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WITNESS: ED BURGESS

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-220066** **Docket UG-220067**

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ED BURGESS

ON BEHALF OF NW ENERGY COALITION, FRONT AND CENTERED, AND SIERRA CLUB

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RMI

How Air Agencies Can Help End Fossil Fuel Pollution from Buildings

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Lead Authors: **Jim Dennison**, **Leah Louis-Prescott**, **Talor Gruenwald**

Contributing Authors: **Denise Grab**, **Stephanie Greene**

Reviewers:

Amneh Minkara, Associate Attorney, Sierra Club

Amy Turner, Senior Fellow, Sabin Center for Climate Change Law at Columbia Law School

Andee Krasner, MPH, Manager, Climate and Health, Greater Boston Physicians for Social Responsibility

Andres Restrepo, Senior Attorney, Sierra Club

Andrew deLaski, Executive Director, Appliance Standards Awareness Project

Bruce Nilles, Executive Director of Climate Imperative, Energy Innovation

Jack Lienke, Regulatory Policy Director, Institute for Policy Integrity at New York University School of Law

Jim Edelson, Director of Policy, New Buildings Institute

Jose Torres, California Director, Building Decarbonization Coalition

Julia Stein, Project Director, Emmett Institute on Climate Change and the Environment

Kayla Robinson, Associate, Environmental & Energy Consulting

Lauren Cullum, Policy Advocate, Sierra Club California

Luis Amezcua, Senior California Policy & Campaign Manager, Building Decarbonization Coalition

Meghan Harwood, Consultant, Common Spark Consulting

Nancy L. Seidman, Senior Advisor, Regulatory Assistance Project

Nate Kinsey, Policy Advisor, Evergreen Action

Timothy Ballo, Senior Attorney, Earthjustice

Tyler Poulson, Deputy Director, Building Electrification Institute

Highlights

Fossil fuel appliances like gas furnaces and water heaters pollute the air, harm human health, damage the climate, and contribute to the racial and economic injustices that are entrenched in America's housing system. Replacing appliances that burn fossil fuels with highly efficient electric appliances is a critical step in a portfolio of policies that will reduce these harms, save lives, and help mitigate the climate crisis.

State, regional, and national air quality agencies should use their existing authority to help equitably achieve these benefits by enacting carefully designed standards to require zero-emissions appliances. Air agencies should collaborate with other entities to ensure these zero-emissions standards are paired with investments and policies that will secure an inclusive and affordable transition for low-income and BIPOC communities. Specifically, when air agencies enact zero-emissions standards, they should commit to evaluating progress toward the following four criteria for equitable electrification and making any needed adjustments before the standards take effect:

1. affordable upfront costs,
2. affordable energy costs,
3. anti-displacement and renter protections, and
4. necessary housing upgrades.

Through partnership, investment, and careful zero-emissions standard design, air agencies can catalyze an equitable and holistic transition to reduce building pollution and improve health.

Introduction

State and federal pollution standards have dramatically improved our nation's air quality and public health, and decreased greenhouse gas emissions. Standards for coal-fired power plants and industrial facilities have driven investments that have reduced air pollution, saved thousands of lives each year, and advanced the growth of a renewable energy economy. **Vehicle emissions standards** have significantly reduced pollution, resulting in major health benefits, and are accelerating the transition to **electric vehicles** increasingly fueled by clean, renewable energy.

While these policies have made great progress toward reducing climate and air pollution, more is needed to reach the **Biden administration's** public health, climate, and environmental justice goals. To achieve the administration's goals of cutting greenhouse gas emissions in half by 2030 and reaching carbon neutrality by 2050, we will need to rapidly cut pollution from previously neglected sources, including buildings. Each year, burning fossil fuels for space heating, water heating, and cooking in our homes and buildings emits 425,000 tons of nitrogen oxides (NO_X) and other health-harming pollutants, and as much as a **gigaton of greenhouse gas pollution**.[i]

The good news is that zero-emissions appliances are available and already widely used in many parts of the country and globally, and air agencies can accelerate their adoption using the same types of pollution standards that have led to progress in other sectors.

Emissions standards are a powerful policy lever that can drive a swift, inclusive, equitable transition to pollution-free buildings if they are thoughtfully designed. Current **policies** aimed at removing fossil fuels from buildings, such as **building codes**, are typically limited to new construction and major retrofits. By contrast, pollution standards can address pollution from the entire buildings stock. These standards can apply to *all* new furnaces, water heaters, and other appliances, whether they go into new buildings or replace existing appliances when they wear out—**on average every 13–18 years**. As a result, appliance emissions standards can achieve large pollution reductions, encourage manufacturers to produce zero-emitting devices at the speed and scale needed, and ensure that all occupants—especially renters in existing homes—share in the benefits of electrification and clean energy.

Moreover, air agencies have authority to design emissions standards equitably and affordably. Through partnership, investment, and careful standard design, air agencies can advance an equitable electrification transition that prioritizes low-income and Black, Indigenous, and People of Color (BIPOC) communities.

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i This Insight Brief focuses on solutions to pollution from fossil fuel appliances. It does not address the significant air pollution caused by **residential wood burning** or the climate emissions of **refrigerants** used in electric appliances, which are each addressed through existing EPA regulations. As used in this Insight Brief, the terms "appliance pollution" and "building pollution" refer to direct combustion pollution from fossil fuel appliances, unless otherwise noted.

In Part 1 of this Insight Brief, we describe **how fossil fuel appliances contribute to outdoor air pollution, health impacts, and racial-ethnic inequities**.

In Part 2, we focus on **efficient electric appliances as a key opportunity to reduce fossil fuel appliance pollution**. We also acknowledge the intersectional issues contributing to housing injustice and outline four criteria that must be satisfied for appliance electrification to be truly accessible and equitable to all:

1. affordable upfront costs,
2. affordable energy costs,
3. anti-displacement and renter protections, and
4. necessary housing upgrades.

In Part 3, we highlight **air agencies' role in leading an equitable electrification transition**. We recommend air agencies use their statutory authority to enact zero-emissions appliance standards and play an active role in creating the conditions for equitable implementation of those standards. Air agencies should collaborate with community, government, and utility partners to secure funding and tenant protections to support an affordable transition. These combined actions can help advance an equitable transition toward healthier, cleaner, and more affordable homes for all—free of fossil fuel pollution.

