HUD Green Academy

Course 5

Energy Performance Contracting for Small PHAs

Syllabus

Course Description
This course reviews the U.S. Department of Housing and Urban Development (HUD) incentive programs available to support small PHAs' energy and water conservation measures (ECMs). Small PHAs have traditionally had difficulty attracting energy service companies and financing for moderate retrofits. In terms of participating in HUD's incentives, this course focuses on *leveling the playing field* for small PHAs by assisting them with developing a sustainable energy/water project that achieves real energy savings and reduces maintenance costs. This course targets small PHAs and covers the basic process for implementation of an Energy Performance Contract (EPC). Strategies include how to: get started; maximize HUD's incentives to pay for the conservation measures; project implementation methods; validate savings; and, finance the project. Participants will hear success stories from other small PHAs that used different approaches to implement their project either by working with an Energy Services Company, managing their own project or partnering with other PHAs.

Course Objectives

- Understand EPCs and the process of implementation
- Identify common Energy and Water Conservation Measures (ECM)
- Understand and prepare for an Investment Grade Energy Audit (IGEA)
- Describe the financing options and ongoing management required

Module #1	State of Play – Energy Performance Contracting (EPC)
Module #2	Getting Started
Module #3	HUD Incentives – EPC and non-EPC Incentives
Module #4	ESCO, Go It Alone, or Project Aggregation
Lunch	
Module #5	Investment Grade Energy Audit (IGEA)
Module #6	Energy and Water Conservation Measures (ECMs)
Module #7	Measurement and Verification (M&V)
Module #8	Financing and Repayment
Module #9	HUD's EPC Review Process
	Review and Course Evaluation

Module 1
State of Play – Energy Performance Contracting

Topic	Insights and Questions
What is an EPC?	
Historical Perspective	
EPC Program – State of Play	
EPC Benefits	

Module 2
Getting Started

Topic	Insights and Questions
Where do I Begin?	
What are the Next Steps?	

Module 3
HUD Incentives – EPC and non-EPC Incentives

Topic	Insights and Questions
Frozen Rolling Base Incentive	
Subsidy Add-On Incentive	
Resident-Paid Utilities	
Other non-EPC Incentives	

What next steps can you take to investigate appropriate incentives?

Timing	Next Steps	Resources/Info Needed
Short		
Short		
Medium		
Medium		

Module 4
ESCO, Go it Alone, or Project Aggregation

Topic	Insights and Questions
What Should I Consider?	
Bringing and ESCO on Board	
Vignette – Meriden, CT	
Self-Managed EPC Process	
Vignette – Rahway, NJ	
Aggregated Project	
Vignette – Yolo County Housing	

What next steps can you take, and what additional resources do you need to decide whether to use an ESCO, self-managed, or aggregated process?

Next Steps	Resources/Info Needed

Module 6
Energy and Water Conservation Measures (ECMs)

Topic	Insights and Questions
PIH Notice 2011-36	
Prioritizing ECMs	
Staff/Resident Training	

Module 7
Measurement and Verification

Topic	Insights and Questions
M&V Principles	
Benefits of M&V	
Preparing for M&V	
M&V Options	
Benchmarking	

Module 8
Financing and Repayment

Topic	Insights and Questions
Financing Vehicles	
Small PHA Financing	
Selecting Financing	
Section 30 Requirements	

Module 9
HUD's EPC Review Process

Topic	Insights and Questions
HUD Review and Approval	
PHA Responsibilities	
EPC Program Requirements	
Next Steps	

Green Affordable Housing Action Plan

My vision for the role of sustainability in advancing the mission of my organization is:

_____

_____

In order to advance this vision, within the next **three months** I will:

_____

_____

As a first step to achieving this vision, within the next **two weeks** I will:

_____

_____

I will measure the success of this effort over time by:

_____

_____

Upon returning to work, I will reach out to in order to:

Organization or Person _____

I will also explore resources or partnerships that will enable me to:

Insert Goal or Intent _____

_____

Energy Improvements Checklist

Guidance on Selecting Energy Conservation Measures
How to Interpret Attached Information

The information in this guidance provides Public Housing Agencies (PHAs) with information that will assist them in selecting and prioritizing energy conservation improvements to consider, maintenance tasks to perform and the type of energy efficient equipment to purchase. For best results HUD recommends that PHAs consult a whole house performance contractor (See Building Performance Institute, www.bpi.org) or home energy rater (See RESNET, www.natresnet.org) to review the energy efficiency of the existing building to determine the most cost-effective improvements.

Tier 1 Energy Conservation Measures (page 2) – lists nine measures that provide the most return on investment. If a PHA has not invested in any of the nine measures (e.g., energy star lighting), it should consider installing all or most of these measures.

Tier 2 Energy Conservation Measures (page 3) - lists six measures that provide solid return on investment. Tier 2 measures may require more time than Tier 1 measures to achieve savings (e.g., replacement of cooling equipment). A PHA should contract to install Tier 1 and Tier 2 measures, simultaneously, or any other combination thereof.

Tables 1-5 (pages 4, 5): Energy Efficiency with Lighting, Water and Ductwork Sealing and Insulation) specifies the parameters for installing four of the measures outlined on (page A-2), so the PHA is aware what is entailed in terms of type of product specifications and tasks.

Table 6 (pages 5, 6): Envelope Sealing and Installation Specifications - provides the recommended insulation levels for various areas (e.g., attic, crawl space of basement, and basement wall) of the building envelope and by climate zone.

Tables 7-10 (pages 6, 7): Heating, Ventilation and Air Conditioning (HVAC) Maintenance and Replacement Specifications - specifies the maintenance tasks that a PHA should perform to ensure the HVAC equipment operates at peak efficiency, e.g., replacing filters every 30 days, verify registers and grills are open and free of obstruction). Table 10 specifies the type of HVAC equipment a PHA should purchase in order to operate at peak energy efficiency all climate zones (e.g., ENERGY STAR qualified A/C, full-sized dual boilers).

Table 11 (page 8): Replacement Water Heater Specifications - explains what type of water heater equipment to use depending on variable such as whether current equipment has failed or not and whether the PHA is willing to pay a little more upfront to reduce water heating bills by as much as 7/30/50% (e.g., gas condensing water heater, solar technology to heat water).

Table 12 (page 9): Energy Efficient Window, Door and Skylights Specifications - details what type of windows, doors and/or skylights a PHA would purchase depending on climate zone (e.g., Northern, North/Central, South/Central). A gradation of U-Factor and SHGC numbers are provided by climate zone in order to determine the rate of heat/cooling transmissions at various window/door/skylight protection levels. The lower the U Factor the more energy efficient the window, door or skylight will be (e.g., in the South/Central </= 40 is more efficient than </=41SHGC (the solar heat gain coefficient). The lower the SHGC number, the less solar heat it transmits and the greater it's shading ability. A high SHGC rating, the more effective the equipment is at collecting solar heat gain during the winter.

Table 13 (page 9): Energy Efficient Motor/Pumps Specification - provides a web link that describes the scope of products and nominal efficiency levels for motors/pumps that are used to operate energy equipment.

Table 14 (page 10): Building Management System Specification - provides guidance on building management and automation systems.

APPENDIX A

Energy Conservation Measures (See Appropriate Table for Specs.)	Applicable to Detached, Townhome, Semi-Detached	Applicable to Walk-up, Elevator, Mixed Buildings	Benefits of Energy Conservation Measure		
TIER 1					
Lighting, Fixtures and Controls (See Table 1)	Yes	Yes	**ENERGY STAR Qualified Unit**	**Life-Cycle Energy Saved**	**Payback (Years)**
			Lighting	450 kWh	0.3
			Indoor Fixtures	1,740 kWh	2.7
			Outdoor Fixtures	2,660 kWh	0
Appliances (See Table 2)	Yes	Yes	**ENERGY STAR Qualified Unit**	**Life-Cycle Energy Saved**	**Payback (Years)**
			Refrigerators	930 kWh	3.9
			Clothes Washers	280 kWh	4.4
			Dishwashers	850 kWh	0
Programmable Thermostat (See Table 3)	Yes	Yes	Homeowners can save up to $180 a year by properly setting their programmable thermostats and maintaining those settings. Resident education is an important component to realizing the savings from programmable thermostats.		
Water Efficiency (See Table 4)	Yes	Yes	**Water Conservation Measures**	**Justification**	**Payback (Years)**
			WaterSense certified Toilets	Toilets account for approx. 27% of indoor water use	5 to 10
			WaterSense Certified Faucets and Accessories	Faucets account for approx. 16% of indoor water use	1 to 2
			WaterSense certified showerheads	Showers account for approximately 17% of indoor water use	1 to 2
			Inspect water distribution system for leaks and conduct repairs	Important for multi-unit and older buildings with central water heating systems	Save up to 10%
Ductwork Improvements (See Table 5)	Yes	Yes	Ducts that move air to-and-from a forced air furnace, central air conditioner, or heat pump are often big energy wasters. Sealing and insulating ducts can improve the efficiency of your heating and cooling system by as much as 20% (sometimes much more).		
Envelope Improvements (See Table 6)	Yes	Yes	Sealing and insulating the "envelope" or "shell" of your home is often the most cost effective way to improve energy efficiency and comfort. ENERGY STAR estimates that a skilled contractor can save up to 20% on heating and cooling costs (or up to 10% on the total annual energy bill) by sealing and insulating.		
HVAC Maintenance (See Table 7)	Yes	Yes	Maintain your equipment to prevent future problems and unwanted costs. Keep your cooling and heating system at peak performance by having a contractor do annual pre-season check-ups.		
Ventilation Upgrades (See Table 8)	Yes	Yes	Without mechanical ventilation to provide fresh air, moisture, odors, and other pollutants can build up inside a home. Mechanical ventilation systems circulate fresh air using ducts and fans, rather than relying on airflow through small holes or cracks in a home's walls, roof, or windows. Some of the benefits of mechanical ventilation are better indoor air quality, more control of air flow and improved comfort.		
Install Energy Management Controls (See Table 9)	Applicable to Townhomes with Central Boilers	Yes	Energy management controls are used to optimize building systems resulting in cost savings and better comfort		

