

IMPLEMENTING THE INFLATION REDUCTION ACT: A ROADMAP FOR FEDERAL AND STATE BUILDINGS POLICY

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EXECUTIVE SUMMARY

The Inflation Reduction Act of 2022 (IRA) is the most significant climate legislation in United States history. Several independent studies find the IRA's \$370 billion in climate and clean energy investments could help cut U.S. greenhouse gas emissions (GHG) roughly 40 percent by 2030. Combined with state action and forthcoming federal regulations, the IRA puts the U.S. within reach of its Paris Agreement commitment to cut emissions 50 to 52 percent by 2030.

Energy Innovation Policy and Technology LLC[®] prepared a series of research notes to detail the IRA's provisions across the [electricity](#), [transportation](#), and building sectors.^{1,2} The notes also describe how states and private actors can leverage the provisions to unlock economic, public health, and climate benefits, as well as how the U.S. can help bridge the gap to meet its 2030 climate goals.

This note covers the IRA's building sector provisions, which could save consumers money, improve public health, enhance comfort and safety, create good-paying U.S. jobs, and cut building sector emissions.¹

This report highlights the IRA's most impactful policies, examines recent independent modeling investigating the

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IRA's building sector impacts, and provides an implementation roadmap for state and federal policymakers. It explains how state policymakers and other stakeholders can leverage the new law to reduce building sector pollution, increase building efficiency and performance, and reduce consumer energy bills. The report demonstrates how federal regulatory agencies can effectively implement the law and adopt complementary policies to accelerate building decarbonization this decade. It concludes by recommending policy and regulatory actions that can ensure the U.S. building sector quickly transitions to meet climate goals, protect public health, and increase resilience where we live and work.

Top-line research findings include:

- The IRA's historic investments in residential, commercial, and federal buildings will catalyze the building sector decarbonization movement, reduce energy bills, and spur demand for efficient electric appliances and equipment. But slow stock turnover means additional federal, state, and local action is needed to reduce building sector emissions on pace to achieve climate stability.
- Incentives and tax credits targeting low- to moderate-income (LMI) households, multifamily buildings, and underserved communities can provide much-needed relief from high fossil fuel prices and reduce energy burdens—incentives for LMI households will cover between 80 and 100 percent of project costs for whole-home efficiency and electrification measures.
- IRA contractor and builder incentives signal the industry's vital role in the transition and the benefits of early leadership. A trained workforce will also increase consumer confidence in building technologies and facilitate positive installation experiences.
- The IRA's building provisions will affect building energy consumption trends, thus impacting utility electricity grid and gas systems, as well as other fossil fuel infrastructure.

Top-line policy recommendations include:

- State, local, and Tribal governments should move quickly to deploy these funds and help more consumers and businesses save money, while also reducing GHGs at the pace required for a safe climate future.
- The U.S. needs more stringent appliance emissions standards favoring all-electric highly efficient equipment, in addition to IRA building sector incentives. Appliance standards can eliminate hazardous appliance pollutant emissions and help reduce the building sector's GHG emissions at a pace needed for climate stability. Federal agencies should quickly adopt rigorous appliance standards protecting public health and reducing appliance-related emissions, while providing clear information about indoor fuel combustion risks.
- State and local governments should leverage IRA funds for building code development to adopt high-efficiency and zero-emissions buildings that improve air quality and building

- resilience. Building codes are the fastest way to ensure the future building stock aligns with climate goals, while avoiding stranded fossil fuel assets and costly retrofits down the road.
- State utility regulators should require utilities to update their projected adoption rates of the technologies incentivized in the IRA—efficient electric equipment and appliances, distributed generation and energy storage, community-scale energy resources, and high-efficiency all-electric new construction—in their system planning assumptions, investment priorities, rate designs, tariff designs, and business models.
 - Regulators (and utility governing bodies) should direct their utilities to evaluate how existing efficiency and electrification incentives could be restructured to better complement IRA incentives and optimize the cost-effectiveness of their programs.
 - State Energy Offices (SEOs) should prepare for the influx of funding by adding capacity, designing streamlined rebate distribution programs, and engaging with community stakeholders and target audiences. SEOs can start by identifying what will be needed to run successful rebate programs that enable swift and easy allocation of funds.
 - SEOs should coordinate with other state entities offering energy efficiency and electrification incentives to clarify which incentives can be combined to cover different upgrades. Layering incentives will help more households and building owners afford electrification and efficiency improvements.
 - SEOs will be a trusted source of information on available incentives, processes, and guidance. SEOs should help all consumers understand the steps and costs associated with high-efficiency electric appliance upgrades, home weatherization, and whole-home energy performance upgrades. SEO support and communication strategies should fit the varying needs of consumers across income, demographics, and location.
 - States and local governments should work with contractor trade associations, unions, and utilities to create a glidepath for efficient, electrified, and decarbonized buildings while supporting a qualified professional workforce. They should maximize the impact of IRA funding by supporting statewide workforce efforts for contractors and builders, and by providing appropriate guidance and oversight on prevailing wage and apprenticeship provisions.

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IRA PROVISIONS WILL JUMPSTART EQUITABLE ELECTRIFICATION AND INCREASE ENERGY EFFICIENCY IN BUILDINGS

Homes and buildings compose 13 percent of total U.S. GHG emissions, and burning fossil fuels for space and water heating generates harmful indoor and outdoor air pollutants linked to higher rates of asthma and other health harms.³ Mitigating the building sector’s climate and pollution impacts requires policies and regulations targeting the existing building stock (including existing appliances and equipment), new appliances and equipment, and new construction. Policies must be multifaceted to address the unique challenges inherent to different building types, varied ownership and financing scenarios, and the realities of occupants, owners, and contractors alike.

The IRA’s suite of incentives and programs takes this multifaceted approach. For example, rebates for new efficient, all-electric appliances will help consumers and contractors replace old, fossil-fueled equipment; funding for state and local governments will support the adoption of state-of-the-art energy efficient building codes; and tax credits for building owners and builders will enable smart energy renovations and new construction for all building types.

