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Weatherization Innovation Pilot Program (WIPP)

Technical Assistance Summary

Amy Hollander
National Renewable Energy Laboratory

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Office of Energy Efficiency & Renewable Energy
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Technical Report
NREL/TP-7A40-62720
September 2014

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Prepared under Task No. IGST.0400

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Acronyms

DOE	Department of Energy
CDFI	Community Development Financial Institutions
CEC	Community Environmental Center (Long Island, NY)
CECLP	Coalition to End Childhood Lead Poisoning (Baltimore, MD)
CEO	Commission on Economic Opportunity (Wilkes-Barre, PA)
CTEHHI	Connecticut Efficient and Healthy Homes Initiative (CT)
DHCG	Division of Housing and Community Development
DOE	United States Department of Energy
EERE	United States DOE Office of Energy Efficiency and Renewable Energy
ESPC	Energy Savings Performance Contract
EPS	Energy Pioneer Solutions (Hastings, NE)
FFRDC	Federally Funded Research and Development Corporation
FOA	Funding Opportunity Announcement
GHG	Greenhouse Gas Emissions
JCI	Johnson Controls, Inc
HEM	Home Energy Monitoring
HFHI	Habitat for Humanity International (Atlanta, GA)
HUD	United States Department of Housing and Urban Development
HVAC	Heating, Ventilation, and Air Conditioning
LEAP	Local Energy Alliance Program (Charlottesville, VA)
LIIF	Low Income Investment Fund
NHCLF	New Hampshire Community Loan Fund
NREL	National Renewable Energy Lab
NYSERDA	New York State Energy Research and Development Authority
WAP	Weatherization Assistance Program
OWIP	Office of Weatherization and Intergovernmental Programs
ORNL	Oak Ridge National Laboratory
PWC	People Working Cooperatively (OH)
RASEI	Renewable and Sustainable Energy Institute (University of Colorado, Boulder)
ROI	Return on Investment
SAHF	Stewards of Affordable Housing for the Future (Washington, D.C.)
SIR	Savings to Investment Ratio
UI	United Illuminating (New Haven, CT)
UNCC	University of North Carolina (Charlotte)
VEIC	Vermont Energy Investment Corporation (Baltimore, VT)
WAP	Weatherization Assistance Program
WIPO	Weatherization and Intergovernmental Programs Office
WIPP	Weatherization Innovation Pilot Project

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1 Program Background

The U.S. Department of Energy (DOE) Energy Efficiency and Renewable Energy (EERE) Weatherization and Intergovernmental Programs Office (WIPO) launched the Weatherization Innovation Pilot Program (WIPP) to accelerate innovations in whole-house weatherization and advance DOE's goal of increasing the energy efficiency and health and safety of low-income residences without the utilization of additional taxpayer funding. Sixteen WIPP grantees were awarded a total of $30 million in Weatherization Assistance Program (WAP) funds in September 2010. These projects focused on: including nontraditional partners in weatherization service delivery; leveraging significant non-federal funding; and improving the effectiveness of low-income weatherization through the use of new materials, technologies, behavior-change models, and processes.

The WIPP grantees were comprised of non-profit organizations, utility companies, university, and for-profit companies using both volunteer and job training strategies. The pool of grantees proposed a wide variety of pilot projects that resulted in experiences demonstrating what is and is not possible within the structure of the traditional WAP program structure. Some of the proposed innovations were new to weatherization locally, but had proven success in other states. The lessons learned from this work can be used in future planning for legislators and federal and state program administrators. Oak Ridge National Laboratory (ORNL) will release a detailed report on the success and challenges experienced by the grantees in 2014.

The National Renewable Energy Laboratory (NREL) provided technical assistance to grantees for the purpose of supporting the development and implementation of the programs. The goals of the technical assistance were to identify and facilitate opportunities for financial leveraging and multifamily implementation strategies. NREL also aimed to reduce transactional costs for the program by providing experiences and information from other programmatic experiences to grantees that could expedite implementation. The remainder of this report outlines the details of the technical assistance provided to support the WIPP pilot.

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2 NREL Technical Assistance Summary

NREL's in the WIPP pilot was to offer technical assistance to grantees based on their requests. Through the NREL-managed program, grantees had access to multiple experts inside and outside of NREL in the fields of energy efficiency, energy-saving behavior science, building performance, finance, policy, and weatherization. Partner technical assistance providers included: ORNL, Pacific Northwest National Laboratory (PNNL), and Lawrence Berkeley National Laboratory (LBNL); Performance Systems Development of New York to provide technical field knowledge; and the University of Colorado Renewable and Sustainable Energy Institute (RASEI) to provide cutting-edge research on energy action behavior science.

DOE provided the platform to support the grantees, beginning with a kick-off meeting in Washington, DC, in December 2010. At the two-day meeting, NREL staff hosted a session with each of the grantees to identify potential technical assistance needs, and DOE project officers were assigned to assist and monitor the grantees. Following the kick-off meeting, there were several pathways for grantees to request technical assistance: through email, direct contact with project officers, and direct communication with their NREL contact. DOE project officers were informed of NREL technical assistance requests to ensure coordination within the program.

Initially, to support the new-to-weatherization grantees, NREL provided expertise on the specifics of delivering weatherization to low-income households within the rules of WAP. This assistance guided grantees through federal requirements, the importance of using energy auditing to measure the cost effectiveness or the savings-to-investment ratio (SIR) of energy upgrades, and the importance of quality field training for weatherization personnel. Information was shared on the importance of building performance and whole-house building science, allowable materials in WAP's Appendix A, and client energy education.

Following the initial programmatic set-up requests, technical assistance transitioned to facilitating production of weatherized homes. NREL fulfilled 50 technical assistance requests between November 2010 and December 2013. The following assistance was offered in seven general areas:

1. Leveraging private financing
    - Performed research analysis on financial mechanisms for low-income residents (Washington State Department of Commerce (WSDOC)):
        - Introduced Financial Playbook on financing mechanisms from the Weatherization Assistance Program Technical Assistance Center (WAPTAC)
        - Researched payment structures for energy audits in other programs
        - Provided literature on financing mechanisms and credit enhancements
        - Researched low-interest retrofit loan programs for Washington's Multifamily Housing Webinar
        - Researched feasibility of carbon credits as a funding source for low-income weatherization programs
        - Researched "Top Loss" for energy-efficiency loans
        - Performed analysis (9-page memo) of financial mechanisms with community development financial institutions (CDFIs).

