

Appendix A
Facilities

Site Name	Site Number	Number of Units
Western Heights	3-01	244
Western Heights Addition	3-04	444
Lonsdale Homes	3-05	241
Austin Homes Annex	3-06	129
Love Towers	3-07	249
Walter P. Taylor Homes	3-08	230
Lee Williams Senior Citizens	3-09	270
Cagle Terrace	3-10	274
Northgate Terrace	3-11	277
Christenberry Heights	3-12	268
Montgomery Village	3-13	82
Montgomery Village Addition	3-14	370
Isabella Towers	3-18	236
Mechanicsville	3-21	26
The Vista	3-25	175
Lonsdale Homes Addition	3-26	19
The Verandas	3-28	42
Central Garage	N/A	-
Central Maintenance Building	N/A	-
Main Office	N/A	-
Family Investment Center (FIC)	N/A	-

**APPENDIX B
SCOPE OF WORK**

The following section summarizes the Scope of Work included in this ESA.

Measure Name	Western Heights Addition	3-1	Western Heights Addition	3-4	Lonstable Homes Annex	3-6	Love Towers	3-7	Walter P Taylor Homes	3-8	Lee Williams Schlor Citizens	3-9	Crigle Terrace	3-10	Norridge Terrace	3-11	Christenbar Heights	3-12	Montgomery Village Addition	3-13	Montgomery Village Addition	3-14
1 Replace Toilet Valves and Flappers	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
2 Replace Toilets with 1.6 GPF Models	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
3 Install Low Flow Showerheads	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
4 Install Low Flow Faucet Aerators	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
5 Install Front-Loading Washers	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
6 Upgrade Common Area Lighting	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
7 Upgrade Apartment Lighting	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
8 Install Vending Machine Controls	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
9 Install PTHPs With Limiting Thermostats	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
10 Install Energy Star Refrigerators	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
11 Replace Windows	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
12 Replace Rooftop Units	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
13 Replace Gas Furnaces	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
14 Upgrade Common Area HVAC	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
15 Replace Membrane Roofing System	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	

Measure Name	Isabella Towers	3-18	Mechanics Fl	3-21	The Vista	3-25	Lonstable Homes Addition	3-26	The Veardas	3-28	Central Garage Building	N/A	Central Maintenance Building	N/A	Main Office	N/A	Family Investment Center (FIC)	N/A
1 Replace Toilet Valves and Flappers	✓		✓		✓		✓		✓		✓		✓		✓		✓	
2 Replace Toilets with 1.6 GPF Models	✓		✓		✓		✓		✓		✓		✓		✓		✓	
3 Install Low Flow Showerheads	✓		✓		✓		✓		✓		✓		✓		✓		✓	
4 Install Low Flow Faucet Aerators	✓		✓		✓		✓		✓		✓		✓		✓		✓	
5 Install Front-Loading Washers	✓		✓		✓		✓		✓		✓		✓		✓		✓	
6 Upgrade Common Area Lighting	✓		✓		✓		✓		✓		✓		✓		✓		✓	
7 Upgrade Apartment Lighting	✓		✓		✓		✓		✓		✓		✓		✓		✓	
8 Install Vending Machine Controls	✓		✓		✓		✓		✓		✓		✓		✓		✓	
9 Install PTHPs With Limiting Thermostats	✓		✓		✓		✓		✓		✓		✓		✓		✓	
10 Install Energy Star Refrigerators	✓		✓		✓		✓		✓		✓		✓		✓		✓	
11 Replace Windows	✓		✓		✓		✓		✓		✓		✓		✓		✓	
12 Replace Rooftop Units	✓		✓		✓		✓		✓		✓		✓		✓		✓	
13 Replace Gas Furnaces	✓		✓		✓		✓		✓		✓		✓		✓		✓	
14 Upgrade Common Area HVAC	✓		✓		✓		✓		✓		✓		✓		✓		✓	
15 Replace Membrane Roofing System	✓		✓		✓		✓		✓		✓		✓		✓		✓	

Table B.1 ECM List

- ECM 1: Replace Toilet Valves and Flappers**
- ECM 2: Replace Toilets with 1.6 GPF Models**
- ECM 3: Replace Showerheads**
- ECM 4: Replace Faucet Aerators**

Ameresco shall install the new plumbing fixtures at the locations and in the quantities shown in the following four tables:

Development	Toilet Qty.
Western Heights Addition	300
Austin Homes Annex	93
Walter P. Taylor Homes	96
Christenberry Heights	135
Montgomery Village	64
Montgomery Village Addition	230
TOTAL	918

Table ECM-1. Toilet Flush Valve/Flapper Retrofit Quantity by Site

Development	Toilet Type	Toilet Qty.	Urinal Qty.
Western Heights	P-1	1	2
Western Heights	P-4	250	
Western Heights Addition	P-1	200	
Western Heights Addition	P-2	31	
Austin Homes Annex	P-1	45	
Austin Homes Annex	P-2	14	
Austin Homes Annex	P-4	4	
Love Towers	P-5	249	
Love Towers	P-1	2	
Walter P. Taylor Homes	P-1	178	2
Walter P. Taylor Homes	P-2	6	
Lee William Senior Citizens	P-2	270	
Lee William Senior Citizens	P-4	5	
Lee William Senior Citizens	P-6	2	
Cagle Terrace	P-1	3	1
Cagle Terrace	P-2	275	
Northgate Terrace	P-1	1	
Northgate Terrace	P-2	253	
Northgate Terrace	P-3	24	
Christenberry Heights	P-1	134	1
Christenberry Heights	P-2	23	
Montgomery Village	P-1	21	1
Montgomery Village	P-4	7	
Montgomery Village Addition	P-1	230	
Montgomery Village Addition	P-2	24	
Isabella Towers	P-3	210	
Isabella Towers	P-1	4	
Isabella Towers (Rowhouse)	P-2	26	
Central Garage	-	-	1
Central Maintenance Bldg	P-4	2	
Main Office	P-4	4	
Family Investment Center	P-1	1	4
Family Investment Center	P-4	1	
	Total	2,500	12

Table ECM-2. Toilet Replacement Quantities by Site (including Urinal Flushometer Retrofits)

Table ECM-2 Key:

P-1 – Standard height, elongated bowl, 1.6 gallon gravity flush, floor mount/floor outlet Toto CST744S, American Standard Cadet 3, or equal

P-2 – ADA Compliant, elongated bowl, 1.6 gallon gravity flush, floor mount/floor outlet Toto CST744SL, American Standard Cadet 3, or equal

P-3 – ADA Compliant, elongated bowl, 1.6 gallon pressure-assisted flush, floor mount/wall outlet Gerber 21-325, American Standard Yorkville, or equal

P-4 – Standard height, elongated bowl, 1.6 gallon flushometer valve, floor mount/floor outlet Toto CT705, American Standard Madera, or equal w/Toto or Sloan flush valve

P-5 – Same as P-4 with 3-inch seat lift for ADA compliance

P-6 – Standard height, elongated bowl, 1.6 gallon flushometer valve, wall mount/wall outlet, make/model TBD

All new toilets will be furnished with seats: Bemis 1800TT Plastic Seat or equal.

New urinal flush valves will be 1.0 gallons-per-flush, Sloan or equal. Existing urinal china will be reused.

Development	Showerhead Qty.
Western Heights	244
Western Heights Addition	444
Lonsdale Homes	241
Austin Homes Annex	129
Love Towers	249
Walter P. Taylor Homes	230
Lee William Senior Citizens	270
Cagle Terrace	274
Northgate Terrace	277
Christenberry Heights	268
Montgomery Village	82
Montgomery Village Addition	370
Isabella Towers	236
Mechanicsville	26
Lonsdale Homes Addition	19
TOTAL	3,359

Table ECM-3. Showerhead Replacement Quantity by Site

Development	Aerators Qty.
Western Heights	495
Western Heights Addition	975
Lonsdale Homes	535
Austin Homes Annex	285
Love Towers	504
Walter P. Taylor Homes	510
Lee William Senior Citizens	547
Cagle Terrace	552
Northgate Terrace	561
Christenberry Heights	560
Montgomery Village	174
Montgomery Village Addition	854
Isabella Towers	478
Mechanicsville	52
Lonsdale Homes Addition	38
Central Garage	3
Central Maintenance Bldg	2
Main Office	14
Family Investment Center	26
TOTAL	7,165

Table ECM-4. Faucet Aerator Replacement Quantity by Site

Specifically, the scope of work will include the following:

- Remove and properly dispose of existing plumbing fixtures
- Furnish and install new plumbing fixtures in accordance with local plumbing codes
- Jobsite cleanup to "as-was" conditions
- New equipment provided:
 - Toilet Retrofits: Fluidmaster Anti-Siphon Fill Valve (400A); Sure-Fit Super Flapper (504/504BX)
 - Toilets: As noted in Table ECM-2
 - Urinal Retrofits: As noted in Table ECM-2
 - Showerheads: Niagara Conservation, Model N2817, 1.75 GPM
 - Aerators: Niagara Conservation, Model N3210 SAW, 1.0 GPM (for bath applications)
Niagara Conservation, Model N3115, 1.5 GPM (for kitchen applications)

- The new plumbing fixtures will be connected to the existing water supply and waste lines. For toilet installations, Ameresco will include a new wax ring or seal gasket and closet bolts, while existing flanges and stop valves will be reused. Ameresco has budgeted for the replacement of damaged flanges and toilet stop valves for up to 10% of the toilet installations. If any additional repairs are required to properly install the new toilets or other plumbing fixtures, this work shall be completed on a time and materials basis through a Change Order. Under no circumstances will Ameresco proceed with such repair work at any location without the written authorization of KCDC.
- This scope of work excludes repair to pre-existing water damaged, cracked, loose or missing areas of the floors, walls, tiles and ceiling.
- The ESA will provide for installation of fixtures up to the total quantities listed in the plumbing fixture replacement inventories shown in Tables ECM-1 through ECM-4. If the actual replacement count of fixtures exceeds the total quantities tabulated and KCDC authorizes Ameresco to install additional fixtures, then Ameresco will provide such installations and bill KCDC via a Change Order utilizing the following firm-fixed unit pricing schedule (includes administration fee, overhead and profit):

<u>Fixture</u>	<u>Unit Cost</u>
Toilets	
P1	\$520
P2	\$552
P3	\$1,031
P4	\$598
P5	\$770
P6	\$1,057
Urinal Retrofit	\$317
Showerheads	\$45
Aerators	\$28

The above unit pricing does not include any permitting costs that may apply.

