Energy Efficiency *with* Justice

How State Energy Efficiency Policy Can Mitigate Climate Change, Create Jobs, and Address Racial and Economic Inequality

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Executive Summary

Given the current assault on responsible climate policy at the federal level, innovative state and local action will be critical if we are to achieve a just transition to a sustainable economy. IPS is surveying the array of state and local measures that can accelerate the just transition from an extractive, fossil fueled economy to a clean, regenerative economy. In this study, we focus on one set of policies: energy efficiency in residential, commercial, and public buildings.

Energy efficiency is not merely a useful money-saving strategy for households. It is a critical tool to address the inherent inequalities in our energy system.

Our current fossil-fuel powered, dirty energy system cannot provide energy at a price that many vulnerable people can afford in order to live safe, healthy lives. Almost one-third of Americans face energy insecurity, and the shares are much higher for people of color and low-income people. At the same time, the very people who cannot afford the benefits of our energy system are paying a disproportionate share of its costs, as evidenced by their higher exposure to pollution and higher rates of pollution-related illnesses such as asthma. Energy efficiency addresses these inequalities at both ends, by making energy bills more affordable for vulnerable people, while also reducing the need for energy production (and therefore, reducing the associated pollution).

Energy efficiency is also an important driver of job creation. With the right policy tools, people from marginalized communities facing the double burdens of energy insecurity and energy-related pollution can gain access to energy efficiency careers. This is another way in which energy efficiency can help address the inequalities in our energy system.

The particular policies covered in this report include:

- Energy-efficient building codes for new construction.
- Requirements for utilities to provide energy efficiency as a service to all customers, with numerical targets for overall energy use reduction.
- Appliance efficiency standards where not pre-empted by federal standards.
- Targeted incentives for energy efficient lighting.
- Financing mechanisms to address the high up-front costs of energy efficiency investment, that do not burden low-income households with debt, and are accessible to renters as well as homeowners.

A number of states have enacted one or more of these policies, but there are significant gaps. Some states have enacted some but not all of these policies, and some states have policies in place, but with targets that are set too low. Also, some state policies do not have an explicit focus on racial and economic justice, benefits for marginalized communities, and job creation and quality.

Expanding these policies both quantitatively and qualitatively would have significant environmental, economic, and social benefits, including:

Reducing greenhouse gas emissions

The residential and commercial sector together account for almost one-third (32.9%) of U.S. greenhouse gas (GHG) emissions by end use. To put this number in perspective, this share is greater than the end-use emissions of the entire transportation sector. Commercial and residential GHG emissions are primarily from electricity usage for lighting, heating, air-conditioning, and appliances, and from natural gas combustion for heating, hot water, and cooking applications. Any serious effort to reduce U.S. GHG emissions must therefore incorporate aggressive energy use reduction in residential and commercial buildings. Reducing residential energy usage by 1.25% annually, and reducing commercial energy usage by 0.33% annually, in conjunction with other policies such as complete conversion of electricity generation to renewable sources, can reduce U.S. greenhouse gas emissions to 80% below 1990 levels by 2050. Existing utility efficiency mandates are already in this range. The median annual energy use reduction requirement for electric utilities in existing state mandates is 1.25%, and the maximum requirement is 2.94%. The equivalent numbers for gas utilities are 0.6% and 1.61%. Clearly, the required energy use reductions in the residential and commercial sectors to achieve desired GHG reductions (in conjunction with other policies) are quite feasible.

Reducing emissions of other toxic pollutants

Reductions in energy usage in the residential and commercial sectors will lead to lower emissions of nitrogen oxides (NOx), particulate matter, sulfur dioxide (SO_2), and other pollutants, which have a range of harmful health effects, including asthma and other respiratory diseases. Just a conservative 5% reduction in residential and commercial electrical energy usage, if applied uniformly across the U.S. electric power generation fleet, leads to NOx emissions reduction equivalent to the NOx emissions of the eight largest coal-fired power plants in the U.S., and SO_2 emissions reduction equivalent to the SO_2 emissions of the seven largest coal-fired power plants in the U.S. Also, applying the 5% reduction in electricity generation uniformly across the U.S. electric power generation fleet produces a conservative estimate of emissions reductions, because in practice, the reductions in generation are likely to come disproportionately from coal-fired power plants, which are increasingly uncompetitive with other energy sources, and have much higher emissions rate than the power generation fleet as a whole (twice as much NOx emissions per gigawatt-hour of output, and 2.4 times as much SO_2 emissions per gigawatt-hour of output).

Health benefits for environmental justice communities

Reductions in NOx, SO_2, and particulate matter emissions will provide tangible health benefits to communities of color and low-income communities who have borne the brunt of these toxic pollutants, as shown by the disproportionate location of polluting facilities in these communities, and the disproportionately higher asthma rates in these communities compared to the national average. Improved health outcomes for communities will also have educational and economic benefits because of fewer lost school days and work hours.

Reducing utility investment needs and consequent rate increases

If energy efficiency measures significantly reduce residential and commercial energy consumption, the required capital investments by electric utilities for new generation infrastructure and added transmission capacity to address future demand growth and replace retiring capacity will be lower. Similarly, the required capital investments by gas utilities for gas pipeline infrastructure will be lower. A 2014 study found that utility investments in electrical energy efficiency cost only $28 per MWh of energy saved, significantly lower than the investment per MWh of new generating capacity, even for the cheapest energy sources for new generation. Utilities recover these capital investments through rate increases, and therefore, investing in energy efficiency leads to lower rate increases in the future. Every dollar invested in energy efficiency saves ratepayers between $1.24 and $4.00.

Economic benefits for households

Lower energy bills are obviously beneficial to all households. Critically, they are most beneficial to low-income households, who pay an average of 10% of household income on energy bills, compared to a national average of 2.9%. These economic inequities are tied to racial and gender inequities, given the disproportionately higher rates of poverty for people of color (27.6%, 26.2%, and 23.4% for Native Americans, African-Americans, and Latinx, respectively, compared to 10.6% for White people), and the similarly high rates of poverty experienced by women (in more than 55% of households in poverty, all adults present are women). Reduced energy bills are therefore particularly beneficial to low-income people, people of color, and women.

Reduced energy insecurity

When high energy costs compel people to either use less energy than the minimal level needed for health and safety, or cut back on other essential costs to pay their energy bills, they experience energy insecurity. This includes people who are forced to choose between paying energy bills or paying for other essentials such as food or medical care, or people who have their utilities disconnected for inability to pay. Almost one-third of Americans overall experience energy insecurity, and for some populations, half or more experience energy insecurity (almost 62% for Native Americans, 52% for African-Americans, 50% for Native Hawai'ians and other Pacific Islanders, and 51% for households with annual income below $20,000). Energy efficiency can play a critical role in addressing energy insecurity.

Job creation and quality

For every $1 million invested in building retrofits, almost 12 jobs are created, while the equivalent numbers for the coal sector and the oil and gas sector are almost 5 jobs and under 4 jobs, respectively. Energy efficiency thus has the potential to create many more jobs than conventional fossil-fuel based energy. Already, energy efficiency jobs outnumber fossil fuel jobs by more than a factor of two, and are growing much faster. From 2015 to 2016, jobs in Energy Star appliance manufacturing, distribution, and sales grew by 59%, and jobs in advanced building materials grew 53%, compared to a growth of only 9% in fossil-fuel burning electricity generation. Investing in energy efficiency instead of fossil fuels is therefore a proven way to create more jobs. Energy efficiency jobs for the most part have median hourly wages that are higher than the median wage for all occupations, and have a union representation rate of 14% compared to 11% for the entire U.S. workforce.

Even though energy efficiency upgrades have the potential to save a lot of money over their lifetime, the high initial cost of some energy efficiency upgrades can deter many households and small businesses from investing in energy efficiency. Another constraint that limits wider adoption of energy efficiency in rental housing is that tenants are typically responsible for paying utilities, and are therefore the ones who benefit from energy efficiency, but traditional financing mechanisms (such as home equity loans) are tied to property ownership, and owners of rental properties have no incentive to invest in energy efficiency if their tenants pay the bills. The two problems are intertwined, since a disproportionately large share of low-income people are also renters.

One way that states address the problem is by providing (or requiring utilities to provide) free energy efficiency upgrades for low-income households, funded through one or both of direct state funding and a surcharge paid by all utility ratepayers on their monthly utility bills.

Another innovative financing mechanism that addresses both these problems is inclusive financing, in which utilities pay the upfront costs of energy efficiency upgrades, and recover the costs through a charge on the customer's utility bill. Typically, these programs require bill neutrality, which means that the cost recovery charge cannot exceed the savings from the efficiency measures, and therefore, the customer experiences no increase in utility bills, or even benefits from net monetary savings, in spite of paying the cost recovery charges. Also, the financing is tied to the meter rather than the property or the borrower. If the initial borrower moves out and a new tenant moves in, the new tenant becomes responsible for repayment.

Inclusive financing is legislatively required in four states, enabled by legislation in eight more states, and utilities have implemented programs on their own in 19 other states. Inclusive financing can therefore be expanded through legislation in a large number of states.

Some policy recommendations for just and effective energy efficiency policy include:

Policy should be ambitious and comprehensive.

States enacting new energy efficiency policy (or strengthening and updating existing policy) need to set sufficiently ambitious targets, and design policy to increase efficiency as comprehensively as possible. For example:

- Building codes should be based on the most recent available standards.
- Utility efficiency mandates should be enacted where they do not exist, expanded to cover both electric and gas utilities in states where they currently apply only to electric utilities, and the quantitative targets for utility energy use reduction should be raised in states

where they are currently low compared to clearly feasible levels set by other states.
- States should enact water and energy efficiency standards for appliances and equipment unless preempted by federal law.
- States should enact inclusive financing tied to utility meters for energy efficiency upgrades, with bill neutrality.

Equity should be built in by design, not as an afterthought.

Racial, economic, and gender justice should be regarded as an equally important goal of energy efficiency policy as reduction of greenhouse gases and other pollutants, and considerations of justice should be incorporated into designing policies from the outset. Involving affected communities in policy design, implementation, and monitoring is key to ensuring that this happens. A few selected elements of just and equitable energy efficiency policy include:

- **Dedicated funding.** Require utilities to set aside funds for low-income energy efficiency. Supplement these funds with direct state funding.
- **Expanding the definition of low-income households.** The official poverty rate of 12.7% undercounts people facing economic insecurity. The share of the U.S. population that is economically insecure as measured by the Supplemental Poverty Measure (SPM) is 43.5%.
- **Disconnection assistance.** Utilities should be required to set up disconnection assistance funds for low-income customers who have been disconnected, or are facing disconnection, for inability to pay their bills, with a particular focus on reaching the most vulnerable.
- **Prioritizing the upgrades that deliver the greatest savings.** This ensures that the households who are most in need are served first, and each household served by the program gets the greatest possible benefit.
- **Language access.** Energy efficiency programs must be designed to serve the needs of households in which adult members speak no English or limited English, and communities with a large proportion of such households.
- **Effective outreach.** This includes making program information available using multiple media (online, print, radio, TV, in-person door to door outreach, etc.) instead of relying solely on online tools, to account for the pervasive digital divide.

Needs of renters and multifamily building residents must be taken into account.

Nationwide, 37% of households rent their homes, and the numbers are much higher for households with annual income below $20,000 (59%), African-Americans (58%), Native Hawai'ians and Pacific Islanders (56%), Latinx (55%), and Native Americans (52%). It is therefore critical that energy efficiency policy address the needs of renters. Two complementary approaches to addressing renters' needs are inclusive financing for energy efficiency upgrades that are tied to utility meters, and targeted incentives for owners of low-income rental housing to upgrade the energy efficiency of their buildings.

Address the high upfront cost barrier.

Energy efficiency upgrades offer substantial financial benefits over their lifetime, but the high upfront costs of some upgrades act as a barrier to their implementation. States can address this barrier by funding no-cost or low-cost energy efficiency upgrades for low-income households funded through some combination of state funds or required surcharges on all customers' utility bills. They can also implement inclusive financing tied to utility meters, with on-bill repayment and bill-neutrality. The two approaches are not mutually exclusive and can be implemented in conjunction with each other.

Set requirements for job accessibility, training, and quality.

For the job creation benefits of energy efficiency to be widely shared, the jobs resulting from increased access to energy efficiency must be accessible to historically excluded populations such as communities of color, low-income people, formerly incarcerated people, etc. A diverse energy efficiency workforce has the added benefit of attracting a more diverse pool of beneficiaries of energy efficiency, since communities are likelier to participate in programs that involve community members in outreach efforts and that create jobs for community members. For the resulting jobs to deliver real gains for working people, they must pay good wages and benefits and workers should have the opportunity to organize unions. Currently, the energy efficiency workforce lacks racial and gender diversity (about 31% people of color and 24% women, compared to about 35% people of color and 47% women for the entire U.S. workforce). The 14% unionization rate in energy efficiency jobs is higher than the 11% rate for the entire U.S. workforce, but the vast majority of energy efficiency workers are not unionized. Specific policy tools to drive greater diversity and higher labor standards include:

- Hiring goals for government-funded or mandated energy efficiency projects.
- Goals for contracting with minority-owned and women-owned businesses for government-funded or mandated energy efficiency projects.
- Better coordination between energy efficiency policy and workforce development policy.
- Ensuring that energy efficiency skills training available to job seekers matches employer needs.
- Involving organizations based in communities of color and low-income communities, unions, energy efficiency contractors, and a range of other organizations in policy design, as well as in subsequent implementation, including training, hiring, and monitoring and evaluation.
- Setting minimum wage standards (such as a floor for the median hourly wage and/or the starting wage), and requiring that contractors either offer health benefits or pay a supplemental wage to offset health care costs.

Introduction

In the current environment of federal inaction and worse on climate, state and local governments, which tend to be more responsive to popular pressure, offer an opportunity for advancing an ambitious people's climate agenda. In fact, if we are to have any hope of reducing U.S. greenhouse gas emissions over the next few years, and of ensuring that the transition from fossil fuels to clean energy accounts for the rights of low-income communities, communities of color, and displaced former fossil fuel workers, we have no choice but to pressure our states, cities, and counties to act on climate.

Fortunately, many state and local governments have already taken actions to advance a just climate agenda that can be improved upon and replicated across the country. This report is the second in an Institute for Policy Studies series highlighting some of the most promising of these actions, identifying best practices for policy design, and sharing lessons for movement building and advocacy.

The first report in the series focused on expanding state renewable energy mandates, combined with increasing distributed solar energy access for low-income households and renters. This report examines state and local policies that reduce energy demand by making homes and commercial and government buildings and common household, commercial, and industrial appliances more energy efficient, and requiring electric and gas utilities to provide energy efficiency as a service to their customers, thereby reducing energy usage and greenhouse gas emissions.

For methodological reasons, transportation energy efficiency is not included in this report, and will be discussed in a subsequent report on land use and transportation policy.

Energy efficiency policies by definition have an equity impact by saving money for low-income ratepayers, who pay a greater share of their income for energy costs than higher income ratepayers. However, to ensure that everyone truly benefits from the transition to a clean energy economy, equity needs to be incorporated into policies by design. Accordingly, the report addresses ways to increase the equity focus of state and local energy efficiency policy by ensuring that low-income people and people of color benefit from residential energy efficiency upgrades, that tenants and residents of multifamily buildings are not forgotten, and that historically excluded populations have access to the jobs created by residential and commercial energy efficiency upgrades.

The series as a whole will focus on policies that:

1. Have the potential for significant climate impacts.
2. Directly address racial and economic equity.
3. Advance the notion of "economic democracy," or a decentralized production and distribution system for goods and services with greater public control and accountability than today's corporate-controlled economy.
4. Offer existing models that can be improved and replicated.
5. Promote positive solutions (e.g., renewable energy, energy efficiency, green jobs, public transit) as well as policies that roll back climate destruction (such as ending state fossil fuel subsidies).
6. Include examples of effective grassroots campaigns driven by diverse cross-sectoral coalitions.

Our hope is that this report series will both inspire and inform readers to start grassroots organizing to win policy changes at the state and local level to advance a People and Planet First climate agenda.

A Background

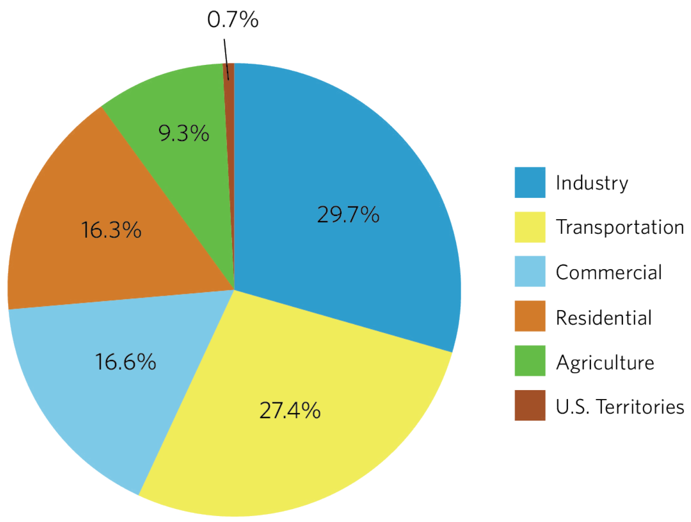
Where Do US Greenhouse Gas Emissions Come From?

If we are to reduce greenhouse gas (GHG) emissions by cutting back on energy consumption, it is important to understand where greenhouse gas emissions in the U.S. come from, by end-use sector.

Apportioning emissions by end-use sector is conceptually different from apportioning emissions by source. When apportioning emissions by source,[1] emissions from fossil-fuel based electricity generation are attributed to the electric power generation sector.

Electricity is used in various sectors of the economy, such as the industrial, residential, and commercial sectors. (The commercial sector includes office buildings, retail stores, hotels, restaurants, etc.) If we attribute emissions from electricity generation in the U.S. in proportion to end-use of electricity by economic sector, we find that industry, transportation, and the residential and commercial sectors together account for the overwhelming majority (90%) of U.S. GHG emissions (Figure 1).

Figure 1. U.S. Greenhouse Gas Emissions by End-Use Sector, 2015 [2]



Source: Environmental Protection Agency

Note that the commercial and residential sectors combined are the largest single source of GHG emissions (32.9%), ahead of industry. This underscores the importance of focusing on these sectors, in particular, for energy efficiency policy.

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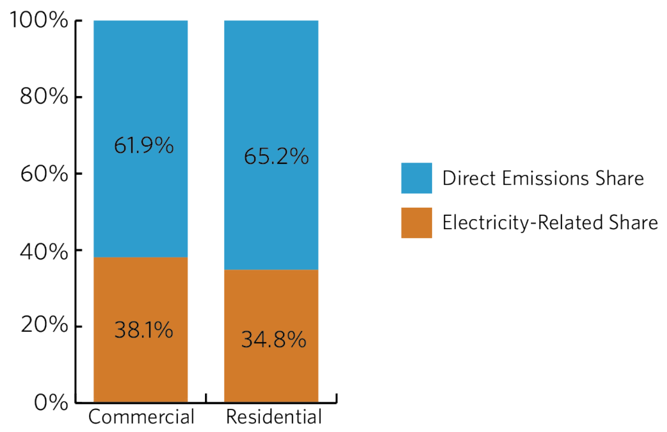
[1] U.S. Environmental Protection Agency (EPA), "Inventory of U.S. Greenhouse Gas: Emissions and Sinks:1990-2015," draft report for public comment, Table 2-10, pp. 2-23 – 2-25, available at https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf.
[2] Ibid., Table 2-12, pp. 2-27 – 2-28. For methodological reasons, EPA does not break out GHG emissions by end-use for U.S. territories, but combines them into a single category.

Commercial and residential GHG emissions are primarily from electricity usage for lighting, heating, air-conditioning, and appliances, and from direct emissions from natural gas combustion in residential and commercial buildings for heating, hot water, and cooking applications.[3] The split between GHG emissions attributable to electricity usage and to direct emissions is relatively similar between the commercial and residential sectors (Figure 2). This similarity in the applications contributing to emissions, and in the split between direct and electricity-related emissions, suggests that a similar set of energy efficiency measures (such as lighting, heating, and air-conditioning efficiency and building insulation) can work in both the residential and commercial sectors.

Figure 2. Shares of Residential and Commercial Greenhouse Gas Emissions Attributable to Electricity and Direct Emissions, 2015[4]



Source: Environmental Protection Agency

More than 73% of industrial GHG emissions are attributable to direct emissions by industry, and less than 26% to electricity use.[5] Direct emissions by industry are primarily from fossil fuel combustion in industrial processes, and also from emissions from industrial processes in which the byproducts are greenhouse gases.[6] Direct emissions from fossil fuel combustion are from a range of industries including steel and other primary metals, cement manufacturing, oil refining, paper manufacturing, food processing, etc. An effective energy efficiency approach for industry would therefore entail a substantively different set of policy interventions than what are needed for residential and commercial energy efficiency, and are outside the scope of this report.

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[3] Ibid., pp. 2-30 – 2-31.
[4] Ibid., Table 2-12, pp. 2-27 – 2-28.
[5] Ibid.
[6] Ibid., p. 2-28, pp. 3-16 – 3-17.

B State and Local Policy Options for Energy Efficiency

This section examines a range of policies adopted by states and municipalities to mandate energy efficiency, and incentivize energy efficiency initiatives that exceed mandates.

B.1 Energy efficiency for new residential and commercial buildings

States have a range of energy efficiency mandates for residential and commercial buildings in their building codes. In most states, however, these apply to new construction alone. Also, there is considerable variation between states regarding whether or not they have adopted the most recent available energy efficiency standard, or an earlier, less state-of-the-art standard, which means that two states with mandatory residential or commercial building efficiency standards may in practice have substantively different standards.

The applicable standards are the International Energy Conservation Code (IECC) standard,[7] mainly used for residential buildings, for which the most recent available standard is 2015, and the ASHRAE[8] 90.1 standard, mainly used for commercial buildings, for which the most recent available standard is 2016.[9]

Currently, 40 states and the District of Columbia have mandatory residential building energy efficiency standards, and another two states have a qualified mandate.[10] Eight states have no statewide mandates for residential building energy efficiency, leaving local jurisdictions to regulate residential building energy efficiency if they choose to. Ten states with mandatory standards allow local jurisdictions to adopt more stringent efficiency requirements.

Forty states and the District of Columbia have mandatory commercial building energy efficiency standards, and another four states have a qualified mandate.[11] Six states have no statewide mandates for commercial building energy efficiency, leaving local jurisdictions to regulate commercial building energy efficiency if they choose to. Thirteen states with mandatory commercial building efficiency standards (including all four states with a qualified mandate) allow local jurisdictions to adopt more stringent efficiency requirements.

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[7] The International Energy Conservation Code standard is an industry standard for residential as well as commercial building energy efficiency, developed by the International Code Council, an industry association (https://www.iccsafe.org/about-icc/government-relations/international-energy-conservation-code-resource-page/).