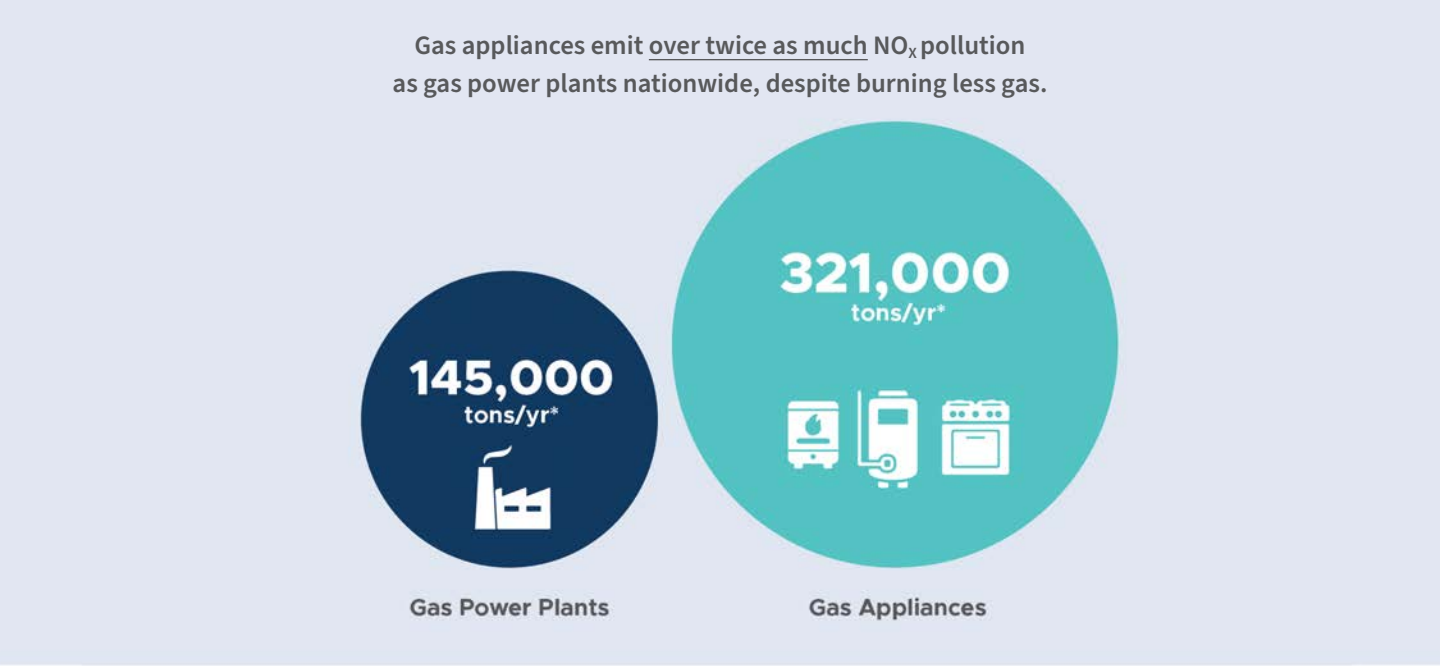
Air agencies should collaborate with community, government, and utility partners to secure funding and tenant protections to support an affordable transition.

Part 1: The Harms of Appliance Pollution

Fossil Fuel Appliances Are Major Contributors to Outdoor Air Pollution

Seventy million homes and businesses across the country burn fossil fuels in appliances like gas furnaces, water heaters, stoves, and dryers. This emits **425,000 tons** of harmful NO_X pollution each year,[ii] which contributes to the formation of ozone and particle pollution. That's several times more NO_X than many sectors whose NO_X emissions are regulated by EPA, including **oil refineries** and **cement manufacturing**. Gas appliances produce the majority of this pollution, emitting over twice as much NO_X as gas power plants, even though they burn about **a third less gas** (see Exhibit 1). Fossil fuel appliances also emit approximately **600 million metric tons** of greenhouse gases each year—10% of all US carbon pollution. The global warming impact of these appliances can nearly double to a **gigaton** of annual greenhouse gas emissions when considering methane leaks throughout the supply chain.

Exhibit 1 **2017 NO_X Emissions from Gas Power Plants and Gas Appliances**



**Values rounded to the nearest thousand tons.*
Source: RMI analysis of EPA 2017 National Emissions Inventory

Appliance pollution is typically vented outdoors, just like fumes from a power plant smokestack. One important exception is unvented pollution from **gas stoves**, which can quickly build up to dangerous concentrations inside homes, **increasing asthma risks**. In addition to these indoor harms, gas stove

ii This includes residential and commercial emissions for the gas, oil, and other fuel categories, with commercial emissions adjusted to exclude non-appliance sources like pipeline compressor stations.

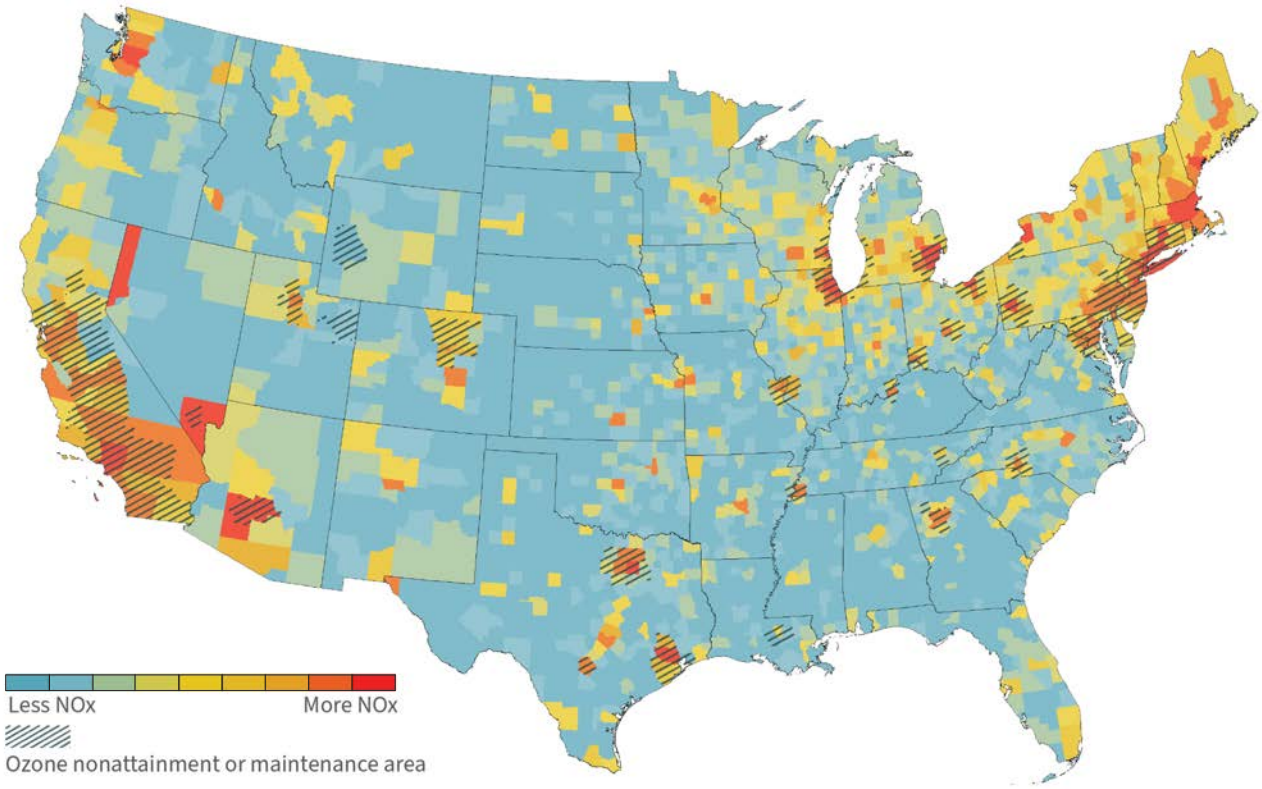
pollution can exit homes through windows, and cracks, and (in some cases) vents, and ultimately contribute to outdoor pollution just like emissions from other vented appliances.

