Transforming the Housing Sector with Green Industrial Policy

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Executive Summary

The traditional economic incentives driving the housing sector are not working to deliver affordable and stable housing in the midst of climate and cost-of-living crises. To meet the moment and ensure adequate, affordable, decarbonized and climate-resilient housing, the United States should adopt a suite of policy interventions to direct the housing sector's sustainable development and transformation—in other words, *green industrial policy* for the housing sector.

To reach carbon reduction goals and housing supply needs, the US housing sector will need to double the current housing construction pace and multiply the pace of retrofits 30 fold.[1] This is on top of the roughly 35 percent of US homes (45 million units) that are in need of general habitability repairs, an estimated investment need of nearly $150 billion.[2] And, of course, all of this is happening in a context of a deep housing affordability crisis—with over half of renters cost-burdened—making it essential that these efforts prioritize affordability for renters and homeowners.[3]

Meanwhile, at a time when there is a historic amount of work to do, the construction sector is on the decline. In 2022, the construction workforce was 6.2 million, 11 percent lower than in 2007 and 2 percent lower than before the pandemic.[4] Hundreds of thousands of open construction jobs remain routinely unfilled, and industry groups expect that job openings will exceed half a million in 2025.[5]

To address this market failure, we need a new approach that will coordinate labor, manufacturing, capital providers, utilities, and residents to deliver

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[1] Adam Hasz, Nicholas Ryan, and Joan Glickman, "Advanced Building Construction (ABC) – A Not Quite 'Easy as 1-2-3' Initiative to Scale Deep Energy Retrofits and Transform US Buildings," US Department of Energy Building Technologies Office, 2020, https://studylib.net/doc/25495873; Paul Emrath, "More New Homes Needed to Replace Older Stock," National Association of Home Builders Economics and Housing Policy Group, August 2, 2018, https://www.nahbclassic.org/generic.aspx?sectionID=734&genericContentID=263243.

[2] Eileen Divringi, "Research Brief: Updated Estimates of Home Repair Needs and Costs," Federal Reserve Bank of Philadelphia, March 2022, https://www.philadelphiafed.org/-/media/FRBP/Assets/Community-Development/Reports/23-02-Home-Repairs-Update.pdf.

[3] Joint Center for Housing Studies of Harvard University, "The State of the Nation's Housing 2023," June 2023, https://www.jchs.harvard.edu/sites/default/files/reports/files/Harvard_JCHS_The_State_of_the_Nations_Housing_2023.pdf.

[4] Sophie Huang, "Rebuilding the Construction Trades Workforce," Joint Center for Housing Studies of Harvard University, June 5, 2024, https://www.jchs.harvard.edu/blog/rebuilding-construction-trades-workforce.

[5] Associated Builders and Contractors, "ABC: 2024 Construction Workforce Shortage Tops Half a Million," January 31, 2024, https://www.abc.org/News-Media/News-Releases/abc-2024-construction-workforce-shortage-tops-half-a-million; Home Builders Institute, "The Home Builders Institute (HBI) Construction Labor Market Report," Fall 2024, https://hbi.org/wp-content/uploads/2024/09/Fall-2024-Construction-Labor-Market-Report.pdf.

affordable climate-resilient upgrades to a wide range of homes quickly and effectively.

We argue that advancing green industrial policies for housing can overcome misalignments between manufacturers, builders, capital providers, utilities, and homeowners. This approach can facilitate equitable market transformation to deliver affordable and sustainable new construction and retrofits at scale. Industrial policy has been applied to several US sectors—digital technologies, renewable energy—but is not commonly applied to the housing sector in modern day policy discussions.

With green housing industrial policy, we can lower costs, build coalitions, coordinate interventions, and stack policies to help those in greatest need.

With green housing industrial policy, we can lower the costs of green housing materials; build coalitions across government, industry, labor, and residents; coordinate interventions to get things done; and stack policies to help those in greatest need reap the benefits of upgraded homes. A green housing industrial policy would enable the United States to assemble new coalitions by mobilizing capital to finance construction and building upgrades, increasing manufacturing of appliances and construction materials, bringing labor unions into a more active role in housing construction, and prioritizing innovation across the supply chain. And this approach will put public institutions front and center, enabling them to work better for the public good at the speed and scale required to bring down the cost of housing and address the health and safety issues associated with the climate crisis.

Not only will industrial policy coordinate effective and equitable housing security at the pace and scale needed to respond to climate breakdown, these policy measures can overcome persistent misalignments in contemporary housing construction, including:

- Challenges to the production and commercialization of clean energy technologies for homes and neighborhoods by using sustainable supply chains and high-road labor standards
- The yawning gap between public investments in clean energy technologies and actual housing affordability for low-and moderate-income households
- Construction sector fragmentation and chronic under-investment in workforce development and job quality

In recent years, seeds of innovation and public resources have begun to signal some potential for change. Public housing agencies like the New York City Housing Authority have shown how public procurement of green technologies for public housing can cut costs and increase efficiency, and the Inflation Reduction Act created pools of low-cost capital for building and retrofitting housing. Although the Trump Administration has shown little interest in creating supportive green industrial policies, this is no time to

pause the task of decarbonizing and making resiliency improvements to the housing sector.

In this brief, we call for a green industrial policy for housing and explore the market gaps that this transformative approach would overcome.

State and local governments working with labor unions, manufacturers, and private capital can still make strides in this work and thereby provide a blueprint for federal green housing industrial policy.

In this brief, we explore the market gaps that a green industrial policy for housing would help overcome. We also identify key subsectors and stakeholders in the housing construction industry. We call for initiating coalition- and consensus-building processes over policy interventions at the federal, state, and local levels to define and advance a green industrial policy for housing.

Background

The impacts of the climate emergency—severe weather events, rising home insurance costs, increasing energy bills—are making the US housing crisis even worse.[6] Since the early 2000s, spending on home repairs following weather and climate disasters has steadily increased, reaching $20 billion in 2021.[7] And roughly 35 percent of US homes (45 million units) require general habitability repairs, an estimated investment need of nearly $150 billion.[8]

Making homes *climate resilient* and *decarbonized* is a herculean task. Market analysts suggest that of the 125 million existing homes in the United States, approximately 92 percent will need energy upgrades to become "zero-carbon-aligned" or "electric-ready."[9] Meanwhile, economists estimate

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[6] Associated Press, "L.A.'s Wildfires Are Making a Tough Rental Market Even More Brutal. Here's Why," Fast Company, February 21, 2025, https://www.fastcompany.com/91282643/l-a-s-wildfires-making-tough-rental-market-even-more-brutal-heres-why; Moira Birss, Alex Casey, Michael Esposito, Nick Graetz, Sarah Knuth, C. S. Ponder, and Zac J. Taylor, "Shared Fates: A Housing Insurance Policy Vision for the Home Insurance Crisis," Climate and Community Institute, September 2024, https://climateandcommunity.org/wp-content/uploads/2024/09/Shared-Fates_10-09-24_3.pdf; Drew DeSilver, "A Look at the State of Affordable Housing in the U.S.," Pew Research Center (blog), October 25, 2024, https://www.pewresearch.org/short-reads/2024/10/25/a-look-at-the-state-of-affordable-housing-in-the-us/; Christopher Favelle, "Insurers Are Dropping Homeowners as Climate Shocks Worsen," New York Times, December 18, 2024, https://www.nytimes.com/interactive/2024/12/18/climate/insurance-non-renewal-climate-crisis.html; Robert Walton, "US Electricity Prices Outpace Annual Inflation," Utility Dive, March 13, 2024, https://www.utilitydive.com/news/us-electricity-prices-rise-customer-eia-outlook/710113/.