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- Performed analysis on utility incentives for leveraging dollars (University of North Carolina at Charlotte (UNCC))
- Delivered white paper identifying states with system benefits charges available for low-income weatherization in multifamily buildings (Stewards of Affordable Housing for the Future (SAHF)).

2. Energy modeling tools and software (energy auditing tools)
    - Reviewed energy modeling tools and software (YouthBuild, USA)
    - Reviewed energy auditing software (United Illuminating (UI)).
3. Home energy monitors and lighting
    - Reviewed home energy monitors (Commission on Economic Opportunity (CEO))
    - Provided information on common area lighting measures installed and their payback periods.
4. Energy-saving behavior science
    - Subcontracted with the University of Colorado RASEI to develop energy curriculum and material for home energy behavior action items for weatherization clients (UNCC), including:
        - Weekly meetings and a visit to UNCC to assist with energy action behavior strategies
        - RASEI assisted with a review of data collection and client surveys
        - Created a webinar on effective client energy action methods and education
    - Provided review and input to the Healthy Homes Checklist (UI).
5. Cost-effective analysis of pilot technologies
    - Delivered white paper (8-page analysis) on "Cost-Effectiveness Tests for Clean Energy Measures in Low-Income Applications" (Community Environmental Center (CEC))
    - Quantified metrics for close proximity production and economies of scale (New Hampshire Community Loan Fund (NHCLF)):
        - This task was transferred to ORNL and resulted in summaries of efficiencies but not quantifiable metrics.
6. Carbon offsets
    - Performed analysis on carbon credits for weatherization (CEO):
        - Researched market viability and determined that it was negative, but noted alternative funding through a corporate sponsor would be lucrative
        - Delivered webinar on Maine's successful revenue capture using Chevrolet as the buyer.
7. Other
    - Delivered "Time of Lease" disclosure examples from existing model ordinances (City of Danville, Virginia)
    - Developed sample generic best practice forms for client applications, landlord permissions, and utility permissions for multiple grantees looking for comprehensive client forms

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- Produced written two-page case studies:
  - CEO
  - People Working Cooperatively (PWC)
  - UNCC—on hold due to unapproved measures
  - YouthBuild—on hold due to poor field quality.

Toward the end of the pilot program, production schedules were behind for all remaining grantees. To address this challenge, NREL transitioned to providing field training, generalized assistance via the website, and webinars to address various challenges identified by grantees and DOE. Specifically, NREL provided:

- Field training and visits
  - Provided field training to YouthBuild grantee in Petersburg, Virginia, at the request of DOE project leads. DOE monitoring found that the grantee lacked adequate field quality and production. The training demonstrated every level of basic weatherization properties, and staff responded positively. More training was recommended.
  - Provided field training for Habitat for Humanity International (HHI) in two locations in Central Iowa. The NREL report documented a need for additional training and oversight. Client files did not represent a factual record of activity on each unit, and training was provided on required file documentation. Later, a webinar was broadcast by NREL to demonstrate proper client file documentation.
  - Provided field training to CEC, which helped to create dialogue around opportunities for improvement in project tracking and decision making by the grantee. Key staff members of the organization learned about most, if not all, aspects of weatherization in order to improve their service offerings and share this knowledge with the rest of the organization. The NREL report focused on training provided, and reported that overall, CEC performed high-quality weatherization work, although improvement to organization and documentation of completed work was recommended.
- WIPP website: NREL provided program support to grantees through the creation and maintenance of the WIPP website. NREL posted all technical assistance products for easy access by grantees. The site offered a summary of WIPP-proposed projects, WIPP policy and guidance, a technical assistance link, information on the WIPP evaluation by ORNL, and a contact link. Other content included:
  - Program fact sheet
  - Case studies
  - Webinars tailored for WIPP grantees
  - Energy behavior and energy savings documents by RASEI
  - Leveraging resources for WIPP by NREL
  - Financing Residential Energy Efficiency with Carbon Offsets by Maine Housing
  - Accountability and Best Practices for the Client File
  - WIPP Field Practices – Common Errors and Innovative Solutions.

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- Webinars
  - Webinar: “Financial Leveraging for WIPP” – NREL summarized successes and challenges of financial opportunities performed by WIPP agencies.
  - Webinar: “Accounting for the WIPP Weatherization Unit.” – NREL provided a review of proper documentation of WIPP activity on a unit-by-unit basis.
  - Webinar: “Common Errors and Solutions” – NREL demonstrated common field mistakes found in the WIPP pilot with a focus on proper building performance and the complexities involved.
  - Webinar: “Carbon Offsets for Weatherization” – NREL provided a recap of the Maine Housing carbon offsets program that has sparked financial opportunities for future WIPP or WAP grantees. The webinar served as a how-to guide detailing Maine’s discoveries in navigating the current carbon market for the benefit of low-income weatherization. Lessons learned and jump-start activities were highlighted.

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3 Lessons Learned about Technical Assistance Delivery

NREL recognizes three primary lessons learned from this technical assistance program that could be applied to future programs of this type.

First, the original goal of the technical assistance was to facilitate production by offering technical and technological information to grantees. A large percentage of the technical assistance budget, however, was dedicated to providing programmatic guidance on weatherization program rules and policies in the early stages of the program, as grantees new to weatherization required technical assistance to navigate the complexities of the long-standing WAP rules and regulations. This lack of programmatic knowledge on the part of the grantees was the primary barrier to facilitating production. The grantees responded well to the broad assistance opportunities covering a wide variety of topics on programmatic and technical issues.

Secondly, the multifaceted team of assistance providers was able to respond in an efficient, timely, and expert fashion to all incoming requests. However, there were barriers to success that could not be overcome within the confines of the technical assistance structure. Grantees made research requests, but in scoping for implementation, it was necessary for grantees to explore their own systems' resources and barriers before they could fully engage in advanced technical assistance. For example, Utah and Washington worked within their state policy and housing platforms, only to realize the plans they created were not viable.

