

## COMMERCIAL ENERGY EFFICIENCY EQUIPMENT AND MEASURE DATA

This appendix presents detailed information for all commercial energy-efficiency measures (*equipment* and *non-equipment* measures per the LoadMAP taxonomy) that were evaluated in this study.

Table C-1 and Table C-2 provide brief narrative descriptions for all equipment and non-equipment measures that were assessed for potential.

Table C-3 through Table C-42 list the detailed unit-level data (including economic screen results) for commercial equipment measures in existing and new buildings. The column headings and units are the same as described for the corresponding residential sector tables above.

Table C-43 through Table C-82 list the detailed unit-level data (including economic screen results) for commercial non-equipment measures in existing and new construction. The column headings and units are the same as described for the corresponding residential sector tables above.

**Table C-1 Commercial Energy Efficiency Equipment Measure Descriptions**

End Use	Technology	Measure Description
Cooling	Air-Cooled Chiller	A central chiller plant creates chilled water for distribution throughout the facility. Because of the wide variety of system types and sizes, savings and cost values for efficiency improvements represent an average over screw, reciprocating, and centrifugal technologies. Under this simplified approach, each central system is characterized by an aggregate efficiency value (inclusive of chiller, pumps, and motors), in kW/ton with a further efficiency upgrade through the application of variable refrigerant flow technology.
Cooling	Water-Cooled Chiller	A central chiller plant creates chilled water for distribution throughout the facility. Water source chillers include heat rejection via a condenser loop and cooling tower. Because of the wide variety of system types and sizes, savings and cost values for efficiency improvements represent an average over screw, reciprocating, and centrifugal technologies. Under this simplified approach, each central system is characterized by an aggregate efficiency value (inclusive of chiller, pumps, motors, and condenser loop equipment), in kW/ton with a further efficiency upgrade through the application of variable refrigerant flow technology.
Cooling	Roof Top AC	Packaged cooling systems, such as rooftop units (RTUs), are simple to install and maintain, and are commonly used in small and medium-sized commercial buildings. Applications range from a single supply system with air intake filters, supply fan, and cooling coil, or can become more complex with the addition of a return air duct, return air fan, and various controls to optimize performance. For packaged RTUs, varying Energy Efficiency Ratios (EER) are modeled, as well as a ductless mini-split system.
Cooling	Evaporative AC	An evaporative cooler (or swamp cooler) cools air through the evaporation of water. A significant amount of heat energy must be drawn from the air to drive the phase transition of liquid water to water vapor. Direct evaporative cooling passes supply air directly through a wetted media or area, thereby delivering air to a space that is both cooler and more humid. This technology is cheaper than conventional air conditioning, but is best suited for hot, dry climates. Indirect evaporative cooling passes outside air through a wetted media or area, but then uses a closed-loop heat exchanger to deliver a second stream of air that is cooler, but with unaffected humidity. Evaporative cooling technology must continually consume water to operate.
Cooling/ Heating	PTAC/PTHP	This measure includes efficiency upgrades to other small cooling systems in commercial buildings including room AC units, packaged terminal air conditioning (PTAC) units, and packaged terminal heat pumps (PTHP).
Cooling / Heating	Air-Source Heat Pump	For heat pumps, units with increasing EER and COP levels are evaluated, as well as a ductless mini-split system.
Cooling / Heating	Geothermal Heat Pump	For heat pumps, units with increasing EER and COP levels are evaluated.
Heating	Electric Furnace	Resistive heating elements are used to convert electricity directly to heat. The heat is then delivered by a supply fan and duct system to the regions that require heating.
Heating	Electric Room Heat	Resistive heating elements are used to convert electricity directly to heat. Conductive fins surrounding the element or another mechanism is used to deliver the heat directly to the surrounding room or area. These are typically either baseboard or wall-mounted units.
Ventilation	Ventilation	A variable air volume ventilation system modulates the air flow rate as needed based on the interior conditions of the building to reduce fan load, improve dehumidification, and reduce energy usage.
Water Heating	Water Heater	Efficient electric water heaters are characterized by a high recovery or thermal efficiency (percentage of delivered electric energy which is transferred to the water) and low standby losses (the ratio of heat lost per hour to the content of the stored water). Included in the savings associated with high-efficiency electric water heaters are timers that allow temperature setpoints to change

End Use	Technology	Measure Description
		<p>with hot water demand patterns. For example, the heating element could be shut off throughout the night, increasing the overall energy factor of the unit. In addition, tank and pipe insulation reduces standby losses and therefore reduces the demands on the water heater. This analysis considers conventional electric water heaters and heat pump water heaters.</p> <p>For natural gas hot water heating, the most common type is a storage heater, which incorporates a burner, storage tank, outer jacket, insulation, and controls in a single unit. Efficient units are characterized by a high recovery or thermal efficiency and low standby losses (the ratio of heat lost per hour to the content of the stored water). A further efficiency gain is available in condensing units, which condense the water vapor produced in the combustion process and also use the heat from this condensation.</p>
Interior Lighting	Screw-in	This measure evaluates higher-efficiency alternatives for screw-in interior lamps including halogen, CFL, and LED.
Interior Lighting	High-Bay Fixtures	With the exception of screw-in lighting, commercial lighting efficiency changes typically require more than the simple purchase and installation of an alternative lamp. Restrictions regarding ballasts, fixtures, and circuitry limit the potential for direct substitution of one lamp type for another. Also, during the buildout for a leased office space, management could decide to replace all lamps, ballasts, and fixtures with different configurations. This type of decision-making is modeled on a stock turnover basis because of the time between opportunities for upgrades. For High-Bay fixtures, alternatives include mercury vapor, metal halides, T5 fluorescent high output, and high-pressure sodium.
Interior Lighting	Linear Fluorescent	With the exception of screw-in lighting, commercial lighting efficiency changes typically require more than the simple purchase and installation of an alternative lamp restriction regarding ballasts, fixtures, and circuitry limit the potential for direct substitution of one lamp type for another. Also, during the buildout for a leased office space, management could decide to replace all lamps, ballasts, and fixtures with different configurations. This type of decision-making is modeled on a stock turnover basis because of the time between opportunities for upgrades. For linear fluorescent fixtures, alternatives include T12, T8, Super T8, T5, and LED.
Exterior Lighting	Screw-in	This measure evaluates higher-efficiency alternatives for screw-in interior lamps including halogen, CFL, and LED.
Exterior Lighting	HID	Alternatives modeled include metal halides, T8 and T5 high output, high pressure sodium, and LEDs
Exterior Lighting	Linear Fluorescent	For linear fluorescent fixtures, alternatives include T12, T8, Super T8, T5, and LED.
Refrigeration	Walk-in Refrigerator	These refrigerators can be designed to perform at higher efficiency through a combination of compressor equipment upgrades, default temperature settings, and defrost patterns. Standard refrigeration compressors typically operate at approximately 65% efficiency. High-efficiency models are available that can improve compressor efficiency by 15%. Analysis assumes unit with: 140 square feet, Cooling capacity of 26,230 BTU/hr.
Refrigeration	Reach-in Refrigerator	A significant amount of energy in the commercial sector can be attributed to "reach-in" units. These stand-alone appliances can range from a residential-style refrigerator/freezer unit in an office kitchen or the breakroom of a retail store, to the larger reach-in units in foodservice applications. As in the case of residential units, these refrigerators can be designed to perform at higher efficiency through a combination of compressor equipment upgrades, default temperature settings, and defrost patterns. Analysis assumes unit with: 48 cubic feet, Cooling capacity of 3000 BTU/hr.
Refrigeration	Glass Door Display, Open Display Case	These refrigerators can be designed to perform at higher efficiency through a combination of compressor equipment upgrades, default temperature settings, and defrost patterns. Standard refrigeration compressors typically operate at approximately 65% efficiency. High-efficiency models are available that can improve compressor efficiency by 15%. Analysis assumes unit with: Cooling

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Measure Description
		capacity of 20,000 BTU/hr
Refrigeration	Icemaker	By optimizing the timing of ice production and the type of output to the specific application, icemakers are assumed to deliver electricity savings.
Refrigeration	Vending Machine	High-efficiency vending machines incorporate more efficient compressors and lighting.
Food Preparation	Ovens, Fryers, Hot Food Containers, Dishwashers	This set of measures includes high-efficiency fryers, ovens, dishwashers, and hot food containers. Less common equipment, such as broilers and steamers, and assumed to be modeled with the other more common equipment types.
Office Equipment	Desktop Computer, Laptop, Monitors	ENERGY STAR labeled computers automatically power down to 15 watts or less when not in use and may actually last longer than conventional products because they spend a large portion of time in a low-power sleep mode. ENERGY STAR labeled computers also generate less heat than conventional models.
Office Equipment	Server	In addition to the "sleep" mode a reductions, servers have additional energy-saving opportunities through "virtualization" and other architecture solutions that involve optimal matching of computation tasks to hardware requirements
Office Equipment	Printer/Copier/Fax	ENERGY STAR labeled office equipment saves energy by powering down and "going to sleep" when not in use. ENERGY STAR labeled copiers are equipped with a feature that allows them to automatically turn off after a period of inactivity.
Office Equipment	POS Terminal	Point-of-sale terminals in retail and supermarket facilities are always on. Efficient models incorporate a high-efficiency power supply to reduce energy use.
Miscellaneous	Non-HVAC Motors	Includes motors for a variety of non-HVAC uses including vertical transportation. Premium efficiency motors can provide savings of 0.5% to 3% over standard motors. The savings results from the fact that energy efficient motors run cooler than their standard counterparts, resulting in an increase in the life of the motor insulation and bearing. In general, an efficient motor is a more reliable motor because there are fewer winding failures, longer periods between needed maintenance, and fewer forced outages. For example, using copper instead of aluminum in the windings, and increasing conductor cross-sectional area, lowers a motor's I2R losses.
Miscellaneous	Pool Pump	High-efficiency motors and two-speed pumps provide improved energy efficiency for this load.
Miscellaneous	Pool Heater	Efficient pool heaters can make use of heat pump technology to achieve significantly higher coefficients of performance in the COP=5.0 range. Gas pool heaters have a burner to heat water in a loop. Efficiency improvements can include: exhaust fan controls, electronic ignition (no pilot light), compact size and lighter weight to reduce cycling losses, and sealed combustion. Very high efficiency units, or condensing units, condense the water vapor produced in the combustion process and also use the heat from this condensation.
Miscellaneous	Miscellaneous	Improvement of miscellaneous electricity uses
Heating	Boiler	To qualify for this measure the installed equipment must be replacement of an irreparable existing boiler with a high efficiency, gas-fired steam or hot water boiler. High efficiency boilers achieve gas savings through the utilization of a sealed combustion chamber and multiple heat exchangers that remove a significant portion of the waste heat from flue gasses. Because multiple heat exchangers are used to remove waste heat from the escaping flue gasses, some of the flue gasses condense and must be drained. To qualify for this measure the installed equipment must be a boiler used 80% or more for space heating, not process, and Boiler AFUE rating must be rated greater than or equal to 85%.
Heating	Furnace	This measure covers the installation of a high efficiency gas furnace in lieu of a standard efficiency gas furnace. High efficiency gas furnaces achieve

