

Integrating Housing, Workforce, Health and Energy Equity in Building Decarbonization in Los Angeles, California

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ABSTRACT

Los Angeles aims to decarbonize all buildings by 2050, which is a key step in tackling our climate emergency considering that buildings are responsible for over 41% of LA's greenhouse gas emissions. A dramatic reduction in emissions is integral to mitigating climate change, which impacts marginalized communities the most. Black and Latinx neighborhoods are disproportionately exposed to pollution; they bear the negative health outcomes of such exposure and are least prepared, financially and infrastructurally, to withstand and recover from extreme climate events. Marginalized communities also suffer disproportionately from energy burden and poor quality housing, and they are more likely to hold low-wage jobs and encounter workplace impacts like misclassification. Therefore, decarbonization is critically important in addressing climate change and improving the health of these communities.

However, decarbonizing existing buildings is a costly undertaking. The economic impact of Covid-19 has left many Black and Latinx tenants in crisis, and current regulations do nothing to prevent landlords from raising rents and driving displacement. On the other hand, without high quality decarbonization upgrades, tenants will be left saddled with inefficient, unhealthy buildings and appliances. Additionally, the shift to building electrification can reduce skilled, well-compensated work for those in related industries, such as utility workers and pipefitters.

Optimizing the jobs, equity, and other community benefits of building decarbonization will not happen automatically. We provide recommendations for decarbonization policies and identify opportunities the city should consider that will prevent harm and ensure that renters, low-income neighborhoods, vulnerable businesses, and marginalized populations are able to reap the benefits of building decarbonization.

Introduction

Fossil fuels, and particularly fossil gas, are currently burned in buildings to provide services such as space heating, water heating, and cooking – releasing carbon dioxide and other harmful pollutants into the atmosphere in the process. In Los Angeles, the building stock is responsible for over 41% of LA's greenhouse gas emissions (Garcetti 2019), and Black, Latinx, and low-income communities disproportionately suffer the effects of poor air quality and climate impacts from such emissions (The Building 2004; Barna 2021). As the electricity generation system in California migrates to renewable sources, electricity will, in many cases, be the cheapest low-carbon fuel to use in buildings (Mahone et al. 2019). LA has a goal to decarbonize all buildings by 2050 and thus faces the challenge of eliminating emissions from new and existing buildings. Decarbonization of existing buildings is accomplished through building

retrofits and upgrades, including replacing natural gas appliances like furnaces, boilers, water heaters, stoves, and clothes dryers with highly efficient electric appliances that can run on 100% clean electricity. Decarbonization is critically important in both tackling our climate emergency and improving the health of Black, Latinx, and low-income communities.

To decarbonize LA's existing building stock, landlords will need to retrofit their buildings, and tenants will be affected. By how much and in what ways depend on the policy approach taken by the City. While reducing emissions from buildings is critical to addressing the climate crisis, failing to center such policies around tenant and worker protections risks exacerbating existing inequalities. Without careful planning, costly building decarbonization measures could lead to tenant displacement and harassment, decrease LA's affordable housing stock, increase tenants' rent and energy bills, disproportionately affect Black, Latinx, and low-income renters, and reduce natural gas industry jobs without comparable-wage replacements. If policies are designed wisely, building decarbonization can improve renters' lives by: lowering their energy burdens; eliminating the harmful health impacts of lead, mold, pests and indoor air pollution from natural gas appliances; providing better resiliency to extreme weather; and improving comfort in the home. Additionally, investing in building upgrades requires local workers, thus stimulating job creation. If shaped thoughtfully, building decarbonization can yield not only climate, but also equity and workforce benefits for the city.

The challenge before the City of LA is to develop the tools and strategies to reduce emissions, protect its most vulnerable residents from the current and future harms of climate change, secure accessible and affordable housing for its residents, and ensure that the solutions deployed do not levy disproportionate impacts on poor and working people. This paper evaluates the current decarbonization landscape, analyzes health, equity, and workforce challenges and opportunities, and provides policy recommendations on how to best move forward with equitable building decarbonization in LA.