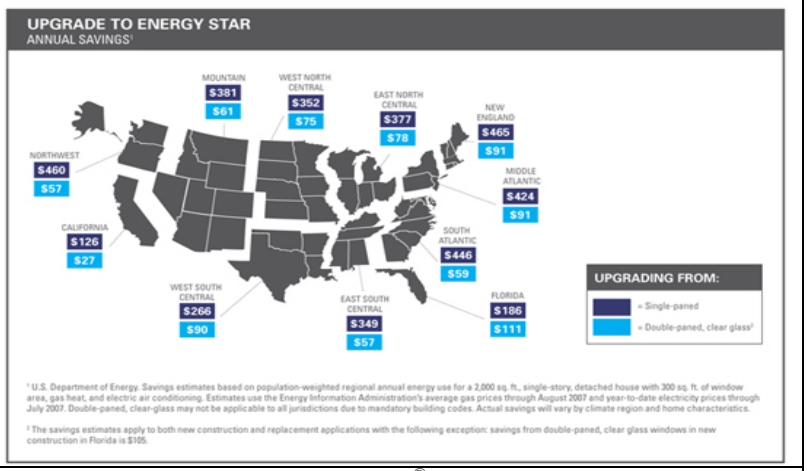
Energy Conservation Measure (See Appropriate Table for Specs.)	Applicable to Detached, Townhome, Semi-Detached Buildings	Applicable to Walk-up, Elevator, Mixed Buildings	Benefits of Energy Conservation Measure
TIER 2			
Replacement Cooling Equipment (See Table 10)	Yes	Yes	Heating and cooling cost the average homeowner about $1,000 a year which is nearly half the home's total energy bill. If your central air conditioning unit is more than 12 years old, replacing it with an ENERGY STAR qualified model could reduce cooling costs by 30 percent.
Replacement Heating Equipment (See Table 10)	Yes	Yes	
Replacement Water Heating (See Table 11)	Yes	Yes	The average household spends $400–$600 per year on water heating, making it the second largest energy expenditure behind heating and cooling. Most homes have conventional water heaters that are barely more efficient than ones sold 20 years ago. ENERGY STAR qualified water heaters include smart design enhancements that offer significant improvements in efficiency and performance. Depending on the technology you choose, you can cut your water heating costs in half.
Replacement Windows, Doors and Skylights (See Table 12)	Yes	Yes	ENERGY STAR qualified windows, doors and skylights can help reduce energy bills up to 15 percent. Estimated savings vary from region-to-region depending on current heating and cooling costs and are generally greatest where there are hot summers, cold winters or both. 
Replacement Motor/Pumps (See Table 13)	No	Yes	Look for and specify NEMA Premium® to optimize motor systems efficiency, reduce electrical power consumption and costs, and improve system reliability.
Install Building Management System (See Table 14)	No	Yes	Energy management controls are used to optimize building systems resulting in cost savings and better comfort

Table 1.0 Energy Efficient Lighting and Fixtures Specifications

Lighting, Fixtures and Controls	**Lighting:** ENERGY STAR qualified light fixtures bulbs use about 75 percent less energy than standard incandescent bulbs, generate75% less heat, and last up to 10 times longer. Bulbs are available in different sizes and shapes to fit in almost any fixture. ENERGY STAR qualified fixtures are designed to optimize the performance of the enclosed efficient light source. **Fixtures in public spaces:** • **Retrofit:** ENERGY STAR qualified compact fluorescent lamps (CFLs) only if the property management entity will be solely responsible for the maintenance of these fixtures to ensure non-regression to incandescent sources. Recessed and/or dimming applications require CFLs designed specifically for the application. • **Replacement:** Replacement fixtures should be ENERGY STAR qualified featuring pin-based fluorescent high pressure sodium or metal halide sources. **Fixtures in private units:** • Meet light fixture performance characteristics of ENERGY STAR qualified light fixtures or better **Lighting controls:** Lighting controls should be carefully selected to ensure optimum performance and compatibility with light fixtures, and to maximize payback. Frequent switching of high efficacy sources, particularly compact fluorescent lighting sources (pin-based fluorescent or screw base CFL) will lead to reduced lamp life, increasing lamp replacement costs. Therefore sensors are best selected for spaces where lighting is likely to be operated for at least 15 minutes at a time. Public spaces such as meeting rooms, where lighting may continue to operate long after occupants have left the room, are ideal locations for installation of sensors. The preferred type of occupancy sensor requires manual activation with an automated off function; some manufacturers refer to this subset of sensors as vacancy sensors. Vacancy sensors may ensure lighting is not activated when not needed, for example in a sun-lit room. Sensors should employ a mechanical air-gap relay. **Information on recycling spent light bulbs containing mercury:** • EPA's Mercury-Containing Light Bulb (Lamps) Recycling Website at http://www.epa.gov/osw/hazard/wastetypes/universal/lamps/index.htm; • Lamprecycle.org sponsored by the National Electrical Manufacturers Association (NEMA) maintains a list of companies claiming to recycle or handle spent mercury-containing light bulbs at http://www.nema.org/lamprecycle/recyclers.html.

Table 2.0 Appliance Specifications

Appliances	• ENERGY STAR qualified refrigerator models use at least 20 percent less energy than required by current federal standards and 40% less energy than the conventional models sold in 2001. • Clothes washers with the ENERGY STAR label can cut clothes washing related energy costs by more than a third and the water costs by more than half. • ENERGY STAR qualified dishwashers use at least 41 percent less energy and much less water than conventional dishwashers.

Table 3.0 Programmable Thermostat Specifications

Programmable Thermostats	• Homeowners or renters with their own dedicated heating and cooling systems can save about $180 a year by **properly setting** their programmable thermostats and maintaining those settings.

Table 4.0 Water Efficiency Specifications

Water Efficiency	• Install WaterSense labeled toilets (Less than 1.28 gallons per flush) List of WaterSense labeled HETs: http://www.epa.gov/watersense/pp/find_het.htm • Install WaterSense labeled faucets or accessories (Less than 1.5 gallons per minute) List of WaterSense labeled faucets/accessories: http://www.epa.gov/watersense/pp/lists/find_faucet.htm • Install Low-flow showerheads (Less than 2.0 gallon per minute) • Inspect water distribution system for leaks and conduct repairs

Table 5.0 Ductwork Sealing and Insulation Specifications

Ductwork Improvements	• Have a qualified contractor verify that that forced air systems are operating within the manufacturer's specifications for airflow (cfm/ton for air conditioners, within heat rise limits for gas and oil furnaces) before and after duct sealing. Make sure the contractor is licensed to do this type of work in your jurisdiction. Organizations such as North American Technician Excellence (www.natex.org) and the Building Performance Institute (www.bpi.org) certify contractors to perform this type of work. Other organizations may offer similar types of certification. • Seal all duct joints with air-tight collars, mastic and/or UL-181 tape • Insulate all ductwork located in unconditioned space to at least R-6 • Insulate all accessible ductwork located in conditioned space to at least R-4. Especially in places where condensation is a problem

Table 6.0 Envelope Sealing and Insulation Specifications

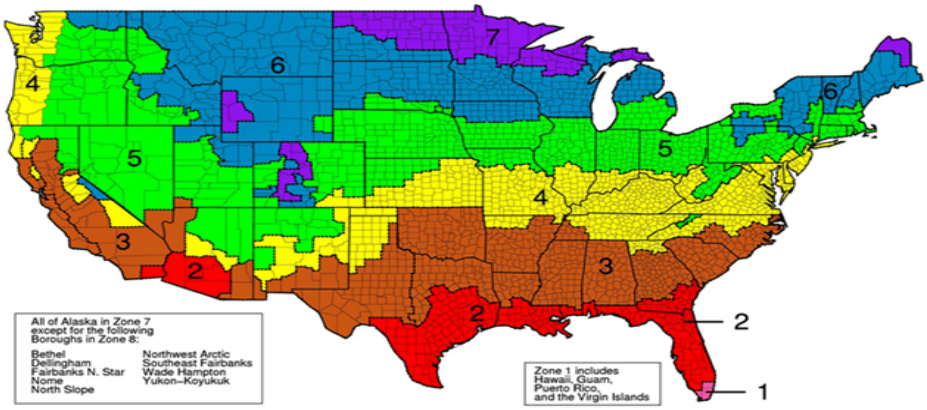
Envelope Improvements	• If accessible, seal air leaks using materials (low VOC if available) that meet local fire code requirements: ▪ to attic spaces or into basements; include sill and top plates ▪ along the top, bottom, or inside party walls ▪ around windows and doors ▪ around access to common stair wells around plumbing, electrical, or ventilation shafts ▪ around any vents, flues, chimneys that penetrate the roof or side walls ▪ around decks, balconies, or cantilevers • Install radiant barriers in attics in Southern climates • Wherever air sealing is installed, upgrade ventilation fans to Energy Star and consider improved controls to maintain adequate air exchange (refer to Ventilation specifications) • Do not add insulation to existing attic spaces without first verifying that an effective air barrier exists between the attic and the living space using the procedures described in the Building Performance Institute's Technical Standards for Building Analysts. http://www.bpi.org/standards_approved.aspx • Air sealing measures should be installed and prioritized using the procedures described in Building Performance Institute's Technical Standards for Envelope Professionals. http://www.bpi.org/standards_approved.aspx • A pre-installation blower door test will help to identify air leaks that need to be sealed. A post-installation blower door test will ensure that the leaks have been sealed and there continues to be adequate ventilation. Units in excess of maximum allowable air exchange rates as determined by ASHRAE Standard 119 shall be sealed to reduce air leakage through the building envelope. Ventilation systems must be installed and/or modified as necessary to ensure compliance with ASHRAE Standards 119 and 62.2 based on final blower door numbers. • A pre-installation combustion test may help determine whether the building has health or safety issues. • **A combustion safety test should be conducted on combustion equipment when air sealing has been performed.**

Recommended Insulation Levels for Retrofitting Existing Wood-Framed Buildings Climate Zone Map

Recommended Levels of Insulation

Insulation level are specified by R-Value. R-Value is a measure of insulation's ability to resist heat traveling through it. The higher the R-Value the better the thermal performance of the insulation. The table below shows what levels of insulation are cost-effective for different climates and locations in the home.

Recommended insulation levels for retrofitting existing wood-framed buildings



Recommended insulation levels for retrofitting existing wood-framed buildings

Zone	Add Insulation to Attic		Floor
	Uninsulated Attic	Existing 3–4 Inches of Insulation	
1	R30 to R49	R25 to R30	R13
2	R30 to R60	R25 to R38	R13 to R19
3	R30 to R60	R25 to R38	R19 to R25
4	R38 to R60	R38	R25 to R30
5 to 8	R49 to R60	R38 to R49	R25 to R30

Wall Insulation: ***Whenever exterior siding is removed*** on an

Uninsulated **wood-frame wall:**

- Drill holes in the sheathing and blow insulation into the empty wall cavity before installing the new siding, and
- Zones 3–4: Add R5 insulative wall sheathing beneath the new siding
- Zones 5–8: Add R5 to R6 insulative wall sheathing beneath the new siding.

Insulated **wood-frame wall:**

- For Zones 4 to 8: Add R5 insulative sheathing before installing the new siding.

