

Addressing Multifamily Buildings with a Consistent and Successful Methodology: The DOE WAP Multifamily Suite of Technical Resources

*Jennifer Somers and Josh Olsen, U.S. Department of Energy Weatherization Assistance
David Hepinstall, Association for Energy Affordability*

ABSTRACT

There are currently over 31 million units of multifamily housing across the United States. This represents a huge untapped potential in the residential energy efficiency market. Upgrading these properties presents unique challenges both technologically and logistically. The Department of Energy's Weatherization Assistance Program (WAP) has developed a suite of multifamily resources to help users approach this unique housing stock consistently and successfully. The WAP benefits from the vast technical resource that is contained in the WAP network of people. Trainers, program managers, and technical and field staff provide a constant feedback loop on what's working well in the program and what needs to be improved. The insights provided through this feedback loop have led to the comprehensive multifamily energy upgrade process being implemented by the program. The consistency of the WAP multifamily process helps to address many investor and owner issues related to work quality and savings outcomes. Additionally, the WAP's development of data gathering guidelines, a new multifamily energy audit tool, standard work specifications and multifamily job task analyses is creating a sturdy foundation upon which to build the multifamily retrofit market. These innovative resources, coupled with a consistent approach to completing projects allow the WAP network to provide insight and innovation that can assist the entire retrofit marketplace. This paper will outline the WAP multifamily process, the technical tools and resources that have been developed to support the process and how the WAP model can be adapted to multifamily projects throughout the industry.

Introduction

The U.S Department of Energy's (DOE) Weatherization Assistance Program (WAP or Weatherization) reduces energy costs for low-income families by making their homes more energy efficient while ensuring their health and safety. Weatherization was established in 1976 to assist American families with energy efficiency investments in their homes since so many were directly affected by the 1973 oil crisis. At the beginning of the program, Weatherization focused on air sealing, weather-stripping and caulking to help reduce energy costs. By the 1980s, Weatherization focused on more permanent and cost-effective measures, such as adding insulation and improving the efficiency of heating systems (DOE 2008). Over time, the breadth of installed energy efficiency measures and reach of Weatherization into multiple buildings types expanded dramatically (DOE WAP). The Weatherization Assistance Program is one of the few true whole-house energy upgrade programs in the country, and unequivocally the largest. In addition to single-family homes, WAP also includes manufactured housing and multifamily buildings. Today, seizing the opportunity presented by the American Reinvestment and Recovery Act (Recovery Act), multifamily weatherization represents over 25 percent of national WAP production with nearly 280,000 units weatherized between the years

2010-2013 alone.¹ The shift towards multifamily buildings is based, in part, on the recognition of the burden energy costs place on low-income residents of these properties. This burden is amplified when utility costs are passed from the owner to the tenant in the form of higher rent.

As the WAP expands its focus on multifamily buildings, the challenges particular to this sector are being addressed through technical resources modeled on high-performing programs in the WAP network. These WAP agencies succeed by taking what is a very complex process and breaking it down into manageable pieces. Access to utility data, owner contributions, project financing, diagnostic testing and split incentives contribute to the complexity. The development of a nationally consistent approach based on successful models provides the WAP the opportunity to inform the process for anyone performing a multifamily energy upgrade.

A study of large multifamily buildings weatherized in New York City (NYC) during the 2008 Program Year demonstrates the value of a successful WAP energy upgrade process.² The WAP will save low-income multifamily residents greater than \$30 million over the life of the retrofit.³ Well trained, full-service community action agencies providing comprehensive energy upgrade services ranging from building selection and eligibility assessments, to site visits and energy audits, to the creation of a scope of work, to measure installation and post-retrofit quality control and assurance are the key to these energy cost savings. The quality retrofit process employed in NYC also led to significant energy savings on buildings that heat with natural gas and impressive energy savings for buildings that heat with fuel oil. On the electric side, substantial savings were achieved for electricity used in multifamily units as well as common area electric use.

The demonstrated savings on the multifamily building housing stock are attributable to the comprehensive energy upgrade process developed over time by the Weatherization Assistance Program. The suite of multifamily energy upgrade tools described in this paper have been developed utilizing the expertise contained in the WAP network and the greater home performance industry to provide a benchmark against which to measure quality. The paper will first outline the process and purpose for each of the tools developed. Then a case study describing a successful retrofit project in the Bronx, NY will draw parallels between that process and the available tools. The application of these tools for use in the greater home performance industry beyond WAP is interwoven throughout the discussion.