End Use	Technology	Measure Description
		<p>savings through the utilization of a sealed, super insulated combustion chamber, more efficient burners, and multiple heat exchangers that remove a significant portion of the waste heat from the flue gasses. Because multiple heat exchangers are used to remove waste heat from the escaping flue gasses, most of the flue gasses condense and must be drained. Furnaces equipped with ECM fan motors can save additional electric energy. To qualify for this measure the installed equipment must be a natural gas fired furnace with a minimum Annual Fuel Utilization Efficiency (AFUE) rating of 92% and input rating of less than 300,000 Btu/hr.</p>
Heating	Unit Heater	<p>In order for this characterization to apply, the efficient equipment is assumed to be a condensing unit heater up to 300 MBH with a Thermal Efficiency &gt; 90% and the heater must be vented, and condensate drained per manufacturer specifications. The unit must be replacing existing natural gas equipment. In order for this characterization to apply, the baseline condition is assumed to be a non-condensing natural gas unit heater.</p>
Food Preparation	Broiler, Griddle, Range, Steamer	<p>This set of measures includes high-efficiency cooking equipment, with improved design, additional insulation, tighter-fitting door gaskets and hinges, and electronic ignition (no pilot light) where applicable.</p>
Water Heating	Water Heater	<p>This measure applies to installing a 67% EF gas-fired water heaters in a non-residential application that already had a gas fired water heater. Primary applications would include (but not limited to) hotels/motels, small commercial spaces, offices and restaurants. In order for this characterization to apply, the efficient equipment is assumed to be gas-fired storage water heaters with 0.67 EF installed in a non-residential application.</p>

**Table C-2 Commercial Energy Efficiency Non-Equipment Measure Descriptions**

End Use	Measure	Description
HVAC (All)	Insulation - Ceiling	Thermal insulation is material or combinations of materials that are used to inhibit the flow of heat energy by conductive, convective, and radiative transfer modes. Thus, thermal insulation can conserve energy by reducing the heat loss or gain of a building. The type of building construction defines insulating possibilities. Typical insulating materials include: loose-fill (blown) cellulose; loose-fill (blown) fiberglass; and rigid polystyrene.
HVAC (All)	Insulation - Ducting	Air distribution ducts can be insulated to reduce heating or cooling losses. Best results can be achieved by covering the entire surface area with insulation. Insulation material inhibits the transfer of heat through the air-supply duct. Several types of ducts and duct insulation are available, including flexible duct, pre-insulated duct, duct board, duct wrap, tacked, or glued rigid insulation, and waterproof hard shell materials for exterior ducts.
HVAC (All)	Insulation - Radiant Barrier	Radiant barriers are materials installed to reduce the heat gain in buildings. Radiant barriers are made from materials that are highly reflective and have low emissivity like aluminum. The closer the emissivity is to 0 the better they will perform. Radiant barriers can be placed above the insulation or on the roof rafters.
HVAC (All)	Insulation-Foundation	Below Grade Insulation to R6
HVAC (All)	Insulation - Wall Cavity	Thermal insulation is material or combinations of materials that are used to inhibit the flow of heat energy by conductive, convective, and radiative transfer modes. Thus, thermal insulation can conserve energy by reducing the heat loss or gain of a building. The type of building construction defines insulating possibilities. Typical insulating materials include: loose-fill (blown) cellulose; loose-fill (blown) fiberglass; and rigid polystyrene.
HVAC (All)	HVAC - Duct Repair and Sealing	Leakage in unsealed ducts varies considerably because of the differences in fabricating machinery used, the methods for assembly, installation workmanship, and age of the ductwork. Air leaks from the system to the outdoors result in a direct loss proportional to the amount of leakage and the difference in enthalpy between the outdoor air and the conditioned air. To seal ducts, a wide variety of sealing methods and products exist. Each has a relatively short shelf life, and no documented research has identified the aging characteristics of sealant applications.
HVAC (All)	Doors - High Efficiency	Like other components of the shell, doors are subject to several types of heat loss: conduction, infiltration, and radiant losses. High efficiency doors have exceptional thermal insulation properties and tight-fitting, weather-stripping on the doorframe to reduce air leakage.
HVAC (All)	Windows - High Efficiency	High-efficiency windows, such as those labeled under the ENERGY STAR Program, are designed to reduce a building's energy bill while increasing comfort for the occupants at the same time. High-efficiency windows have reducing properties that reduce the amount of heat transfer through the glazing surface. For example, some windows have a low-E coating, which is a thin film of metallic oxide coating on the glass surface that allows passage of short-wave solar energy through glass and prevents long-wave energy from escaping. Another example is double-pane glass that reduces conductive and convective heat transfer. There are also double-pane glasses that are gas-filled (usually argon) to further increase the insulating properties of the window.
HVAC (All)	Roof - High Reflectivity	The color and material of a building structure surface will determine the amount of solar radiation absorbed by that surface and subsequently transferred into a building. This is called solar absorptance. By using a living roof or a roofing material with a light color (and a lower solar absorptance), the roof will absorb less solar radiation and consequently reduce the cooling load. Living roofs also reduce stormwater runoff.
Cooling	Air-Cooled Chiller -	Resetting the condenser water temperature to the lowest possible setting

End Use	Measure	Description
	Condenser Water Temperature Reset	allows the cooling tower to generate cooler water whenever possible and decreases the temperature lift between the condenser and the evaporator. This will generally increase chiller part-load efficiency, though it may require increased tower fan energy use.
Cooling	Air-Cooled Chiller - Economizer	Economizers allow outside air (when it is cool and dry enough) to be brought into the building space to meet cooling loads instead of using mechanically cooled interior air. A dual enthalpy economizer consists of indoor and outdoor temperature and humidity sensors, dampers, motors, and motor controls. Economizers are most applicable to temperate climates and savings will be smaller in extremely hot or humid areas.
Cooling	Air-Cooled Chiller - VSD on Fans	Variable speed drives, which reduce chiller energy use under part load, are modeled for both air-cooled and water-cooled chillers.
Cooling	Air-Cooled Chiller - Chilled Water Reset	Chilled water reset controls save energy by improving chiller performance through increasing the supply chilled water temperature, which allows increased suction pressure during low load periods. Raising the chilled water temperature also reduces chilled water piping losses. However, the primary savings from the chilled water reset measure results from chiller efficiency improvement. This is due partly to the smaller temperature difference between chilled water and ambient air, and partly due to the sensitivity of chiller performance to suction temperature.
Cooling	Air-Cooled Chiller - Chilled Water Variable-Flow System	The part-load efficiency of chilled water loops can be improved substantially by varying the flow speed of the delivered water with the building demand for cooling.
Cooling	Air-Cooled Chiller - High Efficiency Cooling Tower Fans	High-efficiency cooling fans utilize efficient components and variable frequency drives that improve fan performance by adjusting fan speed and rotation as conditions change.
Cooling	Air-Cooled Chiller - Maintenance	Filters, coils, and fins require regular cleaning and maintenance for the heat pump or roof top unit to function effectively and efficiently throughout its years of service. Neglecting necessary maintenance leads to a steady decline in performance while energy use increases.
Water- Cooled Chiller	Water Cooled Chiller Condenser Water Temperature Reset	Resetting the condenser water temperature to the lowest possible setting allows the cooling tower to generate cooler water whenever possible and decreases the temperature lift between the condenser and the evaporator. This will generally increase chiller part-load efficiency, though it may require increased tower fan energy use.
Water- Cooled Chiller	Water Cooled Chiller Economizer	Economizers allow outside air (when it is cool and dry enough) to be brought into the building space to meet cooling loads instead of using mechanically cooled interior air. A dual enthalpy economizer consists of indoor and outdoor temperature and humidity sensors, dampers, motors, and motor controls. Economizers are most applicable to temperate climates and savings will be smaller in extremely hot or humid areas.
Water- Cooled Chiller	Water-Cooled Chiller VSD on Fans	Variable speed drives, which reduce chiller energy use under part load, are modeled for both air-cooled and water-cooled chillers.
Water- Cooled Chiller	Water-Cooled Chiller-Chiller Water reset	Chilled water reset controls save energy by improving chiller performance through increasing the supply chilled water temperature, which allows increased suction pressure during low load periods. Raising the chilled water temperature also reduces chilled water piping losses. However, the primary savings from the chilled water reset measure results from chiller efficiency improvement. This is due partly to the smaller temperature difference between chilled water and ambient air, and partly due to the sensitivity of chiller performance to suction temperature.
Water- Cooled Chiller	Water- Cooled Chiller Variable Flow System	The part-load efficiency of chilled water loops can be improved substantially by varying the flow speed of the delivered water with the building demand for cooling.
Water- Cooled	Water-Cooled Chiller	High-efficiency cooling fans utilize efficient components and variable

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Measure	Description
Chiller Water Cooled Chiller	High Efficiency Cooling Tower Fans	frequency drives that improve fan performance by adjusting fan speed and rotation as conditions change.
Water- Cooled Chiller	Water-Cooled Chiller Maintenance	Filters, coils, and fins require regular cleaning and maintenance for the heat pump or roof top unit to function effectively and efficiently throughout its years of service. Neglecting necessary maintenance leads to a steady decline in performance while energy use increases.
Cooling	RTU - Evaporative Precooler	Evaporative precooling can improve the performance of air conditioning systems, most commonly RTUs. These systems typically use indirect evaporative cooling as a first stage to pre-cool outside air. If the evaporative system cannot meet the full cooling load, the air stream is further cooled with conventional refrigerative air conditioning technology.
Cooling	RTU - Maintenance	Regular cleaning and maintenance enables a roof top unit to function effectively and efficiently throughout its years of service. Neglecting necessary maintenance leads to a steady decline in performance while energy use increases. Maintenance can increase the efficiency of poorly performing equipment by as much as 10%.
Heating	Gas Boiler –High Efficiency Hot Water Circulation	Efficiency improvements to the circulation system of a boiler's hot water loop.
Heating	Gas Boiler- Hot Water Reset	This measure relates to improving combustion efficiency by adding controls to non-residential building heating boilers to vary the boiler water supply temperature relative to heating load as a function of the outdoor air temperature to save energy. Energy is saved by increasing the temperature difference between the supply water temperature in the boiler's heat exchanger and the boiler's burner flame temperature. The flame temperature remains the same while the heating supply water temperature decreases with the decrease in heating load due to an increase in outside air temperature. A lockout temperature is also set to prevent the boiler from turning on when it is above a certain temperature outdoors.
Heating	Gas Boiler - Maintenance	Regular cleaning and maintenance enables a natural gas boiler to function effectively and efficiently throughout its years of service. Neglecting necessary maintenance leads to a steady decline in performance while energy use increases. Maintenance can increase the efficiency of poorly performing equipment by as much as 10%.
Heating	Gas Furnace-Maintenance	Regular cleaning and maintenance enables a natural gas furnace to function effectively and efficiently throughout its years of service. Neglecting necessary maintenance leads to a steady decline in performance while energy use increases. Maintenance can increase the efficiency of poorly performing equipment by as much as 10%.
Heating	Space Heating - Heat Recovery Ventilator	Heat recovery ventilation uses a counter-flow, air-to-air heat exchanger between inbound and outbound air flow to selectively transfer heat and reduce space heating loads.
Heating	Boiler O2 Trim Controls	An electronic sensor inserted into the boiler flue, connected to a control panel to measure oxygen and transmit signals to a control damper on the burner air supply
Heating	Insulate Steam Lines/Condensate Tank	Insulation to prevent heat loss from steam lines
Heating	Repair Malfunctioning Steam Traps	Under normal operating conditions, the valve and seat area is subjected to hot high-pressure water flow. Water is corrosive and causes surface erosion. With no maintenance, eventually the valve will fail to close properly and the trap will fail to seal and will waste steam.
Heating	Boiler Blow Down Heat Exchanger (steam)	Recovery of heat from the periodic/continuous flow of outlet waste water (to prevent sludge buildup) to preheat make-up water

