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U.S. Senate Committee on Energy and Natural Resources
International Efforts to Increase Energy Efficiency and Opportunities to Advance Energy Efficiency in the United States
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Thank you for the opportunity to submit a written statement to the U.S. Senate Committee on Energy and Natural Resources' October 22 hearing on *International Efforts to Increase Energy Efficiency and Opportunities to Advance Energy Efficiency in the United States*. We applaud the Committee for examining international best practices and how these can inform U.S. efforts on energy efficiency.

A focus on improving energy efficiency through federal, state, and local actions is already helping to reduce energy waste and lower energy costs across the economy. Energy efficiency reduces energy bills for families across the nation; redoubling efficiency efforts can put even more money in the pocketbooks of all Americans. There are much more cost-effective energy savings that can be achieved. In addition, efficiency can deliver half of the GHG reductions needed by 2050,[1] with a strong economic return ($700 billion in lower energy bills).

The federal government has a number of levers it can use to ensure the market recognizes the important opportunity efficiency presents. This can be through equipment performance standards, tax treatment and fiscal incentives, leadership by example through public procurement and funding research, development and deployment programs. These different levers ensure that U.S. manufacturers continue to innovate and deliver the most competitive products for both domestic and international markets.

Many efficient technologies are already commercially available and can be deployed at scale. These technologies may have a higher first cost but lower lifecycle cost, underlining the importance of efforts this committee is considering incorporating lifecycle costs into investment requirements. These include the All-of-the-Above Federal Building Energy Conservation Act of 2019 (S. 1245) co-sponsored by Senator Hoeven and Senator Manchin, and the Federal Energy and Water Management Performance Act of 2019 (S. 1857) co-sponsored by Senators Murkowski, Manchin, Portman, Shaheen, Gardner, and Hirono.

The U.S. has seen success in scaling energy efficient technologies when federal, state, and local governments include energy efficiency specifications in their procurements or utilize Energy Savings Performance Contracts (ESPCs) via qualified energy service companies. Utility programs and state policies – alongside federal efficiency standards - can play an important role in providing consumers rebates to overcome possible hurdles consumers face in purchasing efficient appliances.

Efficiency is a matter of economic competitiveness. Without standards and incentives for U.S. manufacturers to innovate, there is a risk they will get left behind in global markets. As of September 2019, 675 multinational companies – 130 from the U.S. – have publicly committed to setting greenhouse

[1] S. Nadel, L. Unger, *Half-Way There*, American Council for an Energy Efficient Economy, September 19, 2019, https://aceee.org/research-report/u1907

gas emissions reduction targets grounded in climate science. Science-based target setting is rapidly becoming accepted as a signal of corporate leadership. Efficiency is the first and most cost-effective step to achieve these targets. This initiative now spans 38 countries and 45 sectors, representing at least $10.8 trillion USD in market capitalization. These businesses are going to be purchasing equipment based on energy productivity along with the traditional attributes of quality and price. In this landscape, U.S. companies risk being locked out of markets if products and equipment manufactured in the U.S. are not as efficient as possible.

Energy Demand and the Case for Urgent Efficiency Action

The U.S. Energy Information Agency projects in its baseline scenario that global energy demand will grow by 50% between 2018-2050.[2] In non-OECD countries the growth is projected to be 70%. Meeting the aspirations for economic security and improving the quality of life is greatly assisted if we focus on two simultaneous goals: first, ensuring that in the U.S. and around the world, people are not "locked in" to high monthly energy requirements, and second, linking their energy requirements to supplies of energy that are decarbonized and do not harm their health and the climate.

Renewable energy is now an economically viable supply option for electricity supply at increasingly high penetration levels. But our ability to provide the world's people – and Americans – with the quality of life they seek rests on helping them reduce the total amount of energy they must use alongside their ability to access clean technologies for heating, cooling and powering their homes, businesses and transportation systems. Without a focus on energy productivity, the efforts to deploy new clean supply are dwarfed by the growth in demand.