[7] Joint Center for Housing Studies of Harvard University, "Improving America's Housing 2023," March 2023, https://www.jchs.harvard.edu/sites/default/files/reports/files/JCHS-Improving-Americas-Housing-2023-Report.pdf.

[8] Eileen Divringi, "Research Brief: Updated Estimates of Home Repair Needs and Costs," Federal Reserve Bank of Philadelphia, March 2023, https://www.philadelphiafed.org/-/media/FRBP/Assets/Community-Development/Reports/23-02-Home-Repairs-Update.pdf.

[9] Brett Webster, Aven Satre-Meloy, Leslie Badger, Damon Lane, Kevin McGrath, Eric Wilson, et al. "Accelerating Residential Building Decarbonization: Market Guidance to Scale Zero Carbon Aligned Buildings," Advanced Building Construction Collaborative, 2024, https://advancedbuildingconstruction.org/market-guidance-report/.

that nearly half of US homes are susceptible to extreme weather, phenomena that have only become more frequent and intense with the worsening of the climate crisis.[10]

Although existing housing requires significant investments and effort to become more climate-ready, building experts agree that retrofitting existing units to bring them up to new energy standards produces fewer emissions than demolition and rebuilding.[11] These retrofits may include the installation of exterior sealing, insulation, and energy-efficient, electric-powered appliances; structural hardening; resource conservation; and energy-supply upgrades adapted to the weather and climate extremes of a given area.[12]

Retrofitting existing housing units does not mitigate the need for new housing, however. Demographers suggest that the United States will need approximately 11.3 million new units over the next decade to keep up with housing demand.[13] And housing advocates estimate that the gap in *deeply affordable* housing is 7.1 million units.[14] New construction should likewise be energy efficient, electric-ready, resilient, and affordable.

Unfortunately, despite these pressing needs, the United States is dealing with severe labor shortfalls in the housing sector. Having never fully recovered from the Great Recession, the construction industry was rocked by the pandemic: In 2022, the construction workforce was 6.2 million, 11 percent lower than in 2007.[15] Today, hundreds of thousands of construction jobs remain unfilled, and industry groups expect that job openings will exceed half a million in 2025.[16] The Trump administration's anti-immigrant

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[10] Clare Trapasso, "Climate Risks Threaten Nearly Half of All Homes in the U.S.: What Buyers and Sellers Need To Know," realtor.com, March 13, 2024, https://www.realtor.com/news/trends/climate-risks-threaten-nearly-half-of-all-homes/?ftag=YHF4eb9d17. Importantly, homeowners and residents are highly susceptible to real estate and insurance market changes that result from these projections.

[11] Hailstone, Jamie. n.d. "Why Retrofitting Buildings Is Often Greener Than Demolishing Them." Forbes. Accessed March 6, 2025. https://www.forbes.com/sites/jamiehailstone/2025/01/21/why-retrofitting-buildings-is-often-greener-than-demolishing-them/.

[12] US Department of Energy, "Financing and Implementing Resilience Projects," Better Buildings, n.d., accessed April 2025, https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Financing_and_Implementing_6-20.pdf.; ULI. 2022. "Resilient Retrofits: Climate Upgrades for Existing Buildings." Urban Land Institute. https://knowledge.uli.org/-/media/files/research-reports/2022/resilient-retrofits-climate-upgrades-for-existing-buildings.pdf.

[13] Daniel McCue, "Household and New Housing Unit Demand Projections for 2025–2035 and 2035–2045," Harvard University Joint Center for Housing Studies, January 6, 2025, https://www.jchs.harvard.edu/research-areas/working-papers/household-and-new-housing-unit-demand-projections-2025-2035-and-2035.

[14] National Low Income Housing Coalition, "The Gap: A Shortage of Affordable Rental Homes," March 2025, https://nlihc.org/gap. Following the National Low Income Housing Coalition, by deeply affordable, we refer to housing that is affordable and available to households with incomes at or below either the federal poverty guideline or 30% of their area median income, whichever is greater.

[15] Sophie Huang, "Rebuilding the Construction Trades Workforce," Joint Center for Housing Studies of Harvard University, June 5, 2024, https://www.jchs.harvard.edu/blog/rebuilding-construction-trades-workforce.

[16] Associated Builders and Contractors, "ABC: 2024 Construction Workforce Shortage Tops Half a Million," ABC Press Release, January 31, 2024, https://www.abc.org/News-Media/News-Releases/abc-2024-construction-workforce-shortage-tops-half-a-million; Home Builders Institute, "Construction Labor Market Report," Fall 2024, https://hbi.org/wp-content/uploads/2024/09/Fall-2024-Construction-Labor-Market-Report.pdf.

agenda is expected to exacerbate these labor shortfalls, as 23 percent of the existing construction workforce are immigrants—nearly half of whom are undocumented—and deportation risks may deter workers from showing up to work.[17]

Given current economic conditions, wherein the demand for construction is high, this labor shortage defies reason—that is, until one realizes that many residential construction jobs are non-union and thus potentially lower paid and subject to labor abuses.[18] Without security, stability, and good pay and benefits, these critical construction roles will remain unfilled.

Another challenge to meeting the current crisis is the price of building materials. Since 2020, prices for materials like gypsum, plastic components, lumber, concrete, brick, and clay have increased by 35 percent.[19] Meanwhile, the climate crisis has disrupted supply chains, precipitating, for example, the migration of lumber producers from the US and Canadian West to the US South due to beetle invasions and wildfires.[20] The Trump Administration's tariff policy is expected to worsen these high-cost conditions.[21]

The goal of decarbonizing and adapting housing supply will require the sector to ramp up production significantly, train construction workers on new energy technologies and construction techniques, and improve workers' labor conditions and benefits. Furthermore, the housing sector must integrate any future climate investments in a way accessible to renters and groups who have been historically excluded from housing finance and access. Failure to do so may further entrench trends in "green gentrification" and cycles of displacement.[22]

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[17] Jorge González-Hermoso, Christina Plerhoples Stacy, and Hamutal Bernstein, "Mass Deportations Would Worsen Our Housing Crisis," Urban Institute, February 25, 2025, https://www.urban.org/urban-wire/mass-deportations-would-worsen-our-housing-crisis.

[18] Western States Regional Council of Carpenters, "The Hidden Struggles of Non-Union Construction Workers," September 11, 2024, https://wscarpenters.org/news/the-hidden-struggles-of-non-union-construction-workers/.

[19] Joint Center for Housing Studies of Harvard University, "The State of the Nation's Housing 2023," June 2023, https://www.jchs.harvard.edu/sites/default/files/reports/files/Harvard_JCHS_The_State_of_the_Nations_Housing_2023.pdf.; Gypsum, a mineral used in dry wall and ceilings, has faced supply chain issues and manufacturing backlogs since the pandemic. It has also seen some of the most dramatic price increases.

[20] World Economic Forum. 2022. "Here's How Climate Change Is Altering America's Logging Industry." https://www.weforum.org/stories/2022/11/climate-change-america-logging-industry/.

