



A National Roadmap for Clean Buildings

How President Biden Can Use Executive Action to Drive Toward 100% Zero-Emission Buildings

By Nate Kinsey, Molly Freed, Trevor Dolan, Leah Stokes, Dani Schulman & Sam Ricketts

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Introduction

The first two years of President Joe Biden's administration have included historic progress for climate action, but there remains so much more to do. In order to meet his target of a 50-52% reduction in climate pollution below 2005 levels by 2030, and to prepare the nation to reach net-zero emissions by midcentury, the Biden administration must also move aggressively on executive action. State lawmakers must pursue the same course and take every opportunity to enhance building electrification and efficiency. We need leadership at every level to tackle pollution in the built environment. Buildings represent the nation's largest consumer of energy, fourth largest source of direct carbon pollution, and second largest source of air pollution.

Recognizing the massive potential of upgrading and decarbonizing America's buildings, President Biden campaigned and took office on a set of **bold clean building promises**. He **committed to** upgrading 4 million buildings and weatherizing 2 million homes over 4 years. He proposed providing **direct cash rebates and low-cost financing** to help Americans improve the efficiency and resiliency of their homes through appliance electrification. And he set a goal of cutting building sector **carbon pollution in half by 2035**, and slashing the **disproportionately high energy burden** facing low-income households and communities of color. President Biden has set the stage for the most ambitious clean buildings agenda in United States history. And meeting these commitments **has the potential** to create millions of good jobs, build climate resilience, and alleviate long-standing environmental injustices. And with the passage of the Inflation Reduction Act, the administration and Congress have

made a serious downpayment on doing just that. Now it's time for greater executive and state action.

In this paper, we assess the Biden administration's progress, and propose a suite of additional executive actions that will drive transformation of the buildings sector. We start by reviewing the fundamentals of the building sector by defining key industry terms, and then turn to identify a realistic roadmap towards achieving the president's goals. We compare our proposed roadmap with the Biden administration's building strategies. And we propose a suite of key executive actions that the White House can employ to create a nation of clean buildings. These actions focus on accelerating the market adoption of clean appliances through Clean Air Act regulations, federal appliance efficiency standards and building procurement mechanisms, and improvements to the Department of Energy's Weatherization Assistance Program (WAP). We conclude with a series of recommendations for the administration to ensure the most effective and equitable implementation of the massive federal investments authorized by the historic Inflation Reduction Act of 2022.

Building Sector Fundamentals

America's built environment consists of **124 million residential** and **5.9 million commercial buildings**, most of which generate large amounts of direct and indirect carbon and air pollution. **Direct pollution from fossil-fuel air and water heating and cooking appliances is America's 4th largest source of carbon pollution**, accounting for **13% of national carbon pollution**, or 778 million metric tons, in 2020.

Carbon emissions are not the only pollution generated by fossil fuel appliances. **The nation's fossil fuel appliances emit 425,000 tons of nitrogen oxides (NOx) per year, more than all of America's fossil gas power plants combined.** NOx contributes to the formation of local smog and fine particulate matter (PM), causing billions of dollars of public health impacts across America and thousands of premature deaths each year; researchers have found that **residential and commercial emissions are now the leading cause of cross-state early deaths from air pollution.** Meanwhile, inside America's homes and commercial buildings, appliances contribute to a toxic stew of indoor air pollution that **often far exceeds outdoor pollution requirements.** Combustion from fossil-fuel appliances creates carbon monoxide (CO), which can accumulate to lethal levels, and gas stoves emit a wide range of indoor air pollutants including nitric oxide (NO), CO, NOx, PM, and carcinogens like benzene and formaldehyde, which can contribute and increase the risk of health issues, including a **42% higher risk of childhood asthma.** Recent **research shows** that even when gas appliances are turned off, they can still be leaking toxic pollution into our homes.

Like so many environmental burdens in America, the pollution associated with buildings hits historically marginalized low-income communities and communities of color the hardest. Communities of color are **exposed to twice as much outdoor PM from fossil fuel appliances** and suffer **disproportionately higher rates of asthma** as a consequence, and Black Americans are **55% more likely to die** from the impacts of fossil-fuel appliance pollution compared to white Americans. Often, these communities cannot afford to pay for the building maintenance and improvements necessary

to mitigate fossil fuel appliance pollution. Additionally, low-income communities spend an average **13.9% of their household income—**and sometimes as high as 30%—on energy costs, **nearly three times higher than the average for wealthier households.** Communities of color also spend **disproportionately more of their income on energy costs.** That's partly due to the higher likelihood of these homes being poorly insulated, with older and therefore less efficient appliances.

President Biden's initiatives, which would help resolve these historic injustices, also stand to create good jobs in the buildings space. The energy efficiency employment sector—including construction and manufacturing—has already been **among the fastest-growing** in the energy economy over the last decade. According to DOE's 2022 U.S. Energy & Employment Jobs Report (USEER), energy efficiency was **one of only two energy job categories** that did not lose workers in 2021. USEER further found that 11 percent of those workers are covered by a union or project labor agreement, nearly double the national average of 6 percent—but, despite these strengths, the sector employs people of color at a rate below the national average, and is disproportionately male-dominated. With policymaking attentive to job quality standards, on-the-job training, and other pro-worker practices, President Biden can ensure the creation of more good jobs and help resolve structural inequities.

Overcoming the air pollution, carbon pollution, and environmental justice challenges present in the building sector is a monumental but achievable task that will create good jobs and benefit communities across America. The best way to start the transition is by electrifying millions of fossil fuel appliances.

Cleaning up the Building Sector: Electrification

The electrification of fossil fuel appliances is the simplest, cheapest, and cleanest way to reduce pollution from America's buildings. This fact has been documented by numerous academic research papers, multiple state research efforts, the Department of Energy (DOE)'s national labs, and is the International Energy Agency's cornerstone strategy for cleaning up the building sector. At the heart of electrification is a key piece of technology—the **heat pump**, which could offset over 80% of fossil fuel appliance pollution. Heat pumps can both heat and cool the air as well as create hot water, replacing gas furnaces and water heaters. Along with electric induction cooktops, heat pumps can provide buildings with an efficient means of reducing reliance on fossil fuels and lowering energy costs.