Potential Decarbonization Risks to Tenants

Tenants are in Crisis

Two million people rent in LA (Maciag 2019), and nearly half of those in some of the City's poorest neighborhoods are severely rent-burdened, spending over 50% of their income on rent and utilities. Low-income renters have the highest rent burden (Drehobl, Ross, and Ayala 2020; Goulding 2019). Recent reports from the Southern California Association of Nonprofit Housing show that one minimum-wage worker supporting a family would have to work 145 hours per week at the local minimum wage to afford the average-priced two-bedroom apartment (SCANPH 2021). Many households cut back on food and clothing to pay rent (Angst et al. 2021).

Low-income renters also have the highest energy burden (Angst et al. 2021). They spend an average of 6% of their income on utilities, compared with 2.2% for all households (ACEEE 2020). They live in the least efficient homes, are disproportionately affected by indoor and outdoor air pollution, and are the least prepared for extreme climate events in terms of resources and capacity (The Building 2004). In LA, almost one-third of the City's Black households are energy burdened, and 15% are severely energy burdened (Drehobl, Ross, and Ayala 2020).

The pandemic has worsened this crisis. Many households have found it impossible to pay rent because of Covid-19-related job loss, and lower-income households experienced greater job loss than those with higher incomes (Petek 2021). In 2020, about 61% of LA residents reported

job or wage loss due to the pandemic, and 35% reported spending all or most of their savings during the pandemic (NPR 2020). The total rent debt in California is over \$3.5 billion (National 2022). Since the implementation of LA's 2021 Covid-19 Emergency Rental Assistance Program (ERAP), \$531 million of back rent has been claimed – with an average of \$10,000 per claim – and \$221 million has been paid or is in progress of being paid, with 61% of applications coming from tenants (LAHD 2022).

Black and Latinx renters have been hit hardest. Sixty percent of Black households and 69% of Latinx households lost income from April 23 to July 21, 2020 (Quackenbush 2021). Nationally, Black renters receive a disproportionate share of eviction filings (Quackenbush 2021), and in LA, tenants in Black and Latinx neighborhoods have been subject to illegal evictions more than in other areas (Dillon and Poston 2020). Landlords are using harassment and other tactics to illegally displace tenants who cannot pay rent.

It is not clear how soon employment levels will recover in LA, or when tenants will be able to pay the rent they owe, as it is unclear whether enough funding is available to cover all rental debt and whether the State's rental assistance program will reach the tenants most in need. The priorities for tenants are survival and stability, so decarbonization policy must be thoughtfully considered to ensure it does not exacerbate housing instability.

Upfront Costs of Decarbonization are High, and Tenants Are at Risk

The cost of decarbonization is high (Rosenberg 2021). When considering the cost for all new electric appliances and their installation, disconnecting gas, upgrading electrical panels to accommodate the increased electricity use if needed, and other potential energy-efficiency measures like envelope upgrades, a retrofit can cost between \$14,000 and \$28,000 per housing unit, with much of the cost due upfront (Jones et al. 2019).

Through the Tenant Habitability Program, owners of rent-stabilized buildings may also need to pay temporary relocation costs for tenants if they cannot remain safely in the home during retrofit work. Depending on how long the work takes, this additional cost could be significant. Although no per diem rate exists for temporary relocation assistance in LA, the General Services Administration uses the rate for a hotel room, which in LA is \$182 a night (GSA 2021). A weeklong retrofit would thus mean \$1,274 in relocation costs. This is a conservative estimate that does not account for household size and the potential need for larger accommodations.

Current regulations do nothing to prevent landlords from passing on the cost of decarbonization to tenants. If tenants must pay for decarbonization, the risk of displacement will rise because of existing rental debt and rent burden.

Cost Recovery Programs Burden Rent-Stabilized Tenants

Retrofits will affect tenants in LA differently depending on whether or not they live in an Rent Stabilization Ordinance (RSO) unit, a.k.a. "rent control." While RSO tenants have some protections from cost recovery for building upgrades that do not apply to non-RSO tenants, decarbonization is likely to disproportionately target RSO buildings because of their age and energy use characteristics and threaten their affordability. Multifamily buildings are responsible for 16% of overall energy use in L.A (Stamas et al. 2019).¹ Eighty-two percent of these were

¹ Multifamily buildings are defined here as buildings with five or more units.

built before 1978, when the California Energy Code mandated energy reduction in buildings. Pre-1978 buildings account for 55% of energy use among multifamily buildings and have higher gas consumption than those built after 1978 (Stamas et al. 2019).

