

# U.S. Territories and Weatherization Assistance Program During the Recovery Act Period



Bruce Tonn  
Erin Rose

**March 2015**

## DOCUMENT AVAILABILITY

Reports produced after January 1, 1996, are generally available free via US Department of Energy (DOE) SciTech Connect.

**Website** <http://www.osti.gov/scitech/>

Reports produced before January 1, 1996, may be purchased by members of the public from the following source:

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
**Telephone** 703-605-6000 (1-800-553-6847)  
**TDD** 703-487-4639  
**Fax** 703-605-6900  
**E-mail** [info@ntis.gov](mailto:info@ntis.gov)  
**Website** <http://www.ntis.gov/help/ordermethods.aspx>

Reports are available to DOE employees, DOE contractors, Energy Technology Data Exchange representatives, and International Nuclear Information System representatives from the following source:

Office of Scientific and Technical Information  
PO Box 62  
Oak Ridge, TN 37831  
**Telephone** 865-576-8401  
**Fax** 865-576-5728  
**E-mail** [reports@osti.gov](mailto:reports@osti.gov)  
**Website** <http://www.osti.gov/contact.html>

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Environmental Sciences Division

**U.S. TERRITORIES AND WEATHERIZATION ASSISTANCE PROGRAM  
DURING THE RECOVERY ACT PERIOD**

Bruce Tonn, ORNL  
Erin Rose, ORNL

March 2015

Prepared by  
OAK RIDGE NATIONAL LABORATORY  
Oak Ridge, Tennessee 37831-6283  
managed by  
UT-BATTELLE, LLC  
for the  
US DEPARTMENT OF ENERGY  
under contract DE-AC05-00OR22725



## CONTENTS

	Page
LIST OF FIGURES .....	v
LIST OF TABLES .....	vii
ACRONYMS AND ABBREVIATIONS .....	ix
ACKNOWLEDGEMENTS .....	xi
EXECUTIVE SUMMARY .....	xiii
1. INTRODUCTION .....	1
2. OVERVIEW OF WEATHERIZATION AND U.S. TERRITORIES DURING THE RECOVERY ACT PERIOD .....	3
3. PUERTO RICO CASE STUDY .....	5
3.1 INTRODUCTION .....	5
3.2 PROGRAM OVERVIEW .....	5
3.3 PHILOSOPHY AND APPROACH .....	8
3.4 SURVEY AND ENERGY SAVINGS RESULTS .....	15
3.5 LOOKING TO THE FUTURE POST-ARRA .....	24
4. CONCLUSIONS .....	25
APPENDIX A: SNAPSHOTS -- NINE WEATHERIZED HOMES IN PUERTO RICO .....	A-3
APPENDIX B.1: NATIONAL WEATHERIZATION ASSISTANCE PROGRAM EVALUATION TERRITORIES OCCUPANT SURVEY .....	B-3
APPENDIX B.2: NATIONAL WEATHERIZATION ASSISTANCE PROGRAM EVALUATION TERRITORIES CUSTOMER SATISFACTION SURVEY .....	B-31



## LIST OF FIGURES

Figure	Page
Fig. 3.1. Puerto Rico’s Weatherization Assistance Program Organizational Structure (under AFI).....	6
Fig. A.1. Ponce Region Unit 1 .....	A-3
Fig. A.2. AC unit.....	A-3
Fig. A.3. Solar Water Heater.....	A-3
Fig. A.4. New refrigerator.....	A-4
Fig. A.5. Ponce Region Unit 2.....	A-4
Fig. A.6. Chandelier CFLs.....	A-5
Fig. A.7. Roof Solar HW .....	A-5
Fig. A.8. Louvered Windows.....	A-5
Fig. A.9. Ponce Region Unit 3.....	A-5
Fig. A.10. Homeschool room.....	A-5
Fig. A.11. Window A/C Unit.....	A-6
Fig. A.12. Wall AC Unit.....	A-6
Fig. A.13. Ponce Region Unit 4.....	A-6
Fig. A.14. Wall AC unit.....	A-6
Fig. A.15. Solar water heaters.....	A-6
Fig. A.16. Program Staff.....	A-6
Fig. A.17. Ponce Region Unit 5.....	A-7
Fig. A.18. Roof Solar HW Heater.....	A-7
Fig. A.19. Southwestern Region Unit 6.....	A-7
Fig. A.20. Miami Windows .....	A-8
Fig. A.21. Clothes line-dried.....	A-8
Fig. A.22. S.W. Region Unit 7.....	A-8
Fig. A.23. Solar HW Heater.....	A-8
Fig. A.24. Utility Meter .....	A-8
Fig. A.25. Southwestern Region Unit 8.....	A-9
Fig. A.26. Puerto Rico Housing Development .....	A-9
Fig. A.27. Southwestern housing development with several rooftop solar HW heaters.....	A-9





## LIST OF TABLES

Table	Page
Table 2.1 U.S. Territories: ARRA Period Weatherization Funding and Units Produced.....	4
Table 3.1 Estimated Electricity Use Pre- and Post-Weatherization and Savings .....	19
Table 3.2 Household Energy-Related Behaviors Pre- and Post-Weatherization (N=141) .....	21
Table 3.3 Client Satisfaction with Weatherization Services Provided.....	22
Table 3.4 Client Perceptions of User-Friendliness of Weatherization Program .....	22
Table 3.5 Client Satisfaction with Solar Water Heaters .....	23



## ACRONYMS AND ABBREVIATIONS

AAE	Energy Affairs Administration
AFI	Infrastructure Financing Authority
ARRA	American Recovery and Reinvestment Act
CAA	Community Action Agency
CDD	Cooling Degree Day
CFL	Compact Fluorescent Light
CFR	Code of Federal Regulation
DOE	Department of Energy
EISA	Energy Independence and Security Act
HDD	Heating Degree Days
kWh	Kilowatt per hour
NEAT	National Energy Audit Tool
NTEL	National Energy Technology Laboratory
ORNL	Oak Ridge National Laboratory
OWIP	Office of Weatherization and Intergovernmental Programs
PAGE	Performance and Accountability for Grants in Energy
PREAT	Puerto Rico Energy Audit Tool
PREPA	Puerto Rico Electric Power Authority
PY	Program Year
RFP	Request for Proposal
SIR	Savings-to-Investment Ratio
SMS	Simonson Management Services
SWH	Solar Water Heating
US	United States
WAP	Weatherization Assistance Program



## **ACKNOWLEDGEMENTS**

The work presented in this report was funded by the U.S. Department of Energy's (DOE) Office of Weatherization and Intergovernmental Programs (OWIP). We wish to thank the staff of Puerto Rico's weatherization program for hosting our visit. We also wish to thank Puerto Rico and the other territories for completing the program information survey. Lastly, we wish to thank APPRISE Inc. and the Energy Center of Wisconsin for administering the surveys and collecting and analyzing the electricity bills.



## EXECUTIVE SUMMARY

This report provides an assessment of the expansion of the U.S. Department of Energy's (DOE) Weatherization Assistance Program (WAP) to U.S. territories specifically for Program Year (PY) 2010 and more generally with respect to the American Recovery and Reinvestment Act (ARRA) period. Briefly, WAP provides grants, guidance, and other support to Grantees: weatherization programs administered by each of the 50 states, the District of Columbia, territories and several Native American tribes. The Grantees, in turn, oversee a network of 900+ local weatherization agencies (Subgrantees): community action agencies, nonprofit organizations, and local government agencies that are eligible to receive weatherization funding from DOE. These weatherization agencies qualify eligible households, assess their homes' energy efficiency opportunities, install energy-saving measures, and inspect the work. The work performed includes air sealing, insulation upgrades, furnace replacements, and other dwelling-specific measures found to be cost-effective, as well as home improvements needed to ensure the health and safety of household occupants. The work is done at no cost to the eligible participants. This general model was transferred to the U.S. territories.

In April 2009, the U.S. Congress passed ARRA (also referred to herein as the Recovery Act). Included in the hundreds of billions of dollars of programs, initiatives, and investments was \$5 billion for WAP. The national weatherization network was given approximately three years to spend these funds. Annually, this funding represents about six times more per year than Congress had been typically appropriating for WAP. The huge increase in funding was based on the assumption that weatherization was a 'shovel ready' program, capable of quickly ramping up production and, most importantly, employing significant numbers of individuals to weatherize low-income homes.

Five U.S. territories benefitted from the ARRA period funding for WAP: Commonwealth of Puerto Rico, Guam, the U.S. Virgin Islands, the Commonwealth of the Northern Mariana Islands, and American Samoa. Puerto Rico received just over \$65 million in funding and weatherized over 15,000 units. The other four received between \$1 and \$2 million in funding and weatherized an average of 590 units.

Most of the research reported on in this report focuses on Puerto Rico's newly developed weatherization program. It is found that the recipients of the program are similar to those served by WAP in the U.S.; elderly individuals, persons with disabilities, and children. The homes in the Puerto Rico program averaged three bedrooms and three other rooms, comparable to WAP homes elsewhere. However, other ways the homes serviced by the Puerto Rico program varied from the national WAP homes. Unlike homes found in the cold regions of the U.S., few if any homes weatherized in Puerto Rico had heating systems, central air conditioning or thermostats. Because of the tropical climate, installing heating equipment, air sealing measures or insulation was not allowable per DOE approved priority lists. Instead, the preponderance of homes received rooftop solar water heaters, refrigerators, air conditioners, low-flow faucets, and various electric base-load measures. Expenditures on health & safety measures were low (only a percent or two, except for Guam, which spent about 12% on health and safety measures per unit) compared to the mainland programs (which averaged 15%).

Electricity billing histories were collected for over 14,000 weatherized units pre- and post-weatherization. Overall, the average electricity savings was 876 kWh (Kilowatts per hour) per year, or 15% of pre-weatherization electricity use. This is considered a conservative estimate of energy saved by the program because energy savings that could be attributed from replacing propane fueled water heaters with rooftop solar water heaters were not measured. It is suggested that the program's savings-to-investment ratio (SIR) is in the vicinity of 1.34. These results are comparable to energy savings and cost effectiveness of the established weatherization programs found in the rest of the U.S.

Through a client satisfaction survey, it was found that the overwhelming majority of respondents were satisfied or very satisfied with the weatherization program (97%). Over 90% reported that the auditors, crews, and inspectors arrived for work on-time or early. Over 25% of respondents reported that their homes were no longer kept at unsafe temperatures post-weatherization. The number of households reporting that someone needed medical attention from being too hot in their home dropped from 14% pre-weatherization to 5% post-weatherization. Most respondents reported receiving some sort of information about energy use from the program (88%), but similar to respondents in the continental U.S., few altered their energy use behaviors post-weatherization.



## 1. INTRODUCTION

This report is part of the national evaluation of the U.S. Department of Energy's (DOE) Weatherization Assistance Program (WAP) for the American Recovery and Reinvestment Act (ARRA), also referred to herein as the Recovery Act period. The evaluation is being managed by Oak Ridge National Laboratory (ORNL) on behalf of DOE. The pages that follow describe weatherization activities conducted by five U.S. territories during the Recovery Act generally and Program Year (PY) 2010, more specifically.

WAP was created by Congress in 1976 under Title IV of the Energy Conservation and Production Act. The purpose and scope of the Program as currently stated in the Code of Federal Regulations (CFR) 10 CFR 440.1 is "to increase the energy efficiency of dwellings owned or occupied by low-income persons, reduce their total residential energy expenditures, and improve their health and safety, especially low-income persons who are particularly vulnerable such as the elderly, persons with disabilities, families with children, high residential energy users, and households with high energy burden." (Code of Federal Regulations, 2011)

WAP provides grants, guidance, and other support to Grantees: weatherization programs administered by each of the 50 states, the District of Columbia, territories and several Native American tribes. The Grantees, in turn, oversee a network of 900+ local weatherization agencies (Subgrantees): community action agencies, nonprofit organizations, and local government agencies that are eligible to receive weatherization funding from DOE. These weatherization agencies qualify eligible households, assess their homes' energy efficiency opportunities, install energy-saving measures, and inspect the work. The work performed includes air sealing, insulation upgrades, furnace replacements, and other dwelling-specific measures found to be cost-effective, as well as home improvements needed to ensure the health and safety of household occupants. The work is done at no cost to the eligible participants.

In April 2009, the U.S. Congress passed ARRA. Included in the hundreds of billions of dollars of programs, initiatives, and investments was \$5 billion for WAP. The national weatherization network was given approximately three years to spend these funds. Annually, this funding represents about six times more per year than Congress had been typically appropriating for WAP. The huge increase in funding was based on the assumption that weatherization was a 'shovel ready' program, capable of quickly ramping up production and, most importantly given a major goal of ARRA, employing significant numbers of individuals to weatherize low-income homes.

In March 2009, a Final Rule was published in the Federal Register amending DOE's definition of "state" to include the Commonwealth of Puerto Rico, Guam, the U.S. Virgin Islands, the Commonwealth of the Northern Mariana Islands, and American Samoa. The new definition is consistent with modifications made to Section 411(c) of the Energy Independence and Security Act (EISA) of 2007. The final rule extended all federal regulations and guidance of WAP to these U.S. territories under both regular and ARRA program years.

This report documents the weatherization activities conducted by these five U.S. territories during the ARRA period. Section 2 presents summary statistics on units produced and funding spent during this time. As indicated in this section, Puerto Rico administered the largest of the U.S. territory weatherization programs. Its program is documented in detail in Section 3. Appendix A contains short descriptions of nine typical homes weatherized in Puerto Rico. Appendix B contains the occupant and client satisfaction surveys.



## 2. OVERVIEW OF WEATHERIZATION AND U.S. TERRITORIES DURING THE RECOVERY ACT PERIOD

Characterization of WAP, as delivered by the U.S. territories, was completed by collecting state and agency-level survey data. Table 2.1 shows the total WAP funding received by each territory, the total number of units weatherized, and units weatherized by housing type, heating fuel type and WAP priority client categories. Puerto Rico, by virtue of having the largest population among the territories, received the most WAP funding, over \$65 million, and weatherized the most units, over 15,000. The other four territories received approximately \$1 to \$2 million in funding and weatherized on average 590 units. Overall, most of the units weatherized were single family homes, though 62% of units weatherized in the U.S. Virgin Islands were in multifamily buildings. The owner-occupied production rates for the single family homes weatherized ranged from a high of 99% and 100% in the Marianas Islands and Samoa, respectively, to a low of 11% in Guam. The only territory reporting weatherizing units with heating systems was the U.S. Virgin Islands; 2% of the weatherized units had fuel oil heating systems. A preponderance of weatherized units had clients that fell into one or more of the priority categories, though the demographics of the clientele differed greatly between the territories (i.e., households with elderly persons were most prevalent in the U.S. Virgin Islands and Puerto Rico versus households with children in Guam, Samoa and the Marianas Islands).

The territories reported their expenditures by several categories. The program operations category captured all costs associated with auditing, measure installation, and inspection. On average, 79% of funding was expended in this category by the five territories, with a low of 70% (Guam) and a high of 86% (U.S. Virgin Islands). Unit weatherization costs, calculated by dividing program operations costs by total number of units weatherized, ranged from a low of \$1100 per unit weatherized in Guam to a high of \$3539 and \$3200 in Puerto Rico and the U.S. Virgin Islands, respectively. The reported expenditures in the health and safety category per unit weatherized ranged from a low of \$0, \$7 and \$14 per unit weatherized in the U.S. Virgin Islands, Samoa, and the Marianas Islands, respectively, to highs of \$91 and \$131 per home in Puerto Rico and Guam, respectively. These expenditures on health and safety measures are quite low in magnitude and as a percentage of job costs when compared to typical weatherization jobs in the continental U.S., which averaged 15% for single family and mobile homes in PY 2010.

Billing data to estimate energy savings were only able to be collected for the Puerto Rico program and are presented in detail in the next section. In general, although households in hot-weather climates typically use much less energy than the average US household, residents of island states can pay up to double in electricity per kWh, resulting in a near comparable home energy cost burden. Hot-climate tropical weatherization projects tend to focus on base-load electric measures from household appliances and efficient cooling systems, both of which tend to be less costly than heating system replacements or installations.<sup>1</sup> For example, approximately 24% of home energy use in Puerto Rico is attributed to air conditioning (www.energystar.gov, 2009). As a result, the per-unit cost of retrofits in the tropical and sub-tropical marine climate zones of these U.S. territories was expected to be lower than in the rest of the United States. The results presented above support this working hypothesis. Lower per job costs may allow an increased number of local housing units to be weatherized. However, it is also possible that a greater number of housing units in the territories will be fitted with renewable energy technologies due to the ample availability of renewable energy in the forms of solar, wind, and geothermal resources. Two of the five U.S. territories placed solar water heaters on their priority lists for weatherization; Puerto Rico and Samoa. The use of this technology could increase the cost per unit (observed with respect to Puerto Rico

---

<sup>1</sup> It should be noted that DOE approved priority lists for the five territories did not allow many measures that are typically installed in the continental U.S., such as air sealing and insulation.

but not Samoa), creating the potential for those dwellings to reach the maximum allowable cost and resulting in the final number of homes weatherized being similar to initial projections.

**Table 2.1 U.S. Territories: ARRA Period Weatherization Funding and Units Produced**

	Total funding	Total units	Units by housing type		Units by heating type (%)		Units by households containing priority clients		
			SF	MF	None	Fuel Oil	Elderly persons	Persons with disabilities	Children
Puerto Rico	\$65,258,769	15,306	15,189	117	100%	0%	6,794	4,358	3,047
Guam	\$1,396,697	878	862	16	100%	0%	177	92	653
American Samoa	\$896,449	517	517	0	100%	0%	215	46	431
Marianas Islands	\$989,743	510	505	5	100%	0%	139	92	348
U.S. Virgin Islands	\$1,693,345	455	170	285	98%	2%	411	77	3

### **3. PUERTO RICO CASE STUDY**

#### **3.1 INTRODUCTION**

The island of Puerto Rico is an unincorporated territorial possession of the United States. Located in the northeastern Caribbean Sea, Puerto Rico is home to nearly 4 million people and has a hot, humid tropical climate with an average temperature of about 85 degrees Fahrenheit (28 degrees Celsius) and an average rainfall of about 66 inches or 168 cm. Puerto Rico's climate makes weatherization practice quite different from that in colder-weather states: no air sealing (or any shell measures as they are not cost-effective), but air ventilation—getting as much air through the house as possible during the day-- is the priority in the hot, rainy climate.

WAP, as noted above, was introduced in Puerto Rico at the beginning of the ARRA period; until that time Puerto Rico had not had a strong tradition of environmentally sustainable home energy use. Recycling was rare, and there were few solar water heaters or energy-efficient appliances available.

Puerto Rico's weatherization program is described and assessed in this section. Five sources of information are woven together to create this in-depth case study:

- In-person interviews conducted with the leaders of Puerto Rico's program and recipients of weatherization services;
- Electricity bills collected pre- and post-weatherization for thousands of weatherized homes;
- A survey administered to collect information about Puerto Rico's program;
- Two surveys of program recipients, one that focused on general energy behaviors and household issues pre- and post-weatherization and a second that inquired about recipients' satisfaction with the program.

This section has four major components. Section 3.1 presents an overview of the program. Section 3.2 discusses the program's philosophy and approach. Section 3.3 describes the households and homes that received weatherization services, presents estimates of energy savings and cost-effectiveness, and presents results from the program and two recipient surveys. This section concludes with a discussion of Puerto Rico's program moving forward.