Once released outside, NO_X from appliances reacts in the atmosphere to form harmful secondary pollutants like **ground-level ozone** and **fine particulate matter** ($PM_{2.5}$). These appliance emissions contribute significantly to nonattainment of Environmental Protection Agency's (EPA's) **National Ambient Air Quality Standards** (NAAQS). RMI analysis of **EPA's National Emissions Inventory** shows that counties in ozone nonattainment areas experience over 850 tons of appliance NO_X pollution per year on average. That's more than the average emissions in those counties from *all* power plants, including coal-fired plants. And in counties in ozone nonattainment areas classified as moderate or higher, which must apply **Reasonably Available Control Measures** to all emissions sources, appliances emit 1,150 tons per year of NO_X on average—over *twice* as much as the average power plant emissions of 460 tons per year.

Exhibit 2 shows many areas with the highest NO_x pollution from buildings are also nonattainment or maintenance areas for ozone standards,[iii] suggesting appliances are an important source to reduce emissions and improve air quality.

Exhibit 2

2017 NO_X Emissions from Fossil Fuel Appliances and Ozone Nonattainment/Maintenance Areas

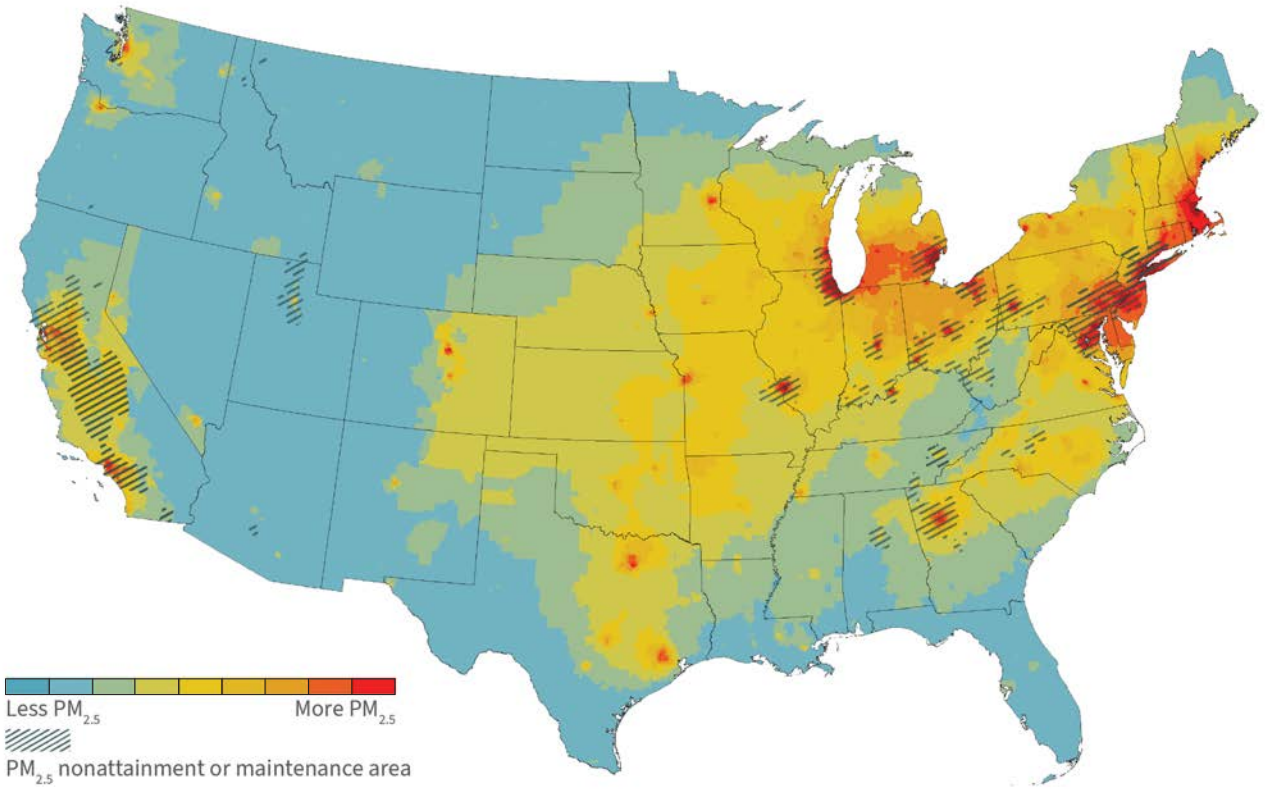


Source: RMI analysis of EPA 2017 National Emissions Inventory

iii Maintenance areas were previously designated as nonattainment areas and have been redesignated as attainment after meeting the air quality standard. States with maintenance areas must continue to meet Clean Air Act requirements and submit **maintenance plans** to EPA.

Exhibit 3

2017 $PM_{2.5}$ Concentrations from Fossil Fuel Appliances and $PM_{2.5}$ Nonattainment/Maintenance Areas



Source: RMI analysis of EPA 2017 National Emissions Inventory and InMAP pollution modeling tool

Appliance pollution also contributes to $PM_{2.5}$ formation and nonattainment. Exhibit 3 shows an RMI analysis of appliances' contribution to ambient $PM_{2.5}$ concentrations. Many of the areas with the highest $PM_{2.5}$ pollution from buildings are nonattainment or maintenance areas for $PM_{2.5}$ standards.

Appliance Pollution Is a Serious Threat to Human Health

Outdoor pollution from fossil fuel appliances contributes to a **range** of **health harms**, including asthma attacks and other respiratory ailments, cardiovascular harms like strokes and heart attacks, and even premature death. Analysis by **Harvard public health researchers**, summarized in this **RMI overview**, indicates that fossil fuel appliance contributions to outdoor $PM_{2.5}$ alone caused **roughly 6,000 premature deaths** nationwide in 2017.[iv] That's 16 early deaths *per day*—more than eight times as many deaths as were caused by gas power plants. RMI found similar estimates of appliance pollution's health impacts using EPA's **Benefits Mapping and Analysis Program**. In a single year, these included up to 5,400 premature deaths, 2,300 heart attacks, 55,000 asthma attacks, 2,600 asthma-related emergency room visits, 1,140 hospital admissions, and 355,000 work loss days, totaling $45.8 billion in avoidable health costs (in 2017 dollars). Carbon pollution from fossil fuel appliances contributed at least $24.7 billion more in climate damage,[v]

iv Based on additional analysis from Jonathan Buonocore, Sc.D., the study's lead author, and RMI analysis using median estimates from the results of three reduced complexity models used in the study.

v RMI analysis based on **fuel consumption** and **emissions factor** data from EIA and the **Interagency Working Group's** interim social cost of carbon values for a 3% discount rate.