In OECD countries, residential energy intensity is expected to decrease by only an average of 0.1% per year from 2018 to 2050. This means that for many consumers, their ability to decrease energy demand is not realized under a business-as-usual scenario. In non-OECD countries, energy demand is expected to increase on average 1.3% per year.[3] Leading demand growth in this scenario are China, India and other countries in non-OECD Asia. And finally, it is important to recognize that while we have renewable electricity options, energy efficiency also is required to reduce the amount of primary fuel needed outside of the electricity sector. Globally, the industrial sector is the largest part of the energy economy – and expected to grow 30% by 2050.

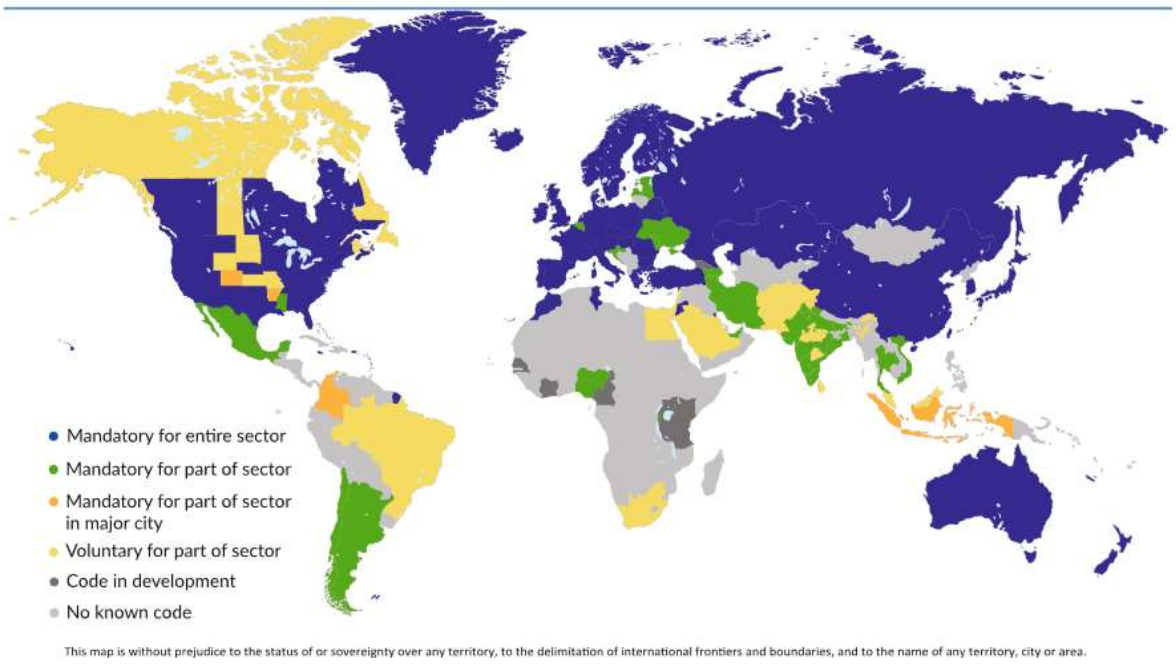
<u>International Energy Efficiency Policies and Programs</u>

Rising electricity costs, air quality concerns and climate change risks mean many countries are beginning to set targets for energy efficiency improvements. Some countries are seeking dramatic reduction of energy demand from entire sectors of their economy over the next 10 to 30 years. Leading on global efficiency today are: Italy, Germany, France, the United Kingdom and Japan.[4] The U.S. is not in a position of leadership: the policies and actions captured in the 2018 International Energy Efficiency Scorecard show the U.S. tied with Canada in 10th place globally for its energy efficiency policies and actions, behind China and Taiwan.