ECM 5: Install Front-Loading Washers

KCDC shall renegotiate their existing lease agreement to swap out the existing top-loading washers with front-loading equivalents at the following four locations:

Love Towers
Cagle Terrace
Northgate Terrace
Isabella Towers

Ameresco will support KCDC with vendor coordination to assure that the proper front-loading washers are installed, which will assure that the predicted water savings are achieved. The ESA excludes any other costs associated with this measure such as payment of additional vendor fees or changes to existing building systems that may be necessary. Furthermore, in order to maintain the water and energy savings associated with this measure throughout the ESA contract term, KCDC agrees to continue to use only front-loading washers at the above noted sites for the full term of the ESA.

ECM 6: Upgrade Common Area Lighting
ECM 7: Upgrade Apartment Lighting

Ameresco shall install new lighting fixtures and retrofits in accordance with the lighting audits presented in Attachments E and F of Section VI of the Energy Audit Report, dated August 4, 2006. Lighting products used shall be in accordance with or equal to those presented in Attachment H of the Energy Audit Report.

The scope of work shall include removal of the existing equipment and installation of the new equipment in accordance with the above referenced lighting audits, proper disposal of all job site waste, including any hazardous waste, and job-site cleanup. Existing power wiring and controls shall be reused, unless otherwise noted in the lighting audit.

ECM 8: Install Vending Machine Controls

Ameresco shall install occupancy sensing plug load controllers in accordance with the following table:

Development	Beverage Machine Qty	Snack Machine Qty
Western Heights	1	0
Love Towers	1	0
Water P. Taylor/Lee Williams	3	1
Cagle Terrace	3	2
Christenberry Heights	1	0
Montgomery Village	2	0
Isabella Towers	2	1
Main Office	1	0
Family Investment Center	1	1
Total	15	5

Table ECM-8. Beverage and Snack Machine Controls Quantities by Site

Each refrigerated beverage machine shall receive a Vending Miser brand controller, while each snack machine shall receive a Snack Miser brand controller. Each controller shall be integrated with the existing 110V vending machine power source.

ECM 9: Install Packaged Terminal Heat Pumps with Limiting Thermostats

Ameresco shall replace the existing packaged terminal heat pumps (PTACs) and integral electric heaters at the sites listed above with packaged terminal heat pumps (PTHPs) and supplemental electric resistance heat, in accordance with the following equipment schedule. The new PTHPs shall include the capability to limit the heating and cooling temperature settings on the unit mounted controls. Such limiting ranges shall be determined prior to equipment ordering or setup and shall be reviewed and approved by KCDC.

As part of this scope of work, Ameresco shall remove, decommission, and properly dispose of the existing PTAC units. The new equipment will be installed in accordance with the manufacturer's instructions and all applicable codes. New thru-wall fan circulators (Suncourt or equal) will be installed where existing PTAC multi-room duct extensions are present.

This scope of work does not include enlarging or reducing existing wall openings to fit the new equipment, or any finish work not directly associated with this installation (e.g., repair of existing wall damage or finish).

Site	Location	# Units	Existing Model	Nominal Cooling Capacity BTUH	Proposed Cooling Efficiency EER	Nominal Heating Capacity BTUH	Proposed Heating Efficiency COP	Supplemental Heating Source	Supplemental Heating KW	Volts/Phase/Hz	Proposed Model
Love Towers	Apartments Bldg. A	202	Carrier PTAC Mod. # 52SEC312301AA; Typ. Serial # 3899E61730	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat
	End Apartments Bldg. A	28	Carrier PTAC Mod. # 52SEC312301AA w/ Duct Extension	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat and Remote Mounted Transfer Fan with Cord and Cap
	Apartments Bldg. B	169	Carrier PTAC Mod. # 52SEC312301AA	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat
	End Apartments Bldg. B	28	Carrier PTAC Mod. # 52SEC312301AA w/ Duct Extension	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat and Remote Mounted Transfer Fan with Cord and Cap
Cagle Terrace	Apartments Bldg. A	190	Amana PTAC Mod. # PTC123A35AB; Ser # 12105610	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat
	Apartments Bldg. B	129	Amana PTAC Mod. # PTC123A35AB	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat
Northgate Terrace	Apartments	307	Carrier PTAC Mod. # 52SEC312301AA; Typ. Serial # 1899E60793	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat
	Common Areas	60	Amana PTAC Mod. # PTC153A35AB; Typ. Serial # 9908152830	12,000	9.9	13,300	3.2	Electric	3.0	208/1/60	Trane Model PTHE1501UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat
Isabella Towers	Apartments	240	McQuay PTAC Mod. # MQE12EG3ST1H; Serial # 7 7B0077300	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat
	Common Areas	48	Carrier PTAC Mod. # 52SEC312301AA; Typ. Serial # 2799E62392	12,000	11.2	10,600	3.1	Electric	3.0	208/1/60	Trane Model PTHE1201UA, Pkg. Terminal Heat Pump w/ Electric Strip Heat

Table ECM-9. PTAC Replacement Schedule

ECM 10: Install Energy Star Refrigerators

Ameresco shall furnish and install a total of 1,021 Hotpoint Model HTH16BBS nominal 16 cubic foot Energy Star rated refrigerators and two (2) Hotpoint Model GTH18DBR nominal 18 cubic foot Energy Star refrigerators (one each at Western Heights and Main Office), in accordance with the following equipment schedule.

Site	Apartment Replacement Refrigerator Qty.	Common Area Replacement Refrigerator Qty.
Western Heights	0	2
Western Heights Addition	166	0
Austin Homes Annex	32	0
Walter P. Taylor Homes	79	0
Lee Williams Senior Citizens	119	0
Cagle Terrace	252	0
Northgate Terrace	0	3
Christenberry Heights	79	0
Montgomery Village Addition	172	0
Isabella Towers	117	0
Main Office	0	2
Total	1,016	7

Table ECM-10. Refrigerator Replacement Quantity

Specifically, the scope of work includes the following:

- Delivery of new refrigerators, unpacking, and installation
- Removal and handling of old refrigerators
- Disposal of all packing debris
- The ESA will provide for installation of new refrigerators up to the total quantity listed in the above equipment schedule. If the actual replacement count of refrigerators exceeds the total quantity tabulated above and KCDC authorizes Ameresco to install additional refrigerators, then Ameresco will provide such installations and bill KCDC via a Change Order utilizing the following firm-fixed unit pricing schedule (includes administration fee, overhead and profit):

16 CF Model: \$538 EA.
 18 CF Model: \$627 EA.

ECM 11: Replace Windows

Ameresco shall replace the existing single-pane, aluminum-framed windows at the Western Heights gym and Christenberry Heights maintenance facility/gym noted below with new, aluminum-framed, thermally insulated windows of equivalent configuration.

Replacement Window Sizes (Approximate):

Western Heights Gym: Twenty (20) windows, including ten (10) windows at 2' 8" x 4' 6" and ten (10) windows at 5' 8" x 12' 0"

Christenberry Heights Maintenance Facility/Gym: Thirty-six (36) windows at 5' 8" x 2' 0"

This scope of work excludes the removal or reinstallation of existing window treatments or window air conditioning units for the affected window systems—that will be the responsibility of KCDC. In addition, testing for and abatement of any hazardous materials including lead and asbestos associated with the affected installation is not included, nor is repair work associated with existing conditions not directly associated with the new window systems. The new glazing specified shall have a U-Value of 0.60 or less, exclusive of the framing.

ECM 12: Replace Rooftop Units

Ameresco shall replace existing rooftop heating and cooling equipment with high efficiency heat pumps and supplemental electric heat, in accordance with the following equipment schedule.

As part of this scope of work, Ameresco shall remove, decommission, and properly dispose of the existing equipment. The new equipment will be installed in accordance with the manufacturer's instructions and all applicable codes. All existing ductwork and electrical services shall be reused.

Site	Location	# Units	Existing Model	Nominal Cooling Capacity TONS	Proposed Model	Efficiency Cooling	Efficiency Heating	Heat Pump Heating Capacity BTUH	Supplemental Heating Source	Supplemental Heating Capacity	Volts/Phase/Hz
Montgomery Village	Shop Roof	1	Trane 7.5 Ton Packaged Rooftop Heat Pump: Mod. # WCD090C300AA; Ser. # G091421610	7.5	Trane 7.5 Ton Pkg. Rooftop Heat Pump w/ Elec. Heat: Mod. # WSC090A3RCA	10.1 EER	2.2 COP	50,000	Electric	9 kW	208/3/60
	Shop Roof	1	Trane 4 Ton Packaged Rooftop Heat Pump: Mod. # WCD048C300BA; Ser. # G10101665	4	Trane 4 Ton Pkg. Rooftop Heat Pump w/ Elec. Heat: Mod. # WSC048A3RBA	10.7 SEER	2.02 COP	28,800	Electric	6 kW	208/3/60
	Shop Roof	1	Trane 5 Ton Packaged Rooftop Heat Pump: Mod. # WCD060C300BA; Ser. # G09101558	5	Trane 5 Ton Pkg. Rooftop Heat Pump w/ Elec. Heat: Mod. # WSC060A3RBA	10.1 SEER	2.1 COP	59,000	Electric	6 kW	208/3/60
	Montgomery Village Ministry	1	Trane 5 Ton Packaged Rooftop Heat Pump: Mod. # WCH0601002A	5	Trane 5 Ton Pkg. Rooftop Heat Pump w/ Elec. Heat: Mod. # WCZ060F100B	15.05 SEER	3.46 COP	54,500	Electric	6 kW	208/1/60
	Boys and Girls Gym	2	Trane 7.5 Ton Split System Heat Pump: Mod. # TWE090A3/TWA090A300B A; Ser. # G10198876	7.5	Trane 7.5 Ton Split System Heat Pump w/ Elec. Ht: Mod. # TWE090A300E/ TWA090A300F	10.1 EER	2.4 COP	55,000	Electric	6 kW (est.)	208/3/60

Table ECM-12. Rooftop Unit Replacement Schedule

ECM 13: Replace Gas Furnaces

Ameresco shall replace existing apartment furnaces with high-efficiency gas furnaces, in accordance with the following equipment schedule. For the Tenant Association and Lighthouse Ministry, Ameresco shall install split system heat pumps with gas furnaces.

As part of this scope of work, Ameresco shall remove, decommission, and properly dispose of the existing equipment. The new equipment will be installed in accordance with the manufacturer's instructions and all applicable codes. All existing ductwork and electrical services shall be reused.