Energy Innovation[®] modeled the IRA’s climate policies, including several directed at the building sector, across a range of scenarios (Low, Moderate, and High) compared to business-as-usual (BAU). The scenarios reflect different assumptions regarding market uptake and successful implementation of the new policies.

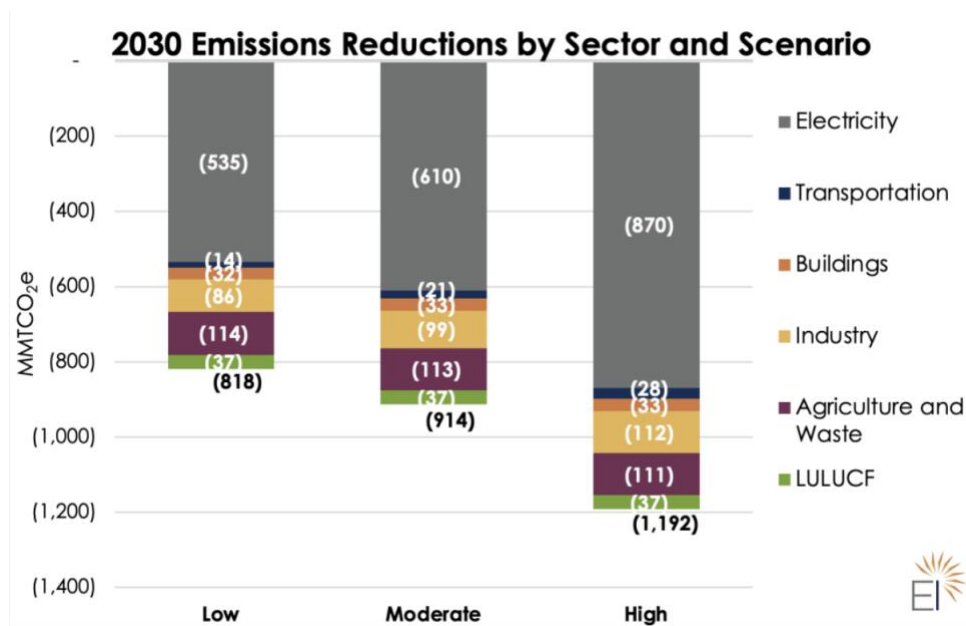


Figure 1. 2030 Greenhouse Gas Emissions Reductions by Sector and Scenario. LULUCF: Land use, land use change, and forestry.

According to our modeling, the IRA will reduce annual building sector emissions by 32 to 33 million metric tons carbon dioxide equivalent (MMT CO₂e) in 2030, depending on the scenario.

The IRA's largest emissions reductions come from its electricity provisions. Modeling shows deploying carbon-free clean electricity will reduce emissions 72 to 85 percent by 2030. Grid decarbonization also enables building sector emissions reductions through increased electrification. For existing buildings, electrification entails swapping out fossil fueled appliances and equipment with efficient, all-electric alternatives powered by clean electricity. For new construction, electrification avoids the need for fossil fuel infrastructure through construction of highly efficient, all-electric buildings. For all buildings, increased energy efficiency is a cost-effective energy resource for utilities that helps save households money on energy bills.

Building sector emissions reductions resulting from IRA provisions are considerably smaller relative to other sectors (a 5 to 6 percent reduction of building sector emissions in 2030, relative to BAU). This is partially due to slow building appliance stock turnover, given their long lifecycles and the fact that many replacements do not occur until the end of an appliance's useful life. Building retrofits and equipment replacement also require upfront capital or financing, which may not be readily accessible to all building owners or occupants. Older buildings may also require other upgrades, such as updated electrical wiring, insulation, or remediation of safety issues (such as mold or lead paint), which can add expenses and time to a project. These challenges make it important to ensure smart construction from the start, which requires state and local governments to adopt and enforce state-of-the-art building codes.

While the IRA's historic buildings provisions will help jumpstart market transformation, their ability to decarbonize the building sector will be limited between now and 2030 because of the stock turnover challenge. Nonetheless, over the next decade, these incentives will help consumers invest in more efficient, electrified equipment for their homes and send a strong market signal to that building decarbonization is the way of the future. States and local governments developing leading building codes will get support for their efforts to decarbonize the future building stock, avoiding costly stranded fossil fuel infrastructure and improving public health. Absent the IRA, the building sector would likely fail to achieve any meaningful emissions reductions, and the law is a critical first step toward reducing building emissions in time to preserve climate stability.

Our modeling shows the IRA also provides notable benefits for consumers and the U.S. economy, saving households \$80 annually in 2030. These savings will likely grow as the grid becomes increasingly clean while more households electrify. The IRA's climate provisions will stimulate economywide job creation, potentially creating 1.2 to 1.3 million net new jobs in 2030 relative to BAU, spread across industries such as manufacturing, construction, trade, and services.

