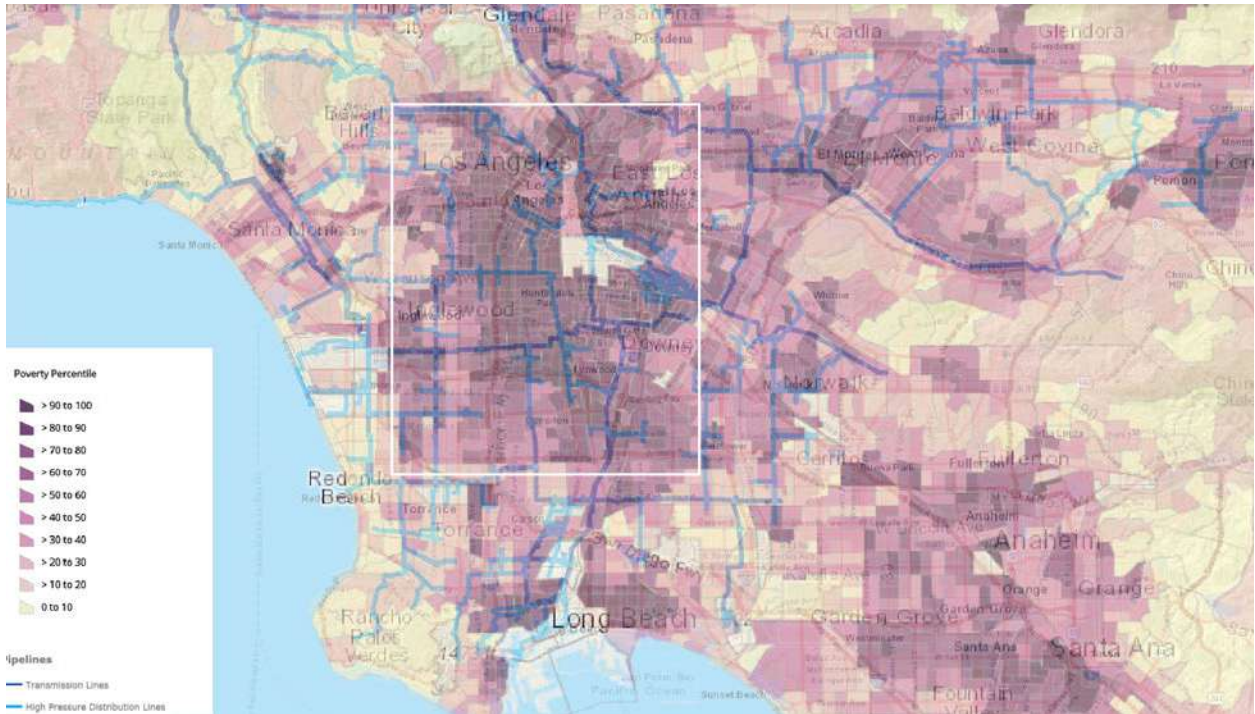


Figure 18: CalEnviroScreen **poverty** and SoCalGas pipelines in the Los Angeles Area.