#### **3.2 PROGRAM OVERVIEW**

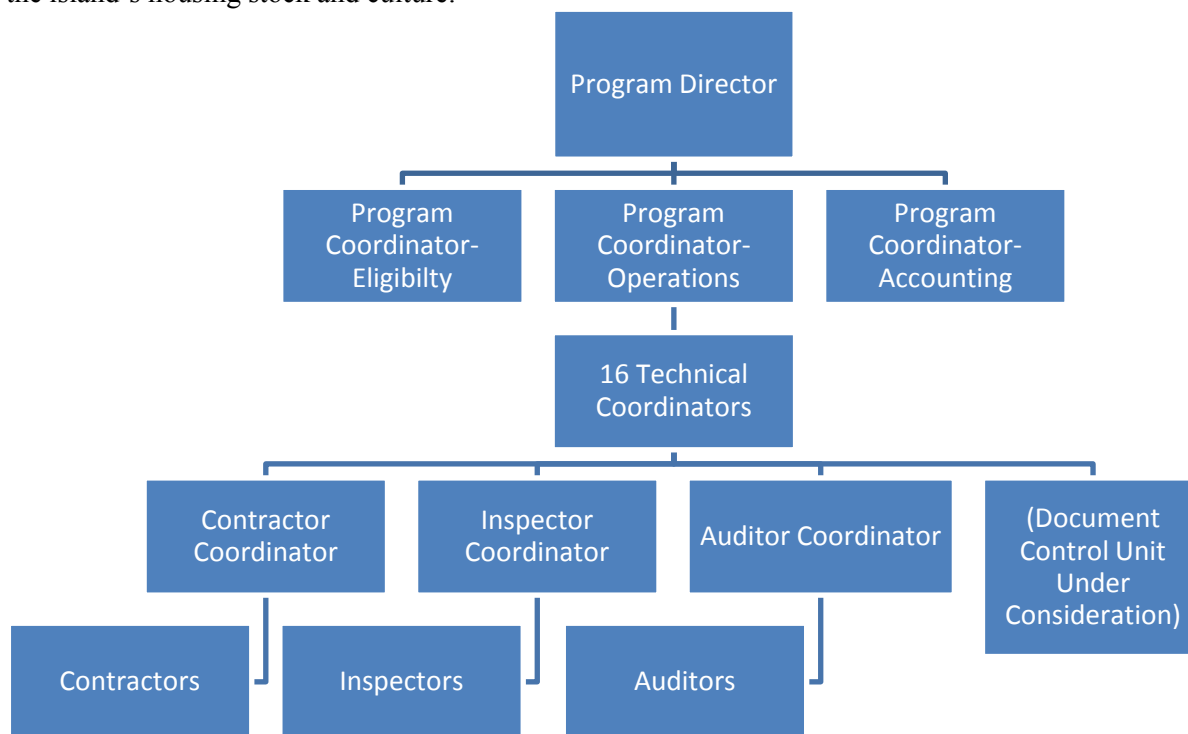
##### ***Organizational Structure***

After eligibility for DOE's weatherization program was established in 2009, the government of Puerto Rico had to develop an organizational process for program management and delivery. As a natural resources agency, the territorial office of the Energy Affairs Administration (AAE in Spanish) was designated as the primary Grantee, but at the time of the case study, Grantee status was slated to move to Puerto Rico's Department of Economic Development. Although WAP Subgrantees are often selected based on Community Action Agency (CAA) status, the Infrastructure Financing Authority (La Autoridad para el Financiamiento de la Infraestructura, also known as AFI) was designated as the Subgrantee to oversee all of Puerto Rico's ARRA-funded projects. Thus, AFI is the sole Subgrantee, but it is also a state agency. Law #8 was passed by the Puerto Rican government and signed by the governor in 2009 designating AFI as the sole Subgrantee; administrative funding was split with AAE.

Although AFI was designated as the Subgrantee, all positions were contracted out, even that of the weatherization director. Thus, 16 contract technical coordinators reported to the weatherization director and manage all of the weatherization field activities. Like the technical coordinators, all auditors,

weatherization measure installers, and inspectors were also contractors. At the time of the site visit interviews during May 2011, 70 to 80 percent of the AFI contract professionals were employed full-time by the WAP. Figure 3.1 shows the organizational structure of the WAP program in Puerto Rico.

It should be noted that with the assistance of the Department of Energy, National Energy Technology Laboratory (NTEL), and Simonson Management Services (SMS), both Puerto Rico's Energy Affairs Administration (AAE) and the infrastructure financing authority (AFI), developed their own models for program philosophy and delivery, relying neither on the infrastructure nor the delivery-system models employed by other U.S. WAP agencies. Time had to be spent on developing the local model, but because Puerto Rico has a tropical marine climate unlike that of other states. There were not many models to replicate so the support teams at AAE and AFI had to develop a program attuned to the technical needs of the island's housing stock and culture.



**Fig. 3.1. Puerto Rico's Weatherization Assistance Program Organizational Structure (under AFI).**

## ***Organizational Structure Assessment***

A state the size of Puerto Rico, with a population of almost four million people, would normally have five to ten Subgrantees geographically dispersed state-wide to deliver a program of this size, as local Subgrantees would be more accessible to potential clients, and weatherization workers would also live in the community, cutting down on travel times and costs.

There were several compelling arguments, informed by consultation with professionals within the weatherization network, to give the Puerto Rico work to a single Subgrantee. First, prior to the WAP program's startup in 2009-2010, there had been no existing network of potential non-profits capable of providing weatherization services on the island. Secondly, AAE wished to develop a program that could be consistently implemented island-wide. It was anticipated that because vigorous debate is a cultural norm in Puerto Rico, it might be a significant challenge to quickly build consensus about program delivery if there were multiple Subgrantees. A third factor was that having AFI as the sole Subgrantee made it relatively easy to expedite since AFI already existed, was already part of the state government, and could coordinate professional services quickly. ORNL staff observed on-site the efficiency and streamlined qualities of program delivery and was able to confirm the wisdom of this approach in conversations with the DOE Project Officer.

## ***Challenges with Puerto Rico's Startup of WAP***

One major challenge that AFI faced was in determining the resources necessary for program delivery. Because no one had been involved in weatherization prior to the American Recovery and Reinvestment Act of 2009, it took time to determine how many people at both the Grantee and Subgrantee levels would be needed to manage the program. Key production time was lost during the first year as a framework for the program was established. The first unit was started on Earth Day, April 22, 2010. As production increased and experience was gained, the number of technical coordinators grew from 6 to 10 to the 16.

Another challenge was acquiring the right mix of specialized and general weatherization contractors, particularly in each of the four specialized measure categories:

- Refrigeration (as of the site visit, there was one contractor in this category, but AFI anticipated an increase to three by July 2011);

## **Primary WAP Start-Up and Production Challenges in Puerto Rico:**

- No weatherization program existed resulting in program creation from scratch. Additionally, there was no one on staff at DOE or in Puerto Rico who had been involved with starting a new WAP program. The new program required special attention from DOE consisting mostly of strategic planning and technical assistance.
- First year was spent establishing framework for the program cutting into key production time. First unit was started on Earth Day, April 22, 2010.
- Administrative costs were split between the Grantee and Subgrantee posing budgeting challenges.
- It was difficult to determine number of staff needed at both Grantee and Subgrantee levels, as well as how many specialized and general contractors should be secured.
- Determining number of projected units was a challenge as a result of initial funding allocation formula error as it did not include regular program year funding.
- The Subgrantee had to provide evidence of funding to the specialized contractors to motivate them to increase inventories.
- Solar Hot Water Heaters had OG100 certifications not OG300 certification required per WAP guidance. A waiver was necessary until the OG300 certification could be obtained.
- Addressing Refrigerator contractor non-compliance with timely invoicing resulting in new contract with new contractor. In addition the recycling documents for the removed refrigerators were not what they should have been with the first contractor.
- Additional training on WAP guidance was required on the installation of measures repairs not justified by energy savings or allowable, such as extensive electrical work. Additional training on WAP guidance was completed.

- Air conditioning (as of site visit, there was one contractor in this category but AFI had issued a Request for Proposal (RFP) to add more);
- Solar water heating (SWH) (as of the site visit, there were two contractors in this category);
- General Contractors (Installation of compact fluorescent light-bulbs (CFLs) and low-flow showerheads, as well as some health-and-safety electrical work).

A third challenge had to do with introducing the concept of weatherization to the island. As has been stated, Puerto Rico was not very environmentally “green” at the beginning of the ARRA period. Recycling rates were low and few homes had energy-efficient appliances or solar water heaters. Consequently, when AFI began to determine that thousands of income-eligible homes would need solar water heaters and Energy Star-rated refrigerators and air conditioners, the desired units were not locally available for purchase. Suppliers of these appliances were skeptical at first, so AFI had to produce evidence that it was funded and ready to sign contracts before appliance suppliers would increase their inventories.

Additionally, budgeting challenges existed because administrative costs had to be split between the Grantee and Subgrantee, and an error in the initial funding allocation formula created difficulty in determining the number of projected units, as regular program year funding was not included. With all these organizational and administrative challenges, there were also minor issues that created opportunities for “lessons learned”:

The solar water heaters available had OG100 (rating only for the collector) certifications, not the OG300 (rating for complete turn-key system) certification required per WAP guidance. A waiver was necessary until the OG300 certification could be obtained.

Because the refrigerator contractor did not provide timely invoicing or proper recycling documentation, a new contractor had to be signed up.

Additional training was needed on how to determine when repairs necessary to install measures, such as extensive electrical work, would be allowed.

### 3.3 PHILOSOPHY AND APPROACH

As every particular place has its own particular weather, every locale poses unique challenges for weatherization. Households in hot climates typically use much less energy than the average U.S. household, but electricity can cost much more on islands, resulting in a nearly comparable home-energy cost burden. One of the missions of WAP in Puerto Rico (and of the program in general) is to help program-eligible residents permanently lower their energy bills by making the existing housing stock

#### **Puerto Rican Household Energy Consumption:**

- Most elderly people native to Puerto Rico do not use hot water for bathing, as they lived many years without access to hot water technology.
- Some schools operate in shifts, so some children are at home during the morning/early afternoon before starting their school shift in the later afternoon. This may lead to increased energy consumption during the day.
- Wall unit air conditioners are primarily used in bedrooms and at night only to allow for comfort while sleeping.
- “Miami” or French style windows are opened during the day to allow for maximum airflow through the home (see photos under Unit Summaries).
- Ice is retrieved from the freezer throughout the day to combat the heat with ice-cold beverages.
- Clothing is usually line-dried, both inside and outside homes, especially in the drier regions of the island regardless of whether the family has a working electric clothes dryer.
- Long, covered patios provide cool spaces for occupants to spend time outdoors.



more energy-efficient. Interestingly, initial state level statements pertaining to the development of WAP in Puerto Rico described a mission targeting not the extremely poor (i.e. unemployed poor) but the working poor. Perhaps this was due to that sector's increased energy consumption behavior or as a strategy to prevent deferrals or "walk-aways" resulting from structural issues associated with housing stock of those living at a greater level of poverty. Additionally, those living in extreme poverty may also be more transient, so they may not be living in the home when the auditor or crew arrives to complete the weatherization work.

In a hot climate, energy use naturally focuses on base-load electric measures dealing with household appliances and cooling systems, both of which tend to be less costly than heating system replacements or installations. For example, approximately 24 percent of home energy use in Puerto Rico is attributed to air conditioning. However, the philosophy of the Puerto Rico program is that if there is no existing working AC unit of appropriate WAP standard size, the unit will not be serviced or replaced, nor will a new one be installed. The thought is that an AC-less home is already saving energy without the use of this technology and the program does not want to increase energy consumption in any way, even if the increase could be offset through the installation of other energy-saving measures.

Again because of the climate, heating system expenditures are not allowable in Puerto Rico's program, as there is only an average 20-degree variation in temperature throughout the year and installment, servicing, or replacement of heating systems is not cost-efficient. As a result, the per-unit cost of retrofits in the tropical and sub-tropical marine climate zones of this U.S. territory has been lower than initial projections, allowing for an increased number of local residential units to be weatherized.

Similarly, insulation is not generally a priority in Puerto Rico because, as noted above, the goal is to move air in and out of a house rather than keep it in or out. Because of the louvered windows and worries about mold and humidity build-up, tight air sealing is neither possible nor advisable. Thus, auditors in Puerto Rico do not conduct blower door tests, and insulation is rarely installed.

Because air sealing is not an issue, audits take less time and auditors need less extensive training since they do not have to understand the science behind building construction. The weatherization process is different, too, requiring much less time to be spent by traditional weatherization crews in each home. Indeed, the general contractors receive only about \$350 per home to install the various energy-efficiency measures (e.g., CFLs and low-flow showerheads).

In Puerto Rico, services are not delivered through a single weatherization crew but through separate contractors. The technical coordinators have a goal to close out a job in 90 days, but this goal is not frequently met because of the need to coordinate up to six different weatherization-related visits: an initial visit with the auditor as well as visits from the general contractor, the solar water heater contractor, the refrigerator replacement contractor, the AC servicing contractor, and then a final visit from the inspector. A major challenge for the technical coordinators is to schedule the deliveries of the various weatherization components. This is in stark contrast to the more common crew-based programs that have specialists in-house.

### **Weatherization in Tropical Marine Climates: What Makes It Different?**

- Ample sunlight and wind mean that many housing units in the territories could be fitted with renewable energy technologies. SMS provided technical assistance addressing this issue.
- Moving air through the home is a high priority, so air sealing and insulation are not recommended. Therefore, opportunities to save energy mostly involve replacement of inefficient incandescent lighting, air conditioners and refrigerators; and improved baseload measures, which involves the installation of low flow plumbing fixtures and more efficient domestic water heaters, especially solar water heaters when appropriate.

## *Weatherization Delivery*

Out of the island's total population of approximately 4,000,000 people, between 500,000 and 700,000 households are income-eligible for weatherization assistance. Although the program application process was on a first-come, first-serve basis, a large percentage of households fell into high-priority categories, especially the elderly, as reported in DOE's Performance and Accountability for Grants in Energy (PAGE) reporting system.

To date, applications for weatherization services through WAP have been opened in two phases. The second phase was initiated when, due to an initial formula error, AE/AFI received additional funding for low-income weatherization, increasing WAP ARRA funds from \$48.9 million to \$65.3 million. Although the WAP goal for units to be completed was initially set at 8,600, the Governor of Puerto Rico announced a goal of 10,000, and documented in Table 2.1, over 15,000 units were eventually weatherized.

A system was established to set up the distribution of the program around the island. Call centers in seven regions asked pre-qualifying questions of potential weatherization client households. If a household was pre-qualified, then an interview was set up with the householder to accept WAP services. The first phase of application collection was set up by each municipality, with a minimum of 100 recipients per municipality. However, if only 80 eligible households applied, the remaining 20 slots were shifted to other municipalities within that region.

AFI did some initial advertising of the program through the use of public awareness campaigns (e.g., newspapers, radio, TV and its website), but after a few homes were successfully weatherized, word quickly spread throughout the island about the program. Neighbors told neighbors, relatives told relatives, and workers told their peers about the program. Ultimately, AFI received thousands more inquiries than could be accepted.

ORNL interviews with program recipients in the field confirmed the success of informal social networks in promoting the program. AFI staff also noted that programs that do not receive this stamp of approval from within the social networks are often not embraced by the public. An AFI staff member believes the most successful strategy for engaging the public and receiving applications was simply the implementation of the program itself. "Once members within the social network received word that the program was legitimate, they then began to trust in the program," the staff member reported. To meet the increased demand for services, AFI efficiently implemented intake procedures in the seven regional offices located around the island.

### **Puerto Rico's Weatherization Wish List:**

The wish list generated for this section is a compilation of responses sought from program recipients, staff and professionals from within the weatherization network in Puerto Rico, DOE and SMS staff, and from the literature published by the government of Puerto Rico providing suggestions for future WAP allowable costs.

- **Cool Roofs:** to reduce solar gain
- **Refrigerators with Through the Door Ice Dispensers:** to address household resistance to refrigerator replacements without this technology
- **Power Strips:** to reduce the phantom load for baseload appliances
- **Fuel Switch:** from electric to gas cooking stoves
- **Using a Combination of Renewable Technologies**
- **Partnering with Other Community Resources in the Industry:** for a more comprehensive retrofit
- **Reduce the # number of Contractors:** less time in homes, fewer contracts to monitor, better coordination, more cost effective. This will be difficult as it will entail a change in the infrastructure currently in place.
- **Only Install 8,10,12, kBTU AC Units**
- **More Time to Reach Production Goals:** funds extending steady funding over a longer time period
- **Annual Training Conferences:** include tropical marine climate topics
- **Evaluation of PREAT as an Effective Auditing Tool:** At the time of the Case Study PREAT was not an approved DOE auditing tool
- **AC Metering Electric consumption evaluation:** As an evaluation to assist with program guidance design

At present, households are ineligible if they have already utilized the program. This rule is adhered to despite the unpredictable tropical marine climate, which is prone to flooding and other damage from hurricanes and tropical storms. Although the program is new and this issue had yet to be of concern, the question was raised within the program's administration whether or not waivers could be granted and homes re-weatherized in case of future natural disasters.

### ***Training and Staffing***

An initial one-week training session was conducted by an Energy Coordinating Agency team from Philadelphia. As the majority of the workforce for AFI has been trained, after this session, weatherization trainings were offered on an as-needed basis as refreshers in certain areas. According to the program survey, no certifications were required. The primary surprise observed in the field, but that was not addressed in the trainings, was electrical wiring and breaker problems that could lead to home fires. During our discussions, various staff also suggested that trainings incorporate flood and other water issues created by hurricanes and tropical storms and the training curriculum could be better tailored to these climate issues. As staffing requirements grew, the Program promoted from within.

### ***Weatherization Audit***

In other weatherization assistance programs, home-energy audits are often performed by trained professionals using computerized audit tools such as the National Energy Audit Tool (NEAT), which are capable of evaluating an individual home, describing its physical characteristics and energy-using components, and generating a prioritized list of recommended measures. Upon determining that the unit meets health and safety standards, the audit is conducted and is further documented using digital images; it includes guidance and instructions for the contractors installing the measures. For example, the auditor will estimate the amount of copper needed for the solar water installation and direct where to put the piping and the roof unit. A questionnaire is also administered to the occupant to gather information on how the household uses energy as well as any health and safety needs.

AAE quickly realized that conventional computer audit tools such as NEAT were not suited for Puerto Rico's tropical climate, so AAE developed its own tool, PREAT (for Puerto Rico Energy Audit Tool), which, like NEAT, is a computerized audit tool that helps auditors identify measures that can be installed to meet the savings-to-investment ratio (SIR) requirement.<sup>2</sup> They reported that if they used the priority list from NEAT, they would be bound to install measures that were unnecessary, in AAE's view, in Puerto Rico; for example, they would have to replace unused or broken air-conditioning units.

At the time of the field observations there appeared to be confusion as to whether or not PREAT had been approved for use. Although the DOE Project Officer was aware of the use of PREAT, it had not been approved for use by DOE. However, AAE and AFI continued using the PREAT auditing tool while DOE reviewed the audit's accuracy. The confusion did not appear to deter either AAE or AFI from using the PREAT auditing tool.

### ***Weatherization Measures***

On its site visit to Puerto Rico, the ORNL team visited nine homes in the field (See Appendix A) and found that the difference in climate resulted in a Puerto-Rico-specific pattern of weatherization measures installed. Weatherization measures for Puerto Rico fell into the following six categories:

---

<sup>2</sup> The SIR is the present value of the expected energy cost savings of a measure divided by the cost of the measure. Only measures that have a SIR of 1.0 or greater are allowed to be installed in homes.

- Solar water heaters with OG 300 Certification
- Wall air conditioners (either replacement or servicing of)
- Refrigerators (either replacement or servicing of)
- Measures to reduce baseload electricity use, including CFLs
- Low-flow showerheads
- Electrical health and safety (raising outlets above flood level, replacing frayed cords, etc.)

Although additional measures, such as reflective window films and power strips, were described in Puerto Rico's State Plan, it was not observed that these measures were actually deployed. The team's guides explained that reflective films do not work with the louvered window style of Miami and French windows and that the use of power strips was not allowable.

Approximately 73 percent of weatherized units receive either a flat plate collector or evacuated tube solar water heating system. Every home visited as part of the case study had had a new solar water heater installed on the roof. They were only installed on homes with concrete roofs, however, because AFI was not able to verify that other types of roofs (e.g., wood or metal) were structurally sound enough to support both solar water heaters and the workers on the roofs doing the installation; however, most of the single-family detached homes seen on the site visit had been built with concrete construction to withstand hurricanes. It should be noted that on DOE monitoring trips and technical assistance visits completed by SMS, some concrete homes were deemed structurally unsound because the concrete was eroding and exposing interior rebar.