Job Creation in 2030

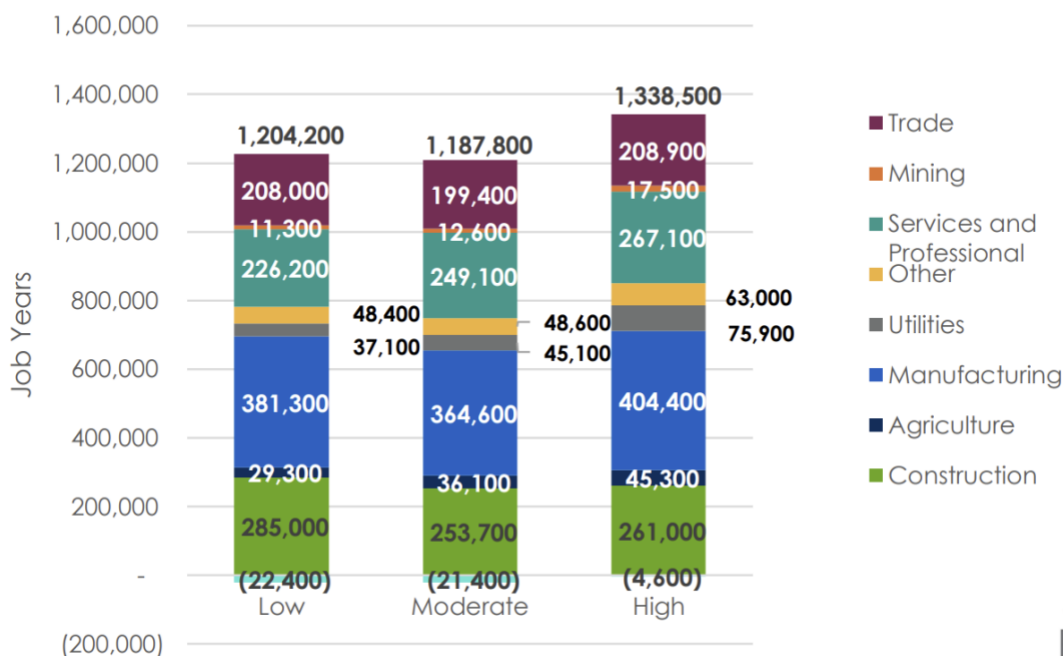


Figure 3. Net Annual Change in Jobs in 2030 by Scenario and Sector.

Building efficiency and electrification will require a trained workforce that knows best installation practices for highly efficient electric appliances and equipment. The energy efficiency industry is already strong, employing more than 2 million people in the U.S., and building electrification can be an even bigger job creator.^{4,5}

Finally, IRA building provisions will save lives and improve public health by cutting air pollution from hazardous pollutants such as nitrogen oxides (NOx). Fossil fuel combustion in homes and buildings contributes to unhealthy indoor and outdoor air pollution. Gas stoves—which emit pollution directly into indoor air—are responsible for dangerous levels of NOx pollution indoors and are linked to a 42 percent higher risk of asthma symptoms in children.^{6,7} Gas appliances that are vented outdoors contribute to outdoor NOx and PM2.5, damaging outdoor air quality and contributing to premature deaths.⁸

Replacing these hazardous gas appliances with all-electric alternatives would improve public health in the U.S. and clean our air. Combined with other provisions, the IRA could avoid between 2,900 and 4,500 premature deaths and prevent between 76,000 to 119,000 asthma attacks in 2030.

IRA BUILDING SECTOR PROVISIONS

IRA building provisions include residential rebates and tax credits for an array of building efficiency, electrification, and distributed energy resources; incentives for developers and housing-providers with dedicated incentives for commercial and federal buildings; and funding for state and local building code implementation. The IRA also encourages adopting strong labor standards to promote high-quality jobs.

RESIDENTIAL REBATE PROGRAMS

IRA residential buildings provisions provide incentives for individuals, households (including LMI households), and multifamily housing owners and occupants to make home efficiency upgrades and replace fossil-fueled appliances with all-electric appliances. The most relevant provisions are:

The **High-Efficiency Electric Home Rebate Program (HEEHRA)** includes \$4.5 billion for LMI households to electrify with the most efficient equipment at a lower cost. These rebates will be offered through SEOs and will likely be available in the latter part of 2023 once the U.S. Department of Energy (DOE) sets forth application guidance for states to receive the funding. SEOS will need to design their programs and distribute rebates to eligible households. The incentives vary depending on household income, and funding will be available starting 2023 through September 2031.

Table 1: Direct LMI Consumer Rebates for Electrifying Homes with HEEHRA Funding

Electric Appliances and Equipment	Low- and Moderate-Income Rebate Values*
Heat Pump Water Heater	\$1,750
Heat Pump HVAC	\$8,000
Cooktop (including induction), Oven, and Heat Pump Clothes Dryer	\$840
Electric Load or Service Panel Upgrade	\$4,000
Insulation and Air Sealing	\$1,600
Electric Wiring Upgrades	\$2,500
Maximum Per Home	\$14,000
Additional qualified contractor incentives	\$500

**Households that earn up to 80 percent of the area median income (AMI) can receive up to 100 percent of project costs, or up to \$14,000 for all projects, whichever total is less. Households that earn more than 80 and up to 150 percent of the AMI are eligible for the lesser of 50 percent of project costs or up to \$14,000 for total combined project costs.*

Rebate values for equipment and upgrades also cover associated installation costs and will be available at the point-of-sale.

Multifamily buildings are also eligible for HEEHRA rebates for buildings that have at least 50 percent of residents in households that qualify as either low- or moderate- income. The buildings can receive either the low- or moderate- income rebate value depending on which income bracket makes up the 50 percent of qualifying households.

Contractors performing HEERA-eligible installations can also receive a \$500 incentive, encouraging contractors and distributors to stock, sell, and install energy efficient, all-electric appliances.

In addition to reducing upfront equipment costs, the rebates cover necessary electrical upgrades to support equipment electrification. Not all buildings have an electric panel with sufficient capacity to support the additional electric load from all-electric appliances and equipment. For example, heat pumps for space heating generally require higher voltage electric panels than the standard electric panel in most U.S. homes – an estimated 30 to 50 percent of non-electrified single-family homes in the U.S. will need a service panel upgrade to fully electrify.⁹

\$4.3 billion in funding for the **Home Energy Performance-based Whole-House Rebates (HOMES)** program in IRA supports efficiency upgrades for all households, including LMI households. Incentive amounts will be determined based on the project’s modeled or measured energy savings.