[21] Carl L. Harris, "Tariffs on Building Materials from Canada and Mexico," letter to President Trump, January 31, 2025, https://x.com/NewsLambert/status/1885703276022116486?mx=2; National Association of Homebuilders, "Good and Bad News on Lumber Production and Tariffs," April 8, 2025, https://www.nahb.org/blog/2025/04/lumber-production-and-tariffs.

[22] Ruthy Gourevitch, "Decarbonization Without Displacement," Climate and Community Institute, January 2024, https://climateandcommunity.org/wp-content/uploads/2024/01/CCP-IRA_final-brief.pdf.

What is Green Industrial Policy?

Green industrial policy refers to sustainable supply-side solutions to problems of political economy; it endeavors to coordinate market actors and shape industrial change to deliver on public objectives. The interventions that might form part of a comprehensive green industrial policy include (but are not limited to) coordinated, sustained, and transparent actions such as grants and low-cost loans to support research and development; standardization and regulation; provision of supportive infrastructure; government contracts and subsidies to direct scaling and commercialization; low-cost, "patient" capital to innovators; direct procurement of goods and contract aggregation; and public development.[23]

A key component of industrial policy is that the state absorbs some of the risks of developing new products, techniques, and markets while, ideally, ensuring that investment successes yield rewards that are redistributed to the public.[24] The object of any green industrial policy is to ensure that public investments in market development activities result in strong, long term "conditionalities" or returns for public benefit.[25] Such investment conditions in the housing sector would entail provisions for housing sustainability, resiliency, and affordability, potentially including (but not limited to) dividends on public equity in development projects, commitments to workforce development and high-road labor standards, or the decommodification of housing properties.

In the past, industrial policy has been applied in the US context to digital technologies, electric vehicle manufacturing, and renewable energy sectors. For instance, the Advanced Research Projects Agency - Energy (ARPA-E) program has invested $4.21 billion into R&D for more than 1,700 renewable energy technologies since 2009.[26] Not every single public investment has resulted in a commercially viable product; however, the effort has attracted nearly $15 billion in private investment and has resulted in the creation of thousands of patents and new companies.[27] Many of these technologies contribute to energy efficiency and renewable energy generation in buildings, but do not contend with market steering for housing development and rehabilitation in particular.

We believe the road to housing affordability, decarbonization, and climate resilience on a massive scale—that is, green housing security for all—runs through green industrial policy. A green industrial policy for the housing sector would coordinate labor, land, finance, and innovative capacities to overcome structural market misalignments and fragmentation; provide robust investment in innovation; and distribute benefits that support high-quality, affordable homes and good paying jobs.

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[23] Todd Tucker, "Industrial Policy and Planning: What It Is and How to Do It Better," Roosevelt Institute, July 2019, https://rooseveltinstitute.org/wp-content/uploads/2020/07/RI_Industrial-Policy-and-Planning-201707.pdf; Ganesh Sitaraman and Chris Serkin, "28 Post-Neoliberal Housing Policy Ideas," Vanderbilt Policy Accelerator for Political Economy and Regulation, April 2025, https://cdn.vanderbilt.edu/vu-URL/wp-content/uploads/sites/412/2025/04/22205711/28-Post-Neoliberal-Housing-Policy-Ideas.pdf.

[24] Mariana Mazzucato, Mariana, "We Socialize Bailouts. We Should Socialize Successes, Too," New York Times, July 1, 2020, https://www.nytimes.com/2020/07/01/opinion/inequality-goverment-bailout.html.

[25] Mariana Mazzucato and Dani Rodrik, "Industrial Policy with Conditionalities: A Taxonomy and Sample Cases," UCL Institute for Innovation and Public Purpose, September 2023, https://www.ucl.ac.uk/bartlett/publications/2023/oct/industrial-policy-conditionalities-taxonomy-and-sample-cases.

[26] ARPA-E. "Impact." Advanced Research Projects Agency - Energy website. Accessed June 2025. https://arpa-e.energy.gov/about/arpa-e-at-a-glance/impact

[27] ARPA-E website.

What Would a Green Industrial Policy for Housing Deliver?

A green industrial policy for the housing sector will ensure that every person has sustained access to housing that is permanently affordable, low-carbon, and resilient to climate hazards.[28] It will achieve this goal through location- and housing-stock-specific projects in four broad categories: energy-efficient appliances, retrofits to existing homes, green new construction, and neighborhood-scale energy upgrades.

Common Types of Green Building Interventions to Create Sustainable and Resilient Housing

Green Building Intervention	Examples	Estimated Number of Projects Needed for Energy Efficient and Electric-Ready Housing 2025-2035
Energy-efficient appliances	• Electric water heaters • Heat pumps • Solar panels • Induction stoves • Household batteries • EV charging	115 million
Retrofits to existing homes to become "electric-ready" and climate secure	• Electric panel upgrades • Building envelope upgrades (windows, siding, roof) • Insulation • Geothermal energy installation • Weatherproofing and structural hardening • Mold and asbestos abatement	75 million[29]
Green new construction	• Climate-ready new builds	11.3 million

[28] Because climate-resilience and affordability needs differ by location, this type of housing will look different in different places. Nevertheless, these homes will be energy-efficient and electric-ready and weather-proofed to accommodate local climate risks.

[29] This estimate reflects the number of homes that would need retrofits to become "zero-carbon-aligned" or ready to electrify for energy transition. It does not reflect the number of homes that would need resiliency retrofits, such as structural hardening.

Neighborhood-scale energy upgrades	• Thermal energy networks • Community solar • Micro-grids • Virtual power plants	N/A[30]

Note: Project estimates derived from market analyses conducted by the Advanced Building Collaborative and the Harvard University Joint Center for Housing Studies.[31]

We start with the most granular: the deployment of clean energy appliances across new and existing homes. Most homes, to be adequately green and climate resilient, will require new technologies such as heat pumps and energy-efficient electric water heaters to replace fossil-fueled and less-efficient appliances. When the grid is powered by clean energy, these efficient electric appliances reduce greenhouse gas emissions and other pollutants from buildings. Some homes might also opt to install rooftop solar panels and/or batteries to generate power for their electric appliances or contribute to more resilient distributed energy solutions like community microgrids. The installation of efficient electric appliances can also improve climate resilience by helping residents conserve energy while retaining health-critical temperatures indoors during extreme heat or cold. Homes that are equipped with onsite renewables, back-up generation, and batteries will be better able to weather the disruptions of disasters.[32]

Second is energy and non-energy retrofits to existing homes. In terms of energy retrofits, energy efficiency projects, such as installing insulation and sealing building envelopes will help to reduce building emissions and conserve energy use, improving household sustainability and resilience. Non-energy modifications are the upgrades that do not yield direct energy savings, but are critical interventions to enable energy-efficiency upgrades and electric appliances installation. For example, mold and asbestos abatement may be needed to ensure that upgrades to seal building exteriors do not trap in hazards or duct work may be needed to accommodate new clean energy appliances. Market analysts estimate that approximately 75 million existing units will need modest to significant

[30] More analysis is needed to determine the number of projects adequate to serve as alternates or supplements to building-scale upgrades.