The WAP Approach to Multifamily Energy Upgrades

Performing energy upgrades on multifamily buildings is complex. During the course of over a quarter-of-a-century, various programs like the Association for Energy Affordability have refined a successful process on which the Weatherization Assistance Program has modeled its resource development. Field staff, energy auditors, quality control inspectors, installers, trainers and management staff throughout the WAP network provided insight over many program years on what has worked well in the program, what should be removed, and where improvements could be made. The resulting “WAP Multifamily Process” takes a building from site selection all the way through to the post-retrofit quality control inspection. The backwards S-Curve below

¹ Weatherization Assistance Program percent of units weatherized, PAGE data pull, March, 2014.

² The Weatherization Assistance Program “Program Year” for the state of New York in 2008 was April 2007 – April 2008. WAP Grantees undergo a state plan approval process that includes indicating the official start date for their program in any given fiscal year.

³ National WAP Impact Evaluation: Energy Impacts for Large Multifamily Homes - to be released Q4 2014.

provides a figurative representation of the comprehensive WAP process from “Intake & Analysis” to “Work & Follow-Up”. WAP has used the backwards S-Curve concept to guide the development of resources to assist organizations in approaching each component of the retrofit process in a consistent and logical manner.



Figure 1. The Weatherization Assistance Program multifamily energy upgrade process.

For the Weatherization Assistance Program, the energy upgrade process begins at building selection and verification that the building is income eligible to receive weatherization services. As detailed in the backwards S-Curve figure, once an energy audit and extensive testing have been performed on a building, a cost-effective scope of work is determined in collaboration with the building owner, and the energy efficiency measures are installed matched to the upgrade opportunities and needs of each building. Construction oversight and quality control inspections are carried out to ensure quality installation. Post-construction monitoring and tracking is recommended for at least one year to ensure measures and any systems upgrades are performing as intended. However, since Weatherization funding stops after the post-retrofit inspection and sign off has occurred, on-going monitoring is not something that can be directly funded by WAP. The backwards S-Curve figure demonstrates multifamily energy upgrades as consecutive steps. In practice, although completion of steps is sequential, several process components may occur simultaneously and may involve circling back to previous steps with a more iterative process.

The Weatherization Assistance Program operates in all 3,056 counties across the United States. There is great diversity in the multifamily housing stock touched by the program. The WAP defines a multifamily dwelling as one that contains 5 or more units. Nationally, 70 – 80 percent of all multifamily properties are in low-rise, small buildings (RECS 2009). The dearth of tools that address this particular housing stock led WAP to focus on this area for technical

resource development. High-rise multifamily buildings are concentrated in the Northeast; however, they still comprise 10 – 15 percent of the multifamily stock in the South, Midwest and East (RECS 2009). It is with the diversity of the housing stock in mind, as well as the creation of a skill ladder for the workers who work on them, that DOE developed a cadre of multifamily resources.

The Standard Work Specifications for Multifamily Energy Upgrades

The Standard Work Specifications for Multifamily Energy Upgrades (SWS) were the first enterprise undertaken by the WAP to standardize the program's work in multifamily buildings. The development of the SWS was initiated in response to a need voiced from WAP network (DOE 2009) all the way to the White House (CEQ 2009) for a way to ensure that retrofit measures are installed correctly and perform as intended. The goal of the SWS is to provide confidence that investments made in energy efficiency upgrades – whether from the federal government, a utility, a state-run multifamily performance program or a building or large portfolio owner – deliver their intended savings and performance. The SWS provide a detailed and comprehensive catalog of energy efficiency upgrade measures containing the minimum technical specifications required for those measures to achieve their intended outcomes. They define the “minimum” requirements for ensuring that an energy conservation measure (ECM) is effective, durable and safe. They do this without being prescriptive. The SWS do not specify which measures to install, they simply provide the minimum requirements for a successful installation of individual measures. It is up to the crew and the program to decide what works best for their needs and resources. What is important are the outcomes – the installed measure needs to function as intended to provide energy savings. The SWS define those outcomes and provided the necessary components to achieving them.

The SWS synthesize more than thirty years of building science expertise from the weatherization and greater home performance industry. They combine original content and relevant codes and standards to identify desired outcomes of upgrade measures. The project engaged more than 400 subject matter experts including weatherization professionals, industry technical leaders, health and safety experts, labor, federal partner agencies, and other highly qualified individuals to develop the SWS. During the formal federal comment process, more than 2,000 public comments regarding the SWS were reviewed and addressed. The end result is a nationally vetted resource that can be used and catered to any multifamily building need.