Table 7.0 HVAC Maintenance Specification

HVAC Maintenance	• Clean or replace filters for air distribution systems according to HVAC vendor's recommendations {quarterly minimum} • Verify that all grills and registers are open and free of obstruction {vacuum grille slats whenever noticeable dust is visible} • Correct airflow and charge in refrigerant-based systems (A/C and heat pumps) {annual minimum frequency but recommended semi-annually (seasonally before heating and cooling seasons)} • Consider entering into a regular maintenance contract with an HVAC service company.

Table 8.0 Ductwork Sealing and Insulation Specifications

Ventilation Upgrades	• Minimum: Seal around register boots at the boot/wall and/or boot/ceiling connection at each exhaust and supply register using UL-181 rated products (mastic and/or tape as appropriate) • Advanced: Seal all joints in ventilation ductwork using UL-181 approved method. • Install airflow regulators or other control system on central ventilation stacks • Replace all fans with high efficiency and/or variable frequency drives • Install timers on roof fans per code • Air seal central ventilation stacks • Exhaust ventilation fans in public garages connected to occupied spaces should be controlled with a carbon monoxide detection device

Table 9.0 Energy Management System Specification

Energy Management System	Install timer controls with properly set year-round clocks for boilers providing central heating. Properly set timers should adjust heat levels to respond to seasonal and time of day heating requirements. Install outdoor reset controls set for automatic shutdown at 55°F in warm weather and at 45°F at night.

Table 10.0 HVAC Replacement Specification

Climate Specific Recommendations		
Specifications for individual unit heating and cooling		
	Hot Climates (2004 IRC / IECC 2006 Climate Zones 1, 2, 3)	**Mixed and Cold Climates** (2004 IRC / IECC 2006 Climate Zones 4, 5, 6, 7, 8)
Replacement Cooling Equipment	Right Sized[1]: • ENERGY STAR qualified A/C; OR • ENERGY STAR qualified Heat Pump	Right Sized[1]: • ENERGY STAR qualified A/C; OR • ENERGY STAR qualified Heat Pump
Replacement Heating Equipment	• 80 AFUE[2] gas furnace; OR • ENERGY STAR qualified heat pump; OR • 80 AFUE boiler; OR • 80 AFUE oil furnace	• ENERGY STAR qualified gas furnace; OR • ENERGY STAR qualified heat pump; OR • ENERGY STAR qualified boiler; OR • ENERGY STAR qualified oil furnace • For central boilers, where possible, replace modular boiler sets with full-sized dual boilers (for redundancy) with fully modulating burners • Controls: Hydronic Systems: install night set-back and thermostatic terminal controls Steam Systems: install night setback, thermostatic radiator valves, and outdoor reset for vacuum steam
	Heating System Upgrade • Steam systems: Install thermostatic radiator valves • Boiler systems: Insulate condensate tank, Insulate steam and hot water piping	
Air Handler	• Consult with HVAC vendor to consider - replacing older air handler blower motor with ECM motor, or - replacing older centrifugal (e.g., "squirrel-cage") integrated blower/motor with more efficient air handling design • Seal air handler cabinet joints (and/or gasket if feasible) to prevent "short-circuiting" of air flow	

[1] "right-sizing" needs to be done with consideration for the existing distribution system, or in tandem with a new distribution system. Cooling equipment shall be sized according to the latest editions of ACCA Manuals J and S, ASHRAE 2001 Handbook of Fundamentals, or an equivalent procedure. Maximum oversizing limit for air conditioners and heat pumps is 15% (with the exception of heat pumps in Climate Zones 5 - 8, where the maximum oversizing limit is 25%). In addition, indoor and outdoor coils shall be matched in accordance with ARI standards.

[2] A central furnace or boiler's efficiency is measured by annual fuel utilization efficiency (AFUE). The Federal Trade Commission requires new furnaces or boilers to display their AFUE so consumers can compare heating efficiencies of various models. AFUE is a measure of how efficient the appliance is in the energy in its fuel over the course of a typical year.

Table 11.0 Replacement Water Heater Specification

Replacement Water Heating	**Upgrade:** • Hydronic system: Install outdoor air reset controls (Should also include pipe insulation in un-conditioned spaces, especially first 8-10' of hot water pipe and first 3' of cold water pipe coming out of the heater) **Consider High-Efficiency Gas Storage Water Heater if you:** • Currently have a gas storage water heater that needs to be replaced. • Don't want to make a major change and are satisfied with the style of water heater you have now. • Are willing to pay a little more upfront to reduce water heating bills by about 7%. • Want routine installation and maintenance • Want hermetically-sealed combustion chambers for heating and/or water heating equipment **Consider Whole-Home or point-of-major-use Gas Tankless Water Heater if you:** • Currently have a gas storage water heater that needs to be replaced • Want to replace your existing gas water heater before it fails. • Are conducting a major remodeling project. • Often run out of hot water. • Have limited space and need a water heater that doesn't take up much room. • Want a water heater with a longer lifetime • Are willing to pay more upfront to reduce water heating bills by about 30%. • Have a large enough natural gas line in your home (typically at least 3/4") plus space to install the necessary venting. • Are willing to take on additional maintenance tasks or schedule a regular maintenance check every few years. **Consider Gas Condensing Water Heater if you:** • Want to replace your existing gas water heater before it fails, but don't need to do it right now (although some products are available at present, a larger selection of products will become available over the next 1-5 years). • Are building a new home or conducting a major remodeling project. • Often run out of hot water. • Are willing to pay more upfront to reduce water heating bills by about 30%. • Have through-the-wall access to the outside and space to accommodate a condensate drain and special venting. **Consider a Heat Pump Water Heater if you:** • Want to replace your existing electric water heater before it fails, but don't need to do it right now (although some products are available at present, a larger selection of products will become available over the next 1-5 years). • Are conducting a major remodeling project. • Are willing to pay more upfront to reduce water heating bills by about 50%. • Have space to accommodate a condensate drain. • Consider the location of HPWH's due to their relative noisiness and cooling effect on the space they reside in. **Consider Solar if you:** • Have dependable access to sunshine on your roof or immediately outside your home. • Like the idea of using a renewable energy source to heat your water. • Are willing to take on additional maintenance tasks or schedule a regular maintenance check every year. • Are willing to install or use an existing auxiliary electric or gas storage water heater to provide back-up on cloudy or rainy days.

Table 12.0 Energy Efficient Window, Door and Skylights Specification

Replacement Windows, Door and Skylights

Windows

Climate Zone	U-Factor[1]	SHGC[2]	
Northern	≤ 0.30	Any	Prescriptive
	=0.31	≥ 0.35	Equivalent Energy Performance
	=0.32	≥ 0.40	
North-Central	≤ 0.32	≤ 0.40	
South-Central	≤ 0.35	≤ 0.30	
Southern	≤ 0.60	≤ 0.27	

Skylights

Climate Zone	U-Factor[1]	SHGC[2]
Northern	≤ 0.55	Any
North-Central	≤ 0.55	≤ 0.40
South-Central	≤ 0.57	≤ 0.30
Southern	≤ 0.70	≤ 0.30

[1] *Btu/h·ft²·°F*

[2] *Fraction of incident solar radiation*

Doors are a little different. Many doors don't have any glass (like your front door), but even doors with lots of glass (like a sliding patio door) have lower glass-to-frame ratios than windows or skylights. This means doors can provide more insulation than a window or skylight can. Performance criteria for doors are based on the amount of glass they have (called glazing level) and ratings certified by the National Fenestration Rating Council (NFRC).

Glazing Level	U-Factor[1]	SHGC[2]
Opaque	≤ 0.21	No Rating
≤ ½-Lite	≤ 0.27	≤ 0.30
> ½-Lite	≤ 0.32	≤ 0.30

[1] *Btu/h·ft²·°F*

[2] *Fraction of incident solar radiation*

[1]The rate of heat loss is indicated in terms of the U-factor (U-value) of a window assembly. The lower the U-value, the greater a window's resistance to heat flow and the better its insulating value.

[2]The SHGC is the fraction of incident solar radiation admitted through a window, both admitted through a window, both directly transmitted, and absorbed and subsequently released inward. SHGC is expressed as a number between 0 and 1. The lower a window's solar heat gain coefficient, the less solar heat it transmits.

Residential Windows, Doors, and Skylights Key Product Criteria Map

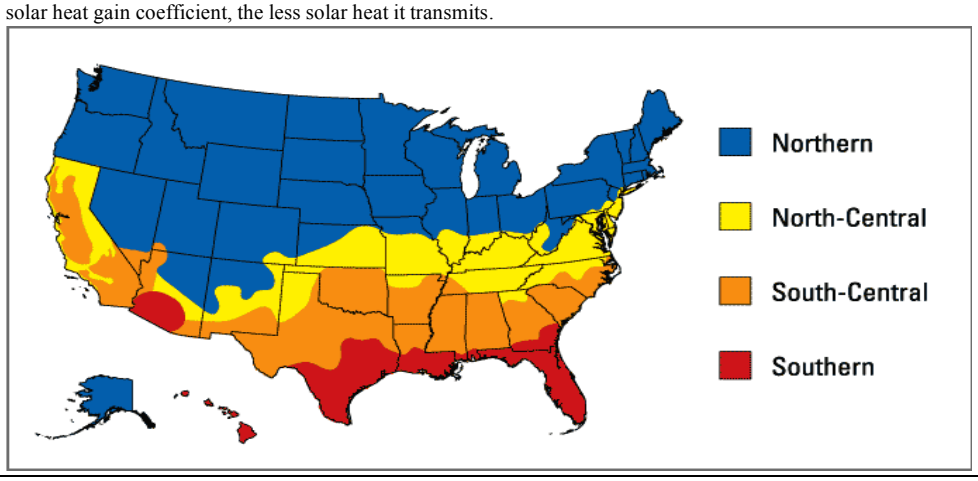


Table 13.0 Energy Efficient Motor/Pumps Specification

Replacement Motors/Pumps	Motors and Pump 1 hp or greater should be National Electrical Manufacturers Association (NEMA) premium efficiency Product scope and nominal efficiency levels for the NEMA Premium program. http://www.nema.org/stds/complimentary-docs/upload/MG1premium.pdf

Table 14.0 Building Management System Specification

Building Management System	Building controls, including building management and automation systems, are intended to optimize the performance of the building's subsystems. Controls use computer-based monitoring to optimize building control subsystems such as: • Heating, Ventilation, and Air Conditioning (HVAC) • Elevators • Fire • Electrical monitoring/management • Lighting • Security and closed circuit TV • Life safety • Access control Good energy management systems can reduce annual energy consumption by 10%-35%.