In order for newly electrified buildings to be 100% clean, the electricity system must also be 100% clean. President Biden has championed achieving a 100% clean electricity grid power by 2035, and Evergreen Action has outlined the three-pronged approach he must take in order to execute on that commitment. The good news is that getting to 100% clean power and electrifying our homes, other buildings, cars, trucks, and parts and heavy industry can cut around three-quarters of current carbon pollution.



Key Building Electrification Technologies

Heat pumps use electricity to power a system that moves heat from one location to another: whether that's changing the air or water temperature. The most common type—the air source heat pump, or ASHP—is incredibly efficient at pulling heat from the outdoor air, while ground source heat pumps (GSHPs, or geothermal heat pumps), use the ground as its source of heat and are increasing in popularity, especially in cold climates. Heat pumps are nearly three times more efficient than the most efficient gas furnaces or boilers, eliminate onsite air pollution, would cut carbon pollution in 98% of American households, and stand to save billions in climate damages and healthcare costs. In addition to heating appliances, we will need to electrify the 49.1 million American households and millions of commercial kitchens that currently use fossil fuel equipment for cooking and install better-performing electric cookware, like induction stoves.

Cleaning up the Building Sector: Energy Conservation

Electric technologies, like heat pumps and induction stoves, are also the most efficient technologies. The Biden administration must ensure these efficient technologies are adopted rapidly, while also pushing other solutions like insulation that conserve energy. Enacted by Congress and updated by DOE, appliance efficiency standards set minimum energy efficiency requirements for products like water

heaters, refrigerators, furnaces, and fans. Tightening existing standards and including new appliances in the standards program would deliver multiple benefits. The American Council for an Energy-Efficient Economy and the Appliance Standards Awareness Project estimate that updating 47 appliance efficiency standards could substantially reduce carbon pollution,¹ lower utility bills for typical households by \$350 per year, and dramatically cut peak electricity demand. The National Renewable Energy Laboratory (NREL) estimates that single-family building stock can economically reduce 6% of national electricity consumption through conservation measures like replacing furnaces and air conditioners with heat pumps, using smart thermostats and installing LED lights. And the DOE estimates that the Weatherization Assistance Program (WAP), which provides money to hire local crews who lower household emissions through insulation, ventilation, heating and cooling improvements in low-income households, can reduce household energy costs by an average of \$283 each year while providing massive health and household-related benefits valued at \$14,418 per home.

Since electrification will grow demand for electricity, ensuring energy conservation efforts will help manage load growth. NREL estimates that widespread electrification of the built environment will increase total building electricity usage by 27%. **With sustained efforts to promote energy conservation, new building sector electricity demand growth could be eliminated.**

The Biden Administration's Clean Building Progress

Since day one, President Biden and his administration have taken action to achieve the Biden campaign's bold building agenda.

In January 2021, President Biden formalized his administration's "whole-of-government" climate strategy, as called for in the [Evergreen Action Plan](#), by signing the [Executive Order to Tackle the Climate Crisis at Home and Abroad, Create Jobs, and Restore Scientific Integrity](#).

The executive order established the target of achieving a net-zero emissions economy by 2050, and has been followed by the appointment of clean building industry experts throughout the federal government. In May 2021, the administration brought together these newly appointed staff, industry leaders, labor groups, appliance manufacturers, non-profits, and environmental justice advocates to [announce a set of new clean building partnerships, programs, and policies](#).

Later that year the administration successfully secured billions of dollars in new investments for the built environment with the passage of the Infrastructure Investments and Jobs Act (IIJA). IIJA contains funding and investments into existing DOE clean building programs, including the [WAP](#), the [Energy Efficiency & Conservation Block Grants \(EECBG\)](#) program, the [Building Better School Infrastructure](#) initiative, and the [Building Energy Codes Program](#).²

Following the passage of the IIJA, the administration also released [a long-term strategy for achieving net-zero emissions by 2050](#) (in which buildings electrification plays a key role), an [executive order](#) to cut federal building emissions in half by 2032 and achieve net-zero by 2045, and a [National Initiative to Advance Building Codes](#) in order to generate a cleaner and more resilient building stock.

Then, in August 2022, the Congress—led by U.S. Senators Chuck Schumer (D-NY) and Joe Manchin (D-WV)—passed [historic](#)

¹ The ACEEE and ASAP report estimate reductions to be 1.5 to 2.9 billion metric tons cumulatively by 2050, or the equivalent of 13 - 25 coal power plants operating over the same period of time.

² EECBG funds can be used by states and local governments to make investments in energy efficiency, building electrification, and transportation electrification.

climate investments as part of the [Inflation Reduction Act \(IRA\)](#). While all the climate provisions contained in IRA are essential to achieving the President's overall climate goals, the clean building investments and tax credits (outlined on page 9) [are critical to jumpstarting the sector's transition to clean, electrified buildings](#). **All told, these provisions are the largest investment into cleaning up the nation's built environment ever.**

However, even with these investments, additional executive action is required by the Biden administration. Analysis by multiple experts (released by Princeton's [Rapid Energy Policy Evaluation and Analysis Toolkit \(REPEAT\)](#), [Rhodium Group](#), [Energy Innovation](#), the [US Department of Energy](#), and the [Rocky Mountain Institute](#)) estimate that the IRA's passage will result in a 40% reduction in climate pollution by 2030, though reductions in building sector emissions were [found to be modest](#) compared to other aspects of the bill. This means there is more to do—at the federal level, by states, local and tribal governments, the private sector, and others—to realize a nation of clean buildings. President Biden can and must lead with greater executive action, and with robust implementation of IRA and IIJA investments. In the sections that follow, we identify a series of executive actions the administration can take to realize a full clean buildings agenda and fulfill President Biden's climate commitments to the American public.



