

**United States House of Representatives
Select Committee on the Climate Crisis**

**Hearing on October 17, 2019
“Solving the Climate Crisis: Cleaner, Stronger Buildings”**

Questions for the Record

**Kara Saul Rinaldi
Vice President, Government Affairs, Policy, and Programs
Building Performance Association**

The Honorable Kathy Castor

- 1. In your testimony, you outlined several policies that could expand the use of energy efficiency in the building sector. In your opinion, which policies would be most impactful and should be prioritized?**

There are five barriers to advancing energy efficiency that need to be addressed in unison for maximum impact, and the associated benefits of reduced emissions, cost savings, and improved health and safety: (1) valuing energy efficiency, (2) upfront costs, (3) accurate measuring and modeling, (4) a shortage of trained workers, and (5) equity. Congress should prioritize policies that together can address all of those challenges and make the greatest impact to increase energy efficiency in the building sector.

- 1. Valuing energy efficiency.** Often the energy efficiency upgrades that result in the greatest energy savings cost the most – costs that most homeowners simply cannot afford without some level of certainty that they will be able to get a return on their investment. Without appropriate consideration in the appraisal, real estate, and mortgage lending processes for energy efficiency upgrades and the value and cost savings that they provide, homeowners cannot recoup the value of their energy efficiency investments at the time of sale or refinancing. Improving valuation of energy efficiency will help homeowners get a fair payback for investments that save energy and reduce emissions, and it will drive future demand for these improvements.

Sensible Accounting to Value Energy (SAVE) Act (114th – HR 614, Rep. Murphy, Rep. Jolly / 113th – S 1106, Sen. Bennet, Sen. Isakson). The SAVE Act would require HUD to develop and issue guidelines to all federal mortgage agencies to implement enhanced loan eligibility based on energy cost savings due to efficiency upgrades. This would help to address this issue of valuing energy efficiency by ensuring consideration and proper valuation of energy efficiency measures in the mortgage lending process. In the 116th Congress the SAVE Act is included in the Energy Savings and Industrial Competitiveness Act (HR 3962, S2137).

- 2. Upfront costs.** Energy efficiency helps homeowners and building owners save money on their monthly utility bills and improve the comfort, health, safety, and resiliency of their homes—providing a significant payback on investment. However, upfront costs remain a significant barrier preventing low and moderate-income households from completing energy efficiency upgrades. Furthermore, the energy efficiency measures that can achieve the most energy savings, such as whole-home insulation and air sealing and upgrading to an efficient HVAC system, often

have the highest upfront costs. Congress should support residential incentives that reduce the upfront cost of energy efficiency improvements to allow more Americans to access the efficiency market.

Home Owner Managing Energy Savings (HOMES) Act of 2019 (116th – HR 2043, Rep. Welch¹). The HOMES Act would create a Grant Program for rebates to residential efficiency customers with a network of rebate aggregators, as well as grants for quality assurance and a pilot on pay for performance. This legislation would lower the barrier of high upfront costs for energy efficiency measures that can achieve substantial energy savings and help more middle-income Americans make efficiency upgrades to their homes. This bill is going through additional changes to include lessons from state programs.

25C tax credit. Residential tax incentives are critical to reducing the upfront cost of energy efficiency improvements. The 25C tax credit is the only residential energy efficiency tax credit provided to consumers. Congress should support a forward-looking extension of a tax credit for residential energy efficiency upgrades and improve the 25C credit by updating goals and transitioning the credit into a permanent performance-based instead of prescriptive incentive.

179D tax credit. Key to advancing commercial energy efficiency is an extension of the 179D Energy Efficient Buildings tax deduction that will help support owners and investors in retrofitting existing buildings, as well as in constructing new above-code buildings. Congress should pass a forward-looking extension of 179D that would provide the certainty needed for consumers, manufacturers, contractors and others to fully capitalize on the incentive. Congress should also modernize the tax credit with updates that reflect the current market of high-efficiency equipment and building technologies.