SUPPLEMENTAL RESOURCES TO ASSIST PHAs

1. Benchmarking – Prioritizing a PHAs Energy Needs

If a PHA needs assistance in identifying projects that might be candidates for energy improvements, they can use the benchmarking tools to target buildings with high energy and water consumption. PHAs are encouraged to use benchmarking tools to compare energy and water consumption in your buildings to similar buildings in your climate zone. The data used to develop the tool was obtained from 349 PHAs nationwide, representing 9,100 buildings (all building types and sizes represented). The Office of Public and Indian Housing (PIH) created the utility benchmarking tools in partnership with the Environmental Protection Agency, ENERGY STAR® Program and the Oak Ridge National Laboratories.

Building utility benchmarking is a very useful starting point for PHAs to target energy- and water-savings opportunities and can help with a PHA's overall asset management strategy. Knowing where your buildings rank compared to other similar buildings is the first step toward improving utility efficiency and the overall financial performance of properties.

The benchmarking tools score each building from 0 – 100. If a building scores low, that building appears to use more energy than it should and has a lot of room for improvement. A score of 50 is average. If it scores high it is probably relatively efficient. After using the benchmarking tools to score your buildings, target low scoring (60 or below) buildings to see how they can be made more efficient. Schedule an energy audit to determine why the buildings are scoring low and make improvements based on cost-effectiveness. Use the benchmarking tool again after the energy conservation measures are installed to check on your improved performance.

Energy and water are benchmarked separately. Each tool requires a few inputs in order to provide a building's (or development's) energy or water consumption benchmark. Each tool is self-explanatory or you can follow these simple instructions for the energy tool (MS-Excel 769KB) or the water tool (MS-Excel 724KB).

These easy-to-use tools are applicable for all residential buildings throughout the entire U.S. public housing stock: multifamily elevator, multifamily walk-up, row house, townhouse, semi-detached and single family residences.

Both benchmarking tools are still under development but provide a "roughly right" indicator for prioritizing projects. Statistically, the energy tool is a very good predictor and the water tool is moderately good. Both tools can be found at:
http://www.hud.gov/offices/pih/programs/ph/phecc/ubenchtool.cfm

2. DOE's Weatherization Program

Weatherization enables low-income families to permanently reduce their energy bills by making their homes more energy efficient. Weatherization technologies include a wide range of energy efficiency measures for retrofitting homes and apartment buildings. Weatherization service providers choose the best package of efficiency measures for each building based on an energy audit.

DOE's Weatherization Program works! In the 3 decades since its founding in 1976, U.S. Department of Energy's (DOE) Weatherization Assistance Program has provided weatherization services to more than 5.6 million low-income families. DOE's Weatherization Assistance Program has served some of society's neediest citizens. It also benefits our nation by reducing our energy dependency, improving the environment, and stimulating economic development in low-income communities. Weatherization permanently reduces energy bills for low-income clients, thus increasing their spending power, improving the local housing stock, and providing jobs in the home improvement industry.

Energy expenses comprise an economic drain on low-income communities. On average, energy bills account for about 14% of a low-income family's gross income, and for many it may account for 20% or more. Economists estimate that more than 80% of energy expenses leave low-income communities, and thus do not circulate and generate additional economic activity inside those communities.

In contrast, weatherization reduces this drain and keeps investments circulating in local economies. On average, weatherization reduces heating bills by 32% and overall energy bills by $358 per year at current prices. Although modest, these savings are significant for many low-income families and directly benefit the communities where they live.

In many states, PHAs may be eligible for Weatherization services through DOE stated funded agencies. DOE provides funding and technical guidance to the states, but the states run their own programs and set rules for issues such as eligibility. They also select service providers, which are usually nonprofit agencies that serve families in their communities, and review their performance for quality. Together, this group of more than 900 agencies makes up a nationwide weatherization network.

For more information and specific state contacts, refer to DOE's Weatherization website http://apps1.eere.energy.gov/weatherization/.

3. Other Federal and State/local Energy Incentives Available to PHAs

The DSIRE website http://www.dsireusa.org/ is a one-stop directory, providing a fast and convenient method for accessing information about renewable energy and energy efficiency incentives and regulatory policies administered by federal and state agencies, utilities, and local organizations.

The homepage features a U.S. map for easy access to policies and incentives available in each state. Clicking on a state brings up a list of available programs organized into the following categories:

(1) Financial Incentives
(2) Rules, Regulations, & Policies

DSIRE tracks federal financial incentives that promote renewable energy and energy efficiency – those designed primarily for residents, businesses, and other end-users rather than funding opportunities for research & development, outreach, or inter-governmental programs. New federal programs and incentives for renewable energy will be added to DSIRE as they become available.

Energy Service Agreement
Completeness Review
HUD Review Checklist

07/07/2011

The following depicts necessary information that is required for HUD to review an Energy Service Agreement (ESA). The recommended format for submission of the Energy Service Agreement (ESA) to HUD for review and approval is noted below. HUD files are to be maintained in this format.

Binder #1 – Energy Audit

1. Required Documentation:
   a. ☐ Copy of the completed energy audit with all supporting documentation.

Binder #2 – HUD EPC Review

1. Required Documentation:
   a. Binder #2 shall include 11 tabbed sections including the following information:

Tab #1 – HUD Approval Letter / Panel Review

1. Required Documentation:
   a. ☐ None - (leave empty, to be inserted by HUD staff. Section to include a copy of the HUD Approval Letter, panel review checklist and related documents)

Tab #2 - PHA Data

2. Required Documentation:
   a. ☐ PHA Contact Person – Provide name, address, email and phone number of the PHA staff person who will serve as a liaison for inquires.
   b. ☐ PIC Building and Unit data – Provide by current project number a detailed listing of the following data:
      1) Current Project Number & Name (AMP Number)
      2) Site Numbers & Names (Old Project Number):
      3) Building type (ex. – High Rise, Row House, Walk-Up, etc)
      4) Unit Type – (Elderly, Family)
      5) Unit Count
      6) Occupancy

Tab #3 – HUD Review Checklist

3. Required Documentation:
    a. ☐ HUD Technical Review Checklist (leave empty, to be inserted and completed by HUD staff)
    b. ☐ PHA / ESCo Checklist Narrative (The ESCo's summary response to each of the HUD Review Checklist items referencing specific contract section, not to exceed 10 pages)

Tab #4 – HUD Cost Summary Sheet

4. Required Documentation:
    a. ☐ HUD Cost Summary Sheet – (HUD cost summary sheet or similar printed on 11 x 17 paper.)
    b. ☐ PHA / ESCo to submit an electronic copy of the HUD Cost Summary Sheet in excel format.

Tab #5 – HUD Baseline Summary

5. Required Documentation:
    a. ☐ Utility baseline data submitted in the HUD Baseline Format or similar format.
    b. ☐ Copies of 52722 forms by AMP for each year of the frozen rolling base.
    c. ☐ PHA / ESCo to submit an electronic copy of the HUD Baseline Summary Sheets in excel format.

Sample Documents / Guidance

    d. Baseline Review Process
    e. Form HUD -52722

Tab #6 – Cost Reasonableness Certification

6. Required Documentation:
    a. ☐ Cost Reasonableness Certification (Cost Reasonableness Certification on PHA letterhead signed by the Executive Director stating that a cost or price analysis has been performed in accordance with the PHAs procurement policy and that all contract costs appear reasonable.
    b. Sample Documents / Guidance
        i. Sample Cost Certification

Tab #7 – Cash Flow

7. Required Documentation:
    a. ☐ Copy of 100% cash flow.
    b. ☐ Electronic copy of the cash flow sheets in excel format.

Tab #8 – Rate Escalation

8. Required Documentation:
    a. ☐ Historical documentation supporting all utility rate escalations.

Tab #9 – Resident Paid Utility Allowances

9. Required Documentation:
    a. Utility Allowances
        i. ☐ The PHA has provided HUD copies of EXISTING utility allowances with supportive documentation.
        ii. ☐ The PHA has provided HUD copies of the PRE utility allowances with supportive documentation.
        iii. ☐ The PHA has provided HUD copies of the POST utility allowances with supportive documentation.
    b. ☐ Copies of 52723 forms by AMP for each year of the frozen rolling base.

Tab #10 – PHA Legal and Section 30 Financing Review

10. Required Documentation:

a. ☐ Review of ESA

i. ☐ Letter from the PHA's legal counsel states that the ESA complies with STATE law.

ii. ☐ Letter from the PHA's legal counsel states that the ESA has been reviewed and is acceptable by the counsel.

b. ☐ Section 30 Review (i, ii and iv or i, iii, and iv)

i. ☐ Copies of modernization Declarations of Trust (DOT) for Non-Mixed Finance public housing properties.

ii. ☐ Certification from counsel that that these represent all non-mixed finance public housing properties.

OR

iii. ☐ Title Report with a certification from the PHA that the DOTs and title report cover all public housing properties, both real and personal property, that will be subject to the security interest or encumbrance related to the EPC.

iv. ☐ Application Letter describing the financing and security interest, and requesting HUD's approval of the security interest.

Sample Documents / Guidance

- Sample Legal Review Document

Tab #11Repayment Certification– PHA

11. Required Documentation:

a. ☐ Repayment Certification on PHA letterhead signed by the Executive Director stating:

i. ☐ Repayment of EPC debt services are to be paid for from energy savings only.

ii. ☐ The Operating Fund Benefit (OFB) is not an EPC incentive and will not be combined with any EPC incentive from this proposed EPC.

iii. ☐ The OFB will not be used in this proposed EPC to fund any Energy Conservation Measures (ECMs).

iv. ☐ Funds from the OFB will not be used within the proposed EPC cash flow as an income stream to subsidize any ECMs.

v. ☐ No ECMs are being subsidized by Operating Funds or

Capital funds; or

vi. ☐ If Operating Funds or Capital Funds are being used to subsidize the installation of ECMs, the associated ECMs are not contributing to the energy savings in the cash flow.

Sample Documents / Guidance

- Sample Repayment Certification

Tab #12 – Energy Service Agreement

12. Required Documentation:

a. ☐ Copy of the energy service agreement (ESA) with all exhibits.

Reviewer Signature

The checklist reviewer certifies that they have reviewed this ESA in accordance with provisions of this checklist.

Reviewer Signature: _____, Date ____/_____/_____

Reviewer Name:(print)_____

Energy Service Agreement
Technical Review
HUD Review Checklist
07-07-2011

HUD Review Information

1. PHA Name:_____
2. ESCo Name: _____
3. Date ESA received for review:____/_____/_____
4. ESA Review assigned to: (check one)
   a. ☐ HUD Field Office, ☐ HUD Energy Center, ☐ HUD Contractor
   b. Review Person:
      i. Name: _____
      ii. Phone: _____
5. Date Completeness Review completed: ____/_____/_____
6. Date ESA Approved: ____/_____/_____

PIC Building and Unit Data

7. ☐ A spreadsheet is provided in the HUD format, or similar, that lists building data for each project included in the contract.
8. ☐ The submitted building and unit data matches the HUD PIC database.