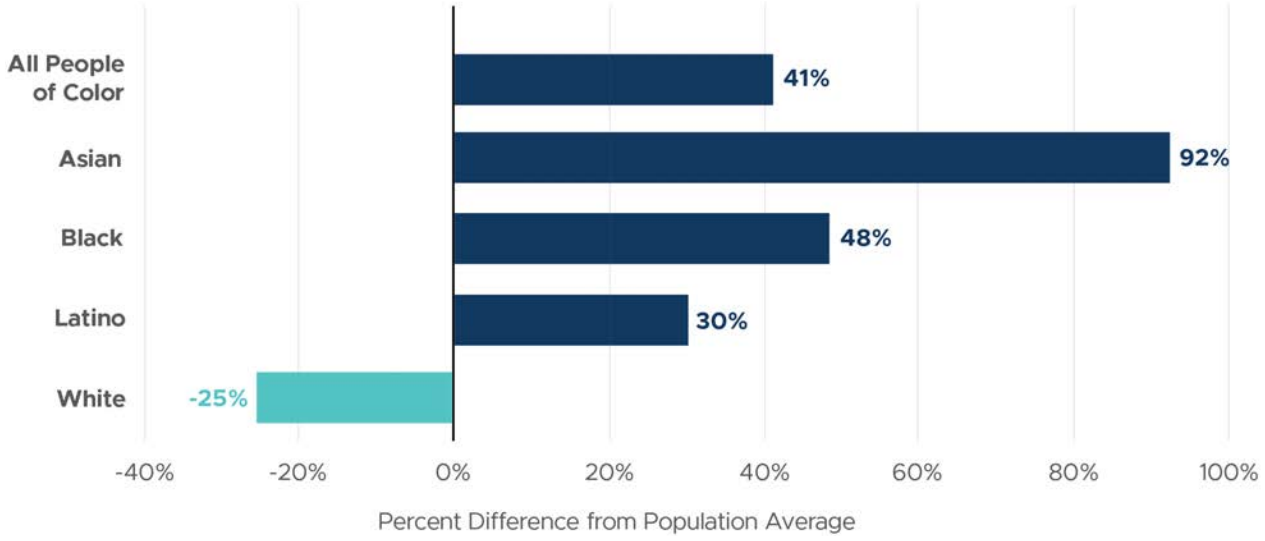
bringing appliances' total social cost to over $70 billion in 2017 alone. Fossil fuel appliances also contribute to additional health harms not included in the estimates above—from ozone-related death and illness to **asthma harms** from exposure to indoor air pollution—which means the true health impacts and costs are even greater.

Appliance Pollution Disproportionately Harms Communities of Color

While appliance pollution impacts everyone's health, communities of color in particular bear an alarming and disproportionate share of the health and pollution burdens from fossil fuel appliances. A recent peer-reviewed study found that People of Color are exposed to ***twice* as much** outdoor $PM_{2.5}$ pollution from residential gas combustion as Whites. Residential gas combustion showed the highest relative racial-ethnic disparity of *any* of the 14 source categories studied—more than power plants, vehicles, and industrial sources. Exhibit 4 shows the differences in exposure to $PM_{2.5}$ pollution from residential gas appliances across racial groups. Asian communities faced the highest average exposure to pollution from residential gas appliances—over *two and a half times* as much as Whites.

Exhibit 4

Racial-Ethnic Disparities in Exposure to $PM_{2.5}$ Pollution from Residential Gas Combustion



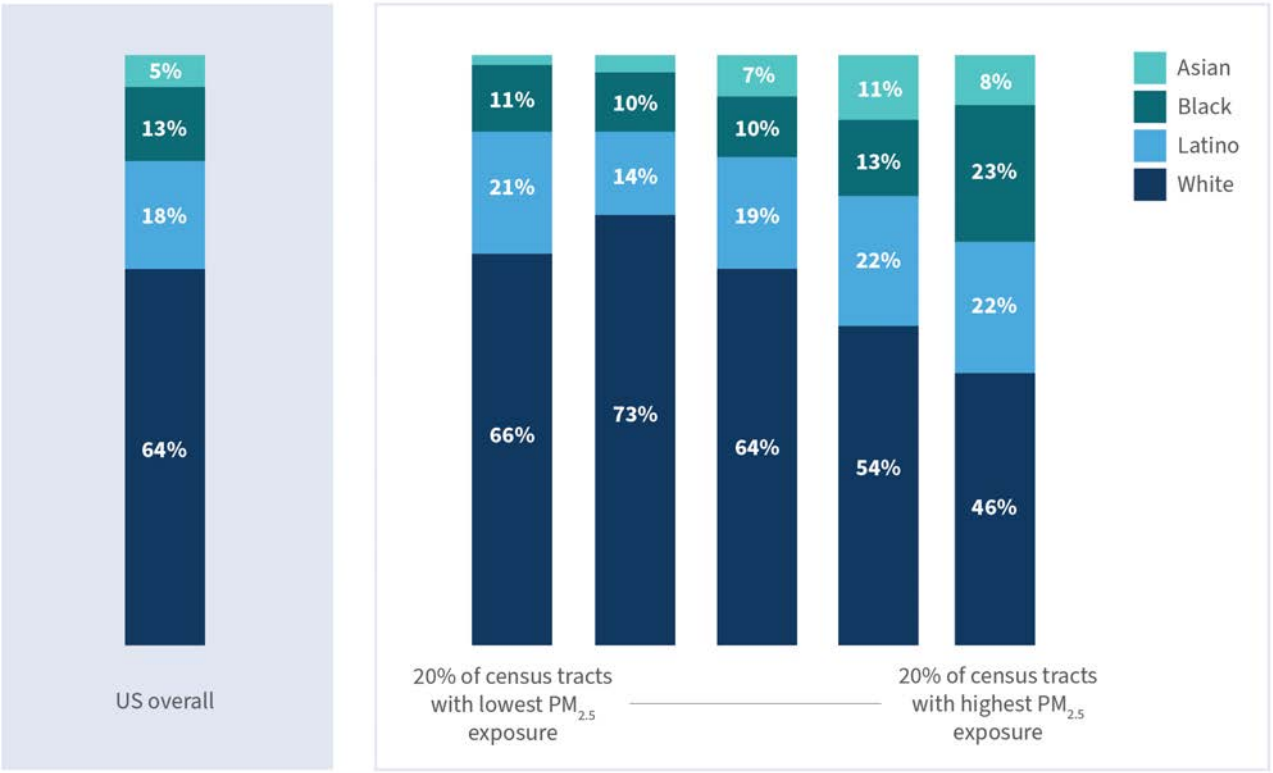
Source: Christopher Tessum et al., *$PM_{2.5}$ Polluters Disproportionately and Systemically Affect People of Color in the United States*, 2021, https://www.science.org/doi/10.1126/sciadv.abf4491

Exhibit 5 shows the racial-ethnic breakdown of each quintile of census tracts, from least to greatest exposure to $PM_{2.5}$ pollution from residential appliances. Communities of color are substantially more likely to live in census tracts with higher exposure rates, while the opposite is true for White communities. Unlike Whites, Asians, Blacks, and Latinos are overrepresented in the census tracts with the highest pollution exposure compared with their percentage of the overall US population. Greater $PM_{2.5}$ exposure increases the likelihood of severe illness and death. Black people are 55% more likely to die from causes related to appliance pollution than Whites, according to RMI analysis.[vi]

vi RMI analysis using **EPA emissions data** and the **InMAP** pollution modeling tool. This analysis uses similar methods (but even more recent data) and reaches similar findings as Tessum et al.'s **peer-reviewed study**.