Clean Building Provisions within the Inflation Reduction Act of 2022

Section	Amount	Description	Eligible entity	Duration	Funding Type
Sec. 13301: Extension, increase, and modifications of nonbusiness energy property credit	\$12.451 billion*	Extends the 25C tax credit for 30% of expenses used to improve the efficiency of a residence through better envelope, provides up to \$2,000 for heat pumps, and funding for breaker box upgrades	Individuals (Residential)	2022-2032	Tax Credit
Sec. 13302: Residential clean energy credit	\$22.022 billion*	Extends 25D tax credit for 30% of expenses used to generate clean energy on a residential site (e.g., solar, wind, fuel cell, battery storage)	Individuals (Residential)	2022-2034	Tax Credit
Sec. 13303: Energy efficient commercial buildings deduction	\$0.362 billion*	More than doubles the rate of tax deductions for commercial properties that retrofit for energy efficiency and meet prevailing wage/apprenticeship requirements. Deduction is calculated based on energy demand reduction	Individuals (Commercial)	2022-	Tax Deduction
Sec. 13304: Extension, increase, and modifications of new energy efficient home credit	\$2.043 billion*	Extends and increases 45L tax credit for new homes that are: zero-energy ready, meet Energy Star SF or MF program requirements, and are built using labor paid prevailing wages	Individuals (Residential)	2022-2032	Tax Credit
Sec. 30001: Enhanced use of Defense Production Act of 1950	\$0.5 billion	Sets aside \$500m to carry out Defense Production Act programs to support heat pump manufacturing and critical minerals extraction	Federal	2022	Grants
Sec. 30002: Improving energy efficiency or water efficiency or climate resilience of affordable housing	\$1 billion	Funds HUD to improve energy and water efficiency and other sustainability upgrades, carry out risk assessments, and benchmark properties	Owners or sponsors of low-income housing	2022-2030	Loans and grants
Sec. 50122: High-efficiency electric home rebate program;	\$4.5 billion	Awards grants to state and tribal energy offices to develop and implement a high-efficiency electric home rebate program, which will cover up to \$14,000 of the cost to electrify and better insulate low- and moderate-income households	State energy offices redistribute to LMI SF households, MF owners with >50% LMI residents	2022-2031	Formula grant to states

Section	Amount	Description	Eligible entity	Duration	Funding Type
Sec. 50123: State-based home energy efficiency contractor training grants	\$0.2 billion	Provides states with funds to implement a training program for contractors involved in energy efficiency and electrification	States	2022	Grants to states
Sec. 50131: Assistance for latest and zero building energy code adoption	\$1 billion	Grants to assist states and local entities to adopt more stringent building codes and zero energy building codes	States and local jurisdictions with control over their building code	2022-2029	Competitive Grants
Sec. 60103: Greenhouse Gas Reduction Fund	\$27 billion	\$7 billion to states, municipalities, and tribal governments to make grants and loans for zero-emissions technologies in disadvantaged communities. \$20 billion to nonprofit green banks to provide loans and grants to greenhouse gas and air pollution reduction programs, with \$8 billion dedicated to disadvantaged, low income communities	Municipalities, states, tribal governments, nonprofits,	2022-2024	Grants, Loans
Sec. 60106: Funding to address air pollution at schools	\$0.05 billion	Addresses air pollution at schools by monitoring and reducing air pollution at public schools in low-income and disadvantaged communities.	EPA	2022-2031	Competitive Grants
Sec. 60201: Environmental and Climate Justice Block Grants	\$3 billion	Grants to address environmental and climate justice issues, including pollution monitoring, extreme heat mitigation, climate resilience, and more	Partnerships between various subnational actors, including Tribes, municipalities, nonprofits, and others	2022-2026	Grants
Sec. 60502: Assistance for federal buildings	\$0.25 billion	Adds to the Federal Buildings Fund for converting federal buildings to high-performance green buildings	Federal	2022-2031	N/A
Sec. 80003: Tribal Electrification Program	\$0.150 billion	Programs aimed at building electrification for Tribal governments	Tribes	2022-2031	Grants

* These tax credits are just estimates from the Joint Committee on Taxation (JCT) and Congressional Budget Office (CBO) — actual spend could be much higher.



State-Level Clean Building Progress

Even as President Biden has pursued executive and legislative action to curb building sector pollution, state lawmakers have led the way on more ambitious regulations. California's Air Resources Board recently [approved a plan](#) that includes a commitment to develop zero-emission standards for residential and commercial furnaces and water heaters, effective 2030. This is the first binding phaseout date in the U.S. for the sale of polluting appliances, and a landmark step toward eliminating onsite air pollution from the buildings sector.

In recent decades, states have innovated other stringent standards for polluting

appliances. [Texas](#), [California](#), [New York](#), and [Utah](#) have all implemented statewide fossil gas appliance emission standards, and California's South Coast Air Quality Management District [regulates NOx pollution](#) from certain appliance categories. Even beyond these novel policies, states are a critical nexus for many building regulations through the adoption and implementation of [building energy codes](#). Federal leadership is critical, and the remainder of this paper centers on recommendations for the Biden administration, but opportunities for state ambition should not be discounted. States will be vital partners in enforcing federal rules, and can often go above and beyond what's mandated at the national level.

Part 1. Apply EPA Standards to Drive Toward 100% Clean Appliances

To achieve President Biden’s building sector climate and air quality goals, his administration must rapidly accelerate the transition from fossil fuel appliances to clean electric appliances, through Clean Air Act (CAA) standards that confront the air pollution from building appliances that are harming American communities today, including NOx and PM. Concurrently, the EPA should send a clear and consistent message to American consumers by modernizing the ENERGY STAR program to accurately incentivize the most clean and efficient appliances available on the market. Additionally, the EPA should work with appliance manufacturers and contractors to achieve industry buy-in and help better facilitate a transition to zero-emission appliances, such as heat pumps.