SWS online tool. To facilitate use of the large SWS database, DOE commissioned the creation of a customizable online tool that permits organizations to cater the content of the SWS to suit their particular need. The online tool is available at <https://sws.nrel.gov> and includes a well-organized database along with useful functions that allow the SWS to be immediately incorporated into daily use. The SWS tool has the functionality to create customized collections of measures for a specific program, agency or jobsite. Those measures can be exported in various formats to create work orders, quality control checklists or contract documents. The tool also has the functionality to create illustrated field guides for contractors on the job. The online tool is a resource that was developed to help make achieving quality work easier for the weatherization and home performance industries. The content is searchable, interactive, and is accessible to third party organization through an Application Programming Interface (API) which allows the functionality of the tool to be housed on other websites or applications.

Home | About | Help | [My Account](#) | [Sign In](#)

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Standard Work Specifications Tool

Search All Topics

Health & Safety
Air Sealing
Insulation
Heating & Cooling
Ventilation
Baseload

- 1. Using the Standard Work Specifications
- 2. Health & Safety
 - 2.01: Safe Work Practices
 - 2.02: Combustion Safety
 - 2.03: Safety Devices
 - 2.04: Moisture
 - 2.05: Radon
 - 2.06: Electrical
 - 2.07: Occupant Education & Access
 - [Basements & Crawl Spaces](#)
 - [Installed Equipment](#)
 - [Insulation](#)
- 3. Air Sealing
- 4. Insulation
- 5. Heating & Cooling
- 6. Ventilation

2.0702.4 Building Operations Staff Education—Mid and High Rise

Topic: Occupant Education and Access

Subtopic: Installed Equipment

Desired Outcome: Building operations staff understands their role and responsibility in the safe, effective, and efficient operation of the equipment

For supporting material, see [Referenced Standards](#).

Multifamily Homes

Select All

TITLE	SPECIFICATION(S)	OBJECTIVE(S)
<input type="checkbox"/> 2.0702.4a Systems operation, maintenance, and sustainability	Operation of the equipment maintenance will be explained to the building operations staff (e.g., design conditions, efficiency measures, differences from previous system or situation) Operation and maintenance manual will be provided and updated to building operations	Ensure building operations staff has an understanding of the equipment's capability Provide long-term resource for maintenance reference

Figure 2. The SWS online tool has simple navigation bars organized around sections and topics. There is a favorites feature that allows a user to create a customized package of details that can be used for a particular building, training or inspection checklist.

Through the WAP Quality Work Plan and Weatherization Program Notice 14–4, the tools and resources developed under the Guidelines for Home Energy Professionals are being integrated into the daily operations of the program.⁴ The WAP is using the online tool to help facilitate the integration of the Standard Work Specifications into program operations by using it to create monitoring and quality control checklists as well as to help communicate the technical requirements and specifications to subcontractors against which the work will be inspected. For the market rate industry, Austin Energy, for example is currently utilizing the tool for its Multifamily Rebate Program. Jaime Gomez, Austin Energy Multifamily Coordinator has said, “The fact that there is an online resource that includes very detailed work specifications, and to

⁴ http://www.waptac.org/data/files/Website_docs/Government/Guidance/2014/WPN-14-4.pdf

be able to just click and choose whichever ones we want to use and then include them in our handbook, is just phenomenal for us. This cut our workload considerably – maybe by more than half (NREL 2014).”

Multifamily Tool for Energy Audits (MulTEA)

The installation of quality measures is predicated on the assumption that an energy auditor has evaluated a building and developed a comprehensive scope of work. A multifamily building energy audit is a necessary part of the overall work flow for performing an energy upgrade and weatherizing the building. To assist the Weatherization Assistance Program network, DOE has supported development of two open source energy audit tools for several years as part of the Weatherization Assistant suite of energy audit tools managed by Oak Ridge National Laboratory (ORNL). These have included the National Energy Audit Tool (NEAT) for single-family homes and the Manufactured Housing Energy Audit tool (MHEA) for mobile homes.⁵ Because of the increase in focus on multifamily buildings and responding to the need for enhanced audit functionality from the field, the WAP commissioned ORNL and Lawrence Berkeley National Laboratory to develop the Multifamily Tool for Energy Audits (MulTEA) for inclusion in the Weatherization Assistant suite. Roundtable discussions with both energy audit methods experts as well as energy auditors produced a long list of desired functionality for multifamily building energy audits to be built into MulTEA (Malhotra et al 2012). Improvements in the software tool range from better modeling of domestic hot water to modeling buildings with multiple heating and cooling distribution systems found in multifamily properties.

