



Building Climate Justice



Investing in Energy Efficiency for a Fair and Just Transition

About Food & Water Watch

Food & Water Watch champions healthy food and clean water for all. We stand up to corporations that put profits before people, and advocate for a democracy that improves people's lives and protects our environment. We envision a healthy future for our families and for generations to come, a world where all people have the wholesome food, clean water and sustainable energy they need to thrive. We believe this will happen when people become involved in making democracy work and when people, not corporations, control the decisions that affect their lives and communities.

Food & Water Watch has state and regional offices across the country to help engage concerned citizens on the issues they care about. For the most up-to-date contact information for our field offices, visit foodandwaterwatch.org.

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Executive summary

The United States must make a sustained and substantial investment to improve energy efficiency to reduce energy consumption, save money, create jobs and protect the climate. This investment should be part of any national strategy to address the climate crisis and would also spur job creation to curb America's growing economic inequality.

Energy efficiency represents the little heralded and low-hanging fruit of the transformation of our energy system necessitated by a rapidly changing climate. The cheapest and cleanest kilowatt-hour is the energy saved from investing in efficiency.

Efficiency is how much energy is required to perform a certain amount of work. A more energy-efficient light bulb requires less energy to generate the same amount of illumination; more fuel-efficient vehicles can travel farther on the same amount of gasoline.

Buildings are the biggest energy hogs in the United States. They use nearly 40 percent of U.S. energy demand — more power than the entire industrial sector uses and more than it takes to fuel the entire transportation sector. Improving the energy efficiency of buildings — homes, offices, schools and more — would save energy and reduce our climate footprint.

The technology to upgrade our buildings already exists, and more efficient technologies are being developed all the time. Improving building weatherization (essentially reducing leaks) means that we are not wasting energy to heat or cool the outdoors. And upgrading the efficiency of energy-using appliances such as heating and cooling systems, water heaters, light bulbs, household electronics and others can substantially reduce energy use.

Food & Water Watch estimated the energy, financial and climate savings that a \$500 billion investment in upgrading the energy efficiency of buildings could have over 15 years. This substantial investment would reap dramatic economic benefits, create good jobs that foster a fair and just transition to clean energy, reduce energy use and save money — all while reducing climate emissions.

Food & Water Watch adapted a National Academy of Sciences approach and estimated that energy use in buildings would be 36 percent below current projected energy demand in buildings by 2035 — cumulatively

reducing utility bills by \$1.3 trillion.¹ The climate emissions of buildings would fall steadily. By 2035, upgraded buildings would reduce emissions by over 300 million metric tonnes of carbon dioxide (CO₂) compared to current projections.

These estimates are necessarily conservative.² Technology is constantly improving, and a robust investment should drive down prices while enhancing the performance of energy-efficient strategies and equipment. This analysis solely considers upgrading residential and commercial buildings. Policies and investments to rapidly shift to clean renewables such as solar and wind would be complemented by upgraded efficiency. Other efforts to upgrade the electric grid, shift to more distributed power generation, and enhance transportation and industrial efficiency would further reduce electricity and fossil fuel demand. But upgrading building efficiency alone would substantially reduce energy use, save money, create jobs and reduce climate emissions.

Both the investment and the savings on utility bills would spur economic growth and job creation — necessary for a fair and just transition for fossil fuel workers and a needed economic jolt to America's communities that have not shared in the economic growth over the past 40 years. A substantial investment in energy efficiency by 2035 has the potential to generate about 20.8 million jobs. This would amount to 1.3 million full-time jobs each year, a roughly 20 percent bump in U.S. job creation.

The majority of these jobs would be high-quality construction and manufacturing jobs that can support families and provide future career opportunities. These jobs would be concentrated in the areas with the most energy-inefficient buildings — primarily older, draftier buildings in lower-income areas and communities of color. Retrofitting those buildings would improve the quality of life for residents, save energy and reduce climate emissions. Moreover, recruiting and training the workforce from these communities to perform these upgrades would create a vital jobs program for economically disadvantaged communities.

But like President Franklin D. Roosevelt's New Deal programs, these green public works programs must be paired with pro-labor policies to ensure that workers share fully in the massive investments.³ These policies must make it easier for workers to form unions, provide a fair and just transition for existing fossil fuel energy

workers and provide comprehensive training for new workers to develop career skills to support their families. The policies also must ensure that companies that manufacture and install energy-efficient equipment and technologies do not have a history of violating labor, wage and hour, workplace safety, tax and environmental rules.

These efforts could completely eliminate the need for new fossil fuel power plants, shifting our country away from dirty fuels and to more sustainable means of living. A bigger nationwide investment — along the lines of the national highway system or the New Deal's infrastructure and rural electrification programs — could yield larger efficiency dividends for consumers, workers, communities and the climate.

Background

As global temperatures continue to rise — risking irreversible worldwide ecological and climatic chaos — the United States gluttonously consumes energy. In 2018, the United Nations' Intergovernmental Panel on Climate Change found that rapid warming would bring increasing droughts, wildfires, food shortages, coral reef die-offs and other ecological and humanitarian crises by 2040 — far earlier than expected — and that dramatic economic reorientation to 100 percent renewable energy is necessary to stave off the imminent risks of this climate catastrophe.⁴

The United States remains one of the top energy consumers, and American residents use more power per person than almost anywhere in the world.⁵ The United States uses almost 20 percent of the world's

energy, second only to China, which has over a billion more people than the United States.⁶ Typical U.S. residents consume roughly twice as much energy as people in France, Germany, Japan and the United Kingdom.⁷

Despite the need for drastic action, the United States is on a fossil fuel building boom, with 364 additional natural gas-fired power plants and 3 new coal plants planned for the period from 2018 to 2022.⁸ The new gas power plants vastly exceed the capacity of the coal plant retirements — the net gas capacity additions are nearly three times as big as the net coal retirements, and the increase in gas-fired electricity “drove the overall increase” in U.S. CO₂ emissions in 2018, according to the Department of Energy (DOE).⁹

Simply put, the United States is using way too much energy, primarily from dirty fossil fuels that spew greenhouse gas emissions that warm the planet. In 2017, total U.S. energy use reached 97.7 quadrillion British thermal units (Btus).¹⁰ But much of this energy is wasted by needless inefficiencies, from power plant to wall socket to electric equipment and appliances. The potential for U.S. energy efficiency improvements represents an energy resource that “is vast and remains largely untapped,” according to the DOE.¹¹

Residential and commercial buildings are considerable power hogs, accounting for 39 percent of U.S. energy use, more than either the industrial or transportation sectors (32 percent and 29 percent, respectively).¹² Drafty buildings leak energy, and heating and cooling equipment as well as other appliances could be much more energy-efficient. We need a national investment to upgrade energy efficiency — especially in buildings





— as a major component in comprehensive energy strategies to address future climatic threats to human health and the environment.

Because upgrading energy efficiency lacks the pizzazz of building offshore wind projects or solar farms, it is the most overlooked policy option. But it is one of the most important weapons to combat climate change. The energy that we do not consume represents coal, oil and natural gas that is not burned for electricity, and reduces the immediate need to build out renewables to meet demand. The United States needs to rapidly shift to renewable electricity generation, and reducing our electricity use is a vital component of a transition to a clean energy future.

Investments in improving efficiency reduce consumption by using less energy to perform the same function. Upgrading homes and businesses with energy-efficient technologies or practices can immediately reduce energy use — and these savings add up over time. Building exteriors (or envelopes) must be strengthened to shepherd heating and cooling energy, and wasteful lighting, appliances, water heaters and electrical devices must be replaced with equipment that uses less energy.

Reducing energy use curbs climate and air pollutants and eliminates the need for new fossil fuel power plants

Energy efficiency measures are critical in mitigating the ecological and climatic changes that come with rising global temperatures. The United States will be unable

to dramatically cut emissions without substantially upgrading energy efficiency.¹³

The electric power industry is a major emitter of air pollutants that harm human health and the environment.¹⁴ Power plants release air pollutants such as mercury, particulate matter, sulfur dioxide (SO₂) and nitrogen oxides (NO_x).¹⁵ All fossil fuel plants discharge SO₂ and NO_x, and coal-fired plants are significant mercury emitters.¹⁶ The SO₂, NO_x and particulate matter pollution from power plants contributes to respiratory health problems, such as chronic bronchitis, asthma, emphysema and existing heart disease, and also causes labored breathing (especially for people living with asthma) and reduces life expectancy.¹⁷

The U.S. electric power industry spews colossal volumes of greenhouse gases. In 2016, U.S. power plants emitted over 1.8 billion metric tonnes of CO₂ from their smokestacks — 28 percent of all U.S. climate emissions that year.¹⁸ This estimate does not include the massive leaks of the potent greenhouse gas methane from the oil and gas industry, which makes the power industry an even greater threat to the planet.¹⁹ Upgrading the efficiency of buildings could reduce natural gas demand (for utilities and power plants) by 40 trillion cubic feet over 15 years, which would also eliminate 2.3 trillion cubic feet of methane leaks.²⁰ By 2035, energy efficiency upgrades would reduce methane leaks by nearly 440 million metric tonnes of CO₂ equivalent.²¹

The United States is still dependent on dirty energy that threatens the climate. In 2017, 62 percent of electricity came from coal, oil and natural gas, and only 8 percent came from zero-emission and environmentally sustainable

wind, solar and geothermal power.²² Despite the unfolding climate crisis, the U.S. energy industry has pushed for even more fossil fuel-fired power plants. In 2018, the power industry planned to build over 350 new natural gas-fired power plants.²³ And natural gas companies are pushing buildings to switch their heating and hot water systems to natural gas, providing substantial financial incentives for buildings to lock in gas demand for decades.²⁴

Efficiency measures are a proven, cost-effective way to reduce power plant air pollutant and climate emissions by avoiding the initial demand to generate electricity.²⁵ The full deployment of energy efficiency upgrades in buildings alone could eliminate the need to build additional power plant capacity — and efficiency investments are cheaper and faster to deploy than building new power plants.²⁶

A study from the University of Massachusetts Amherst and the Center for American Progress concluded that “it will not be possible for the U.S. economy to dramatically cut emissions without a highly aggressive set of initiatives to increase energy efficiency.”²⁷

Improving the energy efficiency of America’s buildings

Energy efficiency simply means doing the same amount of work with less energy — or even doing more with less. Currently available technologies and approaches already make it possible to “achieve significant energy savings and still maintain current lifestyles,” according to the National Academy of Sciences.²⁸

Widespread adoption of energy efficiency is feasible today, and more improved technologies are becoming available every day.²⁹ Advanced energy efficiency technologies already under development or commercially available — including light-emitting diode (LED) lamps, innovative window systems, new types of cooling systems and power-saving electronic devices — are already being adopted.³⁰

Over the past decades, the United States has “steadily improved its ability to produce more with less energy,” but these gains have been “unevenly and incompletely” realized on a national scale, according to the consulting firm McKinsey & Company.³¹ Most other advanced economies are already nearly twice as energy-efficient as the United States, demonstrating that major gains in energy efficiency in the next two decades are

achievable.³² Although energy-efficient technology has been available for decades, adoption has lagged and few existing technologies have been widely implemented.³³

America’s attention turns to efficiency only when energy prices are high. Energy use drops the most during periods of extremely high prices, such as the oil crisis of the 1970s that focused households, businesses and governments on reducing unnecessary energy use through efficiency upgrades.³⁴ But periods of low energy prices — such as today — discourage efficiency improvements, as the upfront costs take longer to recoup in energy savings.