Table 2: Consumer Rebates for Energy Savings Retrofits with HOMES funding

Range of Energy Savings	Single-Family Homes	Multifamily Buildings	LMI Home or Dwelling Unit*
20% to 35% modeled	\$2,000 or 50% of project costs	\$2,000 per DU max \$200,000 per building	\$4,000 or \$8,000 of project cost
> 35% modeled	\$4,000 or 50% of project costs	\$4,000 per DU max \$400,000 per building	\$8,000 or 80% of project costs
15% to 20% measured	\$ per kWh saved equivalent to \$2,000 for 20% energy savings or 50% of project costs	\$ per kWh saved equivalent to \$2,000 for 20% energy savings per DU or 50% of project costs	\$ per kWh saved equivalent to \$4,000 for 20% savings or 80% of project costs

**HOMES defines LMI as below 80 percent AMI. Includes multifamily buildings with at least 50 percent of DUs are occupied by LMI households*

Similar to HEEHRA, HOMES funds will be offered through SEOs with guidance from DOE, with funds likely available for distribution in 2023 through September 2031. DOE will approve procedures for determining modeled and measured home savings. Modeled performance rebates must be calibrated to historical home energy usage, consistent with Building Performance Institute standard 2400.¹⁰ Measured energy savings must be determined through open-source advanced

measurement and verification software approved by DOE with data on monthly, and hourly if available, home energy use prior to efficiency retrofits.

Contractors performing retrofits can receive a \$200 rebate for each home retrofit located in a designated “underserved community,” defined by the IRA as “low-income or racial-minority communities, or communities disproportionately vulnerable to or impacted by economic, social, and environmental stressors.”¹¹

While HOMES and HEEHRA incentives cannot be combined to cover the same equipment costs, LMI customers may take advantage of both rebates for different equipment.

RESIDENTIAL ENERGY EFFICIENCY TAX CREDITS

The IRA increases the value of the individual **Energy Efficient Home Improvement Credit** (25C) to 30 percent of efficiency project costs, including installation fees, up to different max credit values based on the efficiency measure. The IRA also extends the credit through 2032. Eligible technologies include heat pumps, heat pump water heaters, electric paneling, windows, and doors. The credit has an overall annual maximum value of \$1,200, except for heat pumps and heat pump water heaters, which have a maximum credit value of \$2,000. The annual tax credit maximum resets each year, which means additional installations can qualify *each year* between January 2023 and December 2032.

Table 3. Energy Efficient Home Improvement Credit, Annual Maximum Caps by Technology

Equipment	Credit Maximum
Heat pumps, heat pump water heaters, and biomass stoves and boilers	\$2,000*
Windows	\$600
Doors	\$250 for exterior door \$500 for all exterior doors
Home Energy Audit	\$150
Energy Property	\$600**
Annual Maximum Credit	\$1,200 (exception for HP and HPWH)

* The \$2,000 tax credit for heat pumps and heat pump water heaters can apply to technologies powered by both electricity and natural gas.

** The \$600 qualified energy property tax credit can apply to equipment fueled by natural gas, propane, fuel oil, and biomass, pending meeting efficiency standards.

The energy property credit can apply to costs for improving or replacing an electrical panel with a load capacity greater than 200 amps, installed either in conjunction with efficiency improvements or to enable future efficiency upgrades.

Residential Clean Energy Tax Credit (25D)

The IRA expands the **Residential Clean Energy Tax Credit (25D)**. This 30 percent credit for distributed renewable energy generation equipment, such as solar panels and geothermal heat pumps, can now also be applied to battery energy storage systems greater than three kilowatt-hours. The IRA extends the credit through 2034, but it ramps down to 26 percent for installations in 2033, and 22 percent installations in 2034.

Notably, the 25D and 25C credits can be combined to help households maximize energy savings and increase resilience.

DEVELOPER INCENTIVES

The IRA expands the **New Energy Efficient Home Credit (45L)** and extends the credit through December 2032. The credit applies to both ground-up builds as well as major retrofits and renovations for single-family, manufactured, and multifamily homes, based on two standards for new construction: U.S. Environmental Protection Agency (EPA) ENERGY STAR New Construction and DOE’s Zero Energy Ready Homes:

- EPA’s ENERGY STAR Residential New Construction homes are “at least 10 percent more efficient than homes built to code” and average an efficiency improvement of 20 percent. The program includes whole-home efficiency requirements, from HVAC to water, lighting, and building envelope. As new program versions with improved efficiency requirements are released, they will need to be met to receive the credit in subsequent years.¹²
- DOE’s Zero Energy Ready Home (ZERH) represents a sizeable step-up from ENERGY STAR, achieving at least 40 to 50 percent more efficiency than a standard home. The doubling of the credit value is reflective of the increased efficiency. The ZERH program excludes gas furnaces from consideration, opting solely for electric heating.¹³

Multifamily buildings that are built to either of the two program requirements are eligible for a five-fold credit increase if prevailing wage requirements are met.

Table 4. Energy Efficient Home Improvement Credit Maximum

Efficiency Standard	Single-Family	Multifamily*
EPA ENERGY STAR New Construction	\$2,500	\$500 to \$2,500
DOE Zero Energy Ready Homes	\$5,000	\$1,000 to \$5,000

**The high end of the multifamily range represents the credit value if prevailing wage requirements are met.*

Table 5 summarizes the IRA’s residential building efficiency and electrification provisions on a per-equipment or per-dwelling unit basis.

Table 5. Buildings Incentives Applicable to Residential Dwelling Units

Provision	Structure	Housing Type	Labor Incentives	LMI-Targeted
HEEHRA	Point-of-Sale Rebate from State Energy Office	Single & Multifamily	\$500 contractor incentive	Yes
HOMES	Rebate from State Energy Office	Single & Multifamily	\$200 contractor incentive for disadvantaged community installations	Yes*
Energy Efficient Home Improvement Credit (25C)	Tax Credit	Single & Multifamily**	No	No
Residential Clean Energy Credit (25D)	Tax Credit	Single & Multifamily**	No	No
New Energy Efficient Home Credit (45L)	Tax Credit	Single Family & Multifamily	Yes	No

*Rebates are available for all income groups, but additional values are available for LMI households. Contractor incentives favor installation in disadvantaged communities.

**Tax credit must be used for the residency of the taxpayer, meaning landlords cannot use this credit for properties with rental tenants. Rental tenants can use this tax credit for their residence, and while multifamily housing is not precluded from using this credit, tenants rather than landlords would be required to purchase the upgrades.