[8] ASHRAE, formerly the American Society of Heating, Refrigeration, and Air-conditioning Engineers, is a trade association of the built environment climate control industry (https://www.ashrae.org/about-ashrae)

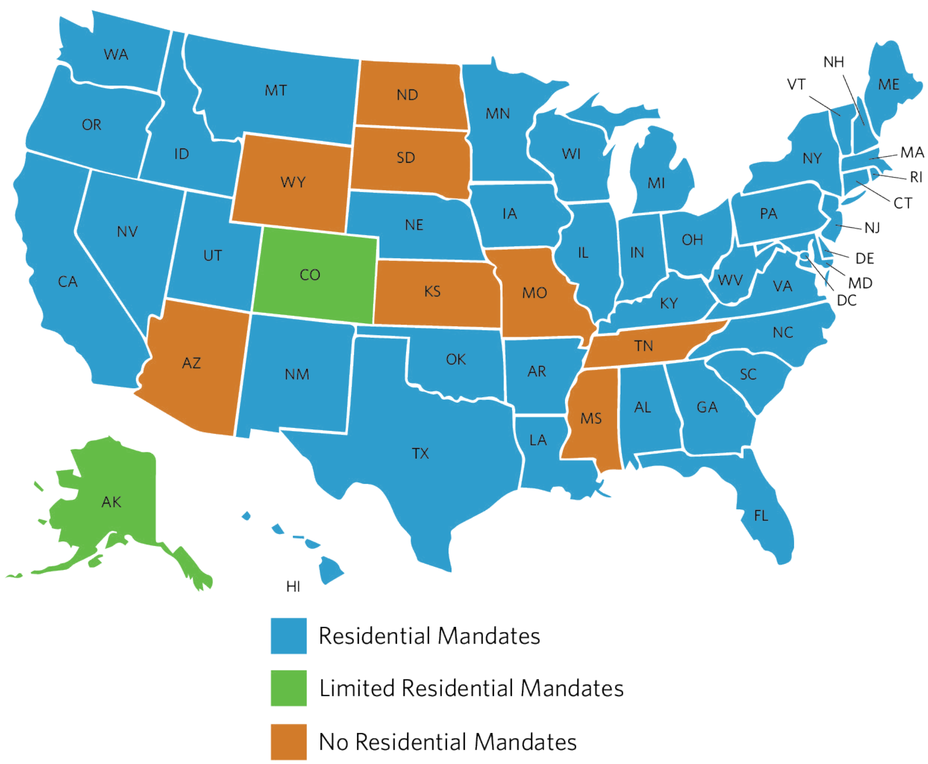
[9] ASHRAE, Energy Standard for Buildings Except Low-Rise Residential Buildings, preview only available at: https://ashrae.iwrapper.com/ViewOnline/Standard_90.1-2016_(IP)

[10] Alaska mandates the 2012 IECC standards only for residential buildings that have received Alaska Housing Finance Corporation financing. Colorado requires the 2003 IECC standards as a minimum for those local jurisdictions that adopt and enforce a residential building energy efficiency code, and for factory-built homes and multifamily apartment buildings, but otherwise doesn't require jurisdictions to have a standard in the first place.

[11] Arizona mandates energy efficiency standards for state-funded commercial buildings only. Colorado requires the 2003 IECC standards as a minimum for those local jurisdictions that adopt and enforce a commercial building energy efficiency code, but otherwise doesn't require jurisdictions to have a standard in the first place. South Dakota and Tennessee allow local jurisdictions to opt out of the statewide commercial building code.

Figure 3 below shows the distribution of states with or without residential building energy efficiency mandates, and Figure 4 presents the corresponding data for commercial building energy efficiency mandates. Table 1 and Table 2 in the Appendix, respectively, present more detailed information on residential and commercial building energy efficiency requirements in the states.

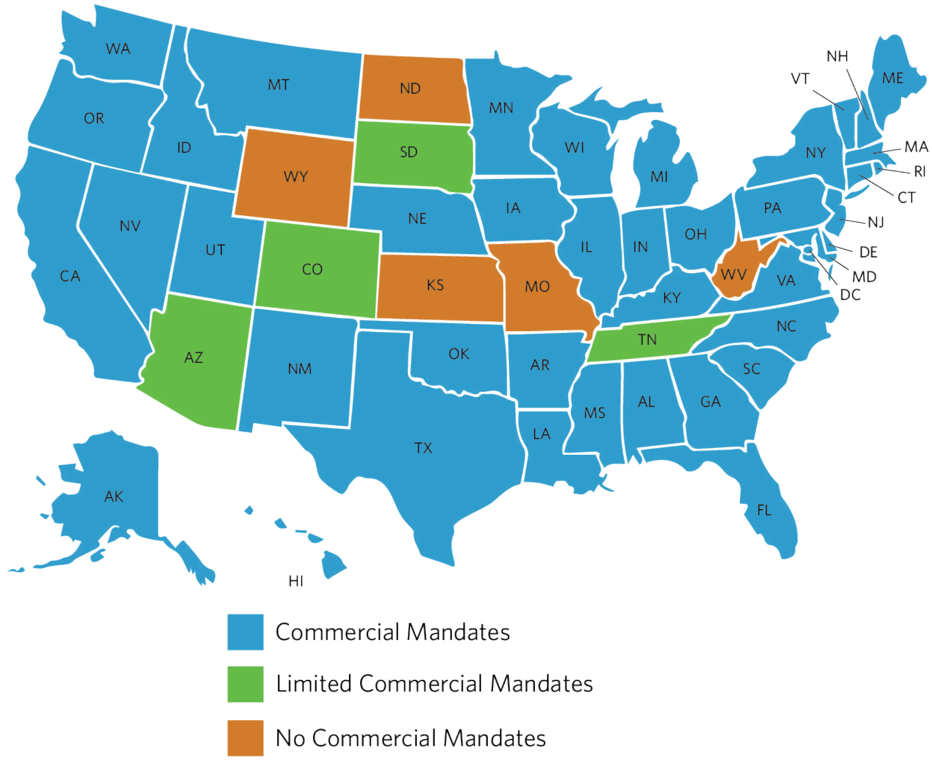
Figure 3. Residential Building Energy Efficiency Mandates in the States, 2017 [12]



Source: American Council for an Energy-Efficient Economy

[12] American Council for an Energy Efficient Economy (ACEEE) State Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/

Figure 4. Commercial Building Energy Efficiency Mandates in the States, 2017 [13]



Source: American Council for an Energy-Efficient Economy

Some states have more stringent requirements for particular types of construction, or buildings above a particular size. Examples include:

- The District of Columbia has a Green Construction Code that specifies more stringent efficiency requirements than the generally applicable building code for commercial buildings of 10,000 sq. ft. or greater, and residential buildings that are 10,000 sq. ft. or greater and with four or more stories.[14]
- Massachusetts requires commercial buildings above 100,000 sq. ft., supermarkets, laboratories, and climate-controlled warehouses to have energy use per sq. ft. that is 10% less than the specifications of ASHRAE 90.1-2013.[15]

[13] Ibid.
[14] Ibid.
[15] Ibid.

Ambitious New Building Energy Efficiency Requirements in California

California has enacted ambitious energy efficiency standards for new buildings, which go into effect on January 1, 2020. The requirements include:[16]

- Most new buildings are required to install solar photovoltaic systems. (While this is not an energy efficiency requirement per se, it reduces the energy that new buildings will draw from the grid.)
- Building envelope standards (minimizing heat transfer between a building and its surroundings) are made more stringent.
- Lighting standards for nonresidential buildings are upgraded.

The California Energy Commission estimates that the new standards will on average provide net savings of $40 per month for homeowners with a 30-year mortgage and reduce nonresidential building energy consumption by 30%.[17]

As noted above, several states allow local jurisdictions to adopt residential or commercial building efficiency requirements that are more stringent than the statewide requirements, and several other states have no statewide requirements, leaving local jurisdictions free to set their own requirements. While a complete mapping of local jurisdictions with higher building energy efficiency requirements in all of these states is beyond the scope of this report, a few key examples are highlighted, as follows.[18]

- Denver, CO, requires residential and commercial buildings to follow the 2015 International Energy Conservation Code (IECC) standard, even though the state of Colorado requires the 2003 standard.
- Lawrence, KS, also requires residential and commercial buildings to follow the 2015 IECC standard. Kansas is a home rule state in which local jurisdictions can set their own requirements in their building codes.
- New York City has adopted the 2016 New York City Energy Conservation Code (NYCECC), which is more stringent than the state-mandated 2015 IECC, for both residential and commercial buildings.

B.2 Energy efficiency requirements for public buildings

States usually have more stringent energy efficiency requirements for public buildings, which also help save the states money. In addition to efficiency requirements for new buildings (usually defined with respect to industry-standard building energy efficiency codes such as ASHRAE and IECC, mentioned earlier), some states also have similar requirements for renovations of public buildings. Figure 5 below shows the distribution of states with or without efficiency requirements for construction or renovation of public buildings.

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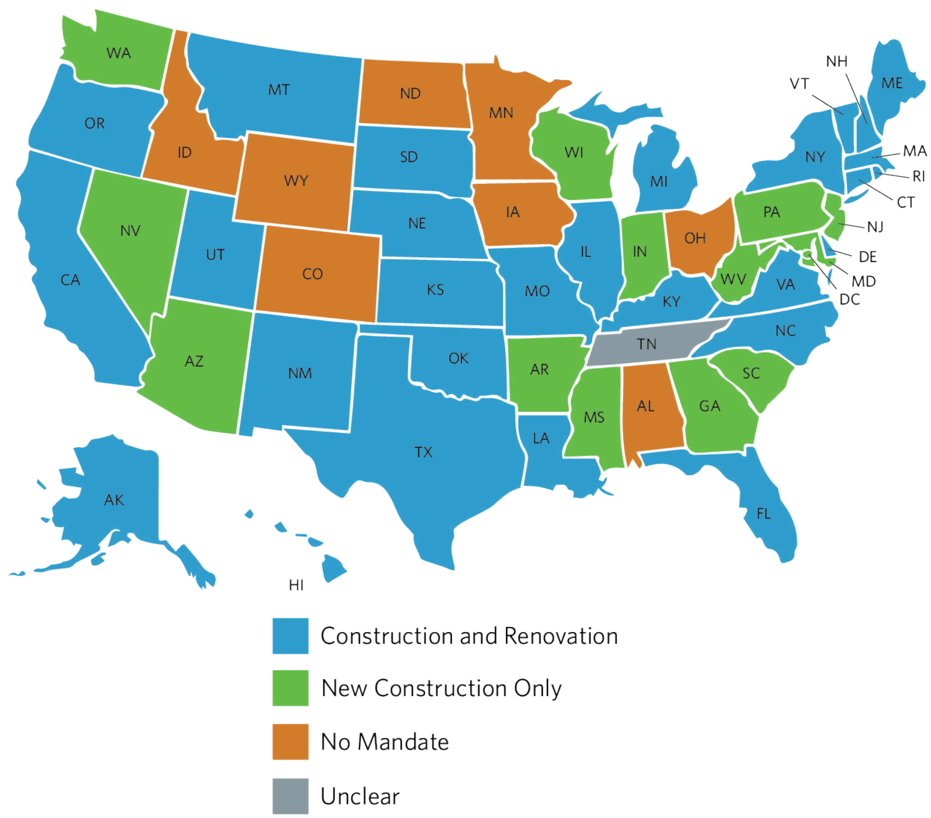
[16] California Energy Commission, “Energy Commission Adopts Standards Requiring Solar Systems for New Homes, First in Nation,” press release, 5/9/2018, available at: https://www.energy.ca.gov/releases/2018_releases/2018-05-09_building_standards_adopted_nr.html

[17] Ibid.

[18] All information from American Council for an Energy Efficient Economy (ACEEE) City Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/

Figure 5. Public Building Construction and Renovation Energy Efficiency Mandates in the States, 2017 [19]



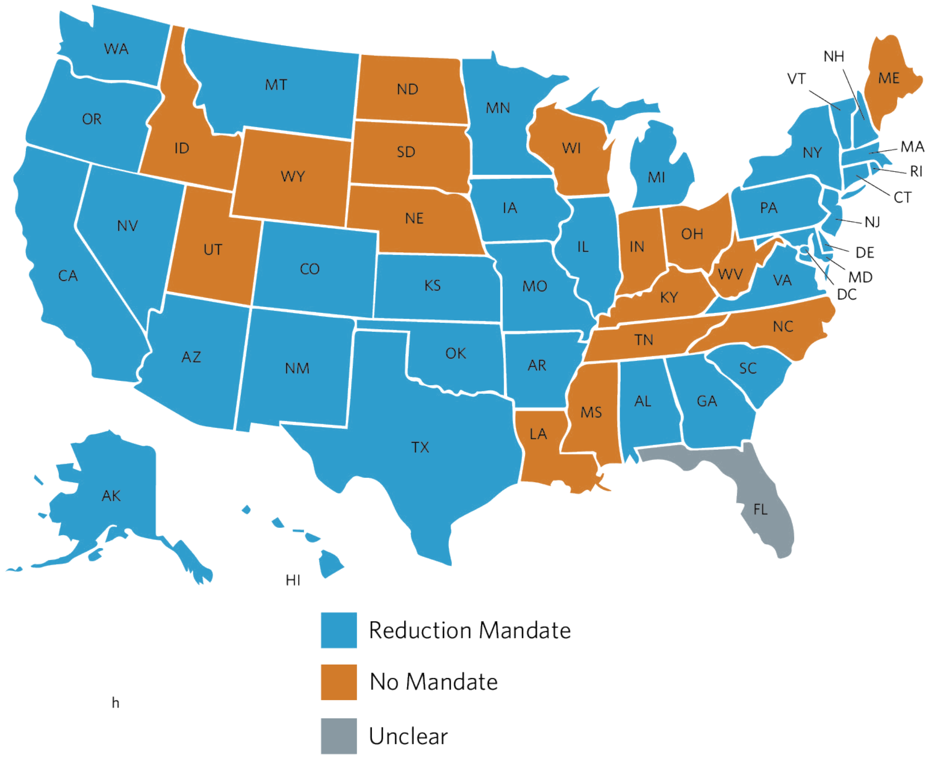
Source: American Council for an Energy-Efficient Economy

Some states apply their energy efficiency standards for construction and/or renovation of public buildings to state-owned buildings only, while others apply their standards to state-owned buildings as well as some combination of buildings leased by the state from third parties, buildings that have received state funds for their construction or renovation, and state university or public school buildings. Table 3 in the Appendix shows more detailed data on construction and renovation related energy efficiency mandates for public buildings in the states.

Many states also require ongoing energy efficiency upgrades in existing public buildings, as shown in Figure 6 below and Table 4 in the Appendix. Unlike the construction and renovation efficiency mandates, these mandates also apply to existing buildings not undergoing renovation. Among states that require ongoing energy efficiency upgrades, there is considerable variation with regard to energy use reduction targets, target and baseline dates, and whether buildings not owned by the state, such as state-leased or state-funded buildings, are covered by the mandate (Appendix Table 4).

[19] American Council for an Energy Efficient Economy (ACEEE) State Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/

Figure 6. State Mandates for Energy Use Reduction in Existing Public Buildings, 2017 [20]



Source: American Council for an Energy-Efficient Economy

Many states also require benchmarking of energy use in public buildings. Benchmarking is a process in which building owners are required to track and report energy use in their buildings, and the data from similar buildings by size and use are compared to generate a relative energy efficiency score. These data can be used by building owners to assess how efficient their buildings are compared to other similar buildings, and give policymakers an accurate picture of building energy consumption in their city or state.[21]

Local governments have the ability to set their own energy efficiency policies for public buildings. As with residential and commercial building energy efficiency standards, a complete mapping of local government public building efficiency requirements is outside the scope of this report. A few examples of strong local policies include:[22]

- Columbus, OH, requires new construction and major renovations in all city-owned buildings, as well as buildings with city investment, to be LEED Silver certified. Columbus also benchmarks 98% of municipal buildings.
- Houston, TX, requires new construction and major renovations in all city-owned buildings, as well as buildings with city investment, to be LEED Silver certified if the buildings are larger than 10,000 sq. ft. The city benchmarks energy usage in all of its municipal buildings,

[20] Ibid.
[21] For more explanation, see American Council for an Energy Efficient Economy (ACEEE), Benchmarking Initiatives in the Multifamily Market, available at: http://aceee.org/sector/local-policy/toolkit/benefits-benchmarking
[22] All information from American Council for an Energy Efficient Economy (ACEEE) City Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/

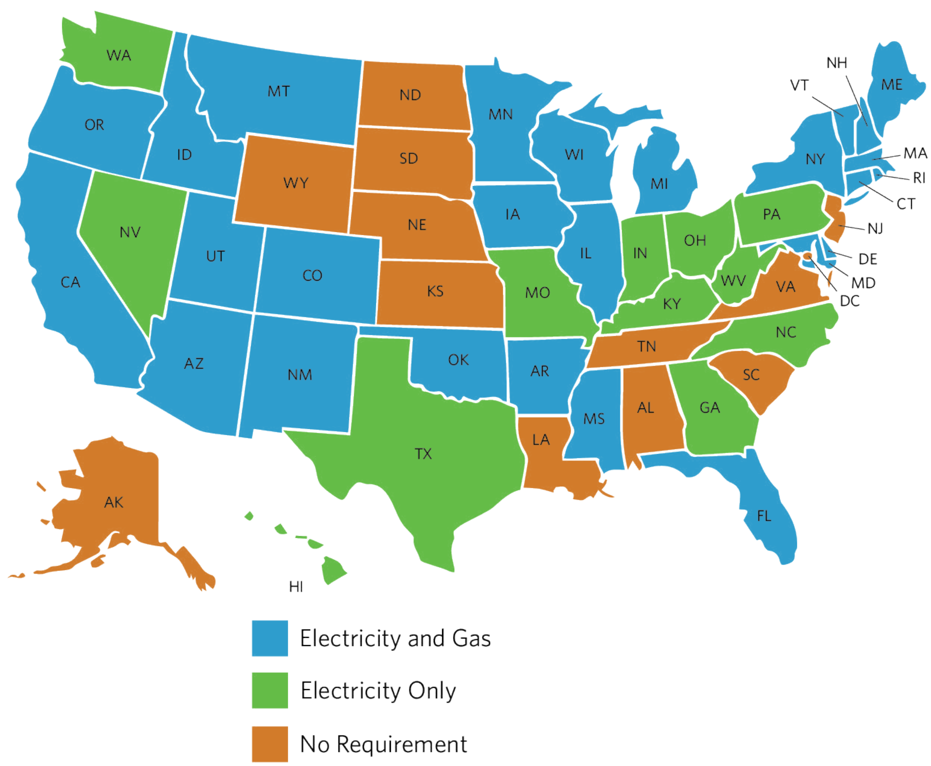
and has a comprehensive retrofitting strategy, which has achieved almost 30% reduction in energy usage since it was adopted.

- Knoxville, TN, requires all new city-owned buildings to meet Energy Star or LEED certification, and benchmarks energy usage in all municipal buildings. The city initiated a project to retrofit all city-owned buildings for greater energy efficiency in 2010, which has been completed.

B.3 Efficiency mandates for utilities

A number of state utility regulators have established requirements for utilities to achieve a certain amount of demand reduction, typically expressed as a target percentage reduction every year (for example, a 1% reduction every year), or as a target total reduction with reference to a baseline year by a target year (for example, a 10% reduction from 2010 levels by 2020). Where these requirements exist, they always cover electric utilities, but sometimes they cover natural gas utilities as well (Figure 7). [23]

Figure 7. State Requirements for Utility Efficiency Programs by Utility Type, 2017 [24]



Source: American Council for an Energy-Efficient Economy

Two states (Nevada and North Carolina) incorporate energy efficiency requirements into their Renewable Portfolio Standards (RPS),[25] which are state policies requiring electric utilities to obtain a growing share of electricity from renewable sources on a specified

[23] American Council for an Energy Efficient Economy (ACEEE), State Energy Efficiency Resource Standards (EERS) Policy Brief, January 2017, downloadable at: http://aceee.org/policy-brief/state-energy-efficiency-resource-standard-activity

[24] Ibid.

[25] American Council for an Energy Efficient Economy (ACEEE), http://aceee.org/topics/energy-efficiency-resource

timetable.[26] Including efficiency as a resource in the RPS is an explicit recognition of the potential for efficiency to reduce power generation from fossil fuel and other non-renewable sources.

Importantly, utility efficiency mandates are a way to reduce energy consumption in existing building stock and not just new buildings. This addresses an important gap identified in the earlier discussion on building codes. Utility efficiency mandates address energy consumption in the industrial sector as well, which is the largest single end-use sector for U.S. greenhouse gas emissions (Figure 1).

In most states with utility efficiency requirements, the programs are administered by utilities, but there are some exceptions:[27]

- In Alaska and New Jersey, the programs are administered directly by the state.
- In California and New York, the programs are administered by utilities as well as the state.
- In the District of Columbia, Maine, and Vermont, the programs are administered by a third-party non-profit. (See box below on the Maine efficiency program.)
- In Oregon, the programs are jointly administered by utilities and a third-party non-profit. (The Oregon program is discussed in some more detail in Section F. below.)

Maine's One-Stop Third Party Efficiency Provider

In Maine, energy efficiency services for all ratepayers for both gas and electricity usage are provided by a statewide third-party non-profit called Efficiency Maine. To preserve public accountability, Efficiency Maine is regulated by the Maine Public Utilities Commission.[28]

Efficiency Maine provides a wide range of household[29] and business[30] energy efficiency programs, with differing shares of funding covered and different cap amounts. Multifamily residential buildings with 5 or more units are considered businesses for the purpose of the program.

Specific programs offered include:

- Home insulation with a rebate of up to $3,000.[31]
- Low income home efficiency upgrades with a customer contribution of as low as $50 in some cases.[32]
- Water heater rebates of up to $750.[33]
- Free high-efficiency water heaters for qualifying low-income households, along with LED lightbulbs and high-efficiency water aerators and showerheads.[34] Households must participate in the federal Low Income Home Energy Assistance Program (LIHEAP) or state and local low-income assistance programs to qualify.

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[26]For a discussion of Renewable Portfolio Standards, see Sen, Basav, "How States Can Boost Renewables With Benefits for All: Renewable Portfolio Standards and Distributed Solar Access for Low-Income Households," Institute for Policy Studies, 2017, available at: http://www.ips-dc.org/report-how-states-can-boost-renewables-with-benefits-for-all/

[27]American Council for an Energy Efficient Economy (ACEEE) State Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/

[28]https://www.efficiencymaine.com/about/

[29]https://www.efficiencymaine.com/at-home/

[30]https://www.efficiencymaine.com/at-work/

[31]https://www.efficiencymaine.com/at-home/home-energy-savings-program/

[32]Ibid.

[33]https://www.efficiencymaine.com/at-home/

[34]https://www.efficiencymaine.com/at-home/low-income-water-heaters/

Different states have different cost recovery mechanisms in place for utility-run efficiency programs. Sometimes these programs are part of the "rate base," meaning that the costs of the efficiency programs are passed on to all ratepaying customers. Sometimes the specific ratepayers who benefit from the program pay for the costs of the specific energy efficiency measures installed in their homes or businesses. This can be a problematic requirement if not combined with mechanisms to enable low-income people to afford the up-front costs of efficiency programs.. (See Section D below on financing mechanisms.) Where programs are part of the rate base, there are sometimes cost caps in place that limit the amount of investment in efficiency that utilities can recover through rate increases.

Appendix Table 5 summarizes key information about utility energy efficiency requirements in the states.

B.4 Appliance standards

Appliance standards are standards governing energy and water efficiency of a very wide range of household and commercial products, including building heating and cooling appliances (such as air-conditioners, heating furnaces, space heaters, and ceiling fans), kitchen appliances (such as stoves, dishwashers, microwaves, refrigerators and freezers, etc.), laundry appliances (washers and dryers), water-using devices (such as showerheads and faucets), lighting equipment, and more.