The powerful energy industry has long promoted guilt-free consumption of abundant and low-cost energy, which is designed to discourage energy efficiency.³⁵ Experts from the conservative, business-oriented think tank the American Enterprise Institute (AEI) have repeatedly promoted cheap, plentiful fossil fuels. In 2018, an AEI-authored opinion piece urged a celebration of “Mother Earth’s bountiful natural resources in the form of abundant, low-cost fossil fuels.”³⁶ Another AEI author wrote that “abundant, low-cost energy is the key to prosperity.”³⁷ A 2013 Drexel University study found that AEI was the biggest recipient of funding to push back against climate science — pocketing \$86.7 million from foundations that were skeptical or hostile to the idea of climate change.³⁸

Homes and businesses are less likely to upgrade efficiency when energy prices are low. The gas, oil and electricity industries sell power by the unit — gallons of heating oil, cubic feet of gas and kilowatt-hours of electricity — so they have an incentive to discourage or downplay energy efficiency efforts that would reduce sales volume.³⁹

The energy industry has an economic incentive to block the widespread adoption of energy efficiency. The American Petroleum Institute has opposed raising vehicle fuel economy standards, claiming: “The rule is not just about vehicle efficiency. It’s about the [Environmental Protection Agency] overreaching to create an opportunity for regulating greenhouse gas emissions.”⁴⁰ A 2018 *New York Times* exposé found that oil companies pushed to roll back vehicle efficiency standards because “oil scarcity is no longer a concern,” and noted that the industry stood to benefit from increased oil sales.⁴¹

Utilities have been slow to promote energy efficiency upgrades because it could reduce their sales. For

example, in Kansas, investor-owned utilities and the state public utility commission voiced opposition to a bill that would establish energy efficiency goals.⁴² And California's Office of Ratepayer Advocates found that Southern California Gas Co. used ratepayer money to thwart energy efficiency improvements.⁴³

Today, increasing energy efficiency is not only about saving money but is also important for the climate and planet. A national program to secure widespread implementation of energy-efficient equipment and practices would not only reduce energy use and save utility customers money, it would substantially reduce climate-destroying emissions.

A basic blueprint for upgrading efficiency in U.S. buildings

America's buildings are literally leaking energy, and outdated equipment and appliances are needlessly wasting energy. The entire U.S. economy needs to become drastically more energy-efficient, including improving vehicle fuel economy, upgrading industrial energy use and especially enhancing the electric power industry.

But upgrading residential and commercial buildings offers the biggest potential savings. The National Academy of Sciences estimated that half of the savings from a sustained push for energy efficiency would come from improving the efficiency of buildings.⁴⁴ Buildings present plentiful energy-savings potential because of the heavy reliance on electric power.⁴⁵

Reducing buildings' electricity demand multiplies the climate savings because two-thirds of generated electricity is lost between the power plant and the electric outlet due to inefficiencies in energy production, distribution and use.⁴⁶ That means that the reductions in demand for delivered electricity are effectively tripled at the power plant smokestack.⁴⁷

The United States must make substantial investments to upgrade the energy efficiency of existing buildings and improve the design and construction of new buildings to reduce energy use, lower climate emissions and save billions of dollars in utility bills. Existing buildings need to be retrofitted and upgraded, and states and localities must update building codes to ensure that new construction maximizes energy efficiency.

A comprehensive upgrade of buildings' energy efficiency would dramatically reduce demand for

electricity.⁴⁸ Building improvements fall into several broad categories: weatherizing building envelopes to prevent heating and cooling leaks; upgrading heating and cooling equipment; modernizing lighting and replacing inefficient appliances and devices.

Weatherization keeps energy in, keeps weather out and fights climate change

Retrofitting building envelopes can deliver major energy efficiency gains. These improvements include anything that separates the indoors from the outdoors. Weatherization upgrades cover windows, roofs, attics, exterior walls, doors, subfloors and the foundation, which can be insulated, sealed or replaced.⁴⁹ Commercial building weatherization retrofits range from installing doors between conditioned and unconditioned spaces, to adding skylights and light pipes to reduce the need for light fixtures, to installing high-efficiency windows.⁵⁰

Weatherization reduces energy use, lowers utility bills and creates more comfortable and healthier living environments.⁵¹ Such upgrades directly influence changes in heating and cooling costs.⁵² The energy bill savings can be twice the costs of the weatherization retrofits and deliver energy savings for over a decade.⁵³ Deployed nationwide, weatherization retrofits would save tremendous amounts of energy, slash utility bills and reduce climate emissions.

Residential energy efficiency upgrades not only reduce utility bills and cut climate emissions, but also result in important quality-of-life benefits. Weatherization reduces leaks and drafts and makes spaces more comfortable and quieter.⁵⁴ It also improves indoor air quality, which substantially reduces the symptoms of asthma and other respiratory illnesses.⁵⁵ The weatherization improvements in quality of life are especially beneficial for lower-income families that live in older and draftier housing by protecting against pests, mold and mildew that pose additional health and safety risks for low-income families.⁵⁶

Upgrading heating, ventilation and air conditioning (HVAC)

Heating and cooling (HVAC) systems use nearly half of all residential and commercial energy, providing the most energy-savings potential.⁵⁷ Improvements to HVAC systems include programmable thermostats, more efficient motors and fans, ground-source heat

pumps and greater use of solar heating and cooling.⁵⁸ Combined with weatherization and insulation, HVAC upgrades save energy and provide more even heating and cooling, making buildings more comfortable.⁵⁹ The Alliance to Save Energy found that advancements in HVAC equipment can improve a home's energy efficiency by as much as 50 percent.⁶⁰

Replacing inefficient light bulbs to save the planet

Inefficient light bulbs are needlessly wasting fossil fuel-fired electricity and contributing to climate change. Lighting alone constituted 10 percent of residential and 17 percent of commercial buildings' electricity use.⁶¹ In 2018, the DOE estimated that replacing all incandescent and compact fluorescent light bulbs with more energy-efficient LED bulbs could reduce lighting energy use by half.⁶² LEDs use at least 75 percent less energy and last 25 times longer than incandescent bulbs.⁶³

Appliances and other equipment

Energy-efficient equipment and appliances typically use 10-50 percent less energy than standard models, and widespread adoption will result in reduced energy consumption.⁶⁴ While appliances and equipment have become more efficient over the past decades,⁶⁵ there are still many inefficient home and office appliances that need to be replaced to reduce energy consumption.

Water heaters:

Water heaters account for nearly 20 percent of household and 7 percent of commercial energy use.⁶⁶ The most energy-efficient water heaters consume between 14 and 55 percent less energy than available standard models, saving households anywhere from \$40 to \$285 on energy bills annually.⁶⁷ It would take \$41.7 billion to replace the 38 million water heaters that are over 10 years old with the most efficient models, but these newer water heaters would use nearly 40 percent less energy, reducing annual utility bills by \$8.6 billion (paying for the upgrades in less than five years) and would reduce annual climate emissions by 15.7 million metric tonnes of CO₂ — the equivalent of about four coal-fired power plants.⁶⁸

Refrigerators, laundry equipment, electronics and office equipment

Nearly one-fifth of household electricity use goes toward refrigerators, dishwashers, laundry equipment and household electronics.⁶⁹ Office equipment and computers

account for 14 percent of commercial electricity use.⁷⁰ The widespread adoption of increasing numbers of personal electronic equipment and electric chargers is expected to only increase demand from these devices.⁷¹

According to McKinsey & Company, if more energy-efficient electrical devices and small appliances — which include microwaves, televisions and personal computers, among other things — had been available and adopted starting in 2008, it could have reduced the energy use by this equipment by up to 44 percent by 2020.⁷² More efficient refrigerators consume around 12 percent less energy than standard models, while more efficient clothes washers are more than three times more efficient than standard models.⁷³

Energy efficiency standards and the voluntary Energy Star program

The United States has made some advances in promoting and raising appliance energy efficiency standards. Mandatory appliance energy efficiency standards were adopted in 1987, which set minimum requirements for appliances that dramatically improved performance and eliminated the least-efficient products from the market.⁷⁴ In compliance with the Energy Policy and Conservation Act, the DOE is required to update efficiency standards and test procedures at intervals of six and seven years, respectively.⁷⁵ In 2018, the Trump administration was taken to federal court after failing for more than a year to implement efficiency standards developed under the Obama administration.⁷⁶

