Energy Efficiency Impact Report

Co-Benefits with Energy Savings

Highlights

Energy efficiency is often credited for achieving energy savings, but it also provides benefits in other areas, such as:

Job Creation

Efficiency jobs make up 40% of all traditional energy jobs, totaling 2.3 million in 2018; 70% of workers are employed by small businesses.

Greenhouse Gas Emissions Reductions

Energy efficiency is responsible for half of the carbon dioxide emissions reductions in the power sector since 2005.

Public Health

In 2017, avoided air pollution due to energy efficiency was responsible for $540 million in public health benefits, including avoided non-fatal heart attacks and asthma exacerbations.

Addressing the Energy Burden

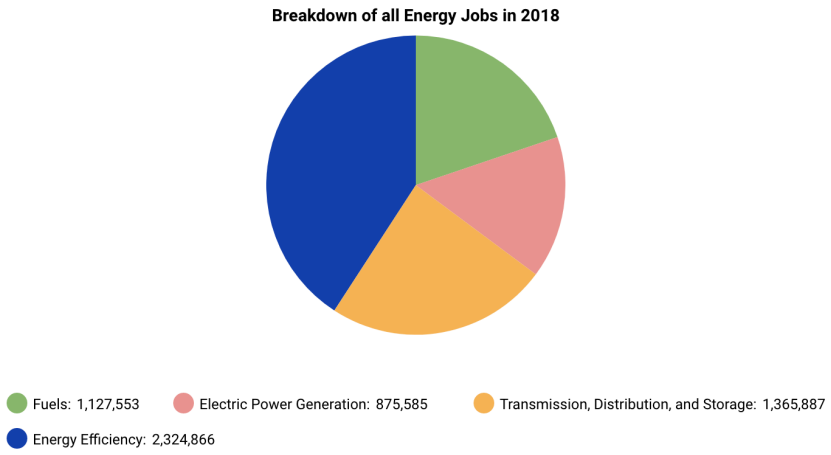
More than 60% of low-income households experience a high financial burden from energy costs. Cost-effective energy efficiency improvements exist in many circumstances that could save consumers on energy costs.