Exhibit 5 Exposure to $PM_{2.5}$ Pollution from Residential Fossil Fuel Appliances

Communities of color are substantially more likely to live in census tracts with higher exposure rates, while the opposite is true for White communities.



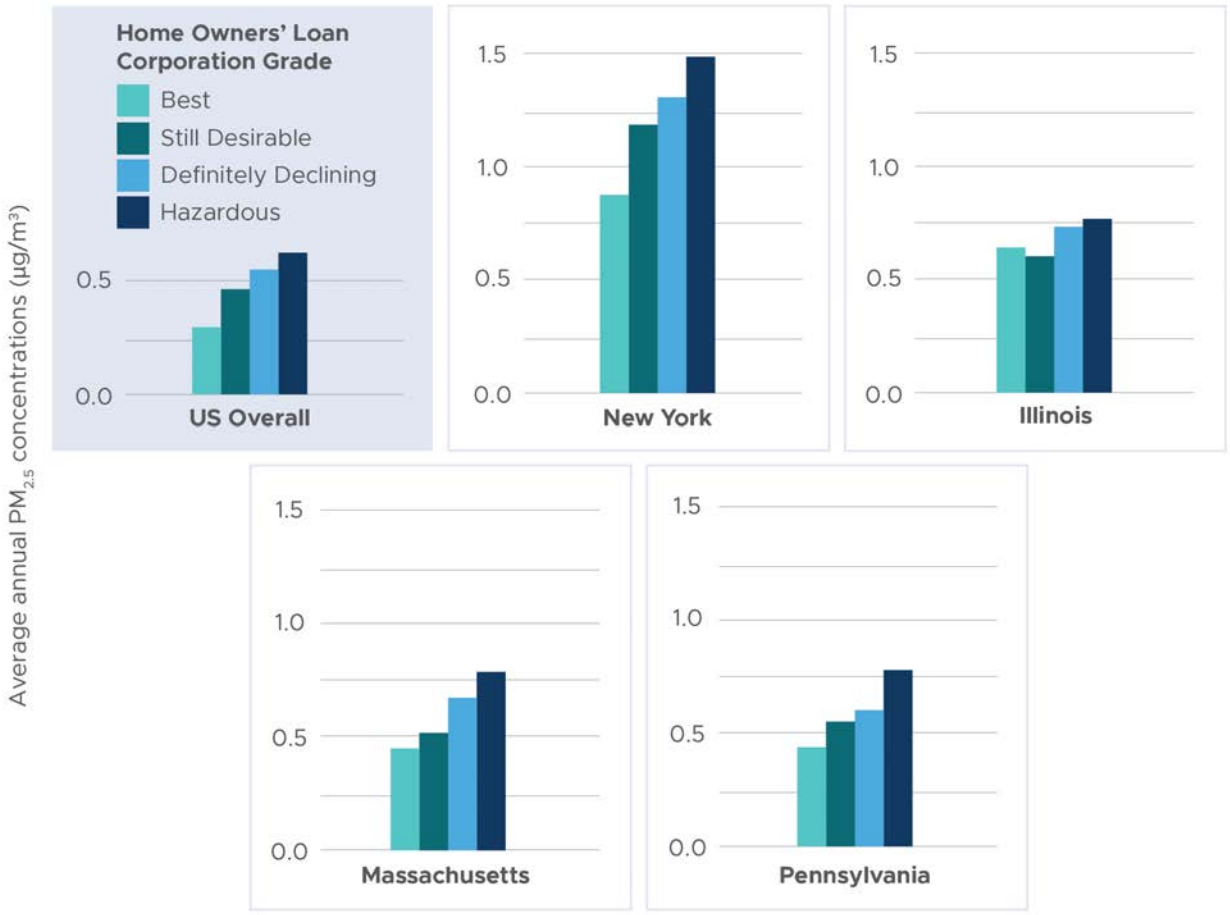
Source: RMI analysis of EPA 2017 National Emissions Inventory, 2017 American Community Survey, and InMAP pollution modeling tool

While the causes of these disparities in appliance pollution impacts have not been thoroughly studied, they appear to be related to America's history of segregation and racist housing policies such as redlining. As shown in Exhibit 6, the highest levels of appliance pollution in many states are found in areas that were historically **redlined** under the Home Owners' Loan Corporation's (HOLC's) grading system. Redlining contributed to neglect, exclusion, and **disinvestment** in these communities, making it harder for the people in these communities to obtain mortgages, accumulate wealth through homeownership, or move into higher HOLC graded neighborhoods. Low-income and BIPOC residents **disproportionately occupy** older, lower-quality housing. RMI analysis has found that appliance pollution levels are typically higher in areas with older median building ages,[vii] and these older houses are **more likely** to use fossil fuel appliances.

vii RMI analysis comparing **US Census data** on median building age with pollution data based on **EPA emissions inventory** and **InMAP** modeling.

Exhibit 6 Disparities in Outdoor $PM_{2.5}$ Concentrations from Residential Fossil Fuel Appliances Across Historically Redlined Areas