1.1 Clean Appliance Standards

To accelerate the transition towards clean appliance adoption, we recommend that the EPA **adopt firm and simple appliance emission standards rules under the Clean Air Act**. This approach seeks to accelerate the transition to clean heating with electric heat pumps. It’s rooted in regulatory precedents limiting pollution from wood heaters and tailpipes at the national level, as well as the aforementioned statewide fossil gas appliance emission standards in Texas, California, New York, and Utah. A more ambitious regulatory framework will also seek to ensure that historically disadvantaged communities identified by the Biden administration benefit both from air pollution cuts in their communities and a reduction in their energy costs.

In August 2022, Evergreen Action submitted a formal petition to the EPA, alongside the Sierra Club and 25 other climate, health, and consumer organizations, calling for the inclusion of appliances as a source category under the Clean Air Act, particularly for heating appliances. The following proposal builds on the compelling case compiled within the petition by outlining a feasible appliance performance standard for the EPA to implement once they take advantage of their authority and add the new source category.

1.1.1 Structuring Clean Appliance Standards

To ensure the market transitions quickly from dirty, NOx-emitting fossil fuel appliances, to clean appliances, the EPA should adopt firm and simple zero-emission Clean Appliance Standards. This work must begin with space and water heating appliances. The standard would be specific to appliance type and class, considering what is achievable with current technology for that application. It is critical that the EPA adopts a 100% zero-emission standard for all new furnaces and water heaters effective no later than 2030.

This zero-emission Clean Appliance Standard standard would:

- Immediately shift the fossil gas appliance market—with a clear signal that the US market is moving fully to zero-emission appliances;
- Provide market actors and industry stakeholders with certainty and a time horizon in which to execute and implement the transition; and

- Create a firm and simple set of emission standards that allows the EPA to develop a compliance strategy to accelerate the clean appliance transition.

1.1.2 Compliance Framework for Clean Appliance Standards

To determine if a manufacturer is meeting the emission standards, should the agency begin with any interim standard, **we recommend the EPA utilize either an appliance-wide average or percentage of zero-NOx appliance sales approach.** Each approach should be paired with a credit compliance system that incentivizes both the adoption of zero-emission appliances in historically disadvantaged communities and credits the manufacturers for selling advanced zero-emission technologies into the market. These two compliance credits are not the only credits EPA should consider as part of the broader clean heating appliance rules, but they should be central to a final rule.

1.2 Modernizing ENERGY STAR

To make further progress on clean buildings faster, the EPA must also modernize the ENERGY STAR products program. Created in 1992, and formalized by Congress in 2005, ENERGY STAR is a voluntary program tasked with identifying and promoting products that reduce energy consumption, improve energy security, and reduce pollution.³ The ENERGY STAR Product program has successfully identified and promoted residential appliances through the ENERGY STAR label and Most-Efficient Appliance designation.

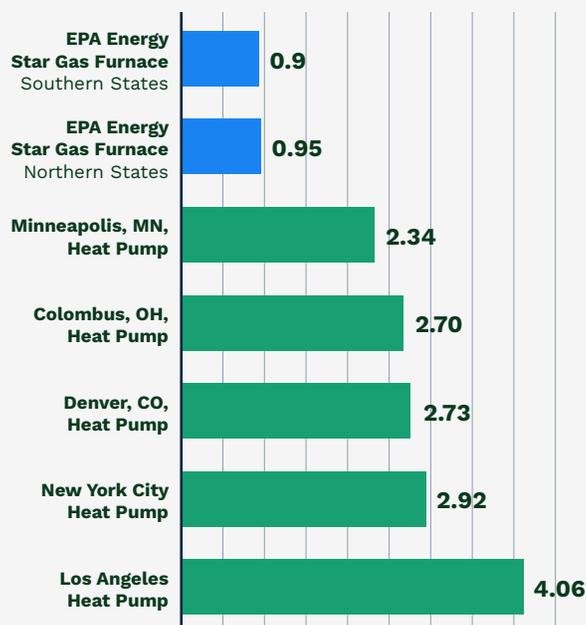
Fossil fuel appliances should not qualify under the ENERGY STAR program, period. Importantly, Biden’s EPA removed furnaces, boilers, and gas dryers from the 2022 ENERGY

STAR “Most Efficient” criteria. This is an important step, but additional executive action is necessary. **We call on the Biden administration to eliminate all fossil fuel appliances from the ENERGY STAR program.**

Notably, ENERGY STAR appliances, products, and service firms were the largest employers in the energy efficiency sector in 2021; eliminating fossil fuel appliances should go hand-in-hand with training and job placement programs to help transition workers who have built careers on fossil fuel appliances.

Appliance Heating Efficiency, Various Climates

Coefficient of Performance (COP)



Data courtesy of RMI

To tackle the climate crisis, the appliance marketplace must shift from fossil fuel appliances to clean, zero-emission appliances, and ENERGY STAR should lead the way.

³ Section 131 of the Energy Policy Act of 2005, P. 28. See: congress.gov/109/plaws/publ58/PLAW-109publ58.pdf

Part 2. Improve DOE Appliance Efficiency Standards

Appliance efficiency standards are a proven policy. At a macro scale, it's estimated that federal efficiency standards implemented between 1987 and 2013 saved American households \$56 billion in utility cost, reducing overall national energy demand and carbon pollution by 4%.⁴ President Biden recognized the value of efficiency standards in an executive order signed on day one of his administration, and while DOE has made strides toward achieving these goals, much work remains to be done.

2.1. Undo the Trump Administration Rules

To start, the Biden administration must finish undoing Trump Administration rules that impact DOE's ability to adopt strong efficiency standards, and essentially froze them in place. DOE has made progress reviewing these rules, and recently proposed a new 95% efficiency standard for fossil gas furnaces to go into effect in 2029. But the gas industry has been fiercely resisting the standard, which hasn't been updated since 1992, claiming an update would "effectively ban cost-effective and efficient natural gas furnaces that customers rely on today." This is just the latest example of fossil gas industry tactics to delay a transition to cleaner appliances and away from dirty fossil fuels.