[2] International Energy Outlook, U.S. Energy Information Administration, September 2019, www.eia.gov/ieo
[3] Ibid.
[4] Fernando Castro-Alvarez, Shruti Vaidyanathan, Hannah Bastian, and Jen King, *2018 International Energy Efficiency Scorecard*, American Council for an Energy Efficient Economy, https://aceee.org/research-report/i1801

Recognizing the economic and health issues of energy waste and the need to shift the demand curve to a more sustainable energy demand growth rate, China and India are advancing efficiency policy. As part of **China**'s 13th Five-Year Period (2016-2020), the Ministry of Housing and Urban-Rural Development (MOHURD) released a *Plan for the Development of Building Energy Efficiency and Green Buildings*. This plan encourages provinces and cities to launch pilot and demonstration projects on low-energy buildings and Nearly Zero Energy Buildings, with the goal to identify common techniques for the regulation, design, construction, operation and maintenance of low-energy and Nearly Zero Energy Buildings and to facilitate the improvement of energy saving standards. MOHURD issued voluntary technical standards for Nearly Zero Energy Buildings in October 2018. Local governments are using these standards to put in place local policies on Nearly Zero Energy Buildings and offering subsidies to qualified building developers based on floor area.

The International Energy Agency reports[5] that as of 2018, about one-third of countries have *building energy codes* (see Figure 1): 69 countries have either voluntary or mandatory building energy codes in place and eight other countries have codes under development. In most of these countries, the code has limited strength or is voluntary.



Source: Derived from IEA (2018c), *Energy Efficiency Policies: Buildings*, www.iea.org/topics/energyefficiency/policies/buildings.

Figure 1: Building energy codes by jurisdiction, 2017-2018. International Energy Agency and the United Nations Environment Programme (2018): 2018 Global Status Report: towards a zero-emission, efficient and resilient building and construction sector. https://www.globalabc.org/uploads/media/default/0001/01/0bf694744862cf96252d4a402e1255fb6b79225e.pdf

Some examples of national policies and trajectories on building codes include:

[5] International Energy Agency and the United Nations Environment Programme (2018): *2018 Global Status Report: Towards a Zero-Emission, Efficient and Resilient Building and Construction Sector*. https://www.globalabc.org/uploads/media/default/0001/01/0bf694744862cf96252d4a402e1255fb6b79225e.pdf

- **Canada** has a continuous improvement process and is guided by the target of achieving net-zero energy ready buildings by 2030. The National Energy Code of Canada for Buildings 2017 pushes towards that target with a 10% energy savings compared to the 2011 version.
- The **European Union**'s Energy Performance of Buildings Directive (EPBD) from 2010 requires energy efficiency to be gradually increased to reach "near zero energy" buildings for all new buildings in 2020 and for public buildings in 2018. A 2018 amendment to the EPBD accelerates renovation of existing buildings, with the goal of a building stock that is highly energy efficient and decarbonized by 2050 in a cost-effective transformation to nearly zero energy buildings. Member states have until March 2020 to transpose provisions into national law.
- **India**'s model Energy Conservation Building Code has covered large commercial buildings since 2007 and a residential building version was recently developed in 2018. These model codes can be voluntarily adopted and implemented by state and local governments, which is not common.
- In **Mexico**, the federal government published a national model code, the Energy Conservation Code, in 2016. This code links legal language for new buildings and standards for existing building. It is not mandatory until local governments adopt it in their local building regulations, which is not common.

85 countries have adopted *building certification programs*, most of which are voluntary. Many building certifications are used among high-end buildings to add value. There is still a lack of large-scale adoption of full mandatory certification programs outside the European Union, which limits the tracking and disclosure of building energy performance over time. ENERGY STAR provides a voluntary certification program in the U.S.

In the **European Union**, the Energy Performance in Buildings Directive (EPBD) requires energy performance certificates to be issued when a building is sold or rented, and they must also be included in all advertisements for the sale or rental of buildings. The EPBD encourages member states to link financing measures for energy efficiency improvements to the energy savings, notably using energy performance certificates to compare energy performance before and after renovation.

International Partnerships on Energy Efficiency

Several international efforts aim to increase action on energy efficiency, especially through commitments and awareness-raising of government officials. At the same time, most international efforts incorporate public-private collaboration, in which public sector action is bolstered by private sector commitments and collaboration across these approaches.

