

**BALES ENERGY ASSOCIATES**

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# **ENERGY STUDY**

## **For the**

# **Ashby Free Public Library**



**Energy Analysis of Measures  
through the  
Massachusetts Clean Energy Center  
Green Communities Program**

**Completed By:**

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## **Table of Contents**

<b>Introduction .....</b>	<b>3</b>
<b>Executive Summary .....</b>	<b>3</b>
Energy Conservation Opportunities Evaluated .....	3
Executive Summary Chart .....	4
<b>Existing Conditions .....</b>	<b>4</b>
Facility Description .....	4
Utility Energy Use .....	5
Building Enclosure .....	5
Heating, Ventilation & Air Conditioning (HVAC) Systems .....	6
Heating System .....	6
Cooling System .....	7
HVAC Distribution System .....	8
Temperature & Ventilating Control System .....	9
Domestic Hot Water System .....	9
Lighting .....	9
<b>APPENDICES.....</b>	<b>10</b>
UTILITY INFORMATION .....	11
HEAT BALANCE INFORMATION .....	12
HEATING SYSTEM MEASURE .....	16
GREENHOUSE GAS INFORMATION .....	18
MASS SAVE INCENTIVE INFORMATION .....	20

## Introduction

Bales Energy Associates, an energy efficiency engineering firm, was contracted to provide an energy study for selected town-owned buildings in Ashby, Massachusetts. The study was supported through grant funding provided by the Green Communities Program of the Massachusetts Clean Energy Center. The building evaluated in this report is the Ashby Free Public Library building located at 812 Main Street.

Bart Bales, PE, MSME, senior engineer at Bales Energy Associates, visited the site, reviewed energy usage & billing information, examined relevant equipment and systems, and developed energy analyses and recommendations with regard to this building's energy related systems.

Given the nature of the funding process for the Green Communities Program, a preliminary site visit identified specific measures for inclusion in the current report. Other potential measures identified in the course of this study have been noted and may be considered for evaluation for future Green Communities grant applications.

Note: Through the course of this study, BEA has evaluated specific system improvement opportunities including building enclosure, HVAC, controls, domestic hot water and other mechanical and electrical systems. This analysis was completed to a level sufficient for recommending and calculating potential energy and dollar savings and for estimating costs for recommended energy system improvements to aid the client in making an informed decision on implementation of the recommendations provided.

Disclaimer: An added design phase for development of final design documents for construction implementation is assumed and recommended to follow this report. This study may be used as a starting point with supporting information for development of final system design and specification documents. Verification of all field measurements and recalculation of all heat load and final system sizing calculations are the responsibility of the final designer of record. Design implementation may be accomplished by any of the following methods: plan-specification-bid process or performance specification-design-build process.

## Executive Summary

### **Energy Conservation Opportunities Evaluated**

During the proposal and contracting process, specific energy conservation measures needing evaluation were identified at each facility. ASHRAE Level II calculations were completed for all measures evaluated.

BEA has approached the Ashby Library building using a "whole systems thinking" approach. Improvements in various systems have interactive impacts with other systems. Key recommendation and conclusions:

- **Install modulating, natural gas-fired condensing boilers to provide heat to the building.**
- **Retro-commission the existing temperature controls and air distribution systems.**
- **Test and balance air and water flow rates in existing system to ensure sufficient heat delivery and maintenance of desired temperatures.**

- **Improve outdoor air ventilation system and assure economizer operation.**
- **Install lead/lag and auto switching of circulator pumps (currently done manually).**
- **Resolve incorrect air filter location and/or access on above-ceiling air handler(s).**
- **Remove domestic hot water heater and replace with point-of-use units at sinks**
- **Resolve/remediate sulfur odor in domestic hot water system.**

The costs, savings, and economic payback for these energy conservation measures are presented in the following Executive Summary Chart. The values shown in the Executive Summary Table represent the savings with measures taken in the order of economic feasibility shown.

The calculations supporting each measure are included in the appendices.

### Executive Summary Chart

Executive Summary Chart													
Green Communities Study													
		Natural Gas	Propane	Oil	Electricity								
		\$1.72 per therm	per gal	per gal	\$0.21 per kWh								
Measure #	Measure Description <i>(RTM = Renewable Thermal Measure)</i> <i>(ECM = Energy Conservation Measure)</i>	Available Incentive (\$)	Fuel Energy Savings (% of base)	Annual Savings (\$ / yr)	Full Cost				Incremental Cost Difference *				
					After Incentive		After Incentive		After Incentive		After Incentive		
						Cost (\$)	Payback (yrs)	Cost (\$)	Payback (yrs)	Cost (\$)	Payback (yrs)	Cost (\$)	Payback (yrs)
ECM 1	Space Heating with Condensing Boiler	\$ 2,000	25%	\$ 1,739	\$ 38,071	21.9	\$ 36,071	20.7	\$ 23,069	13.3	\$ 21,069	12.1	
<b>Totals:</b>		<b>\$ 2,000</b>	<b>25%</b>	<b>\$ 1,739</b>	<b>\$ 38,071</b>	<b>21.9</b>	<b>\$ 36,071</b>	<b>20.7</b>	<b>\$ 23,069</b>	<b>13.3</b>	<b>\$ 21,069</b>	<b>12.1</b>	

\*Incremental = (Full Cost) - (Replacement-In-Kind of Existing)

Fuel Energy Impact										
		Natural Gas	Propane	Oil	Electricity					
		100.0 kBtu / therm	92.5 kBtu / gal	138.7 kBtu / gal	3.413 kBtu / kWh					
Baseline Energy Use		Natural Gas	Propane	Oil	Electricity	Fuel Energy				
Space Heating		3,750		221		405,712				
Measure #	Measure Description <i>(RTM = Renewable Thermal Measure)</i> <i>(ECM = Energy Conservation Measure)</i>	Fuel Usage After Measures				Fuel Energy Use (kBtu / yr)	Fuel Energy Savings (kBtu / yr)	Savings As % of Baseline		
		Natural Gas (therms / yr)	Propane (gal / yr)	Oil (gal / yr)	Electricity (kWh / yr)					
ECM 1	Space Heating with Condensing Boiler	3,043				304,341	101,371	25%		
<b>Totals:</b>						<b>101,371</b>	<b>25%</b>			

## Existing Conditions

### Facility Description

The Ashby Library building is a two-story structure. The original section was built around 1900. The new addition was built in 2008, attached to the rear of the original building. This addition nearly tripled the size of the Library. (See building photos below.) The total conditioned floor space of the entire library is approximately 111,600 ft<sup>2</sup>.

The library is open for 7 hours a day on Tuesday through Thursday and 3 hours on Saturdays (except in July & August) and closed Sunday, Monday and Friday.



## Utility Energy Use

Utility data for a multi-year period was collected. Data for the reference year used, May 2013 - April 2014, is tabulated and reported in the appendices. The electrical usage was 34,487 kWh and the natural dual fuel consumption was 3,750 therms of natural gas and 221 gallons of oil for the time period indicated. (Note that the burner on the boiler was converted from oil-fired operation to natural gas-fired operation early in the heating season.) These utility/fuel values result in annual totals of 523,382 kBtu per year and 45 kBtu/ft<sup>2</sup> of heated floor area.

## Building Enclosure

- Original 1900's structure:
  - The lower level is half below grade and has a poured concrete floor and brick & stone masonry exterior walls. In the above grade portion of the walls there are old windows with wood frames and single pane glazing. There are two rooms on this level that are considered occupied and the whole basement area is conditioned.
  - The first floor level is library space contains the following rooms: historic collection, periodicals, lobby, young adults, study room and lavatory.
  - The attic is unoccupied space and was recently insulated with spray applied foam insulation applied directly to the underside of the roof sheathing. This insulation encapsulated the roof rafters and a portion of the back side of the central dome of the lobby.
- The addition is a two story structure constructed on an insulated slab-on-grade floor with standard floor coverings, including carpet, vinyl, and other materials. On the lower level, roughly one third of the occupied area is cantilevered over a small number of parking spaces. The plan drawings indicate that the floor cavity of the cantilevered floor is insulated with fiberglass insulation. There is one other small overhang over the side entrance with occupied space above. That floor cavity is also shown to be insulated with fiberglass on the plans.

