

**Testimony of Steven Nadel**

**Executive Director, American Council for an Energy-Efficient Economy**

**Before the Subcommittee on Energy of the House Committee on Energy and Commerce**

**Hearing on the Role of the Building Sector in Creating a 100 Percent Clean Economy in the U.S.**

**September 16, 2019**

**Summary**

Recent ACEEE research finds that a set of 11 energy efficiency opportunities can together halve US energy use and greenhouse gas emissions by 2050. Five of these opportunities are in the buildings sector, and collectively these measures can reduce buildings sector energy use and emissions by a little over 50%. We also identify specific policies that together can achieve the vast majority of these savings economy-wide. In my testimony, I present specific policies that will spur building sector energy savings and emissions reductions, including policies addressing new buildings, equipment, and existing buildings as well as several cross-cutting policies that will spur efficiency improvements in buildings and other sectors.

**Introduction**

Thank you for the opportunity to testify. I am the executive director of the American Council for an Energy-Efficient Economy (ACEEE), a non-profit research organization. ACEEE was founded in 1980 by researchers at universities and national laboratories. We produce more than 30 reports and other research products each year on energy-saving technologies, programs, and policies. We have a long history providing input to Congress and state and local policymakers based on our research.<sup>1</sup>

**Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050**

Earlier this week, ACEEE released a major report showing how energy efficiency can reduce U.S. energy use and greenhouse gas emissions by half by 2050, making a large contribution toward reaching long-term climate goals while also saving consumers and businesses money, providing jobs, improving resident comfort, and reducing the health impacts associated with energy-related air emissions.

Specifically, our analysis included 11 different efficiency opportunities, of which five address the buildings sector – improved appliances and equipment, zero energy new buildings, smart buildings, building retrofits, and electrifying existing buildings. Overall, we estimate that the 11 opportunities can reduce 2050 U.S. energy use by about 50%, reduce energy-related carbon dioxide emissions by 57%, and reduce total greenhouse gas emissions by about 50% (including greenhouse gases beyond carbon dioxide, such as methane and nitrous oxide).

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<sup>1</sup> For example, we played a substantial role in the development of the National Appliance Energy Conservation Act of 1987 and of the efficiency provisions in the Energy Policy Acts of 1992 and 2005 and the Energy Independence and Security Act of 2007.

The buildings sector accounts for nearly 40% of energy use and emissions.<sup>2</sup> We found that 2050 buildings sector energy use and emissions can be reduced by a little over 50% (our analysis found slightly larger opportunities in the buildings and transportation sectors than in the industrial sector). No single measure dominates the savings – the overall savings require the combined effect of the many different measures as shown in figure 1 below.