[31] For more information see, Webster, Brett, Aven Satre-Meloy, Leslie Badger, Damon Lane, Kevin McGrath, Eric Wilson, Janet Reyna, et al. "Accelerating Residential Building Decarbonization: Market Guidance to Scale Zero Carbon Aligned Buildings." Advanced Building Construction Collaborative, 2024. https://advancedbuildingconstruction.org/market-guidance-report/ ; and Mccue, Daniel. 2024. "Household and New Housing Unit Demand Projections for 2025–2035 and 2035–2045," Harvard University Joint Center for Housing Studies. https://www.jchs.harvard.edu/research-areas/working-papers/household-and-new-housing-unit-demand-projections-2025-2035-and-2035

[32] US Department of Energy, "Financing and Implementing Resilience Projects," Better Buildings, n.d., accessed April 2025, https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Financing_and_Implementing_6-20.pdf.; ULI. 2022. "Resilient Retrofits: Climate Upgrades for Existing Buildings." Urban Land Institute. https://knowledge.uli.org/-/media/files/research-reports/2022/resilient-retrofits-climate-upgrades-for-existing-buildings.pdf.ibid.

retrofits to be ready to electrify for energy transition.[33] Retrofits for structural hardening, including noncombustible cladding and landscaping, storm shutters, and mechanical elevation, can reduce property damage and injury and improve resiliency in cases of extreme weather.[34]

Third is green new construction. The United States must build approximately 11.3 million new units of housing to keep up with anticipated population growth through 2035;[35] under a green industrial policy regime, this housing will feature sustainably sourced materials and cutting-edge clean energy technologies. These new builds will be "zero-carbon-aligned" meaning that they either run on renewable electric or have the technological components (such as robust electric panels) that would enable the building to readily shift to all-electric energy use.

Finally, some degree of neighborhood-scale energy-system modification will be needed to deliver energy security and climate resiliency to households. Addressing climate security at the scale of the parcel is time-consuming, costly, and resource intensive; but technologies such as thermal energy networks, micro-grids, and virtual power plants can offer significant cost savings, emissions reductions, and grid stability to homes. Infrastructural interventions at the neighborhood and city scale like flood walls, robust drainage systems, micro-grids, and urban tree canopy can also improve climate resiliency.

Green industrial policy would deliver green housing outcomes as well as provide opportunities to develop high-road green jobs.

Green industrial policy would deliver green housing outcomes as well as provide opportunities to develop high-road green jobs. The execution of these housing projects will involve the collaboration of many skills and trades. Electricians will be essential to the installation of new electric appliances and the upgrading of electrical panels and wiring. Carpenters will be needed to build new structures and implement significant rehabilitation on existing homes. HVAC professionals will be crucial to switching out fossil fuel or electric resistance heating systems for cleaner, more efficient electric systems.

But the sector's transformation will not stop at the building trades. Manufacturing employees at appliance and modular construction factories

[33] Brett Webster, Aven Satre-Meloy, Leslie Badger, Damon Lane, Kevin McGrath, Eric Wilson, Janet Reyna, et al. "Accelerating Residential Building Decarbonization: Market Guidance to Scale Zero Carbon Aligned Buildings."
[34] ULI. 2022. "Resilient Retrofits: Climate Upgrades for Existing Buildings." Urban Land Institute. https://knowledge.uli.org/-/media/files/research-reports/2022/resilient-retrofits-climate-upgrades-for-existing-buildings.pdf.
[35] Daniel McCue, "Household and New Housing Unit Demand Projections for 2025–2035 and 2035–2045."

can use union organizing to ensure fair wages and benefits.[36] Pipe fitters, who traditionally hold strong contracts with natural gas utilities, will be central to the expansion of thermal energy networks.[37] And union jobs in recycling parts from clean energy technologies, like wind turbine blades and solar panels, will ensure that vital raw materials in these technologies are used as efficiently as possible and provide in-demand careers for workers in the coming decades.[38]

Residents, for their part, will not have to sacrifice quality for cost: affordability, energy-efficiency, weatherproofing, and quality go hand in hand.

The housing produced by a green industrial policy regime will also be fairly priced. It will be constructed by unionized workers who earn good wages and reliable benefits and enjoy stable, career-length jobs with opportunities to learn new skills and develop with industry changes. Residents, for their part, will not have to sacrifice quality for cost: affordability, energy-efficiency, weatherproofing, and quality go hand in hand.

[36] Lobbyists for the offsite construction and modular housing industry have opposed union expansion into the sector in the past, but that does not preclude union organizing in the future (see Modular Building Institute, "MBI Defeats Davis-Bacon Expansion," August 8, 2023, https://www.modular.org/2023/08/08/mbi-defeats-davis-bacon-expansion/). Some modular builders have embraced union partnerships, such as Factory_OS in California, which employs unionized carpenters (see Factory_OS, "Carpenters' Union Embraces Factory Built Housing to Address Labor Needs in Northern California," December 10, 2018, https://factoryos.com/press/carpenters-union-embraces-factory-built-housing/.

[37] Jay Egg, "Pipefitters Union Brings Strength to National Uptake of TENs," PHCPPros, June 3, 2024, https://www.phcppros.com/articles/19569-pipefitters-union-brings-strength-to-national-uptake-of-tens.

[38] Reyna Cohen, Nathan Lamm, Iris Packman, Angie Liao, Lexi Scanlon, Lara Skinner, Avalon Hoek Spans, Jillian Morley, and Alexander Foley, "Pennsylvania Climate Jobs Plan: A Worker-Centered Approach to an Equitable Clean Energy Future," Cornell ILR Climate Jobs Institute, August 2024, https://unionenergypa.org/wp-content/uploads/2024/08/ILR_CJI_PA_State_Report_final.pdf.

Sectoral Misalignments Underscore Why a GIP Approach is Needed

As the table above on common types of green building interventions suggests, the technology and know-how already exists to decarbonize the existing housing stock and build green, climate-resilient homes. And, indeed, resources have already been allocated to the effort. Advances in manufacturing and public incentives have increased the cost effectiveness for common clean energy technologies like heat pumps and solar photovoltaics.[39] The Biden Administration established the Greenhouse Gas Reduction Fund (GGRF), a $27-billion capital investment to be administered through CDFIs, green banks, credit unions, and state and local governments to promote emissions reductions, including programs to support building decarbonization.[40] And advances in clean energy are expected to create thousands of new jobs, with solar and energy-efficiency jobs as some of the fastest growing fields in the sector (with annual growth of 5 percent and 3.4 percent respectively).[41] With so much promising action, why has the United States been so slow to implement housing decarbonization affordably and at a transformative scale and pace?

The combination of significant resources and halting progress suggests that market misalignments are to blame. **The housing market is highly complex and fragmented, incorporating an array of sub-markets and economic actors—developers, builders, landowners, financial institutions, materials manufacturers—with key regulatory, financial, and labor differences across housing types and locations.[42] The way these actors**

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[39] Goksin Kavlak, James McNerney, and Jessika E. Trancik, "Evaluating the Causes of Cost Reduction in Photovoltaic Modules," Energy Policy 123 (December 2018): 700–710. https://doi.org/10.1016/j.enpol.2018.08.015; Eric J. H. Wilson, Prateek Munankarmi, Brennan D. Less, Janet L. Reyna, and Stacey Rothgeb, "Heat Pumps for All? Distributions of the Costs and Benefits of Residential Air-Source Heat Pumps in the United States," Joule 8, no. 4 (April 2024): 1000–1035, https://doi.org/10.1016/j.joule.2024.01.022.

[40] US Environmental Protection Agency, "Greenhouse Gas Reduction Fund," accessed April 2025 , https://www.epa.gov/greenhouse-gas-reduction-fund. Although we discuss the GGRF at length in this brief, it is important to note that, as we wrote, the Trump Administration froze the accounts holding the awardees' obligated funds. See Diana DiGangi, "EPA $20B Funding Freeze Leaves 'Green Bank' Nonprofits Unable to Pay Bills," Utility Dive, March 4, 2025, https://www.utilitydive.com/news/epa-funding-freeze-ggrf-green-bank-renewable-energy-trump-zeldin/741485/.