Decisions about whether to install air conditioner units were somewhat more complex. Unused air conditioners were not replaced, as their installation would not save any energy even if the replacement could be considered a Health and Safety issue (See Appendix A, Unit 9). Also, only air conditioners of 8,000 to 12,000 BTUs in size were replaced with Energy Star rated units, per Puerto Rico's state plan. The AAE and AFI staff said that this size limitation turned out to be a problem, as they found numerous homes with bigger AC units that could have been replaced, and that the size of the units in these homes was appropriate. They planned to raise the limits on this specification in a future plan.

### ***Weatherization Inspections***

Post-weatherization inspections are completed by a trained professional, but never by the same person who audited the unit in the first place. At first, inspectors reported that contractors were incorrectly orienting the solar HW units or inadequately anchoring the solar HW units to roofs. However, with further contractor training, this problem has now been largely resolved.

### **Strengths of Puerto Rico's WAP:**

- **Education and experience level of Subgrantee staff:** Most AFI management staff, auditors, and inspectors have backgrounds in engineering and architecture and are compensated adequately for their expertise.
- **Documentation:** DOE monitoring visits suggest above-average documentation processes with pictures of units and directions from auditors. Few discrepancies between reports and observations were seen.
- **Compliance with DOE WAP rules, guidance, and suggestions for improvement:** Both AAE and AFI continue to make improvements to their program based on best practices and recommendations by DOE and training and technical assistance (T & TA) support staff.
- **Consistent client reports of energy savings:** Program recipients reported a consistent energy savings as observed on their utility bills despite an increase in gas and electricity rates.
- **Competent contractors:** Contractors are having no problems meeting the demands of the program. The refrigerator contractor is now able to install 50 units/day, installing 700 units in April 2011.

Initial DOE/SMS inspections highlighted concerns with electrical issues, improper installation of through-the-wall A/C units, and showerheads. During more recent reviews, DOE/SMS inspectors were not observing problems with solar installations. Occasionally, however, a client reports an issue that turns out to be a problem with education, not installation. For example, one householder complained of running out of hot water. The problem turned out to be that the electric backup was not hooked up. It was suggested that this issue could be a good client education topic and contractors should at least tell households that the hook-up is available to get more hot water. Additional education topics could include time of use for optimal availability and storage capacity of the systems. Another early problem was the installation of the wrong CFL bulbs outdoors where there was no protective covering to keep them from getting wet.

### ***Health and Safety***

According to the program survey, the Program assigns a medium priority to health and safety measures. AFI keeps expenditures to a strict limit of \$600 per home for health and safety measures, such as replacing frayed electrical cords, fixing electrical outlets or ground interruptions, or addressing the use of extension cords used with heavy appliances such as refrigerators. At times, unsafe light fixtures are also replaced. 65% of respondents reported receiving from the program information on how to improve health and safety in home. 24% said major repairs were done in the home.

AFI teams are conscious of home construction dates (especially prior to 1978) as they pertain to the presence of lead in homes. As a rule, AFI does not do any work that might disturb lead in a home. For example, windows are not replaced in homes that are assumed to contain lead based on the age of the home, and holes are not drilled in walls or ceilings. Window or wall AC units are only replaced if no work is needed to increase the size of the hole in the wall for the unit. Households are always informed about any potential lead risk.

### ***Client Education***

The site visit guides informed the team that client education about energy consumption behavior is done at each phase of weatherization, therefore being reinforced multiple times. The auditor has the main responsibility for explaining how the Program works, what the benefits of saving energy are, how the audit is conducted, its results, potential measures to be installed, and other ways that clients can save energy. Auditors leave several informational brochures for clients to read after their visit, including information about dealing with mold, disposing safely of CFLs, and how changing energy consumption behavior can improve their quality of life. The post-weatherization inspector also reinforces the information given by the auditor. Between those two points in time, contractors who install new solar water heaters, air-conditioning units, and refrigerators also explain the energy-efficiency features of these new appliances and how to use and maintain them. All the clients we interviewed reported satisfactory client education experiences. Beyond the standard information about weatherization, the auditors, inspectors, and contractors tailor their advice to the tropical environment of the households, helping householders understand how to achieve persistent energy savings by actions like the following:

- Opening bedroom doors in the early evening to allow for air flow before turning on the A/C unit and closing up the room
- Not placing the refrigerator next to the stove
- Washing full rather than partial loads of laundry
- Unplugging appliances when not in use

- Monitoring the refrigerator thermostat
- Using natural light and air during the day
- Purchasing outlet strips to reduce phantom load<sup>3</sup>

### ***Walk-aways and Deferrals***

With respect to WAP-provided services, occasionally the projected work cannot be completed because of a problem on the client's side. These situations are called "walk-aways" and "deferrals" and these decisions are guided by a formal policy. AFI makes a distinction between the two. In a deferral, something in the home may need to be repaired before the home can be weatherized; once they are enrolled in the Program, householders are allowed 30 to 60 days to fix problems. Although deferrals occur primarily because a house is structurally unsound (e.g., issues with the electrical system, stability of the roof) and cannot be weatherized "as is," "walk-aways" also occur when the auditor finds one of any number of additional unacceptable conditions in or relating to the home. These include for-sale signs in front (indicating that the householder is taking advantage of the WAP to improve the value of the home before selling), excessive mold, and/or illegal electricity connections. Examples of "walkaway" conditions that DOE observed on monitoring trips included crumbling concrete with exposed rebar and "live" wired light fixtures in the middle of a roof leak. In PY2010, the Program estimated that 1-5% of homes were walk-aways and none of these homes were expected to eventually be weatherized.

It was a problem for auditors when they would have to drive an hour to a unit, and the home needed to be deferred or the householder would then refuse services. At the beginning of the program, the auditors would not get paid for their time. DOE and AFI worked out a solution establishing a set fee for deferral homes. Lastly, AFI also added a screening process to the telephone application, helping to cut down on wasted time spent visiting homes that could be quickly screened for deferral or walk-away issues.

### ***Monitoring and Verification***

AFI's client files have been inspected by both DOE and AAE and were found to be complete, with photo documentation of everything related to projects. Indeed, it had been noted during earlier DOE monitoring trips that AAE and AFI were told that they were collecting too much documentation to support billing invoices and that information in files was duplicated, thus interfering with production goals and representing a time-management issue. However, it was reported to the ORNL team that suggestions made on these previous monitoring visits had been heard and responded to by both AAE and AFI, with the result that subsequent monitoring visits saw satisfactory production levels. Although, as noted, it took a year for AAE and AFI to establish their framework for WAP, both agencies were commended by SMS staff for having the foresight to establish a good program before attempting implementation.

### ***Integration of Services with Other Agencies***

The WAP program in Puerto Rico is not tied to a larger social services network, and there is no clear policy about referrals to other social-service agencies when, for example, a house weatherization must be deferred for health-and-safety issues in households with children or elderly people (e.g. vulnerable populations). There seems to be less of a governmental network in Puerto Rico than in the mainland states, where community action agencies generally operate a myriad of programs or where weatherization programs are in communication with other community or social services agencies that can deal with

---

<sup>3</sup> Phantom loads are those that draw electricity while not in use.

issues of concern but that are outside the scope of WAP. One AFI staff member reported, however, that homes observed to have a serious safety hazard are referred to the local offices for Puerto Rico's Department of Housing and Urban Development. Overall, from the program survey, the Program indicated that 1-25% of homes were referred to a non-energy program. The results from the occupant survey suggest that only 1% of the respondent's households were referred to a non-energy program.

### ***Leveraging and Collaborations***

Through the program survey, Puerto Rico reported not receiving any leveraging money from utilities or other sources in PY2010, did not advocate and did not seek any leveraged funding, and did not perceive that leveraged funding was important to the Program at that time. The Program stated that it did believe that ARRA funding was beneficial for establishing leveraging relationships over the longer-term and that information on energy savings and benefits of leveraging to potential partners was needed to help establish these relationships.

## **3.4 SURVEY AND ENERGY SAVINGS RESULTS**

As noted above, recipients of weatherization services in Puerto Rico were surveyed. Potential respondents were randomly selected from a list of weatherized homes provided by the program. All told, 141 homes participated in the 45 minute phone survey that was conducted both in English and in Spanish. The response rate was 71%.

### ***Characteristics of Households Weatherized***

From this survey, these descriptive statistics about the households weatherized by the Puerto Rico program were collected:

- Mean household income -- \$15,600
- Mean household size -- 2.8 persons
- 45% homes can be classified as elderly (respondent's age >55 years old)
- 61% have at least one child in residence
- Mean number of children is 1.1
- Only a single individual lives in 16% of households

The following statistics characterize the main respondents:

- 81% of respondents are female
- Mean respondent age of the respondents is 53 years old
- 57% of respondents say they are the primary wage earner
- 42% of main respondents are employed (68% full time)
- 43% of respondents are married

- 58% received education beyond high school
- 29% of respondents received college degrees
- 100% of respondents described themselves as Latino

Lastly, the respondents were asked about why they applied for weatherization and how they heard about the program.

- Reasons for applying to WAP:
  - reduce energy bills, 97%
  - receive free services, 41%
  - support environmental efforts to conserve energy, 33%
  - improve health and safety, 29%
  - make homes more comfortable, 17%
- How found out about program:
  - relative or friend, 61%
  - newspaper or other local media, 21%
  - neighbor, 9%

The high percentage of respondents who reported finding out about the program indicates a strong social network on the island. Comments made by program staff and clients to the ORNL evaluation team support this observation. It should be noted that 85% of the respondents told other people about the weatherization program.<sup>4</sup>

### ***Characteristics of Homes Weatherized***

From the PAGE system, Puerto Rico reported that of the 15,306 units weatherized during the ARRA period, 99% were single family and 1% were in multifamily buildings.<sup>5</sup> From the occupant survey, which only included residents of single family homes, these summary statistics were estimated:

- 92% of the homes were owner occupied
- 48% of respondents reported that their homes were located in a city; 52% in a rural area
- The average weatherized home had three bedrooms and 3.3 “other” rooms

---

<sup>4</sup> Another evaluation project found that these types of informal communications through social networks does lead to more households applying for weatherization and changes in energy behaviors and investments. See Rose, E. et al. (2014). Assessing the Potential of Social Networks as a Means for Information Diffusion – the Weatherization Experiences (WE) Project. ORNL/TM-2014/405, Oak Ridge National Laboratory, Oak Ridge, TN.

<sup>5</sup> None of the multifamily units weatherized were in public housing or HUD assisted housing. Puerto Rico does have a SHPO program but the program reported that it did not weatherize any residential units falling under SHPO in PY 2010.



- 64% of homes had an air conditioning unit of some kind
- 80% of the air conditioning units were described as being through the wall, with the remaining 20% being window units
- No homes reported having central air conditioning
- No homes reported having a heating system
- No homes reported having a thermostat
- 28% of respondents said their home had a smoke detector
- 14% of homes with a smoke detector reported none worked
- No homes reported having carbon monoxide monitors
- Fuel used for cook stove/oven – 38% electricity, 62% propane
- 18% of respondents reported that exhaust fans vent to the outside when cooking
- 89% use microwave ovens
- 53% of homes have large shade trees

These home characteristics are quite different from the typical home weatherized in a cold region in the continental U.S, where most have central heat and/or air and thermostats, for example.

### ***Estimated Energy Savings***

The evaluation team received usage data from the Puerto Rico's electric utility, Puerto Rico Electric Power Authority (PREPA), for households weatherized in PY 2009, 2010, and 2011. The data was monthly billing data for calendar years 2010 and 2011 for most accounts. Almost none of the accounts contained 12 months of pre and 12 months of post-weatherization data. So, instead of running a PRISM<sup>6</sup>-like model to estimate individual house-level savings, a pooled (fixed-effects) regression model was used to estimate the overall program savings.

The savings estimates were developed using the following regression analysis equation:

$$U_{it} = \alpha_i + \beta_1 * C_{it} + \beta_2 * POST_t + \beta_3 * POST_t * C_{it} + Month_k + \epsilon_{it}$$

Where, for each participant 'i' and billing month 't,'

- $U_{it}$  = average daily usage during the pre- and post-treatment periods
- $\alpha_i$  = average daily non-weather-sensitive baseload usage for each participant in the pre-treatment period
- $\beta_1$  = average daily usage per cooling degree day (CDD) in the pre-treatment period

---

<sup>6</sup> Princeton Scorekeeping Method (PRISM)

- $C_{it}$  = average daily base 70 CDDs
- $POST_t$  = a dummy variable that is 0 in the pre-period and 1 in the post-period
- $\alpha_i + \beta_2$  = average daily non-weather-sensitive base-load usage in the post-treatment period
- $\beta_1 + \beta_3$  = average daily usage per CDD in the post-treatment period
- $\beta_2$  = average daily base-load savings
- $\beta_3$  = heating usage savings per CDD
- $Month_k$  = indicator (0/1) variable for each calendar month ( $k=2,3,\dots,12$ ) to control for month-specific exogenous factors
- $\varepsilon_{it}$  = estimation error term

Since Puerto Rico does not have any heating degree days (HDDs), the model specification does not have any controls for HDDs. Billing records for a comparison group of households were not collected. Table 3.1 presents several sets of results. The “ALL CASES” analysis applied the fixed effects model presented above to all of the electricity billing histories collected, which total over 14,000 homes. The estimated electricity savings per year is 876 kWh, or 15% of pre-weatherization electricity consumption. For comparison purposes, the average natural gas savings in SF homes weatherized in non-territories that heat with natural gas was 17.8% and the electricity savings in those homes was 7.1%. The average electricity savings in homes heated by electricity was 9.0%.<sup>7</sup> Separating out homes that were weatherized in PY 2010 yielded an electricity savings of 14.7%. Comparing pre-weatherization electricity use between homes weatherized in PY 2011 suggests that electricity use might not vary much from one year to the next. Certainly, the temperatures experienced on the island are fairly constant and within a fairly narrow range year round.

The last three rows in Table 3.1 provide estimated electricity savings by pre-weatherization electricity use. It was expected that electricity savings would be greater in homes that used the most electricity pre-weatherization and this is indeed the case. However, the difference in the percentage of savings between the highest and lowest electricity users, about 3.4%, is much smaller than the difference of natural gas savings in homes heated with natural gas between the highest and lowest natural gas users pre-weatherization, which ranged from 22.1% to 11.8%.<sup>8</sup>

---

<sup>7</sup> See Blasnik, M., Dalhoff, G., Pigg, S., Mendyk, A., Carroll, D., and Ucar, F. 2014. Energy Impacts for Single Family Homes. ORNL/TM-2013/409, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

<sup>8</sup> Blasnik et al. Ibid.

**Table 3.1 Estimated Electricity Use Pre- and Post-Weatherization and Savings**

	<b>Pre-Use</b>	<b>Post-Use</b>	<b>kWh Savings</b>	<b>% Saving</b>
ALL CASES – Saving Estimates (Number of Homes: 14,235)	5,849	4,973	876 ( $\pm 17$ ) <sup>9</sup>	15.0%
PY 2010 Cases Only – Saving Estimates (Number of Homes: 7,335)	6,069	5,176	893 ( $\pm 19$ )	14.7%
PY 2011 Cases as Comparison (Pre to Pre) – Saving Estimates (Number of Homes: 6,484)	5,174	5,208	-34 ( $\pm 66$ )	-0.6%
High Users (Top 25% in Pre Usage) (# Homes: 3,557)	10,073	8,518	1,555 ( $\pm 46$ )	15.4%
Moderate Users (Between Bottom 25% and Top 25% in Pre Usage) (# Homes: 7,118)	5,051	4,342	709 ( $\pm 18$ )	14.0%
Low Users (Bottom 25% in Pre Usage) (# Homes: 3,560)	2,585	2,269	316 ( $\pm 18$ )	12.0%

Using data on units weatherized and weatherization costs provided by Puerto Rico to DOE's PAGE system and these energy savings, a general assessment of program cost effectiveness is possible. Under these assumptions, the SIR for the Puerto Rico weatherization program in PY 2011 in 2013 dollars is approximately 1.34:<sup>10</sup>

- Units weatherized - 11,140
- Total expenditures - \$43,600,000
- Percent of expenditures on program operations (e.g., audits, measures) - 83%
- Average weatherization job cost - \$3,247
- Average first year electricity savings - 876 kWh
- Price per kWh - \$0.27
- Average lifetime of typical package of weatherization measures - 20 years
- 20 year OMB discount rate - 0.8%

It should be noted that the price per kWh was assumed to stay the same for the next 20 years. Given that the U.S. Energy Information Administration has not published an electricity price forecast for Puerto Rico, 60% of Puerto Rico's electricity production is currently fueled by oil, and the recent volatility in the international oil markets makes forecasting future oil prices extremely problematic, it was decided that

<sup>9</sup> 90% confidence interval

<sup>10</sup> 2013 dollars are used here because the metric is used to allow a comparative assessment of the cost effectiveness of the program between the retrospective and ARRA period evaluations for the non-territorial programs. The cost effectiveness in 2011 dollars for the Puerto Rico program would be 1.29. Using the ad hoc social discount rate of 3%, the cost effectiveness would be 1.08.

this assumption seems at least plausible.<sup>11</sup> For comparison purposes, the SIR for all units weatherized in non-territorial jurisdictions in PY 2010 using 2013 dollars is 1.59<sup>12</sup>

It should also be noted that this assessment may underestimate program cost effectiveness. This is because the solar water heaters may have saved households money spent on propane. Though the program was unable to provide information on actual measures installed, from the occupant survey and noted above, 62% of households used propane as fuel for their cook stoves and ovens. Assuming that many of these household also used propane to heat water, then installation of the solar water heaters would have reduced their propane costs.

### ***Household Energy-Related Behaviors***

In addition to demographic and energy system questions, the occupant survey contained several questions about home conditions and energy use behaviors. Many of these are summarized in Table 3.2. The most significant result presented in this table indicates that many more homes were much more comfortable post-weatherization. The number of respondents reporting that their homes were kept at unsafe or unhealthy temperatures some months to almost every month dropped by 25%. Homes were some needed medical attention because of heat post-weatherization dropped by 9%. Reductions in medical attention, in turn, could then lead to reductions in medical costs.<sup>13</sup>

For the most part, energy related behaviors did not change appreciably pre- to post-weatherization despite 88% of respondents reporting that weatherization staff provided information on ways to save energy. For example, behaviors with respect to washing and drying laundry did not change much post-weatherization, with the exceptions of never leaving lights on in unoccupied rooms and unplugging appliances. This is similar to the results derived from the national, non-territory occupant survey.<sup>14</sup>

---

<sup>11</sup> One can argue that over a 20 year time period, oil prices can be expected to rebound and continue their overall increases, which would then lead to increased electricity costs for Puerto Rican residents. Conversely, the island's electric utility, PERPA, is planning on increasing its use of natural gas and the island has a renewable portfolio standard. These longer term trends could balance each other out to keep electricity prices stable over the analysis time period.

<sup>12</sup> See Tonn et al. 2014. Weatherization Works – Summary of Findings from the Retrospective Evaluation of the U.S. Department of Energy's Weatherization Assistance Program. ORNL/TM-2014/338, Oak Ridge National Laboratory, Oak Ridge, Tennessee, September.

<sup>13</sup> See Tonn, B., Rose, E., Hawkins, B., and Conlon, B. 2014. Health and Household-Related Benefits Attributable to the Weatherization Assistance Program. ORNL/TM-2014/345, Oak Ridge National Laboratory, Oak Ridge, Tennessee, September.

<sup>14</sup> See Tonn B., Rose E., and Hawkins B. (2015). Survey of Recipients of Weatherization Assistance Program Services: Assessment of Household Budget and Energy Behaviors Pre- to Post-Weatherization. ORNL/TM-2015/64, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Other findings presented in this report also suggest that simply leaving information about how to save energy with households is not effective at changing energy use behaviors.