End Use	Measure	Description
Heating	Boiler Parallel Positioning Control	Modern electronic parallel positioning controls (PPC) incorporate end-device positioning signals to ensure accurate placement of fuel and air positioners for specific firing rates
Cooling / Heating	Heat Pump - Maintenance	Regular cleaning and maintenance enables a heat pump to function effectively and efficiently throughout its years of service. Neglecting necessary maintenance leads to a steady decline in performance while energy use increases. Maintenance can increase the efficiency of poorly performing equipment by as much as 10%.
Ventilation	Ventilation - ECM on VAV Boxes	ECM motors are well suited to the variable flow rates of VAV boxes. ECMs are a higher efficiency option for the air blowers and maintain efficiency better over a wide range of loads.
Ventilation	Ventilation - Variable Speed Control	Variable speed controls adjust ventilation fans for part-load conditions to reduce energy use.
Ventilation	Ventilation- CO2 Controlled	Carbon dioxide (CO2) levels indicate the level of occupancy in a space. This measure uses sensors to monitor CO2 levels and controls on the air handling system to adjust the amount of outside air accordingly. Ventilation rates are thereby controlled based on occupancy, rather than a fixed rate, thus saving HVAC energy use.
Water Heating	Water Heater - Drainwater Heat Recovery	Drainwater Heat Recovery is a system in which drain water is used to preheat cold water entering the water heater. While these systems themselves are relatively inexpensive, upgrading an existing system could be unreasonable because of demolition costs. Thus they are modeled for new vintage only.
Water Heating	Water Heater - Faucet Aerators/Low Flow Nozzles	A faucet aerator or low flow nozzle spreads the stream from a faucet helping to reduce water usage. The amount of water passing through the aerator is measured in gallons per minute (GPM) and the lower the GPM the more water the aerator conserves.
Water Heating	Water Heater - High Efficiency Circulation Pump	A high efficiency circulation pump uses an electronically commutated motor (ECM) to improve motor efficiency over a larger range of partial loads. In addition, an ECM allows for improved low RPM performance with greater torque and smaller pump dimensions.
Water Heating	Water Heater - Desuperheater	A desuperheater can be added to an existing geothermal heat pump system (typically installed with the primary function of space heating and cooling) in order to draw off a portion of the geothermal heat for water heating purposes. The system can either supplement the building's water heater, or be a full-demand water heater that meets all of the building's hot water needs.
Water Heating	Water Heater - Solar System	Solar water heating systems can be used in residential buildings that have an appropriate near-south-facing roof or nearby unshaded grounds for installing a collector. Although system types vary, in general these systems use a solar absorber surface within a solar collector or an actual storage tank. Either a heat-transfer fluid or the actual potable water flows through tubes attached to the absorber and transfers heat from it. (Systems with a separate heat-transfer-fluid loop include a heat exchanger that then heats the potable water.) The heated water is stored in a separate preheat tank or a conventional water heater tank. If additional heat is needed, it is provided by a conventional water-heating system.
Water Heating	Water Heater - Install Timer	These measures use either a programmable thermostat or a timer to adjust the water heater setpoint at times of low usage, typically when a home is unoccupied.
Water Heating	Water Heater - Pipe Insulation	Insulating hot water pipes decreases the amount of energy lost during distribution of hot water throughout the building. Insulating pipes will result in quicker delivery of hot water and allows lowering the water heating set point. There are several different types of insulation, the most common being polyethylene and neoprene.
Water Heating	Water Heater - Tank Blanket/Insulation	Insulation levels on hot water heaters can be increased by installing a fiberglass blanket on the outside of the tank. This increase in insulation

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Measure	Description
		reduces standby losses and thus saves energy. Water heater insulation is available either by the blanket or by square foot of fiberglass insulation with R-values ranging from 5 to 14.
Water Heating	Water Heater- Pre-Rinse Spray Valve	Pre-rinse valves use a spray of water to remove food waste from dishes prior to cleaning in a dishwasher. More efficient spray valves use less water thereby reducing water consumption, water heating cost, and waste water (sewer) charges. Pre-rinse spray valves include a nozzle, squeeze lever, and dish guard bumper. The primary impacts of this measure are water savings. Reduced hot water consumption saves either natural gas or electricity, depending on the type of energy the hot water heater uses. This measure applies to time of sale, retrofit and direct install and appropriate lookup tables are included to support these delivery methods.
Water Heating	Combines Boiler & Water Heating Unit	This measure applies to natural gas boilers that supply hot water for space heat and domestic hot water through on-demand supply. In order for this characterization to apply, the efficient equipment must be a condensing boiler for space heating with on-demand domestic hot water and a AFUE great than or equal to 90%. It is assumed to be installed in a non-residential space and replace existing natural gas equipment used for the same purpose.
Water Heating	Water Heater-Booster Water Heater	Gas booster heaters are used to supply sanitizing water to a dishwashing machine.
Interior Lighting	Interior Lighting - Daylighting Controls	Daylighting controls use a photosensor to detect ambient light and adjust or turn off electric lights accordingly.
Interior Lighting	Interior Lighting - LED Exit Lighting	The lamps inside exit signs represent a significant energy end-use, since they usually operate 24 hours per day. Many old exit signs use incandescent lamps, which consume approximately 40 watts per sign. The incandescent lamps can be replaced with LED lamps that are specially designed for this specific purpose. In comparison, the LED lamps consume approximately 2-5 watts.
Interior Lighting	Interior Lighting - Occupancy Sensors	The installation of occupancy sensors allows lights to be turned off during periods when a space is unoccupied, virtually eliminating the wasted energy due to lights being left on. There are several types of occupancy sensors in the market.
Interior Lighting	Interior Lighting - Timeclocks and Timers	In many cases lighting remains on at night and during weekends. A simple timer can set a schedule for turning lights off to reduce operating hours.
Interior Lighting	Interior Lighting - Task Lighting	Individual work areas can use task lighting instead of brightly lighting the entire area. Significant energy savings can be realized by focusing light directly where it is needed and lowering the general lighting level. An example of task lighting is the common desk lamp. A 25W desk lamp can be installed in place of a typical lamp in a fixture.
Interior Lighting	Interior Fluorescent - Bi-Level Fixture	Bi-level fixtures have the ability to reduce light output to a lower level, given a control strategy that is based on a timer, occupancy sensor, motion sensor, or manual switch.
Interior Lighting	Interior Fluorescent - Delamp and Install Reflectors	While sometimes included in lighting retrofit projects, delamping is often performed as a separate energy efficiency measure in which a lighting engineer analyzes the lighting provided by current systems compared to the requirements of building occupants. This often leads to the removal of unnecessary lamps corresponding to an overall reduction in energy usage. In addition, installing a reflector in each fixture can improve light distribution from the remaining lamps.
Exterior Lighting	Exterior Lighting - Bi-Level Fixture	Bi-level fixtures have the ability to reduce light output to a lower level, given a control strategy that is based on a timer, occupancy sensor, motion sensor, or manual switch.
Exterior Lighting	Exterior Lighting - Daylighting Controls	Daylighting controls use a photosensor to detect ambient light and adjust or turn off electric lights accordingly.

End Use	Measure	Description
Exterior Lighting	Exterior Lighting - Photovoltaic Installation	Solar photovoltaic generation may be used to power exterior lighting and thus eliminate all or part of the electrical energy use.
Refrigeration	Refrigerator - Anti-Sweat Heater	Anti-sweat heaters are used in virtually all low-temperature display cases and many medium-temperature cases to control humidity and prevent the condensation of water vapor on the sides and doors and on the products contained in the cases. Typically, these heaters stay on all the time, even though they only need to be on about half the time. Anti-sweat heater controls can come in the form of humidity sensors or time clocks.
Refrigeration	Refrigerator- Auto Door Closer	Anti-sweat heaters are used in virtually all low-temperature display cases and many medium-temperature cases to control humidity and prevent the condensation of water vapor on the sides and doors and on the products contained in the cases. Typically, these heaters stay on all the time, even though they only need to be on about half the time. Anti-sweat heater controls can come in the form of humidity sensors or time clocks.
Refrigeration	Refrigerator - Decommissioning	Early retirement, removal, and recycling or older, little used refrigerators and freezers removes the energy use of these inefficient, aging units.
Refrigeration	Refrigerator - Demand Defrost	Units can be designed to perform at higher efficiency with a sensing and control system that runs defrost cycles based on demand/only when necessary.
Refrigeration	Refrigerator - Door Gasket Replacement	This measure involves replacing aging door gaskets that no longer adequately seal reach-in refrigerators or glass door display cases.
Refrigeration	Refrigerator- Economizer	Economizers save energy in walk-in coolers by bringing in outside air when it is sufficiently cool, rather than operating the compressor. In addition there is a control installed to cycle evaporator fans on and off as opposed to constantly running while economizer is running. In order for this characterization to apply, the efficient equipment is assumed to be a walk-in cooler with a refrigeration economizer
Refrigeration	Refrigerator - Evaporator Fan Controls	Evaporator fan motor controls allow for part load use or demand scheduling based on variable refrigeration load requirements, reducing energy consumption.
Refrigeration	Refrigeration- High Efficiency Evaporator Fan Motors	Electronically commutated motors (ECM) operate at variable speeds.
Refrigeration	Refrigerator - Floating Head Pressure	Floating head pressure control allows the pressure in the condenser to "float" with ambient temperatures. This method reduces refrigeration compression ratios, improves system efficiency and extends the compressor life. The greatest savings with a floating head pressure approach occurs when the ambient temperatures are low, such as in the winter season. Floating head pressure control is most practical for new installations. However, retrofits installation can be completed with some existing refrigeration systems. Installing floating head pressure control increases the capacity of the compressor when temperatures are low, which may lead to short cycling.
Refrigeration	Refrigerator - Strip Curtain	Strip curtains at the entrances to large walk-in coolers or freezers, such as those used in supermarkets; reduce air transfer between the refrigerated space and the surrounding space.
Refrigeration	Refrigerator - High Efficiency Compressor	Standard compressors typically operate at approximately 65% efficiency. High-efficiency models are available that can improve compressor efficiency by 15%.
Refrigeration	Refrigerator - Variable Speed Compressor	The part-load efficiency of drive systems can be improved by varying the speed of the motor drive. An additional benefit of variable-speed controls is the ability to start and stop the motor and process gradually, thus extending the life of the motor and associated machinery.
Refrigeration	Vending Machine- Controller	Cold beverage vending machines usually operate 24 hours a day regardless of whether the surrounding area is occupied or not. The result is that the