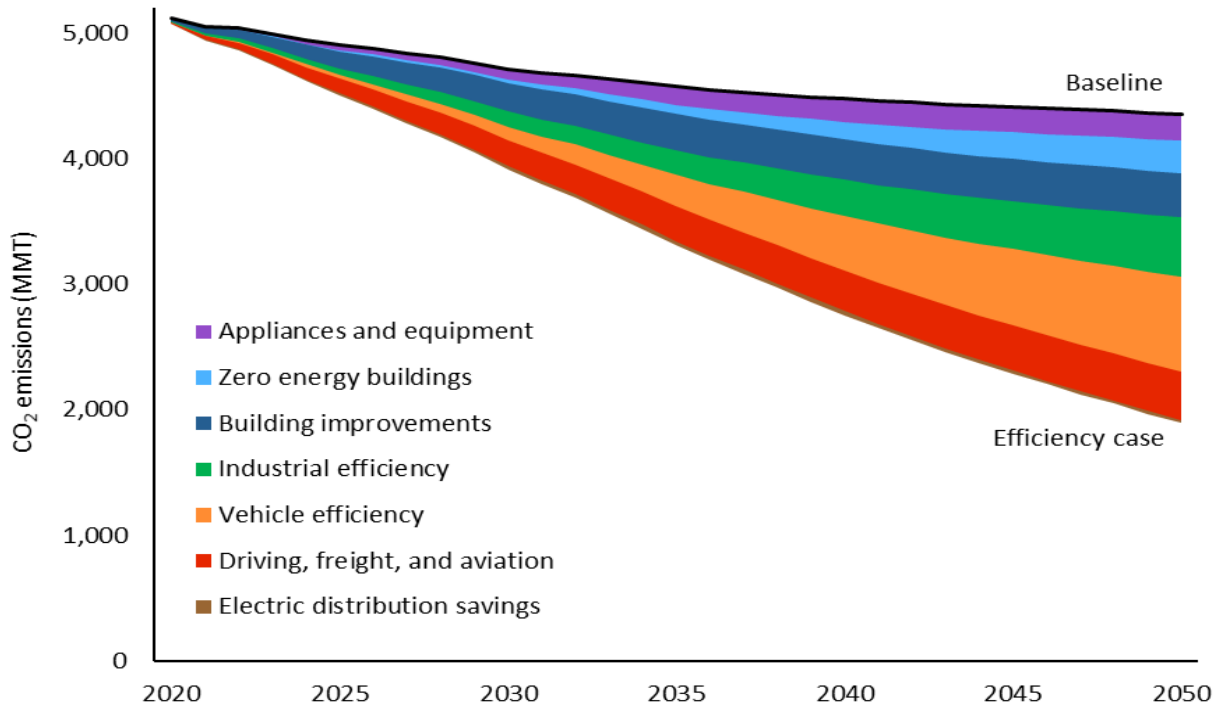


Figure 1. Carbon dioxide emissions reductions in the ACEEE *Halfway There* study. Building improvements include smart buildings, building retrofits, and electrification of existing buildings.

In addition, we conducted a policy analysis, looking at policies to help implement each of the efficiency opportunities we analyzed. Our policy analysis shows a path for achieving about 90% of the efficiency opportunity, a little more for commercial buildings and somewhat less for homes because of the difficulty convincing people to retrofit their homes. The allocation of savings by policy is illustrated in figure 2. A summary of our study is appended to my testimony, and the full report is available at [www.aceee.org/halfway-there](http://www.aceee.org/halfway-there).

<sup>2</sup> 39% in the EIA projection for 2019 as contained in the *2019 Annual Energy Outlook*.