**Table 3.2 Household Energy-Related Behaviors Pre- and Post-Weatherization (N=141)**

Question	Before Weatherization	After Weatherization
Home typically hot or very hot - Yes	79%	58%***
Home kept at unsafe/unhealthy temperature some to almost every month - Yes	79%	54%***
Someone needed medical attention home too hot - Yes	14%	5%***
Air conditioning equipment used	65%	65%
Air condition all rooms in home - Yes	14%	12%
Turned on just about all the time - Yes	24%	30%
Most used ceiling fan – Used just about all the time - Yes	45%	47%
Use window fans to assist cross ventilation - Yes	2%	2%
Windows open all the time - Yes	72%	69%
Close drapes, curtains etc. to block out sun all the time - Yes	22%	16%*
Wash full loads of laundry – most of the time to always	63%	62%
Laundry wash cycle cold	90%	84%***
Laundry rinse cycle cold	92%	90%
Dry full loads of laundry	36%	38%
Hang clothes out to dry frequently to very frequently	82%	79%
Never leave lights on in unoccupied rooms	66%	82%**
Unplug appliances when turned off – Yes	25%	40%***

\*\*\* p < .001, \*\* p < .01, \* p < .05

There is no evidence of the “free rider” phenomena in Puerto Rico’s program. Respondents were asked what ways their households attempted to weatherize their homes or invested in major energy savings measures before applying for the weatherization program. None of the households reported undertaking any of these actions: caulking, removing AC in winter; using material to stop drafts; installing draft stoppers on doors or windows; repairing broken windows; installing home insulation; investing in general energy efficiency measures; and investing new roof/door/windows/appliances or roof sealing. These results strongly suggest that few if any of the households weatherized by the Puerto Rico program would have installed weatherization measures on their own.

### ***Client Satisfaction***

Information about how satisfied the clients were with their weatherization services was mainly collected from a separate client satisfaction survey. Other information was gained through in-person interviews with program staff and clients during the case study visit and from the program information survey. Table 3.3 presents results from the client satisfaction survey. Overall, 97% of respondents reported being satisfied or very satisfied with the program. Table 3.4 indicates that by-and-large the program was user friendly. In other words, it was easy to very easy to request weatherization and schedule visits. As noted above, scheduling visits was a major logistical challenge for the program. Almost all of the respondents (99%) said that weatherization contractors were courteous to very courteous. Over 90% of respondents reported that the auditors, crews, and final inspectors were early or on time. These results are quite similar to results from the national client satisfaction survey.<sup>15</sup>

<sup>15</sup> See Carroll, D., Berger, J., Miller, C., and Driscoll, C. 2014. National Weatherization Assistance Program Impact Evaluation: Client Satisfaction Survey. ORNL/TM-2014/335, Oak Ridge National Laboratory, Oak Ridge, Tennessee, September.

**Table 3.3 Client Satisfaction with Weatherization Services Provided**

<i>How satisfied are you with the _____?</i>	<b>Very Satisfied</b>	<b>Satisfied</b>
Length of time between request to have home weatherized and when it was weatherized	48%	44%
Final condition of the inside of the home	65%	33%
Final condition of the outside of the home	63%	33%
Work performed in the home	71%	24%
New equipment installed in the home	70%	23%
Energy savings achieved after having the home weatherized	57%	31%
Information on saving energy	N/A	N/A
Information on improving health and safety	N/A	N/A
Overall Weatherization Program	70%	27%

**Table 3.4 Client Perceptions of User-Friendliness of Weatherization Program**

<i>How easy was it to _____?</i>	<b>Very Easy</b>	<b>Easy</b>
Request that the home be weatherized	37%	55%
Schedule the initial audit	37%	59%
Schedule the weatherization crew to come to home	45%	52%
Schedule the final inspection	58%	42%

The program reported that approximately 5% of clients had one or more complaints with the program, which is in line with the survey results. The program reported that 75% of the complaints required additional work in the home to resolve. The evaluation team reviewed the history of complaints with the program, the majority of which concerned program recipients calling to check on their status and wondering why the process was taking so long<sup>16</sup>, especially if a neighbor or acquaintance's home had already been weatherized. Other complaints involved a perception of faulty equipment (such as leaky solar water heaters—leaks which often were simply part of the overflow system), and requests for items or services not allowable under WAP guidance or regulations, such as side-by-side refrigerators with through-the-door ice dispensers. However, only a few households have exchanged both a fridge and freezer or multiple refrigerators for a bigger unit, so this was not seen as a significant source of complaint.

A large percentage of respondents (88%) said their homes needed more measures to save energy, with this breakdown:

- other appliances (stove/washer/dryer), 38%
- AC replacement/repair, 36%
- water heater repair or replacement, 10%
- roof replacement/repair, 10%
- solar panels, 6%
- new fridge, 3%

<sup>16</sup> The program reported that in PY 2010 it had 559 units on waiting list with an average wait time of 365 days.

A more significant issue with the program is that clients may not see immediate savings because of the method by which their bills are calculated. There is only one utility company on the island, the Puerto Rico Electric Power Authority. A public corporation founded in 1941, it is heavily dependent on oil for electricity generation. Electric bills are calculated by means of frequent estimates (estimados) as opposed to meter reading (lectura) of actual energy consumption. Estimation cannot catch changes in homes due to weatherization, so customers call to complain when they do not see any reduction in bills. One customer was accused by PREPA of tampering with the electric meter and stealing electricity because the company didn't believe the significant reduction in energy savings. PREPA replaced the meter twice before accepting the client's explanation that weatherization had so significantly reduced energy use. Inaccurate estimation appears to be a problem and households often have to appeal to the PREPA to read the meter after their homes have been weatherized to receive the benefit of energy cost savings.

Because the installation of solar water heaters was a prominent part of the Puerto Rico weatherization program, several questions about this technology were added to the client satisfaction survey. As reported in Table 3.5, almost all of the respondents believe that their solar water heaters work (99%) and are satisfied or very satisfied with this measure (96%). 60% report that the benefits of this technology are lower energy bills and 41% report having more hot water. As noted above, some recipients did not understand how the solar water heaters worked, which did result in some complaints. It does appear as though the program could have provided more education and training about how to maintain this technology. Illustrating again the strong social network in the island of Puerto Rico, 78% of respondents' friends and/or relatives have asked them about their new solar water heaters.

**Table 3.5 Client Satisfaction with Solar Water Heaters**

	<b>Percentage</b>
<i>Did you receive a solar water heater in conjunction with the Weatherization Program? (Yes)</i>	73%
<i>Do you understand how your Solar Water Heater works? (Yes)</i>	96%
<i>Did you receive any education and/or training about how to <b>operate</b> the Solar Water Heater? (Yes)</i>	79%
<i>Did you receive any education and/or training about how to <b>maintain</b> the Solar Water Heater? (Yes)</i>	44%
<i>Does the Solar Water Heater seem to work? (Yes)</i>	99%
<i>Satisfaction with the Solar Water Heater (Very satisfied, satisfied)</i>	96%
<i>Have any of your friends and/or relatives asked you about your new Solar Water Heater? (Yes)</i>	78%
<i>Does it seem as though they (friends/relatives) would also be interested in having a Solar Water Heater installed in their homes?(Yes, most, some)</i>	96%

### ***Program Experiences***

Most weatherization Grantees (i.e., states) and Subgrantees (i.e., local weatherization agencies) in the U.S. found the ARRA period to be extremely challenging at the very least.<sup>17</sup> The rapid program expansion and increased funding often induced more media and political attention and in almost all cases resulted in more oversight. Because Puerto Rico initiated their weatherization program during the ARRA period, additional stresses experienced by other programs throughout the U.S. brought on by massive change

<sup>17</sup> See Tonn B., Rose E., and Hawkins B., (2015). Characterization of the Weatherization Assistance Program During the Recovery Act Period. ORNL/TM-2014/593, Oak Ridge National Laboratory, Oak Ridge, TN, March.

were not experienced to the same extent in Puerto Rico. Through the program information survey, the program reported there were no political issues that concerned them during this period. Though it appears that media attention increased, it was generally positive, focused mainly on the positive stories of energy saved and helping low income households, and was judged to be neither beneficial nor unbeneficial to the program.

In addition to the issues documented above, the program had to deal with a few other administrative issues. For example, as it was expanding, the program experienced some bottlenecks in purchasing refrigerators and air conditioning units and competed with other DOE ARRA programs for labor 'to a moderate extent.' The program found that the public's understanding of the program was only 'fair.' For example, there were difficulties in understanding the income eligibility table. Potential applicants thought they had to meet the maximum income rather than 'equal to' or 'not to exceed' the amount. In response, the program began to include 'Not to exceed' in its ads.

### **3.5 LOOKING TO THE FUTURE POST-ARRA**

Discussions about post-ARRA strategies for Puerto Rico's WAP yielded few options for redressing the significant funding reduction. While ramping down the Program will certainly be an issue for AAE and AFI, both AAE and AFI expressed a desire to get the ARRA period extended to allow them to expend their ARRA funds in the most efficient manner.

As the Program ramps down, there will be job losses; however, this prospect did not appear to generate anxiety among the professional staff within the weatherization network, as the staff's educational levels and the availability of funds in other government projects allow the professional staff to move from one job in their field to the next without much trouble. AFI staff reported no preparation for ramp-down at their level and said that no retraining is offered, other than standard weatherization training.

#### ***Post-ARRA Leveraging***

Prospects for post-ARRA leveraging were not immediately seen on the horizon. No one who was interviewed believed that PREPA could be convinced to provide leveraged resources; weatherization and other energy-efficiency efforts do not benefit a power company's bottom line, and in Puerto Rico, there are no established public resource funds for weatherization services such as exist in other states.

#### ***Role of WAP and ARRA in the Future of Energy Efficiency Efforts in Puerto Rico***

During Puerto Rico's most recent gubernatorial election (2008), candidates spoke of a need to focus on energy efficiency and to move away from dependence on fossil fuels; some attempted to promote renewable energy systems. Until WAP, energy efficiency had been a topic of concern at both the government and household level—householders in Puerto Rico had wanted to do something about home energy consumption, both to reduce the percentage of income used for energy and to deal with the increase in public utility rates for electricity—but the number of householders that wanted to weatherize far outmatched the resources available at the time. WAP and ARRA funds have considerably reduced the discrepancy between the numbers of people who wanted to weatherize their homes and the number who actually could do so. WAP staff at the AAE and AFI agreed that the Program has offered people what they were seeking, as was also evidenced by the volume of applications received at call centers during enrollment periods.



#### **4. CONCLUSIONS**

Included in the Recovery Act milieu that engulfed DOE's WAP was a provision to fund new weatherization programs in five U.S. territories: Puerto Rico, American Samoa, Guam, the U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands. The latter four territories received between \$1 and \$2 million in weatherization funding. Puerto Rico received more than \$65 million. The former weatherized an average of 590 units, the latter over 15,000.

The ARRA period evaluation of WAP offered the unique opportunity to document the establishment of a new weatherization program in Puerto Rico. Through a case study visit and analysis of survey and billing history data, it is shown that Puerto Rico was not only successful in building a viable weatherization program to meet the unique needs of the island, but also that its program saved a comparable amount of energy and achieved comparable high levels of client satisfaction to that of WAP. This was achieved in a housing stock quite unlike the typical homes weatherized across the U.S. and with a different set of weatherization measures.



**APPENDIX A: SNAPSHOTS – NINE WEATHERIZED HOMES IN  
PUERTO RICE**



## APPENDIX A: SNAPSHOTS – NINE WEATHERIZED HOMES IN PUERTO RICO

**Unit 1:** This occupant-owned home is of typical Puerto Rican concrete construction. (See Figures A.1-4 on next page). One side of the home has an open patio, where the occupant spends much time. Washer and dryer are outside, the home has louvered Miami-style windows and is all-electric. This unit received standard WAP measures for Puerto Rico’s program: a solar water heater, a new refrigerator, a window AC replacement in the bedroom, a low-flow showerhead, and new CFL bulbs. The observed utility bill showed about 20 percent kWh savings but no cost savings due to significantly heightened electricity rates.



**Fig. A.1. Ponce Region Unit 1**



**Fig. A.2. AC unit**



**Fig. A.3. Solar Water Heater**



**Fig. A.4. New refrigerator**

**Unit 2.** This home, occupied by an elderly couple, was an example of the practice of utility estimation (rather than meter-reading) being a problem (the electric meter did not actually work). Contractors installed an energy efficient ceiling fan to assist with air-flow through the home during the day. The home had French style glass windows instead of aluminum Miami windows. Unit 2 received the following standard WAP measures for Puerto Rico's program: a solar water heater, a refrigerator replacement, a window AC unit in the bedroom, a low-flow showerhead, and new chandelier with CFL bulbs (See Figures A.5-8).



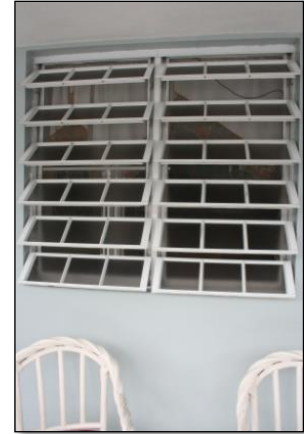
**Fig. A.5. Ponce Region Unit 2**



**Fig. A.6. Chandelier CFLs**



**Fig. A.7. Roof Solar HW**



**Fig. A.8. Louvered Windows**

**Unit 3.** The occupants of this unit are a couple with two small children. The father is a high-school teacher and the mother home-schools the children, one of whom, 7 years old, was present for the audit and has taken a great interest in recycling and energy issues. The mother heard about the Program from a friend; she then spread the word to her own friends. Unit 3 received the following standard WAP measures for Puerto Rico's program: a solar hot- water heater, AC servicing, low-flow showerheads, and new CFLs (See Figures A.9-12). Note: No new refrigerator was installed as the family had recently installed a new one.



**Fig. A.9. Ponce Region Unit 3**



**Fig. A.10. Homeschool room**



**Fig. A.11. Window A/C Unit**



**Fig. A.12. Wall AC Unit**

**Unit 4:** Occupants were a couple with two children. No one is home during the day. Upon arrival for the site visit, the female head of household was just arriving home. The indoor temperature was 87 degrees F. Unit 4 received the following standard WAP measures for Puerto Rico's program: a solar water heater (OG100 Certified), new CFLs, and AC servicing (See Figures A.13-16).



**Fig. A.13. Ponce Region Unit 4**



**Fig. A.14. Wall AC unit**



**Fig. A.15. Solar water heaters**



**Fig. A.16. Program Staff**



**Unit 5.** The occupants of Unit 5 are a mother and child. The home has a mini-split AC with fans on the roof and Miami windows. The family has a propane-fueled washing machine for which fuel is delivered about once every four months. The home has a natural sunlight skylight in the ceiling. Unit 5 received the following standard WAP measures for Puerto Rico's program: a solar water heater, new CFLs, AC servicing and cleaning, and cleaning of refrigerator coils (See Figures A.17-18).



**Fig. A.17. Ponce Region Unit 5**



**Fig. A.18. Roof Solar HW Heater**

**Unit 6.** The house is occupied by a family with many children. The family had already installed CFLs prior to weatherization. The AC unit was not working at the time of the audit, so was not replaced. After weatherization, the occupant reported a decrease in her utility bills from \$300 to \$140. She reported that her neighbor was not eligible for the program but had installed some of the same measures on his own, based on this household's positive report. Line-drying of clothes was evidenced here even though the family possessed an electric dryer (See Figures A.19-21).



**Fig. A.19. Southwestern Region Unit 6**



**Fig. A.20. Miami Windows**



**Fig. A.21. Clothes  
line-dried**

**Unit 7.** The home is a two-story building with two separate units on each story. Only the bottom unit received weatherization services. After weatherization, the family at first reported no change in their electric bill but then realized the bill was still being estimated rather than metered by the utility company. The electric company did not at first believe the amount of the reduction; they came out a second time for a reading to make sure it was accurate. Unit 7 received the following standard WAP measures for Puerto Rico's program: a solar water heater and a new refrigerator (See Figures A.22-24).



**Fig. A.22. S.W.  
Region Unit 7**



**Fig. A.23. Solar HW Heater**



**Fig. A.24. Utility Meter**

**Unit 8.** The home (See Figures A.25-A.26) is located in a 3-year-old subdivision with solar water heaters on every roof. It has a long patio on the side. The householder reported that the Program had been recommended by friends from work and that her meter was read, not estimated. Unit 8 received the following standard WAP measures for Puerto Rico's program: a new refrigerator and new CFLs.

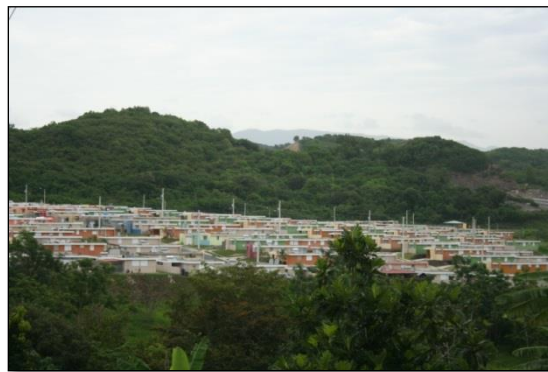


**Fig. A.25. Southwestern Region Unit 8**



**Fig. A.26. Puerto Rico Housing Development**

**Unit 9.** This home (See Figures A.27) did not have AC, so the cooling system was not replaced. However, the female head of household reported having asthma triggered by the pollen outside coming into the home through open windows. Homeowners reported overall satisfaction with the solar water heater and client education, also reporting a decrease in energy bills from \$100 down to \$64. The householder reported having replaced the new low-flow showerhead with her old one, which she preferred. Unit 9 received the following standard WAP measures for Puerto Rico's program: a solar water heater, a new refrigerator, new CFLs, and a low-flow showerhead.



**Fig. A.27. Southwestern housing development with several rooftop solar HW heaters**

**APPENDIX B: NATIONAL WEATHERIZATION ASSISTANCE  
PROGRAM EVALUATION TERRITORIES OCCUPANT AND CLIENT  
SATISFACTION SURVEYS**



## **APPENDIX B.1: NATIONAL WEATHERIZATION ASSISTANCE PROGRAM EVALUATION TERRITORIES OCCUPANT SURVEY**

**INTRO 1:** Hello. May I please speak to **[INSERT NAME FROM SAMPLE]**?

- 01 YES **[GO TO INTRODUCTION]**
- 02 NO, NOT AVAILABLE **[GO TO CALLBACK SCRIPT #1]**
- 96 REFUSED **[GO TO CALLBACK SCRIPT #1]**
- 97 DON'T KNOW/NOT SURE **[GO TO CALLBACK SCRIPT #1]**

**INTRO 2 intentionally omitted**

**(CALLBACK SCRIPT #1):** When would be a good time to call back? **[IF NEEDED SAY]:** When can we schedule a time to speak with the head of household or his or her spouse?

**[WHEN CLIENT OR OTHER HEAD OF HOUSEHOLD COMES TO THE PHONE, OR IF SOMEONE ASKS WHAT THE CALL IS ABOUT, READ]:**

**INTRODUCTION:** This is (INTERVIEWER) from **[INSERT PHONE CENTER]**, calling on behalf of the Energy Affairs Administration regarding the Weatherization Assistance Program Evaluation. We are calling people who received weatherization services, to discuss how they use energy in their homes.

In appreciation of your time, we will send you a **[\$20]** gift card for answering questions related to your energy use. You should have already received a letter in the mail explaining the purpose of this study.

**[IF RESPONDENT ASKS ABOUT LENGTH:** This survey will take about 30 minutes.]

### **READ IF NECESSARY:**

- We received your name from the Energy Affairs Administration, to be used as part of a sample of weatherization clients.
- This survey will take about 30 minutes, depending on your answers, and we will send you **\$20** for completing it.
- All of the information obtained from this survey will be protected and will remain confidential. The data will be analyzed in such a way that the information you provide cannot be associated back to you or your household. Your individual answers will not be shared with anyone at the agency that served you.

**S1 and S2 intentionally omitted**

**S3a (S5b CSS).** Our records show that your current address is: **[INSERT ADDRESS FROM SAMPLE]**. Can you confirm this is your current address?

- 01 YES **[GO TO SECTION A]**
- 02 NO **[ASK S3c]**
- 96 REFUSED **[GO TO TERMINATION SCRIPT]**
- 97 DON'T KNOW/NOT SURE **[GO TO TERMINATION SCRIPT]**

**S3b intentionally omitted**

**S3c.** Have you moved since we last spoke in July?

- 01 YES **[ASK S3d THEN GO TO TERMINATION SCRIPT]**

- 02 NO [GO TO SECTION A]  
96 REFUSED [GO TO TERMINATION SCRIPT]  
97 DON'T KNOW/NOT SURE [GO TO TERMINATION SCRIPT]

S3d. Why did you move?