Sample Documents / Guidance

- HUD Cost Summary Form – PIC Data

HUD Cost Summary Sheet

9. ☐ A spreadsheet is provided in the HUD format, or similar, that lists each ECM measure by AMP / Group / project.
    a. Energy Conservation Measure(s) (ECM) are listed by AMP.
    b. Separate lines are to be provided for different funding sources and different Measurement and Verification methods.
    c. Installation costs, soft costs and overhead and profit are to be listed separately.
    d. Current utility rates must be shown to support the energy savings.
10. ☐ Fuel Conversion – Utility consumption and cost savings are listed for both fuels.
11. ☐ Replacement Costs – Replacement costs are listed for all ECMs based upon a Life Cycle Cost Analysis for each measure. Lamp replacement must be included in for all lighting measures.
12. ☐ The spreadsheet has been included as a formal document within the final energy performance contract.
13. ☐ Contract Amendments - If a contract is being amended, the revised HUD Cost Summary Sheet must show all ECMs and costs for the previously approved contract(s) and the proposed contract / amendment.

Sample Documents / Guidance

- HUD Cost Summary Form

Baseline Data

14. ☐ A spreadsheet is provided in the HUD baseline data format, or similar, that lists the 52722 baselines and adjustments for each AMP Group / project.
15. ☐ The spreadsheet has been included as a formal document within the final energy performance contract.
16. ☐ The Rolling Base Consumption Level (RBCL) is defined and in compliance with HUD requirements.
17. ☐ All AMP baseline adjustments are clearly defined with supportive documentation and acceptable to the reviewer. See baseline review process for additional assistance.
18. ☐ All modernization work performed by the PHA during the RBCL years have been reviewed to insure that energy improvements funded with HUD funds are not benefiting the baseline data. Adjustments to the baseline have been made as appropriate. Reviewer should review the appropriate PHA plans found at: http://www.hud.gov/offices/pih/pha/
19. ☐ Narrative – The reviewer is to provide a written narrative defining the basis for their acceptance of baseline adjustments.

Sample Documents / Guidance

- HUD Baseline Data Form
- Baseline Review Process

Cost Reasonableness

20. ☐ The PHA has provided documentation that they have reviewed and have performed a cost or price analysis as per their procurement policy and that all costs (contract cost and annual fees) appear reasonable, reference 24 CFR 85.36 (f).

Sample Documents / Guidance

- Sample Cost Reasonableness Certification

Financial

21. Cash Flow

    a. ☐ The cash flow is positive over the term of the contract insuring that energy savings are sufficient to cover the contract costs including debt payment, annual fees and replacement costs.

    24 CFR990.185 Requirements – "For a PHA to qualify for these incentives, the PHA must enter into a contract to finance the energy conservation measures, and must obtain HUD approval. Such approval shall be based on a determination that payments under a contract can be funded from reasonably anticipated energy cost savings. The contract period shall not exceed 20 years."

    b. ☐ Add-On Subsidy Incentive – The operating fund cost benefit (OFB) is not an energy cost savings and cannot be included in the cash flow as an income stream to subsidize any ECMs.

    c. ☐ The OFB is not an EPC incentive and is not combined with any EPC incentive from this proposed EPC.

    d. ☐ The OFB is not used in this proposed EPC to fund any Energy Conservation Measures (ECMs);

    f. ☐ Excess energy savings - 75% of the energy savings (over term of the contract) for the frozen rolling base incentive and resident paid utility incentive is used to pay the debt payment, annual fees and replacement cost.

22. ☐ Documentation has been provided to support that all "escalated" utility rates are reasonable. Data should show historical utility rates for each utility for the same period as the projected contract term.

23. ☐ Any PHA contributions of Operating or CFP funds have been reviewed and are in compliance with 24CFR990 requirements, including:

    a. Operating or CFP funds can not contribute to the energy savings.

    b. If operating or CFP funds are used, the ESCo cannot perform the A/E design and construction management services for these funds unless the scope of such services was clearly defined in the original RFP. The RFP would have to define the specific measures or a general category of work with a defined cost range.

    c. ☐ No ECMs are being subsidized by Operating Funds or Capital funds for this EPC; or

    d. ☐ If Operating Funds or Capital Funds are being used to subsidize the installation of ECMs, the associated ECMs are not contributing to the energy savings in the cash flow.

24. ☐ Central Office Cost Center (COCC) measures are funded by non-HUD funds.

Financial

25. ☐ **Narrative- The reviewer is to provide a written narrative should any outliers be noted during the review of the financial items #s 21 through 24.**

Section 30 Financing Review

26. ☐ Copies of modernization Declarations of Trust (DOT) for Non-Mixed Finance public housing properties.
27. ☐ Certification OR Title Report
    a. ☐ Certification from counsel that that these represent all non-mixed finance public housing properties:
        i. Both real (real estate or buildings) and personal (fixtures, equipment, etc.)
        ii. That will be subject to security interest or other encumbrance under the EPC
        iii. That the DOTs are recorded prior to the security interest or other encumbrance
        iv. That the DOTs will remain current and effective for the term of the financing.

    OR

    b. ☐ Title Report with a certification from the PHA that the DOTs and title report cover all public housing properties, both real and personal property, that will be subject to the security interest or encumbrance related to the EPC.
28. ☐ Application Letter describing the financing and security interest, and requesting HUD's approval of the security interest. This letter should include:
    b. PHA counsel's opinion that the PHA has the authority to enter into the transaction, and that the transaction complies with the requirements of the 1937 Act and the Annual Contributions Contract. Include a copy of the requested security interest or encumbrance.
    c. Evidence of a PHA Board resolution authorizing the PHA to undertake the EPC financing and enter into security interests or encumbrances requested with the EPC financing. The resolution must also provide authorization for executive staff to negotiate and enter into legal documents.
    d. Matrix providing the following for EACH PROPERTY on which a security interest or encumbrance is requested:

i. Project Name

ii. Project Number

iii. If less than entire project, a description of the property on which the security interest is being provided

iv. Property description and location if the security interest is not on real property

v. Description of the security interest or encumbrance.

Resident Paid Utilities

29. Utility Allowances

a. EXISTING utility allowances

i. Date of last revision: ____/_____/_____

ii. Methodology Used: ☐ Statistical, ☐ Engineering

iii. Supportive documentation provided: ☐ Yes, ☐ No.

b. PRE utility allowances

i. Do the PRE allowances differ from the EXISTING allowances?

☐ Yes, ☐ No. List average % difference _____

c. Energy Savings

i. ☐ Energy savings (PRE utility allowance less Post utility allowance) are supported by M&V calculations; reference the M&V Guidelines.

ii. M&V Type:

(check options that apply)

1. ☐ Option A, ☐ Option B, ☐ Option C, ☐ Option D.

Measurement and Verification Methodology

HUD M&V Guidelines

i. Option A – Retrofit Isolation with **Key** Parameter Measurement

ii. Option B – Retrofit Isolation with **All** Parameter Measurement

iii. Option C – Utility Data Analysis – *Recommend Approach*

iv. Option D – Calibration Computer Simulation – Requires HUD Approval.

30. M&V Type(s): (check all options used in contract)

a. ☐ Option A, ☐ Option B, ☐ Option C, ☐ Option D.

31. Any verification methodology other than Option C must be approved by the reviewer based upon the HUD M&V Guidelines.

32. HUD may require an Independent 3rd party verify the yearly M&V for all stipulated energy savings funded by the add-on subsidy incentive.
33. ☐ The reviewer has determined that all energy savings are reasonable.
34. ☐ Stipulated savings – POST M&V reviews- The frequency of the POST M&V reviews for stipulated savings is: ☐ First Year Only ☐ Annually ☐ Other -Please Specify

35. ☐ Narrative – The reviewer is to provide a written narrative defining the basis for their determination of reasonable energy savings.

Sample Documents / Guidance

- HUD M&V Guidelines

Heating Degree Day adjustments –

36. ☐ HUD has approved the heating degree-day adjustment methodology.

Contract Document Review

37. The following HUD forms are included as part of the contract:
    a. ☐ Form HUD 5370 (11/2006) - General Conditions for Construction Contracts- Public Housing Programs
    b. ☐ Form HUD 5369-A (11/92) - Representations, Certifications, and Other Statements of Bidders, Public and Indian Housing Programs
    c. ☐ Form HUD 5369-A is filled out and signed by the contractor.
38. ☐ Order of Provisions - The contract clearly states that in the event of a conflict between these General Conditions (HUD 5370) and the Specifications, the General Conditions shall prevail.
39. ☐ RFP Review – The contract complies with the terms of the Request for Proposal including guarantee type and M&V methodology.

HUD Approval Letter

40. The reviewer will develop a draft HUD approval letter in the recommended format. The letter is to list:
    a. ☐ Housing Inventory - Listing of all AMPS included in the contract by Number, Project Number and Project Name.
    b. ☐ Contract Costs – Summary of all contract costs.
    c. ☐ 1st Year Energy Savings – Summary of the 1st year energy savings by utility.
    d. ☐ Cash Flow – A detailed cash flow of the contract showing, loan amount, rebates, interest amount, and all income / expenses throughout the term of the contract.
    e. ☐ Baseline Consumption Levels – Show the baseline utility consumption levels by utility type and AMP. Utility baseline consumption levels should be shown for both the frozen rolling base incentive and the add-on subsidy incentive.
    f. ☐ Resident Paid Utility Incentive

i. Traditional approval – Show all utility allowances for resident paid utilities.
ii. Resident Paid Add-on subsidy approval – Show the add-on subsidy amounts for each year of the HUD incentive.

g. Add-On Subsidy Incentive
   i. ☐ Show the add-on subsidy amounts for each year of the HUD incentive.
   ii. ☐ For add-on subsidy , stipulated savings
      1. Show the M&V calculations to verify energy savings on a yearly basis; **OR**
      2. Require that the PHA hire an independent 3rd party reviewer to verify the energy savings as per the HUD M&V Guidelines.

Reviewer Signature / Narrative

The reviewer certifies that they have reviewed this ESA in accordance with provisions of this checklist. Further, the reviewer certifies that in their determination, that all baseline adjustments and all energy savings are reasonable.

Reviewer Signature: _____, Date ____/_____/_____

Reviewer Name:(print)_____

HUD Approval Process

Final approval of this ESA will be subject to a panel review where the reviewer presents the ESA to the Panel for review. Three signatures, the reviewers and two panel members are required for HUD to approve this ESA.