- The roof is almost flat, with very slight pitch to assist in drainage. The rubber membrane roof is laid over rigid insulation installed on top of metal roof decking supported by steel support members.
- Walls have wood cedar siding over metal stud walls. Wall cavities are insulated with fiberglass batts. Interior wall surfaces are sheetrock over a vapor barrier attached to the metal studs.
- Windows are aluminum framed with dual-pane, insulated glazing.
- Exterior doors are aluminum framed with dual-pane insulated glazing comprising most of the door area.

Below is a picture taken of the interior of the top floor of the Library.



*I: Circulation desk looking through the newer section*

## Heating, Ventilation & Air Conditioning (HVAC) Systems

### Heating System

The Library is heated by a natural gas fired hydronic boiler (HB Smith model: 19A-S/W-04) located in the basement of the building. In the fall of 2013, the boiler was converted from oil-fired operation to natural-gas-fired operation. The boiler is a cast-iron, atmospheric boiler with a barometric draft damper. The boiler has a hydronic output rating of 359 MBH (net IBR rating).

The design heat load for the building is approximately 318,000 Btu/hr.

### **Recommendation: Install a Natural Gas-Fired Condensing Boiler**

Replace the existing boiler with two (2) premium efficiency natural gas-fired condensing boilers with combined capacity sufficient to meet the peak design heating load for the building. Install the new boiler in the location of the existing boiler.

Condensing boilers are designed and constructed to safely capture the latent energy in the boiler exhaust by condensing the water vapor. This condensate contains sulfuric acid. For this reason condensing boilers must be constructed of materials designed to withstand such corrosive condensate. Quality condensing boilers are constructed with a stainless steel heat exchanger and with condensate neutralization to allow for environmentally acceptable disposal of condensate to drain.

The boiler system should also be designed and installed to provide combustion air in a sealed combustion configuration . This means that the combustion air is brought from outdoors via a plastic intake pipe to directly provide air to the burner. The low-temperature exhaust may be vented from the building typically via plastic pipe as well

Other system improvements included in this measure are:

- **Boiler replacement assumes re-use of the existing microprocessor-based scheduling time-clock capabilities** to provide scheduling of occupied and unoccupied periods. Install an outdoor air temperature sensor and a space temperature sensor. Use space temperature and outside air sensor inputs sensors to determine when boiler and circulator shall run for daytime temperature maintenance, and unoccupied temperature setback.
  - **Retro-commission the existing temperature controls and air distribution systems.**
  - **Test and balance air and water flow rates in existing system to ensure sufficient heat delivery and maintenance of desired temperatures.**
  - **Improve outdoor air ventilation system and assure economizer operation.**
  - **Install lead/lag and auto switching of circulator pumps (currently done manually).**
  - **Resolve/remediate sulfur odor in domestic hot water system.**
  - **Resolve incorrect air filter location and/or access on above ceiling air handlers.**

System costs and energy and dollar savings for this measure are reported in an appendix of this report.

#### **Installation & Operational Guidelines for New Condensing Boilers**

- Clean and adjust boiler and burner annually. Use electronic test equipment to determine proper air-fuel mixture and proper flame characteristics. Manual, sight-based adjustments do not typically result in optimal system performance. Test for stack temperature, CO<sub>2</sub>, oxygen, excess air and smoke to optimally tune the burner. Post combustion test results at the boiler and retain copy in electronic records, as well as paper format.
- Program circulation pumps to operate whenever outside air temperatures are 34° F or below.
- Set reduced circulation water temperatures for unoccupied periods to improve night temperature setback by reducing hydronic piping stand-by losses.

**Continue the use of programmable thermostats to control temperatures and allow for automatic setback of unused areas during unoccupied hours. Existing programmed schedule should be reviewed, confirmed and updated as necessary.**

#### **Cooling System**

The facility is conditioned in the summer cooling season by conventional, outdoor condensing units connected to internal refrigerant coils in the air handling units. The three condensing units associated with the air handling units located above the drop ceiling on the first floor are located on the roof. The one associated with the air handling unit serving the rear of the lower level is ground mounted on the west corner of the building adjacent to the parking overhang.

## HVAC Distribution System

The following information is a combination of information from mechanical plans and schedules (from the 2005 bid document drawings) and a site walkthrough. Not all information was confirmed during site walkthrough, due to limited access to mechanical equipment locations such as the roof and the area above the first floor drop ceiling where three main air handlers are located.

The heating distribution system consists of hydronic piping delivering heated boiler water to/from the various heat emitters used throughout the facility. The majority of the heat is delivered via hydronic fan coils internal to the 5 air handling units. Other heat emitting elements used for localized heating of small spaces are fin-tube radiation convectors, unit heaters and electric baseboards.



*2: Fin-tube heating element along south/southwest facing wall of nearly full glazing*

There are some comfort concerns with respect to the heating distribution system in the building.

The staff indicated difficulty in keeping the lower level children's space, including the craft room, warm during the winter and have noticed the air coming from the floor registers to be only slightly warm.

Provision of lower than desirable temperature conditions is predominantly a comfort concern, not an energy efficiency issue. Further investigation may be needed to resolve this comfort issue. It is unclear whether there is a problem with the design of the existing systems or with the operation of the existing system.

A thorough design review of the existing system may be needed to effectively resolve this comfort issue and thorough review of the HVAC design is beyond the scope of the current energy study.

However, as a preliminary step in resolving these issues, Bales Energy Associates has identified potential factors which may be contributing to inadequate heating in this space.

- The heating, ventilating and air conditioning system may need to be tested and balanced to determine whether required air flow rates are being delivered to the problem locations. Balancing of the duct system for the related air handler may be needed to resolve this issue.
- Outdoor air quantities provided to the air handler may exceed the capacity of the heating coil serving the air handler.
- Water temperatures and/or water flow rates delivered to the air handler's heating coil may currently be too low to warm the air to required temperatures to meet the heating load of the space. Temperature and/or flow rate adjustments may be needed.



- Controls, sensors, valves and other equipment associated with this portion of the overall system may not be working and/or may need adjustment.

The large southwest facade of the structure, comprising approximately 90% glazing, creates demanding conditioning requirements in the spaces adjacent to those windows. There are fin-tube (baseboard-style) heat convectors running the length of the windows. The thermostat controlling water flow through those units is also tied to the air handler for this area.

## Temperature & Ventilating Control System

The existing temperature controls are digital programmable thermostats (Honeywell).

## Domestic Hot Water System

Domestic hot water use is limited in the building. There are **four (4)** hand-washing sinks in the lavatories, one small kitchenette sink, and one slop sink for custodial use. Hot water is currently provided by a 40 gallon electric hot water heater (State model: PCE 40 2ORTA). Due to the distances from the storage tank, the lack of a recirculation loop and the lack of insulation on the hot water pipes, the amount of time for hot water to reach each sink is not acceptable.

**Bales Energy Associates recommends discontinuance of the use of the existing central electric water heater in the basement and the installation of point-of-use mini-tank water heaters to serve the lavatories and the slop sink.** This will provide hot water to these spaces more promptly and eliminate the heat losses from the un-insulated hot water pipes.

For the two adjacent lavatories downstairs, install a 3.9-gallon mini-tank water heater and modification to piping to serve both sinks. For the children's lavatory and the kitchenette sink, install one 3.9-gallon mini-tank water heater. For the upstairs lavatory, install a 2.7-gallon mini-tank water heater. For the custodial slop sink, install a 7.1-gallon mini-tank water heater.

The staff indicated a strong sulfur odor from the hot water. A brief internet search indicated that a possible source of the odor may be a reaction between the well water and the anode rods in the water heater. Preliminary investigations suggested that chemical flushing approaches may remediate such a condition and also that reactivity is sometimes affected by the materials employed as anode rods.

Resolution of this problem is beyond the scope of this study.

## Lighting

Interior lighting is not addressed in this report.