The RSO protects tenants from exorbitant rent increases and unjust evictions by capping annual rent increases to the Consumer Price Index and limiting the reasons landlords can evict tenants. The RSO covers buildings constructed before 1978, and most rental buildings in LA are covered by the policy.² Despite these protections, landlords may increase rent beyond the cap to recoup the costs of certain retrofits. Under the four existing cost recovery programs for renovation, capital improvement, rehabilitation, and seismic retrofit (Table 1), landlords can pass on decarbonization costs to tenants (Kirk 2021). Which program would regulate decarbonization depends on the policy approach taken by LA. Under the Primary Renovation Work Program, tenants would see the largest rent surcharge of all the programs. For example, a household who pays \$2,182 per month—the average two-bedroom rent in LA—could see a monthly rental increase of \$157 for a retrofit costing \$28,200 (SCANPH 2021). If the household earns the average median income in LA, \$52,220 after taxes, the household would spend 54% of its income on rent in Year 1 and 57% in Year 2 and thereafter.³ In both scenarios, the household is considered severely rent burdened. Tenants already struggling to pay rent should not bear the costs of electrification and energy efficiency upgrades, especially as it is landlords who will benefit from any increase in property values as a result (Shen 2021).

Table 1. Cost Recovery Work Programs in the City of Los Angeles for RSO Tenants

Program	Use	Percentage of cost recovery	Amortization	Maximum monthly rental increase	Duration
Primary Renovation Work Program	Construction work that requires a Tenant Habitability Plan such as insulation improvements, upgrading electrical panels, and improving cooling and heating systems	100	180 months	10%	Permanent Phased in 50% Year 1 & 50% Year 2

² HCIDLA has identified 147,670 properties with 651,570 units that are subject to the RSO (HCIDLA 2021).

³ This figure was calculated using a California Income Tax Calculator for \$62,142 in gross income (U.S. Census 2021).

Program	Use	Percentage of cost recovery	Amortization	Maximum monthly rental increase	Duration
Capital Improvement Program	Exterior painting, landscaping, flooring, fixtures, doors, windows, fences, security items, meter conversions, major appliances, screens, and window coverings	50	60 months	\$55	Temporary 72 months, or until the total amount approved is collected
Rehabilitation Work Program	Mandated work required by a change in the building code or aftermath of natural disaster	100	60 months	\$75	Temporary 60 months or until the total amount approved is collected
Seismic Retrofit Program	Mandated work applying to about 12,000 soft story buildings	50	120 months	\$38	Temporary 120 months This time limit can be extended

Cost recovery programs don't represent the only rent increases allowed under the RSO. In addition to pass-through costs for retrofits, landlords can raise rent based on the Consumer Price Index, pass the full cost of the annual Systematic Code Enforcement Program (SCEP) fee on to tenants,⁴ and half of the cost of the annual RSO registration fee.⁵

Decarbonization Could Lead to Displacement and Unaffordability

Despite the RSO's rent cap, the policy's vacancy decontrol provision allows rents to be raised to market rate after a tenant vacates the unit. This means that under vacancy decontrol, landlords can charge new tenants significantly higher rents than an existing tenant. This provision has led to landlords using harassment and other tactics to get tenants to move out against their interests so rents can be increased. The RSO maintains low rents without subsidies

⁴ The SCEP fee applies to all registered RSO rental units and is paid to HCID to cover the cost of housing inspections. The SCEP fee for 2020 is \$43.32 (HCIDLA 2022).

⁵ Landlords are responsible for paying an annual rental registration fee to HCID. Landlords can pass on 50% of the fee to tenants in a one-time payment in August each year. For 2020, the fee was \$38.75, and landlords could charge tenants \$19.37 (HCIDLA 2022).

and keeps them below market rate, which is crucial because market-rate rents are out of reach for low-income households. As such, protecting tenants from displacement also preserves housing affordability. A decarbonization retrofit, which necessitates large upfront costs, could motivate landlords to displace tenants and therefore make housing less affordable.

Landlords commonly use harassment to illegally evict the City’s most marginalized tenants so they can charge higher rents. Common tactics include shutting off utilities, changing the locks, issuing fake eviction notices, failing to make repairs, installing security cameras, performing disruptive construction work, and removing services like parking and laundry (Ross 2021). The goal is to make tenants so uncomfortable that they voluntarily abandon their RSO rental leases, which lets landlords set higher rents. Home is supposed to be a place of sanctuary, not discomfort, and tenants leave if they feel threatened and uncomfortable, even if they have nowhere better to go. A decarbonization mandate could motivate harassment from landlords who want to quickly recover the cost of retrofit work from tenants.