- 3. Accurate measuring and modeling.** Energy usage information—especially granular interval data provided by smart meters—is a key tool for advancing energy savings in buildings. Smart meter data can be used to identify cost-effective energy-saving opportunities, measure the performance of specific energy efficiency measures, and drive behavior changes and efficiency investments that achieve measurable and verifiable energy savings. However, utilities control that data and, in many cases, do not readily provide access to customers or allow them to grant access to third party providers who could provide data analysis, actionable insights, and recommendations. Congress should act to encourage and support the adoption of best practices and policies to allow consumers to access and share their own electricity and natural gas data.

Access to Consumer Energy Information Act or the E-Access Act (116th – discussion draft, Rep. Welch). Would allow DOE to facilitate customers' access to their own electricity and natural gas data, adds consumer access to energy use and price data to State energy conservation plans, and provides for establishment of voluntary guidelines with access to third parties according to a protocol established by the Secretary.

- 4. Trained worker shortage.** Across the country, jobs in energy-efficient lighting, HVAC, insulation and air sealing, and energy management technology are available, but in many markets trained professionals are in short supply. Employers in energy efficiency, especially in the construction trades, are experiencing difficulty hiring new employees due to a shortfall of workers with the necessary experience, training, and technical skills to fill these jobs, according to the 2019 U.S. Energy and Employment Report. The energy efficiency industry is comprised

¹ Updated version pending introduction

mainly of small businesses—a large majority have fewer than 20 employees.² Small energy efficiency businesses need resources to help train new hires and provide ongoing education to existing employees, keeping them up to date on certifications and trained in the latest technologies and health and safety practices. To prepare more American workers for quality jobs in energy efficiency and drive further growth in this industry, Congress should act to support workforce development and jobs training.

Blue Collar and Green Collar Jobs Development Act of 2019 (116th – HR 4061, Reps. Rush and Hudson). Directs DOE to prioritize education and training for energy and manufacturing jobs and would establish an energy workforce grant program. Grant program would provide assistance to businesses in the energy efficiency and renewable energy industries that are seeking to educate and train new hires and existing employees, with priority to small businesses. Similar to S 2393, Clean Energy Jobs Act (Sen. Heinrich).

- 5. Equity.** There are a number of unique barriers preventing low-income and other vulnerable households from accessing energy efficiency improvements, when these households could stand to benefit most from the cost savings and health and safety benefits provided by energy efficiency. High upfront costs, creditworthiness requirements, and split incentives between renters and landlords to invest in energy efficiency upgrades can prevent lower-income customers from accessing energy efficiency services. Many low-income homes also face issues such as mold, leaky roofs, asbestos, and other deteriorated conditions that can prevent installation of important efficiency measures. Congress should improve low-income access to energy efficiency by supporting and expanding the Weatherization Assistance Program (WAP) which helps low-income and rural families, seniors, and individuals with disabilities make lasting energy efficiency improvements to their homes.

Weatherization Enhancement and Local Energy Efficiency Investment and Accountability Act (116th – HR 2041, Rep. Tonko, Rep. Rush, Rep. Kaptur). This legislation would reauthorize the Weatherization Assistance Program, helping low-income citizens make important improvements to increase the energy efficiency, health, and safety of their home, save money, and improve their quality of life. It would also update and strengthen the program: supporting innovation in weatherization practices through a new competitive grant and modernizing the program to incorporate the latest cost-effective technology and services—including renewables and smart energy management technologies.

Congress should prioritize these five pillars to create a holistic approach that addresses key barriers to advancing energy efficiency. Each of the above policies is needed to ensure that the others can have the greatest impact and, enacted together, they would create a robust and mutually reinforcing strategy to significantly expand the use of energy efficiency in the building sector.

2. Why is it important to focus on retrofitting existing buildings as opposed to just focusing on increased efficiency of new construction?