[41] US Department of Energy, "United States Energy and Employment Report 2024," October 2024, https://www.energy.gov/sites/default/files/2024-08/2024%20USEER%20FINAL.pdf.

[42] Ahluwalia, Gopal, Kermit Baker, and Kent W Colton. n.d. "Concentration in the Homebuilding Industry: Trends, Strategies, and Prospects."; US Department of Treasury. 2024. "The Geographic Mismatch Between Housing Construction and Shortages." On Point. Office of the Comptroller of the Currency. US Department of Treasury. https://www.occ.treas.gov/publications-and-resources/publications/economics/on-point/pub-on-point-geographic-mismatch-housing.pdf.

interact on any given project—and in the aggregate—determines the pace, scale, and affordability of green housing construction.

Imagine, for instance, a homeowner that wants to pursue energy upgrades to their home, whether installing a heat pump or improving their insulation. Due to high demand for construction workers — trade groups estimate that the industry will need to attract a half-million workers just to keep up—the homeowner will likely have trouble finding a firm to do the job.[43] If the homeowner does manage to find a contractor, a preliminary assessment of their dwelling may uncover additional issues—asbestos, mold, or a leaky roof—that need remediation, thereby raising the total price of the upgrade. Despite robust subsidies to purchase new energy technologies, overall costs may leave upgrades off the table for many low- to moderate-income households.[44]

On the construction side, meanwhile, contractors have expressed how many energy upgrade contracts tend to be limited in scope—perhaps because of homeowners' limited capital—and that smaller projects tend not to be worth the risk of trying something new. Unexpected project costs or dissatisfied customers can severely impact small firms, which tend to run on slim margins and cannot cushion business disruptions. Most US contractors tend to retain only a handful of builders.[45] With these risks, firms may be reluctant to adopt new clean energy technologies or accept contracts for energy upgrades.

Below, we highlight some key examples of misalignment among the housing construction subsectors, pointing to potential areas of intervention for green industrial policies.

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[43] Associated Builders and Contractors, "ABC: 2024 Construction Workforce Shortage Tops Half a Million." This does not even take into account the acute shortages of plumbers and electricians. See Enda Curran, "US Plumbing Shortage Is a Generational Problem," Bloomberg, March 14, 2024, https://www.bloomberg.com/news/newsletters/2024-03-14/plumbing-jobs-available-as-retirements-outnumber-apprentices and US Bureau of Labor Statistics, "Occupational Outlook Handbook," Office of Employment and Unemployment Statistics, accessed April 18, 2025, https://www.bls.gov/ooh/construction-and-extraction/electricians.htm.

[44] Julia Wagner and Lucia Santacruz, "Cooperating through Transition: Limited-Equity Cooperative Housing and Decarbonization Incentives," Journal of City Climate Policy and Economy (in press).

[45] Ford, Carmel. 2020. "Who Are NAHB's Builder Members?" National Association of Home Builders. https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics-plus/special-studies/2020/special-study-who-are-nahb-builder-members-august-2020.pdf

Mapping the Misalignments between Industry Subsectors for Green Housing Construction

	Construction	Homeowners and Housing Providers	Capital Providers	Energy Utilities
Manufacturing	Neither sub-sector has a strong union presence ensuring worker education and high road labor standards. Upfront training costs and installation risks for new materials and technologies create additional hurdles.	Commercialized energy technologies cannot be readily installed in many housing types and still require subsidies to be price competitive.	Many technically viable products do not scale to commercial viability due to lending gaps.	Investor-owned energy utilities are not currently incentivized to use their purchasing power to drive manufacturing innovation.
Construction		Small-scale, climate secure projects are higher risk for contractors, so homeowners and housing providers may struggle to find affordable and skilled contractors.	Lack of certainty in technology viability, regulation, energy markets, capital markets, and industry standards adds risk to construction projects and slows their implementation down, making them more expensive.	Rate-payer incentives do not cover sometimes costly (but necessary) remediative projects that prevent energy upgrades from occurring.
Homeowners and Housing Providers			Many household-scale retrofit projects lack low-cost capital streams. Homeowners and renters carry the burden of retrofits.	Homeowners and housing providers must invest in energy upgrades without certainty about how utility costs will change throughout the life-cycle of their investments.

Misalignments also occur within subsectors. Within the "Homeowner and Housing Provider" subsector alone, there are multiple types of construction, housing, and tenure to consider, each of which can face distinctive challenges regarding the installation of new energy technologies. For example, rental units often go without energy retrofits because the "split incentive"—which occurs when the benefit of an investment does not accrue to the person who makes the investment—deters landlords from investing in upgrades, regardless of whether such upgrades would improve conditions for tenants.[46] On the tenant side, however, many fear retrofits, because landlords can use these investments as a legal justification to raise rents and/or begin eviction proceedings (so-called "renovictions").[47]

[46] Ruthy Gourevitch, "Decarbonization without Displacement: Tenant Advocacy in the Context of Inflation Reduction Act Implementation."

[47] Chelsea Kirk, "Los Angeles Building Decarbonization: Tenant Impact and Recommendations," Strategic Actions for a Just Economy (SAJE), December 2021, www.saje.net/wp-content/uploads/2021/12/LA-Building-Decarb_Tenant-Impact-and-Recommendations_SAJE_December-2021-1.pdf.

Intersecting Barriers within the Homeowner and Housing Provider Subsector

Heterogeneity

The Homeowner and Housing Provider subsector is extremely heterogeneous, with differing housing and tenure types driving distinct economics regarding climate secure new construction and upgrades.

Construction type

- Green and affordable new construction
- Climate-secure retrofits

Tenure type

- Owner-occupied
- Renter-occupied

Housing type

- Manufactured housing (mobile homes)
- Multifamily homes
- Single-family homes

Intersecting Challenges

These differences inform how challenges must be addressed; so while the owners of all housing types may struggle with finding trained contractors, the proposed policy interventions may differ for owner-occupied manufactured housing versus landlord-owned multi-family housing.

Technology installation and new construction challenges

- No mortgage equity (impacts manufactured housing)
- Coordination challenges between co-owners (impacts manufactured and multifamily housing)
- Split incentives between landlords and tenants / threat of “renoviction”
- Extra project costs due to deferred maintenance
- Availability of trained contractors

Maintenance and operations challenges

- Uncertainty about long-term maintenance costs
- Energy burden and rising energy costs

Developers of new construction and the owners of existing buildings also face distinctive challenges. Our interviews with housing practitioners indicate that green new construction is more feasible because developers can integrate green building into their project financing, whereas the owners of existing buildings may struggle to stack low-cost capital funding to complete retrofits.[48] Given the heterogeneity of physical building structures and the differences in capacity to borrow capital, owners may also find it difficult to rightsize contracts and financing for optimal energy upgrades. These are the types of flawed incentives that a GIP can solve.