Landlords are legally allowed to offer tenants cash buyouts to vacate leases in RSO units. Deceptive use of these “cash for keys” buyouts is another tactic used by landlords to motivate tenants to move out of RSO units (McGahan 2016). Landlords, or their representatives, are known to make unprompted offers of cash to tenants, telling them they have no choice but to accept the offer. Tenants do not have to accept the offer, but those who do not know their rights, or who are intimidated by the person making the offer, may accept it. Accepting the buyout offer is usually against their best interests, especially if the tenants had no intention of leaving the home, because the compensation amount is inadequate.

High risks for Non-RSO Tenants

Decarbonization poses higher risks for non-RSO tenants, who have only minimal protections against rent increases and displacement tied to retrofit work. Most non-RSO tenants are protected under AB 1482, the State’s Tenant Protection Act, which covers buildings at least 15 years old that are not covered by the RSO, except single-family homes owned by mom-and-pop landlords. Under AB 1482, landlords can increase rents up to 10% each year and may evict a tenant for substantial remodels in exchange for relocation money in the amount of one month’s rent (Tenant 2019). One month’s rent is inadequate to cover moving, the security deposit on a new home, and the difference in rent costs factoring in changes in market rents. Non-RSO tenants in buildings constructed in the last 15 years do not have any protections (Table 2).

Table 2. Rent Regulation in Los Angeles

Coverage	Law	Protections
Tenants in buildings built on or before Oct. 1, 1978 with the exception of some SFH homes	The Rent Stabilization Ordinance	Rent capped at Consumer Price Index
Tenants in buildings at least 15 years old and not otherwise covered by the RSO, with the exception of single-family homes and condos owned by an investment vehicle.	AB 1482	Rent capped at a 10% increase
Building built in the last 15 years	None	No rent cap

Decarbonization Job and Labor Quality Concerns

Improving the energy performance of buildings has the potential to create good local jobs. Even when improved energy performance is dependent on swapping out one type of equipment for another, significant work needs to be done in buildings to accommodate, install, and maintain new equipment, and because building work cannot be offshored, policies that stimulate such investments in buildings create jobs for local workers. While decarbonization could support jobs for tens of thousands of LA residents, new jobs created by decarbonization are not guaranteed to be high quality, particularly in the private construction market. Additionally, reduced gas infrastructure and sales can lead to a loss of well-paying union jobs associated with the gas system. The public and private sector investment required to realize the potential of high quality decarbonization jobs is significant.

Potential Job Losses

For all-electric new construction, there are but few and conflicting studies on the implications for job loss, such as information on the relative increase or decrease in project costs. Cost increases are typically attributed to more expensive equipment while cost savings are attributed to reduced labor costs, but the case data is insufficient to estimate job loss.⁶ We assume that plumbers and pipefitters will be the occupation most adversely affected by the shift away from gas. The LA Plumbers union has 1,650 members and their journey-person wage is \$48.13/hour, which is about 50% higher than the national average for plumbers and pipefitters in the natural gas industry (DIR 2021; United 2021).

The gas utility and its workforce will be adversely affected by reduced gas sales. While the size of the gas utility workforce is more a function of the size of the system than the fuel moving through it, reduced throughput could have a destabilizing effect on the industry, triggering price increases. Overall, LA County is responsible for 23% of gas consumption in the state (CEC 2021). As of 2019, the natural gas distribution industry in LA County employed 8,580 individuals across a wide range of occupations (IMPLAN 2021). Table 3 shows the number, classification, and wages of workers employed in the natural gas distribution industry in LA County (Jones 2021). If the City of LA succeeds in eliminating gas use in residential and commercial buildings by 2050, many of these workers would need to seek employment in different industries.

Table 3. Number of Workers Employed in Natural Gas Distribution Industry in LA County, by Occupation

Occupation Code	Occupation Title	Employment	Percent of total employment	National mean hourly wage	National annual mean wage
49-0000	Installation, Maintenance, and Repair Occupations	1,853	21.6%	\$36.49	\$75,900
51-0000	Production Occupations	880	10.3%	\$40.12	\$83,450

⁶ This report shows cost savings of \$6,412 for all-electric new construction due to savings from not piping gas from the street or plumbing of gas pipes to the kitchen, dryer, water heater, and furnace (Hopkins et al. 2018).