Site	Location	# Units	Existing Model	Proposed Model	Nominal Gas Heating Capacity BTUH	Heat Pump Cooling/Heating Capacity TONS/BTUH	Supplemental Heating Source	Supplemental Heating Efficiency AFUE	Volts/Phase/Hz
Austin Homes Annex	Apartments	127	Lennox Pulse Furnace Model # G14Q3-40-1 & # G14Q3-40-2	Trane Furnace Model # TUX1B040A9H21A	40,000	-	Gas	95%	230/1/60
	Apartments	2	Lennox Pulse Furnace Model # G14Q3-60-3	Trane Furnace Model # TUX1B060A9H31	60,000	-	Gas	93.3%	230/1/60
	Tenant Association & Lighthouse Ministry	2	Lennox Conservator II G12E Furnace Model # G12Q4E-60-6 with a Split System AC unit attached	Trane Split System Heat Pump w/ Gas Furnace Model #s TUX1C100A948 / 2TWR3048A1 / 2TXCC049AC3 (11.0 EER/3.4 COP)	100,000	4 / 43,500	Gas	93%	230/1/60
	Tenant Association & Lighthouse Ministry	1	Lennox Conservator II G12E Furnace Model # G12Q5E-75-7 with a Split System AC unit attached	Trane Split System Heat Pump w/ Gas Furnace Model #s TUX1C100A960 / 2TWR3060A1 / 2TXCC060AC3 (11.0 EER/3.5 COP)	100,000	5 / 55,000	Gas	92%	230/1/60

Table ECM-13. Existing and Proposed Equipment Schedule

ECM 14: Upgrade Common Area HVAC

Ameresco shall replace the equipment listed in the following equipment schedule with either high efficiency heat pumps or cooling-only units as noted and new indoor sections with supplemental electric heat where noted.

As part of this scope of work, Ameresco shall remove, decommission, and properly dispose of the existing equipment. The new equipment will be installed in accordance with the manufacturer's instructions and all applicable codes. All existing ductwork and electrical services shall be reused.

Site	Location	# Units	Existing Model	Nominal Cooling Capacity TONS	Proposed Model	Heat Pump Efficiency SEER/ COP	Heat Pump Heating Capacity BTUH	Supplemental Heating Source	Supplemental Heating KW	Volts/Phase/Hz
Love Towers	Common Area Bldg A	1	Trane AHU Model # SUA-1503A; Ser# 51-12014 plus connected Condenser	15	Trane 15 Ton Split System Heat Pump w/ Electric Heat; Model # TWE180B300E/TWA180B300F	9.9 / 2.2	106,000	Electric	14.96	208/3/60
	Bldg. A Rooftop Elevator Room	1	Trane Model # TWH064P150C/TTA042C300A0; Ser. # G38374881/G39217486	3.5	Trane 3.5 Ton Split System Heat Pump w/ Electric Heat; Model # 2TEH3F048A1/2TWA3042A3	14.5 / 3.7	35,200	Electric	11.53	208/3/60
	Bldg. B Rooftop Elevator Room	1	Trane Model # TWE060C150C/2TTA0048C3000AA; Ser. # G03819767(TWE Unit)	4	Trane 4 Ton Split System Heat Pump w/ Electric Heat; Model # 2TEH3F048A1/2TWA3048A3	14.5 / 3.6	41,500	Electric	11.53	208/3/60
	Lobby & Beauty Bldg A	3	Sanyo Model # KHS1822/CH1822	1.5	Mitsubishi Ductless Mini Split Heat Pump; Model # MSZA17NA/MUZA17NA; R410	16 / 2.7	20,100	None (Low temp heat pump operation)	-	208/1/60
Cagle Terrace	Residence Hallway Bldg A	8	Sanyo Model # KHS1222/CH1222	1	Mitsubishi Ductless Mini Split Heat Pump; Model # MSZA12NA/MUZA12NA; R410	17 / 3.4	13,600	None (Low temp heat pump operation)	-	208/1/60
	Lobby Bldg B	2	Sanyo Model # KHS1822/CH1822	1.5	Mitsubishi Ductless Mini Split Heat Pump; Model # MSZA17NA/MUZA17NA; R410	16 / 2.7	20,100	None (Low temp heat pump operation)	-	208/1/60
	Residence Hallway Bldg B	8	Sanyo Model # KHS1222/CH1222	1	Mitsubishi Ductless Mini Split Heat Pump; Model # MSZA12NA/MUZA12NA; R410	17 / 3.4	13,600	None (Low temp heat pump operation)	-	208/1/60
	6th Floor Vent Bldg A	2	Bard Model # P1024A1 Ser# 098M930811146-1	2	Trane Pkg. Rooftop Heat Pump w/ Electric Heat; Model # 2WCC3024A1000A	13 / 3.6	11,500	Electric	7.51	208/1/60
Bldg. A Rooftop Elevator Room	6th Floor Vent Bldg B	2	Bard Model # P1024A1 Ser# 098M930811143-1	2	Trane Pkg. Rooftop Heat Pump w/ Electric Heat; Model # 2WCC3024A1000A	13 / 3.6	11,500	Electric	7.51	208/1/60
	Bldg. A Rooftop Elevator Room	1	Trane Model # TWH064P150C1/TTA042C300BA	3.5	Trane 3.5 Ton Split System Heat Pump w/ Electric Heat; Model # 2TEH3F048A1/2TWA3042A3	14.5 / 3.7	35,200	Electric	11.53	208/3/60
	Bldg. B Rooftop Elevator Room	1	Trane Model # TWH064P150C1/TTA042C300A0	3.5	Trane 3.5 Ton Split System Heat Pump w/ Electric Heat; Model # 2TEH3F048A1/2TWA3042A3	10.6 / 3.7	35,200	Electric	11.53	208/3/60

Table ECM-14. Proposed Common Area HVAC Equipment Schedule

Site	Location	# Units	Existing Model	Nominal Cooling Capacity TONS	Proposed Model	Heat Pump Efficiency SEER / COP	Heat Pump Heating Capacity BTUH	Supplemental Heating Source	Supplemental Heating KW	Volts/Phase/Freq Hz
Northgate Terrace	Lobby	1	Carrier Model #'s: 40AQ018300BU / 38ER018300 w/ Duct Heater	1.5	Trane 1.5 Ton Split System Heat Pump w/ Electric Heat; Model # 2TEC3F018/2TWR3018A1	13 / 3.5	16,000	Electric	7.2	208/1/60
	Billiard Room	2	Bard Model #'s: B24EHQ1 / 24HPC; 2 Ton	2	Trane 2 Ton Wall Mounted Split System AC Model # 2TFB3F024 w/ Electric Heat & Condenser Model # 2TTR3024A1	13 / -	-	Electric	7.2	208/1/60
	Rooftop Elevator Room	1	Trane Model # TTA072C300A0; 5.6 Ton Condenser; Ser. # G36299961 and corresponding AHU	6	Trane 6 Ton Split System AC w/ Electric Heat; Model # TWE090A300E/ 2TTA072C3	10.6 / -	-	Electric	N/A	208/3/60
Isabella Tower	Office	1	York Model # N2AHD10A06A; Ser# MGNS260202	2.5	Trane 2.5 Ton Split System Heat Pump w/ Electric Heat; Model # 2TEC3F30A1/ 2TWR3030A1	13 / 3.5	26,000	Electric	7.2	208/3/60
	Elevator Room	1	Trane Model #'s TWH064P150C1/ TTA042C300A0; Ser. #'s G38374882/G39217487	3.5	Trane 3.5 Ton Split System Heat Pump w/ Electric Heat; Model # 2TEH3F048A1/2TWA3042A3	14.5 / 3.7	35,200	Electric	11.53	208/3/60

Table ECM-14. Proposed Common Area HVAC Equipment Schedule (Continued)

ECM 15: Replace Membrane Roofing System

Ameresco shall replace the roofs listed in the following table with an energy efficient, fully-adhered membrane roof system. The existing roof material and any water-soaked insulation will be removed. New insulation will be installed and tapered to the roof drains to provide proper slope to prevent pooling of water. The new roof systems will include flashing, stainless steel coping and counter flashing per the manufacturer's recommendations. New walk pads from stairwells or roof access will be provided as well as around all rooftop equipment as space permits. The new roof systems will have a manufacturer's 20 year warranty.

Development No.	Development/ Building	Description	SF of Roof to Replace	Roof Deck Material	Building Height	Existing Roof
3-10	Cagle Terrace A	Replace Entire Roof	11,968	Concrete	6-Story	Flat, 2-ply modified bitumen
3-10	Cagle Terrace B	Replace Entire Roof	11,968	Concrete	6-Story	Flat, 2-ply modified bitumen
3-01	Western Heights - Gym	Replace Boys and Girls Cub Gym Roof	7,000	Tectum	2-Story	Flat, 2-ply modified bitumen
3-01	Western Heights - Office	Replace Flat Part of Roof at the Rental Office	1,860	Metal or Tectum	1-Story	Flat, 2-ply modified bitumen
3-08/09	Walter P. Taylor Homes / Lee Williams - Office/Gym	Replace Flat Roof on Office/Gym Building	12,770	Tectum	1-Story Office 2-Story Gym	Flat, 2-ply modified bitumen
3-09	Lee Williams Senior Citizen's Center Building	Replace Flat Part of Roof at the Senior Center Building	1,414	Wood	1-Story	Flat, 2-ply modified bitumen
3-13/14	Montgomery Village Office/Shop Building	Replace Entire Roof	6,800	Tectum	1-Story	Flat, 2-ply modified bitumen
NA	Family Investment Center	Replace 3 rd Level Roof	10,380	Concrete	2 and 3-Story	EPDM Singly Ply with Gravel Ballast
NA	Central Maintenance	Replace Entire Roof	6,175	Metal	1-Story	Flat, 2-ply modified bitumen

Table ECM-15. Roof Replacement Schedule

APPENDIX G - MONITORING AND SAVINGS VERIFICATION PLAN

The following table identifies the HUD incentives that will be applied by site and utility and used to determine the savings for the project financing, in accordance with 24 CFR 990.185:

Development	KCDC Paid Electricity		KCDC Paid Gas		KCDC Paid Water & Sewer		Tenant Allowances
	Frozen Base	Add-on Subsidy	Frozen Base	Add-on Subsidy	Frozen Base	Add-on Subsidy	Allowance Adjustment
Western Heights		X		X	X		E
Western Heights Addition					X		E
Lonsdale Homes		X					E, W
Austin Homes Annex		X		X	X		E, G
Love Towers	X				X		
Walter P. Taylor Homes		X			X		E
Lee Williams Senior Citizens		X			X		
Cagle Terrace	X				X		
Northgate Terrace	X				X		
Christenberry Heights		X			X		E
Montgomery Village		X			X		E
Montgomery Village Addition					X		E
Isabella Towers	X				X		
Mechanicsville							E, G, W
The Vista							
Lonsdale Homes Addition							E, W
The Verandas		X					E
Central Garage		X					
Central Maintenance Bldg		X					
Main Office		X					
Family Investment Center		X					

Table G.1 HUD Incentives by Site

¹ Allowances impacted: E=Electric allowance; G=Natural gas allowance; W=Water and sewer allowance.