Commercialization hurdles for new housing energy technologies

Central to any lasting technological change in a market economy is commercialization, the process of making the product fit for market in terms of viability, adoption, and price. Policymakers refer to the window between prototype development and commercialization as the "valley of death," because securing the necessary financing, manufacturing prowess, and consumer trust can prove difficult for even the cleverest technologies.[49]

Housing technologies are subject to the same commercialization challenges as other products. For example, engineers are currently testing a temperature-control method that cycles hot and cold water through panels fixed to the exterior of a building to create energy-efficient, electric radiative heating and cooling.[50] The technology, in theory, would provide a fairly low-cost, electric, efficient heating alternative for fossil-fuel buildings that cannot pursue wholesale envelope upgrades. Yet our interviews suggest that building owners may be reluctant to invest in such new technologies without assurances about its functionality for the long term.

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[48] The reasons for this perceived difference in difficulty are multifaceted. Developers of new construction, especially affordable housing developers, are accustomed to building to subsidy specifications and finding and stacking capital strategically as a key component of the profession. Owners of existing buildings, however, especially owner-occupants, are likely to be much less accustomed to finding and working with these sources of capital. Furthermore, it is easier to find and gather financing mechanisms for new construction or major rehabilitations than it is for mid-cycle renovations.

[49] US Department of Energy, "Technology-to-Market," accessed February 20, 2025, https://www.energy.gov/eere/buildings/technology-market.

[50] Hydronic Shell, "How It Works," accessed February 20, 2025, https://www.hydronicshell.com/how-it-works.

Targeted policy interventions can mitigate consumer hesitancy and help promising technologies reach commercial viability.

Policy can also aid commercialization at the local and regional level.

This is where policy can be useful. Targeted policy interventions can mitigate consumer hesitancy and help promising technologies reach commercial viability. We have already seen how policy can drive the commercialization of clean energy technologies. Programs to support the innovation and commercialization of new household energy-efficiency and electrification technologies—as well provide subsidies to help households pay for them—have made energy upgrades more accessible by lowering the costs of these technologies. Since Fall 2020, the US Department of Energy (DOE) has led efforts to advance the development of building energy technologies like prefabricated insulation panels and integrated mechanical system pods[51] and scale their manufacturing processes.[52] Such research and development programs have helped to foster the invention of commercially viable new technologies. And in late 2023, President Biden leveraged federal wartime production powers to scale up domestic heat pump production, bolstering the commercialization of this low-carbon technology.[53]

Policy can also aid commercialization at the subnational level. The New York City Housing Authority, for example, has used its massive purchasing power to spur the development of plug-in heat-pump window units, helping to address affordability concerns by retrofitting the Authority's multifamily housing stock.[54] Policies to support R&D, manufacturing, and commercialization have greatly improved the price signals of clean energy technologies for housing. Future industrial policy should focus on strategies that ensure the rapid and widespread installation of these technologies in homes through technical assistance, workforce development, and contract aggregation.

Further, as policy measures create conditions favorable to the development and buildout of new technologies, they also have power to shape the *ethical* dimensions of those technologies. For instance, industrialized off-site construction has been touted as an opportunity to rapidly and affordably scale up green housing construction.[55] Already

[51] US Department of Energy."Multifamily Whole-Building Retrofit and Standardized Delivery Solution." Energy.gov. Accessed June 9, 2025. https://www.energy.gov/eere/buildings/multifamily-whole-building-retrofit-and-standardized-delivery-solution.

[52] US Department of Energy, "The ABC Collaborative," accessed February 20, 2025, https://www.energy.gov/eere/buildings/abc-collaborative.

[53] Rachel Frazin, "Biden Administration Uses Wartime Authority to Bolster Energy Efficient Manufacturing," The Hill, November 17, 2023, https://thehill.com/policy/energy-environment/4315744-biden-admin-wartime-authority-bolster-energy-efficient-manufacturing/.

[54] Justine Calma, "The Incredible Shrinking Heat Pump," The Verge, November 15, 2023, https://www.theverge.com/23951214/heat-pump-nycha-public-housing-electric-sustainable.

[55] ADL Ventures, "Industrialized Offsite Construction: A Solution to the Housing Affordability Crisis," accessed January 15, 2025, https://www.adlventures.com/blogs/industrialized-offsite-construction-a-solution-to-the-housing-affordability-crisis.

implemented successfully in Sweden and Japan, industrialized construction balances quality and cost by creating housing components in factories and minimizing on-site construction.[56] Organized labor, however, has met this strategy with understandable wariness, citing offsite factories as a way to remove development from union-friendly localities and bypass high-road labor standards.[57] Industrial policy that strives to stand up industrialized building technologies must be developed with organized labor at the table to ensure that new systems maximize worker stability and other social priorities. Procurement, grants, and government incubators can leverage their support to ensure that technologists and entrepreneurs design and produce technologies using sustainable and ethical supply chain and labor standards.

Existing federal climate finance falls short of housing affordability needs

The 2022 Inflation Reduction Act (IRA) has accelerated decarbonization and climate-resilience efforts. The IRA's residential clean energy and home energy efficiency tax credits, for example, have proven much more popular among consumers than predicted (though use of these credits is still dwarfed by the uptake of other household-oriented IRA measures, such as rebates for electric vehicles), and the IRA's Greenhouse Gas Reduction Fund (GGRF) awarded billions of dollars to coalitions of community development finance institutions (CDFIs), impact investors, and green banks to jumpstart the country's financial ecosystem for clean energy lending.[58] When the GGRF funds are released—as of this writing, the Trump Administration has frozen the accounts holding these obligated funds[59]—awardees will offer financial products (such as low-interest loans and green mortgages) to support the deployment of projects that reduce or avoid emissions of greenhouse gases and other air pollutants.

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[56] Francesca Mari, "How an American Dream of Housing Became a Reality in Sweden," New York Times, June 8, 2024, https://www.nytimes.com/2024/06/08/headway/how-an-american-dream-of-housing-became-a-reality-in-sweden.html?smid=nytcore-ios-share&referringSource=articleShare&sgrp=c-cb.

[57] Honest Builders Coalition, "Factory Built Housing Is Failing San Francisco," accessed April 2025, https://www.honestbuilderscoalition.org/.

[58] Lily Bermel et al., "Clean Investment Monitor: Tallying the Two-Year Impact of the Inflation Reduction Act," Rhodium Group and the MIT Center for Energy and Environmental Policy Research, August 2024, https://cdn.prod.website-files.com/64e31ae6c5fd44b10ff405a7/66b2bf45bd0dd034beefb5bd_Clean%20Investment%20Monitor_Tallying%20the%20Two-Year%20Impact%20of%20the%20Inflation%20Reduction%20Act.pdf; Laura Feiveson and Matthew Ashenfarb, "The Inflation Reduction Act: Saving American Households Money While Reducing Climate Change and Air Pollution," US Department of the Treasury, August 7, 2024, https://home.treasury.gov/news/featured-stories/the-inflation-reduction-act-saving-american-households-money-while-reducing-climate-change-and-air-pollution.

[59] Diana DiGangi, "EPA Granted Appellate Stay after Judge Rules to End GGRF Funding Freeze," Utility Dive, April 17, 2025, https://www.utilitydive.com/news/epa-dc-appeals-court-stay-greenhouse-ggrf-funding-freeze/745677/.

The bulk of these nascent programs use price signals to orient consumers towards clean energy technologies and to provide them with low-cost capital to purchase them. There have also been creative uses of the IRA tax provisions to inject capital into purposive spending on low-carbon housing. One program in Minnesota uses the IRA's Elective Pay (also known as Direct Pay) provision—which allows tax-exempt entities, including municipal and state governments, to take advantage of various energy tax credits—to empower public green banks to front capital funds for entities working on decarbonization.[60] These efforts show promise vis-à-vis housing decarbonization; however, as part of a fully realized GIP, they must be carefully implemented to deliver on climate preparedness *and* affordability.