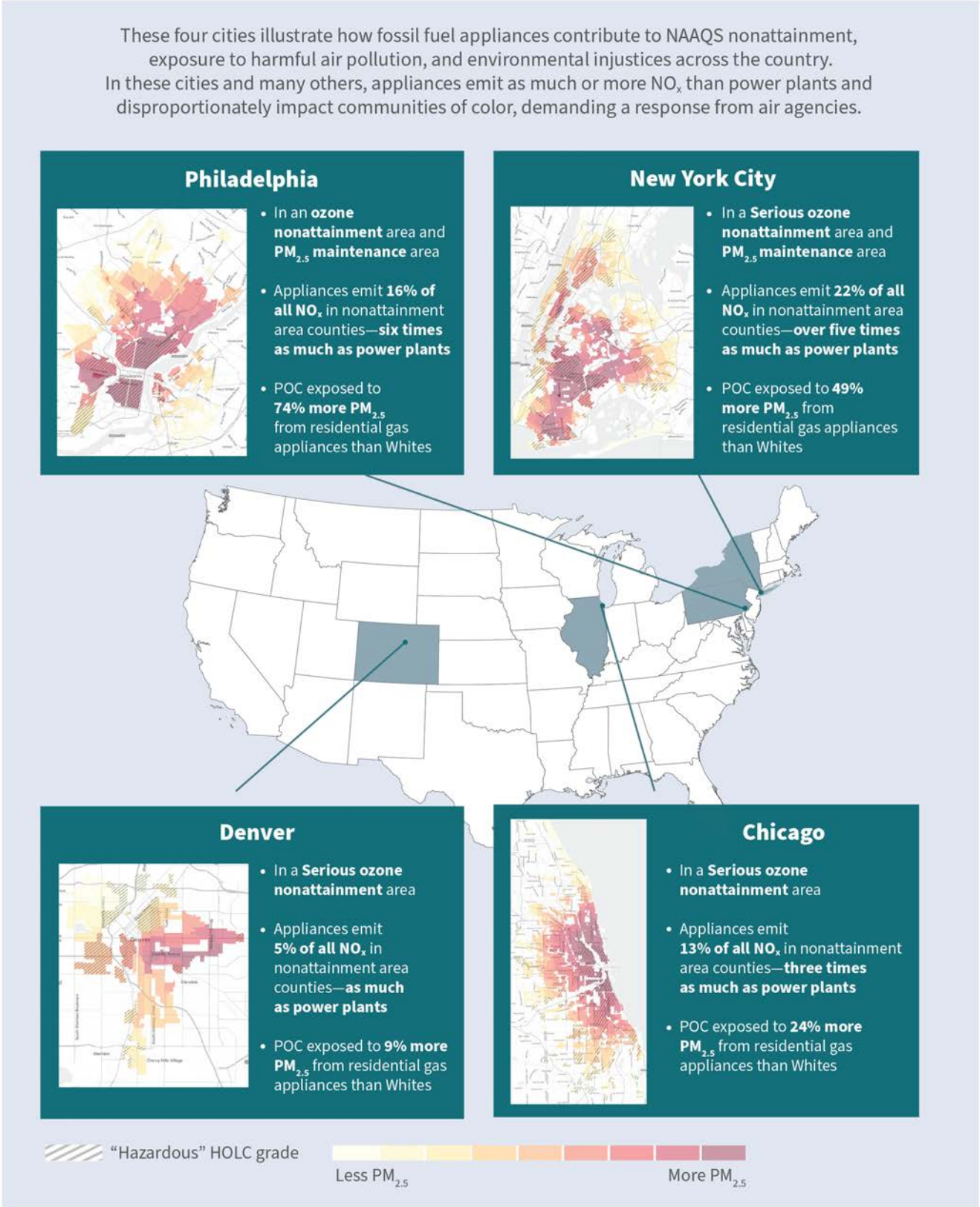
Exposure to outdoor pollution from residential appliances is higher in areas that were assigned "Hazardous" or "Definitely Declining" grades under the Home Owners' Loan Corporation's grading system, which was the foundation of redlining and a major contributor to housing discrimination.



Source: RMI analysis of EPA 2017 National Emissions Inventory and InMAP pollution modeling tool

Racial-ethnic disparities in exposure to appliance pollution contribute to unacceptable **cumulative health burdens** and environmental injustices. For instance, BIPOC communities experience **38% higher exposure** to nitrogen dioxide (NO_2)—one of the main pollutants emitted by appliances and one that is linked to asthma development. People of Color are also **more likely** to suffer from conditions like asthma that can be **worsened** by appliance pollution. Fossil fuel appliances' contributions to these inequitable health harms, along with their substantial pollution and climate impacts, demand action from air agencies.

Exhibit 7 Impacts in Major Cities Show the Need to Act on Building Pollution



Source: RMI analysis using EPA 2017 National Emissions Inventory, InMAP pollution modeling tool, HOLC maps from University of Richmond's Digital Scholarship Lab, and Christopher Tessum et al., $PM_{2.5}$ Polluters Disproportionately and Systemically Affect People of Color in the United States, 2021, https://www.science.org/doi/10.1126/sciadv.abf4491

Part 2: The Opportunity of Electrification

Fortunately, there is an effective solution available to the pollution, climate damage, and inequitable health harms caused by fossil fuel appliances: appliance electrification. But while electrification can provide many benefits, it must be implemented carefully to help address the existing racial and economic inequities of our housing system, rather than risk continuing or worsening them. This Part describes electrification's potential benefits and outlines a framework of four equitable electrification criteria that must be satisfied to realize that potential.

Efficient Electric Appliances Offer Many Benefits

First and foremost, switching to electric appliances eliminates the direct emissions from fossil fuel appliances, helping address the health harms and inequities described above. Ninety-nine percent of Americans live in states where replacing a gas furnace with an efficient electric heat pump will already **reduce total carbon emissions**. Electric appliances will offer even greater pollution reductions as the grid powering them becomes cleaner to meet the **Biden administration's goal** of 100% decarbonized electricity by 2035. Electrification can also substantially reduce NO_X pollution: RMI analysis shows that requiring all-electric new appliances by 2030 could avoid over **500,000 tons of NO_X per year** by 2045.[viii]

Electric appliances provide many other benefits, including energy savings, access to cooling, and grid interactivity. Modern electric appliances can outperform fossil fuel appliances in a wide range of applications. For example, heat pumps can perform well **across climates** at efficiencies three times as high as gas furnaces. And they can expand access to air conditioning, which can be a **life-saving necessity** as **extreme heat** becomes increasingly common, by providing heating and cooling with a single appliance. Similarly, heat pump water heaters are **two to four times as efficient** as gas-burning water heaters. And modern electric induction cooktops **outperform** gas cooktops with higher efficiencies and faster heat-up times to meet both home and restaurant cooking needs. Electric appliances can also be **grid-interactive**, helping improve **grid reliability** and drive down energy bills, especially when paired with energy efficiency.

Building electrification is a cost-effective and **low-risk** pathway to achieving decarbonization goals, as **several states** have **determined**. Electric appliances already have lower overall net present costs than fossil fuel alternatives in many situations, such as in **new construction**, when replacing **propane** or **heating oil** appliances, and when **simultaneously replacing** furnaces and air conditioners. Electrification will continue getting cheaper as device and installation **costs decrease**, equipment becomes **even more efficient**, and solutions are developed for related issues like utility rate structures and **electrical system upgrade requirements**. As discussed further below, zero-emissions appliance standards can provide market certainty and accelerate these cost-saving developments. When paired with efficiency and weatherization, the cost savings can be even greater.

viii This estimate of annual avoided NO_X slightly exceeds the 2017 total appliance NO_X emissions reported above because it includes projected growth in demand and relies on different analytic techniques.

Electrification can also help create **high-road jobs**, if the policies supporting the transition are carefully designed. Prior to COVID-19, energy efficiency was one of the **fastest-growing** sectors of the economy, and investing in building upgrades can help accelerate economic recovery. Home weatherization, energy efficiency, and electrification work is inherently local because upgrades must occur on-site, creating jobs nationwide. Even when accounting for job losses in the fossil fuel industry, **UCLA found** that electrifying California's building stock by 2045 will create 100,000 jobs and at least 60,000 would be in high-road sectors. And **Rewiring America** has estimated that a nationwide electrification program could create up to 318,000 direct construction and manufacturing jobs and 1.1 million total jobs over ten years. The reports from UCLA and Rewiring America, as well as **Greenlining Institute** and others, include specific recommendations for designing electrification policy to promote job creation.

Electrification Should Be Implemented Carefully to Support Broader Housing and Energy Justice

In addition to appliance pollution, several related issues must be addressed to achieve truly equitable, safe, healthy, and affordable homes and buildings for all communities. Historic and current inequities like **housing segregation**, **redlining**, **systematic disinvestment**, and **gentrification** have led to housing and energy burdens, especially for low-income and BIPOC communities. These and other factors have also put many renters at risk of displacement and have forced many BIPOC and low-income families into aging, unhealthy, and unsafe housing. If done right, electrification can serve as an opportunity to improve the health, safety, and livelihood of *all* communities. Policymakers should strive for **beneficial electrification** of housing, which expands beyond simply installing electric appliances to also include lowering housing and energy cost burdens, improving housing quality, reducing harmful pollutants, and improving how buildings interact with the electric grid.