Federal appliance efficiency standards for residential furnaces have not increased since the 1990s, in large part because of pushback from the fossil fuel industry. The freeze of

fossil fuel appliance standards artificially keeps their costs low when compared to clean heating appliances, creating an unnecessary barrier to the cleaning up the buildings sector. This lack of progress slows the transition to a 100% clean building sector, increases carbon pollution, and decreases energy affordability by allowing dirty technologies to remain in the market. DOE must finalize all these rule reviews as soon as possible to facilitate its efforts to implement a clean efficiency appliance strategy.

2.2 Create a Clean Efficiency Standard Strategy

As they roll back the Trump administration's rules, DOE must be laser-focused on accelerating efficiency standards that advance the administration's climate and public health goals. Following Trump administration delays, Biden's DOE has a historic opportunity to advance 66 different appliance efficiency standards on everything from battery chargers to water heaters during the next two years. The American Council for an Energy-Efficient Economy (ACEEE) and the Appliance Standards Awareness Project (ASAP) estimate that, if adopted, these 66 appliance standards could reduce carbon pollution by 1.5 to 2.9 billion metric tons cumulatively by 2050, lower annual utility bills for typical households by \$350, and dramatically cut peak electricity demand.

And while DOE must strive to update all 66 efficiency standards, it should prioritize

⁴ Refrigerators and central air conditioners alone have improved their electrical efficiency by 50% since the 1990s, and clothes washers have improved by 70% since the 1970s.

updating efficiency standards that maximize peak electricity reductions, fossil-fuel heating reductions, and utility bill savings during the next two years. This clean efficiency standard strategy aligns DOE's appliance standard authority with the administration's

100% clean electricity goals and 100% clean buildings policies, all while prioritizing energy affordability. The table below highlights the 5 efficiency standards that ASAP found to have the greatest impact on these three metrics:

Appliance	Carbon Pollution Savings (MMT)	Peak Demand Reductions (MW)	Utility Bill Savings (millions in 2009 dollars*)
Residential Water Heaters	4.9	5,859	\$9,151
Residential Furnaces	2.8	-0.5	\$1,387
Residential Refrigerators and Freezers	1.1	2,208	\$2,068
Residential Central AC/HP	0.5	7,351	\$2,099
Room Air Conditioners	0.5	5,925	\$913

The DOE kicked off this process in June 2022 by issuing a proposed rule to upgrade the efficiency of residential furnaces from 80% to 95%, in effect requiring new models to make use of condenser technology and driving the purchase of up to 300,000 heat pumps per year. As part of a campaign led by ASAP, Evergreen Action has signed onto comments to DOE supporting this crucial

update, along with partner organizations and advocacy groups. DOE must continue this progress and increase the speed of the rulemaking process by promptly directing the Office of Information and Regulatory Affairs (OIRA) to revert to the approach taken during the Obama Administration and grant categorical non-significance determinations for appliance test procedures and early-stage standards documents.

Part 3. Implement 100% Clean Federal Buildings

Since taking office, the Biden administration has made a set of bold promises for the federal building stock. In May 2021, the administration announced its intention to create the nation's first Federal Building Performance Standard. In December 2021, in the [Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability](#), the administration committed to reducing carbon pollution in federal buildings by 50% by 2032, and that 100% of all federal buildings would be net-zero emissions by 2045.

These are bold goals. The federal building stock consists of approximately 115,000 civilian buildings spread across 1.15 billion square feet annually [consuming a massive amount of energy](#). The executive order [does not apply](#) to the U.S. military, which is responsible for over three-quarters of federal government energy usage, has over 275,000 buildings across the globe, and [uses 30%](#) of its energy for facilities. This is a [significant hole](#) in decarbonizing all federal buildings.

No single agency manages the federal building stock's energy usage. As such, the Biden administration must design and implement a federal building performance standard that can help achieve the administration's goals while also accelerating the development of zero-emission appliances and technologies for the commercial sector.

Symbolically, it would also be powerful if President Biden electrified the White House with heat pumps and induction stoves, following in the footsteps of President Jimmy

Carter when he put solar panels on the White House roof decades ago. This act could signal to the entire federal government that clean buildings are the future.

3.1 Federal Building Performance Standard

In the December 2021 [Executive Order 14057](#), the administration established the goal of reducing carbon pollution from each agencies' building portfolio by 50% by 2032 and 100% by 2045. A Federal Building Performance Standard (BPS)—a policy that requires reductions in pollution or energy consumption over time—is also included in the executive order, but the details of its design remain unclear. The [most recent EO 14057 implementation instructions](#) state that the federal BPS will be published by the end of 2022, and emphasize the importance of building electrification and deep retrofits in meeting the federal government's targeted scope 1 emissions reductions by 2030, with incremental reporting beginning in 2024. Outlined below are our recommendations for how the administration should develop and implement a set of BPS metrics, standards, and a compliance methodology.

3.1.1 Metrics

To achieve the administration's climate, clean air, and equity goals, we recommend utilizing three metrics in a federal building performance standard. The program's primary metric should focus on carbon pollution. This metric would calculate carbon emissions, considering sources from the

electricity sector, the fossil fuels consumed on-site, and any district heating and cooling provided to an agency building. Secondly, the program should calculate NOx pollution generated by the fossil fuels consumed by a building on- and off-site, as well as an equity metric that would track the annual carbon and NOx pollution reductions achieved in disadvantaged communities identified by CEQ's Climate and Economic Justice Screening Tool.

3.1.2 Standard

We recommend the federal building performance standards be aligned with the administration's stated goals but expanded to include interim reductions and NOx pollution. While the December 2021 Executive Order provided valuable benchmark goals for 2032 and 2045, they are too far away to drive meaningful action today.

Instead, the federal building performance standard should establish 5-year interim targets for both carbon pollution and NOx pollution reductions for each agency. The standard should reflect reductions already achieved compared to the 2008 baseline and should be unique to each agency's building stock. To accomplish President Biden's environmental justice goals, each agency plan should also ensure that 40% of the investments required to achieve these goals occur in disadvantaged communities identified by CEQ's Climate and Economic Justice Screening Tool.