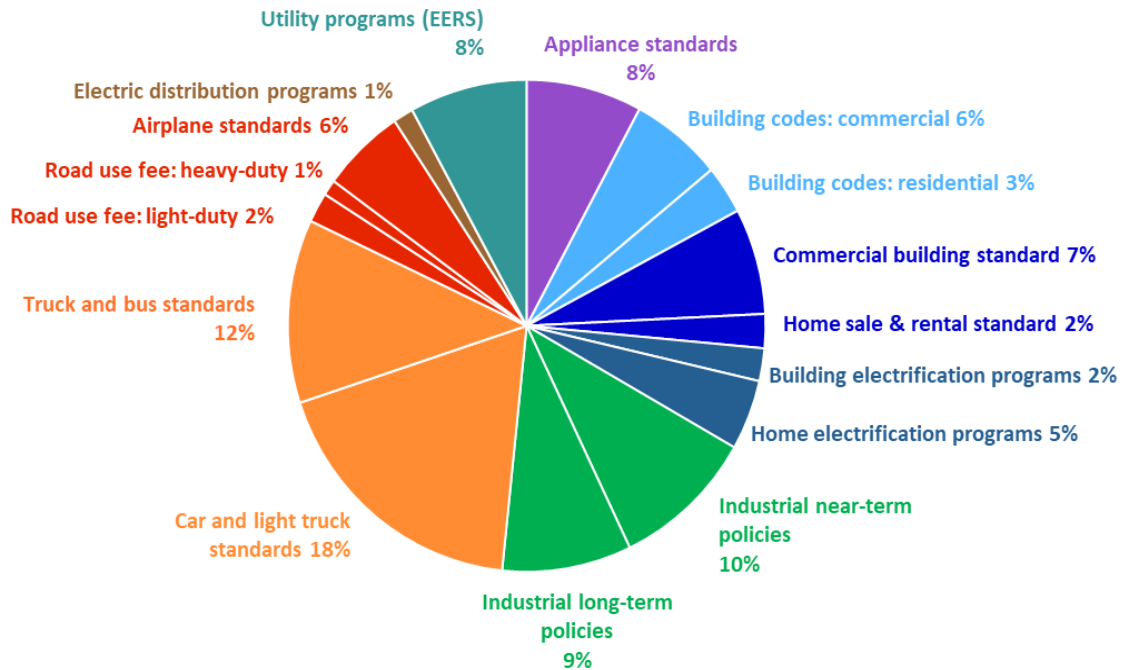


Figure 2. Distribution of energy savings by policy in the ACEEE *Halfway There* study.

In the remainder of my testimony, I will discuss policy steps to help achieve the building energy savings, starting with new buildings and proceeding to equipment, existing buildings, and cross-cutting programs.

### New Construction

As the “law of holes” states, when you are in a hole, the first thing to do is stop digging. In order to address climate change, one of the first priorities is to stop building inefficient homes and buildings. While substantial progress has been made since 1980 in improving building codes, multiple organizations including Architecture 2030, the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE), the state of California, and Natural Resources Canada are all targeting adoption of codes by 2030 that require new homes and buildings to be zero energy or zero carbon when summed over a full year. Such buildings typically combine high levels of energy efficiency to reduce loads about 70% below typical new buildings, with on-site renewable energy systems to provide the remaining energy (and where use of sufficient on-site renewable energy is not possible, off-site renewable energy can be used). In order to encourage the movement toward zero energy and carbon codes by 2030, Congress can take a variety of steps:

1. Adopt H.R. 3962 introduced by Reps. David McKinley (R-WV) and Peter Welch (D-VT). This bill includes provisions promoting regular updates of national model codes and state codes, state and local “stretch” codes that go beyond the model codes, and better compliance with codes. It will not require zero energy codes but will set up a process that will further steady code improvements.
2. Go beyond the McKinley-Welch provisions to set targets for zero energy codes and to direct the Department of Energy (DOE) to assist cities and states in adopting zero energy or carbon codes. DOE should also assist model code bodies (e.g. ASHRAE and the International Code Council) to gradually ramp their codes down to zero energy or carbon levels. In addition, DOE should conduct R&D on ways to achieve zero energy performance in building types for which few examples of zero energy performance exist (e.g. hospitals and supermarkets, both building types with high energy intensity).

3. Provide tax incentives for zero energy homes and buildings, with the incentives phasing out once about a quarter of new homes and buildings are zero net energy.
4. Require that new federal buildings, as of a future date (perhaps three years from date of enactment) be zero energy buildings. In this way the federal government can be a leader, showing the way for others. While zero energy buildings generally cost a little more than conventional construction, the extra cost is recouped in lower operating costs.<sup>3</sup> In the U.S., more than 500 zero energy commercial buildings have been documented.<sup>4</sup>
5. Strengthen federal requirements for the efficiency of new manufactured housing and new and rehabilitated housing that receives federal support (public housing, federally guaranteed loans, disaster rebuilding), with a process for continued improvements.

### Appliances and Equipment

The U.S. has made much progress improving the efficiency of appliances and other equipment, driven by state and federal minimum efficiency standards, Energy Star, and utility and other incentive programs. But further progress is possible. For example, a report by ACEEE and the Appliance Standards Awareness Project (ASAP) identified 12 products that can save more than 1.5 “quads”<sup>5</sup> of energy on a cumulative basis: residential water heaters, central air conditioners and heat pumps, showerheads, clothes dryers, refrigerators and freezers, faucets, and furnaces as well as commercial and industrial fans, motors, distribution transformers, air compressors and packaged air conditioners and heat pumps.<sup>6</sup> Potential cumulative savings for these dozen products exceeds 60 quads (for comparison, the U.S. used about 101 quads in 2018).