The third primary lesson learned was that due to the inexperience of the grantees, NREL had to offer a broad range of technical information and support in addition to the well-rounded platform of assistance that DOE provided. Individual technical requests were fulfilled not only from NREL but also from NREL’s access to multiple national labs, university research, weatherization field experts, and programmatic expertise. In order for grantees new to weatherization to ramp up to high levels of production, all avenues of technical assistance were employed. The length of assistance was extended to a longer-than-expected time period of three years, and it took two years for most grantees to begin production, a noteworthy item for future programs related to WAP.

In summary, the technical assistance provided to WIPP grantees was different than originally expected, but the network of providers responded appropriately to address the most critical questions, despite numerous setbacks.

The appendices in this report summarize the grantee production and leveraging goals and current unit status as of this report's publication.

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4 Appendices

4.1 Appendix 1: Objective of WIPP

The new partnerships and weatherization providers were tasked with taking experimental approaches to find new and more effective ways to weatherize homes. These innovative approaches are expected to improve key weatherization outcomes, such as:

- Increasing the total number of homes weatherized
- Reducing WAP expenditures per home by using leveraged dollars
- Increasing the energy savings in each home weatherized
- Increasing the number of weatherization jobs created and retained
- Reducing greenhouse gas (GHG) emissions.

Other objectives of WIPP were to provide grants for innovative ways to weatherize homes of low-income families with a focus on the following objectives:

- Engaging non-traditional providers and developing new partnerships
- Leveraging non-federal financial resources with a goal ratio of at least 3:1
- Field-testing new materials, technologies, behavior-change models, and/or processes.

The leveraged funding goal of a 3:1 non-federal to federal ratio targeted a total of $90 million in leveraged funds. The WIPP grants were issued by the DOE Field Office in Golden, Colorado, and managed by the DOE OWIP. NREL was tasked to deliver technical assistance to the grantees, while ORNL was tasked with evaluating the program. The funds were to be used to create a weatherized unit, described as: “A dwelling on which a DOE-approved energy audit or priority list has been applied and weatherization work has been completed.” The grant requires the DOE measures installed on the unit to have an average SIR of 1 or greater, but other necessary energy-related health and safety measures may also be included. The low-income homes were required to be served at the same WAP income eligibility levels.

Eligibility and Selection:

Through WIPP, DOE sought partnerships with traditional and non-traditional weatherization providers, including: states and units of local government; nonprofit entities such as community development organizations; for-profit entities; institutions of higher education; Indian tribes; economic development entities; and consortia of these entities. All types of entities were eligible to apply, except other federal agencies, Federally Funded Research and Development Center (FFRDC) contractors, and nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995. Grantees were selected through a merit review panel that included representatives from the Environmental Protection Agency (EPA), The United States Department of Housing and Urban Development (HUD), and DOE staff, and were judged on their ability to add innovation and perform and carry

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out the mission of weatherization using WIPP specifications outlined in the Funding Opportunity Announcement (FOA). Weatherization program guidance was delivered to outline any deviance from WAP rules.

DOE awarded funds to 16 entities in September 2010, with the awards ranging from $600,000 to $3 million. The performance period was to be from September 30, 2010, to September 30, 2012, with one extension running to September 30, 2014. Originally, WIPP planned to weatherize 19,191 units, but this number was reduced to 13,416 after the 16 grantees launched their projects and two grantees de-obligated their award. The entities were made up of the following types of organizations: 10 nonprofit organizations; two state government offices; one local government office; one utility company; one institution of higher education; one private (for-profit) company.

4.2 Appendix 2: Four Grantee Approaches

The 16 grantees sought to advance weatherization through four main approaches:

Financial Tools: In order to maximize weatherization funds, financial approaches were proposed in the areas of loan-loss reserves, on-bill utility financing systems, revolving loan funds, municipal loan programs, one-stop contracting and finance options, loan funds designed specifically for low-income weatherization, below-market loans, conversion of energy consumption reductions into GHG offsets through the use of energy-efficiency technologies, and carbon incentive funds.

Green and Healthy Homes: Grantees paired weatherization and energy-efficiency upgrades with human behavior and energy actions as well as health and safety actions to reduce energy costs while avoiding potential health and safety hazards, and integrated delivery methods to provide sustainable, affordable, and healthy housing for recipients.

New Technologies and Techniques: Grantees developed community-based market approaches to conduct weatherization outreach; developed behavior modification models related to energy use; delivered information on real-time home energy monitoring (HEM) equipment and in-home display devices; and provided targeted high-efficiency appliances and heating, ventilation, and air conditioning (HVAC) equipment replacement.

Workforce Development and Volunteers: Grantees used students, volunteers, and workforce training organizations to expand knowledge and perform energy upgrades. Skills developed include energy auditing; installation of energy-saving upgrades; HVAC testing and installation; installation and analysis of HEMs; energy education; and client engagement.

4.3 Appendix 3: Timeline

The WIPP FOA was issued in April 2010 and closed June 2, 2010. Maximum awards were $3 million, and DOE awarded 16 grants by October 30, 2010. The projects were expected to run up to two years (24 months), but many extensions were necessary. Five grantees were allowed extensions until September 30, 2014, and this will conclude the program.

4.4 Appendix 4: Financial Leveraging

The primary objective of WIPP was innovation, with a strong emphasis on leveraging funds. The pilot allowed for flexibility in planning and implementation. In the end, the working innovations

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were not significantly different than what WAP projects had traditionally achieved. Due to additional funding and partnerships, the following objectives were achieved:

- Gains were made in financial leveraging such as foundation grants and new utility partnerships.
- Energy savings companies (ESCO) models were developed.
- Healthy homes and energy education programs were created and expanded.
- Multifamily pooling of cost-effective items opened doors and incentivized building owners.