In addition to the improvements in modeling, the MulTEA tool has been designed to incorporate many of the tools of the trade that an experienced energy auditor possesses. Multifamily energy auditing can be as much art as science when auditors are forced to be creative in addressing certain measures. Many measures are not easily modeled using existing energy simulation methods. Over the years, auditors have developed rules-based methods for calculating energy savings that are standard formulas or calculations developed and verified through testing in the field. For example, if a building has multiple heating systems, practitioners currently need to coerce the energy audit into analyzing the building as if there were only one system in order to obtain results. These types of expert rules-based methods are incorporated into MulTEA, and it provides extended simulation capabilities to handle multiple heating or cooling systems. The tool itself will be initially released for use on smaller, low-rise buildings with less complex heating and cooling systems that make up the vast majority of the multifamily housing stock. The release date for Version 1.0 is summer, 2014. WAP grantees may elect to use MulTEA in accordance with regulatory requirements or may choose to use an existing proprietary tool which has the option of licensing the API back-end calculation engine.^{6,7} Additional functionality for higher rise buildings with central HVAC systems and combined central and hot water systems will be added in subsequent MulTEA versions. A major innovation planned for the tool is to allow the building model to be calibrated using the historical weather data that prevailed during the utility billing period. The actual weather year data will be

⁵ <http://weatherization.ornl.gov/assistant.shtml> for more information about the Weatherization Assistant Suite.

⁶ 10 CFR 440.21, Energy Audit Procedures and Weatherization Material Standards.

⁷ HESaver API Licensing available at <https://developers.buildingsapi.lbl.gov/>

used in the true-up of the building energy simulations, which will eliminate the need to perform weather normalization of utility bills to compare them to the model results.

MulTEA will produce a recommended list of weatherization measures for a multifamily project based on a savings-to-investment ratio (SIR). Since an audit is not complete until a scope of work is developed, the goal is to ensure that energy efficiency measures are installed that meet Program cost-effective criteria and are installed in rank order of their SIR. The SIR is calculated using life-cycle costing of the installed retrofit measures. From the final scope of work, the project will move into the actual installation of energy efficiency measures.

Technical Guidelines for Multifamily Building Energy Audits

There is currently no single universally accepted multifamily energy audit standard. Through ORNL and their contractor SRA, the Weatherization Assistance Program is developing technical guidelines to help ensure uniformity in energy audit methods and more accurate predictions of energy and cost savings. The WAP had a need to fill both a technical and a programmatic gap that existed in some states within this national program by formulating a systematic approach to gathering and analyzing data in complex and varied properties throughout the country.

The development of a systematic approach to gathering data in multifamily buildings is something that has not yet become standard practice in the industry. The importance of having a consistent methodology cannot be understated as solid, consistent data is the basis for evaluating building performance, investment and program effectiveness. The success of an energy audit and energy upgrade hinges on effective data gathering and accurate building site assessments. This includes analyzing the history of the building, its construction and maintenance, its systems design, its energy use, and how the building operates as a system of interrelated parts. Specific tasks include preparing for a site visit, assessing the site, computer modeling, and conducting an energy audit and a post-weatherization site visit analysis. All of these activities taken together ensure that the scope of work and list of comprehensive energy upgrade and health and safety measures are meeting the particular needs of the building and its occupants.

The Technical Guidelines for Multifamily Building Energy Audits, slated for release in the third quarter of 2014, will provide both procedural and technical guidance on how to perform an energy audit (MacDonald et. al. 2014). The goal of the guidelines is to assist the energy auditor by establishing the components of a comprehensive energy audit process. The objective is to lead to consistency in how the data is collected and analyzed. The Technical Guidelines are intended to be a resource for a wide variety of audiences ranging from energy auditors, program administrators, trainers to incorporate into curricula, and anyone working on the development of audit methods for multifamily buildings.