[GO TO TERMINATION SCRIPT]

**S4a-S6a intentionally omitted**

TERMINATION SCRIPT [IF S3c=01/96/97:] I'm sorry, but at this time you do not qualify to participate in the survey. Thank you for your time.

[READ IF NECESSARY:]

- We are conducting the evaluation of the weatherization program and do not have information on when or if your home will be weatherized. For information on the status of your weatherization application, you have to contact your local agency.
- Unfortunately, the **gift card** is for those who qualify for and complete the survey.

## **A. HOME CHARACTERISTICS**

Now, let's start by talking about your home. . .

A1(A2). How many bedrooms do you have in your home? Please include bedrooms in finished attics or finished basements.

- 01 RESPONSE PROVIDED  
ENTER NUMBER: \_\_\_\_\_  
96 REFUSED  
97 DON'T KNOW/NOT SURE

A2(A3). Please think about other rooms in your home besides bedrooms and bathrooms. Not including unfinished areas, hallways, and closets, how many other rooms are there in your home?

- 01 RESPONSE PROVIDED  
ENTER NUMBER \_\_\_\_\_  
96 REFUSED  
97 DON'T KNOW/NOT SURE

A2a(NEW) Now, I'd like you to think back to the *year before* receiving weatherization in your home. Was any air conditioning equipment used in your home during the year *prior* to receiving weatherization services?

- 01 YES  
02 NO  
96 REFUSED  
97 DON'T KNOW/NOT SURE

A3(A6). Is any air conditioning equipment *currently* used in your home?

- 01 Yes [SKIP TO A3b]  
02 No  
96 REFUSED [SKIP TO A3b]  
97 DON'T KNOW/NOT SURE [SKIP TO A3b]

**[ASK IF A3=NO]**

A3a(A6a). Just to clarify, do you have air conditioning equipment but don't use it, or does your home just not have any air conditioning equipment?

01 HAVE EQUIPMENT, BUT DON'T USE IT **[SKIP TO A5]**

02 DON'T HAVE ANY AIR CONDITIONING EQUIPMENT **[SKIP TO A5]**

96 REFUSED **[SKIP TO A5]**

97 DON'T KNOW/NOT SURE **[SKIP TO A5]**

**[ASK IF A3=1, 96 OR 97]**

A3b What type of air conditioning equipment do you currently use in your home? Do you use **[ASK FOR A THROUGH D]**?

- a. A window unit or units?
- b. A through the wall unit or units?
- c. A mini-split system?
- d. A central air conditioning system?

01 YES

02 NO

96 REFUSED

97 DON'T KNOW/NOT SURE

**[ASK IF A2a=YES, ELSE SKIP TO INSTRUCTIONS BEFORE A4c]**

A4a(NEW). In the year *before* you received weatherization, did you air condition all **[INSERT SUM OF A1+A2]** rooms?

01 YES **[SKIP TO A4c]**

02 NO

96 REFUSED **[SKIP TO A4c]**

97 DON'T KNOW/NOT SURE **[SKIP TO A4c]**

A4b(NEW).How many of those rooms were NOT cooled?

01 RESPONDENT GAVE NUMBER

ENTER NUMBER \_\_\_\_\_

96 REFUSED

97 DON'T KNOW/NOT SURE

**[ASK IF A3=YES]**

A4c(A7). How about *since* receiving weatherization, do you air condition all **[INSERT SUM OF A1 + A2]** rooms?

01 YES **[SKIP TO A5]**

02 NO

96 REFUSED **[SKIP TO A5]**

97 DON'T KNOW/NOT SURE **[SKIP TO A5]**

A4d(A7a).How many of those rooms are NOT cooled?

01 RESPONDENT GAVE NUMBER

ENTER NUMBER \_\_\_\_\_

96 REFUSED

97 DON'T KNOW/NOT SURE



A5(A17). Do you have an on-site system that generates electricity such as a solar system or a small wind turbine? **[INTERVIEWER NOTE: SOLAR WATER HEATERS DO NOT COUNT AS ‘YES’ RESPONSE TO THIS QUESTION]**

- 01 YES
- 02 NO **[SKIP TO A6]**
- 96 REFUSED **[SKIP TO A6]**
- 97 DON’T KNOW/NOT SURE **[SKIP TO A6]**

A5a(A17a). What type of on-site system do you have? **[READ IF NECESSARY]**

- 01 SOLAR OR PHOTOVOLTAIC SYSTEM
- 02 SMALL WIND TURBINE
- 03 COMBINED HEAT AND POWER SYSTEM
- 95 OTHER SPECIFY: \_\_\_\_\_
- 96 REFUSED
- 97 DON’T KNOW/NOT SURE

A5b(A17b). Is your on-site system connected to the grid?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON’T KNOW/NOT SURE

A6(A23). What fuel does the cooking stove and/or oven use? **[READ IF NECESSARY. CHECK ALL THAT APPLY]**

- 01 Electricity
- 02 Natural gas from underground pipes
- 03 Propane (bottled gas)
- 04 Fuel oil
- 05 Kerosene
- 06 Wood
- 95 SOME OTHER FUEL SPECIFY: \_\_\_\_\_
- 96 REFUSED
- 97 DON’T KNOW/NOT SURE
- 99 NO WORKING STOVE OR OVEN IN THE HOME **[IF VOLUNTEERED]**

A7(A24). Is an exhaust fan that vents to the outside used regularly when cooking in your kitchen?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON’T KNOW/NOT SURE

A8(A26). Does your household use a microwave oven?

- 01 YES
- 02 NO **[SKIP TO A9]**
- 96 REFUSED **[SKIP TO A9]**
- 97 DON’T KNOW/NOT SURE **[SKIP TO A9]**

A8a(A26a). Which statement best describes how frequently your household uses the microwave to prepare hot meals and snacks in a typical week? The microwave is. . . **[READ]**

- 01 Used to cook or reheat *most* meals and snacks,
- 02 Used to cook or reheat *about half* of meals and snacks,
- 03 Used to cook or reheat *a few* meals and snacks, or
- 04 Used very little?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A9(A29). Do you currently have a CO (or carbon monoxide) monitor in your house?

- 01 YES
- 02 NO [**SKIP TO A10**]
- 96 REFUSED [**SKIP TO A10**]
- 97 DON'T KNOW/NOT SURE [**SKIP TO A10**]

A9a(A29a). Is your CO monitor currently working?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A10(A30). Do you have one or more smoke detectors in your house?

- 01 YES
- 02 NO [**SKIP TO A11**]
- 96 REFUSED [**SKIP TO A11**]
- 97 DON'T KNOW/NOT SURE [**SKIP TO A11**]

A10a(A30a). How many smoke detectors are there in your house?

- 01 RESPONSE PROVIDED  
ENTER NUMBER \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW

A10b(A30b). How many of these smoke detectors are currently working?

- 01 RESPONSE PROVIDED  
ENTER NUMBER \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF A3b\_d=YES, ELSE SKIP TO INSTRUCTIONS BEFORE A12]**

A11(A34). Central air conditioning requires that the system have ducts to carry the cooled air to the individual rooms. Does your home have ducts like these?

- 01 YES
- 02 NO [**SKIP TO A12**]
- 96 REFUSED [**SKIP TO A12**]
- 97 DON'T KNOW/NOT SURE [**SKIP TO A12**]

A11a(A34a). Does the central air conditioning equipment that cools your home also cool any other apartments, condos, households, businesses, or farm buildings?

- 01 YES
- 02 NO
- 96 REFUSED

97 DON'T KNOW/NOT SURE

A11b(A34b). Which of the following statements best describe the way your central air conditioning system was used *the year before you received weatherization*? The central air conditioning was. . .

[READ]

- 01 Not used
- 02 Turned on only a few days or nights when really needed
- 03 Turned on quite a bit
- 04 Turned on just about all year
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

[ASK IF A3b\_a OR A3b\_b OR A3b\_c=YES, ELSE SKIP TO A13]

A12(A35). Which of the following statements best describes the way your household used the *most used* window or wall air conditioning unit *the year before you received weatherization*? The most used window or wall air conditioner unit was... [READ]

- 01 Not used
- 02 Turned on only a few days or nights when really needed
- 03 Turned on quite a bit
- 04 Turned on just about all year
- 05 NO WORKING WINDOW/WALL UNITS IN HOME
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A13(A37). How many ceiling fans does your household *currently* have?

- 01 RESPONDENT GAVE NUMBER  
ENTER NUMBER \_\_\_\_\_
- 02 NONE [SKIP TO A14]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A13a(A37a). How many ceiling fans did your household have *the year before weatherization*?

- 01 RESPONSE PROVIDED  
ENTER NUMBER \_\_\_\_\_
- 02 NONE [SKIP TO A14]
- 96 REFUSED [SKIP TO A14]
- 97 DON'T KNOW/NOT SURE [SKIP TO A14]

A13b(A37b). [IF A13a>1, INSERT "Thinking about the ceiling fan *that you used the most* before weatherization, how" ; IF A13a=1, INSERT "How" ] often was this fan used that *year*? Was it . . .

[READ]

- 01 Not used at all,
- 02 Used only a few days or nights, when it's really needed,
- 03 Used quite a bit, or
- 04 Used just about all the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A14(A38). Opening windows on opposite sides of the house to cool the indoor temperature is called natural cross ventilation. In the year *before* weatherization did your household use window fans to assist with natural cross ventilation?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A15(A39). In the year before weatherization, how often were your windows open? **[READ]**

- 01 Never,
- 02 Rarely,
- 03 Sometimes,
- 04 Frequently, or
- 05 All the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A16(A41). Do any large trees shade your home from the afternoon sun?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A17(A42). *Before receiving weatherization*, how often did you close the drapes, curtains, shades, and/or blinds during the day to block out the sun? **[READ]**

- 01 Never,
- 02 Rarely,
- 03 Sometimes,
- 04 Frequently, or
- 05 All the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF A2a=YES, ELSE SKIP TO A19]**

A18(A62). In the year *before* weatherization, was your household unable to use the central air conditioner because it was broken?

- 01 YES
- 02 NO
- 94 NO CENTRAL AIR CONDITIONING
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF A2a=YES, ELSE SKIP TO A19]**

A18a(A62). In the year *before* weatherization, was your household unable to use a room air conditioner because it was broken?

- 01 YES
- 02 NO
- 94 NO ROOM AIR CONDITIONING
- 96 REFUSED

97 DON'T KNOW/NOT SURE

A19(A64). Please think about the indoor temperature of your home *before* you received weatherization. Was it typically comfortable, hot or very hot? **[READ LIST]**

01 VERY COLD **[IF VOLUNTEERED]**

02 COLD **[IF VOLUNTEERED]**

03 Comfortable

04 Hot

05 Very Hot

95 OTHER \_\_\_\_\_

96 REFUSED

97 DON'T KNOW/NOT SURE

A20(A66). In year *before* weatherization, how often did your household keep your home at a temperature that you felt was unsafe or unhealthy? **[READ]**

01 Almost every month

02 Some months

03 1 or 2 months

04 Never

96 REFUSED

97 DON'T KNOW/NOT SURE

A21(A68). In year before weatherization, did anyone in your household need medical attention because your home was too hot?

01 YES

02 NO

96 REFUSED

97 DON'T KNOW

Now I'd like you to think about your actions *since receiving* weatherization.

**[ASK IF A3b\_d=YES, ELSE SKIP TO INSTRUCTIONS BEFORE A23]**

A22(A34b\_2). Which of the following statements best describes the way your central air conditioning system is used *now*, since receiving weatherization? The central air conditioning is. . . **[READ]**

01 Not used,

02 Turned on only a few days or nights when really needed,

03 Turned on quite a bit, or

04 Turned on just about all the time?

96 REFUSED

97 DON'T KNOW/NOT SURE

**[ASK IF A3b\_a OR A3b\_b OR A3b\_c=Yes, ELSE SKIP TO INSTRUCTION BEFORE A24]**

A23(A35\_2). Which of the following statements best describes the way your household uses the *most used* window or wall air conditioning unit since receiving weatherization services? The most used window or wall air conditioner unit is... **[READ]**

01 Not used,

02 Turned on only a few days or nights when really needed,

03 Turned on quite a bit, or

04 Turned on just about all the time?

05 NO WORKING WINDOW/WALL UNITS IN HOME

96 REFUSED

97 DON'T KNOW/NOT SURE

**[SKIP TO A25 IF A13=2]**

A24(A37b\_2). **[IF A13a>1, INSERT “Thinking about the ceiling fan *that you use the most* since receiving weatherization, how; IF A13a=1, INSERT “How”]** often has **[IF A13a>1, INSERT “this” ; IF A13a=1, INSERT “your ceiling”]** fan been used *since you received weatherization*? Has it been . . .  
**[READ]**

- 01 Not used at all,
- 02 Used only a few days or nights, when it's really needed,
- 03 Used quite a bit, or
- 04 Used just about all the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A25(A38\_2). *Since receiving weatherization*, has your household used window fans to assist with natural cross ventilation? **[READ IF NECESSARY: Opening windows on opposite sides of the house to cool the indoor temperature is called natural cross ventilation.]**

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A26(A39\_2). *Since receiving weatherization*, how often are your windows open? **[READ]**

- 01 Never,
- 02 Rarely ,
- 03 Sometimes ,
- 04 Frequently, or
- 05 All the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A27(A42\_2). *Since receiving weatherization*, how often do you close the drapes, curtains, shades, and/or blinds during the day to block out the sun? **[READ]**

- 01 Never,
- 02 Rarely,
- 03 Sometimes,
- 04 Frequently, or
- 05 All the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF A3b\_d=YES, ELSE SKIP TO INSTRUCTIONS BEFORE A28a]**

A28(A62\_2). *Since receiving weatherization*, was your household unable to use the central air conditioner because it was broken?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF A3b\_a OR A3b\_b or A3b\_c=YES, ELSE SKIP TO A29]**

A28a(A62\_2). Since receiving weatherization, was your household unable to use a room air conditioner because it was broken?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A29(A64\_2). Please think about the indoor temperature of your home since receiving weatherization. Is it typically comfortable, hot or very hot? **[READ LIST]**

- 01 VERY COLD **[IF VOLUNTEERED]**
- 02 COLD **[IF VOLUNTEERED]**
- 03 Comfortable
- 04 Hot
- 05 Very hot
- 95 OTHER \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A30(A66\_2). Since receiving weatherization, how often does your household keep your home at a temperature that you feel is unsafe or unhealthy? **[READ]**

- 01 Almost every month,
- 02 Some months,
- 03 1 or 2 months, or
- 04 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A31(A68\_2). Since receiving weatherization, did anyone in your household need medical attention because your home was too hot?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW

A32(A43). Does your home have a thermostat that controls the cooling in your home?

- 01 YES
- 02 NO **[SKIP TO B1]**
- 96 REFUSED **[SKIP TO B1]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO B1]**

A33(A44). Some thermostats can be programmed so that the temperature changes automatically at different times of the day; for example, the air conditioning can be automatically turned off while you are away from home, and then turned on again shortly before you return. Is the thermostat that controls your main cooling equipment programmable?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A34(E9). On a typical week day is there someone at home most or all of the day?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

For the next questions, if thermostats are set at different temperatures, only report for the thermostat that affects the rooms where most of the people are.

A35(A58). At what temperature is the central air conditioning equipment set when *someone is inside* your home *during the day*? [**IF NO ANSWER, PROBE:** What's your best estimate?]

- 01 RESPONSE PROVIDED  
ENTER DEGREES CELSIUS: \_\_\_\_\_
- 02 AIR-CONDITIONER TURNED OFF
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A35a(NEW). Is this temperature higher, lower, or the same as it was *before* you received weatherization?

- 01 HIGHER
- 02 LOWER
- 03 THE SAME
- 04 DID NOT HAVE WORKING AC PRIOR TO WEATHERIZATION
- 96 REFUSED
- 97 DON'T KNOW

A36(A59). At what temperature is the central air conditioning equipment set when *no one is inside* your home *during the day*? [**IF NO ANSWER, PROBE:** What's your best estimate?]

- 01 RESPONSE PROVIDED  
ENTER DEGREES CELSIUS: \_\_\_\_\_
- 02 AIR-CONDITIONER TURNED OFF
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

A36a(NEW). Is this temperature higher, lower, or the same as it was before you received weatherization?

- 01 HIGHER
- 02 LOWER
- 03 THE SAME
- 04 DID NOT HAVE WORKING AC PRIOR TO WEATHERIZATION
- 96 REFUSED
- 97 DON'T KNOW

A37(A60). At what temperature is the central air conditioning equipment set inside your home *at night*? [**IF NO ANSWER, PROBE:** What's your best estimate?]

- 01 RESPONDENT GAVE TEMPERATURE  
ENTER DEGREES CELSIUS \_\_\_\_\_
- 02 AIR-CONDITIONER TURNED OFF
- 96 REFUSED



97 DON'T KNOW/NOT SURE

A37a(NEW). Is this temperature higher, lower, or the same as it was before you received weatherization?

01 HIGHER

02 LOWER

03 THE SAME

04 DID NOT HAVE WORKING AC PRIOR TO WEATHERIZATION

96 REFUSED

97 DON'T KNOW

## **B. OCCUPANT BEHAVIOR IN HOME**

The next group of questions is about laundry appliances and water use in your home.

B1. Is a clothes washing machine used in your home? **[READ IF NECESSARY: Do not include community clothes washers that are located in the basement or laundry room of your apartment building.]**

01 YES

02 NO

96 REFUSED

97 DON'T KNOW/NOT SURE

B2. Do you use a clothes dryer in your home? **[READ IF NECESSARY: Do not include community clothes dryers that are located in the basement or laundry room of your apartment building.]**

01 Yes

02 No **[SKIP TO B3]**

96 REFUSED **[SKIP TO B3]**

97 DON'T KNOW/NOT SURE **[SKIP TO B3]**

B2b. Does your clothes dryer vent directly to the outdoors?

01 YES

02 NO

03 DRYER IS VENTLESS **[IF VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

B3(B6). Does your main bathroom have a ventilation fan in it that works?

01 YES

02 NO

96 REFUSED

97 DON'T KNOW

Now, I'm going to ask you some questions specifically about the year *before* you received weatherization.

**[ASK IF B1=YES, ELSE SKIP TO B5]**

B4(B1a). In an average week the year before you received weatherization, how many loads of laundry were washed in your clothes washer? **[READ]**

01 1 load or less,

02 2 to 4 loads,

03 5 to 9 loads,

04 10 to 15 loads, or

- 05 More than 15 loads?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B4a(B1b). In the year before weatherization, how often did your household wash only full loads of laundry? **[READ]**

- 01 Always,
- 02 Most of the time,
- 03 Some of the time, or
- 04 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B4b(B1c). Before weatherization, what water temperature setting did you usually use for the *wash* cycle of your clothes washer? Was it hot, warm, or cold water?

- 01 HOT
- 02 WARM
- 03 COLD
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B4c(B1d). Before weatherization, what water temperature setting was usually used for the *rinse* cycle of your clothes washer? Was it hot, warm, or cold water?

- 01 HOT
- 02 WARM
- 03 COLD
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF B2=YES, ELSE SKIP TO B6]**

B5(B2a). Before weatherization, how often did your household dry only full loads of laundry....?

**[READ]**

- 01 Always,
- 02 Most of the time,
- 03 Some of the time, or
- 04 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B5a(B2c). Before weatherization, did you clean your clothes dryer's lint filter after every use?

- 01 YES
- 02 NO
- 03 DRYER HAS NO LINT FILTER **[IF VOLUNTEERED]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B6(B3). Before weatherization, how frequently did your household hang clothes to dry? **[READ]**

- 01 Very frequently,
- 02 Frequently,
- 03 Infrequently,

- 04 Very infrequently, or
- 05 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B6a(NEW). In the year before you received weatherization, did anyone in your household use *only cold water* to shower?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B7(B7). Electric dehumidifiers remove moisture from the air. Was a dehumidifier used in your home in the year prior to weatherization?