UPGRADES FOR AFFORDABLE AND TRIBAL HOMES

Affordable Housing Energy and Water Efficiency and Climate Resilience Funding

The IRA also extends broad funding for upgrades to affordable housing, which covers about 1.2 million households.¹⁴ **Improving Efficiency and Climate Resilience of Affordable Housing** receives \$1 billion in funding through 2030. Funding covers energy and water use benchmarking, though the bulk of the funding – \$837.5 million – is for direct grants and loans running through 2028, which can be leveraged as subsidies for a much larger \$4 billion in private loans. Building electrification measures, as well as electricity generation and storage, are also eligible for the loans and grants.

Tribal Electrification Program

The IRA provides \$145 million for the **Tribal Electrification Program** to invest in zero-energy homes and connection to the electricity grid for Tribal homes that currently do not have electricity access, which is estimated to be around 14 to 23 percent of Tribal homes, though more data is needed.¹⁵

The funding covers the electrification and transition to zero-emission energy systems in Tribal homes, including any necessary repairs and retrofits required for installation.

GENERAL BUILDING EFFICIENCY AND ELECTRIFICATION INCENTIVES

Building Code Adoption

Building codes are one of the most powerful tools for scaling electrified and decarbonized buildings and homes, but states and local governments must adopt and enforce them.¹⁶ The IRA's **Latest and Zero Building Energy Code Adoption** funding provides \$1 billion for states to pursue adoption and implementation of high-efficiency and zero-emission energy building codes. About two-thirds of this funding supports adoption of zero-energy building codes that meet zero energy provisions in the 2021 International Energy Conservation Code or an equivalent code.¹⁷ Zero energy provisions require homes to meet high energy efficiency and building envelope performance standards and that energy consumption be met with onsite energy generation (e.g., from a home solar and storage system).¹⁸

The remaining funding is for pursuing less advanced but still improved building codes, including the 2021 International Energy Conservation Code for residential buildings, which advances efficiency gains and could achieve an average of nine percent of energy savings and 8 percent of energy cost savings compared to the 2018 IECC code.¹⁹ For commercial buildings, the funding focuses on ANSI/ASHRAE/IES Standard 90.1-2019, which can achieve 4.7 percent of energy savings and 4.3 percent of energy cost savings compared to the 2016 commercial code.²⁰

The IRA funding also applies to code implementation including training, code enforcement, and compliance measurement—all of which support job creation.

Commercial Buildings Energy Efficiency Tax Deduction (179D)

Commercial buildings consume 35 percent of all electricity in the U.S., and make up 18 percent of total U.S. primary energy use.²¹ Of the energy used in a commercial building, the EPA estimates 30 percent is wasted.²² To help save energy and reduce costs, the **Commercial Buildings Energy Efficiency Tax Deduction (179D)** offers incentives per square foot of energy savings. Building upgrades meeting prevailing wage requirements and achieving onsite energy savings of 25 percent are eligible for a tax deduction of \$2.50 per square foot. Each percentage increment of onsite energy savings adds \$0.10 per square foot to the tax deduction, maxing out at \$5.00 per square foot for 50 percent energy savings. If wage requirements are not met, the credit starts at \$0.50 per square foot for 25 percent energy savings and maxes out at \$1.00 per square foot for 50 percent energy savings.

While the funding doesn't specify electrification, requiring savings from onsite energy use ultimately favors electrification pathways for cutting into a building's largest energy consuming operations. For example, heating with electric heat pumps is three to four times more efficient than heating the same space with natural gas furnaces. Given that space heating makes up about

25 percent of a commercial building's total energy use, switching to a heat pump can generate large energy and emissions savings.²³ ACEEE estimates that replacing gas-fueled furnaces with electric heat pumps in all commercial buildings could reduce commercial building sector GHG emissions by 44 percent.²⁴

High-Performance Green Federal Buildings

The IRA includes \$25 million to convert the federal government's 300,000 buildings to High-Performance Green Federal Buildings. This funding will support the Biden Administration's 2021 Executive Order 14057 directing federal facilities to achieve net-zero GHG emissions across government-owned buildings, campuses, and installations by 2045, as well as reduce energy and water use intensity.²⁵ A separate \$2.15 billion in investments will jumpstart the use of low-carbon building materials for alterations and construction of federal buildings. This federal investment will generate significant market momentum for low embodied-carbon building equipment that prioritizes recycled materials.

LABOR INCENTIVES

The IRA also includes support for contractors installing new equipment and providing information for customers deciding which type of appliance or equipment to purchase. The IRA's dedicated \$200 million for the **Contractor Training Program** will help contractors become as comfortable with advanced clean electric technology as they are with incumbent gas technology. This funding complements the contractor incentives for the HOMES and HEEHRA equipment installations.

The IRA also includes labor-focused incentive structures embedded into other electrification and efficiency provisions, including:

- \$500 contractor incentive for HEEHRA installations
- \$200 contractor incentive for HOMES installations in disadvantaged communities
- 5x prevailing wage credit value for Energy Efficiency Home Credit (45L) for developers to build with ENERGY STAR and DOE Zero Energy requirements
- 5x prevailing wage credit value for commercial building efficiency upgrades (179D)

MARKET GROWTH INCENTIVES

Greenhouse Gas Reduction Fund

The IRA amended the Clean Air Act to create a new program, called the Greenhouse Gas Reduction Fund, which will provide competitive grants to mobilize financing and leverage private capital for clean energy and climate projects that reduce GHG emissions. The \$27 billion fund will be administered by EPA through September 30, 2024. The fund will allocate \$7 billion in grants to help low-income and disadvantaged communities deploy or benefit from zero-emission technologies,

including distributed renewable energy. The fund also allocates \$20 billion in grants for eligible entities to provide financial and technical assistance to clean energy projects.²⁶

The GHG Reduction Fund is modeled after other Green Banks that invest in clean energy projects using innovative market- and consumer-oriented financing.^{27,28} The GHG Reduction Fund is designed to leverage private capital to scale the impact of federal dollars—recent data shows Green Banks have leveraged \$3.4 of private investment for every public dollar.²⁹ While Green Banks support many types of clean energy projects, their innovative and flexible financing systems are ripe for supporting projects such as efficiency upgrades or solar for homeowners and renters.