Simply put, we cannot reach the emissions reductions needed from the building sector to achieve net zero emissions by 2050 without addressing existing buildings. Estimates suggest that roughly half of the buildings that will be in use in 2050 have already been built³ and, already, much of America's building stock is aging and inefficient. Therefore, retrofitting the existing building stock is key to decarbonizing the building sector. Approximately half of all commercial buildings in the U.S. were constructed before

² <https://e4thefuture.org/wp-content/uploads/2019/09/Energy-Efficiency-Jobs-in-America-2019.pdf>

³ <https://aceee.org/blog/2019/05/deep-retrofits-financing-needs-play;>

1980. In the residential sector, over 70% of our nation’s housing stock was built before 1990, with almost 40% older than 1970.⁴ These older buildings waste energy, costing more to heat and cool and making them an outside contributor to greenhouse gas emissions. To reduce the carbon footprint of our buildings—which are currently responsible for 31% of all U.S. greenhouse gas emissions⁵—we must focus on the sizable opportunities to increase efficiency in existing buildings.

Focusing on retrofitting existing homes is also key to ensuring that American families across the country are part of and benefit from the transition to a decarbonized economy. The occupants of the vast majority of homes in the U.S. experience comfort problems, health issues, and/or high utility bills.⁶ Energy efficiency retrofits can address these problems, and improve the health, wellbeing, and financial security of Americans, while simultaneously reducing carbon emissions and increasing the resiliency of homes in the face of climate change. Numerous studies have illustrated the health and safety benefits of energy efficiency retrofits, including significant improvements in asthma symptoms, reduced thermal stress, and improved overall physical and mental health.^{7 8} Energy efficiency also improves a home’s resilience, which is increasingly important in the face of climate change, and the increasingly frequent and devastating storms, extreme weather, and wildfires that will accompany it. Efficiency measures that improve the durability of homes and minimize residents’ exposure to wind, moisture and temperature extremes are critical to keeping people safe through a storm or power outage. Focusing on existing buildings is also an equity issue, as many families cannot afford to buy new homes being built to the latest energy codes.

With the cost savings, non-energy benefits to households, and societal benefits including reduced emissions and economic growth, energy efficiency retrofits are a win-win and an essential strategy for addressing the climate crisis. According to the U.S. Department of Energy, every \$1 invested in weatherization generates \$4.50 in energy and non-energy benefits to the home and community and supports local employment.⁹ Furthermore, the National Renewable Energy Laboratory (NREL) estimates that cost-effective measures could reduce total residential electric energy use in single-family homes by 21.9%; use of gas, propane and other bulk fuels by 24%, and total carbon emissions in the single family housing stock by 24%.¹⁰ Focusing on retrofitting existing buildings will improve the lives of Americans, while creating jobs and helping us reach our climate goals.

3. How can the Federal government encourage public-private partnerships to reduce emissions from Federal buildings?

There is significant opportunity to reduce carbon emissions and simultaneously save American taxpayer money by improving the energy performance of federal buildings. Energy Savings Performance Contracts (ESPCs) are an innovative and successful model for public-private partnerships to improve energy efficiency of federal buildings. ESPCs allow federal agencies to procure energy savings and facility improvements with no up-front capital costs or special appropriations from Congress and provide savings guarantees, reducing government risk. Studies by the Oak Ridge National Laboratory show that actual cost savings exceed guaranteed savings for many ESPC projects allowing significant cost savings to

⁴ <https://www.eia.gov/consumption/residential/data/2015/hc/php/hc2.3.php>

⁵ Total combined emissions from the residential and commercial sectors with electricity-related emissions distributed. <https://www.epa.gov/sites/production/files/2019-04/documents/us-ghg-inventory-2019-main-text.pdf>

⁶ <https://www.building-performance.org/sites/default/files/0819-EE-high-performing-homes-blueprint-v8.pdf>

⁷ https://weatherization.ornl.gov/wp-content/uploads/pdf/WAPRetroEvalFinalReports/ORNL_TM-2014_345.pdf

⁸ <https://e4thefuture.org/occupant-health-benefits-of-residential-energy-efficiency/>

⁹ https://www.energy.gov/sites/prod/files/2018/03/f49/WAP-fact-sheet_final.pdf

¹⁰ Wilson, Eric, Craig Christensen, Scott Horowitz, Joseph Robertson, and Jeff Maguire. 2017. *Electric End-Use Energy Efficiency Potential in the U.S. Single-Family Housing Stock*. National Renewable Energy Laboratory.

accrue to the government, while also reducing emissions.¹¹ Congress should promote and support the expanded use of ESPCs to reduce emissions from federal buildings.