Financial gains with the most significant leveraging successes were:

- Maryland received grants from two prominent foundations.
- Pennsylvania gained new utility dollars/partnerships.
- Long Island partnered with the New York State Energy Research and Development Association (NYSERDA) to obtain state utility funds for upgrades.
- Ohio gained utility and housing rehab dollars and became a Medicaid/Medicare provider for home accessibility installations.
- Washington, DC, developed a policy agreement with HUD to allow the energy savings performance contract (ESPC) model to work in privately owned, HUD-assisted housing.
- Vermont gained a grant from Efficiency Vermont, a nonprofit organization managed by the Vermont Energy Investment Corporation, under an appointment issued by the Vermont Public Service Board.

Financing through ESCOs in weatherization has been challenging for WAP projects, but two WIPP grantees saw success from these ventures:

- Washington, DC, tested ESPCs as a way to weatherize multifamily units. They contracted with Johnson Controls, Inc. (JCI), who delivered a cost-benefit analysis on energy and water retrofits in privately owned affordable multifamily housing. They also partnered with the Low Income Investment Fund (LIIF) (http://www.liifund.org/about-liif/faq/) as a unique lending partner.
- Virginia applied an ESCO to analyze and finance energy upgrades and began exploring a carbon credit market. Although they are not able to apply carbon trading to gain funds for WIPP-weatherized units, they will use groundwork intended for WIPP in future projects.

Financial leveraging was the central challenge reported by all but one grantee. Achieving the original financial leveraging goal of 3:1 non-federal to federal dollars was not practical. Table 1 demonstrates how financial leveraging revisions in 2013 reduced expectations, but as of November 2013, agencies are reporting 29% of revised leveraging goals.

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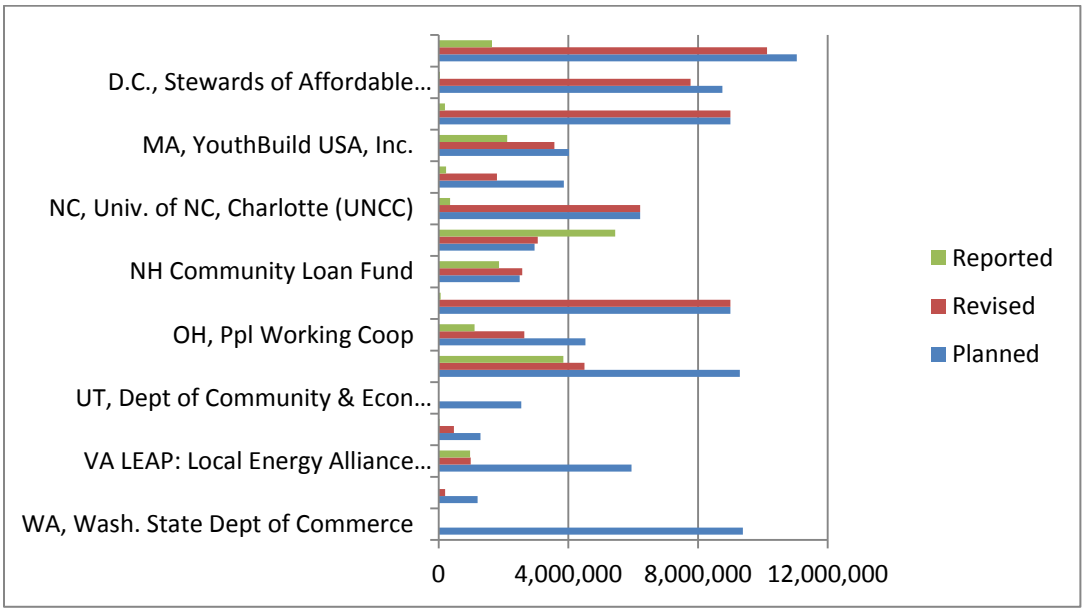
Table 1. Leveraging Dollars Planned, Revised, and Reported as of November 2013

Leveraging	Planned	Revised	Reported
CT, The United Illuminating Co.	$11,047,475	$10,126,786	$1,648,072
DC, Stewards of Affordable Housing	$8,750,000	$7,771,569	$42,527
GE, Habitat for Humanity International	$9,000,000	$9,000,000	$192,358
MA, YouthBuild USA, Inc.	$4,020,593	$3,569,264	$2,116,212
MD, End Child Lead Poisoning	$3,862,793	$1,800,000	$229,222
NC, Univ. of NC, Charlotte	$6,214,400	$6,213,372	$354,879
NE, Energy Pioneer Solutions	$2,959,150	$3,058,594	$5,444,645
NH Community Loan Fund	$2,500,000	$2,578,121	$1,863,726
NY, Long Island Community Env. Center	$9,000,000	$9,000,000	$63,935
OH, People Working Coop	$4,529,536	$2,640,255	$1,106,273
PA, Commission on Econ. Opportunity	$9,291,200	$4,500,000	$3,847,688
UT, Dept. of Community & Econ. Development	$2,550,000	$0	$0
VA, City of Danville	$1,290,000	$472,921	$26,015
VA, Local Energy Alliance Program	$5,950,000	$990,000	$970,992
VT, VEIC in Burlington	$1,200,000	$200,000	$0
WA, Wash. State Dept. of Commerce	$9,386,008	$0	$0
Total	**$91,551,155**	**$61,920,883**	**$17,906,544**



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Leveraged funds are defined as owner contributions, partner contributions, in-kind contributions, project revenues, and state funds. These figures are not cash-in-hand, but are estimates for non-federal funds and contributions that will be applied to the projects throughout the grant period. Leveraging includes volunteer contributions, donated and discounted labor, discounted materials, donated office or warehouse space, donated vehicle trips, donated management, in-kind local government labor, and in-kind private-sector services and resources. A webinar was offered by NREL to help grantees identify leveraging mechanisms, and this resulted in increased reporting. From 36 months of data collected since the inception of WIPP, leveraging is reported at 19.5% of originally planned goals. Revised goals reduced leveraging by 33% of original goals, resulting in grantees reporting 29% of leveraging over the 36 months of reported data.