Occupation Code	Occupation Title	Employment	Percent of total employment	National mean hourly wage	National annual mean wage
47-000	Construction and Extraction Occupations	870	10.1%	\$34.79	\$72,370
52-0000	Transportation and Material Moving Occupations	183	2.1%	\$31.39	\$65,280
33-0000	Protective Service Occupations	9	0.1%	\$39.20	\$81,530
37-0000	Building and Grounds Cleaning and Maintenance Occupations	3	0.0%	\$25.87	\$53,810
Blue Collar Total/Average		3,798	44.3%	\$36.69	\$76,323
43-0000	Office and Administrative Support Occupations	1,529	17.8%	\$29.32	\$60,980
13-0000	Business and Financial Operations Occupations	1,182	13.8%	\$44.92	\$93,430
11-2000	Management Occupations	625	7.3%	\$71.58	\$148,900
17-0000	Architecture and Engineering Occupations	613	7.1%	\$47.91	\$99,660
15-0000	Computer and Mathematical Occupations	390	4.6%	\$48.97	\$101,870
41-0000	Sales and Related Occupations	306	3.6%	\$38.47	\$80,010
19-0000	Life, Physical, and Social Science Occupations	70	0.8%	\$44.93	\$93,450
23-0000	Legal Occupations	33	0.4%	\$80.39	\$167,200
27-0000	Arts, Design, Entertainment, Sports, and Media Occupations	30	0.4%	\$44.86	\$93,300
White Collar Total/Average		4,780	55.7%	\$43.96	\$91,442

Potential Job Growth

Well-designed building decarbonization programs can create well-paying, stable jobs. While the empirical data on job loss or growth related to building decarbonization is sparse, modeling reveals that the most ambitious energy efficiency and electrification programs that include deep efficiency measures such as building envelope and insulation upgrades could create about 18,000 new, full-time jobs for 29 years, as shown in Table 4 (Jones 2021). In these models, new opportunities in building efficiency and electrification would outnumber jobs lost in the natural gas sector (Inclusive 2021).

Table 4. Summary Building Decarbonization Careers (2021-2050)

	Deep Energy Efficiency	Whole Building Electrification	Total Decarbonization
Careers (Small residential and small commercial, except schools)	6,360-9,760	3,150-4,200	11,000-15,600
Total Investment Cost	\$37.1 – 55.2B	\$26.5-35.4B	\$63.6-90.7B
Careers (Large buildings and schools, universities, hospitals)	1,100 – 1,470	700 - 940	1,750 – 2,340
Total Investment Cost	\$9.9 – 13.1B	\$4.9 – 6.7B	\$14.8 – 19.8B
Total Careers Supported (2021-2050)	7,460 – 11,230	3,850 – 5,130	12,750 – 17,940
Total Investment Cost	\$47.0 – 68.4B	\$31.5 – 42.1B	\$78.4 – 110.5B

In the residential sector, policies to encourage homeowners to invest in mid-level cost-effective efficiency upgrades and beneficial electrification could support 3,290–4,900 new long-term jobs for city residents (Jones 2021). Deeper efficiency retrofits require higher levels of investment and support more jobs. Additionally, the types of jobs associated with deeper efficiency retrofits are more variable than with lighter levels of efficiency. The primary sources of jobs in residential electrification are space heating/cooling and electric service and panel upgrades. Deep efficiency retrofits and beneficial electrification of LA’s affordable housing specifically would require a total upfront investment of \$11.5–18.7 billion (Jones 2021). If invested over a 10-year period, this would support 4,560–7,360 careers for city residents (Jones 2021). A 10-year investment, however, assumes early replacement of existing gas appliances and is therefore a higher cost solution than an electrify-upon-burnout solution.

Additionally, investments in commercial building efficiency retrofits show significant efficiency job opportunities in both the small and large commercial sectors. Requirements to improve building energy performance would lead to a combination of efficiency and fuel switching improvements. Large whole-building energy efficiency projects would also require work associated with engineering-grade energy audits. Additionally, electrifying at the time of equipment replacement shifts the distribution of work slightly, increasing the demand for electricians. Electrifying a building when equipment burns out requires more workers than

business-as usual, and there is no system (i.e., electrical, plumbing, HVAC, general carpentry, etc.) requiring fewer hours of work in this situation.