The Federal Energy Management Program (FEMP) is an important program that oversees and facilitates the implementation of ESPC activities, providing crucial assistance, guidance, and training to federal agencies to implement successful projects. FEMP staff help agencies use ESPCs in several ways: advising agencies on scoping, procurement, and performance requirements for energy conservation measures (ECMs); helping agencies select third-party ESCOs; finalizing contracting terms and project approval; and monitoring project implementation and performance.

FEMP is the program manager for the critical ESPC contracting tool used by federal agencies for the implementation of ESPCs – the U.S. Department of Energy (DOE) Indefinite Delivery Indefinite Quantity (IDIQ), Multiple Award, Energy Savings Performance Contract. This contract has historically been instrumental in achieving the aforementioned energy and cost savings as well as job creation outcomes for the nation. Since the inception of the DOE IDIQ ESPCs in 1998, 411 projects have been awarded and approximately \$6.6 billion has been invested in federal energy efficiency and renewable energy improvements. These improvements have resulted in approximately 573 trillion Btu in life cycle energy savings and over \$15 billion in cumulative energy cost savings for the federal government.¹²

Congress should enable more of these successful public-private partnerships through the following pieces of legislation:

Legislation

- **Federal Energy and Water Management Performance Act of 2019 (S. 1857, Sen. Murkowski, Sen. Manchin):** Would reauthorize the Federal Energy Management Program (FEMP) at \$36 million and improve federal energy and water requirements.
- **Energy Savings and Industrial Competitiveness Act of 2019 (S. 2137, Sen. Portman, Sen. Shaheen; H.R. 3962, Rep. Welch, Rep. McKinley):** Would reauthorize the Federal Energy Management Program (FEMP) at \$36 million and improve federal energy and water requirements. It extends energy use reduction goals and would expand the scope of existing energy standards for new federal buildings to include major renovations.
- **Energy Savings through Public-Private Partnerships Act of 2019, (S. 1706, Sen. Gardner, Sen. Coons; H.R. 3079, Rep. Welch):** Would encourage the increased use of ESPCs in federal facilities by addressing barriers and increasing the use of energy efficiency and distributed generation.

Federal Appropriations

Congress should also ensure adequate funding for the following programs to continue to improve the performance and cost savings for federal buildings:

- **Federal Energy Management Program (FEMP).** In addition to reauthorizing this important program (S. 1857), Congress should ensure continued adequate funding for FEMP including carveouts for the Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) program which provides grants to federal agencies to support the use of ESPCs, to achieve energy savings and implement other important climate-related measures like resiliency that might not generate utility bill savings.
- **U.S. General Services Administration (GSA) Office of Federal High-Performance Buildings.** Through ESPCs, construction and leasing policies, and other public private partnership models

¹¹ <https://info.ornl.gov/sites/publications/Files/Pub41816.pdf>

¹² <https://www.energy.gov/eere/femp/awarded-doe-idiq-energy-savings-performance-contract-projects>

GSA has saved millions of dollars. GSA has reported, for example, that sustainable building standards helped GSA avoid more than \$250 million in energy and water costs from 2008 to 2014.¹³ These programs save taxpayers money while reducing energy-related carbon emissions and should continue to be funded by Congress to ensure continued progress.

4. How can we ensure that the advancement of residential energy efficiency helps all Americans, especially low-income households?