Multifamily Job Task Analyses

Multifamily buildings are challenging to classify. They can exist in an undefined space between single family residential and commercial. Any multi-unit residential building may have more in common with a single-family house or a commercial building, or a combination of the two. As a result, a long list of technical issues about working on multifamily buildings has developed along with sometimes ad hoc policies and procedures that have created confusion as to what skills and knowledge are required of multifamily professionals. An energy auditor

working in the Northeast or Midwest will, for example, be largely dealing with complex heating systems, whereas an auditor working in the West or the South may more typically perform audits on less complex systems. The challenge in developing workforce resources for multifamily workers lies in creating tools that are flexible enough to allow workers across the spectrum of building types and climate regions to find value in a national product.

In 2013, the Weatherization Assistance Program worked with NREL and multifamily subject matter experts from around the country to create multifamily specific Job Task Analyses or JTAs. A needs assessment revealed existing commercial JTAs were not sufficient for the four multifamily worker categories (Dirr et al NREL 2013). The JTAs were developed for the following multifamily job classifications: Retrofit Project Manager, Energy Auditor, Building Operator, and Quality Control Inspector. JTAs are developed through the DACUM (Develop a Curriculum) process – an occupational analysis method that is used as a basis for a variety of features of training and education as well as certification programs. The WAP commissioned the development of the multifamily JTAs with the intent to help define multifamily buildings as their own building type and give structure to the expectations of the professionals who work on them. The Job Task Analyses for multifamily buildings will facilitate a growing, skilled workforce for multifamily energy upgrades that is able to meet the increasing demand for energy upgrade work while maintaining quality assurance for homeowners and employers.

In early 2014, The Interstate Renewable Energy Council (IREC) accepted each of the four Multifamily Job Task Analyses as resources to assess training and accredit training providers. DOE WAP commissioned IREC to accredit training programs using the single-family JTAs and they have been doing so since May 2011. IREC's Institute for Sustainable Power Standard is an internationally recognized standard for accreditation of renewable energy and energy efficiency training programs. The IREC ISPQ International Standard 01022: 2011 specifies requirements for competency, quality systems, resources, and qualification of curriculum against which trainers and training programs can be evaluated.⁸ DOE recognizes IREC's accreditation of training programs as a way to ensure that the program is meeting a benchmark for quality and supporting the development of a quality workforce. The WAP is requiring accredited training for the program through the WAP Quality Work Plan. For program managers and professionals seeking training, the accreditation process provides validation of a training program's ability to provide students with effective training, specific to an individual JTA.

The JTA can be used for a variety of purposes, but one of the most salient and useful is a credential that verifies that a worker is capable of performing a specific job. The WAP decided to create certification schemes for two out of the four multifamily specific JTAs – Multifamily Quality Control Inspector (a primary and immediate need for the WAP) and Multifamily Retrofit Project Manager. These two were chosen based on a lack of other JTAs in the industry to address these professional workers. The DOE's commercial JTAs may have some overlap in the auditor and building operator space. Future development of certification schemes for these jobs will happen in coordination with the commercial effort.

Association for Energy Affordability Multifamily Case Study

The Association for Energy Affordability (AEA) has provided training, program design, and implementation services for Weatherization, utility and NYSERDA-funded energy-

⁸ www.irecusa.org

efficiency programs – including serving as both a technical services provider and direct services subgrantee for the Weatherization Assistance Program in New York State. AEA has been involved in a number of research and development projects. AEA serves residential and commercial properties, but specializes in delivering energy efficiency to multifamily properties, including affordable housing.⁹ In May of 2010, AEA began a project that showcases how the tools developed under the Guidelines for Home Energy Professionals project can serve a vital role in the multifamily retrofit process.

Overview. In May 2010 the head of Bronx Borough President's Planning Office invited AEA, the Con Edison Gas, and New York City Housing Preservation & Development (HPD) officials, to plan a pilot project to bring attention to the large environmental problem of the high concentration of Heavy #6 Oil multifamily buildings in the Bronx. AEA was asked to play the role of technical consultant to the pilot project to assist the multifamily building candidates. Like many multifamily projects this endeavor had a variety funding options including:

- An HPD 8-A loan application had been submitted by the building to HPD
- Loan proceeds from HPD could support Bronx BP's environmental goals by initiating a #6 oil change out pilot project which would be an approved use
- Con Edison's oil to gas conversion program had begun to ramp up and might share some costs and provide incentives supporting project completion
- Immediate savings from reduced price of gas vs oil would support viability of upgrades
- Potential WAP project if eligible measure opportunities existed

Assessing project viability. From the outset, multifamily projects require project managers that are able to track the entire process from funding to final inspection. All funding scenarios come with unique requirements and a professional is needed to sort through and assess the viability of the various options. The Home Energy Professional Multifamily Project Manager job task analysis focuses on the skills required of an individual engaged in implementing projects such as this.