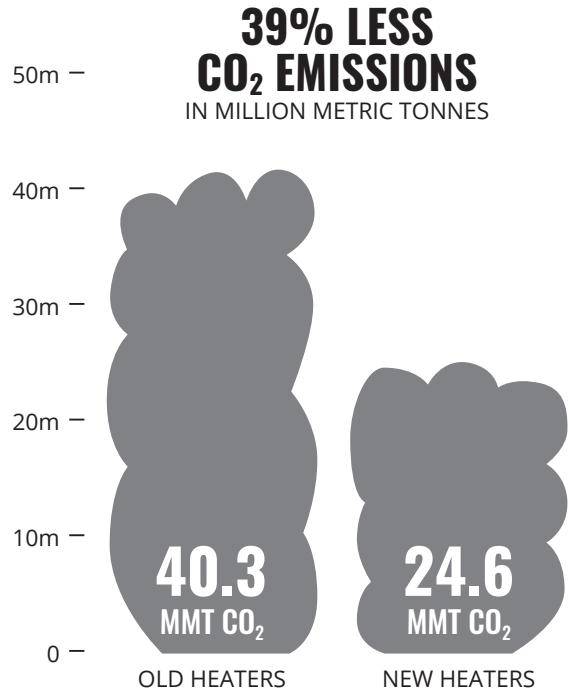
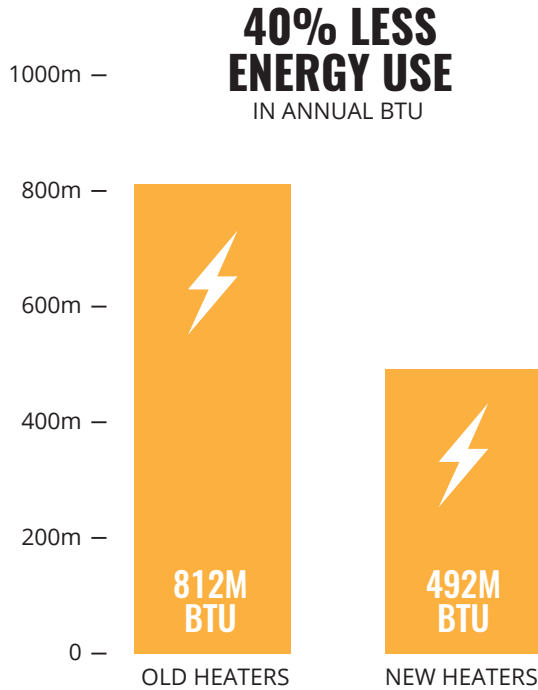
Today, the focus has been the voluntary Energy Star efficiency standards and labeling program that promotes energy-efficient products covering more than 60 categories.⁷⁷ Consumers benefit from knowing which appliances are most energy-efficient, but too often manufacturers offer the most energy-efficient models bundled with other luxury features, meaning that basic models often are less efficient.⁷⁸ Federal appliance standards should strengthen mandatory standards, which McKinsey & Company found was an "accepted and effective manner for the government to help consumers reduce their energy consumption."⁷⁹

Massive energy, financial and climate savings from efficiency upgrades to buildings

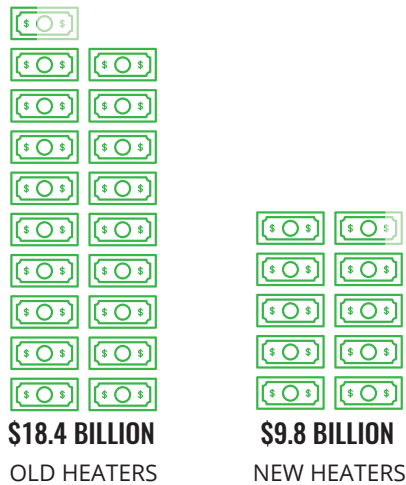
The entire economy needs an efficiency upgrade to reduce total energy demand. Reduced energy demands

There are 38 million water heaters that are over 10 years old.

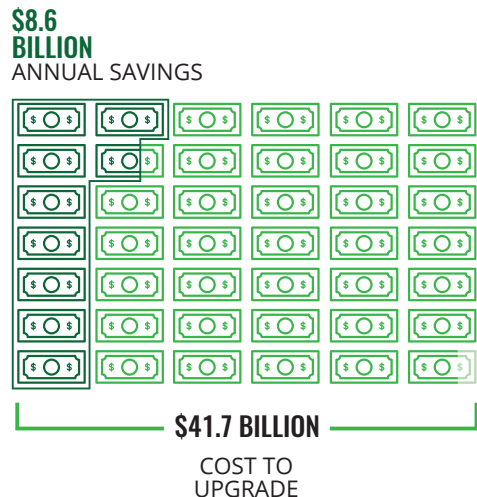
Upgrading to more efficient water heaters would generate substantial energy, climate and financial savings that pays for itself in five years.



ANNUAL SAVINGS OF \$8.6 BILLION



THE ANNUAL SAVINGS WILL COVER THE COST OF THE UPGRADES IN **LESS THAN FIVE YEARS**



generate tremendous economic savings and substantially reduce climate and air pollutants. The reduction in energy consumption translates into household and business savings from lower electricity and fuel bills. And reduced energy use decreases climate emissions from power plants, tailpipes and fossil fuel infrastructure.

Studies by the National Academy of Sciences, McKinsey & Company and the University of Massachusetts Amherst's Political Economy Research Institute with the Center for American Progress estimate that an aggressive, economy-wide push to upgrade energy efficiency could reduce demand and consumption by between one-quarter and one-third over two decades.⁸⁸ That would reduce energy use, reduce energy expenditures and reduce emissions.

And the investments and energy savings would foster economic growth. The development, manufacturing and installation of energy-efficient technology and equipment would generate new employment

opportunities. The money that households and businesses saved on energy bills could be spent on other things, further driving economic growth. A national investment to upgrade energy efficiency can stimulate the economy and create domestic (and mostly unexportable) jobs, while reinvigorating the national approach to energy.

Upgrading building energy efficiency brings the biggest energy savings

Residential and commercial buildings are power hogs. A national program that substantially invested in improving the efficiency of buildings would significantly reduce energy use, especially electricity consumption. In 2017, buildings used 39 percent of total energy consumption, more than the industrial or transportation sectors (at 32 percent and 29 percent, respectively).⁸⁹ An even larger share of electricity generation went to buildings — about three-quarters of retail electricity sales powered buildings.⁹⁰

Energy efficiency upgrades especially benefit economically and socially disadvantaged households

Any national efficiency strategy must provide equitable investments to benefit renters and lower-income homeowners. Energy efficiency upgrades can have high upfront costs but deliver longer-term savings that repay the investments multiple times over.⁸⁰ More financially secure property owners are more likely to make energy efficiency investments. The renters and lower-income homeowners who would benefit most from improved energy efficiency are least able to afford the needed improvements.

African American and Latino households, lower-income families and renters tend to live in older, less efficient homes with higher energy costs per square foot.⁸¹ People of color and families living under 200 percent of the federal poverty line made up nearly half the households living in inadequate housing (including poor insulation, heating problems and structural leaks and holes), and about 60 percent of African American and Latino families live in housing stock built before 1970, when construction rarely prioritized efficiency.⁸²

High energy burdens can force these households to decide whether to pay their utility bills or spend money on other basic necessities such as food or medical care.⁸³ In 2016, lower-income households spent a considerable share of their income — up to 11 percent of household expenditures — on energy.⁸⁴ Reducing energy costs by one-third would deliver substantial and needed economic benefit to lower-income families. Typical weatherization improvements can reduce lower-income households' energy bills between \$300 and \$400 annually.⁸⁵

Renters face a uniquely complicated energy efficiency conundrum. Landlords have little incentive to invest in efficiency upgrades when the savings accrue to the tenants.⁸⁶ And renters — especially lower-income families — have little remedy for the drafty, energy-inefficient apartments and houses that are all too common.

A national strategy would provide sufficient funding and grants to upgrade the houses for lower-income homeowners. The modest Department of Energy Weatherization Assistance Program (WAP) reaches only 35,000 homes annually, but over 35 million lower-income households are eligible for upgrades.⁸⁷ At the current funding pace, the WAP program would take 29 years to weatherize 1 million homes — neither the climate, the families nor the housing stock can wait that long.

Since buildings dominate U.S. energy consumption, upgrades to the efficiency of buildings offer the greatest potential energy savings. McKinsey & Company estimated that residential and commercial buildings represent 60 percent of all energy efficiency potential.⁹¹ A substantial, national investment — both public and private investments, as well as policy directives and incentives to encourage upgrades — to increase building energy efficiency could generate dramatic reductions in energy use, savings on energy bills and declines in climate emissions.

Food & Water Watch estimated energy savings by applying a modeled annual efficiency reduction to the DOE's projected business-as-usual demand for natural gas and electricity in the residential and commercial sectors.⁹² The annual efficiency reduction was adapted from a 2010 National Academy of Sciences approach and used the median, annual potential technical energy efficiency savings (as a percentage) from multiple efficiency meta-analyses.⁹³

The reduction in building energy use was then used to estimate reduced utility bills (because of unused natural gas and electricity) and reduced greenhouse gas emissions (based on the reduction in demand for fossil-fueled electricity and reduced gas combustion for

water heaters and furnaces). For a complete discussion of the model, see Methodology on page 21.