Access to Efficiency Improvements for All Income Levels

Policies aimed at retrofitting the over 115 million homes across the country will not only help reduce carbon emissions from the nation's residential building stock, but will also help homeowners save money on their monthly utility bills and improve the comfort, health, safety, and resiliency of their homes. Reducing monthly energy costs of homes is something that will benefit every American, as energy costs often represent the second or third largest recurring cost of homeownership, depending on location (behind mortgage and in some markets property tax). However, upfront costs remain a significant barrier preventing low and moderate-income households from completing energy efficiency upgrades. Meanwhile, nearly one-third of U.S. households reported facing a challenge in paying energy bills or sustaining adequate heating and cooling in their homes in 2015, with even higher rates among low-income and racial minority households.¹⁴ Low-income households also face the highest energy burdens, paying 7.2% of their household income on energy, more than three times the percentage that higher income households pay.¹⁵ Energy efficiency is an underutilized strategy that can help reduce these high energy burdens. Congress should advance policies to ensure Americans of all income levels, especially low-income households, have access to residential energy efficiency measures.

To ensure equity, we need to provide robust funding for low-income energy efficiency programs. It is critical that Congress continue to support and expand the Weatherization Assistance Program (WAP).¹⁶ I was the lead author of a 2017 report,¹⁷ published by the Home Performance Coalition (now the Building Performance Association), that offered recommendations for improvements to WAP, opportunities for streamlining, and ways to encourage the use of private sector contractors. Some of these ideas are included in the *Weatherization Enhancement and Local Energy Efficiency Investment and Accountability Act (HR 2041)* which would reauthorize and make updates to the program. This bill has passed out of Committee this year and awaits a floor vote. The Building Performance Association urges Congress to act on this important legislation. We also encourage consideration of the full list of recommendations from the 2017 report (Appendix A).

Congress should also create incentives to support low- to moderate-income families who don't qualify for low-income weatherization programs. The *HOMES Act (HR 2043)*¹⁸ would help middle-income Americans make efficiency upgrades to their homes and incentivize investments that can achieve substantial energy savings. Furthermore, incentives are often targeted to "owner-occupied" buildings. To encourage landlords to upgrade their properties, I recommended removing this requirement from incentive programs as the tenants will benefit from the energy savings.

¹³ https://app.gsagov_prod_rdcgwaajp7wr.s3.amazonaws.com/GSA_FY_2015_SSPP_Final.docx

¹⁴ <https://www.eia.gov/todayinenergy/detail.php?id=37072>

¹⁵ <https://aceee.org/research-report/u1602>

¹⁶ Since 1976, WAP has helped make more than 7 million homes more efficient, saving the average recipient about \$4,200 over the lifetime of their home.

¹⁷ <https://www.building-performance.org/sites/default/files/Weatherization%20%26%20HP%20Recommendations%20Report2.pdf>

¹⁸ Updated version pending introduction from Rep. Welch

Job Opportunities for Communities Across America

Advancing residential energy efficiency will also create quality local jobs in communities across the country. According to this year's "Energy Efficiency Jobs in America"¹⁹ report from E4TheFuture, the energy efficiency sector employs 2.3 million Americans, twice as many workers as the entire U.S. fossil fuel industry, and energy efficiency is leading the nation's energy economy in new job creation. A significant portion of energy efficiency jobs in the U.S. are in the residential sector, and approximately 56 percent of energy efficiency jobs involve construction and repairs. These are the contractors – the “boots on the ground” – installing energy efficiency products and technologies and working to reduce energy waste in homes and buildings across the country. These jobs are, by their very nature, inherently local and cannot be exported. Energy efficiency workers work in their own communities and earn a livable wage while helping homes and businesses reduce energy waste and save money. Policies that encourage investment in energy efficiency can further advance growth in this industry, creating even more well-paying jobs all across the country and generating economic opportunity for Americans through the decarbonization transition.