This section describes four equitable electrification criteria that must be satisfied for the transition to be truly accessible and beneficial to all:

1. affordable upfront costs,
2. affordable energy costs,
3. anti-displacement and renter protections, and
4. necessary housing upgrades.

This is not intended as an exhaustive checklist, and the criteria should always be refined through inclusive processes to center local communities' specific needs and interests. Nor are the criteria directed solely at air agencies, which cannot be expected to create the conditions for equitable electrification alone. But by understanding and prioritizing these criteria, air agencies and their partners can work to advance housing equity in parallel with health and climate goals.

1. Affordable Upfront Costs

Millions of Americans face income constraints and housing cost burdens that could put the upfront costs of electric appliances out of reach if policymakers fail to act. In 2019, **37.1 million households** spent over 30% of their incomes on housing, and these households were disproportionately low-income and households of color. For electrification to be equitable, we must minimize upfront costs to low-income households and underserved residents.

First and foremost, this requires **ending existing subsidies** for fossil fuel appliances and redirecting those funds to investments in zero-emitting appliances. These investments may include upfront **rebates**, new or expanded programs focused explicitly on low-income retrofits, **tax credits**, and **on-bill financing**. Funding may be implemented by regional, state, or **federal** entities like legislatures, air agencies, energy departments, efficiency and weatherization programs, and utilities. Wherever possible, rebates and tax credits should apply immediately at the point of sale to minimize customers' upfront costs, and program administrators should make it as easy as possible to apply for and receive benefits.

First and foremost, [affordable electrification] requires ending existing subsidies for fossil fuel appliances and redirecting those funds to investments in zero-emitting appliances.

2. Affordable Energy Costs

Electrification policy should also be designed carefully to avoid increasing energy costs for those who are most burdened by them. BIPOC and low-income communities experience disproportionate **energy burdens**. Low-income households, which are **disproportionately** BIPOC, spend **three times** more of their income on energy costs than wealthier households. The median energy burden is 43% higher for Blacks and 20% higher for Hispanics compared with Whites.

Utilities and utility regulators should ensure that customers with higher energy burdens do not experience bill increases when replacing a fossil fuel appliance with an electric one. They can help keep bills affordable after customers electrify appliances by adopting time-varying electric rates, discounted winter heating rates, demand flexibility programs, and **percentage of income rates**. These solutions should be combined with measures like government- and utility-sponsored bill assistance and protection programs to ensure that electrification results in equal or lower total energy bills for low-income residents.

3. Anti-Displacement and Renter Protections

By pairing electrification policy with strong **anti-displacement protections** and enforcement, policymakers can ensure that electrification does not contribute to America's **affordable housing shortage**. This careful pairing can help avoid **rent increases**, evictions, or **displacement** following the appliance and building upgrades.

Federal, state, and local housing agencies could pass protective policies such as rent stabilization, just cause eviction **provisions**, and **affordability agreements** or deed restrictions ensuring that rent increases or evictions will not follow electrification. Some financing mechanisms, such as **energy service agreements (ESAs)**, can also ensure that total costs (rent plus utilities) are the same before and after a retrofit with the proper mix of energy efficiency and renewable energy technologies, thereby maintaining affordability for tenants. Anti-displacement protections, combined with investments and policies to promote efficiency and electrification in **rental**, **public**, and affordable housing, can ensure that electrification is affordable for these housing sectors.

4. Necessary Housing Upgrades

A truly equitable and **beneficial** electrification strategy must extend beyond individual appliances and include investments in critical health and safety upgrades. As described above, low-income and BIPOC residents are **more likely** to live in older, lower-quality homes with efficiency, insulation, deferred maintenance, health, and safety issues. These issues must be addressed through investments in health, safety, weatherization, and electrical system upgrades before many of these homes can be electrified, as discussed in a recent **report** by the Green and Healthy Homes Initiative. These investments can be administered through federal, state, and local entities focused on **housing** and **energy efficiency**, and can include stacked incentives, grants, tax credits, and financing, similar to the upfront cost investments described above. They should also be accompanied by anti-displacement and renter protections.

Part 3: Air Agencies' Role in Equitably Advancing Electrification

Air agencies are poised to help lead an inclusive, equitable transition away from fossil fuel appliances. They should use their statutory authority to enact zero-emissions appliance standards and play an active role in creating the conditions for equitable implementation of those standards. Specifically, air agencies should

1. collaborate with stakeholders and other decision makers,
2. invest in solutions for low-income households, and
3. carefully design zero-emissions standards with features that enable an equitable transition.

In doing so, air agencies should also lead comprehensive planning processes that center the needs of impacted communities. This should include securing financial support in cooperation with other agencies and utilities and making direct investments in affordable electrification where authority and funds exist. Most importantly, air agencies can design appliance standards with enough lead time to lay the foundation for an equitable transition. Air agencies' leadership will help drive and support action by other public and private entities and reflect the reality that appliance pollution reduction and housing equity must be pursued together.

Throughout the entire policymaking process—initial planning, interagency convening, developing investments, designing standards, and enacting policies—air agencies should be collaborating with community members. As environmental justice **advocates** have shown **time** and **again**, policymakers can achieve the greatest success and most equitable outcomes by partnering with impacted communities early and often, especially the BIPOC and low-income communities who are most impacted by housing burdens, energy burdens, and appliance pollution. This engagement process is especially crucial for building trust when developing housing-related policies, given the history of government-sponsored housing discrimination discussed above.

The **Spectrum of Community Engagement to Ownership** is a useful tool to help policymakers shift power and deepen collaboration with communities to achieve more equitable and transformative solutions. Another resource is Greenlining Institute's ***Equitable Building Electrification* report**, which proposes a five-step framework focused on an inclusive and equitable process for creating electrification policy. Importantly, this process begins with assessing the communities' needs and establishing community-led decision-making prior to developing policies and programs.

Throughout the decision-making process, air agencies should also ensure that interested parties are **fully informed** and able to participate, with access to needed **resources and support**. This includes

providing adequate time for public comment, offering materials in multiple languages and channels, and holding public hearings at times and in formats that promote participation. Air regulators should monitor engagement and adjust processes as needed to ensure inclusion and participation. By collaborating with communities throughout the process, air agencies and other agency partners are more likely to develop policies that produce **stronger** outcomes.

1. Collaborate with Other Decision Makers

An equitable transition will require coordinated efforts across agencies and utilities to shape buildings and housing policy. Air agencies alone cannot, for example, restructure utility rates or strengthen rent control. So, air agencies must encourage other entities to pass policies that address the equitable electrification criteria described in Part 2 before appliance emissions standards go into effect, stepping up as leaders and conveners when necessary.