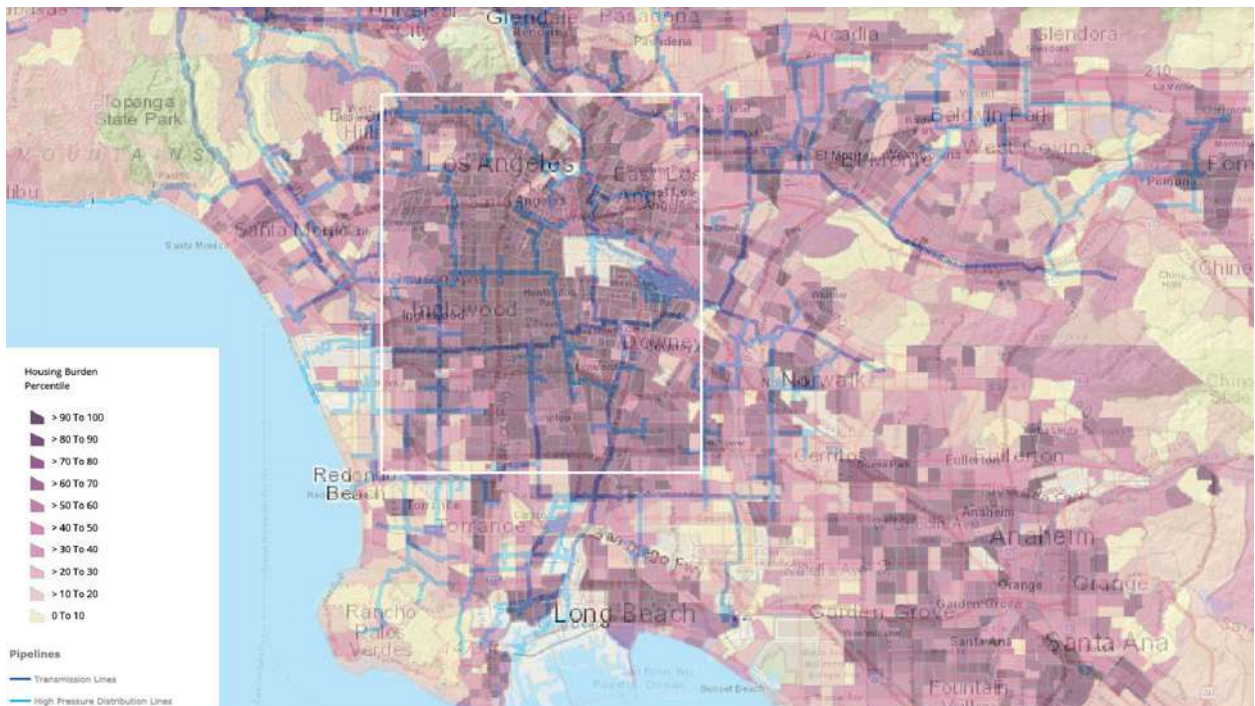


Figure 19: CalEnviroScreen **housing burden** and SoCalGas pipelines in the Los Angeles Area.

Case Study Los Angeles

Figures 20 and 21 use a more specific area south of Monterey Park as a case study of a geographically-targeted approach for electrification. To reiterate, red areas are in the highest percentiles of the overall score (indicating the most disadvantaged areas) and green areas are the lowest percentiles.

Figure 20 shows potential phases in which gas infrastructure could be decommissioned. Phase 1 (white) consists of outer branches of the distribution infrastructure. Phase 2 (light purple) consists of branches that connect lines from Phase 1 to other infrastructure. Phase 3 (mid purple) consists of branches that connect lines from Phase 2 to other infrastructure. Finally, Phase 4 consists of transmission lines.

Figure 21 zooms in on the neighborhood indicated by the frame in Figure 20, between Commerce in the north and Bell Gardens in the south. Again, pipelines are grouped into phases 1 to 4. The blue dots indicate affordable housing units funded by HUD, USDA, and LIHTC that have been placed in service (with the year they have been placed in service). From the clustering of affordable housing units, we can deduce three clear priority zones. In addition, the age of the affordable housing units can help determine a potential hierarchy for the priority zones, with the oldest units prioritized first.