Other WIPP grantees needed to completely restructure their leveraging plans to meet revised goals. Danville, Virginia, hoped to leverage landlord contributions in multifamily buildings, but had little success convincing landlords to participate because they calculated the direct benefits and would not see a payback in the near future or within five years. Landlords did not believe the energy upgrades would secure tenants, even though tenants usually vacated after one season of paying astronomical energy bills. Danville also could not finance through a municipal loan program for rental property owners as the city had planned. Danville found 10 single-family landlords to pay 50% of the upgrades.

Vermont Energy Investment Corporation (VEIC) leveraged $200,000 from Efficiency Vermont to purchase HEM systems for their smart grid pilot. This has not been reported to DOE. HHI and PWC had both planned to leverage millions of dollars from volunteer labor, but this was not easily accomplished. HHI hired AmeriCorps volunteers to work daily on units and lead volunteers, but also had full-time staff working in the field. PWC needed to hire more trained staff to shepherd its volunteers. HHI will de-obligate funds, but PWC was able to count 56% of its leveraging from volunteer labor.

4.5 Appendix 5: Energy and Healthy Homes Education

Energy and healthy homes education, along with healthy home treatments delivered alongside weatherization services, proved successful for clients.

- Connecticut and Maryland developed a robust Healthy Homes Checklist coupled with grant-funded partnerships to make whole-house upgrades.
- New York, Pennsylvania, and Vermont piloted HEMs and programmable thermostats with robust client education. In total, the grantees will have installed nearly 2,000 HEMs.
- North Carolina, New Hampshire, Ohio, and Vermont added strong educational components to support the energy efficiency upgrades. Some included three phone interviews with the client to reinforce energy conservation. Some included one-on-one counselling in the home and hands-on demonstration of programmable thermostats.

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Energy savings education advocates have stated behavior can influence energy savings by up to 25%.[1] It should be noted that client education for energy efficiency has long been considered a valuable part of WAP, and it is a program requirement. The WIPP grantees who allocated more resources than usual to client education reported effective results, especially in terms of one-on-one follow-up, energy counseling, and instruction on the use of programmable thermostats.

4.6 Appendix 6: Multifamily Activity

Multifamily activity included offering WIPP-funded incentives that attracted building owners. Setting up the perfect situational factors took more than two years in the cases of New York, Maryland, and Washington, DC. Their efforts required several strategies. First, the pooling of cost-effective upgrades for the multifamily buildings (as opposed to individual SIRs) attracted building owner participation when higher energy savings could be marketed. Secondly, a high rate of vacancy had to exist in order to provide market drivers for landlords and building owners. These items set up a strong platform for talking to building owners about financing the energy upgrades through ESCOs. Maryland and Washington, DC, motivated building owners by studying their needs, building partnerships, and offering an incentive of the WIPP grant to grow interest into thousands of units being weatherized in an urban area.

Some WIPP grantees focused on multifamily buildings for innovation, and others turned to multifamily models after they began program development. Traditionally, WAP has had challenges targeting multifamily buildings, but less so in large urban areas. In most non-urban locations it is usually difficult to find a building with 66% of its residents income-qualified at 200% of the poverty level, a requirement to weatherize an entire building. Table 2 below shows the WAP eligibility income levels for 2011, the year most WIPP grantees began targeting clients. Strategic planning around the WAP-eligible income levels was important in WIPP planning, as these limits are lower than housing assistance eligibility limits. Grantees seeking to blend other funding sources had to balance eligibility with services.

Table 2. 2011 WAP Eligibility Income Levels

Size of Family Unit	200% of the Federal Poverty Rate
1	$21,780
2	$29,420
3	$37,060
4	$44,700
5	$52,340
6	$59,980
7	$67,620

The increased interest in large multifamily units has generated some discussion regarding policy and approach. EERE and WAP have developed a Continuum of Resources for WAP Multifamily (http://www1.eere.energy.gov/wip/solutioncenter/pdfs/bbs2013_somers_weatherization_assistance_program.pdf), which includes standard work specifications and job task analysis for four multifamily weatherization positions.

[1] University of Colorado; Renewable And Sustainable Energy Institute Webinar; Low-income Weatherization, The Human Dimension: http://www1.eere.energy.gov/wip/pdfs/human_dimension_wx_presentation.pdf

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WIPP pilot findings provide insight into the future of WAP multifamily projects in rural and urban settings.

4.6.1 Multifamily and WIPP Policy Waivers

- SAHF and the Local Energy Alliance Program (LEAP) contracted with ESCOs to finance the landlord portion of the weatherization measures, thus collecting the required leveraging. The energy savings and health and safety gains had to be substantial to entice landlords into the ESCO contracts and to engage them in the tasks requiring their time, attention, commitment, and tenant buy-in.
- SAHF developed a protocol to allow utility savings from energy upgrades to be available to the building owner to pay for energy upgrades. To incentivize the building owners, the WIPP grant paid 50% of the energy upgrades on low-income properties where 63% or more of the building tenants were low-income qualified at 200% of the federal poverty rate (the WAP requirement). In HUD-assisted properties, there is a variation on the classic "split incentive" problem wherein the benefits of lower utility costs primarily flow to HUD. SAHF and HUD devised a method to allow the utility savings to stay with the property owner for the duration of the term of the loan, which is used to finance the WIPP upgrades, and after the loan is paid, the savings are passed on to the tenant through lower maintenance and operation charges.
- The WIPP guidelines allowed CEC and CEO to perform work scopes with a package of upgrades hitting the cost-effective mark of an SIR of 1 or greater (rather than individual measures hitting the mark of an SIR of 1 or greater). This greatly enhanced their ability to work with landlords, and increased the number of upgrades. Traditionally, in WAP, each item must have an SIR of 1. DOE approved the package approach for upgrades for WIPP, and this works well for multifamily because many upgrades such as windows or lighting fixtures may not pay back in energy savings on a small scale, but when packaged with a building heating upgrade, all items together are cost effective to an SIR of 1. In order to entice more landlords with ESCOs, WAP may want to consider adopting this WIPP policy for multifamily buildings.
- CEC developed procedures to calculate owner contributions for multifamily buildings owned by for-profit management companies. In New York State, there has been a wide variance in owner contribution requirements (anywhere from 0% to 50% since 2000). This has led to program inconsistency and unrealistic expectations from owners. CEC developed a calculator to extract the portion of monetary savings from weatherization that will benefit the owner over a five-year period (with a buffer for error in projections). CEC requested this owner contribution after the energy audit was conducted. This tool will serve the WAP in future multifamily projects.
- Retrocommissioning, (also known as re-commissioning) multifamily building systems is documented to save 5% to 30%, as footnoted earlier in this report. CEC's analysis found that when buildings failed to meet retrofit projections, it was often due to the inexperience of operators or to technical failures that could be easily mitigated by energy professionals. WAP may want to consider a policy change that would allow first- and second-year retrocommissioning of buildings to become an allowable expense for qualified multifamily buildings. Currently, WAP policy does not allow a return to units

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after the final inspection. A waiver or policy change would be necessary in order for multifamily buildings to benefit from retrocommissioning.