1. Reviewer contacts the OFO-Energy Center to schedule a review.
2. The OFO-Energy Center will establish a review time and panel membership.
3. Reviewer submits electronic copies of the following documents to all panel members:
   a. Signed HUD Review Checklist.
   b. HUD Cost Summary Sheet
   c. HUD Baseline Review Sheets
   d. Cash Flow(s)
   e. Utility Allowance Reviews
   f. Other supportive information
   g. Draft HUD Approval Letter
4. Narrative – The reviewer is to provide a written narrative defining the basis for their acceptance of baseline adjustments and their determination of reasonable energy savings.

Final ESA Approval

The following panel members have reviewed the above ESA and authorize approval of such:

Panel Member #1

Reviewer Signature: _____ Date ____/_____/_____

Reviewer Name:(print)_____

Panel Member #2

Reviewer Signature: _____ Date ____/_____/_____

Reviewer Name:(print)_____

File Maintenance

The reviewer is to assemble the Energy Performance Contract file in the format prescribed in the completeness review checklist.

Approval Comments

Energy Service Agreement
Technical Review – PHA Self Managed
HUD Review Checklist

07-11-2011

HUD Review Information

1. PHA Name:_____
2. Date ESA received for review:____/_____/_____
3. ESA Review assigned to: (check one)
   a. ☐ HUD Field Office, ☐ HUD Energy Center, ☐ HUD Contractor
   b. Review Person:
      i. Name: _____
      ii. Phone: _____
4. Date Completeness Review completed: ____/_____/_____
5. Date ESA Approved: ____/_____/_____

PIC Building and Unit Data

6. ☐ A spreadsheet is provided in the HUD format, or similar, that lists building data for each project included in the contract.
7. ☐ The submitted building and unit data matches the HUD PIC database.

Sample Documents / Guidance

- HUD Cost Summary Form – PIC Data

HUD Cost Summary Sheet

8. ☐ A spreadsheet is provided in the HUD format, or similar, that lists each ECM measure by AMP / Group / project.
   a. Energy Conservation Measure(s) (ECM) are listed by AMP.
   b. Separate lines are to be provided for different funding sources and different Measurement and Verification methods.
   c. Installation costs, soft costs and overhead and profit are to be listed separately.
   d. Current utility rates must be shown to support the energy savings.
9. ☐ Fuel Conversion – Utility consumption and cost savings are listed for both fuels.
10. ☐ Replacement Costs – Replacement costs are listed for all ECMs based upon a Life Cycle Cost Analysis for each measure. Lamp replacement must be included in for all lighting measures.
11. ☐ The spreadsheet has been included as a formal document within the final energy

performance contract.

12. ☐ Contract Amendments - If a contract is being amended, the revised HUD Cost Summary Sheet must show all ECMs and costs for the previously approved contract(s) and the proposed contract / amendment.

Sample Documents / Guidance

- HUD Cost Summary Form

Baseline Data

13. ☐ A spreadsheet is provided in the HUD baseline data format, or similar, that lists the 52722 baselines and adjustments for each AMP Group / project.
14. ☐ The Rolling Base Consumption Level (RBCL) is defined and in compliance with HUD requirements.
15. ☐ All AMP baseline adjustments are clearly defined with supportive documentation and acceptable to the reviewer. See baseline review process for additional assistance.
16. ☐ All modernization work performed by the PHA during the RBCL years have been reviewed to insure that energy improvements funded with HUD funds are not benefiting the baseline data. Adjustments to the baseline have been made as appropriate. Reviewer should review the appropriate PHA plans found at: http://www.hud.gov/offices/pih/pha/
17. ☐ Narrative – The reviewer is to provide a written narrative defining the basis for their acceptance of baseline adjustments.

Sample Documents / Guidance

- HUD Baseline Data Form
- Baseline Review Process

Cost Reasonableness

18. ☐ The PHA has provided documentation that they have reviewed and have performed a cost or price analysis as per their procurement policy and that all costs (contract cost and annual fees) appear reasonable, reference 24 CFR 85.36 (f).

Financial

19. Cash Flow

    a. ☐ The cash flow is positive over the term of the contract insuring that energy savings are sufficient to cover the contract costs including debt payment, annual fees and replacement costs.

    24 CFR990.185 Requirements – "For a PHA to qualify for these incentives, the PHA must enter into a contract to finance the energy conservation measures, and must obtain HUD approval. Such approval shall be based on a determination that payments under a contract can be funded from reasonably anticipated energy cost savings. The contract period shall not exceed 20 years."

    b. ☐ Add-On Subsidy Incentive – The operating fund cost benefit (OFB) is not an energy cost savings and cannot be included in the cash flow as an income stream to subsidize any ECMs.

    c. ☐ The OFB is not an EPC incentive and is not combined with any EPC incentive from this proposed EPC.

    d. ☐ The OFB is not used in this proposed EPC to fund any Energy Conservation Measures (ECMs);

    f. ☐ Excess energy savings - 75% of the energy savings (over term of the contract) for the frozen rolling base incentive and resident paid utility incentive is used to pay the debt payment, annual fees and replacement cost.

20. ☐ Documentation has been provided to support that all "escalated" utility rates are reasonable. Data should show historical utility rates for each utility for the same period as the projected contract term.

21. ☐ Any PHA contributions of Operating or CFP funds have been reviewed and are in compliance with 24CFR990 requirements, including:

    a. Operating or CFP funds can not contribute to the energy savings.

    b. If operating or CFP funds are used, the ESCo cannot perform the A/E design and construction management services for these funds unless the scope of such services was clearly defined in the original RFP. The RFP would have to define the specific measures or a general category of work with a defined cost range.

    c. ☐ No ECMs are being subsidized by Operating Funds or Capital funds for this EPC; or

    d. ☐ If Operating Funds or Capital Funds are being used to subsidize the installation of ECMs, the associated ECMs are not contributing to the energy savings in the cash flow.

22. ☐ Central Office Cost Center (COCC) measures are funded by non-HUD funds.

23. ☐ **Narrative- The reviewer is to provide a written narrative should any outliers be noted during the review of the financial items #s 19 through 22.**

Section 30 Financing Review

24. ☐ Copies of modernization Declarations of Trust (DOT) for Non-Mixed Finance public housing properties.

25. ☐ Certification OR Title Report

    a. ☐ Certification from counsel that that these represent all non-mixed finance public housing properties:

        i. Both real (real estate or buildings) and personal (fixtures, equipment, etc.)

        ii. That will be subject to security interest or other encumbrance under the EPC

        iii. That the DOTs are recorded prior to the security interest or other encumbrance

        iv. That the DOTs will remain current and effective for the term of the financing.

    OR

    b. ☐ Title Report with a certification from the PHA that the DOTs and title report cover all public housing properties, both real and personal property, that will be subject to the security interest or encumbrance related to the EPC.

26. ☐ Application Letter describing the financing and security interest, and requesting HUD's approval of the security interest. This letter should include:

    b. PHA counsel's opinion that the PHA has the authority to enter into the transaction, and that the transaction complies with the requirements of the 1937 Act and the Annual Contributions Contract. Include a copy of the requested security interest or encumbrance.

    c. Evidence of a PHA Board resolution authorizing the PHA to undertake the EPC financing and enter into security interests or encumbrances requested with the EPC financing. The resolution must also provide authorization for executive staff to negotiate and enter into legal documents.

    d. Matrix providing the following for EACH PROPERTY on which a security interest or encumbrance is requested:

        i. Project Name

        ii. Project Number

        iii. If less than entire project, a description of the property on which the security interest is being provided

iv. Property description and location if the security interest is not on real property

v. Description of the security interest or encumbrance.

Resident Paid Utilities

27. Utility Allowances

a. EXISTING utility allowances

i. Date of last revision: ____/_____/_____

ii. Methodology Used: ☐ Statistical, ☐ Engineering

iii. Supportive documentation provided: ☐ Yes, ☐ No.

b. PRE utility allowances

i. Do the PRE allowances differ from the EXISTING allowances?

☐ Yes, ☐ No. List average % difference _____

c. Energy Savings

i. ☐ Energy savings (PRE utility allowance less Post utility allowance) are supported by M&V calculations; reference the M&V Guidelines.

ii. M&V Type:

(check options that apply)

1. ☐ Option A, ☐ Option B, ☐ Option C, ☐ Option D.

Measurement and Verification Methodology

HUD M&V Guidelines

i. Option A – Retrofit Isolation with **Key** Parameter Measurement

ii. Option B – Retrofit Isolation with **All** Parameter Measurement

iii. Option C – Utility Data Analysis – *Recommend Approach*

iv. Option D – Calibration Computer Simulation – Requires HUD Approval.

28. M&V Type(s): (check all options used in contract)

a. ☐ Option A, ☐ Option B, ☐ Option C, ☐ Option D.

29. Any verification methodology other than Option C must be approved by the reviewer based upon the HUD M&V Guidelines.

30. HUD may require an Independent 3rd party verify the yearly M&V for all stipulated energy savings funded by the add-on subsidy incentive.

31. ☐ The reviewer has determined that all energy savings are reasonable.
32. ☐ Stipulated savings – POST M&V reviews- The frequency of the POST M&V reviews for stipulated savings is: ☐ First Year Only ☐ Annually ☐ Other -Please Specify

33. ☐ Narrative – The reviewer is to provide a written narrative defining the basis for their determination of reasonable energy savings.

Sample Documents / Guidance

- HUD M&V Guidelines

Heating Degree Day adjustments –

34. ☐ HUD has approved the heating degree-day adjustment methodology.

HUD Approval Letter

35. The reviewer will develop a draft HUD approval letter in the recommended format. The letter is to list:
    a. ☐ Housing Inventory - Listing of all AMPS included in the contract by Number, Project Number and Project Name.
    b. ☐ Contract Costs – Summary of all contract costs.
    c. ☐ 1st Year Energy Savings – Summary of the 1st year energy savings by utility.
    d. ☐ Cash Flow – A detailed cash flow of the contract showing, loan amount, rebates, interest amount, and all income / expenses throughout the term of the contract.
    e. ☐ Baseline Consumption Levels – Show the baseline utility consumption levels by utility type and AMP. Utility baseline consumption levels should be shown for both the frozen rolling base incentive and the add-on subsidy incentive.
    f. ☐ Resident Paid Utility Incentive
        i. Traditional approval – Show all utility allowances for resident paid utilities.
        ii. Resident Paid Add-on subsidy approval – Show the add-on subsidy amounts for each year of the HUD incentive.
    g. Add-On Subsidy Incentive
        i. ☐ Show the add-on subsidy amounts for each year of the HUD incentive.
        ii. ☐ For add-on subsidy , stipulated savings
            1. Show the M&V calculations to verify energy savings on a yearly basis; **OR**
            2. Require that the PHA hire an independent 3rd party reviewer to verify the energy savings as per the HUD M&V Guidelines.