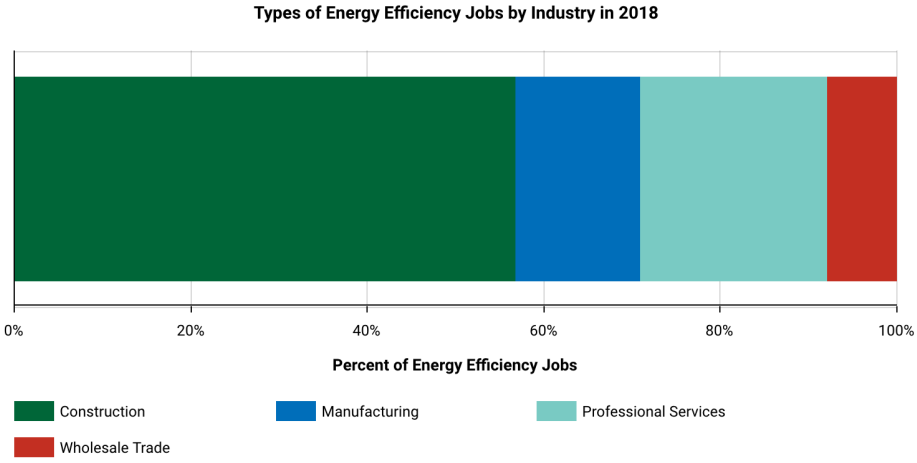
Other Commercial Benefits

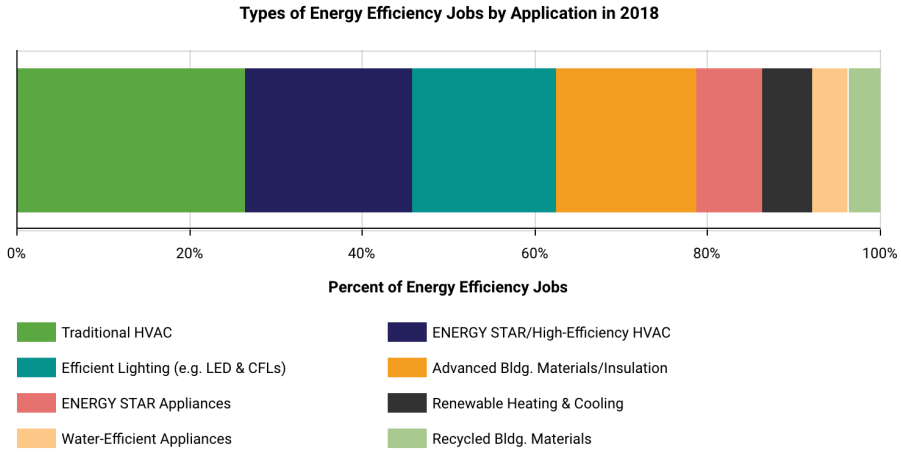
Energy efficiency can unlock higher levels of cost savings in commercial buildings beyond energy savings themselves, including increased worker productivity, health, and satisfaction, reduced costs for maintenance and operation, and higher asset values.

7 Energy Efficiency Jobs

Efficiency jobs totaled 2.3 million in 2018, and 70% of workers are employed by small businesses







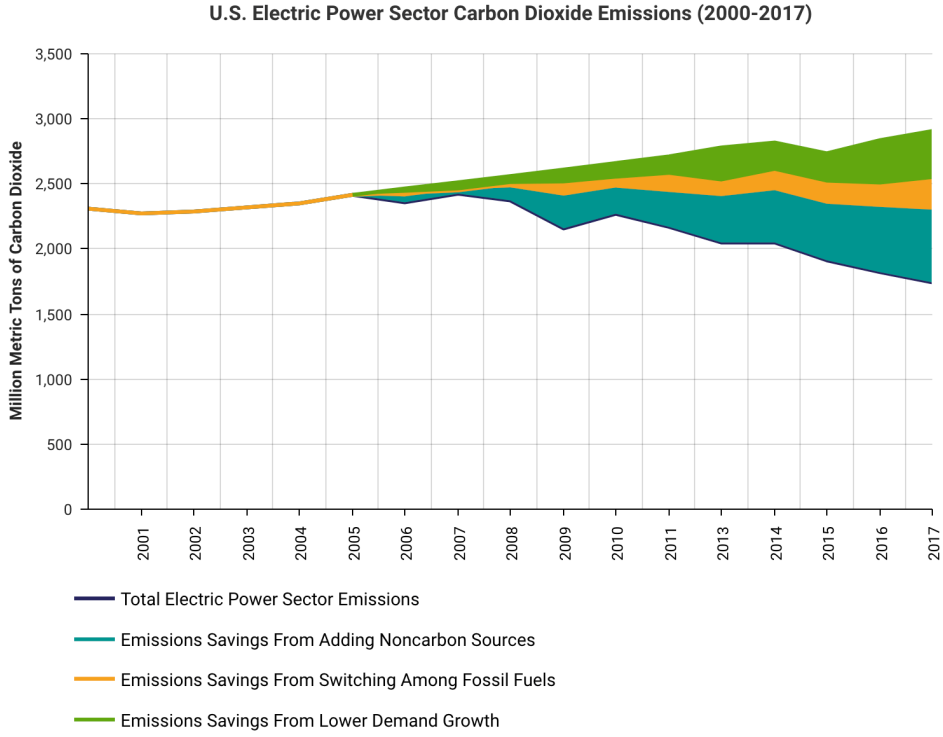
Source: NASEO & EFI (2019), The 2019 U.S. Energy and Employment Report

There were more than 2.3 million U.S. jobs in energy efficiency in 2018, making up 40% of all traditional energy and energy efficiency jobs[1] as defined by the 2019 U.S. Energy & Employment Report (USEER).[2] Not only is energy efficiency a leading job-creator nationwide in the energy sector, energy efficiency jobs are also a key driver of our local economies: 70% of workers are employed by small businesses, and energy efficiency jobs exist in every state.[3,4,5]

These jobs also represent a wide range of skillsets, many of which cannot be outsourced: more than 50% of energy efficiency jobs are in construction, while professional services (including consulting, engineering, finance, legal, etc.) constitute about 20% of jobs.