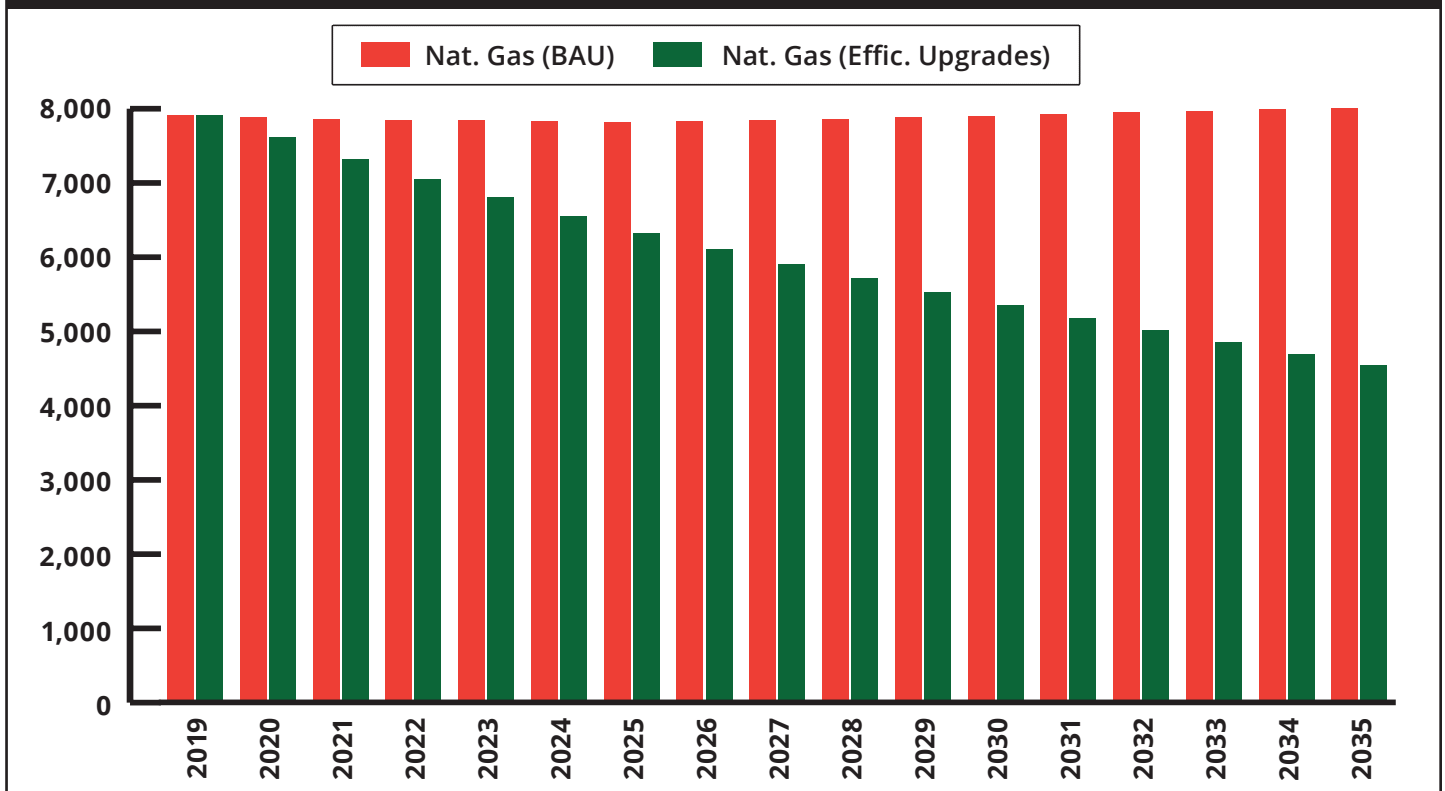
This estimate is likely to be a conservative assessment of energy efficiency savings. The National Academy of Sciences wrote that “the risk of overestimating efficiency potential is minimal” and that efficiency studies “openly and intentionally make assumptions that lead to ‘conservatively’ low estimates of the efficiency resource.”⁹⁴

These savings are likely an underestimate of what is possible with a strong public campaign and investment in deploying energy efficiency that would likely achieve greater energy (and financial and climate) savings.⁹⁵ Substantial investments would drive demand that could increase efficiency of the technologies while reducing prices for improved equipment. Food & Water Watch assumed a \$500 billion investment from 2020 to 2035, or about \$33.3 billion a year.⁹⁶

Energy efficiency building upgrades reduce energy use by over one-third in by 2035

Sustainable investments in building efficiency upgrades could create millions of jobs and foster substantial energy, utility bill and climate savings. Food & Water

Figure 1 • Natural Gas Demand in Buildings Under Business as Usual (BAU) versus With Efficiency Upgrades (trillions of cubic feet)



Watch estimated the technical potential energy efficiency savings that could annually reduce residential and commercial building electricity and natural gas utility use by 2.2 percent and 3.5 percent, respectively.⁹⁷ By 2035, these small annual efficiency improvements add up.

The DOE projected that buildings would use 2 percent more energy by 2035 than in 2019. But even modest efficiency improvements would reduce combined electricity and natural gas use by 34.8 percent by 2035 — substantially below both DOE business-as-usual projections and below 2019 building energy use.⁹⁸

In 2035, residential and commercial buildings would use 3.5 trillion cubic feet less natural gas than the business-as-usual projection (43.4 percent less than forecast) and 860 billion kilowatt-hours less electricity than the business-as-usual projection (29.9 percent below the forecast) (see Figures 1 and 2).⁹⁹

Trillion-dollar cumulative savings on utility bills

This unused energy represents substantial savings for ratepayers and the climate. From 2020 to 2035, these savings would reduce cumulative energy use by 7.6 trillion kilowatt-hours and 31.7 trillion cubic feet of

gas. The reduced energy use could save residential and commercial ratepayers an average of \$82.7 billion annually between 2020 and 2035, for cumulative savings of \$1.3 trillion (see Figure 3 on page 12).¹⁰⁰ In 2035, building energy bills would be one-third (32.8 percent) lower, with most of the savings coming from a reduction in higher-priced electricity. These savings significantly exceed the cost of the efficiency investments — and building efficiency upgrades would continue to deliver savings for years into the future.¹⁰¹

Reduced demand for gas is the equivalent of the output of 130,000 gas wells by 2035

The building efficiency upgrades would substantially reduce demand for both utility gas and gas-fired electric generation. Combined, these reductions would reduce total building natural gas consumption (utility and gas-fired generation) by one-third by 2035 — an annual savings of 4.4 trillion cubic feet of gas by 2035.¹⁰²

The efficiency upgrades would amount to a significant reduction in demand for U.S. natural gas production. In the first year, the eased demand would represent 1 percent of projected dry gas production, and by 2035 the reduced consumption

Figure 2 • Electricity Demand in Buildings Under Business as Usual (BAU) versus With Efficiency Upgrades (trillions of kilowatt hours)

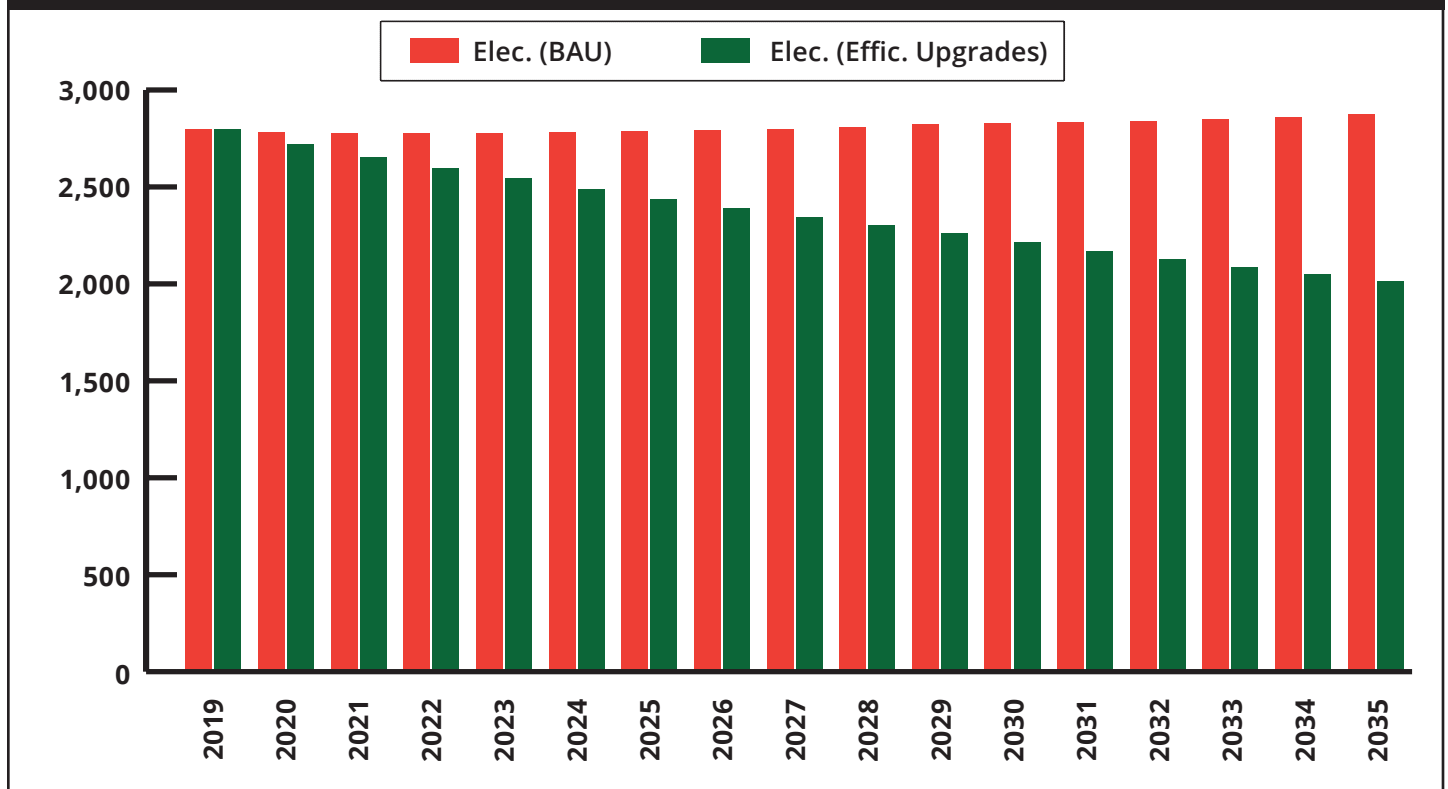
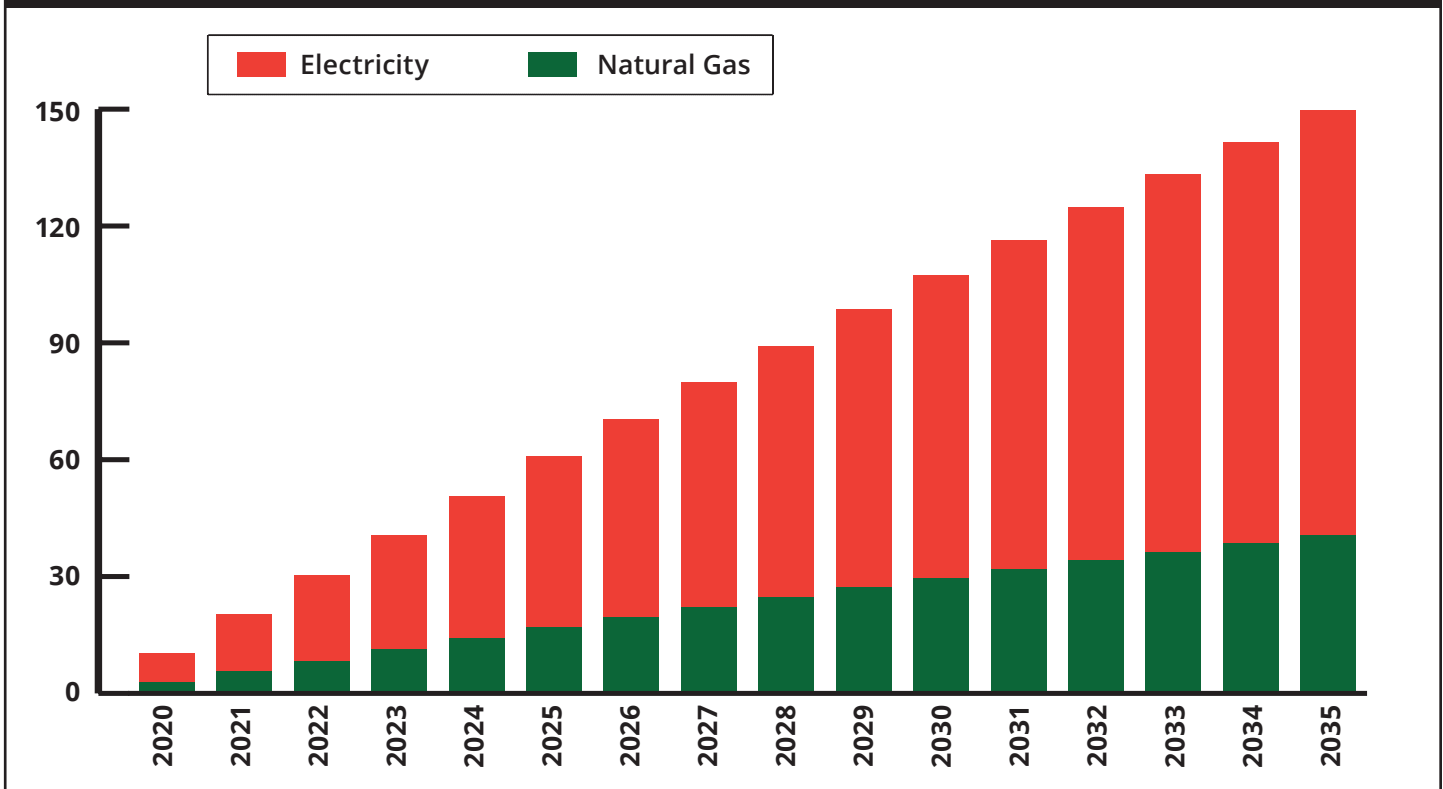