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Measure	Description
		vending machine consumes energy unnecessarily, because it will operate all night to keep the beverage cold even when there would be no customers until the next morning. A vending machine controller can reduce energy consumption without compromising the temperature of the vended product. The controller uses an infrared sensor to monitor the surrounding area's occupancy and will power down the vending machine when the area is unoccupied. It will also monitor the room's temperature and will re-power the machine at one to three hour intervals independent of occupancy to ensure that the product stays cold.
Refrigeration	Refrigerator - eCube	The eCube consists of a solid, waxy food simulant that is fitted around a thermostat sensor that would otherwise measure air temperature. The refrigeration controls therefore attempt to regulate the temperature of food, which changes more slowly and gradually than air, thereby reducing the frequency of refrigeration cycles.
Refrigeration	Vending Machine - Controller	Cold beverage vending machines usually operate 24 hours a day regardless of whether the surrounding area is occupied or not. The result is that the vending machine consumes energy unnecessarily, because it will operate all night to keep the beverage cold even when there would be no customers until the next morning. A vending machine controller can reduce energy consumption without compromising the temperature of the vended product. The controller uses an infrared sensor to monitor the surrounding area's occupancy and will power down the vending machine when the area is unoccupied. It will also monitor the room's temperature and will re-power the machine at one to three hour intervals independent of occupancy to ensure that the product stays cold.
Refrigeration	Grocery- Display Case- LED Lighting	High-efficiency LED display case lighting not only reduces direct lighting energy use, but also reduce internal heat gains to the case from lights that must be removed by the refrigeration system.
Refrigeration	Grocery- Display Case Motion Sensors	Motion sensors reduce lighting load when area around display case is unoccupied to save energy on lighting.
Refrigeration	Grocery- ECM's for Display Cases	Replacement of shaded-pole evaporator fan motors with ECM motors in display cases allows for variable refrigeration loads to be handled. Reductions come from increased motor efficiency and the reduction of heating load.
Refrigeration	Grocery- Open Display Case- Night Covers	Night covers can be used on open refrigeration cases when a facility is closed or few customers are in the store.
Refrigeration	Refrigerator- eCube	The eCube consists of a food simulant that mimics food temperature. The thermostat regulates refrigeration temperature based upon the food temperature and not the air temperature. It is fitted to the thermostat sensor, which controls the compressor, thereby reducing the frequency of refrigeration cycles.
Food Preparation	Cooking Exhaust Hoods with Sensor Control	Improved exhaust hoods involve installing variable-speed controls on commercial kitchen hoods. These controls provide ventilation based on actual cooking loads. When grills, broilers, stoves, fryers or other kitchen appliances are not being used, the controls automatically sense the reduced load and decrease the fan speed accordingly. This results in lower energy consumption because the system is only running as needed rather than at 100% capacity at all times.
Office Equipment	Office Equipment - ENERGY STAR Power Supplies	Power supplies with an efficient ac-dc or ac-ac conversion process can obtain the ENERGY STAR label. These devices can be used to power computers, phones, and other office equipment.
Office Equipment	Office Equipment - Plug Load Occupancy Sensors	Occupancy sensors can control power strips and thus turn off energy used by plug loads, such as task lights, when an office is unoccupied.
HVAC (All)	Energy Management System	An energy management system (EMS) allows managers/owners to monitor and control the major energy-consuming systems within a commercial

End Use	Measure	Description
		building. At the minimum, the EMS can be used to monitor and record energy consumption of the different end-uses in a building, and can control operation schedules of the HVAC and lighting systems. The monitoring function helps building managers/owners to identify systems that are operating inefficiently so that actions can be taken to correct the problem. The EMS can also provide preventive maintenance scheduling that will reduce the cost of operations and maintenance in the long run. The control functionality of the EMS allows the building manager/owner to operate building systems from one central location. The operation schedules set via the EMS help to prevent building systems from operating during unwanted or unoccupied periods. This analysis assumes that this measure is limited to buildings with a central HVAC system.
HVAC (All)	Thermostat - Clock/Programmable	A programmable thermostat can be added to most heating/cooling systems. They are typically used during winter to lower temperatures at night and in summer to increase temperatures during the afternoon. There are two-setting models, and well as models that allow separate programming for each day of the week. The energy savings from this type of thermostat are identical to those of a "setback" strategy with standard thermostats, but the convenience of a programmable thermostat makes it a much more attractive option. In this analysis, the baseline is assumed to have no thermostat setback.
Miscellaneous	Lodging- Guest Room Controls	Hotel guestrooms can be fitted with occupancy controls that turn off energy-using equipment when the guest is not using the room. The occupancy controls comes in several forms, but this analysis assumes the simplest kind, which is a simple switch near the room's entry where the guest can deposit their room key or card. If the key or card is present, then lights, TV, and air conditioning can receive power and operate. When the guest leaves and takes the key, all equipment shuts off.
HVAC, Lighting	HVAC - Occupancy Sensors	Occupancy sensors turn off or adjust HVAC settings when a space is unoccupied.
HVAC, Lighting	Commissioning - HVAC, Lighting	For new construction and major renovations, commissioning ensures that building systems are properly designed, specified, and installed to meet the design intent and provide high-efficiency performance. Commissioning begins during the design process.
HVAC, Lighting	Retrocommissioning - HVAC, Lighting	In existing buildings, the retrocommissioning process identifies low-cost or no cost measures, including controls adjustments, to improve building performance and reduce operating costs. Retrocommissioning addresses HVAC, lighting, DHW, and other major building systems.
HVAC (All)	Advanced New Construction Designs	Advanced new construction designs use an integrated approach to the design of new buildings to account for the interaction of building systems. Designs may specify the building orientation, building shell, proper sizing of equipment and systems, and controls strategies with the goal of optimizing building energy efficiency and comfort. Options that may be evaluated and incorporated include passive solar strategies, increased thermal mass, natural ventilation, energy recovery ventilation, daylighting strategies, and shading strategies. This measure is modeled for new vintage only.
HVAC, Lighting	Custom Measures	Custom measures may be included in the analysis to serve as a "catch all" for measures for which costs and savings are not easily quantified and that could be part of a custom program. Typical costs and energy savings are assumed such that the measures pass the economic screen.
Electronics	Electronics- Smart Power Strip	This measure relates to Controlled Power Strips (or Smart Strips) which are multi-plug power strips with the ability to automatically disconnect specific connected loads depending upon the power draw of a control load, also plugged into the strip. Power is disconnected from the switched (controlled) outlets when the control load power draw is reduced below a certain adjustable threshold, thus turning off the appliances plugged into the switched outlets. By disconnecting, the standby load of the controlled

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Measure	Description
		devices, the overall load of a centralized group of equipment (i.e. entertainment centers and home office) can be reduced. Uncontrolled outlets are also provided that are not affected by the control device and so are always providing power to any device plugged into it.
Electronics	Electronics- Monitor Power Management	EZ Save Monitor Power Management Software
Miscellaneous	Pool Heater - Solar	This measure replaces a conventional pool heater with a solar system.
Miscellaneous	Pool Pump - Timer	A pool pump timer allows the pump to turn off automatically, eliminating the wasted energy associated with unnecessary pumping.
Miscellaneous	Non-HVAC Motors - Variable Speed Control	The part-load efficiency of motors can be improved by varying the speed of the motor drive. There are two major types of variable speed controls: mechanical and electronic. An additional benefit of variable-speed controls is the ability to start and stop the motor gradually, thus extending the life of the motor and associated machinery. This analysis assumes that electronic variable speed controls are installed.
Miscellaneous	Destratification Fans (HVLS)	High volume low-speed (HVLS) ceiling fans are large (8-ft. to 20-ft. in diameter). They will effectively mix and circulate air within a given space to equalize temperature between ceiling and floor levels.
Miscellaneous	Exhaust Hood Makeup Air	Install dedicated make-up air supply for exhaust hoods. Exhaust hoods remove heat and vapor associated with cooking processes. An equal volume of makeup air must replace the air removed through the kitchen exhaust hood.
Miscellaneous	Optimizing Kitchen Ventilation	Customized optimization strategies that are site specific - very difficult to quantify typical savings. Optimizing the kitchen ventilation system in new construction or major renovation to achieve optimum performance and energy efficiency.

**Table C-3 Energy Efficiency Equipment Data, Electric-Office, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.45	\$0.24	20	2.59	\$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.54	\$0.27	20	2.75	\$0.04
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.13	\$0.30	20	5.13	\$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.20	\$0.34	20	4.93	\$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.52	\$0.10	20	7.08	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.59	\$0.11	20	7.49	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.69	\$0.13	20	7.34	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.83	\$0.20	20	5.66	\$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.86	\$0.22	20	5.33	\$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.93	\$0.25	20	5.25	\$0.02
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.30	\$0.02	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	0.61	\$0.02	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.80	\$0.07	15	4.09	\$0.01
Cooling	Roof top AC	Ductless Minisplit	1.00	\$0.23	15	1.97	\$0.02
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.33	\$0.02	15	-	\$0.01
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.53	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.70	\$0.09	15	2.29	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.77	\$0.13	15	2.13	\$0.02
Cooling	Air Source Heat Pump	Ductless Minisplit	0.97	\$0.22	15	2.31	\$0.02
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.18	\$0.05	15	4.29	\$0.03
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.34	\$0.10	15	3.81	\$0.03
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.82	\$0.14	15	6.85	\$0.02
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.10	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.23	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.26	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.34	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.10	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.23	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.26	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.34	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.28	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.72	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.01	\$0.01	15	-	\$0.08
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.02	\$0.00	15	1.00	\$0.01
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.03	\$0.03	15	0.13	\$0.11
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.03	\$0.05	15	0.09	\$0.17
Heating	Air Source Heat Pump	Ductless Minisplit	0.03	\$0.08	15	0.09	\$0.23
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.07	\$0.02	15	1.94	\$0.03
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.17	\$0.04	15	2.17	\$0.02
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.43	\$0.05	15	4.12	\$0.01

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.01	15	-	-
Heating	PTAC	EER 11	-	\$0.01	15	-	-
Heating	PTAC	EER 11.5	-	\$0.01	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.05	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.13	\$0.01	15	9.98	\$0.01
Heating	PTHP	EER 11	0.15	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.20	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	1.15	(\$0.07)	10	1.00	(\$0.01)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.01	\$0.00	15	2.16	\$0.03
Water Heating	Water Heating	EF 2.0	0.33	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.37	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.38	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.38	\$0.01	3	1.64	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.58	\$0.02	3	2.29	\$0.01
Interior Lighting	Screw-in	CFL	1.09	\$0.01	2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	1.18	\$0.12	20	4.85	\$0.01
Interior Lighting	Screw-in	LED (2020)	1.36	\$0.03	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.12	\$0.06	15	-	\$0.05
Interior Lighting	High-Bay Fixtures	T8	0.12	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.12	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.15	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.15	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.22	\$0.01	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.79	\$2.18	15	1.00	\$0.28
Interior Lighting	Linear Fluorescent	T8	0.82	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.14	\$0.32	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	T5	1.32	\$0.24	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	2.46	\$0.60	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.06	\$0.00	3	1.82	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.10	\$0.00	3	2.32	\$0.01
Exterior Lighting	Screw-in	CFL	0.18	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.20	\$0.05	20	2.04	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.23	\$0.01	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.16	\$0.21	15	0.19	\$0.13
Exterior Lighting	HID	T8	0.17	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.18	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.21	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.21	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.31	\$0.05	15	-	\$0.02