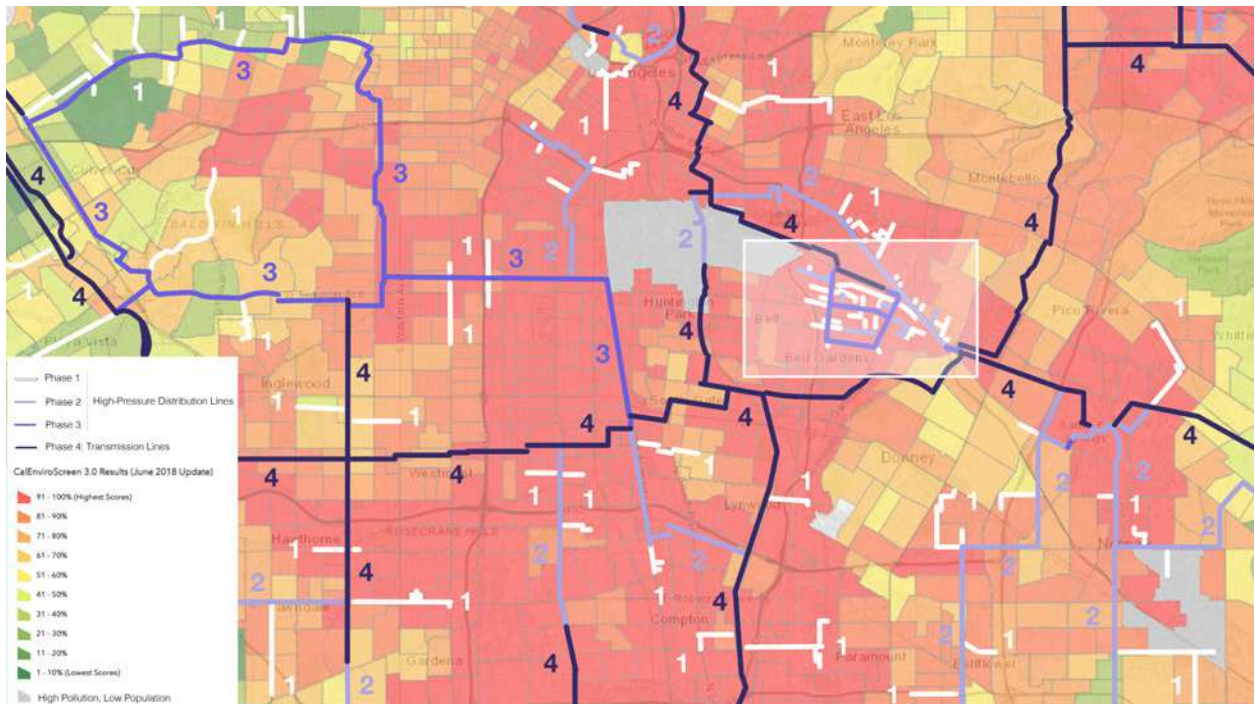


Figure 20: CalEnviroScreen overall results and SoCalGas pipelines between Monterey Park (north) and Paramount (south).

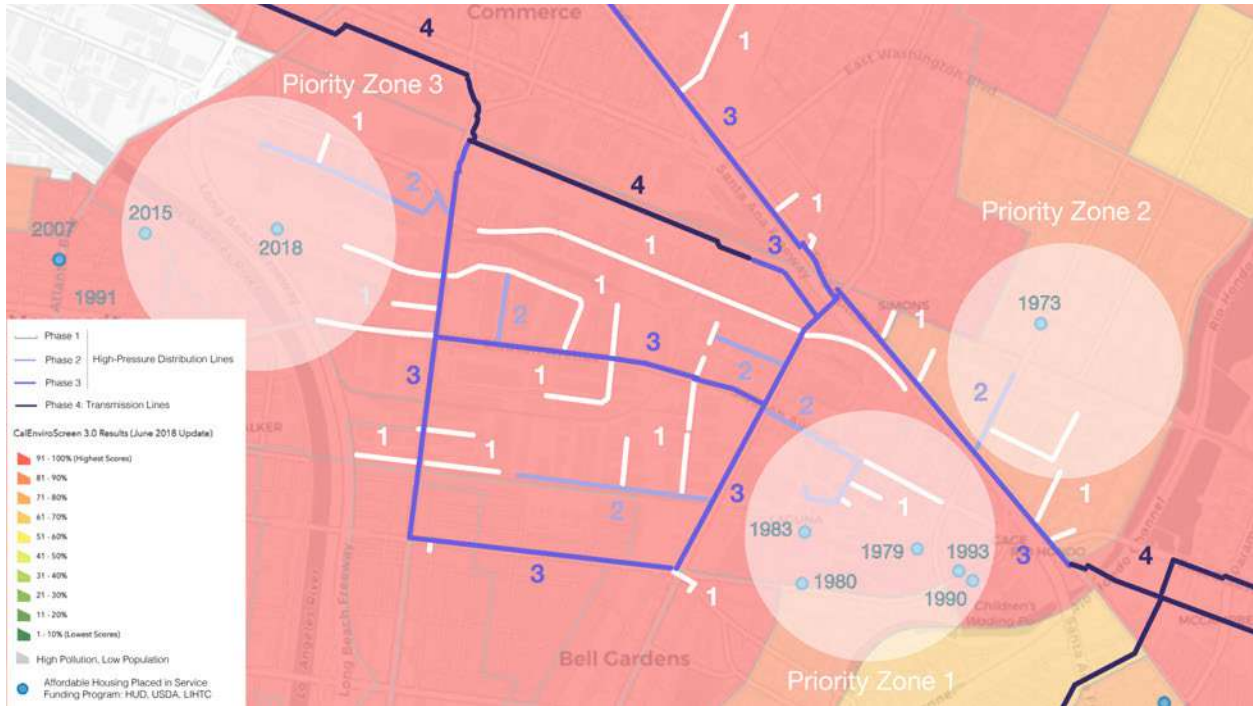


Figure 21: CalEnviroScreen overall results and SoCalGas pipelines between Commerce (north) and Bell Gardens (south).