Figure 3 • Efficiency Upgrades Yield Billions in Utility Bill Savings (*billions of dollars*)



would represent 11 percent of projected gas production.¹⁰³ This would allow the United States to stop drilling new gas wells (including fracked wells). The gas savings from increased building energy efficiency would allow the United States to shut down about 130,000 wells in 2035 (about 17 percent of wells) without any impact on energy security.¹⁰⁴

Reduced electricity and natural gas demand would reduce annual climate emissions by over 300 million metric tonnes of CO₂ by 2035 — the same as the emissions from nearly 80 coal power plants

The reduced building energy use would substantially reduce climate emissions. The natural gas that goes to buildings is used in gas-fired furnaces, gas-fired water heaters and other gas-fired appliances, and all of that gas combustion generates CO₂ emissions. Reducing demand for electricity lowers emissions from power plants. The DOE estimates that fossil fuels will continue to produce 59 percent of U.S. electricity by 2035.¹⁰⁵ Residential and commercial buildings are projected to consume 70 percent of electricity through 2035, so reducing buildings' electricity use could substantially reduce climate emissions.¹⁰⁶

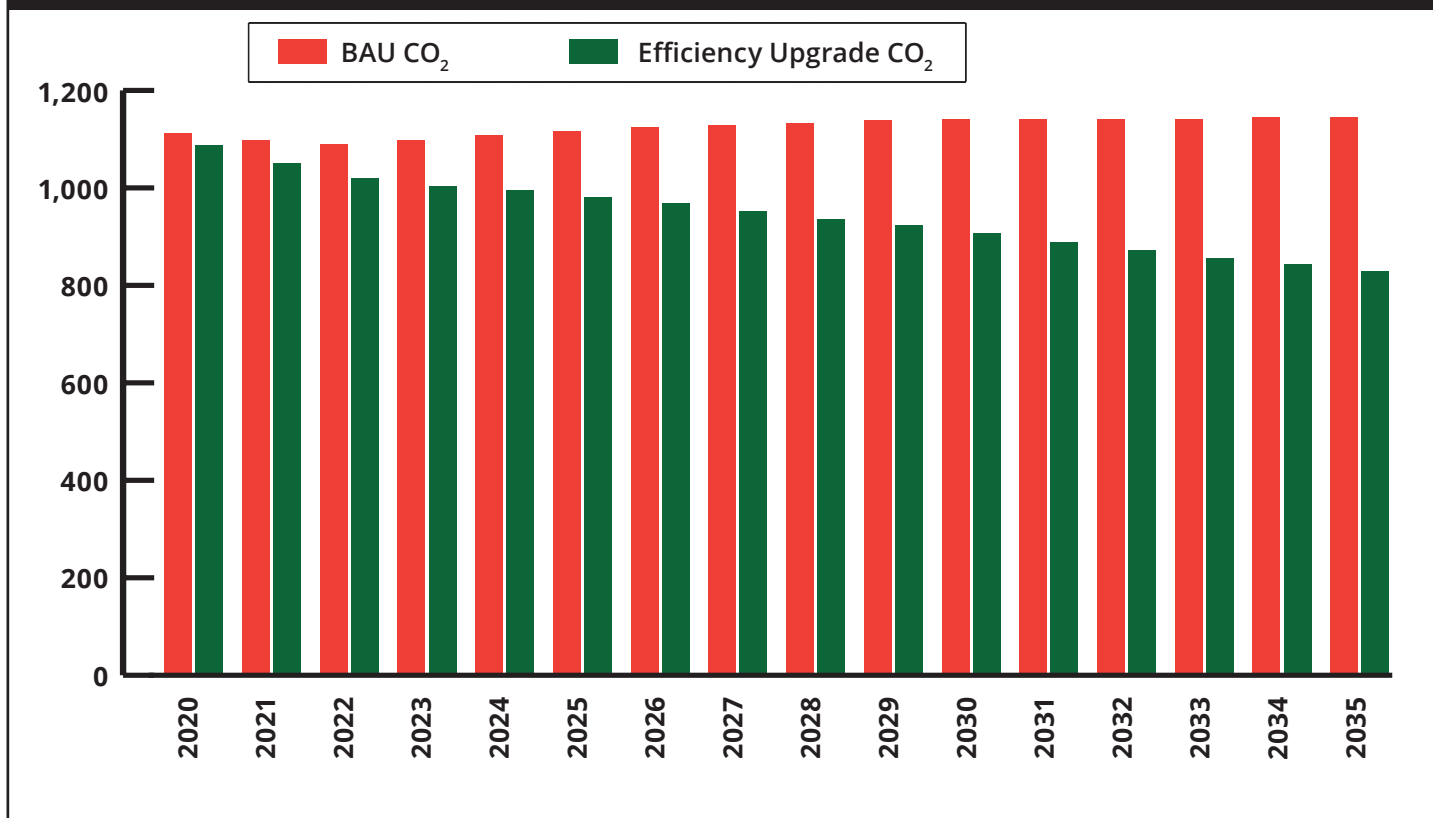
Food & Water Watch estimated reduced climate emissions based on the decline in electricity demand that would be fulfilled by fossil fuel power plants and the decline in natural gas consumption (and combustion) in buildings. Combined, building energy efficiency upgrades would steadily reduce climate emissions, and building CO₂ emissions would be 317 million metric tonnes lower than the business-as-usual projections in 2035 (see Figure 4 on page 13 and Methodology on page 22).¹⁰⁷

The DOE business-as-usual projections would have buildings' climate emissions rise by 3 percent by 2035, but the efficiency emissions would decline by 24 percent from 2020 to 2035 and would be 28 percent lower than the business-as-usual projections in 2035. The 2035 reduction of over 300 million metric tonnes would be the equivalent of the emissions from 79 coal-fired power plants.¹⁰⁸

National energy efficiency program could create 20.8 million jobs and curb the crisis of economic inequality

A national investment in upgrading the energy efficiency of buildings would generate economic growth

Figure 4 • Greenhouse Gas Emissions of Buildings Under Business as Usual (BAU) versus With Efficiency Upgrades (millions of metric tonnes of CO₂)



and create millions of jobs. These investments must be paired with pro-labor policies and reforms to ensure that workers get a fair share of the benefits of the substantial economic investments. The massive economic transformation necessary to move off fossil fuels must be paired with worker protections to address the widening economic inequality for both disadvantaged communities and fossil fuel workers that would bear a disproportionate economic brunt of decarbonization.