All of these products are covered by the DOE equipment efficiency standards program, but unfortunately rulemaking activity at DOE has slowed to a crawl and no new standards have been issued since July 2017. Congress should continue to provide oversight, encouraging DOE to get moving again to establish strong, cost-effective standards. Congress should also consider tax incentives to encourage manufacturers to develop and sell even higher efficiency equipment. Specific policy recommendations include:

1. In order to encourage DOE to stay on track with regular updates to standards, and to create a pathway for progress if DOE does not act, Congress should sunset federal preemption of state standards at the time DOE misses legislative deadlines for revising standards.
2. Congress should also consider directly enacting new standards. Manufacturers and the energy efficiency community have a long history of negotiating consensus standards,<sup>7</sup> and we hope to work with industry to develop some consensus standards based on existing state standards, ENERGY STAR specifications that now have high market share, and other negotiated approaches. Congress

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<sup>3</sup> Corvidae et al., 2019, *The Economics of Zero Energy Homes*, Rocky Mountain Institute. [rmi.org/insight/economics-of-zero-energy-homes/](http://rmi.org/insight/economics-of-zero-energy-homes/).

National Renewable Energy Laboratory, 2014, *Cost Control Strategies for Zero Energy Buildings*. [www.nrel.gov/docs/fy14osti/62752.pdf](http://www.nrel.gov/docs/fy14osti/62752.pdf).

<sup>4</sup> [newbuildings.org/nbi-releases-zero-energy-building-count-and-trends-for-2019/](http://newbuildings.org/nbi-releases-zero-energy-building-count-and-trends-for-2019/).

<sup>5</sup> A quad is a quadrillion (10<sup>15</sup>) British Thermal Units.

<sup>6</sup> deLaski et al., 2016, *Next Generation Standards*, ASAP and ACEEE, [aceee.org/research-report/a1604](http://aceee.org/research-report/a1604).

<sup>7</sup> For example, in each of the bills noted in footnote 1.

also could enact the light bulb standard that DOE is trying to roll back in order to end legal uncertainty.

3. Congress should update federal tax incentives for heating and cooling equipment that were contained in the now expired 25C section of the tax code. We understand that Representatives Jimmy Gomez (D-Calif.) and Mike Kelly (R-Pa.) are planning to introduce such a bill soon. Likewise, we have suggested ways that efficiency can be added to Representative Tom Reed's (R-NY) "Energy Sector Innovation Credit Act of 2018," which does not presently include energy efficiency.
4. DOE should work with industry to expand R&D on improved efficiency equipment, and also on ways to improve equipment installation and maintenance (it is not uncommon for poor installation or maintenance to reduce efficiency of some equipment by 20%).<sup>8</sup>

### Improvements to Existing Buildings

A substantial portion of the homes and commercial buildings that will be standing in 2050 have already been built. This reality makes retrofitting existing buildings critically important. Residential programs such as Home Performance with ENERGY STAR can reduce energy use by 20–30%, and retrofits saving 50% or more have been documented. Similar savings are possible in commercial buildings. In addition, smart building controls can typically reduce home energy use by 15% and commercial building energy use by 20% or more. Heating homes and buildings with high-efficiency heat pumps optimized for local climates can reduce primary energy use by an additional 20% or more. If the electricity is low-carbon or carbon free, even larger percentage emissions reductions result (citations for all of these figures can be found in ACEEE's *Halfway There* report).

In order to encourage these different energy efficiency measures, Congress should:

1. Have the federal government lead by example by requiring agencies to undertake deep energy retrofits at the time federal buildings are undergoing major renovations. GSA has done a variety of these projects; an evaluation by Oak Ridge National Laboratory of ten projects found average energy savings of 38%.<sup>9</sup>
2. Direct DOE to expand work with cities and states on energy use benchmarking and retrofit programs. More than 20 cities and three states now require commercial building benchmarking, which typically results in energy use reductions of 3-8% over a few years. New York City, Washington DC, and Washington State have gone a step further and required such buildings to be improved over a 5-15 year period to reduce energy use 20% or more (citations in ACEEE's *Halfway There* report). DOE should also expand R&D on ways to improve energy retrofits and lower retrofit costs.
3. Expand existing building retrofit programs and establish new programs. DOE now operates the Weatherization Assistance Program to weatherize the residences of low- and moderate-income families. In most states this program has a long waiting list – funding should be doubled or tripled so that many more homes can be served. In addition, a program should be started to encourage whole-

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<sup>8</sup> Domanski et al., 2014, *Sensitivity Analysis of Installation Faults of Heat Pump Performance*, NIST, [www.nist.gov/publications/sensitivity-analysis-installation-faults-heat-pump-performance](http://www.nist.gov/publications/sensitivity-analysis-installation-faults-heat-pump-performance) .