Energy Efficiency

The **Three Percent Club** was launched on 23 September at the UN Climate Action Summit in New York by a coalition of 15 countries and over a dozen businesses and institutions working together to drive a 3% annual improvement rate in global energy intensity. This initiative builds on International Energy Agency research showing that the right energy efficiency policies could deliver over 40 percent of the emissions cuts needed to reach the goals of the Paris Agreement, without requiring new technology. The Three Percent Club aims to significantly increase global momentum on energy efficiency, a critical concern since global energy efficiency progress has been slowing since 2015. The coalition will concentrate on accelerating the deployment of available energy-efficient technology and materials in buildings, transportation, appliances, lighting and district energy. Such improvements will lower carbon

emissions, reduce energy costs and air pollution and create local jobs. Delivering on the three percent target would bring household energy savings of $500 billion per year by 2040.

The **Global Commission for Urgent Action on Energy Efficiency**, and the new public-private **Energy Efficiency Global Alliance** are good examples of multi-sectoral leadership efforts designed to focus on scaling efficiency efforts.

The Sustainable Energy for All **Global Energy Efficiency Accelerator Platform**, launched in 2014, promotes public-private collaborations to scale up energy efficiency policies, action and investment in order to double the global rate of improvement in energy efficiency by 2030 – resulting in a target similar to that of the Three Percent Club. This alliance of partners is committing to new and expanded actions to accelerate energy efficiency in specific sectors, including buildings, lighting, appliances, district energy systems, industry and transportation. The Platform promotes stronger collaboration between the public, private and civil society sectors which cover the whole range of policy and regulatory frameworks, technology standards, financial solutions, incentives and public education that together can accelerate action.

One example of the programs within the Global Energy Efficiency Accelerator Platform is the **Building Efficiency Accelerator (BEA)**. This partnership, for which WRI is the Secretariat, comprises 52 cities in 24 countries around the world all working to accelerate policy and program action on building efficiency. Over 50 global organizations, companies, and multilateral institutions – along with dozens of local companies and organizations – provide technical assistance to support actions like improved building codes, retrofits, and targets. In 4 countries (Colombia, India, Mexico, and Turkey), concerted efforts are underway to improve alignment and coordination between national, state, and local governments, especially to learn from leading cities and scale their successes to other local governments within these countries.

Through the **Zero Carbon Buildings for All** initiative, also launched at the UN Climate Action Summit in New York, developing and industrialized countries commit to decarbonize their building sector by 2050 with a goal for all new buildings to be zero carbon by 2030. Four countries have joined this initiative to date, along with more than 15 financial institutions, leading private sector companies, and civil society partners.

Closely linked to this, the **Net Zero Carbon Buildings Commitment** run by the World Green Building Council provides a pathway for businesses, organizations, cities and states to meet these same building sector decarbonization targets. Launched in 2018, this initiative already has commitments from 31 businesses and organizations and 32 cities, states and regions aiming to achieve these goals.

<u>Energy Efficiency in Cooling</u>

Advanced and integrated cooling solutions are a critical portion of a comprehensive energy efficiency strategy. Global markets for air conditioning and refrigeration technology represent a big export opportunity for U.S. manufacturers, and manufacturers that lead on energy efficiency will see market growth for efficient technologies as countries around the world raise standards for cooling technologies to lower costs and carbon emissions. In addition to efficient technologies, integrated cooling strategies are critical to reduce the need for cooling technologies through systems solutions like improved ventilation, building envelopes, and cool roofs. Service providers like Energy Service Companies (ESCOs), many of which are U.S. based companies, are well-positioned to deliver these strategies which will be more important and in higher demand.

The Kigali Amendment to the Montreal Protocol was agreed upon in October 2016 and entered into force in January 2019. Under this amendment, 197 countries committed to cut the production and consumption of hydrofluorocarbons (HFCs)—potent greenhouse gases used in refrigeration and air conditioning—by more than 80 percent over the next 30 years. This effort has the potential to avoid up to 0.5° C increase in global temperature by the end of the century.