A national energy efficiency program could create 20.8 million jobs from 2020 to 2035 that could provide economic opportunities to lower-income workers. By 2035, the \$500 billion investment in building efficiency has the potential to create over 7.8 million jobs (15.7 jobs per \$1 million invested¹⁰⁹), and the \$1.3 trillion in energy savings could create another 12.7 million net new jobs, accounting for any jobs lost from the shift away from energy spending (9.8 jobs per \$1 million saved¹¹⁰). Combined, the efficiency jobs and the induced jobs from energy savings would create over 1.3 million permanent full-time jobs per year — which would

represent 52 percent more new jobs than were created annually between 2013 and 2017.¹¹¹

The retrofitting investments create jobs in manufacturing and construction to upgrade buildings, and the energy savings can be reinvested into the economy, spurring more economic, job-creating activity. The savings translate to overall capital savings for the economy, contributing to economic growth.¹¹²

These investments can be effectively self-funding, as the energy bill savings and economic activity stimulated by energy efficiency upgrades would likely exceed the cost of the programs.¹¹³ For example, every \$1 million invested in energy efficiency in the U.S. southeast produced \$3.87 million in economic output — meaning that the economic benefits were nearly four times the investment.¹¹⁴

Energy efficiency is a readily implementable approach for stimulating job growth and diminishing the need for additional fossil fuel plants.¹¹⁵ Moreover, investments in energy efficiency generate nearly three times as many jobs as comparable investments in fossil fuels.¹¹⁶ In

2017, there were 2.25 million workers in the energy efficiency sector, primarily in manufacturing or installing energy-efficient equipment or technologies.¹¹⁷

Jobs in building efficiency include both installation and construction jobs (putting in insulation, upgrading windows, new construction, etc.) and manufacturing higher-efficiency equipment (heating systems, appliances, etc.), known as direct and indirect jobs.¹¹⁸ For example, installing high-efficiency windows would be a direct efficiency job, but manufacturing the windows and delivering the windows would be indirect jobs that supply the installers.¹¹⁹

Most energy efficiency jobs are in construction — 1.27 million workers in 2017 (about 18 percent of all construction workers).¹²⁰ These jobs are inherently localized and domestic; they are almost impossible to outsource and exist across the country in both rural and metropolitan areas.¹²¹ Another 300,000 manufacturing workers made energy-efficient appliances, lighting and other equipment.¹²²

National crisis of economic inequality

These efficiency jobs could begin to address the widening income and wealth inequality in the United States that has made it impossible for working families to get ahead. The growing economic inequality is what Nobel-winning economist Joseph Stiglitz called one of the “critical issues facing our country” that has made the “American dream a myth.”¹²³

Household income inequality has been increasing, and by 2015 the top 1 percent of households earned more than 26 times more than the rest of the 99 percent of households.¹²⁴ The wealth gap is even more stark, with the most affluent 0.1 percent of families (160,000 households) holding 22 percent of the nation’s wealth — the same amount as the bottom 90 percent of families (144,000,000 households).¹²⁵ As the richest seized a greater share of the pie, middle-income families saw their real, inflation-adjusted household incomes decline, and the poverty rate has risen.¹²⁶

The widening gulf between economic haves and have-nots has disproportionately harmed people of color. For example, typical African American household income has remained less than 60 percent of typical white household income over the past 50 years (57 percent in 1968 and 56 percent in 2016).¹²⁷

The yawning income inequality has made it increasingly difficult for children born to lower-income families to get ahead — these kids are far less likely to climb the income ladder than kids born to upper-income families.¹²⁸ This lack of income mobility is much more pronounced for African Americans and Native Americans who face “large income disparities that persist across generations”; for Latinos, intergenerational income mobility is slightly lower than for whites, but the typical Latino household income starts at a much lower level.¹²⁹ One author noted that “once racial inequality exists, increases in economic inequality will exacerbate racial disparities.”¹³⁰

National efficiency jobs program to start curbing economic inequality

The more than 20 million jobs created in building efficiency from 2020 to 2035 (nearly 1.3 million full-time jobs annually) could help address the widening economic and long-standing racial disparities in America, but only if the jobs programs are designed to recruit and train lower-income and socially disadvantaged workers to fill good, family supporting jobs that provide career advancement. It is essential that any national investment program to combat climate change provide a fair and just transition for existing fossil fuel workers and provide opportunities for workers from communities that have not shared America’s economic expansions.

Merely investing money in energy efficiency will not ensure that the jobs present high-quality employment opportunities or reach disadvantaged workers. The construction industry workforce has historically been disproportionately white and male, leaving women and people of color out of the job opportunities for efficiency upgrades.¹³¹ In 2017, only 23 percent of the energy efficiency workers were women; African Americans made up 8 percent and Latinos made up 15 percent of the energy efficiency workforce (below the 12 percent and 17 percent, respectively, of the overall workforce).¹³²

But programs that aggressively recruit and train efficiency construction workers from underserved areas can start to remedy this historic lack of opportunity. Ensuring that workers are recruited from the neighborhoods where the building upgrades are being deployed — which include many lower-income

Figure 5 • Energy Efficiency Annual Earnings Opportunity (comparable 2017 annual earnings)

Plumbing/HVAC

58,886

Typical Construction

55,052

Drywall/Insulation

53,614

Roofers

49,961

Typical Manufacturing

45,518

Fight-for-\$15 Job

31,200

Typical Earnings High School/GED

29,815

Typical Earnings Less than High School

21,738

Minimum Wage Job

15,080

SOURCE: Food & Water Watch analysis of U.S. Census Bureau, Bureau of Labor Statistics data.

areas and communities of color — would be essential. Community-based outreach and targeted hiring are essential to meet the needs of the socially and economically disadvantaged communities that have more energy-inefficient housing stock and more need for economic investments.¹³³ In New York, one-third of the jobs created by the Green Jobs Green New York program were in disadvantaged communities in both urban and rural areas.¹³⁴

Ensuring that green jobs are good jobs

The energy efficiency investment must be paired with strong policies to ensure that the jobs that are created are good jobs with opportunities to build middle-class careers. Jobs in manufacturing and installing energy efficiency building upgrades can provide living wages that sustain working families and provide career ladders to build economic stability.

There are energy efficiency jobs at every skill and wage level.¹³⁵ Some of these jobs are in higher-wage, capital-intensive industries, and many pay above-average wages.¹³⁶ For entry level, lower-skill workers, many of the most common energy efficiency jobs in the construction industries pay considerably more than the typical pay for workers with high-school degrees or less — at least 50 percent more for typical manufacturing workers and nearly double for plumbers and heating/air conditioning workers (see Figure 5).¹³⁷

Moreover, energy efficiency workers are considerably more likely to be unionized than typical workers, meaning that some of these workers receive higher wages and benefits. About one in seven (14 percent) of energy efficiency jobs are unionized, more than double the 6.5 percent average for private sector workers.¹³⁸ These union jobs can represent a better opportunity not just for family-supporting wages, but also a route to career advancement for lower-skilled, less-educated workers.¹³⁹

Although there are more unionized energy efficiency jobs than average, many construction contracting firms are not unionized. Any investment in energy efficiency infrastructure needs to be paired with reforms that make it easier for workers to form unions as well as requirements that ensure that firms that receive contracts do not have a history of violating labor, wage, workplace safety, tax or environmental laws or regulations.

Investments in energy efficiency in buildings also must include strong job training and skills-building opportunities — including apprenticeships, vocational training, and certificate or licensure qualifications — to ensure that workers can advance into jobs with more opportunities.¹⁴⁰ Energy efficiency jobs, especially with investments in job and career development and training, can foster career advancement.¹⁴¹ In New York, about 15 percent of the state-funded efficiency jobs were upskilled and up-waged in 2014 and 2015, with average wage increases of 21 percent to over \$22 per hour.¹⁴²



Providing a fair and just transition for existing fossil fuel workers

About 1 million workers are currently employed in fossil fuel extraction and electricity generation, according to the DOE.¹⁴³ The necessary shift away from fossil fuels will disproportionately harm these workers and their communities, where falling incomes would also undercut local funding for schools and other social services. AFL-CIO President Richard Trumka rightly observes that fighting climate change must not solely impose substantial and disproportionate economic burdens on coal miners, oil and gas workers, and other fossil fuel energy workers and their communities.¹⁴⁴

Any national climate policy that transforms our fossil fuel economy into a clean energy economy — including the substantial investment in retrofitting and upgrading the energy efficiency of buildings — must provide meaningful and generous support for transitioning fossil fuel workers and retirees to provide for their families. Fossil fuel workers are legitimately skeptical that any transition programs would provide a sufficiently robust pathway to meaningful, economically viable employment opportunities.

The past few decades have heralded a decidedly unjust economic transition for workers.¹⁴⁵ Corporate-driven globalization has eliminated millions of high-wage manufacturing jobs — often union jobs — that provided economic security for generations of working families.

The offshoring of these manufacturing jobs was economically calamitous for families and communities that relied on these good jobs. The current programs for unemployment, job training and trade adjustment assistance for displaced workers have been totally insufficient to ensure that dislocated workers can return to jobs that can support their families.¹⁴⁶ There has been little or no safety net or support for the nearly 30,000 coal miners who have lost their jobs as the energy industry and nation have shifted away from coal since 2010.¹⁴⁷

A genuine just transition program would provide wage insurance to ensure that transitioning workers maintain their incomes and benefits; protect and shore up the pensions of fossil fuel workers; provide job training and re-skilling, educational opportunities and relocation assistance; and invest in communities to develop new industries to replace lost fossil fuel extraction or generation jobs.¹⁴⁸ These programs must fully compensate workers and their families for the loss of their livelihoods, prevent fossil fuel workers from bearing the brunt of the costs of decarbonizing the economy and provide a pathway to comparable, meaningful work for younger workers or a bridge for older workers to reach retirement and safeguard their pensions.¹⁴⁹

Even without a coordinated national energy efficiency program, there are already more energy efficiency jobs than there are jobs in mining for coal, drilling for oil and gas, building pipelines or operating fossil fuel-fired

power plants. In 2016, there were twice as many jobs in manufacturing and installing energy-efficient upgrades than in the fossil fuel extraction and electricity generation industries (2.2 million and 1 million, respectively), according to the DOE.¹⁵⁰ A 2017 study found that every \$1 billion in federal funding that is shifted from fossil fuels (tax credits) to energy efficiency (such as weatherization grants) would create more than 5,000 net jobs (accounting for job losses in fossil fuels).¹⁵¹

The nationwide investment in building efficiency can create enough jobs to counteract any employment losses in the fossil fuel industries, but job training and transition assistance must be part of the coordinated just transition to a clean energy economy. Many fossil fuel workers already possess job skills that would be broadly transferrable to energy efficiency and clean energy jobs.¹⁵² This job training would be part of broader labor policy reforms necessary to ensure that the new efficiency jobs are good jobs with economic opportunities that support working families.

Conclusion and recommendations

For the sake of our planet and economy, energy efficiency must be a national and regional priority in the United States. Any national climate program must include substantial investments and policy improvements to upgrade the energy efficiency of America's buildings. Current levels of efficiency adoption and technological improvements alone will not realize the potential energy efficiency gains discussed above; aggressive and robust energy efficiency policies are needed to upgrade existing buildings and to ensure that new buildings meet high efficiency standards. Food & Water Watch estimates that a \$500 billion investment from 2020 to 2035 would generate substantial energy, financial and climate savings while creating millions of jobs.