- 01 YES
- 02 NO **[SKIP TO B8]**
- 96 REFUSED **[SKIP TO B8]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO B8]**

B7a(B7a). In the year before weatherization, how many months was the dehumidifier used? **[READ]**

- 01 1 to 3 months,
- 02 4 to 6 months,
- 03 7 to 9 months,
- 04 10 to 11 months, but not all year, or
- 05 Turned on all year long?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Now I have some questions about lights and appliances inside your home. Again, when answering these questions, please think about the year *before* weatherization.

B8(B8). How often did you find lights left on in rooms that are not occupied in the year *before* you received weatherization? **[READ]**

- 01 Never,
- 02 Almost never,
- 03 Sometimes,
- 04 Most of the time, or
- 05 All the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B9(B11). In the year before weatherization, did you unplug any appliances like TVs, VCRs, stereos, radios, clocks, or computers when they were turned off?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Now I'd like you to focus on your laundry appliances and water use in your home, *since you received weatherization services*.

**[ASK IF B1=YES, ELSE SKIP TO INSTRUCTIONS BEFORE B11]**

B10(B1a\_2). In an average week since you received weatherization, how many loads of laundry are washed in your clothes washer? **[READ]**

- 01 1 load or less,
- 02 2 to 4 loads,
- 03 5 to 9 loads,
- 04 10 to 15 loads, or
- 05 More than 15 loads?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B10a(B1b\_2). Since you received weatherization, how often does your household wash only full loads of laundry? **[READ]**

- 01 Always,
- 02 Most of the time,
- 03 Some of the time, or
- 04 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B10b(B1c\_2). Since you received weatherization, what water temperature setting do you usually use for the *wash* cycle of your clothes washer? Is it hot, warm, or cold water?

- 01 HOT
- 02 WARM
- 03 COLD
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B10c(B1d\_2). Since you received weatherization, what water temperature setting do you usually use for the *rinse* cycle of your clothes washer? Is it hot, warm, or cold water?

- 01 HOT
- 02 WARM
- 03 COLD
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF B2=YES, ELSE SKIP TO B12]**

B11(B2a\_2). Since you received weatherization, how often does your household dry only full loads of laundry....? **[READ]**

- 01 Always,
- 02 Most of the time,
- 03 Some of the time, or
- 04 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF B2=YES, ELSE SKIP TO B12]**

B11a(B2c\_2). Since you received weatherization, do you clean your clothes dryer's lint filter after every use?

- 01 YES
- 02 NO
- 03 DRYER HAS NO LINT FILTER **[IF VOLUNTEERED]**
- 96 REFUSED

97 DON'T KNOW/NOT SURE

B12(B3\_2). Since receiving weatherization, how frequently does your household hang clothes to dry?  
[READ]

- 01 Very frequently,
- 02 Frequently,
- 03 Infrequently,
- 04 Very infrequently, or
- 05 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B13(B4). Since receiving weatherization, has the temperature of your water heater been adjusted?

- 01 YES
- 02 NO
- 03 NO WATER HEATER [IF VOLUNTEERED]
- 04 RECEIVED NEW WATER HEATER VIA PROGRAM [IF VOLUNTEERED]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

[ASK IF B13=YES, ELSE SKIP TO B14]

B13a(B4a). How has the temperature been adjusted? [READ]

- 01 The temperature is much warmer,
- 02 The temperature is warmer,
- 03 The temperature is cooler,
- 04 The temperature is much cooler, or
- 05 The hot water heater was not in working order for the last 12 months?
- 06 RECEIVED NEW WATER HEATER VIA PROGRAM [IF VOLUNTEERED]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B14(B5). Since you received weatherization, has the duration of the showers taken by household members increased, decreased, or not changed?

- 01 INCREASED
- 02 DECREASED
- 03 NOT CHANGED
- 04 NO SHOWER [IF VOLUNTEERED]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

[ASK IF B14=01 OR B14=02, ELSE SKIP TO INSTRUCTIONS BEFORE B15]

B14a(B5a). Since receiving weatherization, has the duration of showers taken by household members [IF B14=01: increased; IF B14=02: decreased] a lot or just a little?

- 01 A LOT
- 02 JUST A LITTLE?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

[ASK IF B3=1, ELSE SKIP TO B15b]

B15(B6a). Since you received weatherization, how often do you or members of your household operate the fan while showering? [READ]

- 01 Never,
- 02 Rarely,
- 03 Sometimes,
- 04 Frequently, or
- 05 All the time?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF B15=2, 3, 4, 5, ELSE SKIP TO B15b]**

B15a(B6b). How long after showering do you or members of your household operate the fan? **[READ]**

- 01 The fan is turned off when leaving the shower area,
- 02 A few minutes,
- 03 Several minutes, or
- 04 Until the steam in the shower area is gone
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B15b(NEW) Since receiving weatherization, does anyone in your household use only cold water to shower?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

B16(B7\_2). Since receiving weatherization, has your household used a dehumidifier in your home?

**[READ IF NECESSARY: Electric dehumidifiers remove moisture from the air.]**

- 01 YES
- 02 NO **[SKIP TO B17]**
- 96 REFUSED **[SKIP TO B17]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO B17]**

B16a(B7a\_2). Is the dehumidifier used more often, less often or about the same as it was before you received weatherization?

- 01 MORE OFTEN
- 02 LESS OFTEN
- 03 ABOUT THE SAME
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Now I'm going to ask about the use of lights and appliances in your household since receiving weatherization.

B17(B8\_2). Since receiving weatherization, how often do you find lights left on in rooms that are not occupied? **[READ]**

- 01 Never,
- 02 Almost never,
- 03 Sometimes,
- 04 Most of the time, or
- 05 All the time?
- 96 REFUSED

97 DON'T KNOW/NOT SURE

B18(B11\_2). Since receiving weatherization, do you unplug any appliances like TVs, VCRs, stereos, radios, clocks, or computers when they are turned off?

01 YES

02 NO

96 REFUSED

97 DON'T KNOW/NOT SURE

B19(B9). Do members of your household purchase or intentionally seek out and install compact fluorescent bulbs in your home?

01 YES

02 NO **[SKIP TO B20]**

03 I DO NOT KNOW WHAT COMPACT FLUORESCENT BULBS ARE **[IF VOLUNTEERED] [SKIP TO B20]**

96 REFUSED **[SKIP TO B20]**

97 DON'T KNOW/NOT SURE **[SKIP TO B20]**

B19a(NEW). Did your household begin buying CFLs before or after receiving weatherization?

01 BEFORE

02 AFTER

96 REFUSED

97 DON'T KNOW

B19b(B9a). How do you dispose of compact fluorescent light bulbs that are broken or no longer working? Are they. . . **[READ]**

01 Put directly in household garbage?

02 Doubled bagged in plastic in household garbage?

03 Transported to local recycling center?

95 OTHER (SPECIFY) \_\_\_\_\_

96 REFUSED

97 DON'T KNOW/NOT SURE

B20(B10). Are you familiar with the Energy Star® label?

01 Yes

02 No **[SKIP TO SECTION C]**

96 REFUSED **[SKIP TO SECTION C]**

97 DON'T KNOW/NOT SURE **[SKIP TO SECTION C]**

B20a(NEW). Were you familiar with the Energy Star® label *before* you received weatherization services?

01 YES

02 NO **[SKIP TO SECTION C]**

96 REFUSED **[SKIP TO SECTION C]**

97 DON'T KNOW/NOT SURE **[SKIP TO SECTION C]**

B20b(B10a). Before receiving weatherization, did your household buy or intentionally install appliances or consumer electronics that had an Energy Star® label?

01 YES

02 NO

- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

### C. HOME CONDITIONS

In this next set of questions, I will ask you about conditions in your home.

C1(C7). Does your home frequently have a mildew odor or musty smell?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

C2(C8). How often do you observe standing water anywhere in your home? Examples of standing water include wet carpet, puddles, or flooding in the home. **[READ]**

- 01 Never,
- 02 Rarely,
- 03 Sometimes,
- 04 Often, or
- 05 Always?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

C3(C9). Have you seen mold in your home in the past 12 months?

- 01 YES
- 02 NO **[SKIP TO D1]**
- 96 REFUSED **[SKIP TO D1]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO D1]**

**[ASK IF C3=YES, ELSE SKIP TO SECTION D]**

C3a(C9a). What have you done about the mold? **[READ] [CHECK ALL THAT APPLY]**

- 01 Nothing
- 02 Cleaned with bleach
- 03 Cleaned with other chemical mold remover
- 04 Cleaned with natural mold remover (vinegar or natural product)
- 05 Air Conditioned
- 06 Used ventilation (fans)
- 07 Used a dehumidifier
- 08 Contacted a professional
- 09 CLEANED WITH A WATER PRESSURE MACHINE [NEW CODE ADDED AFTER INTERVIEWING COMPLETE, NOT READ TO RESPONDENTS]
- 95 OTHER SPECIFY \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

### D. ENERGY BILLS



Now I would like to ask you a few questions about your energy bills. Some households may face challenges in paying home energy bills. The following questions ask about challenges your household may have paying home energy bills or maintaining cooling equipment.

D1. Some energy utilities and suppliers offer *budget* payment plans that allow a household to pay the same amount on the home energy bill each month. Since receiving weatherization, did your household use a *budget* plan for any home energy bill?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

D2. How well do you understand the information on your energy bill other than the amount owed? For example, information about how much energy your household used during the billing period compared to the same billing period one year ago. **[READ]**

- 01 Very well,
- 02 Well,
- 03 Neither well nor not well,
- 04 Not well, or
- 05 Not well at all?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Now let's focus on issues your household may have faced *before* receiving weatherization.

D3. Before receiving weatherization, how hard was it to pay your energy bills? **[READ]**

- 01 Very hard,
- 02 Hard,
- 03 Neither hard nor not hard,
- 04 Not hard, or
- 05 Not hard at all?
- 96 REFUSED
- 97 DON'T KNOW

D4(D13). In the year before receiving weatherization, how often did your household pay an amount less than what you owed on your home energy bill, because you were unable to afford the whole home energy bill? **[READ]**

- 01 Almost every month,
- 02 Some months,
- 03 1 or 2 months, or
- 04 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

D5(D15). When home energy bills are not paid on time, it is common for energy utilities and suppliers to send late notices. If the bill is very late, they will send a disconnect, shut-off, or non-delivery notice. In the year before receiving weatherization, how often did you receive a disconnect, shut-off, or non-delivery notice? **[READ]**

- 01 Almost every month,
- 02 Some months,
- 03 1 or 2 months, or

- 04 Never? **[SKIP to D6]**
- 96 REFUSED **[SKIP TO D6]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO D6]**

D5a(D15a). Did you enter into a payment arrangement with your energy utility or supplier . in response to the disconnect, shut-off, or non-delivery notice that they sent you in the year before you received weatherization?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

D6(D16). In the year before receiving weatherization, was your electricity ever disconnected because you were unable to pay your home energy bill?

- 01 YES
- 02 NO **[SKIP TO D6b]**
- 96 REFUSED **[SKIP TO D6b]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO D6b]**

**[ASK ONLY IF A2a=YES, OTHERWISE GO TO D6b]**

D6a(D16b). While your electricity was disconnected, was there a time when you wanted to use your air conditioner but were unable to?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

D6b (D12). In the *five years prior* to receiving weatherization, did you or anyone in the household experience any of the following as a result of energy bills? [First is/Next is] [INSERT ITEM. RATE ALL, A-E]

- a. Eviction from your home
- b. Foreclosure on your mortgage
- c. Moved in with friends or family
- d. Moved into a shelter or been homeless
- e. Family separation

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF D6b\_e=YES, ELSE SKIP TO D7]**

D6c(D12a). In what way or ways was the family separated? **[READ] [SELECT ALL THAT APPLY]**

- 01 Only adult partners were separated
- 02 One adult partner was separated from the other partner and children
- 03 Only one parent was separated from children
- 04 Both parents were separated from children
- 05 An elder parent of relative was separated from the family
- 95 OTHER SPECIFY: \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Now I'd like to talk about your situation *since receiving weatherization*. When thinking about these questions, include all of your experiences since receiving your weatherization services.

D7(D3\_2). How hard is it to pay your energy bills since you received weatherization? **[READ]**

- 01 Very hard,
- 02 Hard,
- 03 Neither hard nor not hard,
- 04 Not hard, or
- 05 Not hard at all?
- 96 REFUSED
- 97 DON'T KNOW

D8(D13\_2). Since receiving weatherization, how often has your household paid an amount less than what you owed on your home energy bill, because you were unable to afford the whole home energy bill?

**[READ]**

- 01 Almost every month,
- 02 Some months,
- 03 1 or 2 months, or
- 04 Never?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

D9(D15\_2). Since receiving weatherization, how often have you received a disconnect, shut-off, or non-delivery notice? **[READ]**

**[READ IF NECESSARY:** When home energy bills are not paid on time, it is common for energy utilities and suppliers to send late notices. If the bill is very late, they will send a disconnect, shut-off, or non-delivery notice.]

- 01 Almost every month,
- 02 Some months,
- 03 1 or 2 months, or
- 04 Never? **[SKIP TO D10]**
- 96 REFUSED **[SKIP TO D10]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO D10]**

D9a(D15a\_2). Did you enter into a payment arrangement with your energy utility or supplier in response to the disconnect, shut-off, or non-delivery notice?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

D10(D16\_2). Since receiving weatherization, was your electricity ever disconnected because you were unable to pay your home energy bill?

- 01 YES
- 02 NO **[SKIP TO D10b]**
- 96 REFUSED **[SKIP TO D10b]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO D10b]**

**[ASK ONLY IF A3=YES, OTHERWISE GO TO D10b]**

D10a(D16b\_2). While your electricity was disconnected, was there a time when you wanted to use your air conditioner but were unable to?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

D10b(D12). Since receiving weatherization, have you or anyone in the household experienced any of the following as a result of energy bills? **[INSERT "First is/Next is"] [INSERT ITEM. RATE ALL, A-E]**

- a. Eviction from your home
- b. Foreclosure on your mortgage
- c. Moved in with friends or family
- d. Moved into a shelter or been homeless
- e. Family separation

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF D10b\_e=YES, ELSE SKIP TO SECTION F]**

D10c(D12a). In what way or ways was the family separated?

- 01 Adult partners only separated
- 02 One adult partner separated from partner and children
- 03 One parent separated from children only
- 04 Both parents separated from children
- 05 Elder parent of relative separated from family
- 95 OTHER SPECIFY: \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**THERE IS NO SECTION E**

## **F. HOUSEHOLD COMPOSITION/EMPLOYMENT**

In this section I will be asking household composition and employment questions.

F1(E7). Including yourself, how many people normally live in this household? Do not include anyone who is just visiting, those away in the military, or children who are away at college.

- 01 RESPONSE PROVIDED  
Enter Number \_\_\_\_\_
- 96 REFUSED **[SKIP TO F3]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO F3]**

F2(E8). Now, I'd like to get some information about each member of the household so I can ask questions about each. Could you please give me the name, gender, age and whether or not they are in school for each person in the household? First, let's start with you – **[NOTE: IF S2=3, RESPONDENT IS PROXY, SAY 'Remember, please answer all of these questions as if you were [INSERT orig\_sample\_name answering these questions.]'**

**[IF F1=1]:** Can you tell me your name again, as well as your age and whether or not you are in school.

**[IF F1>1]:** Now let's turn to the next person in the household. Can you please tell me that person's first name, gender and age, that person's relationship to you and whether or not they are in school?

**[INTERVIEWER NOTE:** "so that person is your \_\_\_\_\_"]

*Respondent*

F2a(E8a) First Name

01 RESPONSE PROVIDED

Name \_\_\_\_\_

96 REFUSED

97 DON'T KNOW/NOT SURE

F2b(E8b) Gender

01 MALE

02 FEMALE

96 REFUSED

97 DON'T KNOW/NOT SURE

F2c(E8c) Age

01 RESPONSE PROVIDED

Age \_\_\_\_\_

96 REFUSED

97 DON'T KNOW/NOT SURE

F2d(E8d) Relationship

01 SELF

02 SPOUSE/PARTNER

03 CHILD

04 GRANDCHILD

05 PARENT

06 GRANDPARENT

07 SIBLING

08 BOYFRIEND/GIRLFRIEND

09 NIECE/NEPHEW

95 OTHER (Specify \_\_\_\_\_)

96 REFUSED

97 DON'T KNOW/NOT SURE

F2e(E8e) In school

01 YES

02 NO

96 REFUSED

97 DON'T KNOW/NOT SURE

PERSON 2

PERSON 3

PERSON 4

PERSON 5

PERSON 6

PERSON 7

PERSON 8

PERSON 9  
PERSON 10

**[SKIP IF F1=1]**

F3(F1). Are you the primary wage earner in your household?

- 01 YES
- 02 NO
- 03 NO PRIMARY WAGE EARNER IN THE HOUSEHOLD
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F3a(F1a). **[IF F3=01 OR F3=03 OR F1=1: Are you; IF F3=02 OR F3=96 OR F3=97: Is the primary wage earner in the household] currently...? [READ]**

- 01 Employed for wages,
- 02 Self-employed,
- 03 Out of work for more than 1 year, **[SKIP TO F3d]**
- 04 Out of work for less than 1 year, **[SKIP TO F3d]**
- 05 A Homemaker, **[SKIP TO F4]**
- 06 A Student,
- 07 Retired, or **[SKIP TO F4]**
- 08 Unable to work? **[SKIP TO F4]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F3b(F1b). **[IF F3=01 OR F3=03 OR F1=1: Are you; IF F3=02 OR F3=96 OR F3=97: Is the primary wage earner in the household] employed full-time or part-time?**

- 01 FULL-TIME
- 02 PART-TIME
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F3c(F1c). How many hours per week **[IF F3=01 OR F3=03 OR F1=1: do you; IF F3=02 OR F3=96 OR F3=97: does the primary wage earner in the household] usually work at all of [IF F3=01 OR F3=03 OR F1=1: your; IF F3=02 OR F3=96 OR F3=97: their] jobs?**

- 01 RESPONSE PROVIDED  
ENTER HOURS \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F3d(F1d). **[IF ANSWERED (03) or (04) to F3a] [IF F3=01 OR F3=03 OR F1=1: Have you; IF F3=02 OR F3=96 OR F3=97: Has the primary wage earner in the household] looked for work during the last 4 weeks?**

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F3e(F1e). **[IF ANSWERED 02 TO F3d] What is the main reason [IF F3=01 OR F3=03 OR F1=1: you were; IF F3=02 OR F3=96 OR F3=97: the primary wage earner was] not looking for work during the last four weeks? [CHECK ALL THAT APPLY] [DO NOT READ LIST]**

- 01 BELIEVES NO WORK AVAILABLE IN LINE OF WORK OR AREA

- 02 COULDN'T FIND ANY WORK
- 03 LACKS NECESSARY SCHOOLING, TRAINING, SKILLS OR EXPERIENCE
- 04 EMPLOYERS THINK TOO YOUNG OR TOO OLD
- 05 OTHER TYPES OF DISCRIMINATION
- 06 CAN'T ARRANGE CHILD CARE
- 07 FAMILY RESPONSIBILITIES
- 08 IN SCHOOL OR OTHER TRAINING
- 09 ILL HEALTH, PHYSICAL DISABILITY
- 10 TRANSPORTATION PROBLEMS
- 95 OTHER (SPECIFY \_\_\_\_\_)
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F4(F2). Does a physical, mental or emotional problem NOW keep **[IF F3=01 OR F3=03 OR F1=1: you; IF F3=02 OR F3=96 OR F3=97: the primary wage earner in the household]** from working at a job or business?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F5(F3). In the past 12 months did anyone in the household receive income from any of the following sources? **[READ AND CHECK ALL THAT APPLY]**

- 01 Supplemental Security Income (SSI)
- 02 Welfare payments or case assistance
- 03 Veteran's payments (VA Benefits)
- 04 Unemployment Compensation
- 05 NONE OF THESE SOURCES
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F6(F4). **[IF ANSWERED (01), (02), (04), OR (06) TO F3a]** During the past 12 months **[IF F3=01 OR F3=03 OR F1=1: have you; IF F3=02 OR F3=96 OR F3=97: has the primary wage earner in the household]** had more than one job (or business), including part time, evening, or weekend work?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

F7(F5). **[IF ANSWERED (01), (02), (04), OR (06) TO F3a]** Thinking about the last 12 months, is **[IF F3=01 OR F3=03 OR F1=1: your; IF F3=02 OR F3=96 OR F3=97: the primary wage earner's]** main job, that is, where the most hours were worked, considered seasonal?