# APPENDICES

# UTILITY INFORMATION

May 2013 - Apr 2014													Billed Energy Use Table for Electricity & Fuel	
Building Name		Library												
Owner		Town of Ashby												
Month	Electricity KWH	Billed Demand KW	Delivery Charged \$	Supplier Charged \$	Electricity Total \$	Oil Gallons	Oil \$	Natural Gas therms	Natural Gas Delivery \$	Natural Gas Supplier \$	Natural Gas Total \$	Energy \$ Totals		
May 2013	2,551	17.0	\$372	\$163	\$535						\$0	\$535		
Jun	2,534	23.0	\$424	\$18	\$442						\$0	\$442		
Jul	3,971	28.5	\$574	\$301	\$874						\$0	\$874		
Aug	2,923	22.0	\$436	\$223	\$658						\$0	\$658		
Sept	2,724	24.0	\$435	\$191	\$626						\$0	\$626		
Oct	3,246	22.5	\$449	\$220	\$669	121.3	\$388				\$0	\$1,056		
Nov	2,740	16.0	\$348	\$193	\$541	100.0	\$318	159.3	\$135	\$118	\$253	\$1,112		
Dec	2,629	14.0	\$319	\$241	\$561			683.6	\$544	\$508	\$1,053	\$1,614		
Jan	2,918	14.5	\$346	\$327	\$673			839.3	\$652	\$654	\$1,306	\$1,979		
Feb	2,954	17.0	\$376	\$344	\$721			910.0	\$701	\$758	\$1,459	\$2,179		
Mar	2,779	16.0	\$354	\$240	\$594			711.5	\$564	\$852	\$1,416	\$2,010		
Apr 2014	2,518	15.0	\$327	\$182	\$509			446.6	\$386	\$560	\$946	\$1,455		
Annual (Units)	34,487		\$4,760	\$2,643	\$7,403	221	\$706	3,750	\$2,981	\$3,451	\$6,433	\$14,542		
Heating Season (Units)	19,784		\$2,520	\$1,747	\$4,267	221	\$706	3,750	\$2,981	\$3,451	\$6,433	\$11,406		
Annual (\$/Unit)			\$0.14	\$0.08	\$0.21		\$3.19				\$1.72 / therm			
Heating Season (\$/Unit)			\$0.13	\$0.09	\$0.22		\$3.19				\$1.72			
	<b>Electricity kBtu</b>					<b>Oil kBtu</b>		<b>Nat. Gas kBtu</b>			<b>Energy Use Totals (kBtu)</b>	<b>Energy \$ Totals</b>		
Annual (kBtu)	117,670					30,694		375,018			523,382			
Heating Season (kBtu)	67,503					30,694		375,018			473,215			
											<b>Totals (kBtu/sf)</b>	<b>(\$/sf)</b>		
Annual (kBtu/sf)	10.1					2.6		32.3			45.0	\$1.25		
Heating Season (kBtu/sf)	5.8					2.6		32.3			40.7	\$0.98		
Building Name	Library										Heated Square Footage	11,619		

# HEAT BALANCE INFORMATION

BASELINE: Temperature & Schedule Information							
Building Name: Library							
Total Heating Days		212			Floor SF		
Outdoor Winter Temperature		35			11,619		
Wing name	Occupied Temp.	Unoccupied Temp.		Htg System Occ. Hrs per day *	Schedule	Occ Level Heating Days	
		Night	Off days				
1	Original Building	68	58	55	6	Tu-7, W-7, Th-7, Sa-3 121	
2	Addition, Upper (front 2/3rds)	68	58	55	6	Tu-7, W-7, Th-7, Sa-3 121	
3	Addition, Upper (rear 1/3rd)	68	58	55	6	Tu-7, W-7, Th-7, Sa-3 121	
4	Addition, Lower (front 2/3rds)	68	58	55	6	Tu-7, W-7, Th-7, Sa-3 121	
5	Addition, Lower (rear 1/3rd)	68	58	55	6	Tu-7, W-7, Th-7, Sa-3 121	

Peak Design Heat Load	
Modeled CFM	1,827 cfm
* (Constant)	1.08
= subtotal	1973.5
+ Design UA	2573.5
= Total	4547.0
* design Delta T	70 degrees
/	1000
= Equipment Sizing	318 kBtu/hr

BASELINE: HEAT BALANCE	
GAINS AND LOSSES BTU/HEATING SEASON* 1E6	
CONDUCTION LOSSES	-303.0
INFILTRATION LOSSES	-101.6
VENTILATION LOSSES	-37.8
SOLAR GAIN	99.1
OCCUPANT GAIN	2.2
ELECTRICAL GAIN	64.1
<b>NET HEATING DEMAND</b>	<b>-277.0</b>

Net Heating Demand (MMbtu)	/Energy Required (MMbtu)	Seasonal Efficiency %
277.0	405.7	68%

<b>BASELINE: HEAT LOSS COEFFICIENTS</b>							
<b>Zone #</b>	<b>Building Zone</b>		<b>U-Value (BTU/hr-sf-F)</b>	<b>Area (sf)</b>		<b>UA-Value (BTU/hr-F)</b>	
<b>1</b>	<b>Original Building</b>	Roof 2 - orig. structure	0.039	2,033	per l.f.	79	
		Wall 2 - orig structure	0.291	1,481		431	
		Above Grade	0.414	544		225	
		Below Grade	1.479	96		142	
		Doors 1	0.690	60		41	
		Windows 2 - single pane w/ storm	0.570	282		161	
		Windows 3 - stained glass, no storm	0.910	63		58	
		Below Grade Slab	0.030	96		per l.f.	3
		Slab-on-Grade	0.720	50		per l.f.	36
		<b>Wing UA Total</b>					<b>1175.8</b>
<b>2</b>	<b>Addition, Upper (front 2/3rds)</b>	Ceiling 1 - new addition	0.032	2,677		87	
		Wall 1 - new addition	0.078	2,048		160	
		Windows 1	0.600	90		54	
		Floor - overhangs	0.041	145		6	
		<b>Wing UA Total</b>					<b>307.2</b>
<b>3</b>	<b>Addition, Upper (rear 1/3rd)</b>	Ceiling 1 - new addition	0.032	1,330		43	
		Wall 1 - new addition	0.078	1,226		96	
		Windows 1	0.600	552		331	
		<b>Wing UA Total</b>					<b>470.3</b>
<b>4</b>	<b>Addition, Lower (front 2/3rds)</b>	Wall 1 - new addition	0.078	1,406	per l.f.	110	
		Windows 1	0.600	96		58	
		Slab-on-Grade	0.720	150		108	
		<b>Wing UA Total</b>					<b>275.7</b>
<b>5</b>	<b>Addition, Lower (rear 1/3rd)</b>	Wall 1 - new addition	0.078	722		56	
		Windows 1	0.600	389		233	
		Floor - overhangs	0.041	1,330		55	
		<b>Wing UA Total</b>					<b>344.5</b>
<b>Building Total UA:</b>					<b>2573.5</b>		

<b>BASELINE:</b>		<b>CONDUCTION LOSSES</b>					
<b>#</b>	<b>Zone</b>	<b>UA</b>	<b>HOURS/ DAY</b>	<b>DAYS/ -</b>	<b>TEMP DIFF</b>	<b>LOSSES (* 1E6)</b>	<b>Sub Totals</b>
<b>1</b>	<b>Original Building</b>	1,176	6	121	33	28	
		1,176	18	121	23	59	
		1,176	24	91	20	51	138.4
<b>2</b>	<b>Addition, Upper (front 2/3rds)</b>	307	6	121	33	7	
		307	18	121	23	15	
		307	24	91	20	13	36.2
<b>3</b>	<b>Addition, Upper (rear 1/3rd)</b>	470	6	121	33	11	
		470	18	121	23	24	
		470	24	91	20	21	55.4
<b>4</b>	<b>Addition, Lower (front 2/3rds)</b>	276	6	121	33	7	
		276	18	121	23	14	
		276	24	91	20	12	32.5
<b>5</b>	<b>Addition, Lower (rear 1/3rd)</b>	344	6	121	33	8	
		344	18	121	23	17	
		344	24	91	20	15	40.6
	<b>Total UA</b>	<b>2,574</b>	<b>Conduction Total</b>				<b>303.0</b>