Utility Savings Calculation Methodologies

Frozen-Rolling Baseline

Master-metered water and electric consumption savings for select sites identified in Table G.1 will be determined utilizing the Frozen Rolling Baseline method, where usage savings will be measured at the meter. A sample calculation for the Frozen Rolling Baseline Method is presented in Appendix G-1. The frozen baselines may be weather or occupancy adjusted as necessary, in accordance with the protocol presented in Appendix G-5.

Add-on Operating Subsidy

KCDC receives an Add-On Operating Subsidy for calculated master-metered gas and electricity savings. Appendix G-2 summarizes the stipulated savings by measure, while Appendix G-5 presents the calculation methodologies.

Utility Allowance Adjustments

KCDC also receives a subsidy for the difference between present utility allowances for individually-metered, resident-paid utilities and the resultant utility allowances created by consumption savings for those utilities. Appendix G-3 presents a summary of the utility allowance savings by site, while Appendix G-5 presents the calculation methodologies.

Total Savings for Financing and Guarantee

The Total Savings for the performance contract equals the sum of the Add-on Operating Subsidy, the Utility Allowance Savings, and the actual savings generated by the Frozen Rolling Baseline method. The usage savings are valued at the greater of the current rates or the floor rates as presented Appendix G-4.

APPENDIX G-1
 FROZEN ROLLING BASELINE SAVINGS SAMPLE CALCULATION

KNOXVILLE'S COMMUNITY DEVELOPMENT CORPORATION

The sample savings calculations below are based on estimated post-retrofit use for all sites and utilities with Frozen Rolling Baselines. (See Attachments A and C in the Energy Audit Report for Baseline totals by development.)

Calculations have been designed to reflect the subsidy KCDC will receive using the HUD 52722 Form. Line numbers from the HUD Form are provided below.

TOTALS (52722 Line No.)	Frozen Base (Line 1-3)	Weather Adj. Use [3] (Line 16)	Actual Use (Line 14)	Savings	% Savings	Actual Costs		Savings		Base Cost (Line 17,20) J=G+I
						Actual Rate (Line 15) F=G/C	Total Cost (Line 13) G	Savings Rate H [4]	Total Savings I=D*H	
	A	B	C	D=B-C	E=D/B					
Gas (therms)	12,901,103	12,901,103	10,085,050	2,816,053	21.8%	\$0.0715	\$720,969	\$0.0716	\$201,503	\$922,472
Electric (kWh)	221,110	221,110	160,296	60,814	27.5%	\$6.6728	\$1,069,616	\$7.0256	\$427,256	\$1,496,872
Water (ccf)							\$1,790,585		\$628,759	\$2,419,344
Total										

NOTES:

1. Entries in bold print (frozen base) include only sites included in the frozen rolling base per Table G.1 and will remain constant through the length of the contract.
2. Entries in italics (actual use and cost, weather adjusted base year) will change annually.
3. Although HUD no longer requires Baselines to be weather adjusted, Ameresco will weather adjust to calculate heating and cooling savings against the electric baseline.
4. Savings are valued at the "then-current" delivered rates for all sites. The Savings Rate is a weighted average based on consumption savings, and therefore may differ from the actual delivered rate. The Savings Rates shall never be less than the Floor Rates presented in Appendix G-5.

APPENDIX G-2
ADD-ON SUBSIDY SAVINGS SUMMARY

KNOXVILLE'S COMMUNITY DEVELOPMENT CORPORATION

NOTES:

1. Pre-Retrofit Baseline Use is from the Energy Audit Report, Attachments A and B.
2. Stipulated savings will be consumption-based and equal to the computed savings presented in Appendix G-6.
3. The Savings Rates applied in the calculations will remain fixed throughout the contract term.

Table G.2.1. Calculated Master-Metered Electric (kWh) Savings

Baseline Use	Replace Toilet Valves and Flappers [1]	Replace Toilets with 1.6 GPF Models [2]	Install Low Flow Showerheads [3]	Install Low Flow Faucet Aerator [4]	Install Front-Loading Washers [5]	Upgrade Common Area Lighting [6]	Upgrade Apartment Lighting [7]	Install Vending Machine Controls [8]	Install PTHs With Limiting Thermostats [9]	Install Energy Star Refrigerators [10]	Replace Windows [11]	Replace Rooftop Units [12]	Replace Gas Furnaces [13]	Upgrade Common Area HVAC [14]	Replace Membrane Roofing System [15]	Total Savings (kWh)	Savings Rate (\$/kWh)	Stipulated Cost (\$/Yr)	Savings as Percent of Baseline
Western Heights	87,184					35,326		1,841		1,624	1,404					40,195	\$0.0668	\$ 3,490	46%
Western Heights Addition	202,951					3,119											\$0.0668	\$ -	0%
Lonsdale Homes	196,798					5,718							2,838			8,556	\$0.0653	\$ 266	2%
Austin Homes Annex	69,843																\$0.0669	\$ 744	12%
Love Towers	203,193					52,012		5,914								57,925	\$0.0795	\$ 4,606	29%
Lee Williams Senior Citizens	2,967,445		27,460	42,716		154,231				48,292						272,699	\$0.0817	\$ 22,270	10%
Cagle Terrace																0	\$0.0676	\$ -	-
Northgate Terrace																0	\$0.0684	\$ -	-
Christenberry Heights	233,271					26,382		1,841			5,688					33,901	\$0.1900	\$ 6,442	15%
Montgomery Village	207,408					15,464		3,692				32,385				51,550	\$0.0832	\$ 4,288	25%
Isabella Towers																0	\$0.0682	\$ -	-
Mechanicsville																0	\$0.0688	\$ -	-
The Vista	35,815															0	\$0.1039	\$ -	0%
Lonsdale Homes Addition																0	\$0.0853	\$ -	-
The Verandas	N/A					3,661										3,661	\$0.0850	\$ 328	-
Central Garage	56,110					9,152										9,152	\$0.0856	\$ 784	16%
Central Maintenance Building	79,624					20,566										20,566	\$0.0849	\$ 1,746	26%
Main Office	428,440					15,040		1,841		5,056						21,937	\$0.0757	\$ 1,660	9%
Family Investment Center (FIC)	431,960					91,561		2,232								93,793	\$0.0810	\$ 7,599	22%
Total	5,034,042	0	27,460	42,716	0	278,160	154,231	17,950	0	54,972	7,102	32,385	2,838	0	0	617,234		\$ 54,224	12%

Table G.2.2. Calculated Master-Metered Natural Gas (Therms) Savings

Baseline Use	Replace Toilet Valves and Flappers [1]	Replace Toilets with 1.6 GPF Models [2]	Install Low Flow Showerheads [3]	Install Low Flow Faucet Aerator [4]	Install Front-Loading Washers [5]	Upgrade Common Area Lighting [6]	Upgrade Apartment Lighting [7]	Install Vending Machine Controls [8]	Install PTHs With Limiting Thermostats [9]	Install Energy Star Refrigerators [10]	Replace Windows [11]	Replace Rooftop Units [12]	Replace Gas Furnaces [13]	Upgrade Common Area HVAC [14]	Replace Membrane Roofing System [15]	Total Savings (Therms)	Savings Rate (\$/Therm)	Stipulated Cost (\$/Yr)	Savings as Percent of Baseline
Western Heights	1,694										401					401	\$1,2063	\$ 483	24%
Western Heights Addition	3,944															0	\$1,2063	\$ -	0%
Lonsdale Homes	3,765															0	\$1,1879	\$ -	0%
Austin Homes Annex	1,635															768	\$1,2459	\$ 956	47%
Love Towers	3,475															0	\$0.0000	\$ -	-
Lee Williams Senior Citizens	1,295															0	\$1,1950	\$ -	0%
Cagle Terrace																0	\$1,2665	\$ -	0%
Northgate Terrace																0	\$0.0000	\$ -	-
Christenberry Heights																0	\$0.0000	\$ -	-
Montgomery Village																0	\$0.0000	\$ -	-
Montgomery Village Addition																0	\$0.0000	\$ -	-
Isabella Towers																0	\$0.0000	\$ -	-
Mechanicsville																0	\$0.0000	\$ -	-
The Vista																0	\$0.0000	\$ -	-
Lonsdale Homes Addition																0	\$0.0000	\$ -	-
The Verandas																0	\$0.0000	\$ -	-
Central Garage	3,074															0	\$1,2202	\$ -	0%
Central Maintenance Building	5,743															0	\$1,1679	\$ -	0%
Main Office	4,170															0	\$1,2290	\$ -	0%
Family Investment Center (FIC)	4,652															0	\$1,1714	\$ -	0%
Total	33,647	0	0	0	0	0	0	0	0	0	401	0	768	0	0	1,168		\$ 1,440	3%

GRAND TOTAL ADD-ON OPERATING SUBSIDY \$ 55,663

**APPENDIX G-3
ALLOWANCE ADJUSTMENT SAVINGS SUMMARY**

KNOXVILLE'S COMMUNITY DEVELOPMENT CORPORATION

NOTES:

1. Allowance consumption and cost savings by utility and apartment type are presented in Attachment D of the Energy Audit Report.
2. Allowance consumption savings are valued at current allowance unit rates, as presented in the Attachment D of the Energy Audit Report.
3. The total allowance savings will remain fixed throughout the contract term.

Table G.3.1. Annual Allowance Savings Summary

Development	Annual Totals										Total (\$)
	Electric		Natural Gas		Water						
	(kWh)	(\$)	(therms)	(\$)	(ccf)	(\$)					
Western Heights	319,030	\$ 23,334									\$ 23,334
Western Heights Addition	680,806	\$ 49,794									\$ 49,794
Lonsdale Homes	431,809	\$ 31,582			6,022	\$ 40,134					\$ 71,716
Austin Homes Annex	113,417	\$ 8,295	6,692	\$ 9,630							\$ 17,926
Love Towers											\$ -
Walter P. Taylor Homes	260,576	\$ 19,059									\$ 19,059
Lee Williams Senior Citizens											\$ -
Cagle Terrace											\$ -
Northgate Terrace											\$ -
Christenberry Heights	392,322	\$ 28,694	0	\$ -							\$ 28,694
Montgomery Village	145,193	\$ 10,619									\$ 10,619
Montgomery Village Addition	553,764	\$ 40,502									\$ 40,502
Isabella Towers											\$ -
Mechanicsville	16,977	\$ 1,388	918	\$ 1,321	261	\$ 1,739					\$ 4,448
The Vista	0	\$ -									\$ -
Lonsdale Homes Addition	29,525	\$ 2,159			141	\$ 939					\$ 3,099
The Verandas	24,775	\$ 1,812									\$ 1,812
Central Garage											\$ -
Central Maintenance Building											\$ -
Main Office											\$ -
Family Investment Center (FIC)											\$ -
Total	2,970,193	\$ 217,240	7,610	\$ 10,951	6,423	\$ 42,812					\$ 271,004

GRAND TOTAL ALLOWANCE ADJUSTMENT: **\$271,004**

Appendix G-5 Measurement and Verification Protocol

G.5.1 Water Conservation Measures

(Includes Toilets Replacements and Retrofits, Aerators, Showerheads, and Front-loading Washers)

IPMVP Methodology Employed: Option A – Stipulated and Option C – Billing Data

Formulae for Savings:

FROZEN ROLLING BASELINE WATER SAVINGS (in accordance with Appendix G-1):

Water (and Sewer) Savings in CCF = [Baseline Metered Water Use in CCF] + [Baseline Water Adjustments (if any) in CCF] – [Actual Metered Water Use in CCF]

STIPULATED WATER SAVINGS: See Table G.5.1

STIPULATED THERMAL SAVINGS FROM AERATORS & SHOWERHEADS: See Table G.5.1

Input Values:

Actual metered water data, where pre- and post-metered usage shall refer to same meter numbers as delineated in Section VI, Attachment C of the Energy Audit Report.