4.6.2 Multifamily Barriers and Challenges

- One barrier in working with multifamily buildings is the building owner belief that energy savings opportunities rank lower than more immediate maintenance and cosmetic priorities. Convincing building owners to add insulation instead of new carpet is challenging without market demand. Another strategy is to target cities that have a "time of lease energy use disclosure ordinance," which motivates building owners to value energy upgrades and assist in the retrofits.
- Landlord participation requires extensive outreach, networking, and collaboration to ensure landlords are aware of the benefits. The City of Danville was unable to convince the multifamily building owner to participate, but when they turned to single-family homes, the outcome was positive and could be used in the future to create a successful platform to launch a large multifamily WAP project.
- Policy should be reviewed and modified before working with affordable housing non-profits, for-profit companies, and HUD. SAHF broke ground by developing a policy agreement with HUD, but it took over two years for production to start.

DOE has contracted with NREL to write multifamily standard work specifications, including developing a professional certification for four multifamily job tasks for energy upgrades:

- Multifamily Energy Auditor
- Multifamily Retrofit Project Manager
- Multifamily Building Operator
- Multifamily Quality Control Inspector.

This groundwork will build a platform of recognition and confidence in the energy upgrade industry. Using this certification and lessons learned from WIPP, opportunities should open to weatherize the large inventory of low-income multifamily units through WAP in the future.

4.6.3 Multifamily Summary

In summary, the WIPP grantees opened doors for multifamily units by inventing ways to work with subsidized housing and ESCOs. They also demonstrated how landlord partnerships are more successful when pooling the energy upgrades to reach a collective SIR of 1 or greater, rather than calculating this value for each individual upgrade. In addition, energy education approaches that came out of WIPP, such as the Healthy Homes Checklist, can be utilized in multifamily units and provide a more robust benefit to the occupants.

WIPP delivered surprising and creative solutions that can be applied to WAP in a post-American Recovery and Reinvestment Act (ARRA) funding environment. If not for the program, thousands of homes would not have received weatherization services. The cost of administering the innovations was high, but the generation of leveraged funding sources proved to be very lucrative. If all grantees complete the revised WIPP production goals for 13,416 units, the unit

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average for the $30 million dollar federal budget will be $2,236, and this includes the cost of DOE administration, technical assistance by NREL, and ORNL evaluation. Considering the average unit cost of a WAP unit is $6,500, the WIPP was a successful program.

The question of field quality for the 13,416 WIPP units has not been addressed in this report, but it should be considered. Will the energy savings of WIPP reflect good field quality? Perhaps this will be revealed in the ORNL WIPP evaluation report when it is published in 2014. Going forward, field quality will be easier to measure when all grantees under WAP are performing to the DOE Home Energy Professional standard work specifications, and if they employ certified workers.

Other questions regarding WIPP that will be answered by the ORNL evaluation report include:

- Will the energy education pilots save energy?
- Will the thousands of units that received HEMs combined with education save the low-income WIPP clients energy the way this strategy has proven to work for other income levels?
- Will multifamily units achieve an SIR of 1 when energy upgrades are bundled, or will the energy savings be static?

4.7 Appendix 7: Production

Production was a challenge across the board for all 14 WIPP grantees. Grantees underestimated the time it would take to obtain the experience and quality to successfully weatherize homes and multifamily housing. Even grantees that contracted with experienced weatherization crews had to overcome barriers such as vendor approval, plan change documentation and approval, and monitoring plan approval. At the start, WIPP grantees planned to weatherize 19,191homes, but had to reduce production by 30%. The revised production numbers are expected to be 13,416, but as of February 2014 the reported number of units was 5,561, or 41% of production was completed. Two of the grantees will report most of their units in the next nine months, but in the end there may still be a large gap between revised production goals and completed units.

4.8 Appendix 8: Grantee Withdrawals

Two WIPP grantees needed to withdraw their pilots.

The Utah Department of Community and Economic Development and the Washington Department of Commerce failed in several different attempts to make their financial plans successful. Each began its WIPP project with optimism that a loan partnership would entice low-income borrowers. Utah planned a multifamily revolving loan fund, subsidized by WIPP and in partnership with a utility. Unfortunately, the state's attorney was unable to grant the loan terms and deemed it ineligible, so Utah requested to de-obligate its grant.

The state of Washington was posed to operate under state offices and partner with western Washington CDFIs and utility companies to establish the Replicable Innovative Sustainable Energy (RISE) Weatherization Pilot. This program intended to establish a loan fund exclusively for low-income weatherization, and create a one-stop shop offering utility rebates, below-market

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loans, a carbon incentive fund, and subsidies for property owners and developers of multifamily buildings for low-income residents. Washington was similar to Utah in that it could neither obtain loan approval, locate a carbon credit buyer, nor get the utility involved enough to leverage funding. A progress report from Washington in October 2011 described a variety of planned leveraging resources, stating: "Once specific client projects are lined up these leveraged funds will be recorded. Currently pledged rebate and incentives are valued at:

- Puget Sound Energy – $510,000.
- Snohomish Public Utility District – $250,000
- Chelan Public Utility District – $65,000
- Enterprise Community Partners – approximately $2 million of non-federal loan funds to combine with DOE WIPP funds."