Proposed Policies in Support of the Geographical Framework

In order for a geographically-targeted electrification transition to be successful in ESJ communities, and to support and preserve affordable housing, it is critical that specific policy mechanisms are put into place. Based on research and advice from experts in the field, we have compiled the following list of policy recommendations.

Avoid Expansion of the Gas System

Policies need to be established to restrict new construction of gas infrastructure. Cities across California have already enacted reach codes to eliminate natural gas and to move to all-electric new construction projects.⁸⁵ A recent roundtable hosted by California Housing Partnership found that “[service] providers agreed that for new construction, initial equipment and installation costs [of all-electric systems] are now comparable to gas infrastructure in the majority of situations.”⁸⁶ Continuing to increase the reach of the natural gas distribution system is going to continue to increase the financial burden on future Californians, who will be financially responsible for the cost to operate and maintain the network, including affordable housing developments and

⁸⁵ California Energy Codes and Standards (n.d.). *Statewide Reach Codes Program*. <https://localenergycodes.com/>

⁸⁶ California Housing Partnership (2021). *Prioritizing California’s Affordable Housing in the Transition Towards Equitable Building Decarbonization*.

ESJ communities. As more buildings become all electric, customers who do not have the financial resources or the autonomy to upgrade their homes, such as renters, may result in affordable housing and ESJ communities being the last remaining customers on the system. Expanding the natural gas system will continue to increase the cost of gas service for remaining customers served by the system.⁸⁷ Freezing the expansion of California's natural gas infrastructure could be implemented at the state level, either by the California Energy Commission through code or by the California Air Resource Board through increased air quality regulations.

Rent Protections for Tenants

Policies need to specifically support tenants through the electrification process and provide protections against rent increases, displacement, and possible reductions in naturally occurring affordable housing availability.⁸⁸ As owners of naturally occurring affordable housing projects invest in electrification of their buildings, one possible unintended impact could include rent increases for tenants.⁸⁹ Assurances need to be provided to protect rental affordability, such as those included in the Low-Income Weatherization Program (LIWP) which prevent owners from raising rents following the completion of building updates sponsored by the program.^{90,91}

Provide Sufficient Funding for Building Owners

Financial support needs to be provided to owners of affordable housing developments to fully incentivize the transition from natural gas to electricity. Incentive programs do exist to support this transition, but some experts argue that it is not enough.^{92,93} The Sierra Club has provided the general advice to "improve affordability of electrification with incentives, rate reform, and financing, with a priority focus on low-income residents."⁹⁴ In addition to other affordable housing funding opportunities, the California Housing Partnership roundtable participants also suggested that additional tax credits be awarded to projects that are all electric, and that the state should provide more money for decarbonization in affordable housing retrofits.⁹⁵

⁸⁷ California Energy Commission (2020). *The Challenge of Retail Gas in California's Low-Carbon Future*.

⁸⁸ NRDC, CHPC, Earthjustice, Sierra Club (2020). *Comments on AB 3232 May 22 2020 Workshop*.

⁸⁹ NRDC, CHPC, Earthjustice, Sierra Club (2020). *Comments on AB 3232 May 22 2020 Workshop*.

⁹⁰ Sierra Club (2019). *Building Electrification Action Plan for Climate Leaders*.

⁹¹ Department of Community Services and Development (2019). *Low-Income Weatherization Program: Program Guidelines*.

⁹² California Housing Partnership (2021). *Prioritizing California's Affordable Housing in the Transition Towards Equitable Building Decarbonization*.

⁹³ AEA, Nick Dirr & Sheetal Chitnis (2020). *Multifamily Clean Heating Pilot: Summary of Project-level Analysis and Findings*.

⁹⁴ Sierra Club (2019). *Building Electrification Action Plan for Climate Leaders*.