BASELINE:		INFILTRATION LOSSES							
0.42									
#	Zone	VOLUME	ACH	HRS/ DAY	DAYS/ YR	0.018	TEMP DIFF	LOSSES (* 1E6)	Sub Totals
1	Original Building	36,729	0.48	18	121	0.018	23	15.7	
		36,729	0.48	24	91	0.018	20	13.7	
	Occ.	36,729	0.60	6	121	0.018	33	9.5	39.0
2	Addition, Upper (front 2/3rds)	35,256	0.42	18	121	0.018	23	13.4	
		35,256	0.42	24	91	0.018	20	11.6	
	Occ.	35,256	0.00	6	121	0.018	33	0.0	25.0
3	Addition, Upper (rear 1/3rd)	19,147	0.42	18	121	0.018	23	7.3	
		19,147	0.42	24	91	0.018	20	6.3	
	Occ.	19,147	0.00	6	121	0.018	33	0.0	13.6
4	Addition, Lower (front 2/3rds)	21,987	0.42	18	121	0.018	23	8.3	
		21,987	0.42	24	91	0.018	20	7.3	
	Occ.	21,987	0.00	6	121	0.018	33	0.0	15.6
5	Addition, Lower (rear 1/3rd)	11,967	0.42	18	121	0.018	23	4.5	
		11,967	0.42	24	91	0.018	20	4.0	
	Occ.	11,967	0.00	6	121	0.018	33	0.0	8.5
<b>Infiltration Total</b>									<b>101.6</b>

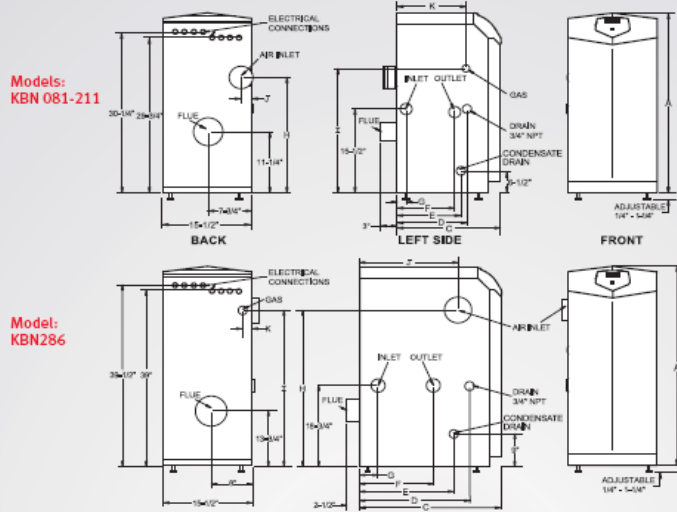
BASELINE:		VENTILATION LOSSES						
Zone #	Area Name	1st cut CFM	1.08	HOURS/ DAY	DAYS/ -	TEMP DIFF	LOSSES (* 1E6)	
1	Original Building	0	1.08	6	121	33	0.0	
2	Addition, Upper (front 2/3rds)	400	1.08	6	121	33	10.3	
3	Addition, Upper (rear 1/3rd)	200	1.08	6	121	33	5.2	
4	Addition, Lower (front 2/3rds)	660	1.08	6	121	33	17.1	
5	Addition, Lower (rear 1/3rd)	200	1.08	6	121	33	5.2	
1,460							<b>Ventilation Total</b>	<b>37.8</b>

# HEATING SYSTEM MEASURE

ECM # 1							Space Heating with Condensing Boiler Library						
Fuel Rate (\$ / therm)													
\$1.72		<b>Existing Condition:</b>					<b>New Condition:</b>						
<b>Equipment Type</b>		<b>Space Heating Boiler</b>					<b>Space Heating Boiler</b>						
<b>Boiler #</b>	1					1	2						
<b>Make</b>	HB Smith					Lochinvar	Lochinvar						
<b>Model</b>	19A-S/W-04					KBN 211	KBN 211						
<b>Type</b>	Atmospheric					Condensing	Condensing						
<b>Heating Medium</b>	Water					Water	Water						
<b>Control Mode</b>						Modulating	Modulating						
<b>Output kBtu/Hr</b>	359					170	170						
<b>Steady State Eff</b>	83%					94%	94%						
<b>Input kBtu/Hr</b>	433					210	210						
<b>Seasonal Eff</b>	68%					91%	91%						
<b>Percentage of Load</b>	113%					53%	53%						
<b>Replacement-In-Kind Costs</b>						<b>Installed System Costs</b>							
<b>Boiler</b>		\$15,002				<b>Condensing Boiler</b>		\$25,004					
		Retro-commission Existing Temperature Controls & Test & Balance Ventillation Air Quantities and Provision of Outside Air						\$2,700					
		Investigate & Remediate Domestic Water Quality Issues						\$360					
		Install four (4) Mini-tank Domestic Hot Water Heaters						\$3,400					
								\$31,464				<i>Subtotal</i>	
						<b>Contingency</b>		\$3,146					
								\$34,610				<i>Subtotal</i>	
						<b>Contractor Oversight</b>		\$3,461					
<b>Totals</b>		<b>\$15,002</b>				<b>Total:</b>		<b>\$38,071</b>					
<b>Summary of Existing Building-Related Heat Loads</b>	<b>Annual Building Operating Load (kBtu/year)</b>	<b>Existing Fuel Usage Converted to therms</b>	<b>Projected Fuel Usage therms</b>	<b>Fuel Cost</b>	<b>Peak Space Heating Load (kBtu/hr)</b>	<b>Provide (#)</b>							
						<b>2</b>	<b>Boiler @</b>						
							<b>107%</b>						
							<b>of design Load</b>						
Space Heating Load	276,951	4,057		\$6,959	318		340						
	276,951		3,043	\$5,221									
			<b>Savings</b>	<b>\$1,739</b>									
		<b>Cost</b>	<b>Savings</b>	<b>Payback</b>									
<b>Full Equipment Cost Basis:</b>		\$38,071	\$1,739	21.9									
<b>Incremental Equipment Cost Difference:</b>		\$23,069	\$1,739	13.3									



**KNIGHT® BOILER DIMENSIONS AND SPECIFICATIONS - FLOOR-STANDING MODELS**



KNIGHT HEATING BOILER					
Model Number	Input Min. MBH	Input Max. MBH	AFUE %	Heating Capacity MBH	NET AHR1 MBH
KBN081	16	80	95.0	74	64
KBN106	21	105	95.0	97	84
KBN151	30	150	95.0	139	121
KBN211	42	210	95.0	196	170
KBN286	57	285	95.0	267	232

DIMENSIONS AND SPECIFICATIONS														
A	C	D	E	F	G	H	I	J	K	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Shipping Wt. (lbs.)
33-1/4"	14"	7"	5-3/4"	5"	3"	20-1/2"	22"	1-3/4"	6-1/2"	1/2"	1"	3"	3"	125
33-1/4"	14"	6-1/2"	5-3/4"	4-1/2"	1-1/2"	20-1/2"	22"	1-3/4"	6-1/2"	1/2"	1"	3"	3"	129
33-1/4"	18"	12-1/4"	11-1/2"	10"	1-1/2"	21-1/4"	23"	1-3/4"	12"	1/2"	1"	3"	3"	157
33-1/4"	22-1/4"	16-1/2"	15-3/4"	14-1/4"	5-1/4"	21-1/4"	23"	1-3/4"	16-1/4"	1/2"	1"	3"	3"	172
42-1/4"	19-3/4"	12-3/4"	13-1/2"	6"	2"	34"	31"	11-3/4"	4-1/4"	3/4"	1-1/4"	4"	4"	224

Notes: Indoor installation only. All information subject to change. Change "N" to "L" for LP gas models.  
 Net ratings based on piping and pick-up allowance of 1.15

**SMART SYSTEM™ FEATURES**

- ▶ **SMART SYSTEM Digital Operating Control**
  - ▶ Multi-Color Graphic LCD Display with Navigation Dial and Soft Keys
  - ▶ Three Setpoint Temperature Inputs
  - ▶ Built-in Cascading Sequencer for up to 8 Boilers
    - ▶ Cascade Multiple Sized Boilers
    - ▶ Lead Lag
    - ▶ Efficiency Optimization
    - ▶ Front End Loading Capability with Copper Fin II
  - ▶ **Outdoor Reset Control with Outdoor Air Sensor**
    - ▶ Programmable for Three Reset Temperature Inputs
  - ▶ **Programmable System Efficiency Optimizers**
    - ▶ Night Setback w/Override Function
    - ▶ DHW Night Setback w/Override Function
    - ▶ Anti-Cycling
    - ▶ Outdoor Air Reset Curve
    - ▶ Ramp Delay
    - ▶ Boost Temperature & Time
  - ▶ **Three Pump Control**
    - ▶ System Pump with Parameter for Continuous Operation
    - ▶ Boiler Pump with Variable Speed Pump Control\*
    - ▶ Domestic Hot Water Pump
  - ▶ **Domestic Hot Water Prioritization**
    - ▶ DHW tank piped with priority in the boiler loop
    - ▶ DHW tank piped as a zone in the system with the pumps controlled by the Smart System
    - ▶ DHW Modulation Limiting
    - ▶ Separately Adjustable SH/DHW Switching Times\*
  - ▶ **Building Management System Integration**
    - ▶ 0-10 VDC Input to Control Modulation or Set Point
    - ▶ 0-10 VDC Modulation Rate Output
    - ▶ 0-10 VDC Input Signal from Variable Speed System Pump\*
    - ▶ 0-10 VDC Input to Enable/Disable call for heat