8 Reduced Greenhouse Gas Emissions

Energy efficiency is responsible for 50% of the carbon dioxide emission reductions in the power sector since 2005



Source: EIA (2018), Today in Energy

In the power sector, greenhouse gas emissions have fallen by nearly 30% from 2005 to 2017 relative to baseline growth at a fixed carbon intensity. While a significant portion of these emissions reductions are derived from fuel switching from coal or petroleum to natural gas (25%) and renewable deployments (24%), more than half of the primary emissions reductions are due to reduced demand growth.

1 The USEER provides jobs data for the motor vehicles and component parts sector as well, however this sector is not considered in the report as part of the traditional energy industry.

2 NASEO & EFI (2019), The 2019 U.S. Energy and Employment Report

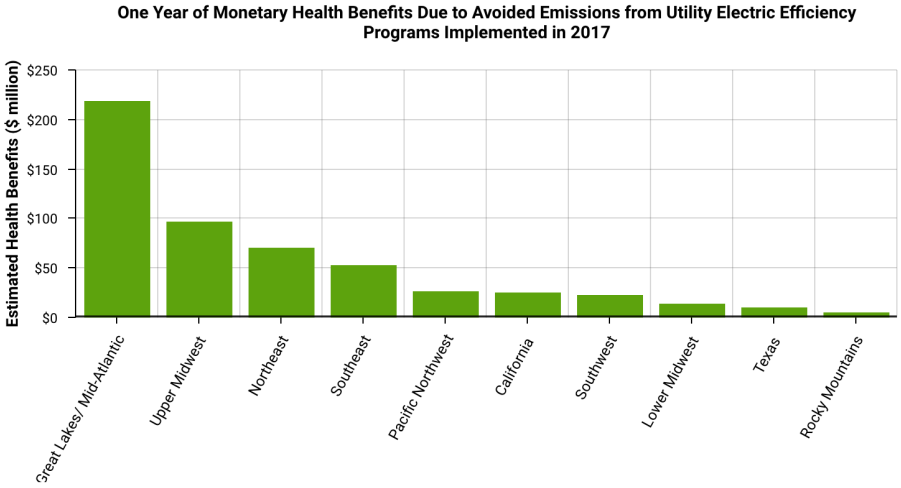
3 Environmental Entrepreneurs and E4TheFuture (2016), Energy Efficiency Jobs in America: A Comprehensive Analysis of Energy Efficiency Employment Across All 50 States

4 For small business with fewer than 10 employees.

5 E2 & E4TheFuture (2018), Energy Efficiency Jobs in America

9 Public Health Benefits

By reducing air emissions, 2017 utility electric efficiency programs were responsible for more than $500 million a year in public health benefits



Sources: EPA (2019), Public Health Benefits per kWh of Energy Efficiency and Renewable Energy in the United States: A Technical Report; ACEEE (2018), The 2018 State Energy Efficiency Scorecard

Energy efficiency also has positive impacts on public health, primarily by avoiding particulate matter emissions from additional energy generation.[6] However, until recently, few methods existed to estimate the health impacts of energy efficiency. In 2019, the EPA published estimates for monetized health benefits per kilowatt-hour (kWh) of electricity savings in 2017.[7]

The chart illustrates the estimated total monetary value of health benefits ($541 million) for one year of savings (also called incremental savings) from electricity ratepayer-funded energy efficiency programs implemented in 2017.[8,9] This amounts to 40% of the estimated levelized

6 Many studies have linked exposure to particulate matter air pollution to various cardiovascular and respiratory issues, including nonfatal heart attacks and aggravated asthma, especially for children. EPA (2018), Health and Environmental Effects of Particulate Matter

7 EPA's estimates for benefits per kWh in its "Public Health Benefits per kWh of Energy Efficiency and Renewable Energy in the United States: A Technical Report" vary significantly across regions due to difference in the fossil fuel mix used for generation – for instance, California has low benefits per kWh values because its generation largely comes from natural gas, which has low emissions rates compared to other fossil fuels. Also, note that energy efficiency could also curtail renewable energy, but the chart above assumes all curtailment was from fossil fuel generation.