While water efficiency is an important goal in its own right, this report focuses solely on energy efficiency, including the energy-saving benefits of water-efficient faucets and showerheads that conserve hot water.

The market for appliances in household and commercial use is nationwide, but historically, states have been the first to enact energy efficiency standards for appliances, in a process that has repeated itself at least three times. California enacted refrigerator, freezer, and air-conditioner standards in 1976. Then, as more states started to adopt the standards, appliance manufacturers became concerned about having to meet a patchwork of state standards and negotiated with states and efficiency advocates to push for mutually acceptable uniform federal standards, which pre-empted existing state standards. Subsequently, states enacted efficiency standards for a different set of appliances, and the process repeated itself.[35]

The Appliance Standards Awareness Project (ASAP) has a comprehensive list of residential, commercial, and lighting products (including street lighting and traffic signals) with energy and water efficiency standards at the federal and state levels.[36]

For the most part, when federal standards are enacted for a type of appliance, they "pre-empt" state standards, meaning that states are precluded from enacting standards for these products, and in most instances, state standards that precede the enactment of the federal standard become inapplicable. In some cases, state standards that are more stringent than

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[35]Mauer, Joanna, Andrew deLaski, and Marianne DiMascio, "States Go First: How States Can Save Consumers Money, Reduce Energy and Water Waste, and Protect the Environment with New Appliance Standards," Appliance Standards Awareness Project (ASAP) and American Council for an Energy-Efficient Economy (ACEEE), July 2017, available at: http://aceee.org/research-report/a1702

[36]https://appliance-standards.org/national

federal standards are allowed to remain in place.[37] In particular, since federal standards for water efficiency for faucets and showerheads (which, as noted earlier, have a significant energy efficiency impact because they affect hot water usage) have not been updated since 2010, the Department of Energy has waived the federal preemption of state standards for faucets and showerheads.[38] [39]

Appendix Tables 6, 7, and 8 show which common household, commercial, and lighting equipment, respectively, have standards at the federal level. For equipment with no federal standards (and some limited types of equipment with federal standards where preemption does not apply), the tables also show which states have enacted their own efficiency standards. Lighting equipment is considered separately in Table 8 from household and commercial equipment because in most cases the same lighting equipment is used for both household and commercial applications. Also, note that water efficiency requirements for water-using equipment are considered for two reasons. First, as noted earlier, efficient water use (in equipment such as faucets and showerheads, for example) reduces energy consumption for heating water. Secondly, water efficiency standards for equipment that does not use hot water (for example, sprinklers and toilets) also have an energy consumption impact, because there is "embodied energy"[40] in water, meaning, the energy used by the water supply utility to collect, purify, and distribute water.

As seen from Tables 6, 7, and 8, there are a number of product types for which states can enact efficiency standards, and relatively few states have done so. For example, only California has efficiency standards for computers (Table 6) and directional lamps for track lighting (Table 8). No states have enacted efficiency standards for air purifiers and lawn sprinklers (Table 6), or for common restaurant and foodservice equipment such as fryers and commercial dishwashers (Table 7). There is clearly substantial opportunity for states to enact efficiency standards.

A recent study has identified 21 appliances, spanning residential, commercial and industrial, and lighting appliances, that would generate the most energy or water savings, and consequently the most monetary savings, if states were to enact efficiency standards.[41] Appendix Table 9 shows the 21 appliances that states should prioritize for efficiency standards. Note that for more than half (11 of 21) products, no states have adopted efficiency standards, and for seven other products, fewer than five states have adopted standards. Clearly, appliance standards is an area with very large potential for state action on energy efficiency.

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[37]For a brief explanation of preemption, see Rottenstein Law Group, http://www.rotlaw.com/legal-library/what-does-preemption-mean-in-law/

[38]https://appliance-standards.org/product/faucets

[39]https://appliance-standards.org/product/showerheads

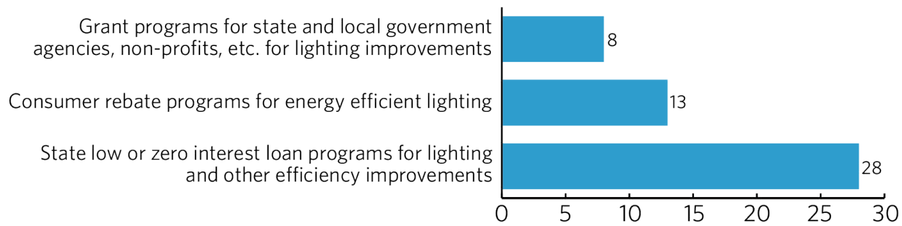
[40]Embodied energy is defined as "the sum of the energy requirements associated, directly or indirectly, with the delivery of a good or service". (Cleveland, C.J. & Morris, C.G., Dictionary of Energy: Expanded Edition, Elsevier Science, 2009.)

[41]Mauer, Joanna, Andrew deLaski, and Marianne DiMascio, "States Go First: How States Can Save Consumers Money, Reduce Energy and Water Waste, and Protect the Environment with New Appliance Standards," Appliance Standards Awareness Project (ASAP) and American Council for an Energy-Efficient Economy (ACEEE), July 2017, available at: http://aceee.org/research-report/a1702

B.5 Energy efficient lighting incentives

Thirty-six states have incentive programs to increase use of energy-efficient lighting.[42] Some of these programs are directly operated by states, and others are utility rebate programs authorized or mandated by states. Figure 8 below shows the distribution of these programs by type. (Note that the total number of programs in Figure 8 exceeds 36, because some states have more than one program type.)

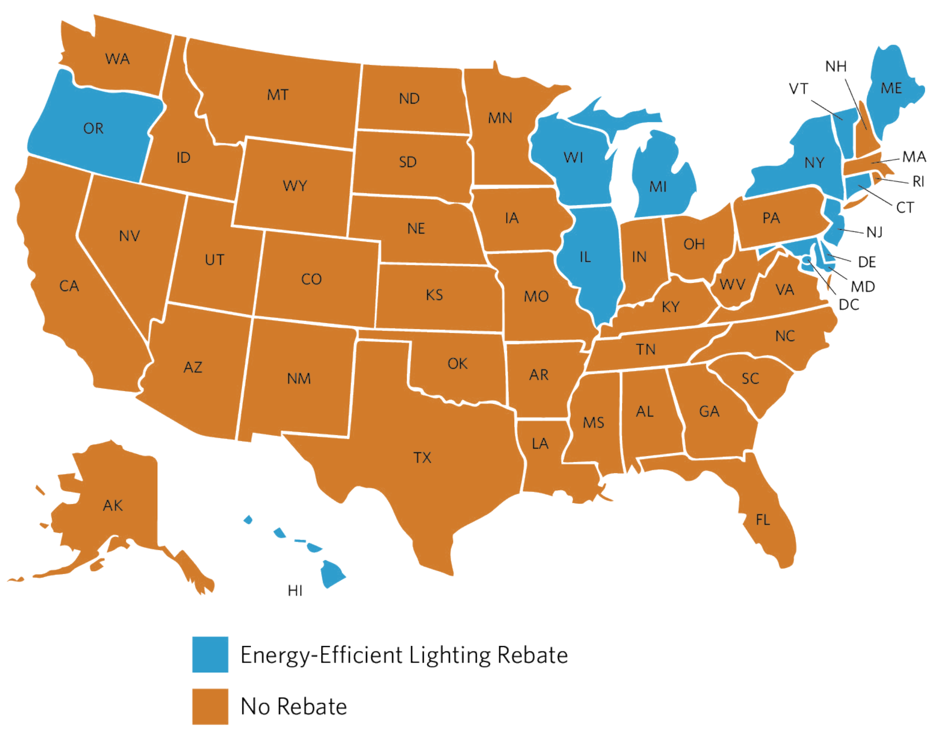
Figure 8. Number of State Lighting Incentive Programs by Program Type, 2016.[43]



Source: National Council of State Legislatures

Figure 9 below shows the distribution of consumer rebate programs, in particular, because they have the strongest potential to incentivize consumer adoption of efficient lighting, and make efficient lighting affordable for low-income households.

Figure 9. States with Consumer Rebate Programs for Energy Efficient Lighting, 2016 [44]



Source: National Council of State Legislatures

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[42] http://www.ncsl.org/research/energy/energy-efficient-lighting.aspx
[43] Ibid.
[44] Ibid.

A Cautionary Tale: Low-Income Communities Lack Access to Energy-Efficient Lighting in Michigan

The existence of consumer rebate programs does not ensure that low-income residents, in particular, have access to energy-efficient lighting. A recent study of energy-efficient lightbulbs in Detroit found that they were both less frequently available and higher-priced in areas with high poverty rates. Similarly, they were less frequently available and higher-priced in smaller stores (such as neighborhood hardware stores, convenience stores, etc.) than large retailers. Also, large retailers generally did not have locations serving low-income neighborhoods. Since residents of low-income areas often do not own cars and lack access to adequate and affordable public transit, they were not necessarily able to purchase energy-efficient lightbulbs from the stores in higher-income neighborhoods where they were more readily available and lower-priced.[45] Most disturbingly, Michigan is a state with a consumer rebate program for efficient lighting (Figure 9).

It is likely that the rebate program failed to address this issue because the BetterBuildings for Michigan residential energy efficiency program is offered in "selected neighborhoods" with a "high percentage of home ownership,"[46] a problematic requirement given the racial, economic, and other disparities in home ownership (see Section F.3), energy burden (see Section C.5), and energy insecurity (see Section C.6).

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[45] Reames, Tony G., Michael A. Reiner, and M. Ben Stacey, "An incandescent truth: Disparities in energy-efficient lighting availability and prices in an urban U.S. county," Applied Energy, Vol. 218, May 15, 2018, pp. 95 – 103. (Purchase required.) Also see press release accompanying study, "Energy injustice? Cost, availability of energy-efficient lightbulbs vary with poverty levels," University of Michigan, April 11, 2018, available at: https://www.eurekalert.org/pub_releases/2018-04/uom-eic041018.php

[46] BetterBuildings for Michigan Residential Program Fact Sheet, available at: https://www.energy.gov/sites/prod/files/2014/01/f6/michigan_residential_fact_sheet.pdf

C Social and Environmental Benefits of Energy Efficiency

C.1 Greenhouse gas reduction

As seen from Section A, Figure 1, the residential and commercial sectors combined are responsible for almost one-third (32.9%) of greenhouse gas emissions in the U.S. To put this number in perspective, it is about 20% greater than the total greenhouse gas emissions by end-use for the entire transportation sector. In other words, it is 20% greater than the combined emissions from every single car, truck, bus, diesel locomotive, and aircraft in the U.S., plus all the emissions from coal and natural gas combustion in power plants to generate electricity consumed by every electrified train in the U.S.

The amount of greenhouse gas reduction accomplished by a given reduction in energy use in the residential and commercial sector will vary greatly by state, depending on a number of factors, such as climatic conditions (which determine the length of heating and cooling seasons), the mix of residential and commercial energy consumption, the mix of types of commercial uses, the average age of the housing stock, the proportions of electricity, natural gas, and fuel oil for heating and cooking applications, the mix of sources in electric power generation, etc.

The Deep Decarbonization Pathways Project (DDPP), an international research consortium, has performed a study of feasible pathways to reduce U.S. greenhouse gas emissions 80% below 1990 levels by 2050, which they model as the scale of emissions reductions required to be made by the U.S. to keep global temperature increase to within 2 degrees Celsius (2ºC) above pre-industrial levels, the target set by the Paris accord.[47] While the DDPP study sets a 2ºC upper limit for global average temperature increase, scientific studies are increasingly calling for limiting temperature increase to at most 1.5 ºC. See the box below for an explanation.

Why a 2 degrees Celsius target is insufficient

The 2015 Paris Climate Agreement set 2ºC as the maximum temperature increase above pre-industrial levels that the world cannot afford to exceed, but also urged countries to pursue efforts that would limit global temperature increase to 1.5ºC.[48] However, the scientific community has since recognized that an increase of 2ºC would transition the world into a dangerous new climate regime, whereas 1.5ºC "marks the upper limit of present-day natural variability," the effects of which are better understood and can therefore be more adequately

[47]Deep Decarbonization Pathways Project (DDPP), "Pathways to Deep Decarbonization in the United States," U.S. 2050 Vol. 1, Technical Report, November 2015, available at: http://deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Technical_Report.pdf

[48]United Nations Framework Convention on Climate Change (UNFCCC), "Paris Agreement," 2015, Article 2, pp. 3, available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf

prepared for.[49]

The probabilities of extreme heat waves and precipitation are much higher for an average temperature rise of 2ºC as compared to 1.5ºC.[50] Similarly, mean sea level rise is expected to be significantly higher for 2ºC temperature increase as compared to 1.5ºC.[51] The differences in climate impacts between 1.5ºC and 2ºC will be felt most acutely in Asia, the Pacific, and Africa, in countries that host the largest populations of low-income people and people of color, and have the least resources to effectively adapt to climate change. For these environmental and social justice reasons, countries should strive to limit temperature increase to at most 1.5ºC.

Taking into account factors such as expected population and economic growth, and technical and economic feasibility of different technologies, the DDPP study finds that overall energy use in the economy needs to decrease between 18 and 22% below 2014 levels by 2050. (Note that this scenario assumes conversion of most end-uses in the residential and commercial sectors to electricity, and complete decarbonization of the electric grid.)

Figure 10 below shows the required decrease in residential and commercial energy use by 2050 relative to 2014 levels, and relative to a "Reference Case" scenario for 2050 (assuming no change in policy from 2014). As seen in Figure 10, deep reductions in energy use are required especially for the residential sector (in conjunction with other changes to our energy system) to be consistent with a target of no more than 2ºC global average temperature increase above pre-industrial levels.

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[49] Schleussner, Carl-Friedrich, Tabea K. Lissner, Erich M. Fischer, Jan Wohland, Mahé Perrette, Antonius Golly, Joeri Rogelj, Katelin Childers, Jacob Schewe, Katja Frieler, Matthias Mengel, William Hare, and Michiel Schaeffer, "Differential climate impacts for policy-relevant limits to global warming: the case of 1.5ºC and 2ºC," Earth System Dynamics, Vol. 7, April 21, 2016, pp. 343-44, available at: https://www.earth-syst-dynam.net/7/327/2016/esd-7-327-2016.pdf

[50] Schleussner, Carl-Friedrich, Joeri Rogelj, Michiel Schaeffer, Tabea Lissner, Rachel Licker, Erich M. Fischer, Reto Knutti, Anders Levermann, Katja Frieler, and William Hare, "Science and policy characteristics of the Paris Agreement temperature goal," Nature Climate Change, Vol. 6, July 25, 2016, pp. 828, available at: https://www.nature.com/articles/nclimate3096.epdf?author_access_token=RexikyN5vxy3ugz-flUY7NRgN0jAjWel9jnR3ZoTv0OZIUAyrJekwZ4HMq3DtbGkVcyLY2h9bp31usCfC_u2h2g9dVxNGp7x5wx9RnALdQbHs8mUKSwWRZf1ZPgp9tzH

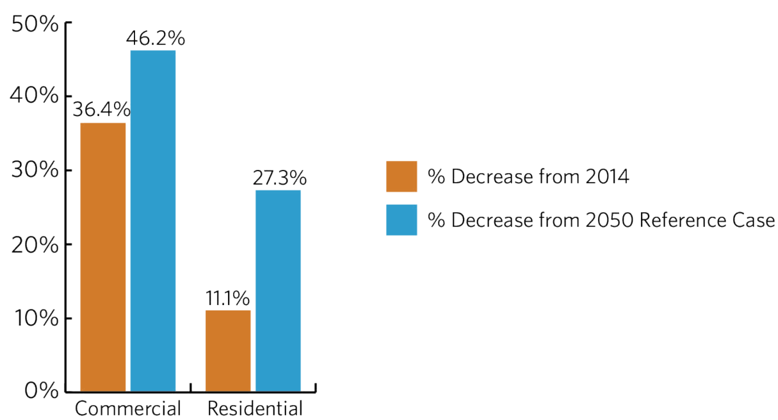
[51] Schleussner, Carl-Friedrich, Tabea K. Lissner, Erich M. Fischer, Jan Wohland, Mahé Perrette, Antonius Golly, Joeri Rogelj, Katelin Childers, Jacob Schewe, Katja Frieler, Matthias Mengel, William Hare, and Michiel Schaeffer, "Differential climate impacts for policy-relevant limits to global warming: the case of 1.5ºC and 2ºC," Earth System Dynamics, Vol. 7, April 21, 2016, pp. 343-44, available at: https://www.earth-syst-dynam.net/7/327/2016/esd-7-327-2016.pdf

[52] Deep Decarbonization Pathways Project (DDPP), "Pathways to Deep Decarbonization in the United States," U.S. 2050 Vol. 1, Technical Report, November 2015, p. 21, available at: http://deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Technical_Report.pdf.

Key residential and commercial energy efficiency measures identified by the study to meet the reduction targets in Figure 10 are: [53]

- Conversion of space heating and water heating from natural gas, fuel oil, etc. to high efficiency electric heat pumps. (The study did not consider direct geothermal heat as a potential energy source for heating and hot water applications.)
- Aggressive efficiency targets for end uses such as lighting, laundry, and dishwashers, together with a very high penetration of LED lighting.
- Improving building envelopes (doors, windows, and insulation).

Figure 10. Required Reductions in Energy Use to Meet Paris Accord Target [54]



Source: Deep Decarbonization Pathways Project

A 36.4% reduction in residential energy use from 2014 to 2050 translates into an annual reduction of 1.25% in residential energy usage, and an 11.1% reduction in commercial energy use from 2014 to 2050 translates into an annual reduction of 0.33% in commercial energy usage.[55] For existing state mandates for utility energy efficiency programs (Appendix Table 5), the median annual energy use reduction required for electric utilities is 1.25%, and the maximum is 2.94%. The equivalent numbers for gas utilities are 0.6% and 1.61%.[56] Clearly, the range of annual energy use reduction consistent with Figure 10 is feasible, and can be achieved in many instances by setting more ambitious quantitative targets for existing policy.

These overall energy reduction goals provide broad guidance to state and local policymakers to set aggressive energy efficiency targets for buildings, appliances, utilities, and more.

[53] Ibid., pp. 25-27.
[54] Our calculations based on Ibid., Table 7, p. 19.
[55] Our calculations, based on a geometric decay formula.
[56] Our calculation, based on data from American Council for an Energy Efficient Economy (ACEEE) State Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/. Where required energy use reduction is defined as a cumulative percentage over a number of years rather than an annual rate, we have converted it to the equivalent annual rate using an exponential decay formula.

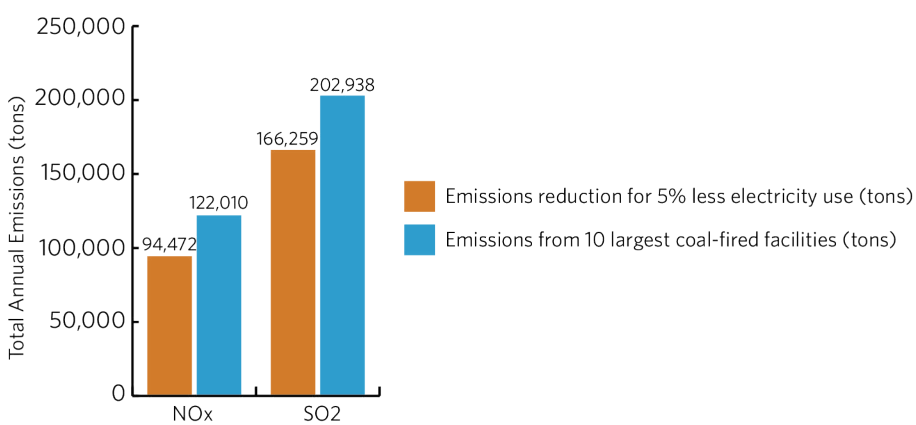
C.2 Air pollutant reduction and associated health benefits

Reduction in energy usage leads to reduction in fossil fuel usage, which in turn leads to reduction in emissions of particulate matter, nitrogen oxides, sulfur dioxide, and other pollutants from fossil fuel combustion. In particular, nitrogen oxides (abbreviated as NOx) are precursors to ozone, which triggers asthma and other respiratory diseases.[57] Sulfur dioxide (SO_2) emissions also aggravate asthma and other respiratory conditions, both directly and through reactions that form particulate matter. [58] Children and the elderly are particularly vulnerable.

Analysis of the EPA database of all power generation facilities in the U.S.[59] shows that even a conservative 5% reduction in electricity use (which is not even close to the levels of reduction identified in Section C.1 above), if applied uniformly to all generating facilities in the U.S., will lead to very significant reductions in pollutants with known adverse health effects.

Figure 11 below compares the reductions in total annual NOx and SO_2 emissions resulting from a 5% reduction in electricity generation applied uniformly to all generating facilities, to the total annual NOx and SO_2 emissions of the top 10 coal-fired generating facilities in the U.S. measured by their total output in 2014, the year of the data. The reduction in NOx emissions from a 5% reduction in energy usage are equivalent to the total emissions of the top eight coal-fired power plants in the U.S., and the corresponding reduction in SO_2 emissions is greater than the total emissions of the top seven coal-fired power plants in the U.S.

Figure 11. Emissions Reduction Attributable to 5% Less Electricity Use, Compared to Emissions of Top 10 Coal-Fired Generating Facilities in the U.S., 2014 [60]



Source: Our calculations using Environmental Protection Agency data

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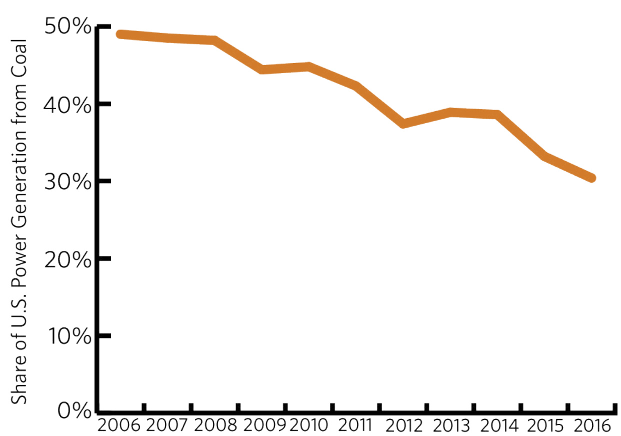
[57] https://www.epa.gov/ozone-pollution
[58] https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#effects
[59] Our calculation based on U.S. Environmental Protection Agency (EPA), eGrid 2014 data set, 2/27/2017, plant-level data, downloadable in Excel format at: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid, supplemented with the corresponding technical documentation, downloadable at: https://www.epa.gov/sites/production/files/2017-02/documents/egrid2014_technicalsupportdocument_v2.pdf.
[60] Ibid.

Note that the actual emissions reductions from a 5% reduction in energy usage are likely to be greater than what is shown in Figure 11, meaning that the benefits are understated. This is because the calculation uses the simplifying assumption of applying the 5% reduction in output uniformly to all generating facilities in the U.S. In practice, it is likely that the reduction in energy usage will lead to significantly greater declines in output from coal-fired power plants, as explained briefly below, and these are among the most polluting of generation facilities. Consequently, the emissions reductions are likely to be larger than shown in Figure 11.