Once the funding mechanisms were identified, the next stage in the project was to assess and select an appropriate building from the available properties that would match retrofit opportunities with funding options. After reviewing all alternative projects, a 6 story, 44-unit low-income cooperative (co-op) was selected by all parties as the Bronx pilot conversion project. The property at 530 East 159th St (530 East) had the appropriate opportunity for improvement that matched with available funding to make it an ideal candidate for this pilot program. The experience and knowledge required to match opportunity to funding is a vital component of initiating multifamily projects. These skills and abilities are outlined in the MF Project Manager JTA.

Building performance assessment. Once the property had been selected, the next step in the process was to perform the building assessment. The process of assessing a building requires the interaction of a number of professionals including qualified energy auditors, building owners and building maintenance staff. Understanding the appropriate timing and engagement of these parties is the responsibility of the Project Manager and the complexity of this task points again to the importance of having a job task analysis specific to this role. In the case of the 530 East

⁹ <http://aea.us.org>

project this assessment included, among other things, historical site data, utility analysis, discussion of owner priorities, income verification of tenants and the collection of “pre-audit data.”

Energy audit/field site assessment. Once the basic building assessment has established the viability of the project, the full energy audit verifies which measures are eligible for installation. This process requires an individual with a highly technical skill set specific to multifamily buildings. The Home Energy Professional Multifamily Energy Auditor job task analysis was developed specifically for the professionals working on projects like 530 East. Following the approach outlined and codified in the Technical Guidelines, and using a DOE approved audit tool that incorporates SIR requirements, including capacity to run measures savings calculations with interactivity among the measures, an AEA energy analyst (who was one of the subject matter experts that participated in Technical Guidelines development and review meetings convened by ORNL) carried out the energy analysis and modeling, as well as developed the proposed scope of work and completed the audit report for review and transmittal to the owner. Once the audit was complete, the scope of work was developed in accordance with WAP rules. The proposed Scope of Work incorporates estimated costs and savings for each measure, identifies Savings to Investment Ratios (SIRs) of each measure, and lists measures in rank order from the highest to the lowest (with interactivity in savings calculations).

Owner agreement. The steps outlined above are all precursors to getting the building owner to agree to undertake the project. The project manager must be experienced enough to identify the owner’s concerns and present a compelling case for the benefits of the project. There are many barriers to an owner agreeing to move forward including a lack of understanding of the various program rules and options for installing measures that do not meet cost-effectiveness guidelines. It is up to the project manager to weave together the various strands of funding, savings opportunities and owner priorities into a package that is compelling. For 530 East, in moving through the “snake” of the multifamily WAP production process, educating the Board Chair about the potential for reduced operating costs in the low-income co-op was key since the residents are the owners (and her neighbors). By including a burner upgrade and other cost-effective WAP measures into this project, these savings can be monetized and seen as a source of funds paying back for the cost of the project. These savings would bring lasting benefit to the building.

Developing work specifications. Once the project has been signed off on by the building owner, specifications for installation of the selected measures must be developed. The Standard Work Specifications for Multifamily Energy Upgrades were developed to provide a national baseline for installation standards. The standards must be prescriptive enough to ensure that high quality work is defined for the contractors, but also leave room for flexibility in implementation. AEA has the “in house” expertise to write specifications for various components of the project and AEA served as the market lead in the development of the SWS for Multifamily. The SWS tool allows skilled users to develop a work order, generate a quality control checklist and specify the outcomes required of each measure to be installed.

Subcontractor selection and construction monitoring. Once work specifications have been developed, it is the project manager’s responsibility to select appropriate contractors and to

monitor the progress of the construction. In this project, WAP work started in April 2011 and AEA field technicians and three separate contractors were monitored from project start through measure completion and sign-off. The WAP crew completed measures in the apartments, insulated heating and DHW pipes and installed weather-strips on outside doors. All WAP work was completed on the last day of June. The AEA Project Manager stayed involved overseeing the project through to completion consistent with the Multifamily Project Manager JTA.

Summary of completed project. The 530 East Project was a resounding success due to the professionalism of the AEA staff and the deliberate process that was followed. The resources developed under the Guidelines for Home Energy Professionals project are intended to help all organizations achieve similar results by defining and documenting the tools that AEA and other successful organizations use.