<sup>9</sup> Shonder, 2014, *Energy Savings from GSA's Deep Energy Retrofit Program*, ORNL, [www.gsa.gov/cdnstatic/NDEREnergySavingsReport5.pdf](http://www.gsa.gov/cdnstatic/NDEREnergySavingsReport5.pdf).

home retrofits by middle-income residents; Representatives Welch and McKinley have introduced such a bill, called the HOMES Act (H.R. 2043), and there also are related tax incentive proposals.

4. Expand federal support for applying information and communication technologies to improve building efficiency, including through the Smart Building Acceleration Act (HR 2044) introduced by Representatives Welch and Adam Kinzinger (R-IL).
5. Expand and better coordinate federal support for strategic energy management, a management approach that seeks continuous improvement to reduce energy use in large commercial buildings as well as manufacturing plants, including through DOE's 50001 Ready program.

## Cross Cutting

In addition to specific policies directed at equipment and new and existing buildings, I would also urge Congress to consider several cross-cutting policies that would encourage efficiency investments in buildings as well as other sectors:

1. Energy Efficiency Resource Standard (EERS). An EERS is a set of annual energy saving targets for electric and natural gas utilities; 27 states have adopted such targets.<sup>10</sup> Congress should consider a national program, to be operated by states. Such a bill – S. 2288 – has been introduced by Senators Tina Smith (D-MN), Angus King (I-ME), and Jeff Merkley (D-OR), and in previous Congresses by Representatives Ben Ray Lujan (D-NM) and Welch. Energy efficiency could also be incorporated into a broader clean energy standard.
2. Put a price on greenhouse gas emissions. Putting a price on greenhouse gas emissions would encourage investments in low-emissions technologies. This could take the form of a carbon tax or a cap and trade program. Such programs have been documented for 19 countries and 15 North American states and provinces. ACEEE research finds that these policies can be particularly impactful if a portion of the revenue collected is reinvested in programs to help households, businesses, and factories reduce their emissions.<sup>11</sup>
3. Clean Free Market Act. The Clean Capitalist Coalition, including ACEEE, is now putting together a proposal to reduce taxes on a portion of the interest income from bonds and loans used to finance clean energy investments. We hope to have legislation introduced by the end of this year.<sup>12</sup>

## Conclusion

Our research finds that energy efficiency can reduce U.S. greenhouse gas emissions by half, including emissions due to homes and commercial buildings, while saving consumers and businesses money and providing many other benefits. Congress can and should take the lead in adopting policies, as I have outlined, to help achieve these savings.

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<sup>10</sup> [aceee.org/policy-brief/state-energy-efficiency-resource-standard-activity](https://aceee.org/policy-brief/state-energy-efficiency-resource-standard-activity).

<sup>11</sup> Nadel, 2016, "Learning from 19 Carbon Taxes: What Does the Evidence Show?" [aceee.org/files/proceedings/2016/data/papers/9\\_49.pdf](https://aceee.org/files/proceedings/2016/data/papers/9_49.pdf).

Nadel and Kubes, 2019, *State and Provincial Efforts to Put a Price on Greenhouse Gas Emissions, with Implications for Energy Efficiency*, [aceee.org/white-paper/carbon-tax-010319](https://aceee.org/white-paper/carbon-tax-010319).

<sup>12</sup> Further information can be found here: [cleantaxcuts.org/wp-content/uploads/ctc-cfma-conceptsummary-180828.pdf](https://cleantaxcuts.org/wp-content/uploads/ctc-cfma-conceptsummary-180828.pdf).