To tackle building energy performance in non-residential buildings in a way that is compatible with good jobs and community benefits, investments could also be made in schools and other public-service sectors such as universities and hospitals. There are local and state funding sources that could complement new city investments in improved energy performance of these buildings. For example, Measure RR provides \$7 billion for improved building facilities and safety measures in the Los Angeles Unified School District, and AB 841 provides funding for school efficiency in territory served by investor-owned utilities, including Southern California Gas (Jones 2021). When concentrated public investments are made, contracts such as project labor agreements or community workforce agreements can specify labor and wage standards, as well as targeted hire metrics, to ensure that the investments are supporting job quality and job access.

Labor Quality Concerns

Despite the potential for job growth through efficiency and electrification, such jobs are not guaranteed to be high quality without the adoption of robust labor and apprenticeship standards. Violations of labor laws and building codes in the single-family residential sector are common, and enforcement is necessary to support improved job quality. In addition, low cost is the primary driver of competition between firms serving the residential sector. Business models built on providing the lowest-cost service are often premised on low, sometimes illegal wages (Jacobs 2022).

Without policy action to change course, 85% of these jobs will be in traditionally “low-road” market sectors, where firms compete by outbidding each other (Jones 2021). This ultimately proves problematic for consumers who, unable to evaluate the quality of a new air source heat pump installation for example, experience comfort or cost problems due to poor quality installation or commissioning. Firms who do invest in a skilled and trained workforce have trouble competing and may get out of residential work altogether. Without efforts to evaluate and ensure work quality in the residential and small commercial sectors, work quality and job quality will remain, at best, highly variable, which is problematic for market transformation.

Additionally, with the replacement of water heaters, stoves, and dryers with efficient electric alternatives, much of the cost is the equipment itself, with little work required to install other than running a dedicated circuit for appliances. In the case of heat pump water heaters, plumbing and sometimes duct work is also required. The small scale and multi-craft nature of residential electrification makes it particularly challenging.

Opportunities and Recommendations

Improve Habitability through Decarbonization

As buildings are retrofitted for decarbonization, they should be evaluated for mold, lead, asbestos, and any other health and safety violations in accordance with California Civil Code

1942, and local housing codes should be used to remediate violations and enhance building safety.⁷

One benefit of decarbonization for tenants is that it can make housing safer, less polluted, and more comfortable by addressing indoor pollution, air leakage, and deficient insulation. But these are not the only things that make housing uncomfortable and unhealthy. Slum housing conditions, such as pest infestations and mold, and hazardous conditions, including asbestos and lead, are sickening Angelenos, particularly those in low-income communities of color. Tenants of such buildings may not see decarbonization as a benefit unless it addresses broader habitability.

Beyond electrification and energy efficiency, decarbonization is an opportunity to make buildings healthier. If done thoughtfully, decarbonization not only can eliminate unhealthy conditions but also boost comfort. Decarbonization can include envelope improvements such as insulation, air sealing, and integrated pest management measures paired with adequate ventilation, which results in both energy efficiency and healthier housing.

Mandate Comprehensive Decarbonization Upgrades

LA should mandate comprehensive retrofits that require electrification while also addressing energy efficiency, a healthy indoor environment, safety and comfort. A decarbonization mandate should establish a minimum scope of work that property owners are expected to carry out, including electrification, deep energy efficiency (insulation, building envelope, lighting, etc.), remediation of uninhabitable conditions (such as leaks and mold), and climate resiliency measures (such as rooftop solar with battery storage and a back up power system). Passthrough costs or fees for tenants for decarbonization retrofits should be prohibited, and corporate property owners should pay the full cost of decarbonization. Existing law already requires audits, energy benchmarking and retro-commissioning for privately owned buildings 20,000 square feet or larger, and City-owned buildings larger than 7,500 square feet (LADBS 2022). Therefore, to align with these existing requirements, the first phase of decarbonization should target these buildings as well as all new construction.