Air and environmental agencies already lead multi-agency efforts to address fossil fuel appliance pollution in several states, such as **Michigan**, **New York**, and **California**. And air regulators have a variety of tools to coordinate with other entities at every stage, from planning to rulemaking to implementation. They can seek input from **government advisory boards** with environmental justice and equity expertise, partner with **interagency task forces** to develop holistic strategies, and **share their expertise** with other actors as they develop and implement parallel strategies. Air agencies can also **resolve** to support other agencies' electrification policies, conduct **joint rulemakings** with other agencies,[ix] and enter commitments with other agencies and private partners.[x] Each of these tools can help achieve the coordination needed to satisfy the four equitable electrification criteria leading up to implementation of appliance pollution standards.

2. Invest in Solutions for Low-Income Households

In addition to encouraging other entities to make coordinated investments in an equitable and affordable transition to zero-polluting appliances, air agencies should also make direct investments themselves wherever funds and authority exist. For example, California's South Coast Air Quality Management District has developed a revenue-neutral **heat pump rebate program** with funds reserved for customers located in disadvantaged and low-income zip codes. The rebates are **immediately available** to customers at the point of sale, and **funded by fees** that manufacturers pay if they fail to achieve the district's appliance emissions requirements. This program offers a promising model of how appliance standards themselves can be designed to generate funds that can be invested in an affordable transition.

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ix Joint or coordinated rulemakings could have many potential applications in the building pollution context, including a joint rulemaking between EPA (covering appliance pollution) and DOE (covering appliance efficiency).

x EPA has already entered several such commitments to reduce pollution from buildings and appliances, such as its **Memorandum of Understanding** with DOE on the ENERGY STAR program, a **multi-agency MOU** on federal leadership on sustainable buildings, and an **MOU** with the American Institute of Architects establishing a public-private partnership to advance green building design.

3. Design Equitable Zero-Emissions Appliance Standards

Air agencies' primary tools for addressing appliance pollution are emissions standards. These standards set a limit on the amount of pollution—typically NO_X—that new appliances may emit, either individually or averaged across all the units sold by a given manufacturer. As detailed in a recent report from the **Institute for Policy Integrity**, emissions standards for new appliances fall squarely within EPA's authority under **Section 111** of the Clean Air Act, and this includes standards based on zero-emitting electric appliances. Similarly, the Act **allows** state and local air agencies to set even stronger standards than the EPA. Indeed, air agencies in **California**, **Utah**, and **Texas** have limited NO_X from appliances as early as 1978, and some air agencies in **New York** and **California** are already **considering** zero-emissions standards.

The Clean Air Act leaves air agencies considerable flexibility to design pollution standards, which they can use to advance inclusive and equitable electrification. First, zero-emissions appliance standards can support an inclusive transition by covering *all* new appliances of a given category, whether they're installed in new or existing buildings, owner-occupied or rental units. Air agencies can also use their flexible statutory authority to design standards that advance electrification equitably and support parallel efforts by other agencies and partners.

Three features of standard design can be especially valuable in these efforts.

- **Lead time:** Air agencies can enact standards with compliance dates in the future. This lead time can help drive the innovation, investment, and workforce developments that will bring down electrification costs and transition the market. Setting a future implementation date establishes a commitment to electrifying newly installed appliances, while providing industry and government bodies the lead time needed to ensure that all equitable electrification criteria can be satisfied by the time electrification is required.

- **Ramp-up:** Air agencies can require zero emissions for a percentage or subset of appliances and include more appliances over time. For example, an air agency might design standards to initially require zero emissions for a relatively small percentage of the appliances sold by each manufacturer, in order to lay a foundation for broader electrification and verify that the four equitable electrification criteria can be met. The standards could ramp up toward requiring 100% zero-pollution appliances on a pre-determined timeline as investments and programs for equitable electrification are scaled. Like the "lead time" feature, this would chart a course toward full electrification while allowing equity investments and protections to expand alongside the standards.

- **Equity Conditions and Review:** Air agencies can set equity conditions for the implementation of standards and commit to evaluating whether those conditions are satisfied as the implementation date approaches. Staff could conduct an interim evaluation to determine whether the standard should go into effect on the implementation date or whether adjustments or extensions are needed to meet the conditions.

Efforts for Equitable Standards in Action: Four Case Studies

The following four case studies present promising examples of agencies working to adopt equitable appliance standards.[xi] The case studies note where these agencies have applied the strategies outlined above for collaboration, investment, and equitable standard design, and identify additional opportunities for the agencies to adopt these strategies.

As a leading example, California's Bay Area Air Quality Management District is in the process of **developing** zero-NO_x appliance standards that apply two key principles of equitable standard design: lead time and equity review. The draft standards would take effect between 2027 and 2031 (depending on appliance type), providing adequate lead time to ensure that the equitable electrification criteria can be satisfied. The district has committed to issuing public reports on the accessibility and affordability of zero-NO_x appliances at least two years before its standards take effect and determining whether any changes to the standards are required in response to the reports' findings. These reports will aim to address many of the equitable electrification criteria, including affordability, "[a]ssurance that policy promotes affordable housing and anti-displacement outcomes," and "[a]ccess to health and safety benefits."

Other leading agencies considering alternative approaches are **New York State** and **California's South Coast Air Quality Management District**. These agencies may be able to increase the likelihood of equitable results by considering the recommendations in this Insight Brief as they develop their proposals. The South Coast air district is considering standards that would apply first to appliances installed in new buildings and apply later or not at all to appliances in existing buildings. New York's approach would provide for "thoughtful development of alternative compliance pathways" for "extenuating circumstances" including issues related to housing affordability. Although these are well-intentioned efforts to avoid requiring low-income residents to comply before they can afford to electrify, they could risk leaving these residents behind in the transition. Instead, the agencies could consider phasing in zero-emissions standards to cover an increasing percentage of appliances, with planned support, investment, and protections for low-income and disadvantaged households. These investments could include electrification rebates paired with the standards and funded by noncompliance fees, much like the South Coast air district's existing **heat pump rebate program**. This would ensure these households can be among the early adopters of zero-emissions appliances.

California's Air Resources Board (CARB) recently **proposed** statewide zero-greenhouse gas standards for all new space and water heating appliances by 2030. These standards would function in much the same way as zero-NO_x standards and achieve substantial NO_x reductions in addition to climate benefits. The Board can develop this early-stage proposal into a successful, equitable policy by applying the recommendations in this Insight Brief, including robust engagement with impacted communities.

xi Case studies are based on the best available information as of early October 2021.

Conclusion

The pollution, health harms, climate impacts, and racial injustice caused by fossil fuel appliances demand an urgent response from air agencies. Thanks to key technological developments in recent years, zero-emissions appliances present an opportunity to eliminate this harmful building pollution. And thanks to decades of effort by environmental and housing justice organizations, policymakers have clear guidance for inclusive policymaking processes that center impacted communities. It is now up to air agencies to seize the opportunity before them by developing equitably designed zero-emissions standards for appliances, guided by community input, and by leading joint efforts on investments and policies that prioritize low-income and BIPOC communities. By applying the recommendations in this Insight Brief, air agencies can make a transformative impact on America's buildings sector, and center low-income and frontline communities in the transition to cleaner air and healthier homes and communities.