Congress should promote greater access to job opportunities in the growing energy efficiency industry and provide resources to communities for workforce development. A comprehensive, nationwide program is needed to improve education and training for workers in the energy efficiency industry, including manufacturing, engineering, construction, and building retrofitting jobs. This is exactly what the *Blue Collar and Green Collar Jobs Development Act of 2019 (HR 4061)* would create. One of the main pillars of HR 1315 is an energy workforce grant program, which would provide assistance to businesses in the energy efficiency and renewable energy industries that are seeking to educate and train new hires and existing employees. Importantly, the legislation would give priority to eligible businesses that recruit employees from local communities, minorities, women, foster children, persons who are transitioning from fossil energy sector jobs, and veterans; and would support critical on-the-job training and reskilling for workers. Congress should pass HR 1315 to prepare more American workers—especially transitioning workers, minorities, and members of low-income communities—for quality jobs in energy efficiency.

5. How can energy-efficiency in buildings make a transition to building electrification more successful?

Energy efficiency is critical to achieving electrification goals, particularly in cold weather climates where a poorly insulated, inefficient building would not be able to maintain its temperature with a traditional electric heat pump. Importantly, building electrification only leads to decarbonization if the electricity used is carbon-free, renewable energy. Coordinated delivery of energy efficiency and electrification improves outcomes in many ways:

1. **Technology advancement.** Energy efficiency programs have been instrumental in advancing high-efficiency technologies, including air and ground-source heat pumps and heat pump water heaters. Northeast Energy Efficiency Partnerships, with support from many efficiency program administrators, maintains a cold-climate specification and list of air-source heat pumps that perform well in cold climates, even in the coldest states.²⁰ These high-efficiency heat pumps,

¹⁹ <https://e4thefuture.org/wp-content/uploads/2019/09/Energy-Efficiency-Jobs-in-America-2019.pdf>

²⁰ There is widespread availability of cold-climate heat pumps, which ensure that the equipment performs well in cold climates and doesn't, for example, kick into electric resistance mode. NEEP maintains a cold-climate spec and associated product list: <https://neep.org/ASHP-Specification>. There are 4,775 products listed from more than 24 manufacturers in all configurations: single-zone, multi-zone, ducted, ductless. Cold states like Vermont and Maine have high rates of adoption of ductless mini-split heat pumps because the customer economics are really compelling

coupled with energy efficiency improvements in the building envelope, make it possible for buildings to switch to electric heat.

2. **Workforce development.** The contractors who install energy-efficient equipment are now adding heat pumps to their businesses, and the trade ally networks currently supported by efficiency programs are expanding to support building electrification. Efficiency programs are key partners for recruitment, training, and quality assurance of building electrification contractors, making whole-building energy efficient a part of the business model.
3. **Customer experience.** Efficiency programs have strong skills in customer engagement, and know-how to design programs that overcome barriers to customer adoption of new technologies. They are well-positioned to help customers navigate an increasingly complicated set of energy options, including electrification of buildings and transportation.
4. **Reduced electric system costs as the building and transportation sectors electrify.** To effectively reduce emissions, building electrification will need to be coupled with a transition to clean, decarbonized electricity generation. By lowering demand, energy efficiency will ease the speed and scale of investment in renewable and low-carbon energy resources needed to support this transition. Efficiency lowers overall energy demand and demand flexibility (dynamic efficiency, demand response, and smart technology) allows for the shifting of load. Together, these strategies both curb the increase in electricity demand as more end uses are powered with electricity and shift load to allow for grid stability. This will lower requirements for new electricity generation and transmission through the transition, saving money on power plant construction and grid buildout.
5. **Grid stability and reliability.** Building electrification will affect the timing and seasonality of peak demand. For example, in cold climates, as heating load is electrified, power systems may to become winter peaking with significantly higher demand during the coldest times of the year). Energy efficiency is needed to help effectively manage the peak load impacts of new electricity demand; lowering baseload demand and supporting load shifting through energy efficiency ensures that peaks are not as high, improving reliability. Mitigating grid stress and supporting stability through energy efficiency can reduce the risk of brownouts and rolling blackouts. That grid reliability is increasingly important as more buildings electrify (and depend on electric power for heating and cooling).
6. **Better performance of electrified buildings.** Creating a tight building envelope lowers heating and cooling loads and allows highly efficient electric heat pumps to meet the full heating and cooling needs for more homes and businesses. Super-insulated homes can be heated entirely with heat pumps, and it is becoming increasingly possible for heat pumps to fully replace fossil fuels, even in cold climates, through emerging whole-house heat pump systems and air-to-water systems.²¹ In the case of a power outage that would cut off electrified heating and cooling systems, building envelope improvements like high-performance insulation, air sealing, and strong leak-resistant windows also help to ensure that homes remain safe and comfortable, allowing people to shelter in place. Finally, an efficient, well-sealed home also enables demand flexibility allowing timing of space heating or cooling to be shifted in order to maximize the use of renewable energy while still maintaining comfortable conditions.