- ▶ **High-Voltage Terminal Strip**
  - ▶ 120 VAC / 60 Hertz / 1 Phase Power Supply
  - ▶ Three Sets of Pump Contacts
- ▶ **Low Voltage Terminal Strip**
  - ▶ 24 VAC Device Relay
  - ▶ Proving Switch Contacts
  - ▶ Flow Switch Contacts
  - ▶ Alarm on Any Failure Contacts
  - ▶ Runtime Contacts
  - ▶ DHW Thermostat Contacts
  - ▶ 3 Space Heat Thermostat Contacts
  - ▶ System Sensor Contacts
  - ▶ DHW Tank Sensor Contacts
  - ▶ Outdoor Air Sensor Contacts
  - ▶ Cascade Contacts
  - ▶ 0-10 VDC BMS External Control Contact
  - ▶ 0-10 VDC Boiler Rate Output Contacts
  - ▶ 0-10 VDC Variable Speed System Pump Signal Input
  - ▶ 0-10 VDC Signal to Control Variable Speed Boiler Pump
  - ▶ Modbus Contacts
- ▶ **Time Clock**
- ▶ **Data Logging**
  - ▶ Hours Running, Space Heating
  - ▶ Hours Running, Domestic Hot Water
  - ▶ Ignition Attempts
  - ▶ Last 10 Lockouts
- ▶ **Access to BMS Settings through Graphic LCD Display**
- ▶ **Maintenance Reminder**
  - ▶ Custom Maintenance Reminder with Contractor Info
  - ▶ Installer Ability to De-activate Service Reminder
- ▶ **Low-Water Flow Safety Control & Indication**
- ▶ **Dual Level Password Security**
- ▶ **Customizable Freeze Protection Parameters**

**STANDARD FEATURES**

- ▶ **ENERGY STAR Most Efficient Recognition**
- ▶ **95% DOE AFUE Efficiency**
- ▶ **Modulating Burner with 5:1 Turndown**
  - ▶ Direct-Spark Ignition
  - ▶ Low-NOx Operation
  - ▶ Field Convertible from Natural to LP Gas
- ▶ **ASME Stainless Steel Heat Exchanger**
  - ▶ 30 psi ASME Relief Valve
- ▶ **Vertical & Horizontal Direct-Vent**
  - ▶ PVC, CPVC, Polypropylene or SS Venting up to 100 feet
- ▶ **Smart System Control**
- ▶ **Condensate Trap**
- ▶ **Other Features**
  - ▶ Automatic Reset High Limit
  - ▶ Adjustable High Limit w/Manual Reset
  - ▶ Boiler Circulating Pump
  - ▶ Adjustable Leveling Legs
  - ▶ Zero Clearances to Combustible Materials
  - ▶ 12-Year Limited Warranty (See Warranty for Details)
  - ▶ 2-Year Parts Warranty

**OPTIONAL EQUIPMENT**

- ▶ Modbus Communication
- ▶ Condensate Neutralization Kit
- ▶ Multi Temperature Loop Control
- ▶ Flow Switch
- ▶ Low-Water Cutoff w/Manual Reset & Test
- ▶ Alarm Bell
- ▶ Concentric Vent Kit
- ▶ SMART SYSTEM PC Software
- ▶ Stack Frame
- ▶ BMS Gateway to LON or BacNet
- ▶ Sidewall Vent Termination

**FIRING CODES**

- ▶ M9 Standard Construction
- ▶ M7 California Code

\*Exclusive feature, available only from Lochinvar



Lochinvar, LLC  
 300 Maddox Simpson Parkway  
 Lebanon, Tennessee 37090  
 P: 615-889-8900 / F: 615-547-1000  
[www.Lochinvar.com](http://www.Lochinvar.com)

Patent Pending



# GREENHOUSE GAS INFORMATION

Greenhouse Gas (GHG) Impact								
Baseline Fuel Usage		Natural Gas	Propane	Oil	Electricity	MT eCO2		
Space Heating		375		221		22		
Measure #	Measure Description <i>(RTM = Renewable Thermal Measure)</i> <i>(ECM = Energy Conservation Measure)</i>	Fuel Usage After Measures				GHG Emmissions (MT eCO2)	GHG Savings (MT eCO2)	Savings As % of Baseline
		Natural Gas (MMBtu / yr)	Propane (gal / yr)	Oil (gal / yr)	Electricity (kWh / yr)			
ECM 1	Space Heating with Condensing Boiler	304				16	6	27%
						<b>Totals:</b>	<b>6</b>	<b>27%</b>

GHG Emmissions		
10.3	MT eCO2 / 1,000	gallons of #2 Fuel Oil
5.3	MT eCO2 / 1,000	gallons of Propane (LPG)
53.2	MT eCO2 / 1,000	MMBtu's of Natural Gas
14.1	MT eCO2 / 100	short ton of wood pellets (2,000 lbs.)
333.7	MT eCO2 / 1,000,000	kWh of electricity
<i>per Clean Air Cool Planet Campus Carbon Calculator (2013 value)</i>		

# Bosch Tronic 3000T Electric Mini-Tank Water Heater

Point-of-use hot water heaters can supply up to 2 sinks at a time and provide endless hot water and energy savings. These water heaters are easy to install and you will never have to worry about heat loss from long pipe runs. A point-of-use water heater is the perfect solution for home and office sinks.... hot water without the wait.

These point-of-use electric mini tanks are designed with titanium for longer life. The "Titanium Plus Inside" glass lining protects the tank against leakage. These units can be installed independently or in-line with a larger hot water source eliminating long waits for hot water.

Bosch Tronic Electric Mini-Tank Water Heater offers three different models you can choose from that can be mounted on the wall or floor. Built with titanium for longer life, and durable poly-composite housing which resists corrosion. Also comes with an 8 year residential and commercial warranty from Bosch.

## Bosch Tronic 3000T | ES8, ES4, ES2.5 Point-of-Use Electric Mini-Tank Water Heaters

### Hot Water Where You Need It

The Bosch Tronic 3000T point-of-use electric mini-tanks are available in three sizes which can be wall-hung (bracket included) or floor-mounted.

**Easy installation.** Simply tap into the cold water line, provide electrical connection and install the water heater directly at the sink. Can be used alone to provide a small volume of water or installed inline with a central water heater near the point-of-use to eliminate the wait for hot water.

Technical Specifications	ES8	ES4	ES2.5
Part Number	7736500902	7736500901	7736500900
Thermal Efficiency	98%	98%	98%
Tank Volume (gal)	7.1	3.9	2.7
Heating Capacity, Watts	1440	1440	1440
Recovery Rate @ 90°F Rise, GPH	6.6	6.6	6.6
Temperature Range (°F)	65 - 145	65 - 145	65 - 145
Max Operating Pressure (psi)	150	150	150
Weight (lbs)	29.5	17.3	15.5
Dimensions (in)	17¼ x 17¼ x 14¼	14 x 14 x 12¼	14 x 14 x 10¼
Water Fittings	¾" Male NPT	½" Male NPT	½" Male NPT
Relief Valve	Include d	Installe d	Installe d
Electrical Requirements			
Volts (VAC)	120	120	120
Amps	12	12	12
Connection Type	Hard Wired	Plug-In	Plug-In



Note: Sold in U.S. Only

### Features

- ▶ Supplies up to 2 sinks at a time (ES8 model)
- ▶ Provides hot water quickly at point-of-use
- ▶ Compact, lightweight, space saving
- ▶ Thick CFC-free foam insulation maximizes energy efficiency
- ▶ Units can be wall / floor mounted (bracket included) with multi-directional mounting available (ES8 model only)
- ▶ Temperature / pressure relief valve included
- ▶ Glass-lined tank for long service life
- ▶ Models ES2.5 and ES4 have a simple 120 VAC plug-in connection
- ▶ 8 year limited warranty\*