⁹⁵ California Housing Partnership (2021). *Prioritizing California's Affordable Housing in the Transition Towards Equitable Building Decarbonization*.

Create Synergies Among Incentive Programs

There is a lot of interest in creating new electric-specific incentive programs that are very closely aligned with existing programs and share the same qualification requirements. There are suggestions to “align affordable housing incentives programs with decarbonization” including through the operation of the Tax Credit Allocation Committee (TCAC), California Debt Limit Allocation Committee (CDLAC), and Affordable Housing and Sustainable Communities (AHSC).⁹⁶ There was also feedback to “remove silos between affordable housing and energy programs,”⁹⁷ and pair energy efficiency programs and solar programs together in conjunction with electrification programs, which was a key motivator for participants in the BayREN clean heating multifamily pilot program.⁹⁸

Support All-Electric Equipment and Provide Technical Assistance

There also seems to be agreement that policy action needs to be taken to provide additional support to the electrification equipment market and technical assistance in the design process. New policies need to follow the blueprint of the California Solar Initiative (CSI) and encourage heavy investment in all electric equipment and appliances,⁹⁹ in order to make them low-cost, and to ensure that they are readily available for all-electric new construction mandates and to “transform the market for high-efficiency electric equipment.”¹⁰⁰ Policy also needs to dedicate funds for robust technical assistance¹⁰¹ and address the “need for additional contractor knowledge and availability.”¹⁰²

Redefine the Obligation to Serve

Policy support needs to be given to redefine the utility’s obligation to serve. As a natural monopoly, the utility is obligated to serve all customers within its service territory. Currently, there is concern that a utility would be responsible for providing natural gas service to a future customer who is located along a distribution line that was previously decommissioned. This would require the utility to reinstate the distribution line or provide new infrastructure at great cost. Legislation will need to be enacted at the state level “to provide clear directive to the CPUC and regulated utilities that obligation to serve can be met by a different fuel, and that the state authorizes the CPUC to allow for replacement to happen in scenarios where a non-pipeline alternative is

⁹⁶ NRDC, CHPC, Earthjustice, Sierra Club (2020). *Comments on AB 3232 May 22 2020 Workshop*.

⁹⁷ NRDC, CHPC, Earthjustice, Sierra Club (2020). *Comments on AB 3232 May 22 2020 Workshop*.

⁹⁸ AEA, Nick Dirr & Sheetal Chitnis (2020). *Multifamily Clean Heating Pilot: Summary of Project-level Analysis and Findings*.

⁹⁹ NRDC, Olivia Ashmoore (2020). *Policy Pathways to Zero-Emissions Buildings*.

¹⁰⁰ NRDC, CHPC, Earthjustice, Sierra Club (2020). *Comments on AB 3232 May 22 2020 Workshop*.

¹⁰¹ AEA, Nick Dirr & Sheetal Chitnis (2020). *Multifamily Clean Heating Pilot: Summary of Project-level Analysis and Findings*.

¹⁰² AEA, Nick Dirr & Sheetal Chitnis (2020). *Multifamily Clean Heating Pilot: Summary of Project-level Analysis and Findings*.

more cost-effective.”¹⁰³ The obligation to serve needs to be redefined as the requirement to provide customers with a sufficient utility connection, with no explicit or implicit fuel requirements.

Suggestions for Future Work

In order for a more complete analysis of how gas infrastructure can be decommissioned, it is imperative that utilities make more detailed information publicly available, particularly on gas distribution lines. Such data could include the age, state, and material of the transmission and distribution lines, plans for replacement and maintenance, and natural gas leaks. In addition, data on which distribution pipelines serve both core and noncore customers would help identify lines that are more difficult to decommission.