First and foremost, GGRF awardees need to maintain housing affordability while investing in the expansion of clean energy technologies.[61] A major dimension of housing affordability is that many existing units are not available at the right price points, meaning that the lowest-income households face the most severe shortages. The National Low Income Housing Coalition, for example, estimates that 87 percent of extremely low-income renters face housing cost burdens in part because so few units are available at affordable prices, and recent industry reports find that new construction has been concentrated in luxury and high-cost housing markets.[62] As climate finance is used to expand energy upgrades, mission-oriented investors should dedicate those funds to units that will be affordable to low- and moderate-income households.

Second, public capital must lighten the cost burden on residents. In current market economics, residents are often saddled with the costs of upgrading their dwellings by taking on debt to cover the upfront capital projects or through rent increases when a landlord passes on the costs of work. Green banks, CDFIs, and government entities can use capital

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[60] Reema Bzeih, Rachel Chang, and Shara Mohtadi, "The Key Role of States in Unlocking Direct Pay for Clean Energy," Center for American Progress (blog), May 28, 2024, https://www.americanprogress.org/article/the-key-role-of-states-in-unlocking-direct-pay-for-clean-energy/; St. Paul, Minnesota, "The Heights Awarded $4.7 Million for Geothermal Energy System," March 27, 2024, https://www.stpaul.gov/news/heights-awarded-47-million-geothermal-energy-system.

[61] GGRF awardees are well-poised to do this. Most GGRF awardees have coalition members that are experienced practitioners in developing and/or financing affordable housing. GGRF awardees under the GGRF Clean Communities Investment Accelerator (CCIA) program, for example, are required to lend in low-income and disadvantaged communities (LIDACs) while GGRF awardees in the National Clean Investment Fund (NCIF) must dedicate 40% of their work plans to LIDACs. GGRF-funded new housing construction may also take advantage of other federal capital incentives, such as the Low-Income Housing Tax Credit (LIHTC) for affordable housing, which comes with affordability requirements.

[62] Joint Center for Housing Studies of Harvard University, "THE STATE OF THE NATION'S HOUSING 2023"; National Low Income Housing Coalition, "The Gap."

funds more creatively than everyday consumers, aggregating projects across multiple homes to achieve cost savings by maximizing economies of scale. **As these projects roll out, funds should be spent strategically to expand access to high-quality, climate-secure affordable housing at large**. Through robust technical assistance, program managers can assume much of the labor associated with home repairs, including contractor vetting and selection, contract negotiation, and incentives stacking.

Finally, GGRF awardees and future public investment institutions must add guardrails to their investments—tenant protections, in particular—to prevent rent and price hikes that exclude existing residents.[63]

One way to do so is to use the purchasing power of awardees to change market expectations around industry standards of practice, in which sustainable materials, low-carbon technologies, high-road labor standards, and permanent affordability are baked into development contracts. For instance, GGRF awardees can prioritize financing housing decarbonization projects in buildings that commit to limits on rent increases and other affordability measures.

Given rapidly changing and increasingly uncertain global production networks upset by both geopolitics and climate breakdown, GGRF awardees will need to move beyond conventional finance and answer questions of market development, coordination, and transformation. This more capacious understanding of project finance will likely include investments in workforce development to ensure there are adequate construction workers to get work done and strong tenant affordability agreements or community ownership . GGRF awardees will need support from policies and institutions to spur the development of housing that is low-carbon, resilient and built with high environmental and labor standards—and that is permanently affordable.

Construction sector fragmentation undercuts green builds

As we note above, the acute workforce shortages in the housing sector comprise a major challenge to green retrofits and new builds. However,

[63] For examples of guardrails for equitable public funding, see Just Solutions Collective, "GGRF Awardee Best Practices for Equity and Governance," March 2024, https://justsolutionscollective.org/wp-content/uploads/2024/03/GGRF-Awardee-Best-Practices-for-Equity-and-Governance-2.pdf.

an insufficient number of workers is not the only problem hampering these efforts; sectoral fragmentation, too, is an obstacle to decarbonizing and fortifying the housing stock by creating barriers between worker training opportunities and green job sites.

Unions have proved to be an important resource for training tradespeople on technical developments in their crafts and for bringing new workers into the field through apprenticeship and pre-apprenticeship programs[64]. Pre-apprenticeship programs can also improve sector diversity and equity by creating an industry on-ramp for women, people of color, and formerly incarcerated individuals, who remain underrepresented in the union construction workforce[65]. However, fragmentation of the housing construction market means that union workers are shut out of most residential contracts. The majority of US housing starts consist of single family homes,[66] and a significant portion of single family home developers do not use union labor.[67] As of 2024, only 10% of employed construction workers were union members.[68] This market gap creates a divide between skilled tradespeople with skill development opportunities and the construction push for climate-ready housing construction and retrofits.

For another, the nature of conceptualizing and financing clean energy retrofits on a house-by-house basis results in contractor hesitancy to perform retrofit work. Interviews with industry professionals reveal that contractors see clean energy projects involving new technology as risky; they fear making mistakes, encountering unexpected issues, or mispricing contracts.[69] Such risks can be especially onerous for small firms, which tend not have the reserves to absorb significant cost overruns. Residential contractors also tend to be small firms. A recent study of a building trade organization's membership found that

[64] Center for American Progress. "Fact Sheet: How State and Local Governments Can Make Climate Jobs Good Jobs," October 9, 2020. https://www.americanprogress.org/article/fact-sheet-state-local-governments-can-make-climate-jobs-good-jobs/.; Cunningham, Zach, and Melissa Shetler. 2023. "Building an Equitable, Diverse, & Unionized Clean Energy Economy: What We Can Learn from Apprenticeship Readiness." Cornell University Climate Jobs Institute. https://hdl.handle.net/1813/113728.

[65] Role, Kemi, Maurice Emsellem, Phil Hernandez, and Jodi Pincus. 2021. "Pre-Apprenticeship: Advancing Equity & Access to Good Careers." National Employment Law Project. May 9, 2021. https://www.nelp.org/insights-research/pre-apprenticeship-advancing-equity-access-to-good-careers/.; Parrot, Max. 2023. "Pre-Apprenticeship Program Boosts Diversity within NYC Construction Trades – LaborPress." Labor Press, 2023. https://www.laborpress.org/pre-apprenticeship-program-boosts-diversity-within-nyc-construction-trades/.

[66] Joint Center for Housing Studies of Harvard University. 2023. "THE STATE OF THE NATION'S HOUSING 2023." https://www.jchs.harvard.edu/sites/default/files/reports/files/Harvard_JCHS_The_State_of_the_Nations_Housing_2023.pdf

[67] Interviews conducted with professionals in the labor organizing and housing development sectors in Summer 2024.

[68] US Bureau of Labor Statistics. 2024. "Union Members - 2024." US Bureau of Labor Statistics. https://www.bls.gov/news.release/pdf/union2.pdf.