3.1.3 Compliance

To simplify and provide agencies with compliance flexibility, we recommend the

administration apply these standards at an agency-wide average portfolio, not at an individual building level. The portfolio level approach to compliance will allow each agency to strategically implement building retrofits and schedule major modernization projects to achieve their 5-year pollution reduction and equity goals. The agency would track and report annual pollution metrics for small (<10,000 square feet) and large (>10,000 square feet) facilities separately, and each agency would propose pollution reduction goals for each category in its annual sustainability plans.⁵

3.1.4 Use of ENERGY STAR Portfolio Manager

To enable the tracking of these metrics and the expansion of a federal building performance standard to the rest of the federal government, we recommend the EPA modernize their ENERGY STAR portfolio manager tool. The ENERGY STAR portfolio manager tool is a web-based tool used by the commercial building industry to benchmark their facilities' energy use and greenhouse gas pollution.

To apply to our proposed federal building performance standard, the ENERGY STAR portfolio manager tool needs to be updated in two ways. First, the tool needs to report both carbon pollution and NOx pollution metrics. Second, the ENERGY STAR portfolio manager tool should incorporate the administration's Climate and Economic Justice Screening Tool to identify facilities located in disadvantaged communities. This will help the administration ensure that 40% of upgrades made to federal buildings occur

⁵ Historically, facilities less than 10,000 square feet have not been included in building performance standard requirements, largely due to their low energy consumption; however, we propose including them in the federal building performance standard for three reasons. First, small facilities, as categorized above, account for 47% of DOD's, DOE's, EPA's, and GSA's building stock and account for 13% of the entire federal building stock. This saturation of small facilities throughout the federal government means there is no path to 100% clean buildings without these facilities. Second, these small facilities represent warehouses, offices, restrooms, laboratories, and industrial facilities located throughout the United States. Each facility type requires a unique, clean heating strategy and presents the federal government with an opportunity for innovation-led deployment. And third, these buildings are low-hanging fruit for electrification: because they're often small enough to use residential-type space heating technologies or gas rooftop units, their heating systems can usually be replaced one-for-one with heat pump rooftop units.

in disadvantaged communities, and more generally track the equitable distribution of federal funding appropriated to commercial buildings through IIJA and IRA.

Together, these metrics, standards, and compliance methodology will shift these agencies' procurement, construction, and renovation practices towards clean heating appliances, technologies, and building designs.

3.2 Implement Section 433 of the Energy Independence and Security Act and Information Act.

In parallel with, and to strengthen the federal building performance standards, DOE should expedite implementation of [Section 433 of the Energy Security and Information Act of 2007 \(EISA\)](#), which established fossil fuel generated energy consumption mandates. As adopted by statute, newly constructed and majorly renovated federal buildings were meant to reduce fossil fuel energy consumption by 55% starting in FY 2010 and achieve a 100% reduction by FY 2030 compared to the [2003 Commercial Buildings Energy Consumption Survey or Residential Energy Consumption Survey Data](#) with interim goals in between.

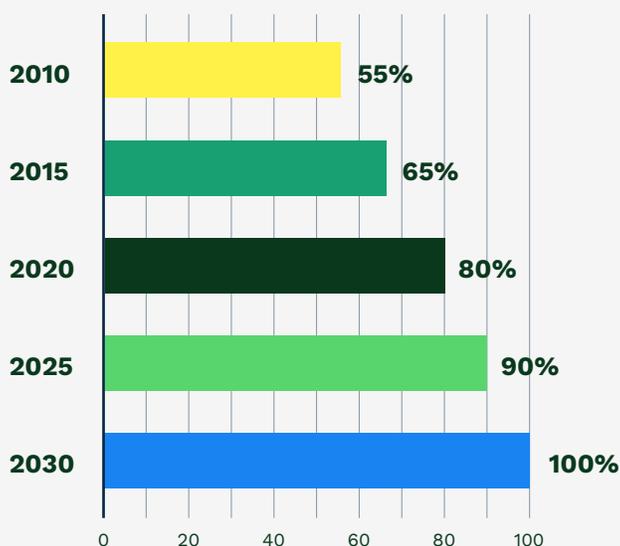
While President Obama's DOE [commenced a rulemaking](#) to implement this statutory requirement, they never finalized it. This not only puts the federal government at risk of noncompliance with the law, it also generates ambiguity in the federal government construction and renovation process.

In addition, the federal government can showcase its leadership with zero-carbon new construction—particularly given that since the first rulemaking, the nation has

embraced efforts to adopt zero codes. The nation's model code now contains zero-carbon code appendices, IRA has funding to support zero code adoption, and a number of jurisdictions have now committed to adopting zero codes. State leadership will be critical to escalating the adoption and implementation of these zero codes.

We call on the Biden DOE to finalize the rulemaking process begun by President Obama and codify these reductions by the end of 2022, on the White House to issue an executive order directing all new federal construction projects to comply with the 2030 goal of 100% fossil fuel reduction. We also call on state lawmakers to adopt zero codes to further decarbonize construction nationwide.

Congressionally Mandated Targets for Reducing Fossil Fuel Energy Consumption in Federal Buildings



Part 4. Advance Environmental Justice through the Weatherization Assistance Program

To achieve President Biden’s environmental justice goals, the administration should strengthen DOE’s Weatherization Assistance Program (WAP). Since 1976, WAP and its grantees have provided weatherization services to increase a household’s energy efficiency, reduce its energy expenditures, and improve health and safety in low-income, energy-burdened, and vulnerable households. WAP has succeeded in meeting these goals. The program has weatherized over 7 million eligible households, and a [2014 Oak Ridge National Laboratory evaluation report](#) found the program cost-effective, mission-oriented, and effective at providing health and safety benefits to eligible households.