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.01	\$0.02	15	1.00	\$0.28
Exterior Lighting	Linear Fluorescent	T8	0.01	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.01	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	T5	0.01	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.02	\$0.00	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	-	-	12	-	-
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	-	-	12	-	-
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	-	-	12	-	-
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.01	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.02	\$0.00	12	-	\$0.01
Refrigeration	Glass Door Display	8400 kWh/yr	0.06	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.07	\$0.00	12	3.09	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.01	\$0.00	12	-	\$0.04
Refrigeration	Open Display Case	4330 kWh/yr	0.02	\$0.00	12	1.26	\$0.02
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.00	\$0.00	10	0.51	\$0.10
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.01	\$0.00	10	0.51	\$0.10
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.01	\$0.01	10	0.51	\$0.10
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	2.80	\$0.02
Refrigeration	Vending Machine	2400 kWh/year	0.02	\$0.00	12	2.80	\$0.02
Refrigeration	Vending Machine	1700 kWh/year	0.03	\$0.00	12	6.05	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.23	-	12	-	-
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.15	-	12	-	-
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	1.21	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.78	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.69	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.11	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.05	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.08	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.08	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.01	\$0.00	4	0.73	\$0.06
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	6.63	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	6.63	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.01	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-4 Energy Efficiency Equipment Data, Natural Gas-Office, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.04	16	1.57	\$0.37
Heating	Furnace	EF .82	0.02	\$0.12	16	0.85	\$0.69
Heating	Furnace	EF .90	0.04	\$0.10	16	2.07	\$0.28
Heating	Furnace	EF .96	0.05	\$0.15	16	1.91	\$0.31
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.04	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.06	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.09	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.13	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.03	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.00	\$0.01	12	2.57	\$0.21
Water Heating	Water Heating	Tankless	0.01	\$0.02	12	1.93	\$0.28
Water Heating	Water Heating	Indirect Fired	0.01	\$0.01	12	5.04	\$0.11
Water Heating	Water Heating	EF 0.94	0.02	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.09	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.16	\$0.01	12	> 10	\$0.00
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.13	-	12	-	-
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.02	\$0.00	12	> 10	\$0.00
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.08	\$0.00	12	> 10	\$0.00
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.39	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.05	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-5 Energy Efficiency Equipment Data Electric-Office, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.38	\$0.26	20	2.03	\$0.06
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.46	\$0.30	20	2.15	\$0.06
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.96	\$0.33	20	4.03	\$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.02	\$0.36	20	3.87	\$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.39	\$0.10	20	5.29	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.44	\$0.11	20	5.59	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.52	\$0.13	20	5.49	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.62	\$0.20	20	4.23	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.64	\$0.22	20	3.98	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.70	\$0.25	20	3.92	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.25	\$0.02	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	0.50	\$0.02	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.65	\$0.06	15	3.86	\$0.01
Cooling	Roof top AC	Ductless Minisplit	0.81	\$0.20	15	1.86	\$0.03
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.27	\$0.02	15	-	\$0.01
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.43	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.57	\$0.08	15	2.17	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.63	\$0.11	15	2.01	\$0.02
Cooling	Air Source Heat Pump	Ductless Minisplit	0.79	\$0.19	15	2.18	\$0.02
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.19	\$0.05	15	4.04	\$0.03
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.35	\$0.11	15	3.59	\$0.03
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.86	\$0.15	15	6.45	\$0.02
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.09	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.21	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.24	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.31	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.09	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.21	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.24	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.31	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.28	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.72	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.03	\$0.01	15	-	\$0.03
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.07	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.10	\$0.04	15	0.46	\$0.04
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.10	\$0.06	15	0.31	\$0.06
Heating	Air Source Heat Pump	Ductless Minisplit	0.13	\$0.09	15	0.36	\$0.07
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.08	\$0.02	15	2.06	\$0.03
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.19	\$0.04	15	2.31	\$0.02
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.49	\$0.06	15	4.38	\$0.01

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	0.00	\$0.00	15	0.31	\$0.17
Heating	PTAC	EER 10.8	0.00	\$0.00	15	0.10	\$0.53
Heating	PTAC	EER 11	0.00	\$0.00	15	0.09	\$0.57
Heating	PTAC	EER 11.5	0.00	\$0.00	15	0.08	\$0.67
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.05	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.11	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 11	0.13	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.18	\$0.00	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	1.59	(\$0.12)	10	1.00	(\$0.01)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.01	\$0.00	15	2.37	\$0.03
Water Heating	Water Heating	EF 2.0	0.31	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.35	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.36	\$0.00	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.38	\$0.01	3	1.64	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.58	\$0.02	3	2.29	\$0.01
Interior Lighting	Screw-in	CFL	1.09	\$0.01	2.2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	1.18	\$0.12	20	4.85	\$0.01
Interior Lighting	Screw-in	LED (2020)	1.36	\$0.03	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.12	\$0.06	15	-	\$0.05
Interior Lighting	High-Bay Fixtures	T8	0.12	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.12	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.15	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.15	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.22	\$0.01	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.79	\$2.18	15	1.00	\$0.28
Interior Lighting	Linear Fluorescent	T8	0.82	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.14	\$0.32	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	T5	1.32	\$0.24	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	2.46	\$0.60	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.06	\$0.00	3	1.82	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.10	\$0.00	3	2.32	\$0.01
Exterior Lighting	Screw-in	CFL	0.18	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.20	\$0.05	20	2.04	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.23	\$0.01	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.16	\$0.21	15	0.19	\$0.13
Exterior Lighting	HID	T8	0.17	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.18	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.21	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.21	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.31	\$0.05	15	-	\$0.02

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.01	\$0.02	15	1.00	\$0.28
Exterior Lighting	Linear Fluorescent	T8	0.01	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.01	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	T5	0.01	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.02	\$0.00	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	-	-	12	-	-
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	-	-	12	-	-
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	-	-	12	-	-
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.01	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.02	\$0.00	12	-	\$0.01
Refrigeration	Glass Door Display	8400 kWh/yr	0.06	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.07	\$0.00	12	3.09	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.01	\$0.00	12	-	\$0.04
Refrigeration	Open Display Case	4330 kWh/yr	0.02	\$0.00	12	1.26	\$0.02
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.00	\$0.00	10	0.51	\$0.10
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.01	\$0.00	10	0.51	\$0.10
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.01	\$0.01	10	0.51	\$0.10
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	2.80	\$0.02
Refrigeration	Vending Machine	2400 kWh/year	0.02	\$0.00	12	2.80	\$0.02
Refrigeration	Vending Machine	1700 kWh/year	0.03	\$0.00	12	6.05	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.23	-	12	-	-
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.15	-	12	-	-
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	1.21	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.78	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.69	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.11	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.05	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.08	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.08	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.01	\$0.00	4	0.73	\$0.06
Miscellaneous	Non-HVAC Motors	Standard (EPAAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	6.63	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	6.63	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.01	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-6 Energy Efficiency Equipment Data, Natural Gas-Office, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.04	16	2.01	\$0.29
Heating	Furnace	EF .82	0.02	\$0.11	16	1.09	\$0.54
Heating	Furnace	EF .90	0.04	\$0.10	16	2.64	\$0.22
Heating	Furnace	EF .96	0.06	\$0.14	16	2.44	\$0.24
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.04	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.06	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.09	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.13	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.03	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.00	\$0.01	12	2.35	\$0.23
Water Heating	Water Heating	Tankless	0.01	\$0.02	12	1.77	\$0.30
Water Heating	Water Heating	Indirect Fired	0.01	\$0.01	12	4.61	\$0.12
Water Heating	Water Heating	EF 0.94	0.02	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.09	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.16	\$0.01	12	> 10	\$0.00
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.13	-	12	-	-
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.02	\$0.00	12	> 10	\$0.00
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.08	\$0.00	12	> 10	\$0.00
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.39	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.05	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-7 Energy Efficiency Equipment Data, Electric-Restaurant, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.97	\$0.38	20	3.06	\$0.03
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	1.17	\$0.43	20	3.25	\$0.03
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	2.43	\$0.48	20	6.07	\$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	2.58	\$0.53	20	5.84	\$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	1.58	\$0.24	20	7.97	\$0.01
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	1.79	\$0.26	20	8.44	\$0.01
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	2.11	\$0.31	20	8.27	\$0.01
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	2.53	\$0.48	20	6.39	\$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	2.64	\$0.53	20	6.01	\$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	2.85	\$0.58	20	5.92	\$0.02
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.55	\$0.02	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	1.09	\$0.02	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	1.43	\$0.07	15	6.56	\$0.00
Cooling	Roof top AC	Ductless Minisplit	1.79	\$0.22	15	3.16	\$0.01
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.76	\$0.03	15	-	\$0.00
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	1.22	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	1.61	\$0.11	15	3.68	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	1.77	\$0.16	15	3.42	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	2.24	\$0.27	15	3.71	\$0.01
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.43	\$0.06	15	6.89	\$0.01
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.78	\$0.12	15	6.13	\$0.02
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	1.90	\$0.17	15	> 10	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.17	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.41	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.47	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.62	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.17	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.41	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.47	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.62	\$0.02	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.51	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	1.30	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.06	\$0.02	15	-	\$0.03
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.12	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.18	\$0.07	15	0.44	\$0.04
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.18	\$0.10	15	0.30	\$0.06
Heating	Air Source Heat Pump	Ductless Minisplit	0.23	\$0.16	15	0.33	\$0.07
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.15	\$0.05	15	1.70	\$0.03
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.35	\$0.09	15	1.91	\$0.03
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.89	\$0.13	15	3.62	\$0.01