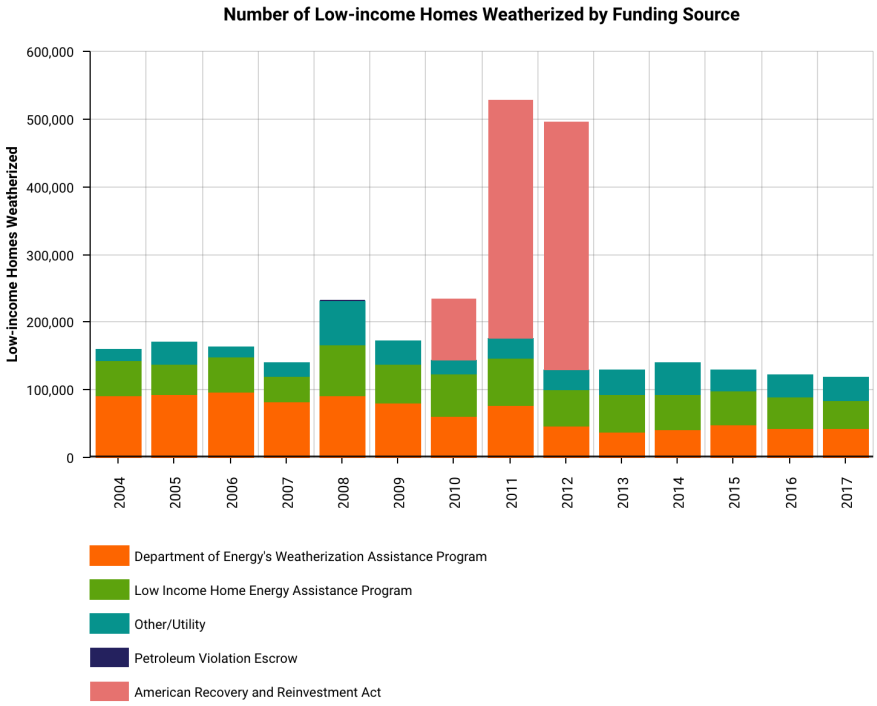
8 To estimate energy savings across regions, the state apportionments by AVERT region (based on generation from 2010 to 2013) were applied to the 2017 incremental energy savings from energy efficiency programs implemented in each state (state data taken from ACEEE's State Energy Efficiency Scorecard). Note that the percentage breakdown of states' savings across regions are based on the share of fossil-fuel generation rather than consumption. Furthermore, the model limits curtailment to plants within the region although in reality electricity transmission between some regions is large. See EPA's AVoided Emissions and geneRation Tool (AVERT) User Manual for more information on the limitations and caveats of AVERT.

9 To estimate monetary health benefits across regions, the estimated incremental energy savings from energy efficiency programs (described in the footnote above) were multiplied by the respective regions' 2017 benefits per kWh (BPK) values (using the low estimate for "Uniform EE" at a 3% discount rate) found in EPA's technical report on Public Health Benefits per kWh of Energy Efficiency and Renewable Energy in the United States.

total cost of the incremental electricity savings from the energy efficiency programs across all regions shown ($1.36 billion).[10,11]

10 Addressing the Energy Burden

Weatherization assistance programs have enhanced the energy efficiency of nearly 3 million homes since 2004



Source: NASCSP (2004-2017), WAP Annual Funding Surveys

More than 60% of low-income households in the U.S. face a high energy burden, with some paying more than 20% of their income on utility bills.[12] These consumers' lower incomes, coupled with the fact that they often live in less energy-efficient housing, makes energy efficiency investments highly impactful to enhance quality of life and reduce energy expenditures.

Community action agencies have weatherized nearly 3 million homes since 2004 under DOE's Weatherization Assistance Program (WAP). Additional funding came from the Low Income Home Energy Assistance Program (LIHEAP), utility programs, and, for brief periods, the Petroleum Violation Escrow (PVE) Funds (2004-2009) and 2009 American Recovery and Reinvestment Act (ARRA) appropriations (2010-2012).