Analysis of trends in the regional power generation mix in different parts of the U.S. shows that coal-fired power plants are expensive to operate and are increasingly unable to compete with natural gas and renewables.[61] Figure 12 below shows the declining share of coal in utility-scale power generation in the U.S. over the last ten years. The economic and technological factors that are driving the trend shown in Figure 12 are likely to lead to accelerating decline in output from coal-fired power plants in particular, in response to decreasing demand.

Figure 12. Declining Share of Coal in the Electricity Generation Mix, 2006-2016.[62]



Source: Energy Information Administration

Figure 13 below shows NOx and SO_2 emissions per gigawatt hour (GWh) of power generated from coal-fired power plants and from the electric power generation sector as a whole. Clearly, a 5% reduction in power generation across the board (as assumed in the hypothetical calculation shown in Figure 11) would lead to less emissions reduction than a disproportionately larger reduction of generation from coal-fired power plants.

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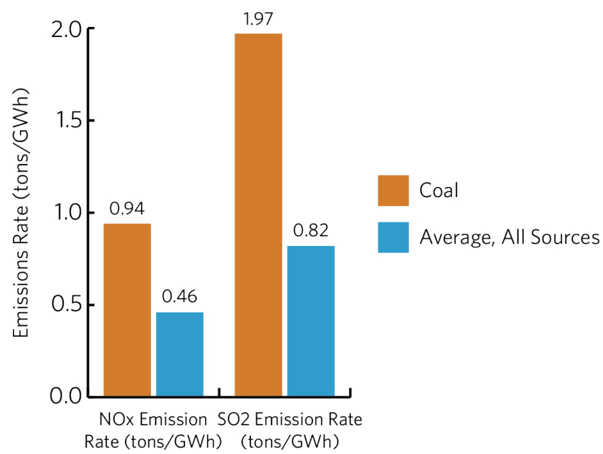
[61]See, for example, U.S. Energy Information Administration (EIA), “Natural gas has displaced coal in the Northeast’s generation mix over the past 10 years,” 5/11/2017, available at: https://www.eia.gov/todayinenergy/detail.php?id=31172; “Natural gas power generation share grew in Southern states for a decade as coal declined,” 12/5/2017, available at: https://www.eia.gov/todayinenergy/detail.php?id=33992

[62]Our calculation based on U.S. Energy Information Administration (EIA), Electric Power Annual Data, Table 3.1.A. Net Generation by Energy Source: Total (All Sectors), 2006 – 2016, available at: https://www.eia.gov/electricity/data.php#generation

[63] Our calculation based on U.S. Environmental Protection Agency (EPA), eGrid 2014 data set, 2/27/2017, plant-level data, downloadable in Excel format at: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid, supplemented with the corresponding technical documentation, downloadable at: https://www.epa.gov/sites/production/files/2017-02/documents/egrid2014_technicalsupportdocument_v2.pdf.

Figure 13. Comparative Emissions Rates (Tons/GWh) for Coal-Fired Power Plants and Entire Power Generation Sector, 2014.[63]



Source: Our calculations using Environmental Protection Agency data

These national-level emissions reduction numbers understate even greater local air quality and health benefits for populations living in proximity to polluting power generation facilities that cut back their generation in response to reduced electricity demand.

C.3 Environmental justice impact of emissions reduction

The public health impacts of the pollution from power generating facilities is also a racial and economic justice issue, since the populations living near polluting power generation facilities are likelier to be low-income and people of color than the overall population. A 2012 report finds that the population within a 3-mile ring of large coal-fired power plants is on average 39% people of color (as compared to 36% in the overall population) and has a per-capita income that is 14.8% lower than the nationwide per-capita income.[64] Therefore, reduction in energy use, and the resulting reduction in power generation from polluting facilities, contributes to greater racial and economic equity.

Unequal exposures to pollution faced by low-income people and people of color lead to measurably unequal health impacts. For example, people of color and low-income people suffer from higher rates of asthma, an illness that has been shown to be aggravated by emissions of nitrogen oxides (NOx)[65] and sulfur dioxide (SO_2),[66] as shown in Figures 14 and 15 below. There are gender disparities in asthma rates as well, as shown in Figure 16.

Since children have smaller airways than adults, the inflammation of airways that

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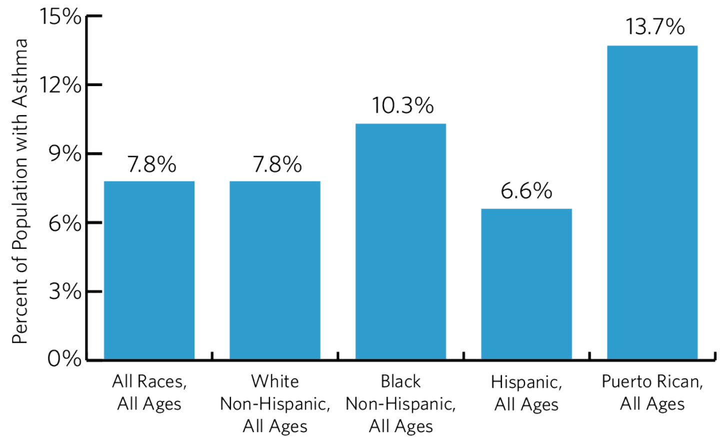
[64] National Association for the Advancement of Colored People (NAACP), Indigenous Environmental Network (IEN), and Little Village Environmental Justice Organization (LVEJO), "Coal Blooded: Putting Profits Before People," 2012, p. 15, available at: http://www.naacp.org/climate-justice-resources/coal-blooded/
[65] https://www.epa.gov/ozone-pollution
[66] https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#effects

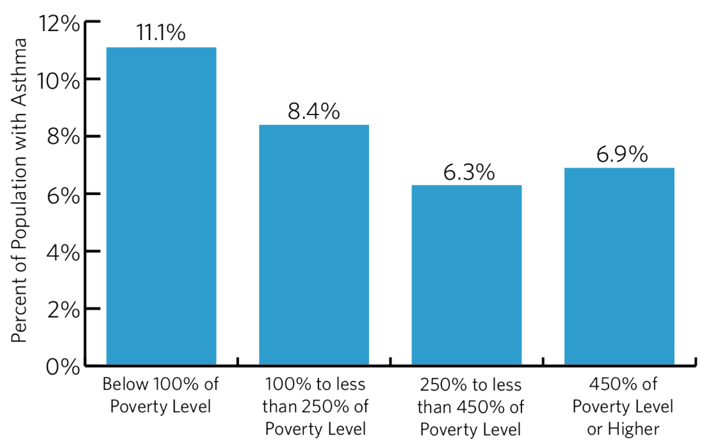
characterizes asthma has a particularly serious effect on them.[67] Asthma rates for children are shown in Figure 17.

Figure 14. Asthma Rates by Race, All Ages, 2016 [68]



Source: Centers for Disease Control and Prevention

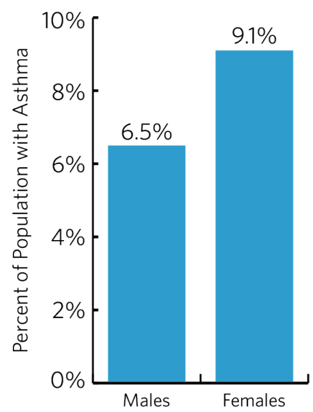
Figure 15. Asthma Rates by Ratio of Household Income to Poverty Level, 2016 [69]



Source: Centers for Disease Control and Prevention

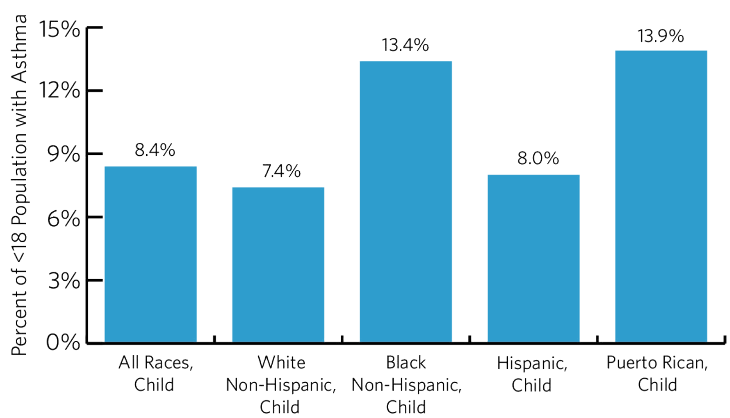
[67] https://medlineplus.gov/asthmainchildren.html
[68] https://www.cdc.gov/asthma/most_recent_data.htm
[69] Ibid. The ratio of household income to poverty level is expressed as a percentage in Figure 15. For example, household incomes below the poverty level are denoted as "Below 100% of poverty level," and household incomes ranging from equal to the poverty level to under 2.5 times the poverty level are denoted as "100% to less than 250% of poverty level."

Figure 16. Asthma Rates by Gender, 2016[70]



Source: Centers for Disease Control and Prevention

Figure 17. Childhood Asthma Rates by Race, 2016[71]



Source: Centers for Disease Control and Prevention

The higher incidence of asthma among people of color and women leads to higher rates of death from asthma (2.9 times higher for Blacks than for Whites, 1.3 times higher for females than males, and 1.6 times higher for adult women than adult men).[72]

Reduction in energy usage will therefore result in beneficial health impacts overall through reduction in NOx and SO_2 pollution, and beneficial health impacts for people of color, low-income people, and women, in particular.

Higher incidence of asthma among children leads to more absences from school, and consequently, poorer educational outcomes for children of color as compared to their White counterparts. Similarly, lower income people lose proportionally more workdays because of asthma-related hospitalization than higher income people, leading to greater economic

[70] Ibid.
[71] Ibid.
[72] Ibid.

insecurity for a population working in low-wage jobs and often lacking access to paid sick days. Also, the proximity of communities of color and low-income communities to polluting facilities adversely impacts property values in these communities. Consequently, property tax revenue decreases, leading to less funding for public schools in these communities. Improved health outcomes from lower pollution levels will therefore have educational, economic, and other benefits for the most vulnerable communities.

C.4 Capital cost savings and ratepayer benefits

Every unit of energy saved through efficiency is a unit that does not need to be generated and transmitted. This means that, cumulatively, reduction of energy usage through efficiency measures will reduce the need for electric utilities to invest in new power generation and transmission and distribution capacity, and for gas utilities and their upstream suppliers to invest in more exploration, drilling, pipelines, etc. These capital investment costs are all passed on to utility ratepayers.

A 2014 report found that the average cost per unit for electric energy efficiency investments is 2.8 cents per kWh (or $28/mWh).[73] A very recent study by the Lawrence Berkeley National Laboratory (published immediately prior to the publication of our report) found the average cost to be 2.5 cents per kWh (or $25/mWh).[74]

Figure 18 below compares this cost per unit for efficiency investments with the cost per unit of power generation from newly installed generating capacity for selected energy sources. For ease of presentation, some energy sources for which data are available are not shown, but the four cheapest energy sources other than efficiency (geothermal, onshore wind, advanced combined-cycle natural gas without carbon capture and sequestration, and solar photovoltaic) are all shown. The cost per unit for three of the sources (denoted with an asterisk) are reduced to reflect tax credits that these sources are eligible for. These tax credits effectively reduce the price per unit generated.[75]

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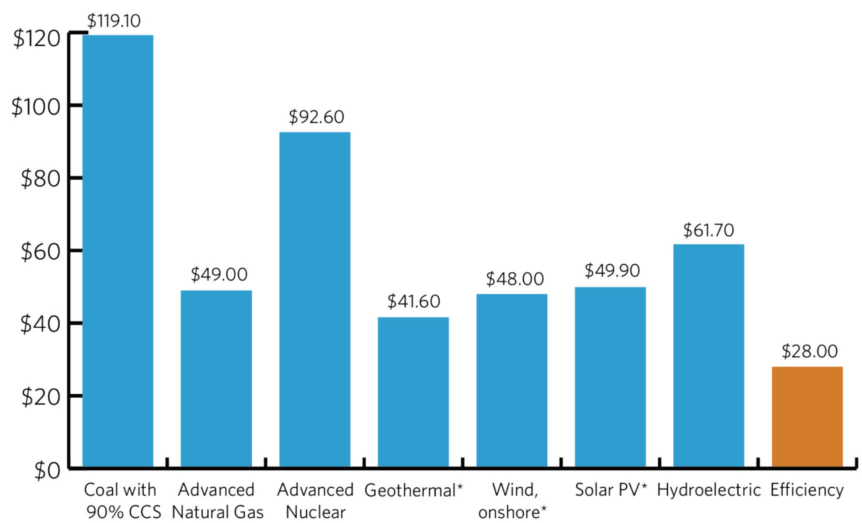
[73] Molina, Maggie, "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs," American Council for an Energy Efficient Economy (ACEEE), March 2014, available (with free registration required) at: https://aceee.org/research-report/u1402

[74] Hoffman, Ian , Charles A. Goldman, Sean Murphy, Natalie Mims, Greg Leventis and Lisa Schwartz, "The Cost of Saving Electricity Through Energy Efficiency Programs Funded by Utility Customers: 2009–2015," Lawrence Berkeley National Laboratory Electricity Markets and Policy Group, June 2018, available at: http://eta-publications.lbl.gov/sites/default/files/cose_executive_summary_20180619.pdf

[75] U.S. Energy Information Administration (EIA), "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2018," March 2018, box on p. 2, available at: https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

[76] Cost per unit for efficiency investment from Molina, Maggie, "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs," American Council for an Energy Efficient Economy Economy (ACEEE), March 2014, available (with free registration required) at: https://aceee.org/research-report/u1402. All other data from U.S. Energy Information Administration (EIA), "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2018," March 2018, Table 1b, p. 6, available at: https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

Figure 18. Capital Cost per Unit of New Generating Capacity for Selected Sources, 2018, Compared to Cost per Unit of Energy Saved Through Efficiency Investments, 2014 [76]



Source: Energy Information Administration, American Council for an Energy-Efficient Economy

Two of the sources shown in Figure 18 require a brief explanation. The coal power plant used in the analysis includes an apparatus to capture and store 90% of the carbon dioxide emissions, a technology known as Carbon Capture and Storage (CCS).[77] The nuclear power plant used in the analysis is a new, more efficient design using a pressurized water reactor, such as the Westinghouse AP 1000.[78]

As seen from the data, efficiency has by far the lowest cost per unit, and therefore investing in efficiency results in significant avoided capital costs for utilities – savings that are passed on to ratepayers. The 2014 study finds that each dollar invested by utilities in efficiency saves ratepayers between $1.24 and $4.00.[79]

C.5 Income, racial, and gender disparities and economic benefits

All households stand to benefit from increased investment in energy efficiency. However, those who stand to benefit the most from increased energy efficiency are low-income households, who face the highest burden of energy costs as a share of income (Figure 19).

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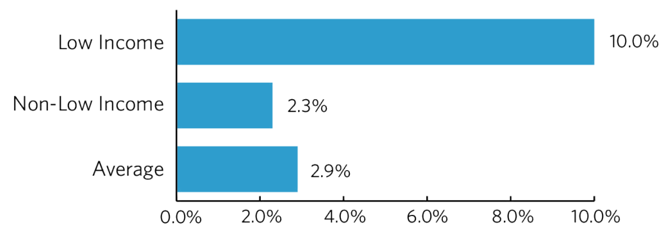
[77] Biello, David, "Can Carbon Capture Technology Be Part of the Climate Solution?," Yale Environment 360, 9/8/2014, available at: https://e360.yale.edu/features/can_carbon_capture_technology_be_part_of_the_climate_solution

[78] U.S. Energy Information Administration (EIA), "Capital Cost Estimates for Utility Scale Electricity Generating Plants," November 2016, available at: https://www.eia.gov/analysis/studies/powerplants/capitalcost/pdf/capcost_assumption.pdf

[79] Molina, Maggie, "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs," American Council for an Energy Efficient Economy (ACEEE), March 2014, available (with free registration required) at: https://aceee.org/research-report/u1402

Figure 19. Residential Energy Expenditures as a Share of Household Income, By Income Group, 2012 [80]



Source: Department of Health and Human Services

Note that the energy burdens by income group shown in Figure 19 are averages. Many low-income households experience an energy burden of greater than 10%. A 2016 study of household energy burden by income group and other demographic indicators in the 48 largest metropolitan areas in the U.S. showed that median energy burden exceeded 10% in three U.S. cities (Memphis, TN; Birmingham, AL; and Atlanta).[81] The lower limit of the highest quartile [82] of household energy burden in nine U.S. cities exceeded 15%, and in one city (Memphis, TN), it was as high as 25.5%.

Women and people of color are disproportionately impacted by poverty. This means that the group of low-income ratepayers, who pay a greater share of their income on energy costs (Figure 19), are disproportionately people of color and women.

As seen in Figure 20, poverty rates are disproportionately higher for people of color, with more than a quarter of Native American and Black households living in poverty, meaning that the higher energy burden for lower income households disproportionately affects people of color. The study of household energy burden in the 48 largest metropolitan areas, cited earlier, also found that African American and Latinx households paid more for utilities per square foot than the median household, indicating that they reside in less efficient housing. This results in African American and Latinx households bearing a higher energy burden than their White counterparts.

In more than half of households in poverty (Figure 21), all adult household members (in the

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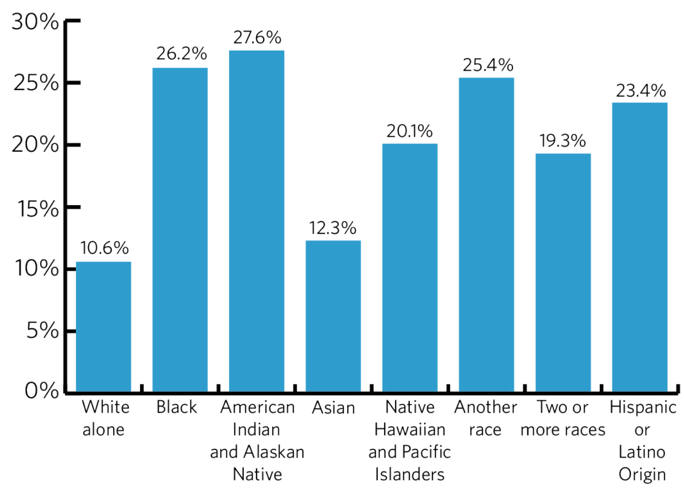
[80] U.S. Department of Health and Human Services (HHS), Low Income Home Energy Assistance Program (LIHEAP), "LIHEAP Home Energy Notebook for FY 2012," Tables 2-1a through 2-1c, p.4, available at: https://www.acf.hhs.gov/ocs/resource/home-energy-notebook-fy-2012. In this study, a low-income household is defined as a household with annual income less than the greater of 150% of HHS Poverty Guidelines and 60% of state median income.
[81] Drehobl, Ariel, and Lauren Ross, "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities," American Council for an Energy Efficient Economy (ACEEE), April 2016, available (with free registration required) at: http://aceee.org/research-report/u1602
[82] If the distribution of household energy burdens is ordered from highest to lowest and then split into four equal groups, each group is called a quartile. The highest quartile is the quarter of the distribution who have the highest household energy burdens.
[83] U.S. Census Bureau, Current Population Survey Subject Definitions, available at: https://www.census.gov/programs-surveys/cps/technical-documentation/subject-definitions.html#householder

terminology used by the Census Bureau, householders[83]) are women. These include family households with one or more adult women but no adult men present, as well as non-family households with one or more adult women but no adult men present. The corresponding share of all households in which all adult members are women is significantly smaller (31%).

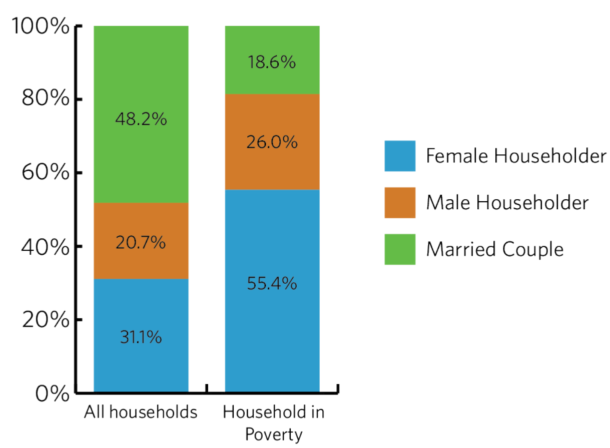
Accordingly, gains in energy efficiency particularly benefit women and people of color by reducing the disproportionate energy burden they face.

Figure 20. Poverty Rates by Race, 2012 - 2016 [84]



Source: Bureau of the Census

Figure 21. All Households, and Households in Poverty, by Gender of Householder, 2012 - 2016 [85]



Source: Bureau of the Census

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[84] U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, (2016), Poverty Status In The Past 12 Months [Data File]. doi: S1701. Note, these data are 5-year estimates, based on data collected over the 2012 – 2016 period. For more details on the distinction between a single year's data and 5-year estimates, see: https://www.census.gov/programs-surveys/acs/guidance/estimates.html

[85] U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates. (2016). Poverty Status In The Past 12 Months By Household Type By Age of Householder. [Data File]. doi: B17017. Note, these data are 5-year estimates, based on data collected over the 2012 – 2016 period. For more details on the distinction between a single year's data and 5-year estimates, see: https://www.census.gov/programs-surveys/acs/guidance/estimates.html

We must be careful not to overemphasize the benefit of energy efficiency (and consequently, lower energy bills) for low-income people, people of color, and women. A part of the reason for the higher energy burden they face is because their income is on average lower, and therefore, even a lower absolute energy bill than average in dollar terms could be a higher share of their income than the same bill (or even a higher bill) would be for a household with much higher income. In other words, the disproportionately higher energy burdens faced by marginalized populations is partly just a function of income inequality, and the racial, gender, and other inequalities that intersect with income inequality.

This is not to say that energy efficiency measures, particularly ones targeted to benefit marginalized populations, are ineffective. They are critical in saving households money, making their living conditions more comfortable, and protecting them from extreme energy insecurity (see Section C.6 below). This is just to point out that, even with the best-designed energy efficiency measures, a highly unequal income distribution inevitably leads to inequalities in household energy burdens.

C.6 Addressing energy insecurity

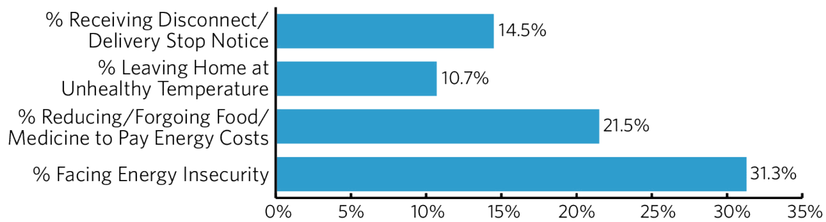
Energy insecurity is a broad term to describe the range of problems faced by households who face challenges paying their utility bills. It includes households who experience, or have experienced, any of the following:[86]

- Being compelled to choose between paying for utilities and paying for other basic necessities such as food and health care.
- Having utilities disconnected for inability to pay or receiving disconnection notices.
- Keeping their house at an uncomfortable and potentially unhealthy temperature (too cold in the winter or too hot in the summer) to be able to afford energy bills.
- Being forced to resort to dangerous home heating methods (such as burning wood in a wood stove) to minimize winter heating bills, increasing their risks of fire and carbon monoxide poisoning.