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.01	15	-	-
Heating	PTAC	EER 11	-	\$0.02	15	-	-
Heating	PTAC	EER 11.5	-	\$0.02	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.09	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.22	\$0.01	15	9.98	\$0.01
Heating	PTHP	EER 11	0.26	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.35	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	1.78	(\$0.52)	10	1.00	(\$0.04)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.07	\$0.01	15	4.55	\$0.01
Water Heating	Water Heating	EF 2.0	3.56	\$0.02	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	4.00	\$0.03	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	4.12	\$0.03	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	1.48	\$0.05	3	2.07	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	2.27	\$0.06	3	2.79	\$0.01
Interior Lighting	Screw-in	CFL	4.26	\$0.02	2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	4.61	\$0.39	20	6.07	\$0.01
Interior Lighting	Screw-in	LED (2020)	5.32	\$0.11	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.66	\$0.26	15	0.22	\$0.04
Interior Lighting	High-Bay Fixtures	T8	0.67	(\$0.02)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.71	\$0.01	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.83	\$0.02	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.85	\$0.02	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	1.27	\$0.06	15	-	\$0.00
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.78	\$1.78	15	1.00	\$0.23
Interior Lighting	Linear Fluorescent	T8	0.81	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.13	\$0.26	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	T5	1.31	\$0.20	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	2.44	\$0.49	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.13	\$0.00	3	2.20	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.20	\$0.01	3	2.81	\$0.01
Exterior Lighting	Screw-in	CFL	0.37	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.41	\$0.09	20	2.47	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.47	\$0.02	20	-	\$0.00
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	1.09	\$1.17	15	0.24	\$0.11
Exterior Lighting	HID	T8	1.12	(\$0.03)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	1.19	\$0.01	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	1.39	\$0.03	15	1.00	\$0.00
Exterior Lighting	HID	T5	1.42	\$0.03	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	2.09	\$0.30	15	-	\$0.01

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.23
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	1.19	\$0.03	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	1.32	\$0.10	12	6.53	\$0.01
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	1.50	\$0.17	12	4.12	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.29	\$0.01	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.39	\$0.02	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.41	\$0.02	12	> 10	\$0.01
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.55	\$0.02	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.51	\$0.11	12	-	\$0.03
Refrigeration	Glass Door Display	8400 kWh/yr	1.27	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	1.60	\$0.11	12	1.42	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.25	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.26	\$0.17	12	-	\$0.08
Refrigeration	Open Display Case	4330 kWh/yr	0.46	\$0.17	12	0.58	\$0.04
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.08	\$0.14	10	0.23	\$0.23
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.14	\$0.23	10	0.23	\$0.23
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.20	\$0.34	10	0.23	\$0.23
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.08	\$0.03	12	1.28	\$0.04
Refrigeration	Vending Machine	2400 kWh/year	0.27	\$0.10	12	1.28	\$0.04
Refrigeration	Vending Machine	1700 kWh/year	0.35	\$0.06	12	2.78	\$0.02
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.97	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.61	\$0.02	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	2.53	\$0.05	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	1.62	\$0.07	12	> 10	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.11	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.10	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.03	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.06	\$0.03	4	0.31	\$0.13
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	-	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	-	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-8 Energy Efficiency Equipment Data, Natural Gas- Restaurant, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.03	16	2.29	\$0.25
Heating	Furnace	EF .82	0.02	\$0.09	16	1.24	\$0.47
Heating	Furnace	EF .90	0.04	\$0.08	16	3.01	\$0.19
Heating	Furnace	EF .96	0.05	\$0.11	16	2.78	\$0.21
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.03	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.06	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.08	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.12	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.03	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.02	12	3.56	\$0.15
Water Heating	Water Heating	Tankless	0.02	\$0.04	12	2.67	\$0.20
Water Heating	Water Heating	Indirect Fired	0.04	\$0.03	12	7.05	\$0.08
Water Heating	Water Heating	EF 0.94	0.07	(\$0.01)	12	1.00	(\$0.01)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.05	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.08	\$0.18	12	2.15	\$0.25
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.07	\$0.05	12	6.33	\$0.09
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.01	\$0.00	12	> 10	\$0.04
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.04	\$0.01	12	> 10	\$0.02
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.20	\$0.01	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-9 Energy Efficiency Equipment Data, Electric—Restaurant, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.79	\$0.55	20	1.71	\$0.06
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.95	\$0.63	20	1.82	\$0.06
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.97	\$0.70	20	3.39	\$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	2.09	\$0.77	20	3.26	\$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	1.26	\$0.34	20	4.52	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	1.43	\$0.36	20	4.78	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	1.69	\$0.43	20	4.69	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	2.02	\$0.67	20	3.61	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	2.11	\$0.74	20	3.40	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	2.28	\$0.82	20	3.35	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.40	\$0.02	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	0.80	\$0.03	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	1.05	\$0.08	15	4.02	\$0.01
Cooling	Roof top AC	Ductless Minisplit	1.31	\$0.27	15	1.93	\$0.02
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.56	\$0.04	15	-	\$0.01
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.89	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	1.19	\$0.13	15	2.26	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	1.30	\$0.19	15	2.09	\$0.02
Cooling	Air Source Heat Pump	Ductless Minisplit	1.64	\$0.33	15	2.27	\$0.02
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.33	\$0.08	15	4.22	\$0.02
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.60	\$0.16	15	3.75	\$0.03
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	1.46	\$0.21	15	6.73	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.16	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.37	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.43	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.57	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.16	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.37	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.43	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.57	\$0.02	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.51	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	1.30	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.06	\$0.02	15	-	\$0.04
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.11	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.16	\$0.07	15	0.37	\$0.05
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.16	\$0.11	15	0.25	\$0.07
Heating	Air Source Heat Pump	Ductless Minisplit	0.20	\$0.18	15	0.28	\$0.09
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.14	\$0.06	15	1.32	\$0.04
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.33	\$0.12	15	1.48	\$0.04
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.85	\$0.16	15	2.80	\$0.02

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	0.00	\$0.00	15	0.31	\$0.17
Heating	PTAC	EER 10.8	0.00	\$0.01	15	0.10	\$0.53
Heating	PTAC	EER 11	0.00	\$0.01	15	0.09	\$0.57
Heating	PTAC	EER 11.5	0.00	\$0.01	15	0.08	\$0.67
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.08	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.20	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11	0.23	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.31	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	2.20	(\$0.89)	10	1.00	(\$0.05)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.07	\$0.01	15	4.55	\$0.01
Water Heating	Water Heating	EF 2.0	3.38	\$0.02	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	3.80	\$0.02	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	3.91	\$0.03	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	1.48	\$0.05	3	2.07	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	2.27	\$0.06	3	2.79	\$0.01
Interior Lighting	Screw-in	CFL	4.26	\$0.02	2.2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	4.61	\$0.39	20	6.07	\$0.01
Interior Lighting	Screw-in	LED (2020)	5.32	\$0.11	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.66	\$0.26	15	0.22	\$0.04
Interior Lighting	High-Bay Fixtures	T8	0.67	(\$0.02)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.71	\$0.01	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.83	\$0.02	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.85	\$0.02	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	1.27	\$0.06	15	-	\$0.00
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.78	\$1.78	15	1.00	\$0.23
Interior Lighting	Linear Fluorescent	T8	0.81	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.13	\$0.26	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	T5	1.31	\$0.20	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	2.44	\$0.49	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.13	\$0.00	3	2.20	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.20	\$0.01	3	2.81	\$0.01
Exterior Lighting	Screw-in	CFL	0.37	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.41	\$0.09	20	2.47	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.47	\$0.02	20	-	\$0.00
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	1.09	\$1.17	15	0.24	\$0.11
Exterior Lighting	HID	T8	1.12	(\$0.03)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	1.19	\$0.01	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	1.39	\$0.03	15	1.00	\$0.00
Exterior Lighting	HID	T5	1.42	\$0.03	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	2.09	\$0.30	15	-	\$0.01

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.23
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	1.19	\$0.03	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	1.32	\$0.10	12	6.53	\$0.01
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	1.50	\$0.17	12	4.12	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.29	\$0.01	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.39	\$0.02	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.41	\$0.02	12	> 10	\$0.01
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.55	\$0.02	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.51	\$0.11	12	-	\$0.03
Refrigeration	Glass Door Display	8400 kWh/yr	1.27	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	1.60	\$0.11	12	1.42	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.25	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.26	\$0.17	12	-	\$0.08
Refrigeration	Open Display Case	4330 kWh/yr	0.46	\$0.17	12	0.58	\$0.04
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.08	\$0.14	10	0.23	\$0.23
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.14	\$0.23	10	0.23	\$0.23
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.20	\$0.34	10	0.23	\$0.23
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.08	\$0.03	12	1.28	\$0.04
Refrigeration	Vending Machine	2400 kWh/year	0.27	\$0.10	12	1.28	\$0.04
Refrigeration	Vending Machine	1700 kWh/year	0.35	\$0.06	12	2.78	\$0.02
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.97	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.61	\$0.02	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	2.53	\$0.05	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	1.62	\$0.07	12	> 10	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.11	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.10	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.03	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.06	\$0.03	4	0.31	\$0.13
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	-	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	-	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-10 Energy Efficiency Equipment Data, Natural Gas-Restaurant, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.03	16	2.36	\$0.25
Heating	Furnace	EF .82	0.02	\$0.08	16	1.28	\$0.46
Heating	Furnace	EF .90	0.04	\$0.07	16	3.10	\$0.19
Heating	Furnace	EF .96	0.05	\$0.10	16	2.87	\$0.20
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.02	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.03	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.05	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.07	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.03	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.02	12	3.82	\$0.14
Water Heating	Water Heating	Tankless	0.02	\$0.03	12	2.87	\$0.19
Water Heating	Water Heating	Indirect Fired	0.04	\$0.03	12	7.51	\$0.07
Water Heating	Water Heating	EF 0.94	0.06	(\$0.01)	12	1.00	(\$0.01)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.05	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.08	\$0.18	12	2.15	\$0.25
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.07	\$0.05	12	6.33	\$0.09
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.01	\$0.00	12	> 10	\$0.04
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.04	\$0.01	12	> 10	\$0.02
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.20	\$0.01	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-11 Energy Efficiency Equipment Data, Electric-Retail, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.33	\$0.13	20	3.52	\$0.04
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.40	\$0.15	20	3.74	\$0.03
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.83	\$0.17	20	6.99	\$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	0.88	\$0.18	20	6.72	\$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.48	\$0.07	20	9.25	\$0.01
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.55	\$0.08	20	9.79	\$0.01
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.64	\$0.10	20	9.60	\$0.01
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.77	\$0.15	20	7.41	\$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.81	\$0.16	20	6.97	\$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.87	\$0.18	20	6.87	\$0.02
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.35	\$0.01	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	0.71	\$0.01	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.93	\$0.04	15	8.68	\$0.00
Cooling	Roof top AC	Ductless Minisplit	1.16	\$0.13	15	4.17	\$0.01
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.39	\$0.01	15	-	\$0.00
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.62	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.82	\$0.05	15	4.87	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.90	\$0.07	15	4.52	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	1.13	\$0.12	15	4.91	\$0.01
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.22	\$0.03	15	9.11	\$0.01
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.39	\$0.06	15	8.10	\$0.01
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.96	\$0.08	15	> 10	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.11	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.26	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.30	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.40	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.11	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.26	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.30	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.40	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.33	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.84	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.00	\$0.08	15	-	\$2.82
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.01	\$0.01	15	1.00	\$0.21
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.01	\$0.31	15	0.00	\$5.12
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.01	\$0.45	15	0.00	\$7.59
Heating	Air Source Heat Pump	Ductless Minisplit	0.01	\$0.77	15	0.00	\$12.39
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.13	\$0.16	15	0.42	\$0.13
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.30	\$0.32	15	0.47	\$0.11
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.76	\$0.44	15	0.90	\$0.06