\* Copies of original warranties in their entirety are available at [www.boschheatingandcooling.com](http://www.boschheatingandcooling.com)

# MASS SAVE INCENTIVE INFORMATION



**FINANCING  
NOW AVAILABLE**

## High-Efficiency Commercial Natural Gas Equipment Rebate

*Save energy with high-efficiency equipment. Rebates are provided to reduce the cost difference between standard efficiency and high-efficiency equipment.*

- High-Efficiency Heating Equipment
- After Market Boiler Reset Controls
- Steam Traps
- High-Efficiency Water Heating Equipment
- Programmable Thermostats

2014



### ENERGY EFFICIENCY PROGRAM ADMINISTRATORS

**berkshire gas**  
A U.S. HOLDINGS COMPANY  
1-877-883-1759  
www.BerkshireGas.com  
efficiency@berkshireGas.com

**Cape Light Compact**  
1-800-797-6699  
www.Capelightcompact.org  
efficiency@capelightcompact.org

**Columbia Gas of Massachusetts**  
A NiSource Company  
1-800-232-0120  
www.ColumbiaGasMA.com  
efficiency@columbiagasma.com

**nationalgrid**  
1-800-843-3636  
www.nationalgridus.com/energyefficiencyservices  
efficiency@nationalgrid.com

**Liberty Utilities**  
1-508-324-7811  
www.libertyutilities.com  
efficiency@libertyutilities.com

**NSTAR**  
1-781-441-8592  
www.nstar.com • efficiency@nstar.com

**Unitil**  
1-888-301-7700  
www.unitil.com • efficiency@unitil.com

**Western Massachusetts Electric**  
The Northeast Utilities System  
1-800-835-2707  
www.wmecc.com • efficiency@wmecc.com

**FINANCING  
NOW AVAILABLE**

**APPLICATION INSTRUCTIONS**

1. If you are interested in financing your project, please contact your energy efficiency program administrator to discuss terms and eligibility prior to purchasing your qualifying equipment. Further information can be found on [masssave.com/financing](http://masssave.com/financing).
2. Purchase and install the qualifying equipment. *Must be installed between 1/1/2014 and 12/31/2014.*
3. Go to [www.smartenergy-zone.com/masssave/](http://www.smartenergy-zone.com/masssave/), to submit your online rebate application. Customers who do not have online access can call 1-877-883-1759.
4. Upload or return the completed application along with the following items:
  - Completed and Signed Application
  - A copy of the pre-approval rebate letter (if applicable)
  - Manufacturer's technical specification sheets ("cut sheets") for each type of eligible equipment purchased
  - Copy of a dated work order / invoice / receipt that identifies:
    - Equipment or measure installed
    - Contractor
    - AFUE/EF/Thermal Efficiency Rating
    - Manufacturer
    - Contractor Address
    - Model Number
    - Equipment & Installation Costs

*All are required to process application.*
5. To view an example of an invoice, please visit <https://www.smartenergy-zone.com/masssave/>.
6. Mail the signed rebate form with attached receipt to:  
 Commercial High-Efficiency Gas Equipment Rebate  
 Offer#: H946556  
 P.O. Box 540064  
 El Paso, TX 88554-0064

*Program Details: This rebate program applies to equipment purchased and installed between January 1, 2014 and December 31, 2014. Applications must be postmarked within 60 days from installation date. Please allow 6-8 weeks processing time.*

*Reminder: Retain a copy of the completed rebate form for your records.*

**2014 High-Efficiency Natural Gas Equipment Rebates**

HEATING EQUIPMENT			WATER HEATING EQUIPMENT		
<b>FURNACE</b>	<b>RATING</b>	<b>REBATE</b>	<b>ON-DEMAND TANKLESS</b>	<b>RATING</b>	<b>REBATE</b>
Up to 150 MBH	95% AFUE* or greater & ECM motor	\$300	with Electronic Ignition	Energy Factor of .82 or greater	\$500
Up to 150 MBH	97% AFUE* or greater & ECM motor	\$600		Energy Factor of .94 or greater	\$800
<b>CONDENSING UNIT HEATER</b>	<b>RATING</b>	<b>REBATE</b>	<b>HIGH-EFFICIENCY INDIRECT WATER HEATER</b>		<b>REBATE</b>
Up to 300 MBH	90% Thermal Efficiency or greater	\$750			\$400
<b>INFRARED HEATERS</b>	<b>RATING</b>	<b>REBATE</b>	<b>CONDENSING STAND ALONE</b>	<b>RATING</b>	<b>REBATE</b>
All Sizes	Low Intensity	\$750	75 to 300 MBH	95% Thermal Efficiency or greater	\$500
<b>CONDENSING BOILERS</b>	<b>RATING</b>	<b>REBATE</b>	<b>ENERGY STAR®</b>	<b>RATING</b>	<b>REBATE</b>
Up to 300 MBH	90% AFUE* or greater	\$1,000	Freestanding	Energy Factor of .67 or greater	\$100
Up to 300 MBH	95% AFUE* or greater	\$1,500	<b>COMBINED HIGH-EFFICIENCY BOILER AND WATER HEATING UNIT</b>		
301 to 499 MBH	90% Thermal Efficiency or greater	\$2,000	<b>CONDENSING BOILER</b>	<b>RATING</b>	<b>REBATE</b>
500 to 999 MBH	90% Thermal Efficiency or greater	\$4,000	with On-Demand Hot Water	Minimum AFUE Rating of 90%	\$1,200
1000 to 1700 MBH	90% Thermal Efficiency or greater	\$7,500		Minimum AFUE Rating of 95%	\$1,600
1701 to 2000 MBH	90% Thermal Efficiency or greater	\$10,000	<i>Must be considered one unit by manufacturer.</i>		
<b>CONTROLS EQUIPMENT</b>			<b>NOTES</b>		
<b>AFTER MARKET BOILER RESET CONTROLS</b>		\$225	* AFUE = Annual Fuel Utilization Efficiency, MBH levels are based on the unit's input.		
<b>STEAM TRAPS</b>		\$ 50	Equipment must meet program guidelines, rebates are given on a per-unit basis not to exceed purchase price		
<b>PROGRAMMABLE THERMOSTATS</b>		up to \$ 25	<i>Some restrictions may apply. Rebate offers are subject to change without notice.</i>		

A LIST OF QUALIFYING HEATING EQUIPMENT IS AVAILABLE AT [www.ahridirectory.org](http://www.ahridirectory.org) | 1-877-883-1759

# NATURAL GAS COMMERCIAL APPLICATION

## ACCOUNT HOLDER INFORMATION (Account Number must match Installation Address)

Form must be completed in its entirety.

BERKSHIRE GAS #

COLUMBIA GAS OF MASSACHUSETTS #

LIBERTY UTILITIES (MA only) #

NATIONAL GRID GAS (MA only) #  -  UTILITY REPRESENTATIVE NAME \_\_\_\_\_

NSTAR GAS #  UNITIL GAS (MA only) #  -

ACCOUNT HOLDER'S/COMPANY NAME \_\_\_\_\_

ACCOUNT HOLDER'S TAX ID# \_\_\_\_\_ COMPANY TYPE:  INCORPORATED  NOT INCORPORATED  EXEMPT

INSTALLED STREET ADDRESS \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

CONTACT PERSON \_\_\_\_\_ EMAIL \_\_\_\_\_ TELEPHONE \_\_\_\_\_

### BUILDING TYPE (SELECT ONE)

- |  |  |   |  |                                       |                                       |
|--|--|---|--|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> Assembly          | <input type="checkbox"/> Fast Food               | <input type="checkbox"/> Hotel                    | <input type="checkbox"/> Multi Story Retail    | <input type="checkbox"/> Religious    | <input type="checkbox"/> Small Retail |
| <input type="checkbox"/> Automobile        | <input type="checkbox"/> Full Service Restaurant | <input type="checkbox"/> Large Refrigerated Space | <input type="checkbox"/> Multifamily High Rise | <input type="checkbox"/> K-12 Schools | <input type="checkbox"/> University   |
| <input type="checkbox"/> Big Box           | <input type="checkbox"/> Grocery                 | <input type="checkbox"/> Large Office             | <input type="checkbox"/> Multifamily Low Rise  | <input type="checkbox"/> Small Office | <input type="checkbox"/> Warehouse    |
| <input type="checkbox"/> Community College | <input type="checkbox"/> Heavy Industrial        | <input type="checkbox"/> Light Industrial         | <input type="checkbox"/> Other _____           |                                       |                                       |
| <input type="checkbox"/> Dormitory         | <input type="checkbox"/> Hospital                | <input type="checkbox"/> Motel                    |  |                                       |                                       |