- 01 YES
- 02 NO **[SKIP TO SECTION G]**
- 96 REFUSED **[SKIP TO SECTION G]**
- 97 DON'T KNOW/NOT SURE **[SKIP TO SECTION G]**

F7a(F5a). In what season **[IF F3=01 OR F3=03 OR F1=1: do you; IF F3=02 OR F3=96 OR F3=97: does the primary wage earner]** work the least amount of hours?

- 01 WINTER

- 02 SPRING
- 03 SUMMER
- 04 FALL
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

## G. DEMOGRAPHICS

We're almost done with the survey. This is the final set of questions.

G1(C1). Do you rent or own your current residence?

- 01 RENT
  - 02 OWN
  - 03 NEITHER **[IF VOLUNTEERED]** (Please describe the housing agreement).
- 
- 96 REFUSED
  - 97 DON'T KNOW/NOT SURE

G2(G1). Are you currently...? **[READ]**

- 01 Married,
- 02 Divorced,
- 03 Widowed,
- 04 Separated,
- 05 Never married, or
- 06 A member of an unmarried couple?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

G3(G2). What is the highest degree or level of school you have completed? **[DO NOT READ]**

- 01 NO SCHOOLING COMPLETED
- 02 KINDERGARTEN TO GRADE 12 (NO DIPLOMA)
- 03 HIGH SCHOOL DIPLOMA OR GED
- 04 SOME COLLEGE, NO DEGREE
- 05 ASSOCIATE'S DEGREE (FOR EXAMPLE: AA, AS)
- 06 BACHELOR'S DEGREE (FOR EXAMPLE: BA, BS)
- 07 MASTER'S DEGREE (FOR EXAMPLE: MA, MS, MBA)
- 08 PROFESSIONAL DEGREE (FOR EXAMPLE: MD, JD)
- 09 DOCTORATE DEGREE (FOR EXAMPLE: PHD, EDD)
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

G4(G3). Do you consider yourself to be of Hispanic or Latino origin, **[READ IF NECESSARY: such as Mexican, Puerto Rican, Cuban, or other Spanish background]**?

- 01 YES **[GO TO G6]**
- 02 NO
- 96 REFUSED **[GO TO G6]**
- 97 DON'T KNOW/NOT SURE **[GO TO G6]**



**[ASK IF G4=NO, ELSE GO TO G6]**

G4a. What race would you consider yourself?

---

**G5 and G5a intentionally omitted**

G6(G6). Which of the following best describes the location of your home? Do you live in a city, a town, the suburbs, or in a rural area?

- 01 CITY
- 04 RURAL
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**G7 intentionally omitted**

G8. In the past 12 months, has anyone in your household owned or had the regular use of any cars, trucks, vans, sports-utility-vehicles or similar vehicles? Do not include motorcycles or mopeds. **[IF**

**NECESSARY:** "Regular use" means the vehicle is kept at home and is available for some personal use.]

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

G9. And finally, what was your household's total annual income last year, that is, in 2012?

- 01 RESPONSE PROVIDED  
HOUSEHOLD INCOME: \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

That is the end of the survey. Thank you for your participation! In appreciation of your time, we will be sending you a \$20 gift card in the mail. I just need to verify your full name and address.

M1. Could you please verify that your full name is: **[INSERT resp\_sample\_name OR S2 IF RESPONDENT DIFFERENT FROM SAMPLE]**

- 01 YES
- 02 NO
- 96 REFUSED

**[ASK IF M1=02]**

M1a. Can you please tell me your full name?

- 01 **[RECORD FULL NAME GIVEN: \_\_\_\_\_]**
- 96 REFUSED

M2. Could you please verify that your mailing address is: **[INSERT MAILING ADDRESS FROM SAMPLE]**

- 01 YES
- 02 NO
- 96 REFUSED

**[ASK IF M2=02]**

M2a. Can you please tell me your mailing address?

01 **[RECORD MAILING ADDRESS GIVEN: \_\_\_\_\_]**

96 REFUSED

Thank you, and have a nice day/evening.

**APPENDIX B.2: NATIONAL WEATHERIZATION ASSISTANCE PROGRAM EVALUATION  
TERRITORIES CUSTOMER SATISFACTION SURVEY**

INTRO 1: Hello. May I please speak to **[INSERT NAME FROM SAMPLE]**?

01 YES **[GO TO INTRODUCTION]**

02 NO, NOT AVAILABLE **[ASK INTRO2]**

96 REFUSED **[GO TO CALLBACK SCRIPT]**

97 DON'T KNOW/NOT SURE **[GO TO CALLBACK SCRIPT]**

INTRO2: Is the head of household or his or her spouse available?

01 YES **[GO TO INTRODUCTION]**

02 NO **[GO TO CALLBACK SCRIPT #1]**

96 REFUSED **[GO TO CALLBACK SCRIPT #1]**

97 DON'T KNOW/NOT SURE **[GO TO CALLBACK SCRIPT #1]**

**[CALLBACK SCRIPT #1]:** When would be a good time to call back? **[IF NEEDED SAY]:** When can we schedule a time to speak with the head of household or his or her spouse?

**[WHEN CLIENT OR OTHER HEAD OF HOUSEHOLD COMES TO THE PHONE, OR IF SOMEONE ASKS WHAT THE CALL IS ABOUT, READ]:**

**INTRODUCTION:** This is (INTERVIEWER) from **[INSERT PHONE CENTER]**, calling on behalf of the Energy Affairs Administration regarding the Weatherization Assistance Program Evaluation. We are calling people who received weatherization services, to understand their level of satisfaction with the services provided.

In appreciation of your time, we will send you a **\$10** check for answering questions related to your weatherization experiences. You should have already received a letter in the mail explaining the purpose of this study. **[IF RESPONDENT ASKS ABOUT LENGTH:** This survey will take about 15 minutes.]

**READ IF NECESSARY:**

- We received your name from the Energy Affairs Administration, to be used as part of a sample of weatherization clients.
- This survey will take about 15 minutes, depending on your answers, and we will send you a **\$10 check** for completing it.
- All of the information obtained from this survey will be protected and will remain confidential. The data will be analyzed in such a way that the information you provide cannot be associated back to you or your household. Your individual answers will not be shared with anyone at the agency that served you.

- Please contact Alex Mc Ewan at APPRISE toll-free 888-434-8008 if you have any questions about the survey.

**[IF RESPONDENT DIFFERENT FROM CLIENT IN SAMPLE [INTRO2=YES], ASK S1, OTHERWISE SKIP TO S2]**

S1. May I please have your name?

01 RECORD: \_\_\_\_\_

96 REFUSED **[GO TO CALLBACK SCRIPT #2]**

97 DON'T KNOW/NOT SURE **[GO TO CALLBACK SCRIPT #2]**

S2. **[ASK ALL]** To confirm, are you the head of the household or the spouse of the head of the household? **[INTERVIEWER NOTE: IF THE HEAD OF HOUSEHOLD OR SPOUSE IS DISABLED, A PROXY MAY ANSWER]**

01 YES

02 NO **[GO TO CALLBACK SCRIPT #2]**

03 PROXY ANSWERS FOR HEAD OF HOUSEHOLD

96 REFUSED **[GO TO CALLBACK SCRIPT #2]**

97 DON'T KNOW/NOT SURE **[GO TO CALLBACK SCRIPT #2]**

**[LANGUAGE FOR PROXY RESPONDENTS: IF S2=3, READ: 'Please answer all of these questions as if you were [INSERT orig\_sample\_name FROM DATA FILE] answering these questions.']**

S3a. Our records show that your current address is: **[INSERT ADDRESS FROM SAMPLE]**. Can you confirm this is your current address?

01 YES **[GO TO S4a]**

02 NO **[ASK S3b]**

96 REFUSED **[GO TO TERMINATION SCRIPT]**

97 DON'T KNOW/NOT SURE **[GO TO TERMINATION SCRIPT]**

S3b. Did you *ever* reside at **[INSERT ADDRESS FROM SAMPLE]**?

01 YES **[GO TO TERMINATION SCRIPT]**

02 NO **[GO TO TERMINATION SCRIPT]**

96 REFUSED **[GO TO TERMINATION SCRIPT]**

97 DON'T KNOW/NOT SURE **[GO TO TERMINATION SCRIPT]**

S4a. How long have you lived in your current home?

01 RESPONSE PROVIDED

\_\_\_\_\_ YEARS

\_\_\_\_\_ MONTHS

96 REFUSED **[GO TO TERMINATION SCRIPT]**

97 DON'T KNOW/NOT SURE **[GO TO TERMINATION SCRIPT]**

S4b. In your household, are you a person who is familiar with the weatherization services received through the Weatherization Assistance Program?

01 YES

02 NO **[GO TO CALLBACK SCRIPT #2]**

96 REFUSED **[GO TO CALLBACK SCRIPT #2]**

97 DON'T KNOW/NOT SURE **[GO TO CALLBACK SCRIPT #2]**

**CALLBACK SCRIPT #2:** When can we schedule a time to speak with the person who is most familiar with the weatherization services received through the Weatherization Assistance Program? **[SCHEDULE A TIME.]**

S5a. Have all weatherization services been completed in your home? **[READ IF NECESSARY:** By weatherization services, we mean that weatherization contractors came to your home to install equipment.]

- 01 YES
- 02 NO **[ASK S5b]**
- 96 REFUSED **[GO TO TERMINATION SCRIPT]**
- 97 DON'T KNOW/NOT SURE **[GO TO TERMINATION SCRIPT]**

S5b. Why haven't weatherization services been completed in your home?

- 01 RESPONSE PROVIDED
- 96 REFUSED **[GO TO TERMINATION SCRIPT]**
- 97 DON'T KNOW/NOT SURE **[GO TO TERMINATION SCRIPT]**

S5b\_2. Do you still expect to receive these services?

- 01 SI
- 02 NO

**IF S5a=NO & S5b==96 OR 97, THANK AND TERMINATE, ELSE CONTINUE**

S6. Our records indicate that you received weatherization services in **[INSERT MONTH AND YEAR]**. Is that correct?

- 01 YES**[GO TO START OF SURVEY - Q1]**
- 02 NO **[ASK S6a]**
- 96 REFUSED **[GO TO START OF SURVEY - Q1]**
- 97 DON'T KNOW/NOT SURE **[GO TO START OF SURVEY - Q1]**

S6a. Approximately when did you receive weatherization services? Please tell me the month and year **[READ IF NECESSARY:** Your best guess is fine]

- 01 RESPONSE PROVIDED **[RECORD** Month: \_\_\_\_\_ -Year: \_\_\_\_\_]
- 96 REFUSED **[GO TO START OF SURVEY - Q1]**
- 97 DON'T KNOW/NOT SURE **[GO TO START OF SURVEY - Q1]**

**TERMINATION SCRIPT [IF S5a=02 & S5b==96 OR 97:]** I'm sorry, but at this time you do not qualify to participate in the survey. Thank you for your time.

**[READ IF NECESSARY:]**

- We are conducting the evaluation of the weatherization program and do not have information on when or if your home will be weatherized. For information on the status of your weatherization application, you have to contact your local agency.
- Unfortunately, the **gift card** is for those who qualify for and complete the survey.

Now I'd like to discuss the weatherization program specifically.

Q1. How long have you known about your local weatherization program?

- 01 **[RECORD:** MONTHS: \_\_\_\_\_ YEARS: \_\_\_\_\_]
- 96 REFUSED

97 DON'T KNOW/NOT SURE

Q2. How did you find out about your local weatherization program? **[DO NOT READ] [CHECK ALL THAT APPLY]**

- 01 A CALL FROM THE WEATHERIZATION AGENCY
- 02 LETTER/FLYER
- 03 LOCAL NEWSPAPER OR OTHER LOCAL MEDIA
- 04 FOUND THE PROGRAM ON THE INTERNET
- 05 RELATIVE OR FRIEND MENTIONED THE WEATHERIZATION PROGRAM
- 06 NEIGHBOR WHO HAD THEIR HOME WEATHERIZED
- 07 AGENCY PROVIDING UTILITY ASSISTANCE SUCH AS LIHEAP
- 08 EMAIL FROM AN ORGANIZATION WITH WHICH YOU ARE A MEMBER
- 09 CHURCH
- 10 SOCIAL SERVICES/SENIOR PROGRAM
- 11 UTILITY COMPANY/FUEL SUPPLIER
- 12 TELEVISION OR OTHER MEDIA
- 13 MUNICIPALITY
- 95 OTHER **[SPECIFY \_\_\_\_\_]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q3. How long ago did you first request that your home be weatherized?

- 01 RESPONSE PROVIDED
- MONTHS: \_\_\_\_\_ YEARS: \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q4. How satisfied are you with the length of time between your request to have your home weatherized and when it actually was weatherized? Are you **[READ]**...?

- 01 Very satisfied,
- 02 Satisfied,
- 03 Neither satisfied nor dissatisfied,
- 04 Dissatisfied, or
- 05 Very dissatisfied?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q5. How easy was it to request that your house be weatherized? Was it **[READ]**...?

- 01 Very easy,
- 02 Easy,
- 03 Neither easy nor difficult,
- 04 Difficult, or
- 05 Very difficult?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**INITIAL INSPECTION:**

In this next set of questions, I will be asking about the initial audit of your home, before you received weatherization services. During an audit or assessment, a person from the agency looks at your home and energy-using equipment to see what they can do to reduce the energy used in your home.

Q6. How easy was it to schedule the initial audit of your home? Was it [READ]...?

- 01 Very easy,
- 02 Easy,
- 03 Neither easy nor difficult,
- 04 Difficult, or
- 05 Very difficult?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q7. How timely were the people who did the initial audit of your home? Did they arrive [READ] . .?

- 01 Early or on time,
- 02 Less than 30 minutes late,
- 03 30-59 minutes late,
- 04 1 to 3 hours late, or
- 05 More than 3 hours late?
- 06 DID NOT SHOW UP ON SCHEDULED DAY [IF VOLUNTEERED]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q8. How courteous were the people who did the initial audit of your home? Were they [READ]...?

- 01 Very Courteous,
- 02 Courteous,
- 03 Neither Courteous nor Rude,
- 04 Rude, or
- 05 Very Rude?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**WEATHERIZATION SERVICES RECEIVED:**

Next, I'd like to talk about the weatherization services you received. This would be when weatherization contractors came to your home to install equipment.

**[INTERVIEWER NOTE: IN SOME CASES THE RESPONDENT MAY HAVE HAD MULTIPLE CREWS COME AND INSTALL EQUIPMENT. THE FOLLOWING QUESTIONS REFER TO THE OVERALL EXPERIENCE WITH ALL CREWS WHO INSTALLED EQUIPMENT]**

Q9. How easy was it to schedule the time for the weatherization contractors to come to your home? Was it [READ]...?

- 01 Very easy,
- 02 Easy,
- 03 Neither easy nor difficult,
- 04 Difficult, or
- 05 Very difficult?
- 95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS \_\_\_\_\_ [IF VOLUNTEERED]
- 96 REFUSED

97 DON'T KNOW/NOT SURE

Q10. How timely was the weatherization crew? Did they arrive **[READ]** . . .?

01 Early or on time,

02 Less than 30 minutes late,

03 30-59 minutes late,

04 1 to 3 hours late, or

05 More than 3 hours late?

06 DID NOT SHOW UP ON SCHEDULED DAY **[IF VOLUNTEERED]**

95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS\_\_\_\_\_ **[IF  
VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

Q11. How courteous were the weatherization contractors? Were they **[READ]**...?

01 Very Courteous,

02 Courteous,

03 Neither Courteous nor Rude,

04 Rude, or

05 Very Rude?

95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS\_\_\_\_\_ **[IF  
VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

Q12. How careful of your home and belongings were the weatherization contractors? Were they **[READ]**...?

01 Very careful,

02 Careful,

03 Neither careful nor careless,

04 Careless, or

05 Very careless?

95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS\_\_\_\_\_ **[IF  
VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

Q13. Overall, how clean did the weatherization contractors leave the inside of your home? Would you say **[READ]**...?

01 Very clean,

02 Clean,

03 Neither clean nor dirty,

04 Dirty, or

05 Very dirty?

95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS\_\_\_\_\_ **[IF  
VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

Q13a. Overall, how clean did the weatherization contractors leave the outside of your home? Would you say **[READ]**...?

01 Very clean,

02 Clean,

03 Neither clean nor dirty,

04 Dirty, or

05 Very dirty?

95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS \_\_\_\_\_ **[IF VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

Q14. Overall, how satisfied were you with the final condition that the inside of your home was left in? Were you **[READ]**...?

01 Very satisfied,

02 Satisfied,

03 Neither satisfied nor dissatisfied,

04 Dissatisfied, or

05 Very dissatisfied?

95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS \_\_\_\_\_ **[IF VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

Q14a. Overall, how satisfied were you with the final condition that the outside of your home was left in? Were you **[READ]**...?

01 Very satisfied,

02 Satisfied,

03 Neither satisfied nor dissatisfied,

04 Dissatisfied, or

05 Very dissatisfied?

95 ADDITIONAL CONTRACTOR-SPECIFIC COMMENTS \_\_\_\_\_ **[IF VOLUNTEERED]**

96 REFUSED

97 DON'T KNOW/NOT SURE

### **FINAL INSPECTION:**

Next, I will be asking about the final inspection of your home. During a final inspection, a person comes to your home to inspect and review the weatherization job that was done.

Q15. Have you had a final inspection?

01 YES

02 NO **[GO TO Q18]**

96 REFUSED **[GO TO Q18]**

97 DON'T KNOW/NOT SURE **[GO TO Q18]**

Q15a. How easy was it to schedule the final inspection of your home? Was it **[READ]**...?

01 Very easy,



- 02 Easy,
- 03 Neither easy nor difficult,
- 04 Difficult, or
- 05 Very difficult?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q16. How timely were the people who did the final inspection of your home? Did they arrive **[READ]**...?

- 01 Early or on time,
- 02 Less than 30 minutes late,
- 03 30-59 minutes late,
- 04 1 to 3 hours late, or
- 05 More than 3 hours late?
- 06 DID NOT SHOW UP ON SCHEDULED DAY **[IF VOLUNTEERED]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q17. How courteous were the people who did the final inspection of your home? Were they **[READ]**...?

- 01 Very Courteous,
- 02 Courteous,
- 03 Neither Courteous nor Rude,
- 04 Rude, or
- 05 Very Rude?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**GENERAL LEVEL OF SATISFACTION:**

In this next set of questions, I will be asking about your general level of satisfaction with the weatherization services you received.

Q18. Overall, how satisfied are you with the work performed in your home? Are you **[READ]**...?

- 01 Very satisfied,
- 02 Satisfied,
- 03 Neither satisfied nor dissatisfied,
- 04 Dissatisfied, or
- 05 Very dissatisfied?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q19. How satisfied are you with any new equipment installed in your home? Are you **[READ]**...?

- 01 Very satisfied,
- 02 Satisfied,
- 03 Neither satisfied nor dissatisfied,
- 04 Dissatisfied, or
- 05 Very dissatisfied?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**NEW TECHNOLOGY QUESTIONS [ASK IF SOLAR WATER HEATER INSTALLED VIA THE PROGRAM]**

T1. Did you receive a solar water heater in conjunction with the Weatherization Program?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

T2. Did you receive a solar water heater at the same time as the organization weatherized your home?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**T3 INTENTIONALLY OMITTED**

T4. Do you understand how the solar water heater works?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

T5. Did you receive any education and/or training about how to *operate* the solar water heater?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

T6. Did you receive any education and/or training about how to *maintain* the solar water heater?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

T7. Does the solar water heater seem to work?

- 01 YES [GO TO T10a]
- 02 NO
- 98 REFUSED
- 99 DON'T KNOW/NOT SURE

T8. In your opinion, did the solar water heater ever work?

- 01 YES
- 02 NO [GO TO T11]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

T9. How long ago do you think that the solar water heater stopped working? Was it . . .

- 01 1-2 months ago
- 02 3-4 months ago
- 03 5-6 months ago

- 04 7-8 months ago, or
- 05 more than 8 months ago
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

#### **T10 INTENTIONALLY OMITTED**

T11. Have you experienced any benefits to yourself or your household since the solar water heater was installed?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

#### **[ASK IF T11=1,YES]**

T11a. What benefits have you experienced?