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.01	15	-	-
Heating	PTAC	EER 11	-	\$0.01	15	-	-
Heating	PTAC	EER 11.5	-	\$0.02	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.09	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.21	\$0.01	15	9.98	\$0.01
Heating	PTHP	EER 11	0.25	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.34	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	0.64	(\$0.24)	10	1.00	(\$0.05)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.01	\$0.00	15	3.03	\$0.02
Water Heating	Water Heating	EF 2.0	0.39	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.43	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.45	\$0.00	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.18	\$0.01	3	1.53	\$0.02
Interior Lighting	Screw-in	70W HIR PAR-38	0.28	\$0.01	3	2.06	\$0.01
Interior Lighting	Screw-in	CFL	0.52	\$0.00	2.2	9.72	\$0.00
Interior Lighting	Screw-in	LED (2010)	0.57	\$0.06	20	4.48	\$0.01
Interior Lighting	Screw-in	LED (2020)	0.65	\$0.02	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.11	\$0.06	15	0.17	\$0.06
Interior Lighting	High-Bay Fixtures	T8	0.11	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.12	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.14	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.14	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.21	\$0.01	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	1.24	\$3.84	15	1.00	\$0.32
Interior Lighting	Linear Fluorescent	T8	1.29	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.79	\$0.56	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	T5	2.08	\$0.43	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	LED (2020)	3.88	\$1.06	15	-	\$0.03
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.21	\$0.01	3	1.63	\$0.02
Exterior Lighting	Screw-in	70W HIR PAR-38	0.32	\$0.01	3	2.07	\$0.01
Exterior Lighting	Screw-in	CFL	0.61	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.66	\$0.19	20	1.82	\$0.03
Exterior Lighting	Screw-in	LED (2020)	0.76	\$0.05	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.18	\$0.26	15	0.17	\$0.15
Exterior Lighting	HID	T8	0.18	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.20	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.23	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.23	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.35	\$0.07	15	-	\$0.02

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.32
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.03
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.15	-	12	-	-
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.17	-	12	-	-
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.20	-	12	-	-
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.04	\$0.00	12	9.17	\$0.01
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.05	\$0.00	12	6.37	\$0.01
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.05	\$0.00	12	5.72	\$0.01
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.07	\$0.01	12	6.82	\$0.01
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.07	\$0.01	12	-	\$0.01
Refrigeration	Glass Door Display	8400 kWh/yr	0.17	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.21	\$0.01	12	2.63	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.03	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.03	\$0.01	12	-	\$0.04
Refrigeration	Open Display Case	4330 kWh/yr	0.06	\$0.01	12	1.08	\$0.02
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.02	\$0.02	10	0.43	\$0.12
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.04	\$0.03	10	0.43	\$0.12
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.05	\$0.05	10	0.43	\$0.12
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.02	\$0.00	12	2.36	\$0.02
Refrigeration	Vending Machine	2400 kWh/year	0.07	\$0.01	12	2.36	\$0.02
Refrigeration	Vending Machine	1700 kWh/year	0.09	\$0.01	12	5.10	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.10	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.06	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.54	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.34	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.06	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.06	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.01	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.03	\$0.02	4	0.31	\$0.13
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	-	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	-	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-12 Energy Efficiency Equipment Data, Natural Gas-Retail, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.02	\$0.37	16	0.25	\$2.33
Heating	Furnace	EF .82	0.02	\$1.01	16	0.14	\$4.30
Heating	Furnace	EF .90	0.05	\$0.88	16	0.33	\$1.77
Heating	Furnace	EF .96	0.07	\$1.28	16	0.30	\$1.92
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.03	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.05	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.07	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.11	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.04	\$0.01	15	> 10	\$0.02
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.01	12	3.18	\$0.17
Water Heating	Water Heating	Tankless	0.01	\$0.02	12	2.39	\$0.23
Water Heating	Water Heating	Indirect Fired	0.02	\$0.01	12	6.26	\$0.09
Water Heating	Water Heating	EF 0.94	0.03	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.28	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.47	\$0.00	12	> 10	\$0.00
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.40	-	12	-	-
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.07	-	12	-	-
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.24	-	12	-	-
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	1.17	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.14	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-13 Energy Efficiency Equipment Data, Electric-Retail, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.30	\$0.18	20	2.40	\$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.36	\$0.20	20	2.55	\$0.05
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.75	\$0.22	20	4.76	\$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	0.79	\$0.25	20	4.57	\$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.39	\$0.09	20	6.03	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.45	\$0.10	20	6.38	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.52	\$0.12	20	6.25	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.63	\$0.18	20	4.82	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.66	\$0.20	20	4.54	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.71	\$0.22	20	4.47	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.27	\$0.01	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	0.54	\$0.01	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.71	\$0.03	15	7.75	\$0.00
Cooling	Roof top AC	Ductless Minisplit	0.88	\$0.11	15	3.73	\$0.01
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.32	\$0.01	15	-	\$0.00
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.51	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.68	\$0.05	15	4.35	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.75	\$0.07	15	4.04	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	0.95	\$0.12	15	4.38	\$0.01
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.21	\$0.03	15	8.14	\$0.01
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.38	\$0.06	15	7.23	\$0.02
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.93	\$0.08	15	> 10	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.10	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.24	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.28	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.37	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.10	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.24	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.28	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.37	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.33	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.84	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.03	\$0.04	15	-	\$0.17
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.05	\$0.01	15	1.00	\$0.01
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.08	\$0.16	15	0.09	\$0.21
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.08	\$0.24	15	0.06	\$0.31
Heating	Air Source Heat Pump	Ductless Minisplit	0.11	\$0.40	15	0.07	\$0.39
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.14	\$0.09	15	0.79	\$0.07
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.33	\$0.19	15	0.89	\$0.06
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.84	\$0.26	15	1.69	\$0.03

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	0.00	\$0.00	15	0.31	\$0.17
Heating	PTAC	EER 10.8	0.00	\$0.01	15	0.10	\$0.53
Heating	PTAC	EER 11	0.00	\$0.01	15	0.09	\$0.57
Heating	PTAC	EER 11.5	0.00	\$0.01	15	0.08	\$0.67
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.08	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.19	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11	0.23	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.31	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	0.07	(\$0.41)	10	1.00	(\$0.74)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.01	\$0.00	15	3.13	\$0.02
Water Heating	Water Heating	EF 2.0	0.37	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.41	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.43	\$0.00	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.18	\$0.01	3	1.53	\$0.02
Interior Lighting	Screw-in	70W HIR PAR-38	0.28	\$0.01	3	2.06	\$0.01
Interior Lighting	Screw-in	CFL	0.52	\$0.00	2.2	9.72	\$0.00
Interior Lighting	Screw-in	LED (2010)	0.57	\$0.06	20	4.48	\$0.01
Interior Lighting	Screw-in	LED (2020)	0.65	\$0.02	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.11	\$0.06	15	0.17	\$0.06
Interior Lighting	High-Bay Fixtures	T8	0.11	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.12	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.14	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.14	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.21	\$0.01	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	1.24	\$3.84	15	1.00	\$0.32
Interior Lighting	Linear Fluorescent	T8	1.29	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.79	\$0.56	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	T5	2.08	\$0.43	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	LED (2020)	3.88	\$1.06	15	-	\$0.03
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.21	\$0.01	3	1.63	\$0.02
Exterior Lighting	Screw-in	70W HIR PAR-38	0.32	\$0.01	3	2.07	\$0.01
Exterior Lighting	Screw-in	CFL	0.61	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.66	\$0.19	20	1.82	\$0.03
Exterior Lighting	Screw-in	LED (2020)	0.76	\$0.05	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.18	\$0.26	15	0.17	\$0.15
Exterior Lighting	HID	T8	0.18	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.20	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.23	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.23	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.35	\$0.07	15	-	\$0.02

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.32
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.03
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.15	-	12	-	-
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.17	-	12	-	-
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.20	-	12	-	-
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.04	\$0.00	12	9.17	\$0.01
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.05	\$0.00	12	6.37	\$0.01
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.05	\$0.00	12	5.72	\$0.01
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.07	\$0.01	12	6.82	\$0.01
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.07	\$0.01	12	-	\$0.01
Refrigeration	Glass Door Display	8400 kWh/yr	0.17	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.21	\$0.01	12	2.63	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.03	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.03	\$0.01	12	-	\$0.04
Refrigeration	Open Display Case	4330 kWh/yr	0.06	\$0.01	12	1.08	\$0.02
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.02	\$0.02	10	0.43	\$0.12
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.04	\$0.03	10	0.43	\$0.12
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.05	\$0.05	10	0.43	\$0.12
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.02	\$0.00	12	2.20	\$0.03
Refrigeration	Vending Machine	2400 kWh/year	0.07	\$0.01	12	2.20	\$0.03
Refrigeration	Vending Machine	1700 kWh/year	0.09	\$0.01	12	4.77	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.10	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.06	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.54	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.34	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.06	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.06	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.01	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.03	\$0.02	4	0.31	\$0.13
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	-	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	-	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-14 Energy Efficiency Equipment Data, Natural Gas-Retail, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.02	\$0.17	16	0.54	\$1.08
Heating	Furnace	EF .82	0.02	\$0.47	16	0.29	\$1.99
Heating	Furnace	EF .90	0.05	\$0.41	16	0.71	\$0.82
Heating	Furnace	EF .96	0.07	\$0.59	16	0.66	\$0.89
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.02	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.04	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.06	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.08	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.04	\$0.01	15	> 10	\$0.02
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.01	12	3.29	\$0.16
Water Heating	Water Heating	Tankless	0.01	\$0.02	12	2.47	\$0.22
Water Heating	Water Heating	Indirect Fired	0.02	\$0.01	12	6.44	\$0.08
Water Heating	Water Heating	EF 0.94	0.02	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.28	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.47	\$0.00	12	> 10	\$0.00
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.40	-	12	-	-
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.07	-	12	-	-
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.24	-	12	-	-
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	1.17	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.14	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-15 Energy Efficiency Equipment Data, Electric-Grocery, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.68	\$0.27	20	7.43	\$0.03
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.82	\$0.30	20	7.89	\$0.03
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.71	\$0.34	20	> 10	\$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.81	\$0.37	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	1.02	\$0.15	20	> 10	\$0.01
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	1.16	\$0.16	20	> 10	\$0.01
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	1.36	\$0.20	20	> 10	\$0.01
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1.63	\$0.31	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1.70	\$0.34	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1.84	\$0.37	20	> 10	\$0.02
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.75	\$0.17	15	-	\$0.02
Cooling	Roof top AC	EER 11.2	1.50	\$0.20	15	1.00	\$0.01
Cooling	Roof top AC	EER 12.0	1.96	\$0.63	15	2.36	\$0.03
Cooling	Roof top AC	Ductless Minisplit	2.46	\$2.08	15	1.13	\$0.09
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.82	\$0.21	15	-	\$0.03
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	1.30	\$0.03	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	1.72	\$0.78	15	1.32	\$0.05
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	1.89	\$1.16	15	1.23	\$0.06
Cooling	Air Source Heat Pump	Ductless Minisplit	2.39	\$1.96	15	1.34	\$0.08
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.45	\$0.43	15	2.47	\$0.10
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.82	\$0.89	15	2.19	\$0.11
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	2.02	\$1.21	15	3.94	\$0.06
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.24	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.56	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.64	\$0.03	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.85	\$0.03	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.24	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.56	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.64	\$0.03	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.85	\$0.03	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.70	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	1.78	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.02	\$0.10	15	-	\$0.41
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.04	\$0.01	15	1.00	\$0.03
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.06	\$0.35	15	0.03	\$0.59
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.06	\$0.52	15	0.02	\$0.87
Heating	Air Source Heat Pump	Ductless Minisplit	0.08	\$0.88	15	0.02	\$1.20
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.21	\$0.18	15	0.59	\$0.09
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.48	\$0.38	15	0.67	\$0.08
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.25	\$0.51	15	1.26	\$0.04