Output Values:

The water savings values shall be determined based on the comparison of pre- and post-metered usage, after the proper adjustments (if any) are made.

Baseline Adjustments:

Baseline adjustments may include the addition of new water consuming fixtures, installation of new water meters, changes in occupancy, or other changes made by the PHA or Water Department after installation of the water conserving measures identified in Appendix B of the ESA.

G.5.2. Lighting Measures

(Includes both Apartment and Common Area Lighting Measures)

This methodology applies to both resident-paid utility allowance reduction calculations and master-metered savings included as part of the Add-on Subsidy. Electric savings associated with the Frozen Rolling Baselines will be measured at the meter, in accordance with Appendix G-1.

IPMVP Methodology Employed: Option A - Stipulated

Formula for Savings:

$$\text{Electric Energy Savings in kWh} = \{[\text{Existing Fixture Watts}] \times [\text{Quantity of Existing Fixtures}] - [\text{Proposed Fixture Watts}] \times [\text{Quantity of Proposed Fixtures}]\} \times [\text{Hours of Operation}] / 1,000$$

Refer to Attachments E and F of the Energy Audit Report for the detailed savings calculations for the Common Area and Apartment lighting measures, respectively.

Input Values:

The existing and proposed fixture quantities, wattages, and hours of operation are specified in the detailed lighting audits included in Attachments E and F of the Energy Audit Report and will be held fixed throughout the contract term.

Output Values:

The kWh savings shall be in accordance with Attachments E and F of the Energy Audit Report and held fixed throughout the contract term.

Baseline Adjustments:

None anticipated.

G.5.3. Vending Machine Controls

IPMVP Methodology Employed: Option A - Stipulated

Formula for Savings: See Table G.5.3

Input Values:

See Table G.5.3. The inputs shall be held fixed throughout the contract term.

Output Values:

The kWh savings shall be in accordance with Table G.5.3 and held fixed throughout the contract term.

Baseline Adjustments:

None anticipated.

TABLE G.5.3 STIPULATED VENDING MACHINE CONTROLS SAVINGS CALCULATIONS

NOTES:

1. All savings associated with this measure are stipulated throughout the contract term (Add-on Subsidy).

Dev #	B=Bev. S=Snack	Location	Watts	Baseline Op Hrs	Baseline kWh	Unocc Hours	Proposed Op Hrs	Proposed kWh	kWh Savings
3-01	B	Western Heights Office/Maintenance Building	400	8760	3,504	6,136	4,158	1,663	1,841
3-08	B	Walter P. Taylor Homes/Lee Williams - Gym/Office	400	8760	3,504	6,136	4,158	1,663	1,841
3-08	B	Walter P. Taylor Homes/Lee Williams - Gym/Office	400	8760	3,504	6,136	4,158	1,663	1,841
3-08	B	Walter P. Taylor Homes/Lee Williams - Gym/Office	400	8760	3,504	6,136	4,158	1,663	1,841
3-08	S	Walter P. Taylor Homes/Lee Williams - Gym/Office	85	8760	745	6,136	4,158	353	391
3-12	B	Christenberry Heights Boys & Girls Club	400	8760	3,504	6,136	4,158	1,663	1,841
3-14	B	Montgomery Village Boys & Girls Club	400	8760	3,504	6,136	4,158	1,663	1,841
3-14	B	Montgomery Village Boys & Girls Club	400	8760	3,504	6,136	4,158	1,663	1,841
NA	B	Main Office	400	8760	3,504	6,136	4,158	1,663	1,841
NA	B	Family Investment Center	400	8760	3,504	6,136	4,158	1,663	1,841
NA	S	Family Investment Center	85	8760	745	6,136	4,158	353	391
TOTAL	11		3770		33,025			15,676	17,350

G.5.4. Packaged Terminal Heat Pumps

IPMVP Methodology Employed: Option C – Billing Data

Electric savings associated with this measure will be measured at the meter and reported as part of the Frozen Rolling Baseline savings, in accordance with Appendix G-1. Consumption data shall be normalized for cooling and heating degree-days, with minimum (floor) values per the Baseline.

G.5.5. Energy Star Refrigerators

IPMVP Methodology Employed: Option A - Stipulated

This methodology applies to both resident-paid utility allowance reduction calculations and master-metered savings included as part of the Add-on Subsidy. Electric savings associated with the Frozen Rolling Baselines will be measured at the meter, in accordance with Appendix G-1.

Formula for Savings: See Table G.5.5

Input Values:

See Table G.5.5. The inputs shall be held fixed throughout the contract term.

Output Values:

The kWh savings shall be in accordance with Table G.5.5 and held fixed throughout the contract term.

Baseline Adjustments:

None anticipated.

G.5.6. Window Replacements

IPMVP Methodology Employed: Option A - Stipulated

Formula for Savings: See Table G.5.6

Input Values:

See Table G.5.6. The inputs shall be held fixed throughout the contract term.

Output Values:

The savings shall be in accordance with Table G.5.6 and held fixed throughout the contract term.

Baseline Adjustments:

None anticipated.

TABLE G.5.6 STIPULATED WINDOW REPLACEMENT SAVINGS CALCULATIONS

NOTES:

1. All savings associated with this measure are stipulated throughout the contract term (Add-on Subsidy).

	Window Area	Existing Window U-Value	Proposed Window U-Value	HDD	CDD	SEER	Heating Efficiency	Cooling Savings	Heating Savings	Total Savings	Total Savings
	SQFT	Btu/hr-Ft ²	Btu/hr-Ft ²				%	kWh	kWh	kWh	Therms
Western Heights	800	1.08	0.60	3,478	1,569	10.30	80.0%	1,404	1,404	1,404	401
Christenberry Heights	408	1.08	0.60	3,478	1,569	8.57	99.0%	860	4,838	5,698	
Total								2,264	4,838	7,102	401

G.5.7. Rooftop Unit Replacements

IPMVP Methodology Employed: Option A - Stipulated

Formula for Savings: See Table G.5.7

Input Values:

See Table G.5.7. The inputs shall be held fixed throughout the contract term.

Output Values:

The kWh savings shall be in accordance with Table G.5.7 and held fixed throughout the contract term.

Baseline Adjustments:

None anticipated.

TABLE G.5.7 STIPULATED ROOFTOP UNIT SAVINGS CALCULATIONS

NOTES:

1. All savings associated with this measure are stipulated throughout the contract term (Add-on Subsidy).

Equipment Description	Cooling Energy Savings (kWh/yr)	Heating Energy Savings (kWh/yr)	Total Savings kWh
Replace 5 Ton Pkg Rooftop - Montgomery Village Maint Office	139	-452	-312
Replace 4 Ton Pkg Rooftop - Montgomery Village Maint Office	591	11	602
Replace 7.5 Ton Pkg Rooftop - Montgomery Village Maint Office	3,036	180	3,216
Replace 7.5 Ton Split Heat Pump Systems - Montgomery Village B&G Gym	17,513	6,678	24,191
Replace 5 Ton Pkg Rooftop - Montgomery Village Ministry	4,503	185	4,688
Totals	25,782	6,603	32,385

Equipment Description: Replace 5 Ton Pkg Rooftop - Montgomery Village Maint Office

Location: KCDC - Montgomery Village 03 -13

Existing conditions: Existing unit is Trane DX Pkg Rooftop (Mdl# WCD060C300BA) 5 ton DX Pkg Rooftop. Installation date Early 1992.
(June, 2005) Unit serves an office and the Boys and Girls club Recreation room at the Montgomery Village Maintenance Building / Boys and Girls Club.

Assumptions: From Preston's Guide to unitary A/C equipment and catalogs:
 Estimated cooling efficiency (Derated) = 10.0 SEER
 Existing System Heating COP (derated) = 2.85 COP
 Existing Heating Efficiency = 99 %
 New System Cooling SEER = 10.1 SEER
 New System Heating COP = 2.1 COP
 Post- ECM system heating efficiency = 99 %
 Number of units at Montgomery Village = 1

Summary:

	Cooling Energy (kWh/yr)	Heating Energy (kWh/yr)
Baseline	11,260	4,434
ECM	11,121	4,886
Savings	139	-452

Baseline Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)	
	107	105/109	0	0	100	100	62,000		0		
	102	100/104	72	1	100	100	62,000		6		
	97	95/99	74	21	100	90	62,000		117		
	92	90/94	73	129	100	80	62,000		641		
	87	85/89	72	358	100	70	62,000		1,556		
	82	80/84	70	573	100	60	62,000		2,137		
	77	75/79	68	785	100	50	62,000		2,440		
	72	70/74	66	1058	100	40	62,000		2,630		
	67	65/69	61	928	100	30	62,000		1,730		
	62	60/64	56	782	100	20					
	57	55/59	52	684	10	10		58,000		41	
	52	50/54	47	689	20	20		58,000		164	
	47	45/49	43	690	30	30		58,000		370	
	42	40/44	38	642	40	40		58,000		612	
	37	35/39	34	585	50	50		20,480		886	
	32	30/34	30	440	60	60		20,480		960	
	27	25/29	25	220	70	70		20,480		653	
	22	20/24	20	97	80	80		20,480		376	
	17	15/19	16	40	90	90		20,480		196	
	12	10/14	11	21	100	100		20,480		127	
	7	5/9	6	6	100	100		20,480		36	
	2	0/4	2	2	100	100		20,480		12	
	-3	-5/-1	-1	0							
								Totals		11,260	4,434

ECM Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)	
	107	105/109	0	0	100	100	62,000		0		
	102	100/104	72	1	100	100	62,000		6		
	97	95/99	74	21	100	90	62,000		116		
	92	90/94	73	129	100	80	62,000		634		
	87	85/89	72	358	100	70	62,000		1,538		
	82	80/84	70	573	100	60	62,000		2,110		
	77	75/79	68	785	100	50	62,000		2,409		
	72	70/74	66	1058	100	40	62,000		2,598		
	67	65/69	61	928	100	30	62,000		1,709		
	62	60/64	56	782	100	20					
	57	55/59	52	684	10	10		59,000		56	
	52	50/54	47	689	20	20		59,000		227	
	47	45/49	43	690	30	30		59,000		511	
	42	40/44	38	642	40	40		59,000		845	
	37	35/39	34	585	50	50		20,480		886	
	32	30/34	30	440	60	60		20,480		960	
	27	25/29	25	220	70	70		20,480		653	
	22	20/24	20	97	80	80		20,480		376	
	17	15/19	16	40	90	90		20,480		196	
	12	10/14	11	21	100	100		20,480		127	
	7	5/9	6	6	100	100		20,480		36	
	2	0/4	2	2	100	100		20,480		12	
	-3	-5/-1	-1	0							
								Totals		11,121	4,886

Equipment Description: Replace 4 Ton Pkg Rooftop - Montgomery Village Maint Office

Location: KCDC - Montgomery Village 03 -13

Existing conditions: Existing unit is Trane DX Pkg Rooftop (Mdl# WCH0601002A) 5 Ton DX Pkg Rooftop. Installation date late 80's/Early 90's (June, 2006)
Unit serves the Montgomery Ministry Building which is a 1600 Sq Ft modular building.