A set of initiatives have arisen to support implementation in line with the Kigali Amendment, with the largest to date being the **Kigali Cooling Efficiency Program (K-CEP)**. K-CEP focuses on increasing the energy efficiency of cooling in conjunction with replacing HFC refrigerants with better alternatives by strengthening and accelerating energy efficiency efforts, supporting policies, standards, and programs on cooling efficiency, exploring finance for efficient cooling, and increasing access to cooling. Since its inception in 2017, K-CEP has allocated approximately $48 million to projects in 44 countries, including technical assistance to 27 countries that have committed to include efficient, clean cooling as part of their national development plans. K-CEP includes both energy efficient technology approaches and some focus on integrated cooling strategies.

The **Global Cooling Prize** seeks to spur innovation for a residential cooling solution that will have at least five times less climate impact than standard residential room air conditioners in the market today. The Global Cooling Prize will award up to $3 million in total prize money through the competition. Perhaps more importantly, the prize incentivizes innovation in a market that is expected to grow to 4.5 billion units in use globally by 2050 compared to only 1.2 billion today, providing an enormous market opportunity for manufacturers that can meet this need.

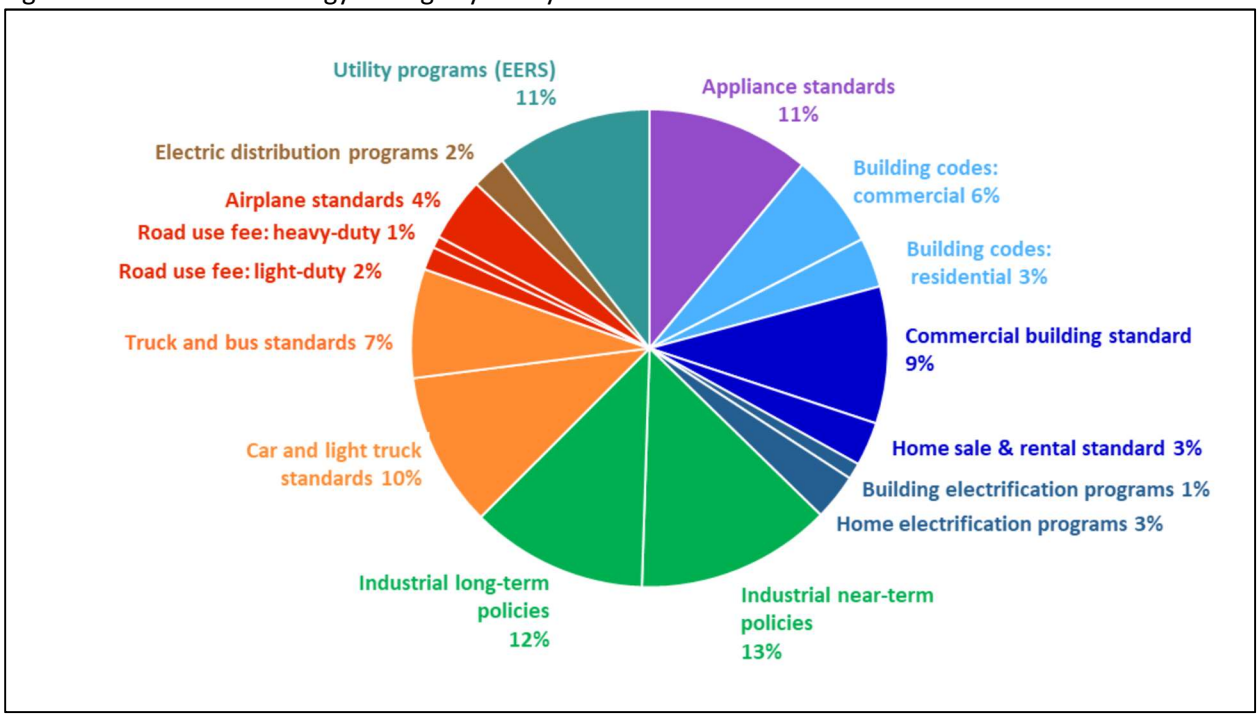
With a similar approach on integrated cooling strategies, the **Million Cool Roofs Challenge** (which is a project under K-CEP) is a $2 million global competition to rapidly scale up the deployment of highly solar-reflective "cool" roofs in developing countries suffering from heat stress and lacking widespread access to cooling services. In a building without air conditioning, replacing a dark roof with a white roof can cool the top floor of the building by 3.5 to 5.5 degrees Fahrenheit. In a one-story building with air conditioning, a white roof can reduce the net annual energy use by up to 20 percent. This approach avoids or minimizes the installation of additional energy-using technologies while keeping buildings cool, and companies providing this service are likely to see significant market growth in the coming years.