Reviewer Signature / Narrative

The reviewer certifies that they have reviewed this ESA in accordance with provisions of this checklist. Further, the reviewer certifies that in their determination, that all baseline adjustments and all energy savings are reasonable.

Reviewer Signature: _____, Date ____/_____/_____

Reviewer Name:(print)_____

HUD Approval Process

Final approval of this ESA will be subject to a panel review where the reviewer presents the ESA to the Panel for review. Three signatures, the reviewers and two panel members are required for HUD to approve this ESA.

1. Reviewer contacts the OFO-Energy Center to schedule a review.
2. The OFO-Energy Center will establish a review time and panel membership.
3. Reviewer submits electronic copies of the following documents to all panel members:
    a. Signed HUD Review Checklist.
    b. HUD Cost Summary Sheet
    c. HUD Baseline Review Sheets
    d. Cash Flow(s)
    e. Utility Allowance Reviews
    f. Other supportive information
    g. Draft HUD Approval Letter
4. Narrative – The reviewer is to provide a written narrative defining the basis for their acceptance of baseline adjustments and their determination of reasonable energy savings.

Final ESA Approval

The following panel members have reviewed the above ESA and authorize approval of such:

Panel Member #1

Reviewer Signature: _____ Date ____/_____/_____

Reviewer Name:(print)_____

Panel Member #2

Reviewer Signature: _____ Date ____/_____/_____

Reviewer Name:(print)_____

File Maintenance

The reviewer is to assemble the Energy Performance Contract file in the format prescribed in the completeness review checklist.

Approval Comments

PIC Building Data

PHA Name: Almost Heaven Housing Authority

Operating Fund Project No.	Operating Fund Project Name	Site Project No.	Site Name	Site Included In EPC	Phase 1 Utility conservation measure Included in initial phase of EPC <y				Phase 2 Utility conservation measure Included in subsequent phase of EPC <y or n>				Building Type	Unit Type	Year Built	No. of Floors	Building Area (GSF)	Number of Units	Total Bedrooms	Full Occupancy	Current Occupancy
<new project number & name> <matches 52722 form>		< old project number & name>		<y or n>	Electric	gas	water	oil	Electric	gas	water	other		• Family • Elderly							Percentage (%)
XX011000001	Apollo Towers	XX011000001	Apollo Towers	y	y	y	y	y	n	n	n	n	Highrise	Elderly	1973	8	58,848	74	74	76	100
XX011000001	Gator Village	XX011000001	Gator Village	y	y	y	y	n	n	n	n	n	Row-House	Family	1969	2	54,241	48	146	155	100
																		122			
														Grand Totals:			113,089	122	220	231	⟸

Family	74
Elderly	48
Totals	122

Cost Summary

Almost Heaven Housing Authority

Description of ECM

Project Number (new AMP number)	Project Number (old)	Project Name	Description of ECM	Installation Cost (Audit)	Electrical Energy Audit Yearly Energy Savings		Propane Energy Audit Yearly Energy Savings		Fuel Oil Energy Audit Yearly Energy Savings		Water & Sewage Energy Audit Yearly Energy Savings		Energy Audit Total Energy Savings	Energy Audit Guranteed Energy Savings 87%	Energy Audit Simple Payback	Useful Life Life Expectanc	Funding Source Who Pays The Utility Bills AF = Authority-Frozen AA = Authority-Add-On R = Resident C = COCC CF = Capital Fund				M&V FEMP Option A Option B Option C Option D				Weather Adjustment
				($)	(KWH)	($)	(Gal)	($)	(Gal)	($)	(CF)	($)	($)	($)	(years)	(years)	Elec.	Gas	Oil	Water	Elec.	Gas	Oil	Water	[ ] yes [ ] no
XX 011-1	XX 011-1	Apollo Tower	Modify Use of Make-up Fan	$1,500	2,168	$292	1,072	$2,423		$0		$0	$2,715	$2,363	0.6	20	AF	AF			c	c			n
XX 011-1	XX 011-1	Apollo Tower	Replace Boilers	$217,100		$0	-29,494	-$66,656	25,248	$87,815		$0	$21,159	$18,417	11.8	20		AF	AF			c	c		n
XX 011-1	XX 011-1	Apollo Tower	Install Limiting Thermostats	$12,600		$0	2,839	$6,416		$0		$0	$6,416	$5,585	2.3	20		AF				c			n
XX 011-1	XX 011-1	Apollo Tower	Lighting Improvements, Ownwers	$42,167	27,880	$3,756		$0		$0		$0	$3,756	$3,269	12.9	6	AF				c				n
XX 011-1	XX 011-1	Apollo Tower	Replace Refrigerators	$29,600	11,174	$1,505		$0		$0		$0	$1,505	$1,310	22.6	12	AF				c				n
XX 011-1	XX 011-1	Apollo Tower	Replace Faucet Aerators	$10,360		$0	621	$1,403		$0	28,133	$2,079	$3,482	$3,031	3.4	5		AF		AF		c		c	n
XX 011-1	XX 011-1	Apollo Tower	Replace Shower Heads	$6,660		$0	450	$1,017		$0	20,392	$1,507	$2,524	$2,197	3.0	5		AF		AF		c		c	n
XX 011-1	XX 011-1	Apollo Tower	Replace Toilets	$37,280		$0		$0		$0	51,218	$3,785	$3,785	$3,295	11.3	20				AF				c	n
XX 011-1	XX 011-1	Apollo Tower	Improve Roof to R24	$0		$0		$0		$0		$0	$0	$0	0.0	20									n
XX 011-1	XX 011-1	Apollo Tower	Improve Roof to R42	$0		$0	0	$0		$0		$0	$0	$0	0.0	20		AF					c		n
			AMP Total	$357,267	41,222	$5,553	-24,512	-$55,397	25,248	$87,815	99,743	$7,371	$45,342	$39,468	9.1										
			Rate			$0.134713		$2.26		$3.4781		$0.0739													
			2010 - HUD 52722 Rate			$0.1489		$2.0395		$2.3003		$4.2429													
XX 011-1	XX 011-1	Gator Village	Insulate and Seal	$318,500		$0	10,788	$24,381		$0		$0	$24,381	$21,222	15.0	20		AF				c			n
XX 011-1	XX 011-1	Gator Village	Replace Windows	$187,915		$0	10,469	$23,660		$0		$0	$23,660	$20,595	9.1	20		AF				c			n
XX 011-1	XX 011-1	Gator Village	Install Limiting Thermostats	$7,650		$0	2,170	$4,904		$0		$0	$4,904	$4,269	1.8	20		AF				c			n
XX 011-1	XX 011-1	Gator Village	Lighting Improvements, Owners	$19,404	3,686	$497		$0		$0		$0	$497	$432	44.9	6	AF				c				n
XX 011-1	XX 011-1	Gator Village	Replace Faucet Aerators	$7,140		$0	695	$1,571		$0	29,653	$2,310	$3,881	$3,378	2.1	5		AF		AF		c		c	n
XX 011-1	XX 011-1	Gator Village	Replace Shower Heads	$4,500		$0	975	$2,204		$0	41,592	$3,240	$5,444	$4,738	0.9	5		AF		AF		c		c	n
XX 011-1	XX 011-1	Gator Village	Replace Toilets	$35,050		$0		$0		$0	88,575	$6,900	$6,900	$6,006	5.8	20				AF				c	n
XX 011-1	XX 011-1	Gator Village	Replace Furnaces	$0		$0		$0		$0		$0	$0	$0	0.0	20									n
			AMP Total	$580,159	3,686	$497	25,097	$56,719	0	$0	159,820	$12,450	$69,666	$60,640	9.6										
			Rate			$0.134713		$2.26		$3.4781		$0.0779													
			2010 - HUD 52722 Rate			$0.1489		$2.0395		$2.3003		$4.2429													
XX 011-1	XX 011-1	Gator Village	Replace Refrigerators, Tenants	$19,600	11,396	$1,535		$0		$0		$0	$1,535	$1,336	14.7	12	AF				c				n
XX 011-1	XX 011-1	Gator Village	Replace Gas Cooking Ranges, Tenants	$0	0	$0	0	$0		$0		$0	$0	$0	0.0										n
XX 011-1	XX 011-1	Gator Village	Lighting Improvements, Tenants	$87,690	62,419	$8,409		$0		$0		$0	$8,409	$7,319	12.0	6	AF				c				n
			AMP Total	$107,290	73,815	$9,944	0	$0	0	$0	0	$0	$9,944	$8,656	12.4										
			Rate			$0.134713		$2.26		$3.4781		$0.0779													
			2010 - HUD 52722 Rate			$0.1489		$2.0395		$2.3003		$4.2429													
			Total	$1,044,716	118,723	$15,994	585	$1,322	25,248	$87,815	259,563	$19,821	$124,952	$108,763	9.6										
XX 011-1	XX 011-1	Apollo Towers	Windows	$1,200,000		$0		$0	6,249	$21,735	0	$0	$21,735	$0	55.2	20			CF						

Project Soft Costs	%	Total
Design A&E	5.00%	$52,236
Construction Management	7.00%	$73,130
Legal / Bond	3.00%	$31,341
Audit Engineering	1.00%	$10,447
Commissioning	1.00%	$10,447
Cost of Risk	5.00%	$52,236
Training	1.00%	$10,447
Total Soft Costs		**$240,285**

Soft Costs

Project Totals	%	Total
Installation Cost		$1,044,716
Project Soft Costs		$240,285
subtotal		$1,285,001
Overhead at 15%	15.00%	$192,750
subtotal		$1,477,751
Profit at 10%	10.00%	$147,775
Project cost		**$1,625,526**

Overhead and Profit

Contingency (unused contingency returns to PHA)	8.00%	$83,577
Project total cost		**$1,709,103**

Please print on 11 x17 paper.