While this report focuses on public health and low-income communities as parameters for a decommissioning framework, additional inputs could be areas prone to public safety power shut offs (PSPS) and wildfires. These areas are in great need of increased resilience, which could be aided by electrification. PG&E has a map with current outages with an indication of the number of customers affected and future PSPS outages with the affected areas.¹⁰⁴ Similarly, SCE has a map with power shut offs, areas under PSPS consideration, high-risk fire areas, and areas served by circuits that cross into high-risk fire areas.¹⁰⁵ SDG&E has a map of unplanned outages and planned active and future outages.¹⁰⁶

For our analysis of affordable housing that should be prioritized, we only took into consideration the year that the housing complex was placed into service. However, funding cycles of the Low-Income Housing Tax Credit (LIHTC) Program by the California Tax Credit Allocation Committee (CTCAC) could be another factor to consider. The LIHTC Program started in 1987 and can be claimed annually over a ten-year period “beginning either with the year the building is placed in service or the following year, depending on which option is selected by the owner”.¹⁰⁷ Projects have to remain in compliance for a minimum of 15 years. A more comprehensive analysis could take into consideration these ten-year and 15-year cycles and prioritize complexes that are the closest to their next upgrade cycle.

As mentioned in the section on the input parameters, this study looks at affordable housing with funding from the United States Department of Housing and Urban Development (HUD), the United States Department of Agriculture (USDA), and Low-Income Housing Tax Credit (LIHTC). However, this study does not consider Naturally Occurring Affordable Housing (NOAH), which refers to “existing multifamily rental properties that are

¹⁰³ Common Spark Consulting (2021). *The Flipside Report: A White Paper on Targeted Geographic Electrification in California's Gas Transition*.

¹⁰⁴ PG&E (n.d.). *Current Outages and Future PSPS Outages Map*. <https://pgealerts.alerts.pge.com/outages/map/>

¹⁰⁵ Southern California Edison (n.d.). *Public Safety Power Shutoff - Am I Impacted?*. <https://www.sce.com/wildfire/pssp>

¹⁰⁶ San Diego Gas and Electric (n.d.). *Outage Map*. <https://www.sdge.com/residential/customer-service/outage-center/outage-map>

¹⁰⁷ California Tax Credit Allocation Committee (2021). *Compliance Online Reference Manual*.

affordable without public subsidy to low-income households”.¹⁰⁸ NOAH constitutes most of the affordable units in the United States.^{109,110,111} According to The California Housing Partnership, “The risk of displacement and homelessness is particularly high for NOAHs located in neighborhoods with high rental prices or in gentrifying areas where rents are increasing rapidly”.¹¹² Therefore, it is important to track and preserve NOAH developments.¹¹³ Once a database with NOAH developments has been developed, this would be an interesting additional input parameter for a geographically-targeted electrification study.

There could be tensions between adjacent neighborhoods that are assigned different priorities in a geographical electrification program. This will likely need to be addressed on a case-by-case basis, and future steps will need to be taken to protect all communities from additional financial burdens regardless of order of electrification priority.

In conclusion, future frameworks and analyses for geographically-targeted electrification could incorporate additional data to provide a more comprehensive evaluation of the different considerations. When electrification plans are carried out, there should be a close collaboration between representatives of vulnerable communities, public health experts, the utilities, and local government leaders.

Conclusion

In this report, we discuss the importance of multifamily affordable housing and ESJ communities in the transition from natural gas to electricity. We reflect on established frameworks and incentive programs, and we propose a methodology to determine key zones for electrification investments. Our proposed geographically-targeted methodology identifies areas in California that have a combination of characteristics that make them particularly of interest for a just transition from natural gas to electricity, and have benefits to the natural gas infrastructure system at large. We propose to prioritize electrification funding towards communities with a high pollution burden, low-income communities with a high housing burden, and areas that are served by an outer branch of a natural gas distribution pipeline (to facilitate decommissioning of individual branches). In addition, we propose a set of policy mechanisms in support of our geographically-targeted electrification framework. With our framework, we hope to alleviate the financial and pollution burdens of environmental and social justice communities, to ensure an equitable and just transition from natural gas to electricity.

¹⁰⁸ Steve King (2021). *Preserving the Largest and Most At-Risk Supply of Affordable Housing*. McKinsey & Company.

¹⁰⁹ Steve King (2021). *Preserving the Largest and Most At-Risk Supply of Affordable Housing*. McKinsey & Company.

¹¹⁰ NOAH Impact Fund (n.d.). <https://noahimpactfund.com/>

¹¹¹ Haisten Willis (2020). *Preserving Communities, Preventing Displacement*. The Washington Post.

¹¹² California Housing Partnership (2019). *Los Angeles County: Annual Affordable Housing Outcomes Report*.

¹¹³ California Housing Partnership (2019). *Los Angeles County: Annual Affordable Housing Outcomes Report*.

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