In the end, Washington was unable to make headway to secure any leveraging, so the state requested to de-obligate its grant. One barrier cited was the inability to pair WIPP funds with WAP funds. Washington also found that the cost-effective SIR eliminated many of the upgrades its partners wanted to collaborate on. Washington also had challenges finding multifamily buildings with willing occupants or building owners.

4.9 Appendix 9: WIPP Challenges

WIPP covered important ground in terms of giving opportunity to non-WAP agencies. Much can be learned from the difficulty in the timely delivery of weatherization services, the reduced unit production numbers, and the inability to meet leveraged funding goals. Many projects presented challenges that will assist the program in any future projects of this nature. Many of these ideas and pilots could be modified and re-planned to bring success, therefore avoiding unnecessary pitfalls and delays. Areas of greatest challenge were:

- Loans for low-income buildings
- Volunteer labor as a basis of leveraged funds
- Job training
- Landlord participation with low SIR returns.

Loans for low-income populations to gain a leveraged funding source, such as those attempted by Utah and Washington, did not succeed, and both grantees de-obligated their grant award. Each had solid plans to offer loans, but the high risk prevented their support structures from allowing them to develop the program. In addition, building owners in Utah were not interested in funding the concept, nor would local attorneys approve such a venture.

Three grantees integrated volunteer labor into their field service delivery. HHI had difficulty using volunteers as their base leveraging source, and training them to perform quality energy upgrades was overwhelming. Their approach sprinkled funding across 16 chapters and 24 affiliates, with intentions to integrate building performance into their national model of building

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and rehabilitation of energy efficient housing. Instead, the added administrative and training necessary to produce 15 to 50 units per affiliate stunted their momentum. HHI realized they needed to train AmeriCorps volunteers to do the bulk of the work, so they subsidized the pilot with volunteer work sessions, which diminished leveraging dollars. A recognized benefit, though, was that the affiliates became informed of building science and the intricacies necessary to embrace whole-house building science.

UNCC began its program working with the local Habitat for Humanity chapter. This was not a successful model due to the training required and the rigorous production schedule. Fortunately, UNCC had a strong monitoring component in its plan (a DOE requirement) and contracted with Advanced Energy to inspect work. This revealed that quality suffered when the work was not performed by trained professionals. Habitat for Humanity has an outstanding training model for building new housing that has been perfected over many years, but this program demonstrated that it will take a great focus to develop a working model that integrates energy retrofits and upgrades into a smooth producing national model. UNCC reported successes working with students who integrated volunteer service of installing low-skilled home energy upgrades into their coursework. They were enthusiastic, hardworking, and willing to return to learn more specialized skills.

PWC in Ohio had in-house and fully trained crews and contractors perform the core field work. Originally, PWC wanted to draw from a pool of 5,000 volunteers, but they quickly realized the model they used for the home rehabilitation and accessibility retrofits would not be transferrable for the highly technical building performance energy upgrades.

Job training with at-risk youth paired with weatherization is an important area worth more attention. YouthBuild, Inc., formed partnerships with many excellent training resources, but the ramping up and training of multiple YouthBuild affiliates was too difficult for the number of homes each affiliate would weatherize. This scenario was identical to the barrier experienced by HHI. Other program challenges include:

- Many of the participating YouthBuild affiliates had little or no field experience, so training was multi-layered and included life skills which were financed from a different source. Field quality suffered, and additional resources were needed to train crews to meet WAP expectations.
- Teaching life skills and other survival mechanisms for at-risk youth takes extra resources and time in addition to teaching the specific skills of weatherization.

Landlord participation for single-family housing as the main leveraged source required a lot of administrative dollars with little return. It was difficult to attract landlords to WIPP projects unless the WAP waiting list was very long. In Danville, Virginia, the WIPP concept was appropriate, and the rental market and had all the right conditions for landlord contributions:

- A very long WAP waiting list
- Blighted housing
- Very high energy bills

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- Landlords unable to rent homes with very high energy costs
- A "time of lease disclosure" ordinance.

With a complete set of energy upgrades, the homes became rentable for more than one heating season. The City of Danville also has a "time of lease disclosure policy" that requires landlords to reveal annual energy costs before the leasing procedures are fully executed. It is not clear why this program had difficulty attracting landlords to pay 50% of the upgrades. Danville had a good outreach plan and even obtained technical assistance from NREL to develop a strategy and printed materials. The City considered lowering the landlord contribution to 30%, but was concerned they would not obtain their leveraging goals. In the end, the 10 landlords who did participate were satisfied and began to speak highly of the program. If Danville had waited for word-of-mouth referrals, they may have had more success.

4.10 Appendix 10: Key Takeaways

To summarize, the following are key takeaways from WIPP efforts:

- Financial leveraging can be expanded by employing ESCOs and partnering with foundations and affordable housing agencies.
- Program changes that may enhance the program include:
    - Allowing multifamily building retrocommissioning
    - Allowing multifamily bundling of cost-effective upgrades to meet the SIR, thus increasing upgrade items and incentivizing building owners
    - Allowing WAP eligibility income limits to match those of affordable housing programs in order to expand into whole-house, healthy homes treatments.
- Volunteers and job training programs require specialized experience and committed resources and should act as a subset to experienced weatherization crews.
- Healthy home, public health, and rehab dollars combined with weatherization can expand client safety and wellbeing for a true whole-house benefit.

4.11 Appendix 11: Production and Budget Proposed by Grantees

Descriptions of the 16 WIPP awards are published on the EERE WIPP website: http://www1.eere.energy.gov/wip/wipp_projects.html. The 16 grantees faced challenges and opportunities expected in the integration of innovation into an existing, longstanding program. As of February 5, 2014, only 5,561 of the projected 13,416 units had been completed. This 41% completion rate reflects some lessons learned and takeaways as well as implementation and innovation challenges that resulted from this program.