- 01 RESPONSE PROVIDED
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

- T11a\_01 LOWER ENERGY BILLS
- T11a\_02 SAVING ENERGY
- T11a\_03 HAVE HOT WATER
- T11a\_04 LOWER WATER BILL
- T11a\_05 BETTER/NEW EQUIPMENT
- T11a\_95 OTHER [SPECIFY\_\_\_\_\_]

T12. Do you have any worries about the solar water heater?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

#### **[ASK IF T12=1,YES]**

T12a. What worries do you have? \_\_\_\_\_

T13. Overall, how satisfied are you with your solar water heater? Are you...?

- 01 Very satisfied,
- 02 Satisfied,
- 03 Neither satisfied nor dissatisfied,
- 04 Dissatisfied, or
- 05 Very dissatisfied?
- 06 REFUSED
- 07 DON'T KNOW/NOT SURE

T14. Have any of your friends and/or relatives asked you about your new solar water heater?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK IF T14=YES]**

T15. Does it seem as though they would also be interested in having a solar water heater installed in their homes? Would you say . . .

- 01 Yes, most are interested
- 02 Yes, some are interested, or
- 03 No, none seem interested
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q20. Do you feel that any additional measures or equipment should have been installed in your home to help you save energy?

- 01 YES
- 02 NO **[GO TO Q21]**
- 96 REFUSED **[GO TO Q21]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q21]**

Q20a. What other measures or equipment should have been installed? **[DO NOT READ] [CHECK ALL THAT APPLY]**

- 01 INSULATION
- 02 REFRIGERATOR
- 03 WEATHERSTRIPPING
- 04 **OPTION REMOVED**
- 05 **OPTION REMOVED**
- 06 WATER HEATER REPAIR OR REPLACEMENT
- 07 VENTILATION EQUIPMENT REPAIR OR REPLACEMENT
- 08 WINDOW CAULKING, WINDOW REPLACEMENT OR REPAIR
- 09 DOOR REPLACEMENT OR REPAIR
- 10 OTHER APPLIANCES (COOKING STOVE, CLOTHES WASHER/DRYER)
- 11 ROOF REPLACEMENT OR REPAIR
- 12 HEAT PUMP REPLACEMENT OR REPAIR
- 13 AIR CONDITIONER REPLACEMENT OR REPAIR (ROOM OR CENTRAL)
- 14 SIDING REPLACEMENT OR REPAIR
- 15 FOUNDATION REPLACEMENT OR REPAIR
- 16 AIR-SEALING
- 17 SOLAR PANELS
- 95 OTHER [SPECIFY \_\_\_\_\_]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q21. After having your home weatherized, did you save any energy?

- 01 YES
- 02 NO **[GO TO Q22]**
- 96 REFUSED **[GO TO Q22]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q22]**

Q21a. How satisfied are you with the energy savings achieved after having your home weatherized? Are you **[READ]**...?

- 01 Very satisfied,
- 02 Satisfied,
- 03 Neither satisfied nor dissatisfied,
- 04 Dissatisfied, or

- 05 Very dissatisfied?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q22. Did the weatherization staff check your home for major repairs, such as roof repairs, at any time during the process?

- 01 YES
- 02 NO **[GO TO Q23]**
- 96 REFUSED **[GO TO Q23]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q23]**

Q22a. Did the weatherization staff say major repairs were needed in your home?

- 01 YES
- 02 NO **[GO TO Q23]**
- 96 REFUSED **[GO TO Q23]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q23]**

Q22b. Were major repairs done to your home?

- 01 YES
- 02 NO
- 03 NOT YET BUT EXPECTING REPAIRS TO BE DONE **[IF VOLUNTEERED]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q23. Did the weatherization staff ask you about the health of the members of your household at any time during the process?

- 01 YES **[GO TO 24a]**
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q24. Did you provide them with any information about the health of the members of your household at any time during the process?

- 01 YES
- 02 NO **[GO TO Q25]**
- 96 REFUSED **[GO TO Q25]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q25]**

Q24a. When the work crew came to your home, were any members of your household in need of health care, but not receiving it?

- 01 YES
- 02 NO **[GO TO Q25]**
- 96 REFUSED **[GO TO Q25]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q25]**

Q24b. Did the weatherization staff help you get the needed care?

- 01 YES
- 02 NO
- 96 REFUSED

97 DON'T KNOW/NOT SURE

Q25. Did the weatherization staff or your weatherization agency refer you to any other housing and/or social service programs?

01 YES

02 NO [GO TO Q26]

96 REFUSED [GO TO Q26]

97 DON'T KNOW/NOT SURE [GO TO Q26]

Q25a. What program or programs did they refer you to? [DO NOT READ] [CHECK ALL THAT APPLY]

01 FOOD STAMPS

02 WELFARE

03 WIC – WOMEN, INFANTS, AND CHILDREN NUTRITION PROGRAM

04 LOW-INCOME ENERGY ASSISTANCE PROGRAM (LIHEAP, HEAP, ETC)

05 RELIGIOUS ORGANIZATION

06 HOUSING ASSISTANCE PROGRAM

07 MEDICAL CARE (MEDICAID, CHIP, ETC)

08 ROOF REPAIR

09 ANOTHER ENERGY PROGRAM

95 OTHER [SPECIFY \_\_\_\_\_]

96 REFUSED

97 DON'T KNOW/NOT SURE

**ISSUES WITH WEATHERIZATION SERVICES:**

Next, I will be asking about any issues you may have had with the weatherization services you received.

Q26. Did you have any problems with the weatherization services you received?

01 YES

02 NO [GO TO Q27]

96 REFUSED [GO TO Q27]

97 DON'T KNOW/NOT SURE [GO TO Q27]

Q26a(Q26b). What was the problem about? [DO NOT READ] [CHECK ALL THAT APPLY]

01 MATERIALS/EQUIPMENT CREW

02 CLEAN-UP

03 INSTALLATION

04 SCHEDULING

05 AGENCY/PROGRAM COMMUNICATION

06 REFRIGERATOR MECHANICAL (LEAKS, TOO COLD, TOO HOT)

07 REFRIGERATOR HARDWARE (BROKEN HANDLE, RUBBER SEALS)

08 WATER HEATER ISSUES

95 OTHER [SPECIFY \_\_\_\_\_]

96 REFUSED

97 DON'T KNOW/NOT SURE

Q26b(Q26a). Did you file a complaint about the weatherization services provided?

- 01 YES
- 02 NO [GO TO Q27]
- 96 REFUSED [GO TO Q27]
- 97 DON'T KNOW/NOT SURE [GO TO Q27]

Q26c. Did you reach a resolution of the situation you complained about?

- 01 YES
- 02 NO [GO TO Q26e]
- 96 REFUSED [GO TO Q26e]
- 97 DON'T KNOW/NOT SURE [GO TO Q26e]

Q26d. How satisfied are you with the resolution of the situation you complained about? Are you [READ]...?

- 01 Very satisfied, [GO TO Q27]
- 02 Satisfied,
- 03 Neither satisfied nor dissatisfied,
- 04 Dissatisfied, or
- 05 Very dissatisfied?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q26e. How might the agency have done a better job of resolving your complaint? [DO NOT READ] [CHECK ALL THAT APPLY]

- 01 LISTENED TO THE COMPLAINT BETTER
- 02 ACTED ON COMPLAINT IF STILL A FIXABLE PROBLEM
- 03 BEEN MORE UPFRONT ABOUT PROGRAM IN THE BEGINNING
- 04 APOLOGIZED FOR THE PROBLEM
- 05 COULDN'T HAVE DONE ANYTHING DIFFERENTLY
- 06 INSTALL HIGHER QUALITY EQUIPMENT
- 07 EMPLOY MORE KNOWLEDGEABLE CONTRACTORS
- 95 OTHER [SPECIFY \_\_\_\_\_]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Next, I will be asking about any information you may have received during weatherization.

Q27. Did the weatherization staff provide you with any information on ways to save energy in your home at the time of the visit? Please include information the staff may have told you as well as any printed materials they may have given you.

- 01 YES
- 02 NO [GO TO Q32]
- 96 REFUSED [GO TO Q32]
- 97 DON'T KNOW/NOT SURE [GO TO Q32]

#### Q28 INTENTIONALLY OMITTED

Q29. How well did you understand what the weatherization staff *said to you* about saving energy? Did you understand [READ]...?

- 01 Very well,

- 02 Well,
- 03 Neither well nor not well,
- 04 Not well, or
- 05 Not well at all?
- 94 STAFF PROVIDED NO INFORMATION VERBALLY [IF VOLUNTEERED]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q30. What educational materials, if any, did the weatherization staff give you about saving energy? **[DO NOT READ. CHECK ALL THAT APPLY]**

- 01 ONE OR MORE BROCHURES, BOOKLETS, OR MANUALS
- 02 ONE OR MORE COMPACT DISCS (CDS), VIDEOS, OR DVDS
- 03 HARDWARE KIT OF WEATHERIZATION MATERIALS
- 04 WEATHERIZATION STAFF SPENT TIME DEMONSTRATING HOW TO SAVE ENERGY
- 94 NO MATERIALS WERE PROVIDED [GO TO E27]
- 96 REFUSED [GO TO Q32]
- 97 DON'T KNOW/NOT SURE [GO TO E27]

#### **Q30a INTENTIONALLY OMITTED**

Q30b. How well did you understand the energy savings *materials* that the weatherization staff *gave you*? Did you understand these materials **[READ]**...?

- 01 Very well,
- 02 Well,
- 03 Neither well nor not well,
- 04 Not well, or
- 05 Not well at all?
- 94 NO MATERIALS WERE PROVIDED [IF VOLUNTEERED]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

#### **Qs 30c, 30d, 30e and 31 INTENTIONALLY OMITTED**

Q32. Did the weatherization staff provide you with any information on ways to improve health and safety in your home? Please include information the staff may have told you as well as any printed materials they may have given you.

- 01 YES
- 02 NO [GO TO Q38]
- 96 REFUSED [GO TO Q38]
- 97 DON'T KNOW/NOT SURE [GO TO Q38]

#### **Q33 INTENTIONALLY OMITTED**

Q34. How well did you understand what the weatherization staff *said to you* about improving health and safety? Did you understand **[READ]**...?

- 01 Very well,
- 02 Well,
- 03 Neither well nor not well,
- 04 Not well, or



- 05 Not well at all?
- 94 STAFF PROVIDED NO INFORMATION VERBALLY **[IF VOLUNTEERED]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**Q34a INTENTIONALLY OMITTED**

Q35. What materials, if any, about improving health and safety did the weatherization staff give you?

**[DO NOT READ] [CHECK ALL THAT APPLY]**

- 01 ONE OR MORE BROCHURES, BOOKLETS AND MANUALS
- 02 ONE OR MORE COMPACT DISCS
- 03 ONE OR MORE VIDEOS (INCLUDING DVD'S)
- 94 NO MATERIALS WERE PROVIDED **[GO TO Q38]**
- 95 OTHER **[SPECIFY \_\_\_\_\_]**
- 96 REFUSED **[GO TO Q38]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q38]**

**Q35a INTENTIONALLY OMITTED**

Q35b. How well did you understand the *materials* about improving health and safety that the weatherization staff gave you? Did you understand **[READ]...**?

- 01 Very well,
- 02 Well,
- 03 Neither well nor not well,
- 04 Not well, or
- 05 Not well at all?
- 94 NO MATERIALS WERE PROVIDED **[IF VOLUNTEERED]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**Qs 35c, 35d, 35e, 36 and 37 INTENTIONALLY OMITTED**

Q38. What are some of the greatest benefits your household received by participating in the weatherization program? **[DO NOT READ] [CHECK ALL THAT APPLY]**

- 01 LOWER ENERGY BILL
- 02 MORE COMFORTABLE HOME
- 03 IMPROVED HOME EQUIPMENT
- 04 ENVIRONMENTAL BENEFITS
- 05 HEALTH BENEFITS FOR HOUSEHOLD MEMBERS
- 06 HOME INSULATED
- 07 TIPS GIVEN BY STAFF
- 08 SOLAR WATER HEATER
- 95 OTHER **[SPECIFY \_\_\_\_\_]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q39. What suggestions, if any, do you have for how the weatherization program can be improved? **[DO NOT PROMPT. MARK ALL THAT APPLY]**

- 01 REMOVED FROM THE ANSWERS
- 02 BE MORE UPFRONT WITH PROCESS/BETTER COMMUNICATION

- 03 FASTER WEATHERIZATION PROCESS
- 04 IMPROVE QUALITY OF MATERIALS/CREW/WORK/INSPECTIONS
- 05 MORE FUNDING/APPROVED INSTALLATIONS
- 06 MORE OUTREACH PROGRAMS/ADVERTISING
- 07 MORE MONITORING OF CONTRACTORS AND INSTALLATIONS
- 08 MORE TRAINING AND/OR TIPS FOR WAP RECIPIENTS
- 94 NO SUGGESTED IMPROVEMENTS **[IF VOLUNTEERED]**
- 95 OTHER, SPECIFY
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q40. In the last 12 months, have you told other people who might be interested in receiving weatherization services about the program?

- 01 YES
- 02 NO **[GO TO Q42]**
- 96 REFUSED **[GO TO Q42]**
- 97 DON'T KNOW/NOT SURE **[GO TO Q42]**

Q41. Have those people had their homes weatherized or are they scheduled to have their home weatherized, as a result of your suggestion?

- 01 YES
- 02 NO
- 03 SOME BUT NOT ALL **[IF VOLUNTEERED]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q42. Why did you apply for the Weatherization Assistance Program? Was it to **[READ]**...? **[CHECK ALL THAT APPLY]**

- 01 Reduce energy bills
- 02 Support environmental efforts to conserve energy
- 03 Make home more comfortable
- 04 Receive free services
- 05 IMPROVE HEALTH AND/OR SAFETY
- 95 OTHER **[IF VOLUNTEERED]** **[SPECIFY \_\_\_\_\_]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q43. Prior to receiving weatherization services, in what ways did your household attempt to weatherize your home? Please explain. **[DO NOT READ. CHECK ALL THAT APPLY]**

- 01 CAULKING
- 02 REMOVE WINDOW A/C IN WINTER
- 03 USED FOAM TAPE (OR OTHER MATERIAL) TO STOP DRAFT
- 04 DRAFT STOPPERS ON DOORS OR WINDOWS
- 05 REPLACED OR REPAIRED BROKEN WINDOWS
- 06 PUT IN INSULATION AROUND A/C DUCTS
- 08 ENERGY EFFICIENCY MEASURES
- 09 INSULATION
- 10 **OPTION REMOVED**
- 11 REPLACED OR REPAIRED ROOF/DOOR/WINDOWS/APPLIANCES

- 12 TURNED OFF LIGHTS, OTHER APPLIANCES WHEN NOT IN USE
- 13 ROOF SEALING
- 14 CHANGED TO EFFICIENT LIGHT BULBS
- 94 DID NOT DO ANYTHING
- 95 OTHER [SPECIFY \_\_\_\_\_]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q44. Do you think weatherization will have any impact on how long you stay in your current home? Would you say you are [READ]...? [PROGRAMMER: RANDOMIZE ANSWER CHOICES 1 AND 2]

- 01 More likely to move from your home,
- 02 Less likely to move from your home, or
- 03 Equally likely to move from your home?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q45. How likely is your household to move in the next 12 months for any reason or combination of reasons? Is it [READ]...?

- 01 Very likely,
- 02 Likely,
- 03 Neither likely nor unlikely,
- 04 Unlikely, or
- 05 Very unlikely
- 06 NO CHANCE [IF VOLUNTEERED]
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

Q46. Please rate your overall satisfaction with the weatherization program. Are you [READ]...?

- 01 Very satisfied,
- 02 Satisfied,
- 03 Neither satisfied nor dissatisfied,
- 04 Dissatisfied, or
- 05 Very dissatisfied?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

## G. DEMOGRAPHICS

We're almost done with the survey. This is the final set of questions.

C1. Do you rent or own your current residence?

- 01 RENT
  - 02 OWN
  - 03 NEITHER (IF VOLUNTEERED) (Please describe the housing agreement).
- 
- 96 REFUSED
  - 97 DON'T KNOW/NOT SURE

G1. Are you currently...? [READ]

- 01 Married,
- 02 Divorced,
- 03 Widowed,
- 04 Separated,
- 05 Never married, or
- 06 A member of an unmarried couple?
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

G2. What is the highest degree or level of school you have completed? **[DO NOT READ]**

- 01 NO SCHOOLING COMPLETED
- 02 KINDERGARTEN TO GRADE 12 (NO DIPLOMA)
- 03 HIGH SCHOOL DIPLOMA OR GED
- 04 SOME COLLEGE, NO DEGREE
- 05 ASSOCIATE'S DEGREE (FOR EXAMPLE: AA, AS)
- 06 BACHELOR'S DEGREE (FOR EXAMPLE: BA, BS)
- 07 MASTER'S DEGREE (FOR EXAMPLE: MA, MS, MBA)
- 08 PROFESSIONAL DEGREE (FOR EXAMPLE: MD, JD)
- 09 DOCTORATE DEGREE (FOR EXAMPLE: PHD, EDD)
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

G3. Do you consider yourself to be of Hispanic or Latino origin [READ IF NECESSARY: such as Mexican, Puerto Rican, Cuban, or other Spanish background]?

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

G4. Which describes your race? You can select one or more categories. **[READ]**

- 01 White
- 02 Black or African-American
- 03 American Indian or Alaska Native
- 04 Asian
- 05 Native Hawaiian or Other Pacific Islander
- 06 HISPANIC OR LATINO **[IF VOLUNTEERED]**
- 95 OTHER (SPECIFY \_\_\_\_\_)
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**[ASK G4a IF G4 HAS MORE THAN ONE RESPONSE, ELSE SKIP TO G6]**

G4a. Which ONE of these groups best represents your race? **[SHOW PRIOR RESPONSES ON SCREEN] [READ RESPONSES TO G5 ONLY]**

- 01 White
- 02 Black or African-American
- 03 American Indian or Alaska Native
- 04 Asian
- 05 Native Hawaiian or Other Pacific Islander

- 06 HISPANIC OR LATINO **[IF VOLUNTEERED]**
- 95 OTHER **[SPECIFY \_\_\_\_\_]**
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**G5 INTENTIONALLY OMITTED**

G6. Which of the following best describes the location of your home? Do you live in a city, a town, the suburbs, or in a rural area?

- 01 CITY
- 02 OPTION REMOVED**
- 03 OPTION REMOVED**
- 04 RURAL
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

**G7 INTENTIONALLY OMITTED**

G8. In the past 12 months, has anyone in your household owned or had the regular use of any cars, trucks, vans, sports-utility-vehicles or similar vehicles? Do not include motorcycles or mopeds. **[IF NECESSARY:** "Regular use" means the vehicle is kept at home and is available for some personal use.]

- 01 YES
- 02 NO
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

G9. And finally, what was your household's total annual income last year, that is, in 2012?

- 01 RESPONSE PROVIDED
- HOUSEHOLD INCOME: \_\_\_\_\_
- 96 REFUSED
- 97 DON'T KNOW/NOT SURE

That is the end of the survey. Thank you for your participation! In appreciation of your time, we will be sending you a **\$10 gift card** in the mail. I just need to verify your full name and address for the check.

M1. Could you please verify that your full name is: **[INSERT resp\_sample\_name OR S2 IF RESPONDENT DIFFERENT FROM SAMPLE]**

- 01 YES
- 02 NO
- 96 REFUSED

**[ASK IF M1=02]**

M1a. Can you please tell me your full name as you would like it to appear on the check?

- 01 **[RECORD FULL NAME GIVEN: \_\_\_\_\_]**
- 96 REFUSED

M2. Could you please verify that your mailing address is: **[INSERT MAILING ADDRESS FROM SAMPLE]**

- 01 YES
- 02 NO
- 96 REFUSED

**[ASK IF M2=02]**

M2a. Can you please tell me your mailing address?

01 **[RECORD MAILING ADDRESS GIVEN: \_\_\_\_\_]**

96 REFUSED

Thank you, and have a nice day/evening