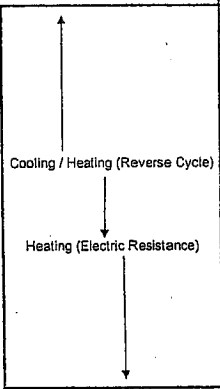
Assumptions: From Preston's Guide to unitary A/C equipment and catalogs:
 Estimated cooling efficiency (Derated) = 10.0 SEER
 Existing System Heating COP (derated) = 1.99 COP
 Existing Heating Efficiency = 99 %
 New System Cooling SEER = 10.7 SEER
 New System Heating COP = 2.02 COP
 Post- ECM system heating efficiency = 99 %
 Number of units at Montgomery Village = 1

Summary:

	Cooling Energy (kWh/yr)	Heating Energy (kWh/yr)
Baseline	8,717	3,978
ECM	8,127	3,966
Savings	591	11

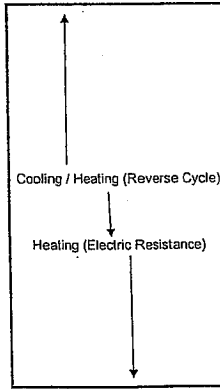
Baseline Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)
	107	105/109	0	0	100	100	48,000		0	
	102	100/104	72	1	100	100	48,000		5	
	97	95/99	74	21	100	90	48,000		91	
	92	90/94	73	129	100	80	48,000		497	
	87	85/89	72	358	100	70	48,000		1,206	
	82	80/84	70	573	100	60	48,000		1,654	
	77	75/79	68	785	100	50	48,000		1,889	
	72	70/74	66	1058	100	40	48,000		2,036	
	67	65/69	61	928	100	30	48,000		1,340	
	62	60/64	56	782	100	20				
	57	55/59	52	684	10	10		24,900		25
	52	50/54	47	689	20	20		24,900		101
	47	45/49	43	690	30	30		24,900		228
	42	40/44	38	642	40	40		24,900		377
	37	35/39	34	585	50	50		20,480		886
	32	30/34	30	440	60	60		20,480		960
	27	25/29	25	220	70	70		20,480		653
	22	20/24	20	97	80	80		20,480		376
	17	15/19	16	40	90	90		20,480		196
	12	10/14	11	21	100	100		20,480		127
	7	5/9	6	6	100	100		20,480		36
	2	0/4	2	2	100	100		20,480		12
	-3	-5/-1	-1	0						
	Totals								8,717	3,978



ECM Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)
	107	105/109	0	0	100	100	48,000		0	
	102	100/104	72	1	100	100	48,000		4	
	97	95/99	74	21	100	90	48,000		85	
	92	90/94	73	129	100	80	48,000		463	
	87	85/89	72	358	100	70	48,000		1,124	
	82	80/84	70	573	100	60	48,000		1,542	
	77	75/79	68	785	100	50	48,000		1,761	
	72	70/74	66	1058	100	40	48,000		1,898	
	67	65/69	61	928	100	30	48,000		1,249	
	62	60/64	56	782	100	20				
	57	55/59	52	684	10	10		24,900		25
	52	50/54	47	689	20	20		24,900		99
	47	45/49	43	690	30	30		24,900		224
	42	40/44	38	642	40	40		24,900		371
	37	35/39	34	585	50	50		20,480		886
	32	30/34	30	440	60	60		20,480		960
	27	25/29	25	220	70	70		20,480		653
	22	20/24	20	97	80	80		20,480		376
	17	15/19	16	40	90	90		20,480		196
	12	10/14	11	21	100	100		20,480		127
	7	5/9	6	6	100	100		20,480		36
	2	0/4	2	2	100	100		20,480		12
	-3	-5/-1	-1	0						
	Totals								8,127	3,966



Equipment Description: Replace 7.5 Ton Pkg Rooftop - Montgomery Village Maint Office

Location: KCDC - Montgomery Village 03 -13

Existing conditions: Existing unit is a Carrier DX Pkg Rooftop (Mdl# 50 QD or QH) 7.5 ton Pkg Rooftop. Installation date estimated late 80 early 1990's
(June, 2006) Units used to provide comfort conditioning of Rental Office Areas.

Assumptions: From Preston's Guide to unitary A/C equipment and catalogs:
 Estimated cooling efficiency (Derated 5% for age) = 8.45 SEER
 Existing System Heating COP = 1.9 COP
 Existing Heating Efficiency = 99 %
 New System Cooling SEER = 10.1 SEER
 New System Heating COP = 2.2 COP
 Post- ECM system heating efficiency = 99 %
 Number of units at Montgomery Village = 1

Summary:

	Cooling Energy (kWh/yr)	Heating Energy (kWh/yr)
Baseline	18,641	6,191
ECM	15,605	6,011
Savings	3,036	180

Baseline Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)
				0	100	100	87,000		0	
	107	105/109	0	0	100	100	87,000		10	
	102	100/104	72	1	100	100	87,000		194	
	97	95/99	74	21	100	90	87,000		1,062	
	92	90/94	73	129	100	80	87,000		2,579	
	87	85/89	72	358	100	70	87,000		3,538	
	82	80/84	70	573	100	60	87,000		4,039	
	77	75/79	68	785	100	50	87,000		4,355	
	72	70/74	66	1058	100	40	87,000		2,865	
	67	65/69	61	928	100	30	87,000			
	62	60/64	56	782	100	20				45
	57	55/59	52	684	10	10		43,000		183
	52	50/54	47	689	20	20		43,000		412
	47	45/49	43	690	30	30		43,000		681
	42	40/44	38	642	40	40		30,720		1,329
	37	35/39	34	585	50	50		30,720		1,440
	32	30/34	30	440	60	60		30,720		980
	27	25/29	25	220	70	70		30,720		564
	22	20/24	20	97	80	80		30,720		294
	17	15/19	16	40	90	90		30,720		191
	12	10/14	11	21	100	100		30,720		55
	7	5/9	6	6	100	100		30,720		18
	2	0/4	2	2	100	100				
	-3	-5/-1	-1	0						
								Totals	18,641	6,191

ECM Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)
				0	100	100	87,000		0	
	107	105/109	0	0	100	100	87,000		9	
	102	100/104	72	1	100	100	87,000		163	
	97	95/99	74	21	100	90	87,000		889	
	92	90/94	73	129	100	80	87,000		2,159	
	87	85/89	72	358	100	70	87,000		2,961	
	82	80/84	70	573	100	60	87,000		3,381	
	77	75/79	68	785	100	50	87,000		3,645	
	72	70/74	66	1058	100	40	87,000		2,398	
	67	65/69	61	928	100	30	87,000			
	62	60/64	56	782	100	20		43,000		39
	57	55/59	52	684	10	10		43,000		158
	52	50/54	47	689	20	20		43,000		355
	47	45/49	43	690	30	30		43,000		588
	42	40/44	38	642	40	40		30,720		1,329
	37	35/39	34	585	50	50		30,720		1,440
	32	30/34	30	440	60	60		30,720		980
	27	25/29	25	220	70	70		30,720		564
	22	20/24	20	97	80	80		30,720		294
	17	15/19	16	40	90	90		30,720		191
	12	10/14	11	21	100	100		30,720		55
	7	5/9	6	6	100	100		30,720		18
	2	0/4	2	2	100	100				
	-3	-5/-1	-1	0						
								Totals	15,605	6,011

Equipment Description: Replace 7.5 Ton Split Heat Pump Systems - Montgomery Village B&G Gym

Location: KCDC - Montgomery Village 03 -13

Existing conditions: Existing units are Carrier (Mdl# 48TJE012) 10 ton Pkg Rooftop GasPak. Installation date estimated Summer 1996
(June, 2006) Units used to provide comfort conditioning of Boys and Girls Club Gym Area

Assumptions: From Presion's Guide to unitary A/C equipment and catalogs:
 Estimated cooling efficiency (Derated 5% for age) = 9.31 SEER
 Existing System Heating COP (derated for age) = 2.037 COP
 Existing Heating Efficiency = 99 %
 New System Cooling SEER = 10.1 SEER
 New System Heating COP = 2.4 COP
 Post- ECM system heating efficiency = 99 %
 Number of units at Montgomery Village = 1

Summary:

	Cooling Energy (kWh/yr)	Heating Energy (kWh/yr)
Baseline	17,513	6,678
ECM	13,662	6,483
Savings	3,851	195

Baseline Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)	
	107	105/109	0	0	100	100	90,000		0		
	102	100/104	72	1	100	100	90,000		10		
	97	95/99	74	21	100	90	90,000		183		
	92	90/94	73	129	100	80	90,000		998		
	87	85/89	72	358	100	70	90,000		2,423		
	82	80/84	70	573	100	60	90,000		3,324		
	77	75/79	68	785	100	50	90,000		3,794		
	72	70/74	66	1058	100	40	90,000		4,091		
	67	65/69	61	928	100	30	90,000		2,691		
	62	60/64	56	782	100	20					
	57	55/59	52	684	10	10		45,000		44	
	52	50/54	47	689	20	20		45,000		178	
	47	45/49	43	690	30	30		45,000		402	
	42	40/44	38	642	40	40		45,000		665	
	37	35/39	34	585	50	50		33,993		1,471	
	32	30/34	30	440	60	60		33,993		1,593	
	27	25/29	25	220	70	70		33,993		1,084	
	22	20/24	20	97	80	80		33,993		624	
	17	15/19	16	40	90	90		33,993		326	
	12	10/14	11	21	100	100		33,993		211	
	7	5/9	6	6	100	100		33,993		60	
	2	0/4	2	2	100	100		33,993		20	
	-3	-5/-1	-1	0							
									Totals	17,513	6,678