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Table 3. Summary of WIPP Budgets, Planned Units, and Negotiated Units

Type of Program	Organization	State(s)	Federal Budget	Units Planned	Units Negotiated
Financing Approaches (Mostly Multifamily)	Washington State Department of Commerce	WA	$3,000,000	2,240	0
	Local Energy Alliance Program (LEAP)	VA	$1,898,938	1,700	796
	Utah Department of Community and Economic Development	UT	$850,000	450	0
	Community Environmental Center Inc.(CEC)	NY	$3,000,000	1,400	1,100
	Stewards of Affordable Housing (SAHF)	DC	$2,590,523	2,500	2,500
	Energy Pioneer Solutions (EPS)	NE	$812,418	250	250
	City of Danville	VA	$1,015,746	300	100
Workforce Development / Volunteer	YouthBuild USA, Inc.	CT, NY, MN, MD, WV, VA	$1,374,020	998	998
	Habitat for Humanity International (HHI)	AL, CA, DC, FL, IA, IL, ME, MI, MN, MS, NC, PA, TN, TX	$3,000,000	1,770	1,000
New Technologies	Vermont Energy Investment Corporation (VEIC)	VT	$719,380	550	116
	Commission on Economic Opportunity (CEO)	PA	$2,449,607	2,500	2,500
	University of North Carolina Charlotte (UNCC)	NC	$2,005,945	800	800
Green and Healthy Homes	The United Illuminating Company	CT	$3,000,000	2,285	2,285
	Coalition to End Childhood Lead Poisoning	MD	$1,287,598	350	210
Other	People Working Cooperatively (PWC)	OH	$1,500,000	673	336
	New Hampshire Community Loan Fund, Inc.	NH	$600,000	425	425
	TOTAL		**$29,104,175**	**19,191**	**13,416**

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4.12 Appendix 12: Utility Participation

The WIPP grantees gained new utility partnerships through the leveraging goals. This is a very valuable resource that can add stabilization to fluctuating funding levels for WAP. Below is a demonstration of how WAP projects currently rely on utility partnerships. According to a report by Economic Opportunity Studies (EOS) in Washington, DC, 40 states leverage rate-based utility programs. State tax revenues contribute to weatherization in six states, and 42 states receive some portion of the federal utility subsidy (LIHEAP/LEAP). In total, $710 million was leveraged in 49 states in 2013, meaning the national WAP budget is but 10.5% of the program funds it manages.

As of September 2013, utility leveraging reports totaled $10.1 million. Table 4 below will be updated upon final reporting after September 30, 2014.

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Table 4. WIPP Utility Leveraging through September 2013

Applicant	Acronym & State	Leveraging Total	Utility Leveraging	Tribal and Local State Govt	Non-profit Leveraging	Production	Per Unit Average	Notes
City of Danville	City of Danville, VI	$27,585	$0	$0	$27,585	10	$4,912	Finished
Coalition to End Childhood Lead Poisoning, Inc.	CECLP, Maryland	$292,536	$0	$0	$292,536	125	$4,740	Foundation Grants, housing grants
Commission on Economic Opportunity	CEO, Pennsylvania	$4,868,793	$4,868,793	$0	$0	2,501	$563	As of 9/3013
Community Environmental Center, Inc.	CEC, New York	$63,935	$0	$63,935	$0	42	$43,273	As of 3/2013?
Vermont Energy Investment Corporation	VEIC, Vermont	$200,000	$200,000	$0	$0	116	HEMs only	Data collection, cleaning and reporting were the primary activities for this quarter,
Energy Pioneer Solutions	EPS, Nebraska	$1,863,135	$242,987	$0	$0	202	$3,288	On-bill financing, systems benefit
Habitat for Humanity International, Inc.	HFHI, Atlanta Based	$1,195,499	$0	$0	$1,195,499	346	$1,800	As of 9/3013
Local Energy Alliance Program Inc	LEAP, Virginia	$970,992	$0	$0	$0	230	$3,680	Building Owner/ESCO
New Hampshire Community Loan Fund, Inc.	NHCLF, New Hampshire	$2,655,740	$758,864	$1,896,876	$0	336	$1,388	State source was RGGI (Regional
People Working Cooperatively, Inc.	PWC, Ohio	$2,218,255	$1,178,675	$645,076	$394,504	324	$4,262	Utility rate payer
Stewards of Affordable Housing for the Future)	SAHF, Washington D.C.	$42,527	$0	$0	$0	0	TBD	Donation and a For Profit.
The United Illuminating Company	UI or CTGHHI, Connecticut	$2,901,358	$2,901,358	$0	$0	868	$2,041	Utility rate payer
The University of North Carolina at Charlotte	UNCC, North Carolina	$649,879	$0	$0	$649,879	74	$15,413	As of 3/2013; NC Housing Finance Agency
YouthBuild USA, Inc.	YouthBuild, Boston Based	$2,270,629	$0	$156,657	$2,067,219	437	$833	Youthbuild Affiliates
TOTAL		**$20,220,863**	**$10,150,677**	**$2,762,544**	**$4,627,222**	**$5,611**	**$7,183**	

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4.13 Appendix 13: Data Conclusions

In summary, the most successful activities in the WIPP pilot were the leveraging ideas and the energy education and healthy homes enrichment. Best practices were not identified as new or innovative. As of February 5, 2014, leveraging for all grantees had only reached 65% of goals, far less than the $90 million that was originally planned by WIPP grantees. Many WAP agencies have already embarked on similar funding trials, but little documentation has been collected. In this sense, much is to be learned through the WIPP pilot, and documentation of what leveraging was attempted and what was successful will be helpful as WAP agencies grapple with funding cuts.

The data reflect that grantees had sufficient support, technical assistance, and access to WAP training facilities to assist them in the delivery of quality weatherization. In addition, they had ample budgets to support them in program planning, training, and ramping up for production.

In 2013, only 10.5% of WAP funds are from DOE.[2] The WAP-funded agencies throughout the country have years of training, equipment, infrastructure, and a documented process to support thousands of low-income families with health and safety checks, furnace replacements, insulation, air sealing, lighting, and other energy upgrades that pay back twice the cost to install. WAP agencies and future WAP providers can examine these pilots for tried methods of leveraging, energy and healthy homes education, volunteer labor, and multifamily building owner partnerships.

[2] Economic Opportunity Studies; Non-Federal Funding for WAP; Meg Power; 11-16-2013

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