### PROJECT TYPE (SELECT ONE)

- Change in the use or Function of the Building Space
- New Building
- Expansion of an Existing Building
- Planned Replacement of Equipment
- New Equipment for New Process or Expanded Operation
- Renovation of Existing Building
- New Controls for Improved Operations
- Replacement of Failed Equipment
- Fuel Conversion

## ELECTRIC UTILITY INFORMATION (Required for an ECM Furnace Rebate Only)

NATIONAL GRID ELECTRIC (MA only) #  -  NSTAR ELECTRIC #

UNITIL ELECTRIC #  -

WESTERN MA ELECTRIC #

Municipal Electric Company

## PAYEE INFORMATION

Choose One  Account Holder  Lender  Vendor/Installer  Landlord

If payee information is different from account holder information and the gas utility provider is National Grid, additional processing time will be needed for payee verification.

PAYEE/COMPANY NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

CONTACT PERSON \_\_\_\_\_ EMAIL \_\_\_\_\_ TELEPHONE \_\_\_\_\_

## CONTRACTOR INFORMATION

Contractor Information is also required to be on the installation invoice.

CONTRACTOR NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_ CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

CONTACT PERSON \_\_\_\_\_ EMAIL \_\_\_\_\_ TELEPHONE \_\_\_\_\_

## ACCEPTANCE OF TERMS

I hereby request a rebate for the equipment listed. Attached are copies of all receipts or invoices. I have read and agree to the Terms and Conditions on the reverse of this form. I certify that a licensed contractor has installed the listed equipment (when applicable) in accordance with Program Guidelines and Terms and Conditions. I certify that I have seen the Energy Efficient Measures that have been installed and I am satisfied with their installation.

DATE \_\_\_\_\_ SIGNATURE X \_\_\_\_\_

GLE

The Customer must send a complete, signed rebate form along with copy of dated receipts and any other required information or documentation to the Program Administrator within sixty (60) days from installation date.

040109

# NATURAL GAS COMMERCIAL APPLICATION

To check on the status of your rebate please visit <https://www.smartenergy-zone.com/massave/TrackFourRebate.aspx>

THE SAME INFORMATION MUST ALSO BE INCLUDED ON YOUR INVOICE.

MEASURE INFORMATION - HEATING EQUIPMENT								
Type of Equipment	Date Installed	Manufacturer	Model Number	Rating (THERMAL EFFICIENCY AFUE OR ENERGY FACTOR)	MBH Input Size	Installed Cost	*Qty Installed	*Rebate Amount
ECM Furnace <i>Must fill out electric information on account holder page.</i>	/ /							
Condensing Unit Heater	/ /							
Infrared Heater	/ /							
Condensing Boiler	/ /							
Integrated Condensing Boiler/ Water Heater	/ /							
On-Demand Tankless Water Heater	/ /							
Indirect Water Heater	/ /							
Condensing Stand Alone Water Heater	/ /							
ENERGY STAR® Storage Water Heater	/ /							

\* PROJECTS THAT ARE EXPECTED TO EXCEED 10 OF THE SAME UNITS AND / OR \$25,000 IN REBATES WILL REQUIRE PRE-APPROVAL FROM YOUR GAS COMPANY.

ANTICIPATED TOTAL REBATE: \$

MEASURE INFORMATION - CONTROLS							
Type of Equipment	Date Installed	Manufacturer	Model Number	Size of Unit Controlled (BTU)	Installed Cost	*Qty Installed	Rebate Amount
After Market Boiler Reset Controls	/ /						
Steam Traps	/ /						

\* PROJECTS THAT ARE EXPECTED TO EXCEED 50 STEAM TRAPS WILL REQUIRE PRE-APPROVAL FROM YOUR GAS COMPANY.

ANTICIPATED TOTAL REBATE: \$

FOR THERMOSTAT REBATES, PLEASE ANSWER THE FOLLOWING QUESTIONS:

MEASURE INFORMATION - THERMOSTAT REBATES							
Type of Equipment	Installed Date	Manufacturer	Model Number	Does the Thermostat Control Air Conditioning?	Purchase/Installed Cost	*Qty Installed	Rebate Amount
Programmable Thermostat	/ /			<input type="checkbox"/> Yes <input type="checkbox"/> No			
Programmable Thermostat	/ /			<input type="checkbox"/> Yes <input type="checkbox"/> No			
Programmable Thermostat	/ /			<input type="checkbox"/> Yes <input type="checkbox"/> No			

ANTICIPATED TOTAL REBATE: \$

GLE

040109

## TERMS AND CONDITIONS

### 1. Definitions

- (a) "Program Administrator" means Berkshire Gas, Columbia Gas of Massachusetts, Liberty Utilities (MA only), National Grid Gas (MA only), NSTAR Gas, or Unitil (MA only), as applicable.
- (b) "Customers" are commercial natural gas customers in Massachusetts on a qualifying rate code.
- (c) "Rebate" means those payment(s) made by the Program Administrator to Customers pursuant to the Program and these Terms and Conditions.
- (d) "Program" means the energy efficiency program offered by the Program Administrator to Customers.
- (e) "EEMs" are those energy efficiency measures described in the Program Materials or other custom measures that may be approved, in writing, by the Program Administrator.
- (f) "Program Materials" means the documents and information provided by the Program Administrator specifying the qualifying EEMs, technology requirements, costs and other Program requirements.

### 2. Customer Eligibility

- (a) You must be an eligible Natural Gas Customer of a Program Administrator to participate and qualify for a Rebate.
- (b) Equipment purchases and installations made between January 1, 2014 and December 31, 2014 are eligible for Rebates.
- (c) Equipment must be installed by a licensed heating or plumbing contractor at the Customer's address listed on the rebate form.
- (d) The Customer must send a complete, signed rebate form along with original dated receipts and any other required information or documentation to the Program Administrator within sixty (60) days from installation date.

### 3. Installation Verification

The Program Administrator is not obligated to pay any Rebate until the Program Administrator has performed a satisfactory pre-installation inspection (unless the Program Materials state such pre-inspection is not required) and post-installation verification of the installation. The Program Administrator or its representatives, reserve the right to perform pre- and post- installation monitoring and inspection of the installed equipment for a three year period following the completion of the installation in order to determine the energy savings. If the Program Administrator determines that any EEMs were not installed in accordance with program requirements, the Program Administrator shall have the right to require modifications before having the obligation to make any Rebate payments. To the extent applicable, the Program Administrator may, at its sole discretion, withhold payment of any Rebate until Program Administrator verifies that the Customer has received, as appropriate, final drawings, operation and maintenance manuals, operator training, and the Program Administrator has received documentation detailing the installation of the EEMs in accordance with these Terms and Conditions and the Program Materials. The Customer shall provide access and information to the Program Administrator and reasonably cooperate in good faith with the Program Administrator regarding such activity. The Customer understands that the scope of the review by the Program Administrator does not include any kind of safety, code, or other compliance review or inspection. Maximum rebate amount cannot exceed purchase price.