In March 2014 the building received three awards from the Con Edison Multifamily Energy Efficiency Program for 2013 including:

- Building with the Highest Gas Savings
- Building with the Highest Common Area Electric & Gas Savings
- Co-op or Condo of the Year, with the Highest Total Electric & Gas Savings

The direct bill impact of the savings was so large that no “study” was needed to lead to the excitement and pride shown by the Board Chair in talking about the project’s successful impact on monthly costs of building operations.

Key lessons from the 503 East Project. The total project included weatherization as the driving factor, led by an experienced weatherization director as the “Multifamily Retrofit Project Manager.” Critical components of each of the new DOE NREL multifamily JTAs, the Technical Guidelines for Multifamily Building Energy Audits and SWS are all in alignment with the best practices displayed on the project. The success of the 503 East and similar AEA projects supports the need to have the DOE supported multifamily resources used as the basis for training and credentialing individuals who work in the multifamily retrofit industry as well as the basis for consistent evaluation and quality control.

WAP: Laying the Foundation for the Wider Multifamily Industry

The DOE WAP led the Guidelines for Home Energy Professionals project to help create uniformity in how energy efficiency upgrades are performed and to have an apples to apples comparison of the work. WAP’s investment in the quality of the work, workforce, tools, resources and service delivery mechanisms has built the capacity to deliver effective multifamily energy efficiency retrofit projects. For the Weatherization Assistance Program, multifamily weatherization has presented unique opportunities to leverage owner, utility, and other multifamily program dollars to maximize the impact of weatherization work.

DOE is actively working with federal partners at the Department of Housing and Urban Development (HUD) and the U.S. Department of Agriculture (USDA) to integrate the tools and resources developed by WAP into their programs. WAP, in turn, has analyzed existing HUD processes such as the use of Green Physical Needs Assessments (PNA) to help streamline activities where both HUD and DOE dollars unite on the same project. Similarly, given the

investment DOE made in training and technical assistance during the course of the Recovery Act to help build the capacity and skills of the multifamily energy upgrade crews performing the work on the buildings, there has been the inception of federal efforts to utilize trained WAP workers on buildings that do not have WAP dollars. In direct response to the President's Climate Action Plan, DOE and HUD expanded the Better Buildings Challenge to include multifamily partners. The Better Buildings partnership has created opportunities for HUD and DOE WAP to focus on the affordable and public housing sectors in particular, and bring the collective federal resources to bear for these sectors.

The Weatherization Assistance Program developed the suite of multifamily energy upgrade tools to fill resource gaps and to ensure that retrofits meet quality standards. The processes, tools and resources were developed to help protect the energy upgrade investment being made in multifamily buildings while ensuring a decrease in the overall energy burden to building owners and occupants. Using a nationally consistent approach based on successful implemented models affords the entire WAP network the opportunity to provide insights and innovation that will benefit the multifamily energy upgrade process for the wider industry.

References

Council on Environmental Quality. 2009. *Recovery through Retrofit*. Washington D.C.: White House Council on Environmental Quality and the Vice President's Middle Class Task Force.

Department of Energy. 2008. *Weatherization Assistance Program Briefing Book*. Washington, DC: DOE.

Department of Energy. 2009. *Weatherization Assistance Program National Weatherization Training and Technical Assistance Plan*. Washington D.C.: U.S. Department of Energy Office of Weatherization and Intergovernmental Program.

Dirr, N., Hepinstall, D., Douglas, M., Buck, S., and Larney, C. 2013. *Guidelines for Home Energy Professionals Project: Multifamily Job Task Analysis Needs Assessment*. Golden, CO: NREL.

Department of Energy, Weatherization Assistance Program. Washington, DC: DOE.

Energy Information Administration. 2009. *Residential Energy Consumption Survey*. Washington, DC: EIA.

MacDonald, M., Ternes, M., and Malhotra, M. 2014. *Technical Guidelines for Multifamily Building Energy Audits*. Oak Ridge, TN: ORNL.

Malhotra, M., MacDonald, M., Accawi, G., New, J., and Im, P. 2012. *National Energy Audit Tool for Multifamily Buildings – Development Plan*. Oak Ridge, TN: ORNL.

National Renewable Energy Laboratory. 2014. *Guidelines for Home Energy Professionals Project Fact Sheet*. Golden, CO: NREL.