ECM Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)	
	107	105/109	0	0	100	100	90,000		0		
	102	100/104	72	1	100	100	90,000		9		
	97	95/99	74	21	100	90	90,000		168		
	92	90/94	73	129	100	80	90,000		920		
	87	85/89	72	358	100	70	90,000		2,233		
	82	80/84	70	573	100	60	90,000		3,054		
	77	75/79	68	785	100	50	90,000		3,498		
	72	70/74	66	1058	100	40	90,000		3,771		
	67	65/69	61	928	100	30					
	62	60/64	56	782	100	20					
	57	55/59	52	684	10	10		45,000		38	
	52	50/54	47	689	20	20		45,000		151	
	47	45/49	43	690	30	30		45,000		341	
	42	40/44	38	642	40	40		45,000		564	
	37	35/39	34	585	50	50		33,993		1,471	
	32	30/34	30	440	60	60		33,993		1,593	
	27	25/29	25	220	70	70		33,993		1,084	
	22	20/24	20	97	80	80		33,993		624	
	17	15/19	16	40	90	90		33,993		326	
	12	10/14	11	21	100	100		33,993		211	
	7	5/9	6	6	100	100		33,993		60	
	2	0/4	2	2	100	100		33,993		20	
	-3	-5/-1	-1	0							
									Totals	13,662	6,483

Equipment Description: Replace 5 Ton Pkg Rooftop - Montgomery Village Ministry

Location: KCDC - Montgomery Village 03 -13

Existing conditions: Existing unit is Trane DX Pkg Rooftop (Mdt# WCH0601002A) 5 ton DX Pkg Rooftop. Installation date late 80's/Early 90's (June, 2006)
Unit serves the Montgomery Ministry Building which is a 1600 Sq Ft modular building.

Assumptions: From Preston's Guide to unitary A/C equipment and catalogs:
 Estimated cooling efficiency (Derated) = 9.4 SEER
 Existing System Heating COP (derated) = 2.91 COP
 Existing Heating Efficiency = 99 %
 New System Cooling SEER = 15.05 SEER
 New System Heating COP = 3.46 COP
 Post- ECM system heating efficiency = 99 %
 Number of units at Montgomery Village = 1

Summary:

	Cooling Energy (kWh/yr)	Heating Energy (kWh/yr)
Baseline	11,906	3,869
ECM	7,403	3,684
Savings	4,503	185

Baseline Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)
	107	105/109	0	0	100	100	61,500		0	
	102	100/104	72	1	100	100	61,500		7	
	97	95/99	74	21	100	90	61,500		124	
	92	90/94	73	129	100	80	61,500		678	
	87	85/89	72	358	100	70	61,500		1,647	
	82	80/84	70	573	100	60	61,500		2,260	
	77	75/79	68	785	100	50	61,500		2,580	
	72	70/74	66	1058	100	40	61,500		2,781	
	67	65/69	61	928	100	30	61,500		1,830	
	62	60/64	56	782	100	20				
	57	55/59	52	684	10	10		58,000		40
	52	50/54	47	689	20	20		58,000		161
	47	45/49	43	690	30	30		58,000		363
	42	40/44	38	642	40	40		58,000		600
	37	35/39	34	585	50	50		17,070		739
	32	30/34	30	440	60	60		17,070		800
	27	25/29	25	220	70	70		17,070		544
	22	20/24	20	97	80	80		17,070		313
	17	15/19	16	40	90	90		17,070		164
	12	10/14	11	21	100	100		17,070		106
	7	5/9	6	6	100	100		17,070		30
	2	0/4	2	2	100	100		17,070		10
	-3	-5/-1	-1	0						
									11,906	3,869

ECM Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (kwh/yr)
	107	105/109	0	0	100	100	61,500		0	
	102	100/104	72	1	100	100	61,500		4	
	97	95/99	74	21	100	90	61,500		77	
	92	90/94	73	129	100	80	61,500		422	
	87	85/89	72	358	100	70	61,500		1,024	
	82	80/84	70	573	100	60	61,500		1,405	
	77	75/79	68	785	100	50	61,500		1,604	
	72	70/74	66	1058	100	40	61,500		1,729	
	67	65/69	61	928	100	30	61,500		1,138	
	62	60/64	56	782	100	20				
	57	55/59	52	684	10	10		58,000		34
	52	50/54	47	689	20	20		58,000		135
	47	45/49	43	690	30	30		58,000		305
	42	40/44	38	642	40	40		58,000		504
	37	35/39	34	585	50	50		17,070		739
	32	30/34	30	440	60	60		17,070		800
	27	25/29	25	220	70	70		17,070		544
	22	20/24	20	97	80	80		17,070		313
	17	15/19	16	40	90	90		17,070		164
	12	10/14	11	21	100	100		17,070		106
	7	5/9	6	6	100	100		17,070		30
	2	0/4	2	2	100	100		17,070		10
	-3	-5/-1	-1	0						
									7,403	3,684

G.5.8. Furnace Replacements

IPMVP Methodology Employed: Option A - Stipulated

Formula for Savings: See Table G.5.8

Input Values:

See Table G.5.8. The inputs shall be held fixed throughout the contract term.

Output Values:

The savings shall be in accordance with Table G.5.8 and held fixed throughout the contract term.

Baseline Adjustments:

None anticipated.

TABLE G.5.8 STIPULATED FURNACE REPLACEMENT SAVINGS CALCULATIONS

NOTES:

1. All savings associated with this measure are stipulated throughout the contract term (Add-on Subsidy or Utility Allowance Adjustments).

Equipment Description	Cooling Energy Savings (kWh/yr)	Heating Energy Savings (kWh/yr)	Heating Energy Savings (MBtu/yr)	Total Savings kWh	Savings Therms
Replace Existing Apartment Gas Furnaces at Austin Homes	0	0	478	0	4,784
Replace Existing Community Gas Furnaces w/ AC at Austin Homes	5,341	-2,503	77	2,838	768
<i>Totals</i>	5,341	-2,503	555	2,838	5,551

Equipment Description: Replace Existing Apartment Gas Furnaces at Austin Homes

Location: KCDC - Austin Homes 03 -06

Existing conditions: Existing Apartments are heated by Lennox Gas Pulse Furnaces; Typical Model Number G14Q3-40, 40,000 Btuh Input Furnaces; Installed in the Early 80's.
(June 2006)

Assumptions: From Preston's Guide to unitary A/C equipment and manufacturer's catalogs: 40,000 BTU
 Estimated unit cooling efficiency = 9.0 EER
 Estimated gas heating efficiency, derated due to age = 84.9 % AFUE
 Proposed new unit cooling efficiency = 9.0 EER
 Proposed new unit heating efficiency = 95.0 % AFUE
 Number of Units to be replaced: 129

Summary:

	Cooling Energy (kWh/yr)	Heating Energy (MBTU/yr)
Baseline	791,131	4,509
ECM	791,131	4,030
Savings	0	478

Baseline Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (MBTU/yr)
	107	105/109	0	0	100	100	36,000		0	
	102	100/104	72	1	100	100	36,000		516	
	97	95/99	74	21	100	90	36,000		9,752	
	92	90/94	73	129	100	80	36,000		53,251	
	87	85/89	72	358	100	70	36,000		129,310	
	82	80/84	70	573	100	60	36,000		177,401	
	77	75/79	68	785	100	50	36,000		202,530	
	72	70/74	66	1058	100	40	36,000		218,371	
	67	65/69	61	928	100	30				
	62	60/64	56	782	20	0		40,000		0
	57	55/59	52	684	20	10		40,000		83
	52	50/54	47	689	20	20		40,000		167
	47	45/49	43	690	30	30		40,000		377
	42	40/44	38	642	40	40		40,000		624
	37	35/39	34	585	50	50		40,000		889
	32	30/34	30	440	60	60		40,000		962
	27	25/29	25	220	70	70		40,000		655
	22	20/24	20	97	80	80		40,000		377
	17	15/19	16	40	90	90		40,000		197
	12	10/14	11	21	100	100		40,000		126
	7	5/9	6	6	100	100		40,000		36
	2	0/4	2	2	100	100		40,000		12
	-3	-5/-1	-1	0						
	Totals								791,131	4,509

ECM Analysis:

	Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kwh/yr)	Heating energy (MBTU/yr)
	107	105/109	0	0	100	100	36,000		0	
	102	100/104	72	1	100	100	36,000		516	
	97	95/99	74	21	100	90	36,000		9,752	
	92	90/94	73	129	100	80	36,000		53,251	
	87	85/89	72	358	100	70	36,000		129,310	
	82	80/84	70	573	100	60	36,000		177,401	
	77	75/79	68	785	100	50	36,000		202,530	
	72	70/74	66	1058	100	40	36,000		218,371	
	67	65/69	61	928	100	30				
	62	60/64	56	782	20	0		40,000		0
	57	55/59	52	684	20	10		40,000		74
	52	50/54	47	689	20	20		40,000		150
	47	45/49	43	690	30	30		40,000		337
	42	40/44	38	642	40	40		40,000		558
	37	35/39	34	585	50	50		40,000		794
	32	30/34	30	440	60	60		40,000		860
	27	25/29	25	220	70	70		40,000		586
	22	20/24	20	97	80	80		40,000		337
	17	15/19	16	40	90	90		40,000		176
	12	10/14	11	21	100	100		40,000		114
	7	5/9	6	6	100	100		40,000		33
	2	0/4	2	2	100	100		40,000		11
	-3	-5/-1	-1	0						
	Totals								791,131	4,030

Equipment Description: Replace Existing Community Gas Furnaces w/ AC at Austin Homes

Location: KCDC - Austin Homes 03 -08

Existing conditions:
(June 2008)

The existing Lighthouse Ministry and Tenant Association are located in a building that formerly contained four two story apartments. The Lighthouse Ministry is located upstairs and the Tenant Association uses the downstairs area. All of the space is heated and cooled by three Lennox G120 series Furnaces with Split AC units. There are two G1204E-60 (60,000 BTU Furnace) units and one G1205E-75 (75,000 BTU Furnace) unit. Currently one of the Lennox G1204E-60 Units is not operating due to the fact the copper lines connecting the AC coil to its condenser were stolen from the side of the building.