[69] Interviews conducted with professionals in the labor organizing and housing development sectors in Summer 2024.

multifamily builders tended to have nine or fewer workers while single-family builders had four or fewer workers on staff.[70] The practice of breaking construction projects into sub-contracts is also exceedingly common, with the average single-family home contract built employing 24 subcontractors per job.[71]

Non-unionized contractors are also often less up-to-date on new technologies than unionized workers. Whereas upskilling can be too expensive for small firms working on slim margins, unions have proven to be an important resource for training tradespeople on technical developments in their crafts and for bringing new workers into the field—including women, people of color, formerly incarcerated people, and other members of underrepresented groups—through apprenticeship and pre-apprenticeship programs.[72]

In practice, sectoral workforce misalignments mean that workers are left out of potential high-road job standards and clean energy skill-building opportunities. For example, despite comprising a small minority of construction workers—10.3 percent in 2024—unionized workers set the standard for wages and benefits, consistently earning higher salaries than their non-unionized counterparts.[73] Policies that support green, climate-resilient housing can attach prevailing wage standards to the work, strengthening the case for union work and raising the bar for all construction laborers in terms of pay and workplace safety.[74]

So far, however, too few housing construction projects feature labor provisions that ensure good wages, resulting in the telling irony that many construction workers cannot afford the houses they build. This is true even for publicly subsidized projects: Housing construction funded by the Low Income Housing Tax Credit, for example, features no

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[70] Ford, Carmel. 2020. "Who Are NAHB's Builder Members?" National Association of Home Builders. https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics-plus/special-studies/2020/special-study-who-are-nahb-builder-members-august-2020.pdf

[71] Emrath, Paul. 2020. "Average New Home Uses 24 Different Subcontractors." National Association of Home Builders. https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics-plus/special-studies/2020/special-study-average-new-home-uses-24-different-subcontractors.pdf.

[72] Center for American Progress, "Fact Sheet: How State and Local Governments Can Make Climate Jobs Good Jobs," October 9, 2020, https://www.americanprogress.org/article/fact-sheet-state-local-governments-can-make-climate-jobs-good-jobs/; Zach Cunningham and Melissa Shetler, "Building an Equitable, Diverse, and Unionized Clean Energy Economy: What We Can Learn from Apprenticeship Readiness," Cornell University Climate Jobs Institute, 2023, https://hdl.handle.net/1813/113728.

[73] Associated Builders and Contractors, "ABC: A Record-High 89.7% of US Construction Workers Are Not Union Members," January 28, 2025, https://www.abcnjc.org/abc-a-record-high-89-7-of-us-construction-workers-are-not-union-members.; U.S. Bureau of Labor Statistics. "Construction: NAICS 23." Accessed June 2025. https://www.bls.gov/iag/tgs/iag23.htm

[74] Frank Manzo IV, Michael Jekot, and Robert Bruno, "The Impact of Unions on Construction Worksite Health and Safety: Evidence from OSHA Inspections," Illinois Economic Policy Institute, November 30, 2021, https://illinoisupdate.com/wp-content/uploads/2021/11/ilepi-pmcr-unions-and-construction-health-and-safety-final.pdf.

prevailing wage provision (though Minnesota is attempting to remedy this).[75]

To create good green jobs for retrofit projects and green new-build construction, the United States has to revamp the contracting process for residential construction to court union contractors and ensure high-road labor standards. Doing so would enable union workers to create lasting inroads in the residential construction sector. This degree of market shift is much easier said than done, but coordinated policies and institutions can bring market actors together to drive change.

Reshaping the Green Housing Sector, Starting with Regional Industrial Policy

Given the complexity of the housing construction industry and its many stakeholders, the United States needs a transformative approach to transition the US housing stock toward affordability and climate security. **What is needed, beyond derisking decarbonization technologies and encouraging the participation of private capital, are concerted planning and market coordination efforts to ensure that public and private resources drive transformative, equitable sectoral change and yield climate-secure homes for *all*.**

Well-conceived policies can overcome many existing coordination issues among market actors. For instance, they can connect existing contractors and potential clients, codevelop new industry capacities in labor and technology, and safeguard the expansion of climate secure retrofits in an orderly, just, and rapid manner. Greater coordination, premised on the public good rather than profit imperatives, will ensure that the public investments are channeled into housing that serves low- and moderate-income communities and meaningfully increases the supply of permanently affordable housing in the places that need it most. Indeed, significant resources—money and technologies—to climate

[75] BlueGreen Alliance, "First-in-Nation Law Will Require Contractors to Pay Workers Prevailing Wage for Subsidized Low-Income Housing Projects in Minnesota," https://www.bluegreenalliance.org/resources/first-in-nation-law-will-require-contractors-to-pay-workers-prevailing-wage-for-subsidized-low-income-housing-projects-in-minnesota/.

proof the housing sector have already been assembled. As we augment these resources and fine-tune technological interventions, our next steps will shape how these resources are distributed, at what pace, and whether they will yield significant changes to the ways in which housing is constructed and maintained in the long term.

Industrial policy work is neither easy nor without consequence. There are many important questions that will require sustained multi-stakeholder conversations. How can policymakers support upgrades in homes across the country while ensuring that households are not overburdened by transition costs? What opportunities are there to support ongoing affordability and maintenance in subsidized units? With innovations in construction, what is a fair distribution of trade jurisdictions and job replacement? Are there new opportunities for labor alliances between manufacturing and construction? What kinds of policies support sustainable and resilient supply chains while ensuring that energy transition in US housing does not export environmental consequences to other countries? Could industrial policy today lay the groundwork for future transformative actions, such as standing up a green social housing development authority? These are just a few questions that require more deliberation and coalition building.

Even in the absence of federal leadership, there are opportunities to leverage industrial policy, coordinate markets, and drive green, climate-resilient housing.

Unfortunately, the current policy landscape under the Trump Administration is volatile. He has retrenched long-standing federal assistance programs, dismantled agency capacity, and usurped fully executed grant awards that were appropriated by Congress. The abrupt withdrawal of much-anticipated public capital appropriated by the IRA is creating uncertainty in the clean energy and housing development markets.[76] Public capital and government leadership is essential to any transformation in the housing construction sector. Discouragingly, the Trump Administration is not signaling that it intends to provide either.

Even in the absence of federal leadership, however, there are opportunities to leverage industrial policy, coordinate markets, and drive green, climate-resilient housing. For example, **coalitions of green banks, CDFIs, and local and state governments can still enact substantial policy measures at the regional or municipal level**. Many market-making and shaping activities can and have played out at the regional, state, and local levels. State energy agencies, housing agencies, and green banks can play a powerful role by aligning energy investments

[76] Alex Guillén and Zack Colman, "EPA's Zeldin Terminates $20B in Biden Climate Grants," Politico, March 11, 2025, https://www.politico.com/news/2025/03/11/zeldin-terminates-greenhouse-gas-reduction-fund-grants-00225481; DiGangi, Diana, "EPA $20B Funding Freeze Leaves 'Green Bank' Nonprofits Unable to Pay Bills."

We believe that the industry has the tools to do better for residents, workers, and the planet.

With careful policies, these resources can better deliver on affordable climate preparedness for all.

with housing affordability. Cities can pursue innovative programs in contract aggregation and contractor vetting and mandate project-labor agreements and community-benefits agreements on new developments. Numerous government entities can use publicly owned land to support housing and distributed energy developments. Even individual agencies, such as public housing agencies, can use their capital-planning and purchasing power to drive market shifts.

In any sector, change does not come without tensions and trade-offs, and revamping the housing construction industry will require sustained agitation, conversation, and intervention. Still, we believe that the industry has the tools to do better for residents, workers, and the planet. With careful policies, these resources can better deliver on affordable climate preparedness for all.