Recognizing the value of WAP, Congress has recently taken steps to modernize the program and infuse it with additional funding. In the Consolidated Appropriations Act of 2021, Congress created a new Enhancement and Innovation subprogram within WAP, which allowed DOE to include health and safety benefits in the program’s cost-effectiveness framework. In IIJA, Congress provided a one-time infusion of \$3.5 billion in supplemental funding to enable hundreds of thousands of additional households to receive weatherization services. In March 2022, the administration [issued guidance](#) on how weatherization managers can apply for this additional funding, including funds for building electrification. That same month, President Biden signed into law \$15 million

of appropriations for the [Weatherization Readiness Fund](#), designed to support low-income homes in need of repair before they can be weatherized. These were great first steps by the administration, but without updated fuel switching guidance, WAP will fall short of the President’s climate and equity goals.

Under current 2019 [DOE guidance \(WPN 19-4\)](#), WAP funds can be used for fuel switching when it is either deemed cost-effective or if it is justified for Health and Safety (H&S) reasons. DOE can administer approval for fuel switching either on a case-by-case basis, literally project by project, or writ large as part of an overarching request from a WAP grantee. This is a very burdensome process riddled with regulatory loopholes, trap doors, and administrative process requirements that make it difficult for funding to be spent in alignment with the President’s goals. As such, we are calling on the administration to modernize the existing guidance for fuel switching in three key ways: replacing fuel switching with electrification, clarifying the definition of health and safety, and modernizing the Savings-to-Investment

4.1 Replace Fuel Switching with Electrification

First, the administration should either redefine fuel switching to be a shift from fossil fuel to electricity, or simply replace the

term “fuel switching” with “electrification.” Under current guidance, DOE can approve fuel switching weatherization projects that transition a WAP participant from oil to fossil gas. Though it is true that a switch from oil to fossil gas reduces overall pollution, the electrification of those appliances eliminates onsite pollution and therefore improves occupancy health without locking in new fossil infrastructure. As such, we recommend DOE update the guidance language to clarify that the electrification of existing appliances is the only type of fuel switching that DOE will consider for approval.

4.2 Clarify the Definition of Health and Safety

Second, DOE should update the guidance to clarify the definition of health and safety and work to quantify the non-energy benefits of weatherization investments. Under current guidance, DOE can approve fuel switching projects when justified for Health and Safety (H&S) reasons, but does not provide guidance on when that threshold is reached. Given the growing body of research on the negative health effects of fossil gas appliances, we recommend DOE adopts a framework of criteria that universally justifies the switch from fossil gas to electric appliances as a benefit to H&S.

4.3 Modernize the Savings to Investment Ratio (SIR)

Third, DOE should modernize WAP's cost-effectiveness framework used to approve and deny weatherization investments made in each eligible home. Under current guidance, WAP personnel can only approve fuel switching investments that are deemed “cost-effective” using the Savings to Investment Ratio, or SIR. The SIR takes the energy benefits that

an investment provides and divides it by the cost it took to achieve those benefits.

$$\text{Savings to Investment Ratio (SIR)} = \frac{\text{WAP Benefits/}}{\text{WAP Costs}}$$

Fuel switching projects with a SIR greater 1.0 pass the SIR test and can be approved by DOE. Fuel switching projects with a SIR less than 1.0 fail the test and cannot be included. This existing cost-effectiveness methodology increases barriers to building electrification deployment and should be modernized by the administration in three key ways.

First, the administration should update the SIR methodology and modeling tools to more accurately capture all the weatherization investments' energy and savings benefits of heat pumps. For example, if a homeowner wanted to replace a fossil fuel heating system with a heat pump that both heats and cools their home, the current SIR methodology would incorporate the new estimated energy costs of running the system (including the cost to cool), without measuring any of the space cooling benefits. DOE must rectify this inequitable policy by providing guidance on quantifying and including all of the benefits from heat pumps.

Second, the administration should direct DOE to incorporate non-energy (including health and safety) benefits of weatherization investments into SIR methodology as authorized in the Consolidated Appropriations Act of 2021. Those could include, for example, avoided costs to the medical system from residents being able to afford prescription drugs with the money they saved on heating and cooling bills. There is also additional income from fewer days of missed work on account of respiratory problems. Incorporating downstream savings would call



for more complex models, but to meet their statutory obligations — and advance building electrification in vulnerable low-income communities — the agency must take a more holistic view of the costs and benefits of fuel switching.

Third, and finally, the administration should direct DOE to more accurately quantify and value the greenhouse gas benefits of WAP investments. DOE should review the January

2021 [Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking](#) and the [February 2021 technical support document](#) for guidance on the metrics to be adopted into WAP regulations, such as the social costs of carbon, nitrous oxide, and methane.⁶ The incorporation of these metrics is a vital step DOE must take to accurately value the benefits of the WAP program and fuel switching measures.

⁶ A [recent study](#) indicates that the real social cost of carbon is at least 3.6x the value of the federal government's current figure — \$186 per ton, vs. the government's \$51 per ton. In addition to incorporating social costs of pollution into WAP regulations, the Biden administration should ensure that its cost valuations reflect the latest science.

Part 5. Advance the Equitable Implementation of Clean Building Provisions

As a package, the Inflation Reduction Act represents an unprecedented investment in cutting carbon pollution. The [clean building tax credits and investments](#), including programs to boost domestic appliance manufacturing and funding for [Defense Production Act initiatives](#), will be critical to jumpstarting the sector's transition to electrified heating. It is now incumbent on the Biden administration to put its Justice40 Initiative and equity commitments into real practice as it implements the IRA, as well as the IIJA.