### 4. No Warranties or Representations

- (a) TO THE FULLEST EXTENT ALLOWED BY LAW, THE PROGRAM ADMINISTRATOR DOES NOT ENDORSE, GUARANTEE, OR WARRANT ANY CONTRACTOR, MANUFACTURER OR PRODUCT, AND THE PROGRAM ADMINISTRATOR MAKES NO WARRANTIES OR GUARANTEES IN CONNECTION WITH ANY PROJECT, OR ANY SERVICES PERFORMED IN CONNECTION HERewith OR THEREwith, WHETHER STATUTORY, ORAL, WRITTEN, EXPRESS, OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THIS DISCLAIMER SHALL SURVIVE ANY CANCELLATION, COMPLETION, TERMINATION OR EXPIRATION OF THE CUSTOMER'S PARTICIPATION IN THE PROGRAM. CUSTOMER ACKNOWLEDGES AND AGREES THAT ANY WARRANTIES PROVIDED BY ORIGINAL MANUFACTURERS, LICENSORS, OR PROVIDERS OF MATERIAL, EQUIPMENT, OR OTHER ITEMS PROVIDED OR USED IN CONNECTION WITH THE PROGRAM UNDER THESE TERMS AND CONDITIONS, INCLUDING ITEMS INCORPORATED IN THE PROGRAM, ("THIRD PARTY WARRANTIES") ARE NOT TO BE CONSIDERED WARRANTIES OF THE PROGRAM ADMINISTRATOR AND THE PROGRAM ADMINISTRATOR MAKES NO REPRESENTATIONS, GUARANTEES, OR WARRANTIES AS TO THE APPLICABILITY OR ENFORCEABILITY OF ANY SUCH THIRD PARTY WARRANTIES. THE TERMS OF THIS SECTION SHALL GOVERN OVER ANY CONTRARY VERBAL STATEMENTS OR LANGUAGE APPEARING IN ANY PROGRAM ADMINISTRATOR'S OTHER DOCUMENTS.
- (b) Neither the Program Administrator nor any of its employees or contractors is responsible for determining that the design, engineering or installation of the EEMs is proper or complies with any particular laws, codes, or industry standards. The Program Administrator does not make any representations of any kind regarding the benefits or energy savings to be achieved by the EEMs or the adequacy or safety of the EEMs.
- (c) Customer acknowledges and agrees that it is solely responsible (directly-based on its own judgment or indirectly-based on the advice of its independent expert, not the Program Administrator) for all aspects of the EEMs and related work including, but not limited to: selecting the equipment; selecting contractors to perform the work; inspecting the work and the equipment; ensuring that the equipment is in good working order and condition; ensuring that the equipment is of the manufacture, design specifications, size and capacity selected by the Customer and that the same is properly installed and suitable for Customer's purposes; and determining if work was properly performed and meets Program requirements and applicable laws, regulations and codes.
- (d) Customer agrees and acknowledges that Program Administrator is not a manufacturer of, or regularly engaged in the sale or distribution of, or an expert with regard to, any equipment or work.
- (e) The provisions of this Section 4 shall survive the termination, cancellation or completion of the Customer's participation in the Program.

### 5. Changes to High-Efficiency Equipment Rebate Program

The Customer understands that the Program is subject to change by the Program Administrator, at its sole discretion, without prior notice to the Customer. The Customer further understands that Rebate offers may increase or decrease at any time.

### 6. Tax Liability

Participants in the Program may be subject to tax liability for the value of goods and services received through the Program pursuant to state or federal income tax codes. The Program Administrator and the rebate administrator are not responsible for any tax liability which may be imposed as a result of receipt of the Rebates provided by the Program Administrator to the Customer.



**TERMS AND CONDITIONS - continued****7. Indemnification**

The Customer shall indemnify, defend and hold harmless Program Administrator, its affiliates and their respective contractors, officers, directors, employees, agents, representatives from and against any and all claims, damages, losses and expenses, including reasonable attorneys' fees and costs incurred to enforce this indemnity, arising out of, resulting from, or related to the Program or the performance of any services or other work in connection with the Program ("Damages"), arising directly or indirectly out of or in connection with the installation or related services and material or caused or alleged to be caused in whole or in part by any actual or alleged act or omission of the Customer, any contractor, subcontractor, agent, third party, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable. The provisions of this Section 7 shall survive the termination, cancellation or completion of the Customer's participation in the Program.

**8. Limitation of Liability**

To the fullest extent allowed by law, the Program Administrator's liability shall be limited to paying approved Rebates in accordance with these Terms and Conditions and the Program Materials. The Program Administrator and its affiliates and their respective contractors, officers, directors, employees, agents, representatives shall have absolutely no liability to the Customer or any other party for any other obligation. In no event, whether as a result of breach of contract, tort (including negligence and strict liability), or any other theory of recovery shall the Program Administrator be liable in connection with this Agreement or the Program for any or all special, indirect, incidental, penal, punitive or consequential damages of any nature whether or not (i) such damages were reasonably foreseeable or (ii) the Program Administrator was advised or aware that such damages might be incurred. The provisions of this Section 8 shall survive the termination, cancellation or completion of the Customer's participation in the Program.

**9. Release**

To the fullest extent allowed by law and as part of the consideration for participation in the Program, the Customer waives and releases the Program Administrator and its affiliates from all obligations (other than payment of a Rebate(s)), and for any liability or claim associated with the EEMs, the performance of the EEMs, the Program and associated work or items, or these Terms and Conditions. The provisions of this Section 9 shall survive the termination, cancellation or completion of the Customer's participation in the Program.

**10. Rebate Amounts**

The Program Administrator shall provide Rebate(s) for approved equipment up to the rebate amount indicated in the Customer's application. Projects greater than ten (10) or more of the same units and/or \$25,000 in Rebates require pre-approval from the Program Administrator for rebate funds to be reserved.

**11. Monitoring and Inspection**

The Program Administrator or its representatives, reserve the right to perform pre- and post- installation monitoring and inspection of the installed equipment for a three year period following the completion of the installation in order to determine the energy savings. The Customer shall provide access and information to the Program Administrator and cooperate with the Program Administrator regarding such activity. The scope of the review by the Program Administrator does not include any kind of safety, code, or other compliance review or inspection. The provisions of this Section 11 shall survive the termination, cancellation or completion of the Customer's participation in the Program.

**12. Miscellaneous**

- (a) Paragraph headings are for the convenience of the parties only and are not to be construed as part of these Terms and Conditions.
- (b) If any provision of these Terms and Conditions is deemed invalid by any court or administrative body having jurisdiction, such ruling shall not invalidate any other provision, and the remaining provisions shall remain in full force and effect in accordance with their terms.
- (c) These Terms and Conditions shall be interpreted and enforced according to the laws of the Commonwealth of Massachusetts.
- (d) In the event of any conflict or inconsistency between these Terms and Conditions and any Program Materials, these Terms and Conditions shall be controlling.
- (e) Except as expressly provided herein, there shall be no modification or amendment to these Terms and Conditions or the Program Materials unless such modification or amendment is in writing and signed by a duly authorized officer of the Program Administrator.
- (f) The provisions of Sections 4, 6, 7, 8, 9 and 11 and any other provision that specifies by its terms that it survives termination, shall survive the termination or expiration of the Customer's participation in the Program.
- (g) Counterpart Execution; Scanned Copy. Any and all agreements and documents requiring signature related to the Program may be executed in several counterparts, each of which, when executed, shall be deemed to be an original, but all of which together shall constitute one and the same instrument. A scanned or electronically reproduced copy or image of such agreements and documents bearing the signatures of the parties shall be deemed an original and may be introduced or submitted in any action or proceeding as competent evidence of the execution, terms and existence of such agreements and documents notwithstanding the failure or inability to produce or tender an original, executed counterpart of the same and without the requirement that the unavailability of such original, executed counterpart of the same first be proven.

**13. Rebate Payment**

Pending approval, we will process and mail the rebate within 6-8 weeks of receipt of the property completed and signed application.

**14. Payments Assignable to a Third Party**

- (a) The Customer may request that the incentive be paid directly to a third party by so indicating in the Program Application. Notification of third party payment will be sent to the Customer ("Account Holder") upon submission of the Program Application for the purpose of customer confirmation.
- (b) If no payment choice is made, the Company will send the incentive payment directly to the Customer ("Account Holder") at the address indicated in the Program Application. If payee information is different from account holder information and the gas utility provider is National Grid, additional processing time will be needed for payee verification.

**15. Financing Option**

Pre-approved custom and prescriptive projects are eligible for 3rd party financing by a 3rd Party Lender. 1. Lender to qualify customer. 2. Invoicing monthly loan payment will be administered by 3rd Party Lender. 3. Interest rate on 3rd party loans is set at prime plus 100 basis points with a 6.25% minimum rate. 4. Scheduled interest payments on the loan will be pre-paid by the local utility or energy efficiency provider in lieu of a portion of the Mass Save Incentive or rebate. If rebate is not sufficient to pay the interest, customer must pay the additional amount indicated to the lender.



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