This requires a national commitment to ensure widespread and rapid adoption of available and emerging technologies to achieve energy and climate savings.¹⁵³ It also will require a coordinated and broad-based mix of policy approaches to maximize implementation of efficiency improvements.¹⁵⁴ This must be combined with a fleet of generously funded programs and policies to ensure that workers share fairly in the benefits of this national investment. Any national climate policy must include upgrading the energy efficiency of buildings.

The following recommendations represent the kinds of policies and investments to substantially improve building energy efficiency performance.

Energy efficiency for buildings recommendations:

- **Congress should fully fund the Weatherization Assistance Program to upgrade all eligible homes by 2035:** An estimated 35 million lower-income households live in housing stock that would be a good and eligible candidate for upgrades under the Weatherization Assistance Program (WAP). The Trump administration has recently proposed eliminating a program that had been spending about \$200 million to upgrade about 35,000 homes annually (about \$5,700 per home).¹⁵⁵ The Obama administration stimulus program funded WAP for \$5 billion in 2010, but to retrofit 2.3 million houses per year (or 35 million by 2035) would cost about \$13 billion annually.¹⁵⁶ This investment would save utility bills and improve the quality of life for lower-income families, invest and generate economic activity directly in lower-income communities, create jobs and reduce climate emissions.
- **Target investments in socially and economically disadvantaged areas and in environmental justice communities with disproportionate pollution burdens:** Lower-income populations and communities of color are considerably more likely to live near polluting facilities. These communities also have a substantial share of the older and more energy-inefficient housing stock. Prioritizing retrofitting projects in these neighborhoods and communities would not only provide economic revitalization but also reduce the exposure that residents face from nearby polluters.
- **Congress should robustly invest in upgrading the energy efficiency of all federal buildings:** The federal government should upgrade all federal buildings to the best available and emerging energy-efficient technologies and require that companies that lease to federal agencies upgrade their buildings as a condition of securing government tenants. The DOE estimates that 1.4 billion square feet of government building area could be upgraded for \$6 billion, a move that could reduce energy costs up to \$15 billion, but the Trump administration's DOE budget has requested only \$10 million to perform these upgrades for 2019.¹⁵⁷

- **Congress should expand funding for energy efficiency research at the Department of Energy:** The DOE research program has helped develop many energy-efficient technologies. Funding for this research has dwindled to nearly nothing. In 1980, the DOE spent \$262 million (in real, inflation-adjusted 2017 dollars) on energy efficiency research for buildings — the highest funding level.¹⁵⁸ In 2018, the Trump administration requested \$35 million for building energy efficiency research — one-seventh of what was spent at the end of the Carter administration.¹⁵⁹
- **Congress should strengthen and require regular upgrades to mandatory energy efficiency requirements for appliances, building shell technologies and other equipment, as well as further incentivize efficiency improvements:** The DOE establishes mandatory minimum energy efficiency standards, but many standards have not been updated in years, and these improvements have languished.¹⁶⁰ The National Academy of Sciences found that the adoption of mandatory standards historically provided “the largest amount of energy savings” for appliances.¹⁶¹ Additional tax incentives for appliance manufacturers can successfully encourage the more rapid adoption and availability of higher-efficiency models.¹⁶²
- **Provide sufficient incentives for building owners to upgrade the efficiency of their appliances, equipment and buildings:** Tax incentives can be effective tools to encourage owners to upgrade equipment, lighting, heating systems and building envelopes.¹⁶³ These tax inducements must be carefully tailored, well administered and directed to encourage the adoption of energy-efficient technologies, especially to ensure that lower-income owners can access the programs (such as refundable tax credits). Additional incentives modeled on the successful Cash for Clunkers low-efficiency vehicle trade-in program could further encourage owners to upgrade more expensive equipment such as space heating, air conditioning and water heating appliances.¹⁶⁴
- **Ensure that landlords and owners of multi-family housing make retrofits and keep their tenants:** Renters pay the higher energy costs in inefficient apartments and houses, but have no ability to upgrade their residences. Specific programs should be developed that encourage the retrofitting of rental properties while preventing landlords from raising rents or evicting tenants from newly renovated and improved living spaces.
- **States should invest in energy-efficient technology by allocating their own grants and other monetary incentives to local companies and communities:** This may also include tax credits, deductions and rebates designed to help leverage local economies by encouraging efficiency efforts pursued by building owners and utility companies. Tax credits can directly incentivize households and



businesses to invest in energy-efficient technology. Some states have implemented property-assessed clean energy financing to help owners finance upgrades that can be repaid over time through their property taxes.¹⁶⁵ Some cities provide additional financing for upgrading home appliances.¹⁶⁶

- **States and localities should strengthen and regularly upgrade building codes to ensure that newly constructed buildings are energy-efficient.** Adopting, implementing and enforcing updated building codes that establish better energy efficiency standards is one of the most cost-effective ways to address climate change.¹⁶⁷ Studies have found that strengthening building codes alone can reduce residential energy use by between 3 and 5 percent.¹⁶⁸ Many localities and states have not adopted newer-model building efficiency codes,¹⁶⁹ but the newer codes would reduce energy use nearly 30 percent more than the model codes from a decade ago.¹⁷⁰ This should include requiring new buildings to be solar-ready, a requirement that several U.S. cities have already imposed.¹⁷¹

Labor reforms, workplace training and recruiting, and fair and just transition recommendations:

- **Ensure that companies receiving federal energy efficiency funding are fair and just employers:** Establish responsible employer standards to ensure that participating manufacturing and construction companies do not have a history of substantial violations of wage and hour rules, labor laws, workplace safety, tax or environmental rules.¹⁷² Require companies and contractors that receive public investment money to provide jobs with at least prevailing wages and benefits to their workers.¹⁷³ The Obama stimulus program incentivized funding for companies with solid records of complying with worker safety and labor laws in order to participate in the program.¹⁷⁴
- **Provide incentives for procurement of American-made energy-efficient equipment, materials and appliances:** Congress should ensure that, to the greatest extent practicable, all energy-efficient equipment, appliances and materials are manufactured in the United States. Much of the federal funding will likely be granted to states or regional partnerships to invest in local projects, much like spending on highway and transportation projects, and should be subject to

domestic procurement requirements similar to the Buy America law that governs domestic iron and steel for transportation and infrastructure investments.¹⁷⁵

- **Implement labor law reforms to make it simpler for workers to establish independent unions:** Economic inequality in the United States has soared as the number of workers in labor unions has declined. Ensuring that workers can more easily join and form unions is essential to securing a more evenly shared economic prosperity for working families. Corporations and trade associations have aggressively resisted labor organizing efforts and pushed to curb workers' rights.¹⁷⁶ Currently, corporations intimidate or retaliate against workers supporting unions, create barriers to union elections and otherwise impose roadblocks on efforts by workers to form independent unions.¹⁷⁷

Although more energy efficiency workers are unionized than the private sector average, the vast majority of construction and manufacturing jobs in the energy efficiency sector are not union jobs. Labor reforms are necessary to prevent companies from blocking workers' efforts to form unions, including raising penalties and creating remedies for anti-union retaliation (including illegal termination) and requiring employers to recognize unions and collective bargaining units when the majority of workers sign authorization cards.¹⁷⁸

- **Establish community-labor partnerships to recruit and train workers from disadvantaged communities where much of the retrofitting must take place:** Much of the retrofitting for energy efficiency will be performed in lower-income areas and communities of color where housing stock has the greatest need for upgrades. Programs must be developed to recruit, train and upskill workers from these socially and economically disadvantaged communities to ensure that these residents and neighborhoods can benefit from the economic investments made in their communities to upgrade energy efficiency.¹⁷⁹ The Los Angeles school district modernization and construction program, which aimed to recruit half the construction workers from inside the district, succeeded in hiring about 40 percent of apprentices and journeymen construction workers from the community.¹⁸⁰ Similar project labor agreements have succeeded in other cities as well.¹⁸¹



- **Fully fund high-quality job training to ensure that efficiency jobs provide career opportunities:**

Community group and labor union alliances have developed programs for municipalities to recruit and train building energy efficiency workers from local communities, included pre-apprenticeship jobs that can build a ladder for advancement.¹⁸² Union hiring halls with high-quality apprenticeship programs can train workers, often with a combination of earn-and-learn on-the-job training with classroom instruction.¹⁸³ Many lower-income workers lack the financial means to afford high-quality job training or the support (child care, flexible schedules, transportation, etc.) necessary to access these programs.¹⁸⁴ The Obama administration economic stimulus package dedicated \$500 million to green jobs training programs, including energy efficiency jobs programs.¹⁸⁵

- **Develop model project labor agreements for dispersed retrofitting projects:** A national investment program to retrofit building efficiency upgrades should develop project labor agreements (PLAs) that address the dispersed nature of the investment (many buildings across broader areas)

to recruit and train workers from disadvantaged communities. PLAs have generally governed larger, discrete construction projects (a single building, infrastructure project or stadium) but can cover an umbrella project with multiple smaller construction sites.¹⁸⁶ Retrofitting investments might address tens of thousands of residences and buildings in a county, potentially requiring a new PLA model to ensure that workers and small businesses can participate.

Many construction projects — such as bridges, commercial buildings, schools and other public and private facilities and projects — utilize PLAs to establish uniform work rules (hours, benefits, prevailing wages, dispute resolution, etc.) and workforce recruitment for all project employers that can reduce project interruptions.¹⁸⁷ These PLAs have not raised costs or reduced subcontractor bidding participation, and have helped recruit and train lower-skilled, younger local workers as well as workers of color.¹⁸⁸

- **Fully fund fair and just transition programs for fossil fuel workers:** All fossil fuel workers who lose their jobs as the nation shifts to a clean energy

economy should receive generous fair and just transition support. This should include 100 percent wage and benefit insurance for five years to ensure that workers and their families do not face catastrophic economic shocks from job displacement.¹⁸⁹ Wage and benefit insurance provides supplements to future job earnings to ensure that workers receive the same income from future work even if it is at a lower pay level. Additionally, workers should receive high-quality job training, re-skilling or educational opportunities necessary to secure meaningful, comparably remunerated employment. Beyond the workers, communities that lose the bedrock of their economic activity face substantial economic downturns when the major employer or industry becomes shuttered. There will have to be substantial incentives to encourage redevelopment of new, clean energy industries — wind turbine, solar panel or high efficiency appliance manufacturing facilities — to relocate to areas that have high densities of fossil fuel extraction or remote fossil fuel power plants.