The most recent (2015) U.S. Energy Information Administration (EIA) Residential Energy Consumption Survey (RECS) found that nearly a third of U.S. households experienced energy insecurity at some point during the year. Figure 22 below shows the respective shares of all U.S. households experiencing different forms of energy insecurity. (The sum of shares of households experiencing different forms of energy insecurity is greater than the total share of households experiencing some form of energy insecurity because the same household often experiences multiple forms of energy insecurity.)

[86] "One in three U.S. households faced challenges in paying energy bills in 2015," U.S. Energy Information Administration (EIA), 2015 Residential Energy Consumption Survey (RECS) analysis brief available at: https://www.eia.gov/consumption/residential/reports/2015/energybills/

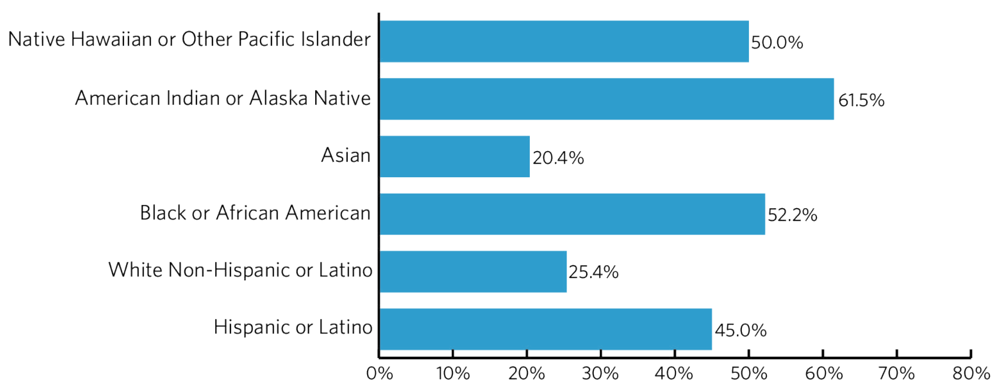
Figure 22. Shares of Households Experiencing Different Forms of Energy Insecurity, 2015
87



Source: Energy Information Administration

As with every measure of deprivation in the U.S., there are significant race and class disparities in terms of who experiences energy insecurity. Figure 23 below shows the shares of households by race who reported experiencing energy insecurity in the 2015 RECS. The share of energy-insecure Native American and Alaska Native households was as high as 62%, and half or more of Black/African-American households and Native Hawaiian or Other Pacific Islander households were energy-insecure.

Figure 23. Shares of Households by Race Experiencing Energy Insecurity, 2015 [88]

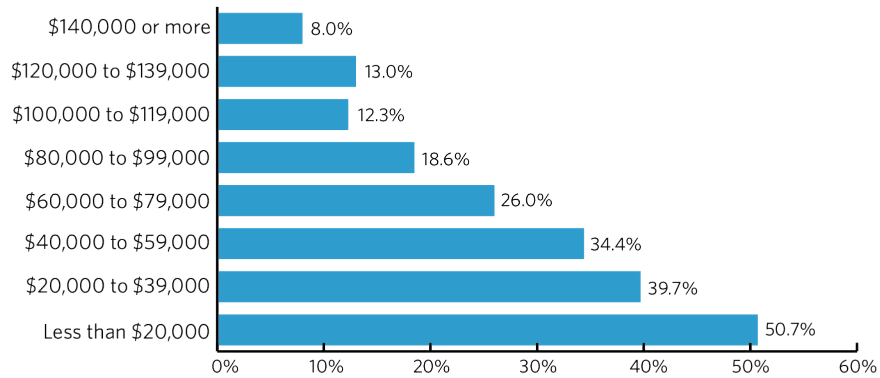


Source: Energy Information Administration

[87] U.S. Energy Information Administration (EIA), 2015 Residential Energy Consumption Survey (RECS), Table HC11.1, downloadable in Excel format at: https://www.eia.gov/consumption/residential/data/2015/
[88] Ibid.

Figure 24 below shows similar disparities by household income.

Figure 24. Shares of Households by Income Range Experiencing Energy Insecurity, 2015 [89]



Source: Energy Information Administration

Large disparities also exist between renters (43% are energy-insecure) and homeowners (24% are energy-insecure) and households with or without children under 18 (42% and 26%, respectively, are energy-insecure). It is also important to note that one demographic distinction across which there is virtually no difference in incidence of energy insecurity is the rural-urban divide, with about 31% each of rural and urban households experiencing energy insecurity. [90]

A 2017 report by the NAACP documents the tragic human cost of utility shutoffs and the racial and income disparities that leave people of color and low-income people more vulnerable to shut-offs, putting faces and stories on the numbers presented above.[91] One example cited in the study is of an elderly patient in Texas suffering from congestive heart failure and chronic obstructive pulmonary disease (COPD), who needed electricity to power his oxygen concentrator in order to survive. His family had informed the utility of his medical condition, but they disconnected his electricity anyway because of unpaid arrears of only $129.62, resulting in his death from suffocation. What makes this story even more profoundly unjust is that he used to live near a trash incinerator, and the pollution from the incinerator had likely aggravated his condition. In general, fatalities and other adverse health consequences from utility shut-offs disproportionately harm seniors.

By reducing energy bills, energy efficiency policies can have a significant positive impact on energy insecurity. To be effective in addressing energy insecurity, however, these policies must be carefully crafted to address the needs of the most vulnerable and energy-insecure populations (see Section F.2 below).

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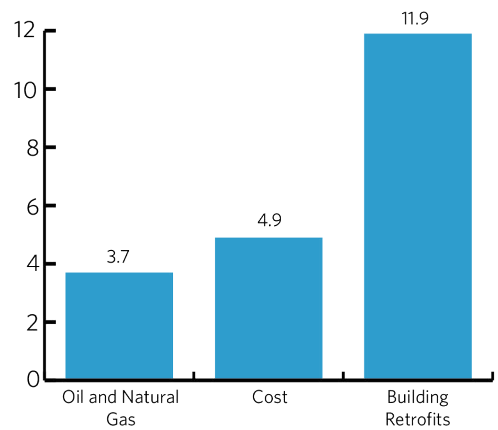
[89] Ibid.
[90] Ibid.
[91] NAACP Environmental and Climate Justice Program, "LIGHTS OUT IN THE COLD: Reforming Utility Shut-Off Policies as If Human Rights Matter," March 2017, available at: http://www.naacp.org/wp-content/uploads/2017/03/Lights-Out-in-the-Cold.pdf
[92] Pollin, Robert, James Heintz, and Heidi Garrett-Peltier, "The Economic Benefits of Investing in Clean Energy: How the Economic Stimulus Program and New Legislation Can Boost U.S. Economic Growth and Employment," Political Economy Research Institute, University of Massachusetts Amherst, June 2009, available at: https://www.peri.umass.edu/publication/item/311-the-economic-benefits-of-investing-in-clean-energy-how-the-economic-stimulus-program-and-new-legislation-can-boost-u-s-economic-growth-and-employment

C.7 Job creation

An important benefit of energy efficiency is its strong job creation potential. A 2009 study showed that investing in building retrofits for energy efficiency creates two to three times more jobs for every dollar than investing in fossil fuel energy (Figure 25).

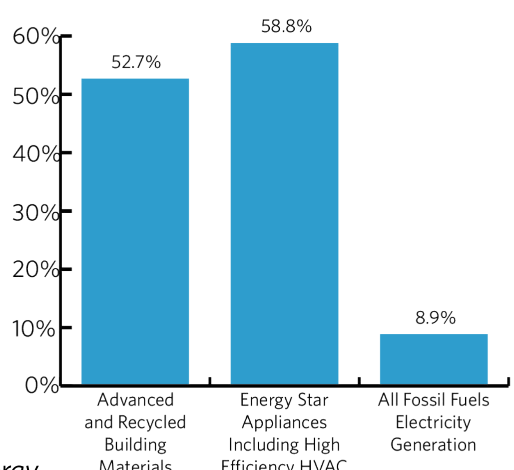
Figure 25. Jobs Created Per $1 Million in Capital Expenditure in Energy Efficiency and Fossil Fuels [92]



Source: Pollin et. al., University of Massachusetts Amherst

This difference in job creation potential is consistent with the noticeable gap in job growth between energy efficiency and fossil fuels. From 2015 to 2016, as shown in Figure 26, there was 53% employment growth in advanced and recycled building materials, and 59% employment growth in Energy Star[93] appliances including high efficiency HVAC, and only 9% growth in fossil fuel-based electricity generation.

Figure 26. Employment Growth in Key Energy Efficiency Industries and Fossil Fuel Power Generation, 2015-2016 [94]



Source: Department of Energy

[93] Energy Star is a government program administered by EPA that certifies energy-efficient household appliances and equipment (https://www.energystar.gov/).
[94] Our calculation, based on U.S. Department of Energy, U.S. Energy and Employment Report 2017, Figure 12, p. 30, and Figure 37, p. 66, available at: https://energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf. Methodological note: fossil fuel power generation employment is the total employment in power generation using coal, natural gas, oil, and advanced gas.

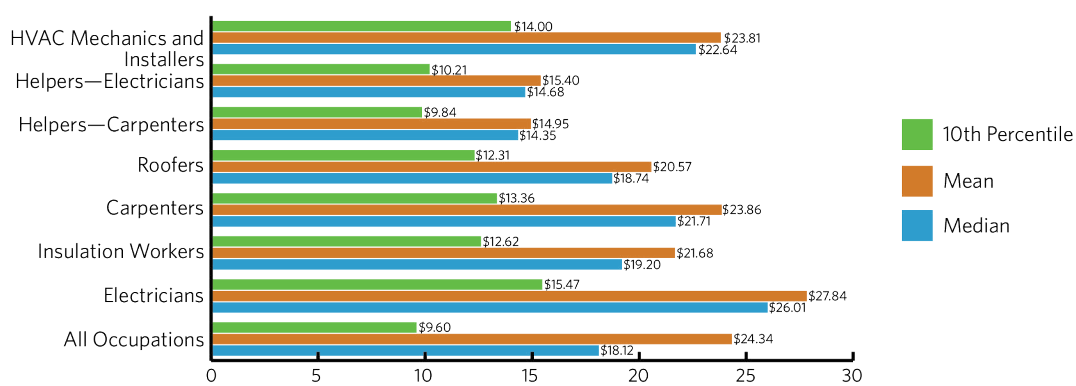
Energy efficiency employs many more people in absolute terms as well. Employment in energy efficiency across all industry sectors totaled 2.18 million, more than twice the 1.07 million in fossil fuels and fossil fuel-based power generation combined.[95]

Energy efficiency work is not a separate occupational category, but includes a number of construction occupations (for example, insulation workers, and HVAC installers working on installing high-efficiency equipment) and manufacturing occupations (for example, workers manufacturing high-efficiency HVAC equipment and LED lightbulbs).

Figures 27 and 28 present income data for energy efficiency workers, including all workers with the skill set required to build or retrofit commercial and residential buildings or install energy efficient HVAC systems and appliances in these buildings. The skills required for construction workers on a high-efficiency building project are broadly similar to skills required for any building project of comparable scope, and likewise, the skills required to install HVAC systems for large office or apartment buildings are similar regardless of whether or not they are high-efficiency systems.

The Bureau of Labor Statistics reports data for mean, median, and selected percentile wage levels by occupation from the Occupational Employment Statistics (OES) survey. Figure 27 below shows the mean, median, and 10th percentile[96] wages for selected energy efficiency jobs with high levels of total employment (ranging from almost 700,000 for carpenters, to about 36,000 for carpenter helpers). The 10th percentile wages can be thought of as a close proxy for starting wages. Figure 28 shows the same median wage data as in Figure 27, expressed as a ratio of median wage for the occupation to the U.S. median wage for all occupations.

Figure 27. Mean, Median, and 10th Percentile Hourly Wages: Energy Efficiency Occupations, 2017 [97]

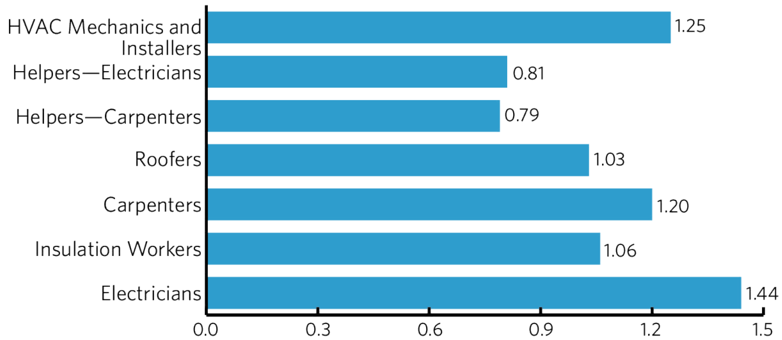


Source: Bureau of Labor Statistics

[95] Our calculation, based on Ibid., Table 1, p. 29, and Figure 32, p. 62. Methodological note: fossil fuel employment is the sum of fossil fuel power generation employment (see endnote 58 above) and fuels employment for coal, oil, and natural gas. Fuels employment "encompasses all work related to fuel extraction and mining, including petroleum refineries and firms that support coal mining, oil, and gas field machinery manufacturing" (Ibid., p. 20).

[96] The median wage is the wage such that half the workers receive a higher wage and half receive a lower wage. In other words, it is the mid-point of the wage distribution. The 10th percentile wage for an occupation is the wage level such that just 10% of workers in the occupation earn lower wages.

Figure 28. Ratio of Median Hourly Wages of Energy Efficiency Occupations to Median Hourly Wage for All Occupations, 2017 [98]



Source: Bureau of Labor Statistics

Wages of energy efficiency workers show sizable differences between occupations, but energy efficiency occupations include several with significantly higher wages than the median for all occupations. Particularly, electricians, HVAC mechanics and installers, and carpenters, three occupations that are in demand for energy efficiency projects, have median wages that are greater than the median wage for all occupations by 20% or more.

[97] Bureau of Labor Statistics (BLS), Occupational Employment Statistics (OES) data, May 2017, available (in Zip file format expandable to Excel) at: https://www.bls.gov/oes/#data.
[98] Our calculation based on Ibid.

D How to Pay for Energy Efficiency Upgrades

The high initial cost for some energy efficiency upgrades, such as new HVAC systems, furnaces, appliances, lighting, and weatherization, can sometimes deter low to moderate income households, small businesses, non-profits, and other ratepayers with financial constraints from paying for the upgrades even though the payback period for the initial investment is sometimes just a few years.[99] Innovative methods of financing have emerged that address this problem, and three of the most promising approaches are discussed in this section.

D.1 State and ratepayer funding

States sometimes provide energy efficiency programs for low-income households as a free service or require utilities to provide it as a free service. These programs are funded through one or both of direct state funding and a small surcharge[100] on the utility bills of all ratepayers (as against only the beneficiary ratepayers), at no cost to the beneficiary household other than the surcharge. In either case the costs of these rebates and grants are borne by the entire population, whether through utility bills or through taxes.

Financing low-income energy efficiency through a utility bill surcharge for all ratepayers has the obvious advantage of being very low cost for the beneficiaries, but can potentially be inequitable in a state or region where a very large share of the population is low to moderate income. Financing the upgrades through direct state funding has the same advantage, but does not have the same potential inequitable impact if the state revenue stream is more progressive. It could however lead to resource constraints in poorer states without significant federal assistance (which is not a given in the current U.S. political climate). In addition, many states have regressive tax regimes over-reliant on sales taxes.

The box below provides two examples of state and ratepayer funded low-income energy efficiency programs. Other examples include Maine (discussed in a box in Section B.3 earlier), Illinois (discussed in detail in Section E below), and Minnesota and Ohio (see Section F).

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[99] http://www.ncsl.org/research/energy/on-bill-financing-cost-free-energy-efficiency-improvements.aspx
[100] As an illustrative example, a utility could charge all its customers a monthly $2 surcharge for low-income energy efficiency. The funds from this surcharge are set aside to fund free energy efficiency upgrades for low-income households. A low-income household might see savings of $100 a month for which they pay only $2 a month in the form of the surcharge. The savings of $100 a month are not unrealistic (see Section D.2).
[101] https://www.nyserda.ny.gov/All-Programs/Programs/~/link.aspx?_id=19C636B1EB14406A8B2ECFC2BD068605&_z=z
[102] https://www.mass.gov/service-details/affordable-access-to-clean-and-efficient-energy-initiative
[103] http://www.masscec.com/about-masscec

Low-Income Energy Efficiency Programs in New York and Massachusetts

EmPower New York is a state-run program that provides energy efficiency services at no cost to income-eligible New Yorkers.[101] Eligible households include homeowners and renters whose household income is below 60 percent of the state median income. EmPower is funded by a "Systems Benefits Charge" paid by all customers of participating utilities on their utility bills. This financing is supplemented by other sources such as the Regional Greenhouse Gas Initiative. Additionally, there is no lien attached to participation in EmPower, and the program does not charge customers for services even if they move or their income changes. EmPower provides energy efficiency services such as:

- replacement of old light bulbs with high-efficiency lighting;
- replacement of inefficient refrigerators or freezers with Energy Star certified models;
- added insulation to regulate home temperature; and
- air sealing to reduce drafts.

The Massachusetts Affordable Access to Clean and Efficient Energy Initiative[102] has a number of energy efficiency programs for low-income residents. These include:

Grants to Non-Profits: The Massachusetts Clean Energy Center (MassCEC),[103] a state economic development agency, awarded $2.3 million in July 2016 to four organizations that use energy efficiency to lower utility bills for low-income residents and multi-family buildings. The grants were funded by MassCEC's Renewable Energy Trust (RET), which collects money through a systems benefits charge paid collectively by utilities customers and municipal electric departments. The average utility customer contributes 32 cents to the RET each month. [104]

Income-Based Rebate Adders: These are rebates on an income-based sliding scale to increase access to clean heating and cooling technologies for low-income, multi-family households across Massachusetts. The Clean Heating and Cooling program supports the installation of renewable heating, hot water and cooling technologies for households that are at or below 80% or 120% of the state median income.[105]

AARC Regional Planning: Through Affordable Access Regional Coordination (AARC) Grants, the Massachusetts Department of Energy Resource's Green Communities Division funds Regional Planning Authorities (RPA) and other technical assistance organizations to provide clean energy training to organizations that support low-income communities. This funding enables RPAs to increase awareness of the state's low-income residential clean-energy programs as well as expand the reach of existing successful programs.[106]

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[104] https://www.mass.gov/news/baker-polito-administration-awards-23-million-for-programs-to-save-low-income-residents-money
[105] http://www.masscec.com/income-based-rebate-adders
[106] https://www.mass.gov/service-details/affordable-access-to-clean-and-efficient-energy-initiative

D.2 Inclusive Financing

Inclusive financing, also known as on-bill tariffs or on-bill financing, is an innovative approach to making energy efficiency upgrades affordable. It typically entails utilities offering an opt-in tariff (effectively a loan)[107] to customers, to invest in cost-effective energy efficiency upgrades. The utilities recover the costs with a charge on the customer's utility bill that is less than the estimated savings over the billing period, a principle known as "bill neutrality." Thus, customers benefit from immediate net monetary savings, which increase even more once cost recovery is complete and the customer starts to get the entire benefit of the savings from the upgrade.[108]

In the typical inclusive financing model, the loan is tied to the utility meter rather than the property, making the financing accessible to renters, an approach we recommend strongly (see Section F below). The loan remains tied to the meter when a current beneficiary tenant moves, so the next tenant at the location benefits from the efficiency upgrades and starts to repay the loan.[109]

Another advantage of tying the loan to the meter is that it addresses the "split incentive" problem in rental housing energy efficiency (also applicable to rental commercial buildings). When tenants pay their own utility bills, property owners have no financial incentive to invest in energy efficiency measures because the resulting savings do not benefit them. Tying the financing to the meter works around this problem by providing the financing to the party who benefits from lower bills and therefore has the incentive to take on the loan.[110]

Sometimes, the lender is a third-party financial institution instead of the utility, but the repayment charges appear on the utility bill and the utility processes the repayments.[111] This raises the concern of allowing a greater role for financial intermediaries, many of whom have a problematic history of not lending to the very communities in greatest need of energy efficiency financing and of predatory lending practices leading to foreclosures and loss of wealth from some of these same communities.

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[107] The literature on inclusive financing typically makes the technical distinction that inclusive financing provides the financing in the form of a tariff and not a loan. The distinction is primarily based on the fact that whoever pays the bills at a particular location, rather than a given borrower, is the responsible party for repayment. If the original borrower moves, they are no longer obligated to repay. Instead, the new resident who moves in to the premises becomes the responsible party. This is distinct from a loan, which is a contract between a lender and a specific borrower. For more detailed understanding of this distinction, see State and Local Energy Efficiency Action Network (SEEAction), "Financing Energy Improvements on Utility Bills: Market Updates and Key Program Design Considerations for Policymakers and Administrators," May 2014, available at: https://www4.eere.energy.gov/seeaction/system/files/documents/onbill_financing.pdf. For simplicity, we refer to on-bill financing as a "loan," in the popular sense of a person repaying a sum of money over a period of time with interest.

[108] http://www.ncsl.org/research/energy/on-bill-financing-cost-free-energy-efficiency-improvements.aspx

[109] Ibid.

[110] Max Toth, Clean Energy Works, personal communication, 5/21/2018.

[111] http://www.ncsl.org/research/energy/on-bill-financing-cost-free-energy-efficiency-improvements.aspx

There are specific policy safeguards that are inherent to (or can be incorporated into) the rules of on-bill financing program design to address these concerns: [112]

- **Requiring universal access:** the on-bill financing should be available to all of a utility's customers, regardless of income, credit score, property ownership status, etc. Even where a financial institution provides the financing, it cannot deny financing to anyone based on such criteria.
- **No lien:** because the loan is tied to the meter and not the property, there is no lien on the property, and no possibility of foreclosure. Also, if the utility customer moves to a different location, they are no longer responsible for repayment.

Hypothetically, not accounting for the customers' income and credit score could make for risky financing. In practice, however, the default rate for inclusive financing is less than one percent,[113] while the lowest default rate for non-credit card consumer loans in the 20 calendar quarters over the 2013 -2017 period compiled by the Federal Reserve was 1.83%, and over almost half the period (9 out of 20 quarters), it was greater than two percent.[114] The lower default rate for inclusive financing is attributable to the fact that the loans are structured so that the cost recovery will be less than the estimated savings. In spite of the requirement of universal access without regard to income and credit score, and the lack of collateral to secure the debt, inclusive financing debt is seen in practice to be less risky for the lender than a typical consumer loan.

A deviation from the typical inclusive financing model outlined above is that sometimes the loan is tied to the property instead of the meter, making it not accessible for tenants except where the property owner pays all utility bills.[115] For reasons explained in Section F below, we do not recommend this approach.