Target Public Assistance

Public subsidies for decarbonization should only be made available to affordable housing providers, community land trusts (CLTs), and certain mom-and-pop landlords, not corporate landlords. Funding is the largest obstacle to decarbonizing LA, and because it is limited, it should be reserved for those who need it. Two-thirds of LA rental units are owned by corporate landlords who have access to large amounts of capital and are better able to comply with a decarbonization mandate (Ferrer 2021). In LA, funding streams such as Measure HHH, JJJ, and M, and state programs such as CAMR, LIWP, and SOMAH can help cover the high upfront cost of building retrofits and appliances for low-income consumers, so they are not stranded with inefficient and unhealthy appliances and buildings (Rosenberg 2021).

⁷ The average cost to remediate slum housing conditions is about \$41,000 per apartment unit, or \$400 million to remediate all L.A.'s slum housing (Lowe and Haas 2007).

Improve Local and State Tenant Protections

Landlords should be required to submit a Tenant Habitability Plan (THP) for decarbonization retrofits. The THP should be amended to limit the time tenants can be displaced to 90 days, with permission required to extend for up to one year. Tenants should also be able to decline a THP if the renovation work is not necessary and will cause more burden than benefit. The Tenant Anti-Harassment Ordinance should also be amended to protect tenants from decarbonization-related harassment and include budget resources for enforcement, and AB 1482 should be amended to remove substantial renovation work as a just cause for eviction. Finally, LA should increase the relocation assistance for tenants displaced by retrofits. Relocation assistance should cover the cost of moving, any cost associated with house hunting, temporary relocation, and travel needed to move. LA should develop a formula that considers current market conditions, out-of-pocket moving expenses, duration of tenancy, and the portfolio size of the property owner.

Ensure High Quality, Accessible Employment

Thinking upfront about who will perform the work to improve building performance is also important. Engaging a skilled and trained workforce is fundamental in ensuring that the expected energy savings and emission reductions are actually achieved. Proper installation, calibration, and maintenance of equipment is essential, particularly as buildings become more integrated with and responsive to the grid.

The City should condition permits and financial incentives on the use of a skilled and trained workforce to achieve energy benefits and ensure that the work created supports city workers and their families. The City should also support apprenticeship standards so that decarbonization work will provide career-track training opportunities for new workers. Targeted hire standards on publicly funded projects and coordination with the City's many MC3 apprenticeship readiness programs can ensure job access for priority populations underrepresented in high-road construction jobs (Olinsky 2013). Support, training, and capacity building of women and minority-owned business enterprises (WMBEs) can ensure diversity, equity, and inclusion on the contracting side.

Expand and Decarbonize District Energy Systems

District energy systems can create jobs for gas utility and other skilled construction workers, such as insulators and boilermakers, while providing numerous other benefits (Jones 2021). These systems should be prioritized where applicable to simultaneously create good jobs and decarbonize the building stock.

Neighboring buildings often have complementary heating and cooling needs and connecting them through a district network can reduce energy consumption, emissions, and tap sources of renewable energy like solar thermal, waste-to-energy, geothermal, and waste heat recovery from sewage or industry, that are not cost effective at the scale of a single building. This reduces demand from the electricity grid and creates opportunities for skilled and trained workers, including those in the gas utility and construction business. If 5–10% of LA's existing buildings (114–227 million square feet) were connected to a modern carbon-free district energy system, the construction alone would create 22,000–44,000 direct construction jobs and require 1,000–2,600 ongoing operations and maintenance jobs (Jones 2021). While this networked

approach is complex, the city could pursue a pilot or feasibility study to identify which neighborhoods in LA are the best candidates for such an approach.

Conclusion

Building decarbonization is not only vital to achieving climate goals, but can also provide health, safety, economic and workforce benefits. LA has the opportunity to implement policies and programs that create family-sustaining jobs, expand tenant protections, provide direct benefits to residents, reduce energy burden, improve public health, and support housing preservation and stabilization. LA is already making emission reduction progress: 37% of LADWP's electricity currently comes from renewable sources, its grid will be 97% carbon-free by 2030, and the city's buildings will be decarbonized by 2050 (Sutley 2022; City 2021). As progress toward these goals continues, low-income renters, vulnerable businesses, and others must be able to benefit from decarbonization, rather than being left behind. As presented here, the path to cleaner and more just living conditions for all LA residents is not without challenges, and the potential costs of decarbonization must be addressed head on. If done thoughtfully, investing in building upgrades can jointly deliver a range of equity, economic, and climate benefits for all LA residents.

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