Defense Production Act

The IRA allocates \$500 million through September 2024 for Biden’s invocation of the Defense Production Act (DPA) in 2022 to accelerate domestic production of clean energy technologies, including solar, electrolyzers, fuel cells, and heat pumps—with \$250 million allocated specifically for heat pumps. Spurring domestic manufacturing of heat pumps will support new manufacturing jobs, advance U.S. global clean technology leadership, and expedite deployment of clean energy technologies that will benefit U.S. households. The DPA can also fast-track commercialization of next-generation cold climate heat pumps.²

MODELING METHODOLOGY

Energy Innovation® used the Energy Policy Simulator (EPS) to model the impact of IRA buildings provisions in terms of emissions reductions, job creation, and public health.³⁰ We largely relied on existing ACEEE modeling of the energy, emissions, and monetary savings and costs from several IRA buildings provisions.^{31,3}

Energy Innovation® incorporated ACEEE’s expected natural gas and electricity savings for our analysis of 179D, 45L, and 25D. For 25D, we also assumed an increased deployment of solar up to 1 gigawatt (GW) of distributed solar per year due to the incentive and based on an RMI analysis.³²

² Cold climate heat pumps are already available on the market, though the DOE is leading a research initiative to achieve technological improvements – which has already resulted in breakthroughs this year. See “Can Heat Pumps Actually Work in Cold Climates?,” Consumer Reports, accessed November 16, 2022, <https://www.consumerreports.org/heat-pumps/can-heat-pumps-actually-work-in-cold-climates-a4929629430/>. and “DOE Announces Breakthrough in Residential Cold Climate Heat Pump Technology,” Energy.gov, accessed November 16, 2022, <https://www.energy.gov/articles/doe-announces-breakthrough-residential-cold-climate-heat-pump-technology>.

³ The original ACEEE analysis modeled the Build Back Better Act (BBBA), which included several of the same provisions in the IRA. Where the final IRA provisions differed ACEEE’s BBBA analysis, we modified the funding amounts and incentive values accordingly. Details regarding ACEEE’s methodology can be found in their report, available at: https://www.aceee.org/sites/default/files/pdfs/clean_infrastructure_final_9-20-21.pdf.

For IRA buildings provisions that differed from those in ACEEE’s analysis in overall incentive value or funding value, we modified the impact using ratios of IRA funding or incentive values to ACEEE modeled funding or incentive values. For example, on HOMES and HEEHRA, we modified assumed natural gas and electricity savings in the ACEEE analysis to reflect IRA funding amounts and adjusted for total deployment in years 2023 to 2031. For 25C we linearly adjusted the number of incremental heat pumps deployed based on the IRA’s \$2,000 incentive cap (compared to ACEEE’s modeled assumption of unconstrained rebates for heat pumps). We then calculated the impacts on decreased natural gas consumption using the U.S. Energy Information Administration’s Annual Energy Outlook data for average natural gas consumption per unit, and added the incremental electricity usage from heat pump deployment based on average heat pump efficiency.³³

Energy Innovation® modeled the impact of building code assistance in the IRA’s \$1 billion for Latest and Zero Building Energy Code Adoption using data from a Pacific Northwest National Laboratory (PNNL) report.³⁴ The report identifies annual emissions reductions and electricity, gas, and fuel oil savings enabled by national building energy codes from 2010 through 2040. The EPS modeling includes Low, Moderate, and High Scenarios that assume IRA funding could achieve 25, 50, or 75 percent of these energy and emissions savings, respectively, with savings growing linearly each year modeled through 2030.

To assess the impact of the \$27 billion GHG Reduction Fund, we assumed that 100 percent of the dedicated \$7 billion for low-income and disadvantaged communities is invested in distributed solar and that 100 percent of the remaining \$20 billion is invested in commercial building retrofits. Using the Coalition for Green Capital’s estimated leverage of \$3.4 dollars of investment per \$1 dollar of capitalization, the modeled \$20 billion resulted in a potential \$68 billion in total capital investment by 2031, and the \$7 billion resulted in \$20 billion in total investments for low-income and disadvantaged communities. The Low, Moderate, and High Scenarios vary in the discount rates for spending based on Congressional Budget Office guidance.³⁵

Finally, we modeled the Assistance for Federal Buildings funding based on a PNNL study giving the average cost and energy per square foot of efficiency measures in federal buildings.³⁶ We also modeled the funding for low-carbon building materials used in federal buildings based on federal procurement of cement and iron and steel using research from BlueGreen Alliance.^{37,38}

Additional information on our modeling methodology can be found at Energy Innovation’s Updated Inflation Reduction Act Modeling Using The Energy Policy Simulator.³⁹

POLICY INSIGHTS AND RECOMMENDATIONS

The IRA’s historic investments in energy efficiency, electrification, and distributed renewable energy and storage will help more U.S. households and businesses save money on their energy

bills. The IRA’s dedicated incentives for LMI households and underserved communities will direct building decarbonization benefits to those communities and support their clean energy transition. The IRA will also stimulate the U.S. market for clean, efficient appliances and equipment as well as higher performing buildings that are more resilient and affordable over their lifetime. Contractor and builder incentives will help the industry recognize their integral role in building decarbonization and the benefits of early leadership. A trained workforce will increase consumer confidence in new building technologies and help ensure a positive experience.

While more funding is needed to decarbonize the building sector, the IRA is a significant first step to align buildings and homes with climate and consumer goals. However, it cannot be the only step. Swift implementation and additional policy and regulatory actions are needed to quickly reduce emissions in the building sector. Our recommendations target both implementation and regulation at local, state, and federal levels.