Inclusive financing should logically have lower interest rates because the default rate is lower, and in practice this seems to be the case, with utilities in California, Connecticut, and Massachusetts offering energy efficiency financing at 0% interest.[116] A 2014 study found that, in a sample of utility inclusive financing programs, the volume-weighted average interest rate charged to borrowing ratepayers was 1.47%. The study raised the concern that many utilities use ratepayer funds to make up for the difference between the low rates they charge for inclusive financing and the market rate they would pay for equivalent financing, so the low interest rates for inclusive financing are effectively subsidized by all ratepayers.[117]

However, this does not take into account the fact that, absent the energy savings from the

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[112] Farrell, John, and Karlee Weinmann, "Inclusive Financing for Efficiency and Renewable Energy," Institute for Local Self-Reliance (ILSR), Nov. 11 2016, www.ilsr.org/report-inclusive-energy-financing/#Time
[113] State and Local Energy Efficiency Action Network (SEEAction), "Financing Energy Improvements on Utility Bills: Market Updates and Key Program Design Considerations for Policymakers and Administrators," May 2014, available at: https://www4.eere.energy.gov/seeaction/system/files/documents/onbill_financing.pdf. The study reported an average default rate of 0.65% for on-bill financing programs with bill neutrality, but cautioned about the small study sample size.
[114] Board of Governors of the Federal Reserve System, Charge-Off and Delinquency Rates on Loans and Leases at Commercial Banks (All Banks, Seasonally Adjusted), available at: https://www.federalreserve.gov/releases/chargeoff/delallsa.htm
[115] http://www.ncsl.org/research/energy/on-bill-financing-cost-free-energy-efficiency-improvements.aspx
[116] Ibid.
[117] State and Local Energy Efficiency Action Network (SEEAction), "Financing Energy Improvements on Utility Bills: Market Updates and Key Program Design Considerations for Policymakers and Administrators," May 2014, available at: https://www4.eere.energy.gov/seeaction/system/files/documents/onbill_financing.pdf

upgrades financed through inclusive financing, electric utilities are likely to have to invest in more power generation and transmission and distribution capacity, and gas utilities and their upstream suppliers will have to invest in more exploration, drilling, pipelines, etc. All these costs will eventually be passed on to ratepayers. As explained in Section C.4 earlier, ratepayers will usually end up paying more for these capacity investments than they would for the efficiency upgrades financed through inclusive financing.

Currently, even the best energy efficiency programs serve less than 2% of customers each year. Large portions of a utility's customers, in particular renters, customers without strong credit, and low-income households, are often locked out of energy efficiency programs. Inclusive financing would provide broader access to energy efficiency upgrades.[118]

Although inclusive financing is still a relatively new approach to energy efficiency financing, the preliminary results are very promising. The box below provides two case studies.

Inclusive financing of energy efficiency upgrades: Two case studies

Roanoke Electric Cooperative's Upgrade to $ave program provides a good illustration of how inclusive financing works. The average cost of upgrades to a member's home was $6,900, which was repaid to Roanoke Electric via their utility bills. The upgrades provided customers an average monthly gross savings of $120 per month, and the average monthly repayment charge was $62, so customers benefited from monthly net savings of $58, which translates to an annual net saving of almost $700, even in the repayment period.[119]

Ouachita Electric Cooperative, a utility based in southern Arkansas, saw participation in their inclusive financing program double within the first quarter of its implementation. Homes participating in Ouachita's inclusive financing program have seen bill reductions of 40% to 50%, with even higher reductions on the horizon.[120]

Inclusive financing is legislatively required in four states, and enabled by legislation in eight more states. Utilities have implemented inclusive financing programs on their own in 19 other states.

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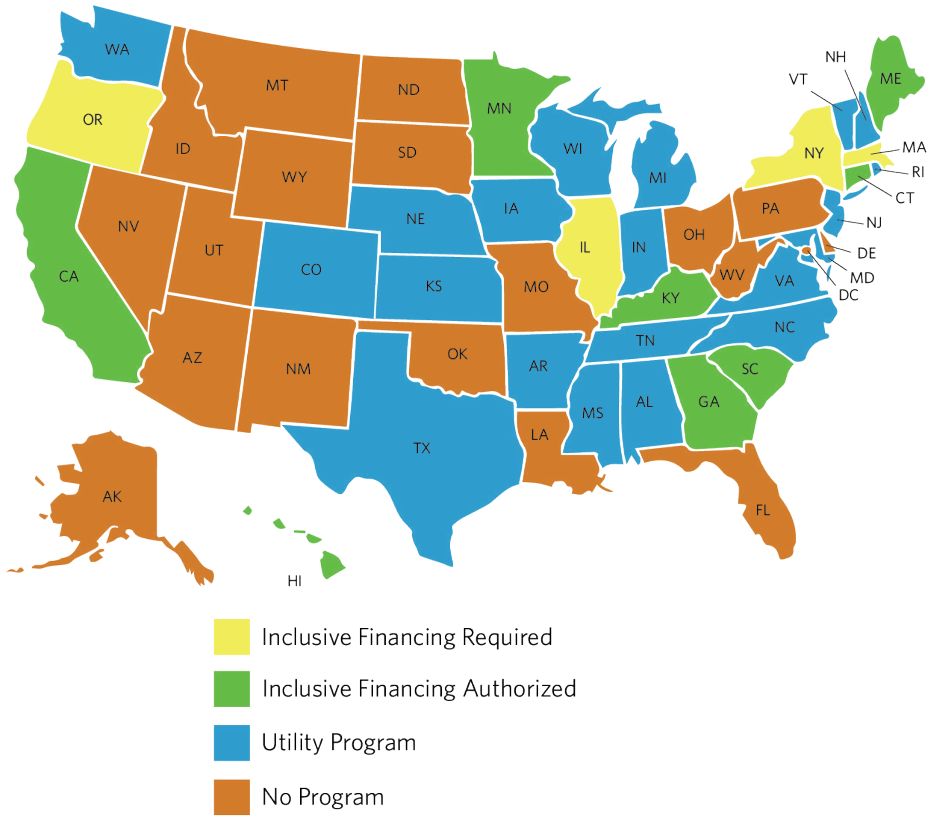
[118] Farrell, John, and Karlee Weinmann, "Inclusive Financing for Efficiency and Renewable Energy," Institute for Local Self-Reliance (ILSR), Nov. 11 2016, www.ilsr.org/report-inclusive-energy-financing/#Time

[119] Environmental and Energy Study Institute (EESI), "The Help My House Model," www.eesi.org/obf/coops/helpmyhouse

[120] Walton, Robert, "Pay As You Save: Co-Ops Are Reaching New Customers with a Novel Way to Pay for Efficiency," Utility Dive, Aug. 17, 2016, www.utilitydive.com/news/pay-as-you-save-co-ops-are-reaching-new-customers-with-a-novel-way-to-pay/424234/

Figure 29. Status of Inclusive Finance Programs in States, 2015 [121]



Source: National Council of State Legislatures

As seen from Figure 29, there is a great deal of potential to expand inclusive financing through legislation in the states. As many as 38 states and the District of Columbia have no legislation enabling inclusive financing (whether or not utilities have set up such programs on their own), and eight other states legislatively enable and authorize, but do not require, utilities to provide inclusive financing.

States use some combination of state funds, local government funds, utility ratepayer funds, utility public benefit funds,[122] and third party financial institutions as funding sources for the financing (or the seed funding for the revolving funds used for the financing). [123]

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[121] http://www.ncsl.org/research/energy/on-bill-financing-cost-free-energy-efficiency-improvements.aspx
[122] Utility public benefit funds are designated funds that states require utilities to collect on utility bills as an itemized surcharge, for specific purposes that the state has determined to be in the public interest, such as incentives for renewables and energy efficiency. See Center for Climate and Energy Solutions, https://www.c2es.org/document/public-benefit-funds/
[123] http://www.ncsl.org/research/energy/on-bill-financing-cost-free-energy-efficiency-improvements.aspx

D.3 Energy Service Performance Contracting

We briefly describe Energy Service Performance Contracting (ESPC) because it is an effective tool for financing energy efficiency, but do not go into detail because it is already legislatively enabled in every single state and the District of Columbia, and is not a policy tool that can be expanded significantly.[124]

Under ESPC, a building owner enters into a contract with an energy efficiency contractor to perform energy efficiency retrofits and upgrades to the building. The contractor pays the up-front costs, and the owner repays the contractor over a specified term. The contract guarantees that the savings on utility bills will equal or exceed the loan repayment amounts, and in the eventuality that the savings in a billing period are less than the repayment, the contractor absorbs the added cost. In practice, a contractor may obtain financing for the upfront costs from a third-party financial institution and be contractually obligated to pay the difference between the savings on the utility bill and the loan repayment amount in cases where the loan repayment exceeds the energy savings.[125]

ESPC is a particularly effective tool for large institutional property owners such as state and local governments, hospitals, and universities to make existing building stock more energy efficient. Some states have established mechanisms to assist state agencies, local governments, state university systems, etc. in making informed decisions about ESPC, such as:[126]

- Establishing standards for contractors eligible to provide ESPC services.
- Maintaining lists of approved contractors.
- Providing guidelines and technical assistance to state agencies, local governments, etc.
- Providing education and outreach to increase awareness of this tool.

[124] http://www.ncsl.org/research/energy/state-energy-savings-performance-contracting.aspx
[125] Ibid.
[126] Ibid.

Case Study

IL Future Energy Jobs Act: What It Does, How It Was Won

A noteworthy example of state legislation expanding energy efficiency with an emphasis on equality is Illinois' Future Energy Jobs Act (FEJA) of 2016. FEJA addresses expanded access to both renewable energy and energy efficiency, but in this section we focus more on the ways in which FEJA increases access to energy efficiency, while also addressing some of its renewable energy provisions.

E.1 Key provisions of FEJA

- By 2030, Illinois' largest utility, ComEd, must expand and enhance customer efficiency programs to cut electricity usage by 21.5 percent, and Illinois' second largest utility, Ameren, must cut usage by 16 percent.[127]
- The law mandates that utilities serving more than 3 million customers in Illinois spend $25 million per year on programs to help low-income homes become more energy efficient, and utilities serving between 500,000 and 3 million customers spend $8.35 million per year.[128]
- It defines low-income households as households with income below 80% of area median income,[129] expanding it beyond the prior definition of households who qualify for state assistance.[130]
- It states that energy efficiency measures targeting low-income households should, where practicable, be contracted to third parties, preferably non-profits or government entities, which have "demonstrated capabilities to serve such households."[131]
- It requires utilities to convene advisory committees to assist in the design and evaluation of low-income energy efficiency programs. The advisory committees must include representatives of community-based organizations.[132]
- It addresses energy insecurity by requiring each utility to contribute $10 million a year for five years to a fund that assists low-income customers including senior citizens who are facing imminent disconnection or have been disconnected from utility service because of inability to pay.[133]
- It extends Illinois' on-bill financing program (see Section D) to multifamily buildings with more than 50 residential units and to condominium associations, and makes products or services needed to safely install energy efficiency measures eligible for on-bill financing, helping more people pay for energy efficiency upgrades through their utility bills.[134]
- It requires utilities serving more than 3 million customers to allocate a total of $30 million each to develop and implement energy job training programs, which will include programs

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[127] Citizens Utility Board, "What Is the Future Energy Jobs Act?", available at: https://citizensutilityboard.org/future-energy-jobs-act/
[128] Illinois Compiled Statutes, 220 ILCS 5 Sec. 8-103B(c), created by Illinois SB2814, Sec. 15, 2016.
[129] Ibid.
[130] Citizens Utility Board, "What Is the Future Energy Jobs Act?", available at: https://citizensutilityboard.org/future-energy-jobs-act/
[131] Illinois Compiled Statutes, 220 ILCS 5 Sec. 8-103B(c), created by Illinois SB2814, Sec. 15, 2016.
[132] Ibid.
[133] Ibid, Sec. 16-108.10.
[134] Ibid., Sec. 16-111.7(b) and Sec. 16-111.7(c), as modified by Illinois SB2814, Sec. 15, 2016.

that focus on individuals from economically disadvantaged and environmental justice communities, youth of color, formerly incarcerated persons, individuals who had been in the foster care system as children, and other traditionally excluded populations.[135]

- It establishes the Illinois Solar for All Program, which provides incentives for distributed solar generation, including community solar projects, that benefit low-income communities.[136]

E.2 How FEJA was won

The Future Energy Jobs Act passed the Illinois House of Representatives with a bipartisan 63-38 vote, passed the Senate with a 32-18 vote, and was signed into law by Governor Rauner on December 7th, 2016.[137] There are important lessons to be learned from the sustained organizing and coalition-building that went into the passage of this legislation, and that has continued subsequent to the bill's passage to monitor the implementation of the bill and ensure that it lives up to its promise.

Support for the bill was widespread, diverse, and multisectoral. The passage of the bill was driven in large part by the Illinois Clean Jobs Coalition,[138] which is a made up of environmental, labor, economic justice, and faith organizations and businesses. Some coalition members include:

- Little Village Environmental Justice Organization (LVEJO), an environmental justice organization based in low-income communities of color in Chicago.[139]
- Preservation of Affordable Housing, a non-profit developer, owner, and operator of affordable housing in greater Chicago.[140]
- Voces Verdes, a network of Latino business, public health, academic, and community leaders and organizational partners who advocate for sound environmental policy.[141]
- Faith in Place, an interfaith environmental network.[142]
- International Brotherhood of Electrical Workers (IBEW) Local 134.[143]
- North Lawndale Employment Network, a community organization in a high-unemployment Chicago neighborhood working to secure jobs with family-supporting wages for people facing barriers to employment, especially formerly incarcerated individuals and low-income job seekers.[144]
- Illinois People's Action (IPA), a statewide institutional and grassroots member organization working on social, economic, and environmental justice issues, with most of its membership in the downstate area.[145]

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[135] Ibid., Sec. 16-108.12, created by Illinois SB2814, Sec. 15, 2016.
[136] 20 ILCS 3855 Sec. 1-56, as modified by Illinois SB2814, Sec. 5, 2016.
[137] Collingsworth, Jessica, "A Huge Success in Illinois: Future Energy Jobs Bill Signed Into Law." Union of Concerned Scientists, Dec. 8 2016, https://blog.ucsusa.org/jessica-collingsworth/big-win-illinois-energy
[138] https://ilcleanjobs.org/
[139] http://lvejo.org/our-mission/mission-vision-statement/
[140] http://www.poahchicago.org/
[141] http://www.vocesverdes.org/
[142] https://www.faithinplace.org/who-we-are
[143] National Electrical Contractors Association and National Brotherhood of Electrical Workers, Local 134, "The Future Energy Jobs Act (FEJA) — What it Means to Our Industry," available at: http://www.necaibewchicago.com/news_events/summer2017/feja.html
[144] http://www.nlen.org/who-we-serve/
[145] http://www.illinoispeoplesaction.org/

Illinois-based chapters of national organizations such as the Sierra Club, Physicians for Social Responsibility, and Unitarian Universalist Advocacy Network were also involved in the coalition.

The passage of the Future Energy Jobs Act was a laborious effort of over two years. To gain a deeper understanding of the campaign to pass the bill and the lessons that can be learned from the campaign, we have spoken with Rev. Tony Pierce, Board Chair of Illinois People's Action and Co-Senior Pastor of Heaven's View Christian Fellowship in Peoria, IL, and Dawn Dannenbring, Lead Organizer of IPA. We share some of their key insights below.

Dannenbring says that IPA's decision to participate in the Illinois Clean Jobs Coalition was driven by its membership, who wanted access to jobs for communities of color and low-income communities, and who wanted to ensure that any energy bill for Illinois did not further burden environmental justice communities with false solutions such as fracked natural gas. Rev. Pierce adds that communities wanted energy sovereignty (more control over production and distribution of energy), which includes not just jobs, but wealth-building in the form of community-owned distributed energy generation such as community solar projects.

A major strength of the coalition was that it brought together traditional environmental groups and worker and low-income organizing groups. Pre-existing relationships were key to bringing such a diverse set of organizations to the table. In addition to diversity of issues and sectors, regional diversity mattered in the coalition. Dannenbring notes that IPA's participation in the coalition was key to ensuring that it was a truly statewide coalition as against a coalition of Chicago-based groups. She points out that Southern Illinois is coal country and there are environmental justice communities there, both in coal mining areas and in the vicinity of coal-fired power plants.

According to Rev. Pierce, the coalition's focus on ensuring that environmental justice communities, communities of color, and low-income communities benefit from solar energy and energy efficiency helped to broaden and energize the coalition's base and contributed to winning a strong bill. However, he says that these communities had to fight hard to ensure that their issues and concerns were addressed in the final outcome. He gives the example of how communities successfully struggled to broaden the definition of traditionally excluded populations to include the formerly incarcerated, because not doing so would mean that large numbers of people in Black and Brown communities would not be able to benefit from the bill.

The emphasis that the legislation places on jobs and benefits for communities of color and low-income communities "could have been divisive between community organizers, labor, and environmentalists if not handled properly," says Pierce. Dannenbring describes some of the early conversations with organized labor as "contentious," but adds that it was worth it, because "it's better to have everyone at the table, to build a better long-term outcome."

Dannenbring observes that the coalition was able to navigate sometimes divergent positions of member organizations effectively because it decided at an early stage to recognize the importance of environmental justice, to set up an environmental justice committee, and to adopt the Jemez Principles[146] of environmental justice (which give primacy to frontline community leadership).

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[146] https://www.ejnet.org/ej/jemez.pdf

Another way in which the coalition was able to resolve internal differences was to provide space to member organizations to advocate on their own for stronger positions than the coalition as a whole was willing to take.

As an example of an issue on which some coalition members took a position that the coalition as a whole didn't adopt, Rev. Pierce cites the debate around demand charges,[147] which are utility charges for peak electricity usage by a customer (as against their total usage). For an electric utility, the total generation, transmission, and distribution infrastructure requirement is determined by the expected maximum load the system will carry at any moment of time, as against the cumulative energy it will deliver over a period of time.[148] Similarly, for a gas utility, the required compressor station and pipeline infrastructure is a function of maximum load. Utilities justify demand charges on the basis that they charge customers for the infrastructure construction and maintenance cost attributable to them. Typically, they are applied to heavy users, such as industrial and commercial customers.

Utilities in Illinois wanted to extend demand charges to residential customers. Rev. Pierce points out that, in our present-day social and economic structure, residential demand charges are inherently inequitable. Higher-income ratepayers usually have "9 to 5" jobs, and could do tasks that require higher energy usage, such as laundry, at times when their overall electricity demand is low. They also have the disposable income to purchase and install "smart" devices that can be set to turn appliances on and off remotely. Thus, they have more flexibility to adjust their energy usage so they're not using a lot of energy at any given moment. Lower income ratepayers often work unpredictable, long hours, and usually can't afford such "smart" devices, so they must perform high energy-usage tasks such as laundry and cooking when they happen to be home, potentially incurring high demand charges.

Consequently, some environmental justice and low-income organizing groups in the coalition opposed residential demand charges, a position that the coalition as a whole avoided taking for fear that it might kill the entire bill. These groups had what Rev. Pierce describes as a "showdown" with the utilities, but they won in the end.

The coalition recognized that it could not win everything it wanted, and had to concede some issues to the utilities in exchange for winning major gains for distributed renewables, energy efficiency, jobs, and economic benefits for low-income people. Dannenbring mentions the bailout of nuclear power as something that almost everyone in the coalition was opposed to, but the coalition compromised on it. They did, however, successfully draw what she describes as a "hard line" on a similar proposed bailout of coal.

A unique strength of the Illinois Clean Jobs Coalition is that it did not disband after passage of the Future Energy Jobs Act, but stayed together to monitor its implementation and to ensure that, in Dannenbring's words, "the promised benefits of the legislation are actually being realized."

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[147] For an introductory explanation of demand charges, see Mosaic Energy, https://www.mosaicenergy.com/understanding-utility-demand-charges/

[148] An easy-to-understand analogy is that a major road is typically designed to be wide enough to handle the peak traffic it is expected to carry, usually during rush hour. At times other than rush hour, we can sometimes have a wide road with very little traffic. The capital expenditure to build the road increases with the width, and is therefore determined by the peak traffic at any given moment, as against the total traffic over, say, a month.

Rev. Pierce explains that community activists stayed involved in the networks for training people from marginalized communities (many of whom are formerly incarcerated) in solar jobs, and in working with solar installation companies to ensure that the people trained through these programs actually get hired. They have had significant success in both the training and the hiring phases. The recidivism rate for graduates of the training program run for ex-offenders by the Community Development Corporation (CDC) associated with Rev. Pierce's church is only 13%, compared to 43% for Illinois as a whole. The CDC also got solar installers to agree to hire 50% of their employees from the local community when building solar projects in environmental justice communities.

Best Practice Elements of State and Local Energy Efficiency Policy

The following are some best practice elements of state (and, where relevant, local) policy and legislation to advance energy efficiency in the residential and commercial sectors. They have been compiled from policies already enacted in different states and cities across the country. The policy elements are selected to maximize the overarching goals of energy use and greenhouse gas reduction with equity and democracy. These do not cover the universe of how to strengthen energy efficiency policies and design policies to achieve greater equity (see endnotes for more information sources).

In addition, not every one of these elements belong in every proposed bill to advance energy efficiency. For example, if a state has strong building codes and utility efficiency standards in place but lacks appliance standards and inclusive financing provisions, only the elements having to do with appliance standards and inclusive financing are relevant.

F.1 Policy should be ambitious and comprehensive

States enacting new energy efficiency policy (or strengthening and updating existing policy) for residential, commercial, and public buildings need to set sufficiently ambitious targets, and design policy to increase efficiency as comprehensively as possible. For example:

- States (and where relevant, cities) with residential and commercial building codes based on standards that are several years old should update them to reflect newer standards (see Appendix Tables 1 and 2).
- States with no utility efficiency requirements should introduce requirements (Appendix Table 5). Likewise, states with efficiency requirements that apply only to electric utilities should extend them to gas utilities.
- States should set ambitious energy use reduction targets for utilities. For existing state mandates for utility energy efficiency programs (Appendix Table 5), the median annual energy use reduction required for electric utilities is 1.25%, and the maximum is 2.94%. The equivalent numbers for gas utilities are 0.6% and 1.61%.[149] States should try to aim for the maximum values and exceed the median values.
- States with no water and energy efficiency standards for appliances and equipment for which state standards are not pre-empted (Appendix Table 9) should enact standards.
- States that have no legislation to enable inclusive financing to make energy efficiency upgrades broadly accessible, as well as states that authorize but do not require inclusive financing (Figure 29, Section D.1) should require inclusive financing.

[149] Our calculation, based on data from American Council for an Energy Efficient Economy (ACEEE) State Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/. Where required energy use reduction is defined as a cumulative percentage over a number of years rather than an annual rate, we have converted it to the equivalent annual rate using an exponential decay formula.

F.2 Equity should be built in by design, not as an afterthought

A key lesson from the campaign to win the Future Energy Jobs Act (FEJA) in Illinois (see Section E) was that the early involvement of environmental justice, low-income organizing, and other grassroots groups in the campaign led to legislation that achieved not just greenhouse gas reduction and other positive environmental outcomes, but also greater racial and economic equity, and a focus on jobs for marginalized populations. Energy efficiency advocates in states can benefit from this insight by making equity a core objective, on the same level as energy use reduction and associated environmental benefits rather than just an incidental added benefit, and organizing with this recognition in mind.

In Section E earlier, the lessons learned from FEJA were discussed from a campaign organizing perspective, but the same insights are equally valid as policy design guidelines. Several reports by American Council for an Energy Efficient Economy (ACEEE) also make valuable recommendations for building equity into energy efficiency programs. [150]

Specific elements of just and equitable energy efficiency policy include:

Require utilities to set aside funds for low-income energy efficiency.