10 Lawrence Berkeley National Laboratory has estimated the national average cost of saved electricity at $0.046 per kWh. LBNL (2018), The Cost of Saving Electricity Through Energy Efficiency Programs Funded by Utility Customers: 2009–2015

11 JLL (2016), A surprising way to cut real estate costs

12 NREL (Data tool, applied 11/2019), Solar for All

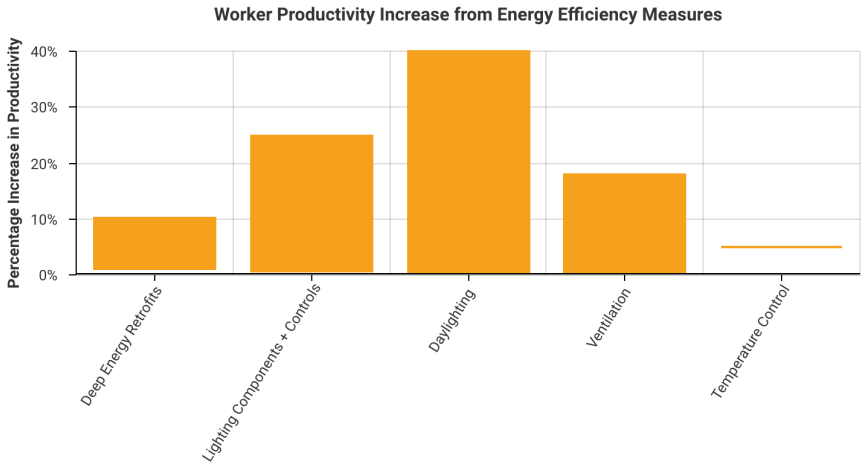
11 Other High-Impact Commercial Benefits

Energy efficiency in commercial buildings increases worker productivity and property value while decreasing energy costs, tapping into new levels of cost savings for companies

Potential Value Beyond Energy Cost Savings

Maintenance Costs Pacific Northwest National Laboratory (2008); Leonardo Academy (2008); Aberdeen Group (2010)	↓ 9.0-14%
Occupant Satisfaction GSA (2011)	↑ 27-76%
Rental Premium Elcholtz, Kok & Quigley (2010); Wiley et al. (2010); Fuerst & MacAllster (2011); Elcholtz, Kok, et al. (2011); Newell, Kok, et al. (2011); Miller, Morris & Kok (2011); Poque et al. (2011); McGraw Hill/Siemens (2012)	↑ 2.1-17%
Occupancy Premium Wiley et al. (2010); Poque et al. (2011); McGraw Hill/Siemens (2012)	↑ 3.14-18%
Property Sale Price Premium Elcholtz, Kok & Quigley (2010); Fuerst & McAllster (2011); Elcholtz, Kok et al. (2011); Newell, Kok et al. (2011)	↑ 11.1-26%
Employee Productivity Lawrence Berkely National Laboratory	↑ 1.0-10%
Employee Sick Days Miller, Poque, Gough & Davis (2009); Cushman & Wakefield et al. (2009); Dunckley (2007); City of Seattle (2005); Romm & Browning (1995)	↓ 0-40%

Jungclaus, M., et al. (2017) ASHRAE Transactions.



ACEEE compilation; CMU Center for Building Performance and Diagnostics (2004), Guidelines for High Performance Buildings

Energy-efficient buildings have many advantages: they consume less energy, require less maintenance, have lower operating costs and higher asset values, and tend to be more comfortable, healthy, and productive work environments for occupants. The table above shows the range of impacts different studies found from deep energy retrofits.

The table of productivity values shows estimates from different studies of the range of impacts of specific energy efficiency measures on the productivity of office workers due to lower rates of absenteeism, employee turnover, and health symptoms, and enhanced job satisfaction and self-assessed performance. The wide ranges show the difficulty of measuring productivity impacts as well as the varying circumstances.

The "3-30-300" rule provides a scale-of-magnitude illustration of the impacts of productivity on a business, noting that a company typically pays $3 for utilities, $30 for rent, and $300 for payroll per square foot; saving 10% on utility costs saves 30 cents per square foot, but saving 10% on payroll costs as a result of increased worker productivity would cover the cost of the real estate.