Opportunities to Advance Energy Efficiency in the United States through Federal Action

Energy efficiency policy can avoid the lock in of decades of waste. The American Council for an Energy Efficient Economy's analysis of the efficiency policy levers estimated savings that could be achieved in the main segments of the U.S. energy economy: the electricity sector itself, buildings, industry, and transportation. They conclude that with 11 policy actions, the US could reduce its energy burden by 47% by 2050 – which would keep the US aligned with the climate science and keep our economy competitive. Figure 2 depicts the allocation of energy savings by policy.[6]

[6] S. Nadel, L. Unger, *Half-Way There*, American Council for an Energy Efficient Economy, September 19, 2019, https://aceee.org/research-report/u1907

Figure 2: Allocation of Energy Savings by Policy



The federal government has an important role to play, particularly through standards, fiscal incentives, grantmaking, technical assistance, and programming in four main areas:

1) Energy codes and standards (*"setting the floor"*)

Appliance and Equipment Standards

National energy efficiency standards for appliances set minimum energy and/or water efficiency levels for more than 60 products ranging from residential refrigerators, clothes washers and hot water heaters to commercial and industrial equipment like boilers, transformers and motors. These products represent about 90 percent of home energy use, 60 percent of commercial building energy use, and 30 percent of industrial energy use.

These standards are required to be cost-effective for consumers, resulting in cost savings over the product's lifetime. **The average household saves approximately $500 on energy bills annually** due to these efficiency standards. The standards currently in place are expected to save 70 quadrillion Btu (quads) of energy by 2020 and 132 quads through 2030, equivalent to more than a year's worth of energy consumption for the entire country. Additionally, standards increase product innovation and consumer choice. This is evidenced by the lighting market in which consumer choice has multiplied over the past 10 years.

Unfortunately, the **Department of Energy (DOE) has missed statutory deadlines** to review the standards for 18 products (as of June 2019)—including refrigerators, clothes dryers, water heaters, and room air conditioners—and is on track to miss another dozen deadlines by January 2021. Worsening

matters, in February 2019, DOE proposed rolling back standards for light bulbs and changing DOE's standards-setting process, making it more difficult to establish strong and effective national standards.

This failure to act is costing households and the economy. A 2016 ACEEE/ASAP report, Next Generation Standards, found that updates to existing appliance standards could save consumers and businesses about *$43 billion each year* on their utility bills by 2035. Inversely, failure to update these standards will impose this cost burden of *$43 billion each yea*r, and more if standards are rolled back. DOE's proposed rollback of lighting efficiency standards alone would cause consumers to lose $12 billion per year in savings.

Congress should act to hold DOE accountable for the failure to meet these deadlines as required by law.

Building Codes

Building codes establish the minimum level of energy efficiency for new and altered residential and commercial buildings. They improve efficiency and consumer value by mandating good energy performance through careful construction and proper selection of building components.

Codes save businesses and families money. Existing model energy codes are projected to save 12.82 quadrillion Btus of energy and $126 billion in energy costs between 2010 and 2040. Updates that improve these codes could save 2.6 trillion kWh of electricity and 5.6 quadrillion Btu of natural gas by 2040 (about two-thirds and one-fifth of total U.S. annual use respectively) and provide consumer savings of $61 billion.