As noted in Section E.1 above, FEJA requires Illinois utilities to designate funds specifically for low-income energy efficiency programs. Similar programs exist in multiple states, and use various mechanisms to deliver benefits to low-income populations. Programs in Minnesota include utility-funded weatherization programs for low-income housing, and new construction and retrofit programs for low-income housing built or operated by non-profit developers.[151] Likewise, a natural gas utility program in Ohio provides up to $4,500 in utility-funded insulation and heating furnace upgrades to low-income buildings with four or fewer units, at no cost to residents who meet income eligibility criteria.[152]

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[150] Drehobl, Ariel, and Lauren Ross, "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities," American Council for an Energy Efficient Economy (ACEEE), April 2016, available (with free registration required) at: http://aceee.org/research-report/u1602; Drehobl, Ariel, and Fernando Castro-Alvarez, "Low-Income Energy Efficiency Programs: A Baseline Assessment of Programs Serving the 51 Largest Cities," American Council for an Energy Efficient Economy (ACEEE), July 2017, available (with free registration required) at: https://aceee.org/white-paper/low-income-ee-baseline; Gilleo, Annie, Seth Nowak, and Ariel Drehobl, "Making a Difference: Strategies for Successful Low-Income Energy Efficiency Programs," American Council for an Energy Efficient Economy (ACEEE), October 2017, available (with free registration required) at: https://aceee.org/research-report/u1713; Shoemaker, Mary, and David Ribeiro, "Through the Local Government Lens: Developing the Energy Efficiency Workforce," American Council for an Energy Efficient Economy (ACEEE), June 2018, available (with free registration required) at: http://aceee.org/research-report/u1805

[151] Gilleo, Annie, Seth Nowak, and Ariel Drehobl, "Making a Difference: Strategies for Successful Low-Income Energy Efficiency Programs," American Council for an Energy Efficient Economy (ACEEE), October 2017, available (with free registration required) at: https://aceee.org/research-report/u1713

[152] Ibid.

Expand the definition of low-income households.

The definition should be expanded to include more households, including more of the "working poor," in recognition of growing economic insecurity. The official rate of poverty in the U.S. is 12.7%,[153] but the share of the U.S. population that is economically insecure as measured by the Supplemental Poverty Measure (SPM), which accounts for expenses for essentials such as food, clothing, housing, and utilities, is 43.5%.[154] Two examples of a more inclusive definition are Illinois, where the Future Energy Jobs Act expanded the definition of low-income households to households with income below 80% of area median income (AMI),[155] and Vermont, where the Low-Income Electrical Efficiency Program (LEEP) uses the same 80% of AMI ceiling to define low-income populations. [156]

Develop tailored programs for different low-income populations.

Instead of a one-size fits-all approach, low-income energy efficiency programs should be designed as a portfolio of programs to address the needs of particular populations of low-income people, such as seniors, the chronically ill and disabled, rural communities, etc.

Language access.

Energy efficiency programs must be designed to serve the needs of households in which adult members speak no English or limited English, and communities with a large proportion of such households. Individuals with limited English proficiency constitute 8.5% of the overall U.S. population,[157] but much higher percentages locally in some communities. While no examples were found of language access policies for energy efficiency in particular, there are numerous examples of language access policies for courts and legal services,[158] health care,[159] and government-wide for state and local governments.[160] These should be adapted to the specific needs of energy efficiency programs.

Tracking and reporting beneficiary demographic information.

Collecting, tracking, and reporting race, income, language spoken at home, and other demographic data on participation in utility energy efficiency programs, and using these data to evaluate program performance, constitute an important accountability measure to ensure that equity goals are actually being met.

Single point of contact.

Programs reach more people when beneficiaries can access information about all of a utility's

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[153] U.S. Bureau of the Census, Current Population Survey 2016 Annual Social and Economic Supplement, Table POV-01, downloadable in Excel format at: https://www.census.gov/data/tables/time-series/demo/income-poverty/cps-pov/pov-01.html

[154] Fox, Liana, "The Supplemental Poverty Measure: 2016," Current Population Reports, U.S. Bureau of the Census, September 2017, available at: https://www.census.gov/content/dam/Census/library/publications/2017/demo/p60-261.pdf

[155] Illinois Compiled Statutes, 220 ILCS 5 Sec. 8-103B(c), created by Illinois SB2814, Sec. 15, 2016.

[156] Gilleo, Annie, Seth Nowak, and Ariel Drehobl, "Making a Difference: Strategies for Successful Low-Income Energy Efficiency Programs," American Council for an Energy Efficient Economy (ACEEE), October 2017, available (with free registration required) at: https://aceee.org/research-report/u1713

[157] U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, (2016), Language Spoken at Home by Ability to Speak English for the Population 5 Years and Over, [Data File]. doi: B16001.

[158] http://www.mncourts.gov/Help-Topics/Language-Access-Plans.aspx

[159] https://www.nih.gov/institutes-nih/nih-office-director/office-communications-public-liaison/clear-communication/language-access-clear-communication

[160] https://ohr.dc.gov/service/know-your-rights-language-access

low-income energy efficiency programs from a single source instead of having to perform a lot of research on their own on where to go for information.

Effective outreach.

This includes making program information available using multiple media (online, print, radio, TV, in-person door to door outreach, etc.) instead of relying solely on online tools, to account for the pervasive digital divide. A 2016 Pew Research Center study showed that, while overall penetration of home broadband use in the U.S. is 73%, it is 53% for households with annual income less than $30,000, 34% for people with less than high-school education, 65% for Black households, 58% for Latinx households, and 51% for people over 65.[161] Effective outreach also requires language access (see above). In-person outreach in a community works best when the individuals performing the outreach are from the community. For example, the City of Knoxville, TN, hired "youth ambassadors" reflecting the demographics of particular neighborhoods to perform outreach on an energy efficiency retrofit program in their own neighborhoods, resulting in a diverse pool of program beneficiaries.[162] Partnering with community organizations for the outreach is an effective tool.

Community oversight.

Utilities should be required to convene committees to guide the design and evaluation of low-income energy efficiency programs, and these committees should include representatives of community-based organizations, who are in the best position to know the particular needs of their community.

Disconnection assistance.

Utilities should be required to set up disconnection assistance funds for low-income customers who have been disconnected or are facing disconnection for inability to pay their bills, with a particular focus on reaching the most vulnerable. The Illinois legislation identified seniors as a particularly vulnerable population. The involvement of affected communities in designing programs is key to making sure that the most vulnerable populations are identified.

Prioritizing the upgrades that deliver the greatest savings.

This ensures that the households who are most in need are served first, and each household served by the program gets the greatest possible benefit. The Ohio low-income weatherization and furnace upgrade program described earlier prioritizes customers who have high gas usage and are enrolled in a payment plan that allows them to pay a fixed percentage of their income on utility bills.[163]

Evaluating program outcomes using both participation metrics and project savings metrics.

The success of low-income energy efficiency programs should be measured using a combination of metrics of overall program participation, metrics of program participation by particular populations (African-American, tribal, rural, elderly, people in particular geographic areas, etc.),

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[161] Rainie, Lee, presentation on Digital Divides to the Board of Feeding America, 2/9/2017, available at: http://www.pewinternet.org/2017/02/09/digital-divides-feeding-america/

[162] Shoemaker, Mary, and David Ribeiro, "Through the Local Government Lens: Developing the Energy Efficiency Workforce," American Council for an Energy Efficient Economy (ACEEE), June 2018, available (with free registration required) at: http://aceee.org/research-report/u1805

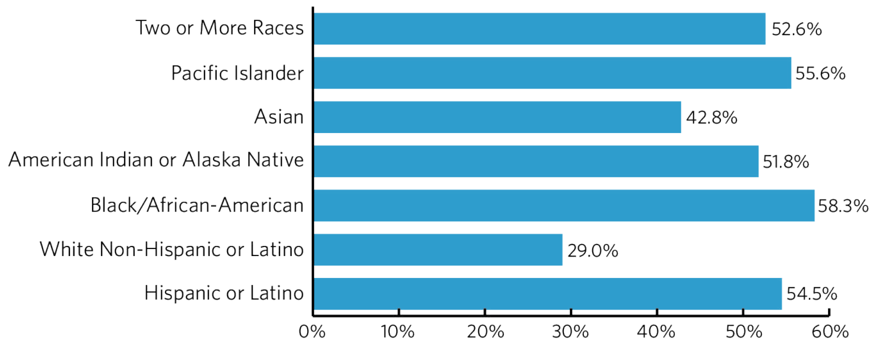
[163] Gilleo, Annie, Seth Nowak, and Ariel Drehobl, "Making a Difference: Strategies for Successful Low-Income Energy Efficiency Programs," American Council for an Energy Efficient Economy (ACEEE), October 2017, available (with free registration required) at: https://aceee.org/research-report/u1713

and metrics of level of energy and cost savings achieved in individual projects.

F.3 Needs of renters and multifamily building residents must be taken into account

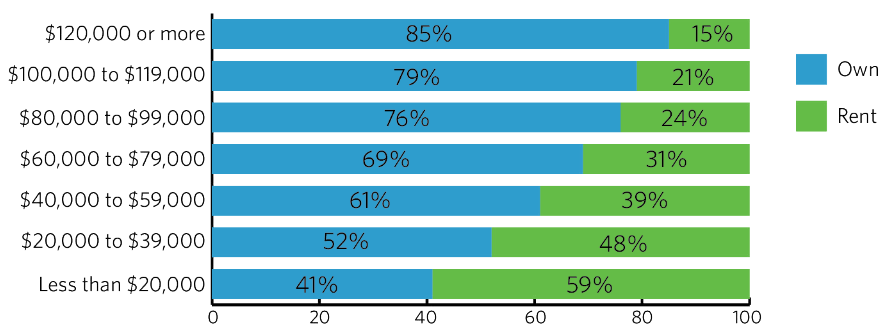
All aspects of energy efficiency policy should be designed to account for the particular needs of renters and residents of multifamily buildings (such as apartment buildings). Nationwide, a significant share of households (37%) rent their homes,[164] so energy efficiency programs that do not serve renters will exclude a sizable number of people from their benefits and achieve significantly less reductions in energy use. Because of the disparities of homeownership by race (Figure 30) and income (Figure 31), it is also a critical issue of justice to design energy efficiency policy to address renters' needs.

Figure 30. Share of Population Who Rent Their Homes, By Race, 2015 [165]



Source: Bureau of the Census

Figure 31. Shares of Homeowners and Renters by Income Range, 2015 [166]



Source: Bureau of the Census

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164 U.S. Census Bureau, 2015 American Housing Survey, interactive table creator, available at: https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html#?s_areas=a00000&s_year=n2015&s_tableName=Table1&s_byGroup1=a1&s_byGroup2=a1&s_filterGroup1=t1&s_filterGroup2=g1&s_show=S

165 Ibid.

166 Ibid.

One of the main barriers to making energy efficiency programs accessible to renters is the "split-incentive" problem, where property owners are responsible for the cost of energy efficiency upgrades, but in most instances, tenants receive the financial benefits. The exceptions to the split-incentive problem are rental buildings where the property owner pays utilities. There are two broad (and not mutually exclusive) approaches to overcoming the split-incentive problem.

One approach, discussed in Section D.2 earlier, is inclusive financing of energy efficiency upgrades, with the responsibility for repayment tied to the meter rather than the property. Another complementary approach is to offer incentives to owners of multifamily low-income rental buildings to upgrade energy efficiency for entire buildings. For example, a Wisconsin program offers the same rebates for energy efficiency upgrades to owners of low-income rental homes with three or fewer units as it offers to low-income households.[167]

As noted, these two approaches to address the split-incentive problem are complementary. Tenants can finance efficiency upgrades in their unit through inclusive financing, while the property owner can receive incentives to upgrade the entire building as well as common areas.

F.4 Address the high upfront cost barrier

Even though energy efficiency upgrades offer substantial financial benefits over their lifetime, the high upfront costs of some upgrades act as a barrier to their implementation. One approach to address the initial cost barrier faced by low-income households is to use a combination of utility bill surcharges for all customers and state funds to finance energy (Section D.1).

Another approach is inclusive financing (Section D.2). For inclusive financing to be just and equitable, bill neutrality should be a program requirement, so low-income households are not burdened with more debt. Also, tying the financing to the meter rather than the property (or the initial borrower) is essential to making the financing accessible to renters.

States should implement both these options, keeping in mind that they are not mutually exclusive. For example Illinois has implemented and expanded both these approaches through the Future Energy Jobs Act (Section E.1).

F.5 Set requirements for job accessibility, training, and quality

As discussed in Section C.7 earlier, residential and commercial energy efficiency employs a very large number of workers, more than twice the number employed by fossil fuel extraction and use. Growth in energy efficiency jobs is about six times the growth in fossil-fueled electricity generation. Also, several energy efficiency occupations have median hourly wages well in excess of the median for all occupations.

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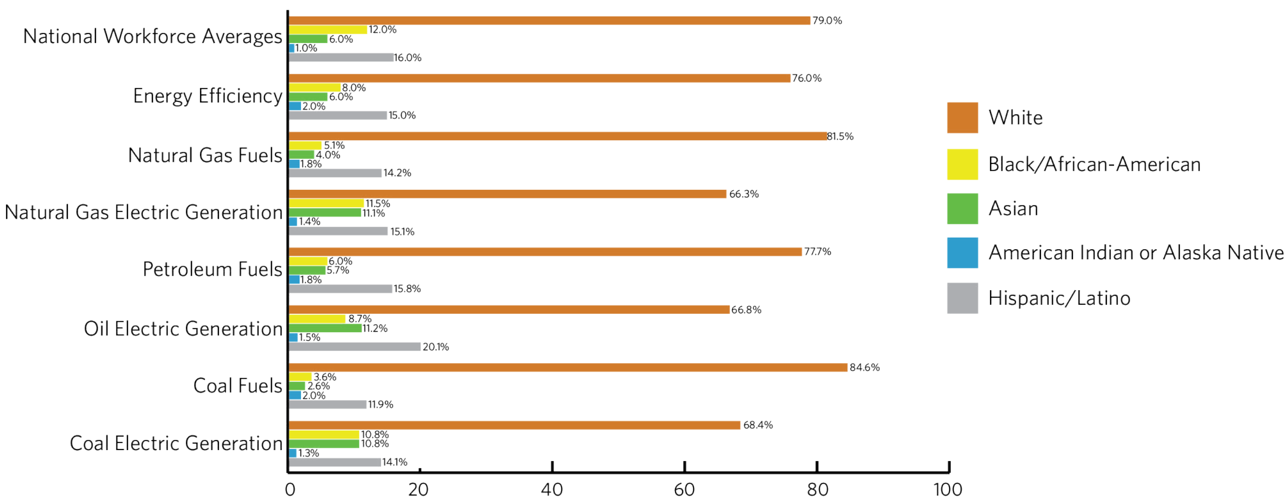
[167] Gilleo, Annie, Seth Nowak, and Ariel Drehobl, "Making a Difference: Strategies for Successful Low-Income Energy Efficiency Programs," American Council for an Energy Efficient Economy (ACEEE), October 2017, available (with free registration required) at: https://aceee.org/research-report/u1713

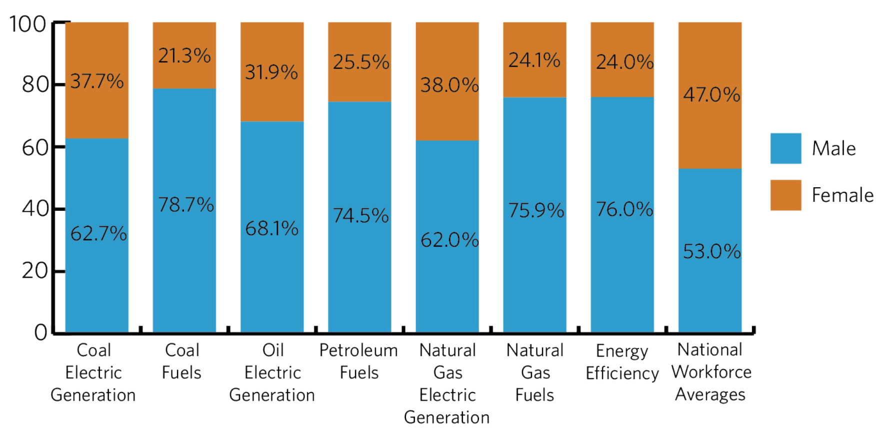
However, energy efficiency jobs have a racial and gender diversity problem (Figures 33 and 34, respectively) compared to the overall national workforce, and even to some fossil fuel-based employment, particularly in fossil fuel electric power generation.

Figure 32. Race Distribution of Energy Efficiency and Fossil Fuel Workforce, Compared to National Average, 2016 [168]



Source: Department of Energy

Figure 33. Gender Distribution of Energy Efficiency and Fossil Fuel Workforce, Compared to National Average, 2016 [169]



Source: Department of Energy

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[168] U.S. Department of Energy, U.S. Energy and Employment Report 2017, pp. 41-43, and Table 11, p. 67, available at: https://energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf. Note: the percentages add up to greater than 100% because of the Census Bureau counts the "Hispanic or Latino" population separately from its "Race" variable, and consequently, persons identifying as "Hispanic or Latino" are also counted in one of the other racial categories.

[169] Ibid.

[170] Shoemaker, Mary, and David Ribeiro, "Through the Local Government Lens: Developing the Energy Efficiency Workforce," American Council for an Energy Efficient Economy (ACEEE), June 2018, available (with free registration required) at: http://aceee.org/research-report/u1805

These data point to the need to design energy efficiency policy with a strong jobs access component, to make energy efficiency jobs accessible to historically excluded populations and reverse the racial and gender disparities shown in Figures 33 and 34.

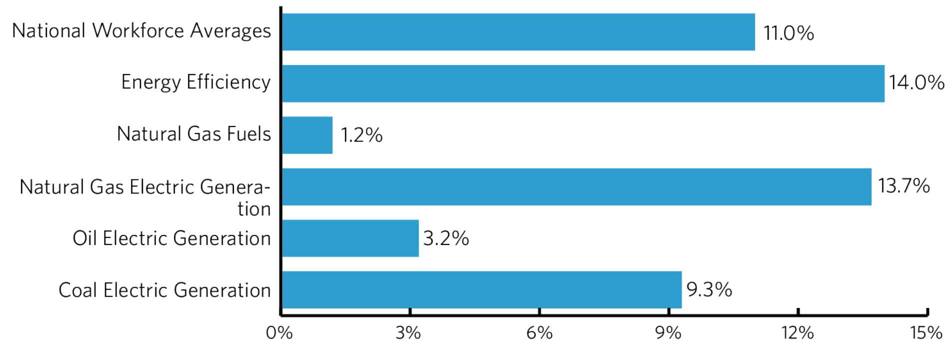
A few specific policy tools to drive greater diversity in the energy efficiency workforce are listed below. The tools are largely based on a recent report[170] by American Council for an Energy Efficient Economy (ACEEE) recommending approaches for local governments to utilize their workforce development agencies and policies to advance a robust, diverse, skilled energy efficiency workforce. (While the report focuses on local governments, many of its recommendations are broad enough to apply to state energy efficiency and workforce development programs as well.) The tools have been supplemented with ideas derived from the successful experiences in Illinois (see Section E above) and Oregon (see box on p. 64).

The policy tools include:
- Set explicit hiring goals for people from historically excluded populations for government-funded or mandated energy efficiency projects.
- Set explicit goals for contracting with minority-owned and women-owned businesses for government-funded or mandated energy efficiency projects.
- Coordinate better between energy efficiency policy and workforce development policy, so that they are both working towards the goal of diversifying the energy efficiency workforce.
- Ensure that the energy efficiency skills training available to job seekers matches the skills needed by energy efficiency employers.
- Involve the widest possible range of partners in workforce policy design, as well as in subsequent implementation, including training, hiring, and monitoring and evaluation. This includes:
    - Organizations based in communities of color and low-income communities;
    - Unions representing workers with the kinds of job functions and skills required in efficiency work;
    - Training organizations such as universities, colleges, and community colleges, union apprenticeship programs, etc.;
    - Utilities;
    - Energy efficiency contractors and their trade associations.

The Illinois Future Energy Jobs Act provides a good example of policy language that requires utilities to fund energy jobs skills training for historically excluded people, including people from environmental justice communities, youth of color, formerly incarcerated individuals, and persons who have been in the foster care system as children (Section E.1). The funding is provided to community organizations, who are familiar with the particular needs in their communities and are therefore better able to design appropriate training programs (Section E.2).

Job quality is also a concern. While it is true that energy efficiency jobs for the most part pay above-average wages (Figures 27 and 28), there are likely to be significant differences between union and non-union positions. The unionization rate in energy efficiency jobs (Figure 34) is greater than the national average, and greater than any of the fossil-fuel energy sectors reported in the Department of Energy jobs report, but to put this number in perspective, the vast majority (86%) of energy efficiency workers are not unionized.

Figure 34. Unionization Rate of Energy Efficiency and Fossil Fuel Workforce, Compared to National Average, 2016 [171]



Source: Department of Energy

Addressing the low rate of unionization in the energy efficiency workforce through state policy is challenging. The federal National Labor Relations Act (NLRA) pre-empts state law (meaning that state laws cannot grant workers rights to unionize that exceed their rights to unionize under the NLRA),[172] and the environment for labor organizing in the U.S. in general is difficult, as shown by the 11% unionization rate of the overall U.S. workforce. However, policies that set minimum labor standards for state-funded or state-mandated energy efficiency programs, such as in Oregon (see box below), can have the practical effect of giving unionized companies a competitive advantage and create a longer-term market incentive for employers to not resist unionization.

How Oregon's Energy Efficiency Program Has Raised Labor Standards

An example of a well-designed program that addresses both workforce diversity needs and job quality standards is Oregon's home energy efficiency program, run by an independent non-profit called Enhabit.[173] It started as a pilot program of the City of Portland called Clean Energy Works Portland, and was then extended statewide as Clean Energy Works Oregon (CEWO).[174] It has had impressive achievements in job creation, equity of job access, and job quality, including: [175]

- 342 new hires on CEWO projects from March 2011 through December 2013.
- Over 1,000 workers were employed on CEWO projects over the same period.
- 47% of new hires were women and people of color.
- More than 55% of hours worked on CEWO projects were by women and people of color, exceeding the program goal of 30%. (Note, this is a better measure of job access than merely number of employees on payroll, because in hourly wage positions with variable hours, being on the payroll is not a guarantee that an employee is actually working and getting paid.)