Thus, funding to states should be issued with guidance to prioritize clean building projects located within disadvantaged communities, as established through the [Climate and Economic Justice Screening Tool](#). States should be required to track and report the improvements completed in these communities, and must ensure that at least 40 percent of the allocated program funds are directed to them. States must likewise ensure that federal funds [go to supporting high-quality union jobs and employing workers from disadvantaged communities](#), through project labor agreements, community benefits agreements, and other mechanisms developed in partnership with community leaders. By the same token, IRA's contractor training grants should be preferenced to support residents of disadvantaged communities, transitioning workers, the

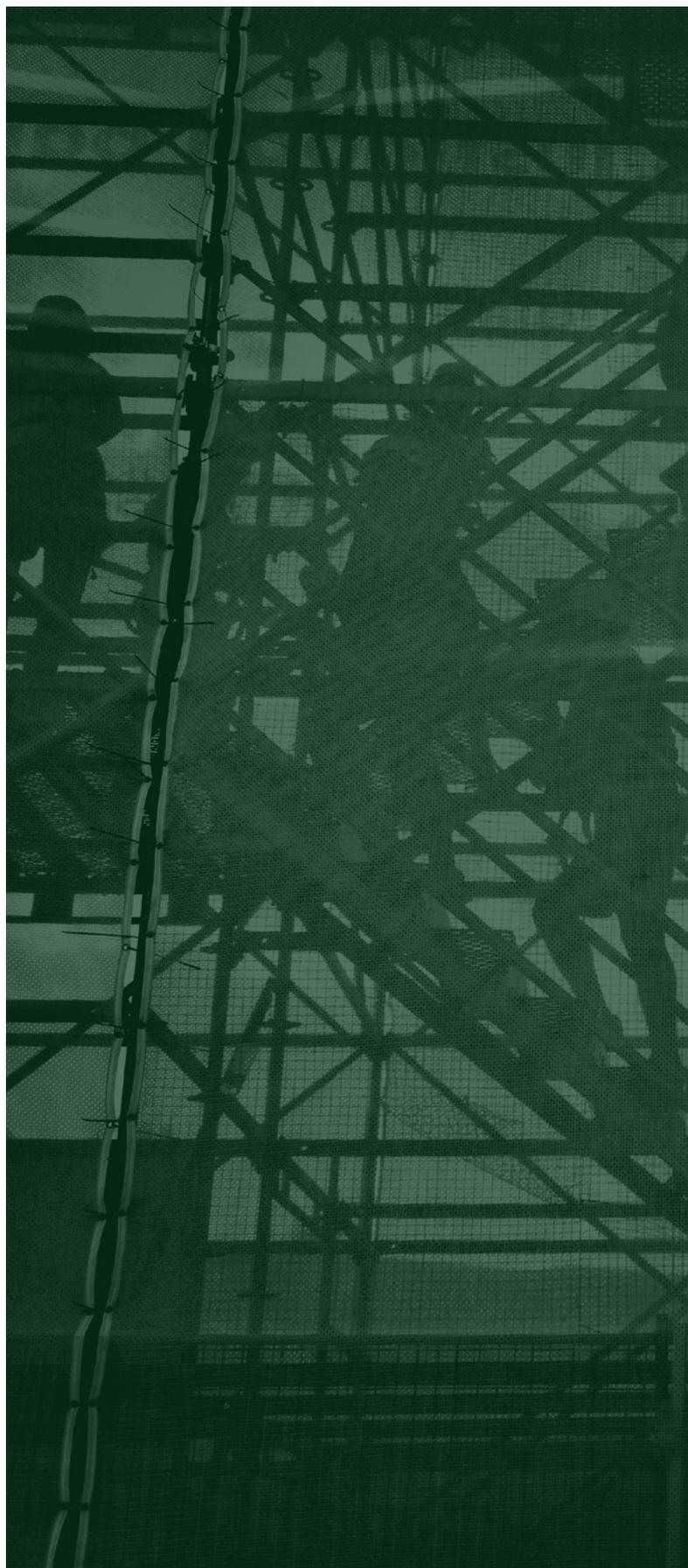
formerly incarcerated, and others who are often denied opportunities for good jobs.

Barriers in program design and program access also often prevent disadvantaged communities from participating in government programs, even if those programs are intended to benefit them. In response, a number of best practices to ensure the uptake of clean building programs within disadvantaged communities have been established, including in [New York State's Barriers and Opportunities Report](#) and a [2021 report from the Green and Healthy Home Initiative](#). The recommendations contained within this report should be incorporated when designing and updating the clean building programs contained within the bill.

The administration will also need to carefully consider how each of the clean building programs contained within the bill—along with existing programs, such as WAP—can work together to maximize impact. A “no wrong door” policy should be adopted for eligible households, such that a HEEHRA or HOME rebate program participant is also encouraged to stack additional upgrade opportunities, such as 25D tax credits for renewable energy, and state incentives, on top of their electrification and insulation improvements. Many building owners will only invest in these upgrades once per decade, so it's crucial that each incentive can be easily packaged together

to generate the most efficient possible building, with minimal hassle for the owner. This once-in-a-decade opportunity also means that the administration should focus on getting funding out to eligible entities as soon as possible, so as to send a clear market signal and capture as many households and commercial buildings as possible.

Finally, the rapidly aging buildings sector workforce cannot keep up with the scale of electrification and retrofits necessitated by the climate crisis. Many established contractors and HVAC specialists are also unfamiliar with heat pump technology, and the sector is facing a serious labor shortage. Installations cannot proceed at pace without a national program for training and job placement. IIJA included only \$20 million for training in building technology installation, and IRA offered an additional \$200 million for state-based grants home energy efficiency contractors. Those investments should not be discounted, but reaching a 100% clean buildings sector will also require much larger federal support for workforce development including pre-apprenticeships and registered apprenticeship programs. The building sector investments in IIJA and IRA are critical for the electrification and efficiency agenda, but much more will be needed to reach President Biden's ambitious commitments. In particular, we expect and would applaud seeing the HEEHRA and HOME programs to spend their money quickly. Congress should continue to invest in these programs swiftly with additional funds as soon as possible.



Conclusion

For the Biden administration to meet its 2030 and 2035 climate goals, America's buildings must swiftly transition to electric, clean appliances like heat pumps and induction stoves, and create many good jobs along the way. We must pair this rapid electrification of our buildings with 100% clean electricity. The investments included in the IIJA and the climate provisions of the IRA provide essential funding to commence the transition, and pioneering state leadership has already driven significant progress. This roadmap takes the next step in identifying a suite of key executive actions the Biden administration can take to achieve their goals. Now we ask President Biden and his administration to show visionary leadership by executing on this roadmap and helping create a nation of clean buildings.