In this area, the federal government sets a national framework, conducts analysis and makes recommendations for updated codes, but it is up to states to adopt and implement to receive the economic benefits. The federal government has a critical role in providing assistance to states, helping them to update the most recent code and implement and enforce their policies. The Portman-Shaheen bill (S. 2137) would **expand federal assistance to states** on energy codes and could result in savings of 30 quadrillion Btus and $60 billion in consumer savings over 25 years.

2) Fiscal approaches and financial incentives (*encouraging faster adoption*)

Policies also change the economics of acting on efficiency and encourage adoption of technologies that go beyond minimum standards. Congress has passed several **tax incentives** for energy efficiency in the past few decades. These incentives reduce the upfront cost of efficiency making improvements affordable to more families and businesses. Tax credits for efficient equipment such as geothermal heat pumps, solar hot water systems, and combined heat and power remain in effect. Unfortunately, some important ones encouraging comprehensive building improvements have recently expired.

Recent changes in tax law now allow businesses to expense or **depreciate the cost of new, efficient investments** all at once. This eliminates a previous bias in the tax code that disincentivized capital investments and led to inefficient equipment being kept in use well after it was out-of-date.

The federal **Weatherization Assistance Program** has helped to ensure that low-income individuals are also able to obtain the benefits of energy efficiency. It has been highly effective at reducing energy cost burdens for those families participating, but there is still great demand for further implementation.

Beyond federal action, **state policies** set targets for efficiency improvements and require **energy utilities** to implement cost-effective programs (ranging from simple appliance rebates to more involved retrofit

assistance programs) to meet them providing efficiency to their customers. In 2018, $8 billion was invested in efficiency through these programs resulting in 27 million MWh in new electric savings (equivalent to 0.73% of total sales) and 46 trillion Btus in new natural gas savings (equivalent to 0.47% of total sales). A unit of energy not used is the cheapest energy source, as these programs have shown. Over the years, efficiency programs have consistently been able to maintain a lower levelized cost of energy than new supply. WRI's *Seeing Is Believing* study found that these programs regularly save $2 for every $1 invested, and sometimes up to $5. And their benefits go far beyond just cost savings—extending to public health, job creation, and climate mitigation and resilience. Unfortunately, there is a big gap between where leaders are here (2% or more savings per year) and lagging states.

3) Assistance and recognition (*celebrating and encouraging leadership and early adopters*):

Finally, Congress and federal agencies have over the past few decades built the world premier set of programs to assist homes and businesses to make energy improvements, provide recognition for leaders, and build professional and industrial capacity to provide efficiency products and services. These include:

- Leading by example in government buildings through the Federal Energy Management Program, as supported by the Federal Energy and Water Management Performance Act of 2019 (S. 1857) recently reported out of this Committee;
- Assisting small and medium businesses implement energy management systems, like ISO50001, through Industrial Assessment Centers;
- Providing information on and recognition of the most efficient buildings and products through ENERGY STAR; and
- Sharing best practices for improving efficiency for all kinds of new and existing buildings and recognizing through the Better Buildings Initiative.

These programs and tools provide the foundations for many state efficiency programs and are central to the business models of many firms providing efficiency services or products. It is essential that Congress continues to invest in these programs and, by extension, American capacity to innovate and improve.

The United States can lead on energy efficiency. Doing so will safeguard the ability of our citizens to enjoy clean air and avoid the burdens of high energy bills due to fuel charges. In buildings, industry and transportation, global growth and economic development represent market opportunities for our businesses. U.S. products and technology must remain on the cutting edge of efficiency if we are to compete in emerging markets and with multinational companies' product expectations. The Senate Energy and Natural Resources Committee has the opportunity to chart a course using data and information on the best available policy options and help ensure that our efforts on RD&D, fiscal and tax policy, equipment and appliance codes and standards and, leading by example, chart a course to global competitiveness and secure Americans' energy future.