Assumptions:

From Preston's Guide to utility A/C equipment and manufacturer's catalogs:
 Estimated unit cooling efficiency (Deteriorated for age) =
 Estimated gas heating efficiency, deteriorated due to age =
 Proposed new unit cooling efficiency =
 Proposed new heat pump unit heating efficiency =
 Proposed new furnace unit heating efficiency =
 Number of Units to be replaced:

60,000 BTU 75,000 BTU
 8.6 EER 8.8 EER
 03.6 % AFUE 03.4 % AFUE
 11.0 EER 11.0 EER
 3.4 COP 3.6 COP
 02.9 % AFUE 02.0 % AFUE
 2 1.0

Summary:

	Cooling Energy (kWh/yr)	Heating Energy (kWh/yr)	Heating Energy (MBTU/yr)
Baseline	25,881	9	145
ECM	20,350	2,503	89
Savings	5,341	-2,503	77

Baseline Analysis:

60,000 BTU Furnace

Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kWh/yr)	Heating energy (kWh/yr)	Heating energy (MBTU/yr)	
107	105/109	0	0	100	100	46,500		0			
102	100/104	72	1	100	100	46,500		11			
97	95/99	74	21	100	80	46,500		203			
92	90/94	73	129	100	80	46,500		1,110			
87	85/89	72	358	100	70	46,500		2,806			
82	80/84	70	573	100	60	46,500		3,698			
77	75/79	68	785	100	50	46,500		4,222			
72	70/74	66	1058	100	40	46,500		4,953			
67	65/69	61	928	100	30		60,000				
62	60/64	56	782	12	20		60,000			4	
57	55/59	52	684	12	20		60,000			3	
52	50/54	47	699	12	20		60,000			3	
47	45/49	43	690	18	30		60,000			3	
42	40/44	38	642	24	40		60,000			7	
37	35/39	34	585	30	50		60,000			17	
32	30/34	30	440	36	60		60,000			18	
27	25/29	25	220	42	70		60,000			12	
22	20/24	20	97	48	80		60,000			7	
17	15/19	16	40	54	80		60,000			4	
12	10/14	11	21	60	100		60,000			2	
7	5/9	6	6	60	100		60,000			1	
2	0/4	2	2	60	100		60,000			0	
-3	-5/-1	-1	0								
							Totals	16,494		89	

ECM Analysis:

60,000 BTU Furnace

Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kWh/yr)	Heating energy (kWh/yr)	Heating energy (MBTU/yr)	
107	105/109	0	0	100	100	46,500		0			
102	100/104	72	1	100	100	46,500		8			
97	95/99	74	21	100	80	46,500		160			
92	90/94	73	129	100	80	46,500		873			
87	85/89	72	358	100	70	46,500		2,119			
82	80/84	70	573	100	60	46,500		2,907			
77	75/79	68	785	100	50	46,500		3,318			
72	70/74	66	1058	100	40	46,500		3,578			
67	65/69	61	928	100	30		60,000		184.3		
62	60/64	56	782	12	20		60,000		188.8		
57	55/59	52	684	12	20		60,000		171.0		
52	50/54	47	699	12	20		60,000		365.3		
47	45/49	43	690	18	30		60,000		837.3		
42	40/44	38	642	24	40		60,000			11	
37	35/39	34	585	30	50		60,000			12	
32	30/34	30	440	36	60		60,000			8	
27	25/29	25	220	42	70		60,000			5	
22	20/24	20	97	48	80		60,000			3	
17	15/19	16	40	54	80		60,000			2	
12	10/14	11	21	60	100		60,000			0	
7	5/9	6	6	60	100		60,000			0	
2	0/4	2	2	60	100		60,000			0	
-3	-5/-1	-1	0								
							Totals	12,963	1,557	42	

Baseline Analysis:

75,000 BTU Furnace

Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kWh/yr)	Heating energy (kWh/yr)	Heating energy (MBTU/yr)	
107	105/109	0	0	100	100	53,000		0			
102	100/104	72	1	100	100	53,000		6			
97	95/99	74	21	100	80	53,000		113			
92	90/94	73	129	100	80	53,000		618			
87	85/89	72	358	100	70	53,000		1,503			
82	80/84	70	573	100	60	53,000		2,062			
77	75/79	68	785	100	50	53,000		2,355			
72	70/74	66	1058	100	40	53,000		2,539			
67	65/69	61	928	100	30		75,000			2	
62	60/64	56	782	12	20		75,000			2	
57	55/59	52	684	12	20		75,000			2	
52	50/54	47	690	12	20		75,000			2	
47	45/49	43	690	18	30		75,000			4	
42	40/44	38	642	24	40		75,000			7	
37	35/39	34	585	30	50		75,000			10	
32	30/34	30	440	36	60		75,000			11	
27	25/29	25	220	42	70		75,000			8	
22	20/24	20	97	48	80		75,000			4	
17	15/19	16	40	54	80		75,000			2	
12	10/14	11	21	60	100		75,000			1	
7	5/9	6	6	60	100		75,000			0	
2	0/4	2	2	60	100		75,000			0	
-3	-5/-1	-1	0								
							Totals	9,197		56	

ECM Analysis:

75,000 BTU Furnace

Mid-pts	DB (F)	MCWB	Total Hrs/yr	% Full load	% runtime	Cooling Capacity (btu/hr)	Heating Capacity (btu/hr)	Cooling energy (kWh/yr)	Heating energy (kWh/yr)	Heating energy (MBTU/yr)	
107	105/109	0	0	100	100	53,000		0			
102	100/104	72	1	100	100	53,000		5			
97	95/99	74	21	100	80	53,000		81			
92	90/94	73	129	100	80	53,000		497			
87	85/89	72	358	100	70	53,000		1,207			
82	80/84	70	573	100	60	53,000		1,636			
77	75/79	68	785	100	50	53,000		1,891			
72	70/74	66	1058	100	40	53,000		2,039			
67	65/69	61	928	100	30		75,000		118		
62	60/64	56	782	12	20		75,000		103		
57	55/59	52	684	12	20		75,000		104		
52	50/54	47	690	12	20		75,000		234		
47	45/49	43	690	18	30		75,000		387		
42	40/44	38	642	24	40		75,000			7	
37	35/39	34	585	30	50		75,000			8	
32	30/34	30	440	36	60		75,000			5	
27	25/29	25	220	42	70		75,000			3	
22	20/24	20	97	48	80		75,000			2	
17	15/19	16	40	54	80		75,000			1	
12	10/14	11	21	60	100		75,000			0	
7	5/9	6	6	60	100		75,000			0	
2	0/4	2	2	60	100		75,000			0	
-3	-5/-1	-1	0								
							Totals	7,387	846	26	

G.5.9. Common Area HVAC Replacements

IPMVP Methodology Employed: Option C – Billing Data

Electric savings associated with this measure will be measured at the meter and reported as part of the Frozen Rolling Baseline savings, in accordance with Appendix G-1. Consumption data shall be normalized for cooling and heating degree-days, with minimum (floor) values per the Baseline.

G.5.10. Membrane Roof Replacement

There are no savings associated with this measure.

**APPENDIX H
STANDARDS OF COMFORT AND SERVICE**

In so far as these conditions are affected by the Scope of Work included in this Agreement:

Control of space temperature shall be maintained, subject to local building and occupancy codes, as follows:

Tenant Occupied Areas (apartments):

Heating Mode: 55° F – 76° F (user-set with recommended setting of 68° F)

Cooling Mode: 85° F – 72° F (user-set with recommended setting of 75° F)

Office Areas:

During Occupied Hours:

Heating Mode: Recommended setting of 68° F

Cooling Mode: Recommended setting of 75° F

During Unoccupied Hours:

Heating Mode: 55° F

Cooling Mode: 85° F



OFFICE OF PUBLIC
AND INDIAN HOUSING

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Knoxville Field Office, Region IV
John J. Duncan Federal Building
710 Locust Street, SW Suite 300
Knoxville, TN 37902-2526

September 27, 2006

Mr. Alvin Nance
Executive Director
Knoxville's Community Development Corporation
P.O. Box 3550
Knoxville, TN 37927

Dear Mr. Nance:

Our Office has reviewed your application for an energy performance contract with AMERESCO. We approve the \$8.99 million contract for efficiency measures that includes water, electric and gas measures affecting both master and resident-paid utilities. Subject to changes in the 9/19/2005 Final Rule regarding operating subsidy, HUD permits

1. Approval of the 'frozen rolling base' conservation incentive (see 990.185(a)(1) and 990.185(a)(1)(ii)) to receive annual incentives equal to the savings achieved at the utility meter at the then-current rate for water and sewer at certain sites (see Appendix G-1 of the submitted contract). According to the 990.185 regulations "The RBCL shall be frozen at the level calculated for the year during which the conservation measures initially shall be implemented."
2. Approval for 'additional operating subsidy eligibility' conservation incentive (24 CFR 990.185(a)(3)) to receive incentives to pay for contract costs at the specific sites (itemized in Appendix B) but not greater than the savings achieved for agency paid gas and electric—which we agree are impractical to attempt to monitor at the utility meters. This approval is contingent upon the Housing Authority submitting an approvable amortization schedule that delineates the add-on subsidies.
3. Adjustment to allow the inclusion of projects with resident-paid electric, water, and gas utilities that occur at one or more family sites of KCDC, as indicated in Appendix G-3. These adjustments must be calculated in accordance with 24 CFR 990.185 (a) (2) (i), (ii) (iii).

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4. A contract term commencing July 1, 2008 and ending June 30, 2028 as allowed by the June 7, 2006 waiver signed by Mr. Orlando J. Cabrera.

The above approval of both energy incentives is approved as stipulated provided that the incentives do not overlap, i.e. apply to the same equipment. In addition, when insufficient funds are available to fully fund operating subsidy eligibility, the Department funds operating subsidy eligibility, including the energy loan amortization add-on, at a prorated amount.

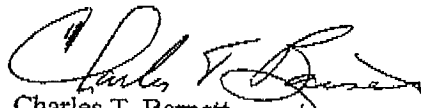
The Authority is reminded that as outlined in Notice PIH 2006-06 issued February 1, 2006, over the life of the contract, the PHA is required to obtain an annual independent audit of the consumption and cost savings related to HUD-approved savings incentives in order to ensure compliance with contract provisions and projected savings.

Asset Management rules require the breakout of equipment cost, utility type and savings contribution and is in keeping with 24 CFR § 990.170 (f) (1), which requires PHAs to keep utility records at the project level.

We would appreciate your sending us the final lease agreement for our files, as soon as it is signed.

If we can be of further assistance please call Shannon Cross at (865) 545-4400 ext. 135.

Sincerely,



Charles T. Barnett
Acting Director, Knoxville Program Center
Office of Public Housing

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