Almost Heaven Housing Authority
AMP 1 - Baseline Review Summary

Sites:		Units	Electric	Propane	Oil	Water	Occupancy	Comments
Apollo Tower	XX011-1	74	A	na	A	A	100%	
Gator Village	XX011-1	49	R	A	na	A	100%	
		A = Authority Paid		R = Resident Pai	R = Resident Paid			

HUD Review Checklist - Baseline Comparison

July - June Consumption			Electric (kwh)	Propane (gal)	Oil (gal)	Water (cf)	Comments	
2008-2009								
2010 Financial	52722 value		478,878	53,287	27,634	15,476		
Data Correction Adjustment			-7,636	461	554	-7,738	Corrected based upon billing data	
Other Adjustments			-52,720		-6,249	-632	COCC yearly consumption	
	ESCo Corrected		418,522	53,748	21,939	7,106		
2009-2010								
2010 Financial	52722 value		462,043	50,198	24,477	14,132		
Data Correction Adjustement			-1,820	-4,194	-126	-7,066	Corrected based upon billing data	
Other Adjustments			-60,840		-6,249	-239	COCC yearly consumption	
	ESCo Corrected		399,383	46,004	18,102	6,827		
2010-2011								
2010 Financial	52722 value		452,891	52,578	22,756	12,876		
Data Correction Adjustment			15,929	-1,678	450	-6,438	Corrected based upon billing data	
Other Adjustments			-56,480		-6,249	-1,245	COCC yearly consumption	
	ESCo Corrected		412,340	50,900	16,957	5,193		
3 Year Average								
2010 Financial	52722 value		464,604	52,021	24,956	14,161		
ESCo Corrected			410,082	50,217	18,999	6,375		
	difference		-54,522	-1,804	-5,956	-7,786		
	% Difference		-11.7%	-3.5%	-23.9%	-55.0%		
Cost of Baseline Adjustment for First Year			$ (7,344.87)	$ (4,076.29)	$ (20,717.03)	$ (575.39)		
Term of Contract - Years			20	20	20	20		
of Baseline Adjustment for Contract Term			$ (195,741)	$ (108,633)	$ (552,109)	$ (15,334)	3.5%	Escalation Rate

ADJUSTMENT CALCULATION

WINDOW ANALYSIS

Property:	Apollo Tower
Total Window Area (sf):	11,502

	Existing:	Proposed:
Window type:	Single pane clear alum window with interior storm window	Double pane clear with thermally broken aluminum frame
Window Performance:		
U-value:	0.569	0.498
SHGC:	0.694	0.684
Visible Light Trans:	0.705	0.705
Annual HDD	7,665	7,665
Annual Conductive Heat Loss (therms)	12,039	10,537
Total Window Perimeter (in):	88,796	88,796
Average Crack Width (in):	0.016	-
Effective Air Leakage Area (sq. in.):	1,387	-
Stack Coefficient (cfm2/in4-°F):	0.07478	0.07478
Wind Coefficient (cfm2/in4-mph2):	0.02254	0.02254
Annual Infiltration Heat Loss (therms):	4,822	-
Total Annual Heat Loss (therms):	16,861	10,537
Boiler Efficiency:	88%	88%
Input Energy to Replace Heat Loss (therms)	19,160	11,974

Savings (therms)		7,186
Savings (gallons oil)		6,249

Note: 115000 Btu / gallon of #2 fuel oil

Almost Heaven Housing Authority
Cash Flow - Guarantee

Year	HUD Funding Year (fiscal)	Annual Energy Savings 3.5%	Annual Debt Payment	Annual Fees M&V 2.5%	Annual Fees Replacement costs	Total Liabilities	Annual Cash-Flow	Cumulative Cash-Flow	
1	2014	$ 112,022	$ 99,652	$ 10,000	-	$ 109,652	$ 2,370	$ 2,370	
2	2015	115,943	103,140	10,250	-	113,390	2,553	4,923	
3	2016	120,001	106,750	10,506	-	117,256	2,745	7,669	
4	2017	124,201	110,486	10,769	-	121,255	2,946	10,615	
5	2018	128,548	114,353	11,038	$ 660	126,051	2,497	13,112	
6	2019	133,048	118,356	11,314	2,547	132,217	831	13,943	
7	2020	137,704	122,498	11,597	2,559	136,654	1,050	14,993	
8	2021	142,524	126,785	11,887	2,571	141,243	1,281	16,273	
9	2022	147,512	131,223	12,184	2,583	145,990	1,522	17,796	
10	2023	152,675	135,816	12,489	720	149,024	3,651	21,446	
11	2024	158,019	140,569	12,801	732	154,102	3,917	25,363	
12	2025	163,549	145,489	13,121	8,552	167,162	(3,613)	21,750	
13	2026	169,274	150,581	13,449	8,692	172,722	(3,449)	18,302	
14	2027	175,198	155,852	13,785	8,832	178,469	(3,271)	15,031	
15	2028	181,330	161,307	14,130	8,972	184,408	(3,078)	11,953	
16	2029	187,677	166,952	14,483	9,112	190,547	(2,871)	9,083	
17	2030	194,245	172,796	14,845	9,252	196,893	(2,647)	6,435	
18	2031	201,044	178,843	15,216	9,392	203,452	(2,408)	4,028	
19	2032	208,081	185,103	15,597	9,532	210,232	(2,151)	1,877	
20	2033	215,363	191,582	15,987	9,672	217,240	(1,877)	(0)	
		$3,167,960	$2,818,133	$ 255,447	$ 94,380	$ 3,167,960	$ (0)	$ (0)	(0)
Guarantee	90%						-		

Almost Heaven Housing Authority
Cash Flow - Guarantee

Cash Flow - 100% Year	HUD Funding Year (fiscal)	Annual Energy Savings 3.5%	Annual Debt Payment	Annual Fees M&V 2.5%	Annual Fees Replacement costs	Total Liabilities	Annual Cash-Flow	Cumulative Cash-Flow	
1	2014	$ 124,900	$ 99,652	$ 10,000	-	$ 109,652	$ 15,248	$ 15,248	
2	2015	129,272	103,140	10,250	-	113,390	15,881	31,129	
3	2016	133,796	106,750	10,506	-	117,256	16,540	47,669	
4	2017	138,479	110,486	10,769	-	121,255	17,224	64,893	
5	2018	143,326	114,353	11,038	$ 660	126,051	17,274	82,167	
6	2019	148,342	118,356	11,314	2,547	132,217	16,125	98,292	
7	2020	153,534	122,498	11,597	2,559	136,654	16,880	115,172	
8	2021	158,908	126,785	11,887	2,571	141,243	17,664	132,837	
9	2022	164,469	131,223	12,184	2,583	145,990	18,479	151,316	
10	2023	170,226	135,816	12,489	720	149,024	21,202	172,518	
11	2024	176,184	140,569	12,801	732	154,102	22,082	194,599	
12	2025	182,350	145,489	13,121	8,552	167,162	15,188	209,788	
13	2026	188,732	150,581	13,449	8,692	172,722	16,010	225,798	
14	2027	195,338	155,852	13,785	8,832	178,469	16,869	242,667	
15	2028	202,175	161,307	14,130	8,972	184,408	17,767	260,434	
16	2029	209,251	166,952	14,483	9,112	190,547	18,704	279,138	
17	2030	216,575	172,796	14,845	9,252	196,893	19,682	298,820	
18	2031	224,155	178,843	15,216	9,392	203,452	20,703	319,523	
19	2032	232,000	185,103	15,597	9,532	210,232	21,769	341,292	
20	2033	240,120	191,582	15,987	9,672	217,240	22,880	364,173	
		$3,532,132	$2,818,133	$ 255,447	$ 94,380	$ 3,167,960	$ 364,173	$ 364,173	-
		-	$0	-	0			-	

$	112,022
	124,900
	90%

ABC Housing Authority

Actual Utility Rates & Escalation Factors for Savings Estimates

	Actual Average Rates from form(s) HUD 52722 07/01/09 to 06/30/10			Rate Inflation Factor	2011 Rates			Rate Inflation Factor	2012 Rates		
	W&S ccf	*Elec.* kWh	Gas Therms		W&S ccf	*Elec.* kWh	Gas Therms		W&S ccf	*Elec.* kWh	Gas Therms
AMP0001	7.2498	0.1568	1.3311	1.0350	7.5035	0.1623	1.3777	1.0350	7.7662	0.1680	1.4259
AMP0002	9.0906	0.1545	1.2074	1.0350	9.4087	0.1599	1.2497	1.0350	9.7380	0.1655	1.2934

**From 2011 form HUD-52722* **3.5%Escalation Factor* **3.5%Escalation Factor*

125 YEARS BUREAU OF LABOR STATISTICS

Series Id: CUURX100SAH2,CUUSX100SAH2
Not Seasonally Adjusted
Area: Northeast urban - Size Class B/C
Item: Fuels and utilities
Base Period: DECEMBER 1997=100
Years: 1997 to 2010

Year	Annual	Change	Annual
2001	129.70		
2002	122.00	(7.70)	-5.9%
2003	136.40	14.40	11.8%
2004	143.60	7.20	5.3%
2005	164.80	21.20	14.8%
2006	177.40	12.60	7.6%
2007	186.97	9.57	5.4%
2008	210.55	23.59	12.6%
2009	197.89	(12.67)	-6.0%
2010	202.01	4.12	2.1%

Average Yearly Escalation 5.05%

to find goal seek:

Data Tab / What-if Analysis / goal seek

1.0504649	1.0000	Change this cell to achieve goal
129.70	129.70	
136.25	129.70	Set Cell: i32
143.12	129.70	To Value: 202.01
150.34	129.70	By Changing Cell: i22
157.93	129.70	
165.90	129.70	
174.27	129.70	
183.07	129.70	
192.31	129.70	
202.01	129.70	Goal: This cell equals 202.01

Almost Heaven PHA- Utility Allowances - COSTS

Best Power	$8.53	for the first 100 kWh or less
Rate A Res. Service	$0.060278	per kWh for all kWh in excess of above
Energy Charge	$0.074380	per kWh for all kWh in excess of above
Total Marginal Rate	$0.134658	per kWh for all kWh in excess of above

Utility Allowances
Resident Paid
Monthly

Operating Fund Project Number	Site Name Location	Bedroom Size	Units	Building Type	Almost Heaven **Existing** (date)	ESCo **PRE**	ESCo **POST**	Energy Savings	Utility: Who Pays The Utility Bills (PRE - POST) A = Authority R = Resident Elec.	Fuel	Water
			A		S	B	C	D=(B-C)*A			
XX011000001	Gator Village	1 BR	0	Townhouse	$0.00	$0.00	$0.00	$0.00	R	A	A
XX011000001	Gator Village	2 BR	14	Townhouse	$43.00	$48.70	$34.86	$193.77	R	A	A
XX011000001	Gator Village	3 BR	22	Townhouse	$59.00	$60.32	$42.35	$395.19	R	A	A
XX011000001	Gator Village	4 BR	13	Townhouse	$67.00	$62.74	$44.30	$239.69	R	A	A
XX011000001											
XX011000001	Apollo Towers	1 BR	74	Highrise	$0.00	$0.00	$0.00	$0.00	A	A	A
XX011000001	Apollo Towers	2 BR	0	Highrise	$0.00	$0.00	$0.00	$0.00	A	A	A
XX011000001	Apollo Towers	3 BR	0	Highrise	$0.00	$0.00	$0.00	$0.00	A	A	A
XX011000001	Apollo Towers	4 BR	0	Highrise	$0.00	$0.00	$0.00	$0.00	A	A	A
			123					$828.65			
								$9,944		Yearly	