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[171] U.S. Department of Energy, U.S. Energy and Employment Report 2017, pp. 41-43, and Table 11, p. 67, available at: https://energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf

[172] For a discussion of NLRA preemption, see Befort, Stephen, "Demystifying Federal Labor and Employment Law Preemption," University of Minnesota Law School Scholarship Repository, 1998, available at: https://scholarship.law.umn.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1089&context=faculty_articles

[173] https://enhabit.org/

• Almost 13% of payments on CEWO contracts went to minority and women owned businesses, which, however, was less than the goal of 20%.
• Median[176] hourly wage on CEWO projects as of December 2013 was $18.46, compared to the 2013 median hourly wage for all occupations in Oregon of $17.24, indicating that CEWO-funded jobs were on the whole higher-paying than typical jobs in Oregon.[177] (The program does not provide data about its detailed occupational make-up, making it hard to compare this median wage number with 2013 statewide wages by occupation in Oregon.)
• 81% of prime contractors offer employer-subsidized health insurance, and all workers receive either health insurance or supplemental wages of at least $2.50 per hour.[178]

Three key takeaways from the Oregon experience are: [179]
1. Setting goals for wage standards, number of workers from traditionally excluded communities hired and trained, etc. are key to ensuring that there is real progress.
2. One way to ensure program success is to set up a scoring system for contractors for goals such as hiring people of color and women, wage levels, providing health benefits, etc., and awarding contracts based on the scores.
3. The program's successes are directly attributable to the fact that a broad range of organizations, many of them consisting of affected populations, were at the table designing the policy. The organizations involved represented various sectors such as organized labor, minority-owned business, Indigenous communities, low-income organizing, etc., and included:
  - Carpenters Union Local 247;
  - LiUNA Laborers Union Local 483;
  - Oregon Tradeswomen, a group promoting women's access to skilled construction work;[180]
  - Oregon Apollo Alliance, a coalition of labor, environmental, community, and business organizations for clean energy and green jobs;[181]
  - National Association of Minority Contractors of Oregon;
  - Metropolitan Alliance for Common Good (MACG), a coalition of Portland-based faith congregations and other organizations working on access to health care and jobs;[182]
  - Native American Youth and Family Center.

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[174] City of Portland Bureau of Planning and Sustainability (BPS), Clean Energy Works Oregon Final Technical Report, December 2013, available at: https://www.osti.gov/servlets/purl/1117211
[175] Ibid.
[176] The median wage is the wage such that half the workers receive a higher wage and half receive a lower wage. In other words, it is the mid-point of the wage distribution.
[177] Bureau of Labor Statistics, Occupational Employment Statistics (OES) data by state, May 2013, downloadable in Excel format at: https://www.bls.gov/oes/tables.htm.
[178] Three caveats about this number are: one, it does not count subcontractors, and the program does not disclose data on what percentage of workers and/or work hours are attributable to prime contractors; two, it does not provide details about the median, or average, degree of employer subsidization of health insurance, and whether or not health benefits are only for workers or for their dependents, so it is hard to assess the degree to which workers have to pay health care costs for themselves and their dependents; and three, the program does not disclose whether the supplemental wage of $2.50 or more per hour is sufficient for workers who receive it to purchase health insurance for themselves and/or their dependents. This is not to downplay the achievements of the program. It is intended solely as a realistic evaluation of what we know and what we don't know with regard to the success of the program.
[179] City of Portland Bureau of Planning and Sustainability (BPS), Clean Energy Works Oregon Final Technical Report, December 2013, available at: https://www.osti.gov/servlets/purl/1117211
[180] http://www.tradeswomen.net/
[181] https://www.sustainable.org/economy/economics-a-finance/1360-apollo-alliance-clean-energy-and-good-jobs
[182] http://iafnw.org/macg/about

Appendix

Detailed Tables

Table 1. State Mandates for Residential Building Energy Efficiency.[1]

State	Statewide Mandate?	Local Authority to Set More Stringent Mandate?	Effective Code Year in Mandate
AL	Yes	Yes	2009
AK	Limited [1]		2012
AZ	No		
AR	Yes		2009
CA	Yes	Yes	2012
CO	Limited [2]		2003
CT	Yes		2012
DE	Yes		2012
DC	Yes		2012
FL	Yes		2012
GA	Yes		2009
HI	Yes		2015
ID	Yes		2009
IL	Yes		2015
IN	Yes		2009
IA	Yes	Yes	2012
KS	No		
KY	Yes		2009
LA	Yes		2009
ME	Yes		2009
MD	Yes		2015
MA	Yes		2012
MI	Yes		2015
MN	Yes		2012
MS	No		
MO	No		
MT	Yes		2012
NE	Yes	Yes	2009
NV	Yes		2012
NH	Yes	Yes	2009
NJ	Yes		2015
NM	Yes	Yes	2009

[1] American Council for an Energy Efficient Economy (ACEEE) State Policy Database, downloadable in Excel format (with free registration required) at: http://database.aceee.org/

State	Statewide Mandate?	Local Authority to Set More Stringent Mandate?	Effective Code Year in Mandate
NY	Yes	Yes	2015
NC	Yes		2009
ND	No		
OH	Yes		2009
OK	Yes		2009
OR	Yes		2012
PA	Yes	Yes	2009
RI	Yes		2012
SC	Yes	Yes	2009
SD	No		
TN	No		
TX	Yes	Yes	2015
UT	Yes		2015
VT	Yes		2015
VA	Yes		2009
WA	Yes		2015
WV	Yes		2009
WI	Yes		2009
WY	No		

Notes:
[1] Applies only if project has received Alaska Housing Finance Corporation financing.
[2] Cities can choose not to apply statewide mandate.

Table 2. State Mandates for Commercial Building Energy Efficiency.[2]

State	Statewide Mandate?	Local Authority to Set More Stringent Mandate?	Standard Source
AL	Yes	Yes	ASHRAE 2013
AK	No		
AZ	Limited [1]	Yes	ASHRAE 2004
AR	Yes		IECC 2009
CA	Yes	Yes	ASHRAE 2013
CO	Limited [2]	Yes	IECC 2003
CT	Yes		IECC 2012
DE	Yes		ASHRAE 2010

[2] Ibid.

State	Statewide Mandate?	Local Authority to Set More Stringent Mandate?	Standard Source
DC	Yes		ASHRAE 2010, IECC 2012
FL	Yes		IECC 2012
GA	Yes		ASHRAE 2007
HI	Yes		IECC 2015
ID	Yes		IECC 2012
IL	Yes		IECC 2015
IN	Yes		ASHRAE 2007
IA	Yes	Yes	IECC 2012
KS	No		
KY	Yes		IECC 2012
LA	Yes		ASHRAE 2007
ME	Yes [3]		IECC 2009
MD	Yes		IECC 2015
MA	Yes		ASHRAE 2010, IECC 2012
MI	Yes		ASHRAE 2007
MN	Yes		ASHRAE 2010, IECC 2012
MS	Yes	Yes	ASHRAE 2010
MO	No		
MT	Yes		ASHRAE 2010, IECC 2012
NE	Yes	Yes	ASHRAE 2007, IECC 2009
NV	Yes		ASHRAE 2010, IECC 2012
NH	Yes		ASHRAE 2007, IECC 2009
NJ	Yes		ASHRAE 2013
NM	Yes	Yes	ASHRAE 2007, IECC 2009
NY	Yes	Yes	ASHRAE 2013, IECC 2015
NC	Yes		ASHRAE 2010, IECC 2009
ND	No		IECC 2009
OH	Yes		ASHRAE 2007, IECC 2009
OK	Yes		IECC 2009
OR	Yes		ASHRAE 2010, IECC 2012
PA	Yes		ASHRAE 2007, IECC 2009
RI	Yes		IECC 2012
SC	Yes		ASHRAE 2007, IECC 2009
SD	Limited [4]	Yes	IECC 2012
TN	Limited [4]	Yes	IECC 2012
TX	Yes	Yes	ASHRAE 2013
UT	Yes	Yes	IECC 2015
VT	Yes		ASHRAE 2013, IECC 2015
VA	Yes		ASHRAE 2010, IECC 2012

State	Statewide Mandate?	Local Authority to Set More Stringent Mandate?	Standard Source
WA	Yes		ASHRAE 2013, IECC 2015
WV	No		
WI	Yes		IECC 2009
WY	No		

Notes:
[1] Applies only to buildings that receive state funding.
[2] Applies only to local jurisdictions that have energy efficiency requirements in their building codes.
[3] Does not apply to municipalities of less than 4,000.
[4] Local jurisdictions allowed to opt out.

Table 3. State Energy Efficiency Mandates for Public Building Construction and Renovation.[3]

State	Type of Mandate	Applicability to Buildings That Are Not State-Owned
AL	No Mandate	State-funded buildings
AK	Construction and Renovation [1]	Public schools
AZ	Construction Only	State-funded buildings
AR	Construction Only	No
CA	Construction and Renovation	No
CO	No Mandate	
CT	Construction and Renovation	Buildings with state funding U $2 million.
DE	Construction and Renovation	Unclear
DC	Construction Only	No
FL	Construction and Renovation	State-funded buildings
GA	Construction Only	No
HI	Construction and Renovation	No
ID	No Mandate	
IL	Construction and Renovation	State-funded buildings > 10,000 sq. ft.
IN	Construction Only	No
IA	No Mandate	
KS	Construction and Renovation [2]	No
KY	Construction and Renovation [3]	Projects where state pays > 50% of costs; state-leased buildings.
LA	Construction and Renovation [4]	State-funded buildings
ME	Construction and Renovation [5]	State-leased buildings.
MD	Construction Only	100% state-funded buildings, partly state-funded schools and community colleges > 7,500 sq. ft.
MA	Construction and Renovation [6]	No
MI	Construction and Renovation [5]	No
MN	No Mandate	
MS	Construction Only	State-leased buildings
MO	Construction and Renovation [7]	State-leased buildings

[3] Ibid.

State	Type of Mandate	Applicability to Buildings That Are Not State-Owned
MT	Construction and Renovation [5]	Standards apply to construction projects only for state-leased buildings.
NE	Construction and Renovation [8]	State-funded buildings.
NV	Construction Only	State-funded buildings.
NH	Construction and Renovation	No
NJ	Construction Only [9]	No
NM	Construction and Renovation [10]	State-funded buildings.
NY	Construction and Renovation	Unclear
NC	Construction and Renovation	No
ND	No Mandate	
OH	No Mandate	
OK	Construction and Renovation	No
OR	Construction and Renovation	No
PA	Construction Only [11]	No
RI	Construction Only [4]	No
SC	Construction Only	No
SD	Construction and Renovation [12]	State-funded buildings.
TN	Unclear	
TX	Construction and Renovation	State-funded buildings.
UT	Construction and Renovation [4]	No
VT	Construction and Renovation [13]	No
VA	Construction and Renovation	No, but energy-efficient buildings are preferred for leases.
WA	Construction Only [4]	State-funded buildings, public schools
WV	Construction Only	State-funded buildings.
WI	Construction Only [5]	No
WY	No Mandate	

Notes:

[1] Legislative and court buildings, buildings < 10,000 sq. ft. are exempted.

[2] Renovation covered only where feasible.

[3] Compliance not required if agency can show " undue burden."

[4] Applies to "major" facilities only.

[5] Cost effectiveness or cost-benefit analysis required.

[6] Renovations exempted if < 20,000 sq. ft.

[7] Applies only to buildings > 5,000 sq. ft.

[8] Applies to renovation if remodeling costs > 50% of building replacement cost.

[9] Applies only to buildings > 15,000 sq. ft.

[10] Additions of < 3,000 sq. ft. not covered.

[11] Applies only to buildings > 20,000 sq. ft.

[12] Applies to projects costing > $500,000 or covering > 5,000 sq. ft.

[13] Applies only to renovation projects > $250,000.

Table 4. State Energy Use Reduction Mandates for Existing Public Buildings.[4]

State	Mandate	Reduction Target	Target Year	Baseline Year	Applicability to Buildings That Are Not State-Owned
AL	Yes	30%	2015	2005	No
AK	Yes [1]	15%	2020	2010	No
AZ	Yes	15%	2011	2003	No
AR	Yes [2]	30%	2017	2008	No
CA	Yes	20%	2018	2003	No
CO	Yes	12%	2020	2015	No
CT	Yes	20%	2018		Buildings with state funding U $2 million.
DE	Yes	30%	2015	2008	State-leased buildings, tenants of state-owned or state-leased buildings.
DC	Yes	20%	2020		No
FL	Unclear				
GA	Yes	15%	2020	2007	No
HI	Yes [3]				No
ID	No				
IL	Yes	20%	2020	2009	State-leased buildings
IN	No				
IA	Yes [4]				No
KS	Yes [5]				State -leased buildings must undergo energy audits before lease is approved or renewed.
KY	No				
LA	No				
ME	No				
MD	Yes	20%	2020	2008	No
MA	Yes	35%	2020	2004	Buildings where state pays utility bills.
MI	Yes [6]				State-leased buildings.
MN	Yes	90%	2025	2003	No
MS	No				
MO	Yes	10%	2019	2009	No
MT	Yes [7]				No
NE	No				
NV	Yes	20%	2015		No
NH	Yes	50%	2030	2005	No
NJ	Yes	20%	2020		Unclear
NM	Yes	20%	2020	2012	No
NY	Yes	20%	2020		State-managed buildings
NC	No				
ND	No				
OH	No [8]				State-leased buildings > 20,000 sq. ft.
OK	Yes	20%	2020	2016	No

[4] Ibid.

State	Mandate	Reduction Target	Target Year	Baseline Year	Applicability to Buildings That Are Not State-Owned
OR	Yes	20%	2023	2013	No
PA	Yes [9]				State-leased buildings
RI	Yes	10%	2019	2014	Unclear
SC	Yes [10]	20%	2020	2000	Public schools
SD	No				
TN	No				
TX	Yes [11]				No
UT	No				
VT	Yes	15%	2030	2016	State-operated buildings.
VA	Yes	10%	2020	2014	Unclear
WA	Yes	20%	2020	2009	Unclear
WV	No				
WI	No				
WY	No				

Notes:
[1] Only applies to 25% of state-owned buildings. Does not apply to legislative and court buildings and buildings < 10,000 sq. ft.
[2] Does not apply to facilities < 20,000 sq. ft.
[3] Applies only to buildings that are > 5,000 sq. ft. or use > 8,000 kWh of electricity annually. Evaluation and benchmarking used to identify energy saving opportunities.
[4] Benchmarking results used to identify buildings with greatest potential for cost-effective efficiency measures.
[5] All state-owned buildings must undergo energy audit every 5 years to identify excessive energy usage.
[6] All state-owned and state-leased buildings must undergo energy audit every 5 years to identify excessive energy usage.
[7] Baselines and targets determined on case-by-case basis.
[8] Energy audits required for all state-owned and some state-leased buildings.
[9] Instead of setting specific statewide goals, State agencies required to make buildings more energy efficient, and implement a range of low-cost and no-cost efficiency measures.
[10] Facilities can petition the SC Energy Office for exemption from mandate.
[11] State agencies and universities must set and report on their own energy efficiency goals.

Table 5. Required Utility Energy Efficiency Programs and Targets in the States. [5]

State	Requirement	Overall reduction target	Electricity reduction target	Gas reduction target	Target type	Target year	Baseline year
AL	None						
AK *	None	15.00%			Cumulative	2020	2010
AZ	Electricity + gas		22.00%	6.00%	Cumulative	2020	2010
AR	Electricity + gas		0.90%	0.60%	Annual		
CA	Electricity + gas		1.15%	0.56%	Annual		

[5] Ibid.

State	Requirement	Overall reduction target	Electricity reduction target	Gas reduction target	Target type	Target year	Baseline year
CO	Electricity + gas		1.35%		Annual		
CT	Electricity + gas		1.51%	0.61%	Annual		
DE	Electricity + gas		Being developed	Being developed			
DC *	None	0.85%			Annual		
FL	Electricity + gas		990.6 GWh	Unclear	Annual		
GA	Electricity only		Vary by utility				
HI	Electricity only		0.14%		Annual		
ID	Electricity + gas		Vary by utility	Vary by utility			
IL	Electricity + gas		2.00%	8.60%	Annual (electricity), Cumulative (gas)	2020	2009
IN	Electricity only		1.10%		Annual		
IA	Electricity + gas		Vary by utility	Vary by utility	Annual		
KS	None						
KY	Electricity only		Vary by utility				
LA	None						
ME	Electricity + gas	20.00%			Cumulative	2020	2013
MD	Electricity + gas		1.40%	Being developed	Annual		
MA	Electricity + gas		2.94%	1.24%	Annual		
MI	Electricity + gas		1.00%	0.75%	Annual		
MN	Electricity + gas		1.50%	1.50%	Annual		
MS	Electricity + gas		Being developed	Being developed			
MO	Electricity only		Vary by utility				
MT	Electricity + gas		Vary by utility	Vary by utility			
NE	None						
NV	Electricity only		Vary by utility				

State	Requirement	Overall reduction target	Electricity reduction target	Gas reduction target	Target type	Target year	Baseline year
NH	Electricity + gas		3.10%	2.25%	Cumulative	2020	2017
NJ *	None	20.00%			Reduction from forecast level	2020	2020
NM	Electricity + gas		8.00%	8.00%	Cumulative	2020	2005
NY	Electricity + gas		Vary by utility	Vary by utility	Annual		
NC	Electricity only						
ND	None						
OH	Electricity only		22.00%		Cumulative	2025	2008
OK	Electricity + gas		Vary by utility	Vary by utility			
OR	Electricity + gas		1.40%	0.70%	Annual		
PA	Electricity only		Vary by utility				
RI	Electricity + gas		2.60%	1.10%	Annual		
SC	None						
SD	None						
TN	None						
TX	Electricity only		0.40%		Annual		
UT	Electricity + gas		Vary by utility	Vary by utility			
VT	Electricity + gas	Targets					
VA	None						
WA	Electricity only		Vary by utility				
WV	Electricity only		Vary by utility				
WI	Electricity + gas		0.77%	0.60%	Annual		
WY	None						

* These states do not have requirements for utilities, but have energy savings goals that apply to state-run programs (AK and NJ) or by a third-party non-profit (DC).

Table 6. National and State Efficiency Standards for Residential Use Products.[6]

Product Type	State Standards Preempted?	States With Standards	Year Federal Standards Go Into Effect
Air Purifiers	No		
Battery Chargers	Yes		
Boilers	Yes		
Ceiling Fans	Yes		
Central Air Conditioners and Heat Pumps	Yes		
Clothes Dryers	Yes		
Clothes Washers	Yes		
Compact Audio Equipment	No	CA, CT, OR	
Computers and Computer Systems	No	CA	
Cooking Products	Yes		
Dehumidifiers	Yes		
Direct Heating Equipment	Yes		
Dishwashers	Yes		
Audio/Video Equipment	No [1]	CA, CT, OR	
External Power Supplies	Yes [2]	CA	
Faucets	No [3]	CA, CO	
Furnace Fans	Yes		
Furnaces	Yes		
Game Consoles	No		
Hearth Products	No		
Lawn Sprinklers	No		
Microwave Ovens	Yes		
Miscellaneous Refrigeration Products (beverage coolers, etc.)	Yes [4]	CA	2019
Pool Heaters	Yes		
Pool Pumps	Yes [4]	AZ, CA, CT, WA	2021
Portable Air Conditioner	Undetermined [5]		
Portable Electric Spas	No	AZ, CA, CT, OR, WA	
Refrigerators and Freezers	Yes		
Room Air Conditioners	Yes		
Set-top Boxes	No		
Showerheads	No [3]	CA, CO	
Televisions	No [6]	CA, CT, OR	
Toilets	No [3]	CA, CO, GA, TX	
Ventilation Fans	No		
Water Heaters	Yes		

[6] https://appliance-standards.org/national; Mauer, Joanna, Andrew deLaski, and Marianne DiMascio, "States Go First: How States Can Save Consumers Money, Reduce Energy and Water Waste, and Protect the Environment with New Appliance Standards," Appliance Standards Awareness Project (ASAP) and American Council for an Energy-Efficient Economy (ACEEE), July 2017, available at: http://aceee.org/research-report/a1702

Notes:
[1] The existing state standards cover only DVD players and recorders.
[2] State standards appear to be preempted, not clear how CA has a standard.
[3] Preemption is waived even though a federal standard exists.
[4] State standards will be preempted when federal standards go into effect.
[5] Federal standards are being litigated.
[6] Federal standard was repealed because of technological change.

Table 7. National and State Efficiency Standards for Commercial and Industrial Use Products.[7]

Product Type	**State Standards Preempted?**	**States With Standards**
Automatic Commercial Ice Makers	Yes	
Boilers, Commercial	Yes	
Clothes Washers, Commercial	Yes	
Commercial Central Air-Conditioners and Heat Pumps	Yes	
Commercial Fryers	No	
Commercial Dishwashers	No	
Commercial Refrigeration Equipment	Yes	
Commercial Steam Cookers	No	
Commercial Warm Air Furnaces	Yes	
Commercial Water Heaters	Yes	
Compressors	Unclear [1]	
Distribution Transformers	Yes	
Electric Motors	Yes	
Fans and Blowers	Yes	
Hot Food Holding Cabinets	No	CA, CT, DC, MD, NH, OR, RI, WA
Pre-Rinse Spray Valves	Yes	
Pumps, Commercial and Industrial	Yes	
Telephones (landline)	No	
Uninterruptible Power Supplies	Unclear [1]	
Unit Heaters	Yes	
Urinals	No [2]	CA, CO, TX
Vending Machines	Yes	
Walk-In Coolers and Freezers	Yes	
Water Dispensers	No	CA, CT, DC, MD, NH, OR, RI, WA
Water-Source Heat Pumps	Yes	

Notes:
[1] DOE rule not yet published, possible that it may be reversed.
[2] Preemption is waived even though a federal standard exists.

[7] Ibid.

Table 8. National and State Efficiency Standards for Lighting Products.[8]

Product Type	State Standards Preempted?	States With Standards
Candelabra & Intermediate Base Incandescent Lamps	Yes	
Ceiling Fan Light Kits	Yes	
Compact Fluorescent Lamps	Yes	
Deep-Dimming Fluorescent Ballasts	No	CA
Fluorescent Lamp Ballasts	Yes	
General Service Fluorescent Lamps	Yes	
General Service Lamps	Yes	
High Intensity Discharge Lamps	Yes	
High Color Rendering Index Fluorescent Lamps	No	
High Light Output Double-Ended Quartz Halogen Lamps	No	OR
Illuminated Exit Signs	Yes	
Incandescent Reflector Lamps	Yes	
Metal Halide Lamp Fixtures	Yes	
Small-Diameter Directional Lamps	No	CA
Torchiere Lighting Fixtures	Yes	
Traffic Signals	Yes	

Table 9. Appliances with Greatest Potential for Energy, Water, and Monetary Savings from Expanded State Standards, in Descending Order of Monetary Savings.[9]

Appliance	States with Standards
Faucets	CA, CO
Showerheads	CA, CO
Lawn Sprinklers	None
Toilets	CA, CO, GA, TX
Computers and Computer Systems	CA
High Color Rendering Index Fluorescent Lamps	None
Air Purifiers	None
Pool Pump Motors	AZ, CA, CT, WA
Commercial Fryers	None
Commercial Dishwashers	None
Commercial Steam Cookers	None
Portable Air Conditioners	None
Urinals	CA, CO, TX
Audio/Video Equipment	CA, CT, OR *
Uninterruptible Power Supplies	None

[8] Ibid.

[9] Mauer, Joanna, Andrew deLaski, and Marianne DiMascio, "States Go First: How States Can Save Consumers Money, Reduce Energy and Water Waste, and Protect the Environment with New Appliance Standards," Appliance Standards Awareness Project (ASAP) and American Council for an Energy-Efficient Economy (ACEEE), July 2017, available at: http://aceee.org/research-report/a1702

Appliance	States with Standards
Telephones (landline)	None
Water Dispensers	CA, CT, DC, MD, NH, OR, RI, WA
Ventilation Fans	None
Portable Electric Spas	AZ, CA, CT, OR, WA
Hot Food Holding Cabinets	CA, CT, DC, MD, NH, OR, RI, WA
Compressors	None

* The standards in these three states cover only DVD players, not A/V equipment more broadly.