UPDATED APPLIANCE STANDARDS

Energy Innovation® modeling shows more stringent appliance standards that favor all-electric, highly efficient equipment, combined with all-electric high-performance building codes, are two policy tools to reduce the building sector’s GHG emissions at a pace needed for climate stability.⁴⁰ Our modeling shows that while retrofits and efficiency are important and have many benefits, policies that target new buildings and equipment can reduce the sector’s GHG emissions by 91 percent by 2050. Buildings and appliances have inherently long lives and very slow stock turnover, making it imperative to focus on new construction and new appliances today if we are to achieve net-zero emissions 30 years from now.

Beyond the climate imperative, adverse public health impacts associated with burning fossil fuels indoors necessitates a new approach to how appliances are regulated. While DOE has overseen appliance energy efficiency standards for decades, the pollution emissions from home and building appliances are not regulated at all.⁴ EPA, which sets national air quality standards, has the authority to implement such regulations to limit harmful emissions from appliances, such as NOx, that impact

⁴ Recent studies show the presence of hazardous air pollutants and carcinogens in natural gas used in homes, as well as potentially hazardous natural gas leakage rates in homes, even when appliances are off. A Massachusetts study found that natural gas used in homes in Massachusetts contains at least 21 hazardous air pollutants, as defined by the EPA, including the carcinogen benzene. A study in California also reports benzene concentrations in California’s consumer natural gas, and low-level leaks from gas stoves – even when turned off – can generate up to seven times higher than California’s recommended exposure limit of benzene. See “Natural Gas Used in Homes Contains Hazardous Air Pollutants,” *C-CHANGE | Harvard T.H. Chan School of Public Health* (blog), June 28, 2022, <https://www.hsph.harvard.edu/c-change/news/natural-gas-used-in-homes/> and Eric D. Lebel et al., “Composition, Emissions, and Air Quality Impacts of Hazardous Air Pollutants in Unburned Natural Gas from Residential Stoves in California,” *Environmental Science & Technology* 56, no. 22 (November 15, 2022): 15828–38, <https://doi.org/10.1021/acs.est.2c02581>.

indoor and outdoor air quality.⁴¹ Federal agencies should act quickly to mitigate air pollution impacts from fossil-fueled appliances and adopt more rigorous appliance standards. The IRA incentives are not a substitute for appliance standards, but they do make standards more economical.

Local and state leadership can provide a blueprint for future federal regulations and for other jurisdictions to emulate. For example, California’s Bay Area Air Quality Management District proposed zero-NOx standards for residential and commercial water and space heating systems.⁴² Similarly, the California Air Resources Board developed a rule to implement a zero-emissions requirement for 100 percent of sales of new residential and commercial space and water heaters by 2030.⁴³ Air quality regulatory agencies in other states should emulate these efforts as part of more comprehensive air quality planning, especially in designated non-attainment areas.⁵

The Consumer Product Safety Commission (CPSC) is tasked with protecting the public “against unreasonable risk of injuries,” and can promulgate mandatory performance standards for appliance manufacturers and require warning labels to protect consumers from polluting home appliances.⁴⁴

Together, federal, state, and local air quality standards can simultaneously reduce building sector GHG emissions and improve public health. The IRA incentives for more energy-efficient, all-electric appliances complement efforts to transform the appliance market in favor of climate- and consumer-friendly options.

ADOPTION OF BUILDING DECARBONIZATION CODES

Building codes are another underutilized tool for reducing building sector emissions, ensuring cleaner air, and increasing resilience. Thus far, the U.S. has had a patchwork approach to code adoption and enforcement. Fortunately, the IRA building code funding supports state and local government adoption of high-efficiency and zero-emissions building codes. Building codes that require all-electric or electric-ready construction, in combination with energy efficiency, weatherization, and decarbonization measures, are the fastest way to ensure a low-emissions future building stock. Strong codes also avoid stranded fossil fuel assets and the need for more costly retrofits down the road. Codes level the playing field for all developers and builders and help them plan for future projects. Additionally, residential all-electric building codes have been shown to save developers and builders on their up-front building costs.⁴⁵

State and local entities tasked with updating and enforcing building codes should leverage IRA funding to adopt best-in-class building decarbonization codes for all new residential, multifamily,

⁵ Non-attainment areas are areas that violate EPA’s defined outdoor air quality standards for a given pollutant. See <https://www.epa.gov/green-book>.

and commercial buildings (and for major retrofits). The New Buildings Institute’s model building decarbonization code provides a template for such a code.⁴⁶ Many cities have adopted stretch codes and all-electric codes to ensure all new construction is aligned with decarbonization and public health goals.⁴⁷ States are also moving forward including Washington, which recently adopted heat pump requirements for residential and commercial new builds, and Illinois, which set a stretch code—a code that municipalities can voluntarily adopt that has stronger efficiency standards than the base code—to accelerate building electrification.^{48,49} States and cities considering high-efficiency and climate stretch-codes can look to these leading cities and states for models.

UTILITY PLANNING AND REGULATION

IRA buildings provisions will impact building energy consumption trends, which in turn will impact utility systems (both the electric grid and the gas system, as well as other fossil fuel infrastructure).

Utility regulators have an important role to play in ensuring an equitable, affordable, and reliable transition. Regulators (and state legislators and governors) should be proactive in adopting new regulatory paradigms that integrate multiple changing inputs into a more holistic regulatory framework.

The increased uptake of efficient electric equipment and appliances, distributed generation, community-scale energy resources, and energy storage, along with high-efficiency all-electric new construction, will shape utilities’ future infrastructure needs. These trends should inform priorities for ratepayer-funded (and regulator-approved) system investments. These factors will also eventually impact revenue requirements and business models. If not properly accounted for by utilities and regulators, IRA incentive implementation (alongside related building sector regulations, policies, and incentives) could result in over-built (and competing) energy systems, increased energy rates for customers, and higher energy burdens on those least able to adapt to rising costs.