for customers using expensive unregulated fuels (oil, propane). In Vermont, there are examples of high-performing efficient homes built to Passive House standards that are 100% heat pump heated.

²¹ This is possible even in the coldest states.

Appendix A

Weatherization and Home Performance: Recommendations for Mutual Success and Collaboration

1. The U.S. Department of Energy (DOE) Residential Building Integration Program, working together with the Office of Weatherization and Intergovernmental Programs, should support the adoption and use of the Building Performance Institute's (BPI) -2101 *Standard Requirements for a Certificate of Completion for Residential Energy Efficiency Upgrades* ("Home Performance Certificate") as a strategy for documenting upgrades (and resulting energy savings) funded by WAP. A BPI-2101-compliant certificate that is issued to homeowners that receive weatherization assistance can be used as reference document by real estate agents, appraisers, and other professionals during the home sale process.

2. The DOE Residential Building Integration Program, working together with the Office of Weatherization and Intergovernmental Programs should promote the use of smart home technologies in weatherization as a way of reducing program costs, streamlining EM&V, and providing real-time feedback on performance to weatherization contractors and program participants. Data from smart home devices can be used to support traditional EM&V, reducing the costs of evaluation and providing real-time or near real-time feedback to contractors, programs, and program participants on performance. Programs can then use this information to target resources to high energy users. Contractors can use this information to better understand the results of their work and communicate to customers the value of weatherization.

The DOE Residential Building Integration Program, working together with the Office of Weatherization and Intergovernmental Programs and the Office of Electricity Delivery and Energy Reliability, should consider establishing a pilot program in FY 2018 and FY2019 in multiple states to test new models for streamlining and maximizing resources. The pilot would aim to test auto-M&V41 and utilize home energy management devices, such as smart thermostats and smart meters that are enabled to provide near real-time data to programs to demonstrate if a project was successfully completed. By utilizing an auto-M&V system, the pilot would test the current 100% quality control currently used by WAP in an effort to reduce both costs to the program and burden on the contractors and homeowners.

3. The DOE Office of Weatherization and Intergovernmental Programs should work to ensure that training and technical assistance is offered to all contractors that make a commitment to work in the WAP program. The training should be consistent with industry best practices. In addition, the WAP provider should consider a stipend for private sector contractors to equalize the time-cost of participation in training.

4. The DOE Residential Building Integration Program, working with Department of Commerce's Small Business Administration, should work to advance small business loans to states that are focused on energy efficiency contracting and training to complement the WAP programs.

5. In FY2017 and FY2018, there should be a series of national dialogues among private contractors and members of the Weatherization network for the purpose of developing a better understanding of WAP programs by contractors, and identifying best practices and shared interests between the two groups that can become the foundation to improve the alignment of residential energy efficiency programs. This dialogue should take place in connection with existing national or regional conferences where contractors and members of the WAP network will be in attendance (to avoid unnecessary costs).

6. The DOE Office of Weatherization and Intergovernmental programs should be authorized to streamline the process for approving energy efficiency measures for inclusion in the Weatherization Assistance Program to advance innovative pilot programs and quickly approve adoption of new technologies for the benefit of low-income clients.