Currently, about 1 million workers are employed in fossil fuel extraction and electricity generation. The outlined energy efficiency investment would reduce fossil fuel consumption at power plants by about 20 percent from 2020 to 2035, meaning that this might cut an estimated 200,000 fossil fuel jobs over 16 years (or about 16,500 jobs a year). More than three-quarters of those workers are older and could be bridged to retirement through attrition, meaning that any program would have to provide full support for at least 3,300 workers leaving the fossil fuel industry annually.¹⁹⁰ These programs must be sufficiently funded to ensure that any “just transition” does not replicate the false promises of past worker transition programs — supports that could require an estimated \$150,000 per dislocated worker annually (including community support).¹⁹¹ Providing five years of support to these workers would cost about \$40 billion through 2040.¹⁹²

Methodology

Food & Water Watch estimated energy savings by applying a modeled annual efficiency reduction to the U.S. Energy Information Administration’s (EIA) projected business-as-usual demand for natural gas and electricity in the residential and commercial sectors, from

the Energy Outlook data series.¹⁹³ The annual efficiency reduction was adapted from a 2010 National Academy of Sciences report that used the median, annual economically achievable energy efficiency savings (as a percentage) from a meta-analysis of multiple efficiency studies by the American Council for an Energy-Efficient Economy (ACEEE).¹⁹⁴ This approach was also used in a report by the University of Massachusetts Amherst Political Economy Research Institute and the Center for American Progress.¹⁹⁵ A Rockefeller Foundation / Deutsche Bank study assumed building retrofit energy efficiency savings of 30 percent, in line with the National Academy study.¹⁹⁶

This model’s efficiency improvement uses the median annual technically achievable efficiency savings percentage from three ACEEE energy efficiency meta-analyses (the one used by the National Academy of Sciences in 2010 and two more recent studies).¹⁹⁷ The technically achievable savings represent the energy efficiency improvements if the best technology were adopted irrespective of cost (the economically achievable savings represent cost-effective adoption of technology that would pay for its installation through energy savings).¹⁹⁸ The technical potential energy efficiency represents widespread adoption of the best available technology, in line with a national investment in energy efficiency. The median annual technical savings was 2.2 percent for electricity and 3.5 percent for natural gas.

This estimate is likely to be a conservative assessment of energy efficiency savings. The studies included in the assessment include studies completed before many high-efficiency technologies were available, such as LED lighting. Additionally, efficient equipment is likely to improve over time, especially as broad-based investments are made. The National Academy of Sciences wrote that “the risk of overestimating efficiency potential is minimal” and that efficiency studies “openly and intentionally make assumptions that lead to ‘conservatively’ low estimates of the efficiency resource.”¹⁹⁹

Moreover, technology is constantly improving, and a robust investment should drive down prices while enhancing the performance of energy-efficient strategies and equipment. This analysis solely considers upgrading residential and commercial buildings. Policies and investments to rapidly shift to clean renewables such as solar and wind would be complemented by upgraded efficiency. Other efforts to

upgrade the electric grid, shift to more distributed power generation, and enhance transportation and industrial efficiency would further reduce electricity and fossil fuel demand.

Energy savings

The annual efficiency improvement was applied to the EIA's 2019 business-as-usual projected electrical and natural gas energy consumption by residential and commercial buildings to determine energy consumption in 2020 and subsequent years through 2035.²⁰⁰ In 2020, the model reduced the EIA's projected energy consumption by 2.2 percent for electricity and 3.5 percent for natural gas. To account for projected changes in demand, for each subsequent year, the model adjusted the prior year's energy consumption by the EIA's projected annual percentage change in annual electricity and natural gas consumption and then applied the efficiency reduction.

For example, in 2021, the model took the reduced 2020 consumption from the applied energy efficiency improvement, adjusted it to reflect the EIA's projected 2020-2021 percentage annual change in consumption, and then reduced consumption by the annual potential technical energy efficiency savings. Each subsequent year accounted for the EIA's projected annual percentage change in energy consumption and then reduced that demand by the efficiency improvements for residential and commercial buildings by energy source (electricity and natural gas).

The energy savings were determined by the difference between the business-as-usual electricity and natural gas projected consumption and the modeled reduced consumption from increased efficiency for each energy source for each year from 2020 to 2035 and cumulatively. The data are reported in quadrillion British thermal units (Btus) but are converted to kilowatt-hours of electricity and cubic feet of natural gas.²⁰¹

Utility bill savings

The building energy expenditures were calculated based on the EIA's business-as-usual projected consumption and price by sector (residential and commercial) and fuel (electricity and natural gas).²⁰² Utility savings were determined from the reduced energy consumption from the efficiency calculation multiplied by the business-as-usual projected electricity and natural gas prices for residential and commercial buildings for each year from 2020 to 2035 and cumulatively.

Combustion climate savings

Climate savings were calculated from unused electricity and natural gas building consumption compared to the business-as-usual projections. The emissions from electricity generation were calculated from the business-as-usual projected percentage of coal, oil and natural gas power generation from 2020 to 2035.²⁰³ The fossil-fueled electricity generation percentages were applied to the electric power consumption by residential and commercial buildings (both the business-as-usual projected consumption and the modeled efficiency consumption) to determine the Btus of electric power from each fuel source.

Next, the CO₂ emissions were calculated based on the volume of each kind of fuel (coal, oil and natural gas) necessary to generate that electricity for both the business-as-usual and efficiency models.²⁰⁴ The CO₂ emissions from utility natural gas, which is burned in furnaces, water heaters and other equipment, were added to the electricity emissions for the business-as-usual and efficiency models. The reduced emissions were the difference between the business-as-usual and the efficiency model emissions.

Methane leak climate savings

Methane leak savings were calculated from the avoided gas usage (utility gas and gas for fueling power plants, see above). The gas savings were divided into saved fracked gas (unconventional) and saved conventional gas based on the projected portion of gas production from unconventional (shale gas and tight oil wells) and conventional wells in the lower 48 states.²⁰⁵ The total gas that would have been pumped into the system (the undelivered gas savings plus the gas that leaked from the system) was calculated based on the saved gas for each type of gas (unconventional and conventional) and the leak rate by type of gas (unconventional and conventional), where total gas equals gas savings divided by 1 minus the leak rate.²⁰⁶

The methane leak rate by type of gas (5.75 percent for unconventional and 3.85 percent for conventional) was applied to the total gas that would have been pumped (by type) to determine the cubic feet of methane leaks. The volume of methane leaks was converted into pounds and then multiplied by the global warming potential of 84 times greater than CO₂ over a 20-year timeline.²⁰⁷

Endnotes

- 1 Food & Water Watch's estimate of energy efficiency savings is based on median annual technical savings from three meta-analyses of energy efficiency studies produced by the American Council for an Energy-Efficient Economy (ACEEE). It is adapted from the National Academy of Sciences. National Academy of Sciences (NAS), National Academy of Engineering and National Research Council (NRC). "Real Prospects for Energy Efficiency in the United States." The National Academies Press. 2010 at Table 2.8 at 56. The NAS used the median annual savings of studies contained in the earliest of the ACEEE studies, and Food & Water Watch updated the studies contained in the meta-analyses dataset with two subsequent ACEEE studies (see Methodology at page 21 for more detail). The 2010 NAS estimate was used by a 2014 Political Economy Research Institute / Center for American Progress study and is in line with the 2009 McKinsey & Company estimates.
- 2 Although this model uses the technically feasible efficiency savings estimate, the NAS report was written before the advent of many currently technically available efficiency equipment types, such as LED lighting, and recognizes that efficiency savings estimates are likely inherently conservative. The NAS writes that "the risk of overestimating efficiency potential is minimal" and that efficiency studies "openly and intentionally make assumptions that lead to 'conservatively' low estimates of the efficiency resource." NAS, National Academy of Engineering and NRC (2010) at 59.
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More Food & Water Watch Research on Energy and The Environment



Cleanwashing: How States Count Polluting Energy Sources as Renewable

Twenty-nine states and the District of Columbia have mandatory programs to encourage renewable electricity generation. These Renewable Portfolio Standard (RPS) programs set renewable electricity goals and determine which energy sources qualify as renewable. Food & Water Watch evaluated each of the state RPS programs based on whether the program goals would target 100-percent renewable electricity, whether the programs included any of six dirty energy sources and the misguided policy of renewable energy credits, and whether the states were on track to achieve 100-percent wind, solar and geothermal electricity generation within two decades — a renewable transition time frame necessary to stop the worst and potentially irreversible effects of climate change.



Another Petrochemical Sacrifice Zone: Proposed Appalachian Gas "Cluster" Would Pollute Region and Entrench Fossil Fuel and Plastics Infrastructure for Decades

The proposed Appalachian storage complex may be a profit bonanza for industry, but it is a pollution pitfall for communities and ecosystems in the area. Converting the region into the second largest concentration of plastics and chemical manufacturing outside the highly polluted Gulf Coast will compound the Tri-State area's already substantial exposure to industrial toxic emissions, while increasing plastic materials that largely end up polluting the earth's oceans.



Saving Energy to Mitigate Climate Change

As global temperatures rise — risking irreversible worldwide climatic changes — the United States consumes too much energy from dirty fossil fuels that spew greenhouse gas emissions. Efficiency measures offer proven and cost-effective ways to reduce emissions from power plants by avoiding the initial demand to generate electricity. Widespread deployment of energy efficiency could effectively mitigate some of the climatic changes that come with rising global temperatures.



Investing in Energy Efficiency for a Fair and Just Transition

The United States must make a substantial investment in energy efficiency to reduce energy consumption, save money, protect the climate and create jobs. This investment should be part of any national strategy to address the climate crisis and also spur job creation to curb America's growing economic inequality. A \$500 billion nationwide investment in upgrading energy efficiency by 2035 could reduce energy use, stimulate the economy, and provide a fair and just transition for fossil fuel workers and vulnerable communities.

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