As such, state utility regulators should require utilities to update their assumptions and modeling methodologies to reflect all relevant IRA provisions in their system planning assumptions, investment priorities, rate designs, tariff designs, and business models. Such efforts should be transparent to ensure integrity of any studies or findings. They should also be designed to solicit and meaningfully incorporate diverse stakeholder input.

Regulators should either require all load-serving utilities to jointly file plans to inform future supply and infrastructure needs and investment priorities, or they should require coordinated planning across all state regulated gas and electric utilities. For example, gas and electric utility proposals should reflect similar assumptions regarding consumer demand for their services, based on updated technology adoption trends and costs, and alignment with relevant climate goals in their service territory. Regulators, and all involved regulatory stakeholders, should have the equal opportunity to compare utilities’ assumptions for future demand, infrastructure needs, and

investment priorities. Approved plans and investments should avoid duplicative infrastructure build-outs and prevent consumer liability for any future stranded assets. Coordinated or joint utility planning efforts, overseen by state utility regulators, can better inform and support investments that meet a state's future energy demands while mitigating risks to consumers and the climate.

Regulators in states where building decarbonization is not yet underway should look to other states and utilities for examples of successful and innovative programs, proceedings, and approaches. For example, regulators in states including Massachusetts and Rhode Island have initiated dockets to explore the future of gas and long-term gas planning.^{50,51} Colorado's commission has proposed future of gas dockets and changes to gas line extension policies, while also requiring investor-owned electric utilities to propose beneficial electrification plans at least every three years.^{52,53,54}

Because IRA rebates and the GHG Reduction Fund will also support electrification of LMI households and communities, regulator should align utility directives to offer targeted electrification and efficiency programs to these same entities. Utilities should design (and regulators should approve) complementary programs that can cost-effectively benefit the most economically vulnerable households and communities first (ahead of higher-income households).

Utility regulators (and utility governing bodies) can benefit all customers by directing their utilities to evaluate existing efficiency and electrification incentives to determine if and how they can be restructured to better complement IRA incentives and optimize the cost-effectiveness of their programs. To the extent no programs exist, utilities should consider creating new programs modeled after IRA incentives and rebates for consistency. Regulators and utilities should play a proactive role in supporting SEO efforts to secure IRA funding, develop programs that align with any existing successful efficiency programs, and help more consumers benefit and alleviate energy burdens. Implementing these rebates and incentives should be easy and straightforward for all customers, with particular attention given to ease of access for LMI households and those living in underserved communities. Regulators should also encourage utilities and SEOs to coordinate information campaigns about the tax credits and rebates so the offerings are clear to customers.

STATE ENERGY OFFICES COORDINATION AND OUTREACH

SEOs should prepare for the influx of funding by adding internal capacity, designing streamlined rebate distribution programs, and engaging community stakeholders and target audiences. SEOs are tasked with deploying direct customer rebates from HEEHRA and HOMES, collectively totaling almost \$9 billion. This funding will be available after DOE solicits public input and issues guidance on program design requirements.

In the meantime, SEOs can prepare by identifying what will be needed for successful operation of programs that enable swift and easy allocation of funds. SEOs should design HEEHRA rebates that are easy to access at the point-of-sale, with streamlined approaches to verify eligibility based on

income. For HOMES funding, SEOs should consider program designs that allow consumers to take advantage of point-of-sale rebates based on modeled energy savings.

Alongside consumer rebate programs, contractors can receive rebates for completing installations that vary in value based on which the rebate eligibility of the given equipment (HEEHRA or HOMES). As such, SEOs should streamline allocation of the different contractor incentives based on the different qualifying factors for each program (e.g., HOMES contractor incentives are offered for installations in disadvantaged communities).

SEOs should coordinate with other state entities offering energy efficiency and electrification incentives to clearly communicate which incentives can be combined to cover different upgrades. Layering incentives helps more households and building owners optimize efficiency and decarbonization improvements. SEOs should work with state and local entities on consumer outreach and engagement efforts, and partner with organizations experienced with reaching LMI households and underserved communities. Different forms of communication, such as printed flyers, email, direct mail, etc., as well as multi-lingual materials can improve community outreach.

SEOs will be a trusted source of information about available incentives, processes, and guidance. SEOs should help all consumers regardless of income, demographics, or locations, understand the steps and costs associated with high-efficiency electric appliance upgrades, home weatherization, and whole-home energy performance upgrades.

STATE SUPPORT FOR BUILDING POLICIES AND WORKFORCE DEVELOPMENT

States legislators and governors should adopt policies that create a glidepath for efficient, electrified and decarbonized buildings and support a qualified professional workforce. For example, Maine's statewide heat pump initiative has installed more than 80,000 heat pumps statewide since 2019—well on the way to the goal of 100,000 by 2025. Colorado's labor-backed beneficial electrification legislation directs its regulated utilities to “promote the use of energy-efficient electric equipment in place of less efficient fossil-fuel-based systems.”⁵⁵ And Minnesota's Bipartisan Natural Gas Innovation Act will align dual-fuel utility incentives with transitioning from fossil fuels, including by electrification using cold climate heat pumps or ground-source district heat.⁵⁶ All are examples of states leading the way to encourage the adoption of energy-efficient, electric technologies.

State legislators, governors' offices, and SEOs should also maximize the impact of IRA funding by supporting statewide workforce efforts for contractors and builders, as well as providing appropriate guidance and oversight on prevailing wage and apprenticeship provisions. States and local governments should work with contractor trade associations, unions, and utilities to develop and implement effective contractor training programs that support swift implementation of IRA building incentives.

CONCLUSION

No single policy or regulation can achieve rapid building sector emissions reductions. The IRA's myriad funding streams targeting consumers, contractors, and builders leverage a multifaceted approach to accelerate the transition to an efficient, all-electric building stock in the U.S.

Now, state, local, and Tribal governments, should move quickly to deploy these funds and help more consumers and businesses save money, while also reducing GHGs for a safe climate future.

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