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.02	15	-	-
Heating	PTAC	EER 11	-	\$0.02	15	-	-
Heating	PTAC	EER 11.5	-	\$0.02	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.11	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.25	\$0.01	15	9.98	\$0.01
Heating	PTHP	EER 11	0.29	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.40	\$0.02	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	2.17	(\$0.29)	10	1.00	(\$0.02)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.00	15	3.07	\$0.02
Water Heating	Water Heating	EF 2.0	1.25	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	1.40	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	1.45	\$0.02	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.40	\$0.01	3	2.21	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.61	\$0.02	3	3.08	\$0.01
Interior Lighting	Screw-in	CFL	1.14	\$0.01	2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	1.24	\$0.09	20	6.54	\$0.01
Interior Lighting	Screw-in	LED (2020)	1.43	\$0.03	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.08	\$0.03	15	-	\$0.04
Interior Lighting	High-Bay Fixtures	T8	0.08	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.08	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.10	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.10	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.15	\$0.01	15	-	\$0.00
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	2.69	\$5.53	15	1.00	\$0.21
Interior Lighting	Linear Fluorescent	T8	2.80	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	3.89	\$0.81	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	T5	4.51	\$0.62	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	8.40	\$1.52	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.10	\$0.00	3	2.45	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.15	\$0.00	3	3.12	\$0.01
Exterior Lighting	Screw-in	CFL	0.29	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.31	\$0.06	20	2.74	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.36	\$0.02	20	-	\$0.00
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.46	\$0.44	15	0.26	\$0.10
Exterior Lighting	HID	T8	0.47	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.50	\$0.01	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.59	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.60	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.88	\$0.11	15	-	\$0.01

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.01	\$0.02	15	1.00	\$0.21
Exterior Lighting	Linear Fluorescent	T8	0.01	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.02	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	T5	0.02	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.04	\$0.01	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	2.08	\$0.04	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	2.33	\$0.12	12	9.75	\$0.01
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	2.63	\$0.21	12	6.16	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.15	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.20	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.20	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.28	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	2.57	\$0.57	12	-	\$0.03
Refrigeration	Glass Door Display	8400 kWh/yr	6.36	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	8.03	\$0.57	12	1.42	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	1.24	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	1.29	\$0.87	12	-	\$0.08
Refrigeration	Open Display Case	4330 kWh/yr	2.28	\$0.87	12	0.58	\$0.05
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.02	\$0.04	10	0.23	\$0.23
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.03	\$0.06	10	0.23	\$0.23
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.05	\$0.09	10	0.23	\$0.23
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.04	\$0.02	12	1.28	\$0.04
Refrigeration	Vending Machine	2400 kWh/year	0.14	\$0.05	12	1.28	\$0.04
Refrigeration	Vending Machine	1700 kWh/year	0.18	\$0.03	12	2.76	\$0.02
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.11	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.07	\$0.00	12	9.36	\$0.01
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.56	\$0.01	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.36	\$0.06	12	3.76	\$0.02
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.07	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.03	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.01	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.05	\$0.03	4	0.26	\$0.16
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	-	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	-	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-16 Energy Efficiency Equipment Data, Natural Gas-Grocery, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.04	16	2.29	\$0.25
Heating	Furnace	EF .82	0.02	\$0.10	16	1.24	\$0.47
Heating	Furnace	EF .90	0.04	\$0.09	16	3.01	\$0.19
Heating	Furnace	EF .96	0.06	\$0.13	16	2.78	\$0.21
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.03	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.05	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.07	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.10	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.03	-	15	-	-
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.00	\$0.01	12	3.22	\$0.17
Water Heating	Water Heating	Tankless	0.01	\$0.02	12	2.41	\$0.22
Water Heating	Water Heating	Indirect Fired	0.02	\$0.01	12	6.30	\$0.09
Water Heating	Water Heating	EF 0.94	0.02	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.02	\$0.01	12	6.76	\$0.08
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.01	-	12	-	-
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.04	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-17 Energy Efficiency Equipment Data, Electric-Grocery, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.55	\$0.39	20	4.15	\$0.06
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.66	\$0.44	20	4.41	\$0.06
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.38	\$0.49	20	8.24	\$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.47	\$0.54	20	7.92	\$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.82	\$0.22	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.92	\$0.23	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	1.09	\$0.28	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1.31	\$0.43	20	8.78	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1.36	\$0.48	20	8.26	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1.47	\$0.53	20	8.13	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.54	\$0.16	15	-	\$0.03
Cooling	Roof top AC	EER 11.2	1.09	\$0.18	15	1.00	\$0.02
Cooling	Roof top AC	EER 12.0	1.43	\$0.59	15	1.85	\$0.04
Cooling	Roof top AC	Ductless Minisplit	1.79	\$1.92	15	0.89	\$0.11
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.65	\$0.22	15	-	\$0.03
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	1.04	\$0.03	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	1.38	\$0.80	15	1.04	\$0.06
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	1.51	\$1.18	15	0.97	\$0.08
Cooling	Air Source Heat Pump	Ductless Minisplit	1.91	\$1.99	15	1.05	\$0.11
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.42	\$0.51	15	1.94	\$0.13
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.77	\$1.05	15	1.72	\$0.14
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	1.87	\$1.43	15	3.09	\$0.08
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.22	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.51	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.59	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.78	\$0.03	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.22	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.51	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.59	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.78	\$0.03	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.70	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	1.78	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.02	\$0.12	15	-	\$0.56
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.04	\$0.02	15	1.00	\$0.04
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.06	\$0.46	15	0.02	\$0.78
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.06	\$0.68	15	0.01	\$1.15
Heating	Air Source Heat Pump	Ductless Minisplit	0.08	\$1.15	15	0.01	\$1.57
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.17	\$0.25	15	0.35	\$0.15
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.39	\$0.51	15	0.39	\$0.14
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.00	\$0.70	15	0.74	\$0.07

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	0.00	\$0.00	15	0.31	\$0.17
Heating	PTAC	EER 10.8	0.00	\$0.01	15	0.10	\$0.53
Heating	PTAC	EER 11	0.00	\$0.01	15	0.09	\$0.57
Heating	PTAC	EER 11.5	0.00	\$0.01	15	0.08	\$0.67
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.09	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.22	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11	0.26	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.36	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	3.88	(\$0.50)	10	1.00	(\$0.02)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.00	15	3.07	\$0.02
Water Heating	Water Heating	EF 2.0	1.19	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	1.33	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	1.37	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.40	\$0.01	3	2.21	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.61	\$0.02	3	3.08	\$0.01
Interior Lighting	Screw-in	CFL	1.14	\$0.01	2.2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	1.24	\$0.09	20	6.54	\$0.01
Interior Lighting	Screw-in	LED (2020)	1.43	\$0.03	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.08	\$0.03	15	-	\$0.04
Interior Lighting	High-Bay Fixtures	T8	0.08	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.08	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.10	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.10	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.15	\$0.01	15	-	\$0.00
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	2.69	\$5.53	15	1.00	\$0.21
Interior Lighting	Linear Fluorescent	T8	2.80	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	3.89	\$0.81	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	T5	4.51	\$0.62	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	8.40	\$1.52	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.10	\$0.00	3	2.45	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.15	\$0.00	3	3.12	\$0.01
Exterior Lighting	Screw-in	CFL	0.29	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.31	\$0.06	20	2.74	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.36	\$0.02	20	-	\$0.00
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.46	\$0.44	15	0.26	\$0.10
Exterior Lighting	HID	T8	0.47	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.50	\$0.01	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.59	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.60	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.88	\$0.11	15	-	\$0.01

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.01	\$0.02	15	1.00	\$0.21
Exterior Lighting	Linear Fluorescent	T8	0.01	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.02	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	T5	0.02	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.04	\$0.01	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	2.08	\$0.04	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	2.33	\$0.12	12	9.75	\$0.01
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	2.63	\$0.21	12	6.16	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.15	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.20	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.21	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.28	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	2.57	\$0.57	12	-	\$0.03
Refrigeration	Glass Door Display	8400 kWh/yr	6.36	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	8.03	\$0.57	12	1.42	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	1.24	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	1.29	\$0.87	12	-	\$0.08
Refrigeration	Open Display Case	4330 kWh/yr	2.28	\$0.87	12	0.58	\$0.05
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.02	\$0.04	10	0.23	\$0.23
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.03	\$0.06	10	0.23	\$0.23
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.05	\$0.09	10	0.23	\$0.23
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.04	\$0.02	12	1.28	\$0.04
Refrigeration	Vending Machine	2400 kWh/year	0.14	\$0.05	12	1.28	\$0.04
Refrigeration	Vending Machine	1700 kWh/year	0.18	\$0.03	12	2.77	\$0.02
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.11	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.07	\$0.00	12	9.36	\$0.01
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.56	\$0.01	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.36	\$0.06	12	3.76	\$0.02
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.07	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.03	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.01	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.05	\$0.03	4	0.26	\$0.16
Miscellaneous	Non-HVAC Motors	Standard (EPAAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.01	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	-	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	-	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-18 Energy Efficiency Equipment Data, Natural Gas-Grocery, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.03	16	2.36	\$0.25
Heating	Furnace	EF .82	0.02	\$0.09	16	1.28	\$0.46
Heating	Furnace	EF .90	0.04	\$0.08	16	3.10	\$0.19
Heating	Furnace	EF .96	0.06	\$0.12	16	2.87	\$0.20
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.02	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.03	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.04	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.06	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.03	-	15	-	-
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.00	\$0.01	12	3.14	\$0.17
Water Heating	Water Heating	Tankless	0.01	\$0.01	12	2.36	\$0.23
Water Heating	Water Heating	Indirect Fired	0.01	\$0.01	12	6.16	\$0.09
Water Heating	Water Heating	EF 0.94	0.02	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.02	\$0.01	12	6.76	\$0.08
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.01	-	12	-	-
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.04	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-19 Energy Efficiency Equipment Data, Electric-College, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.54	\$0.51	20	1.53	\$0.08
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.65	\$0.57	20	1.63	\$0.08
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.35	\$0.64	20	3.04	\$0.04
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.43	\$0.70	20	2.92	\$0.04
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.80	\$0.28	20	4.06	\$0.03
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.91	\$0.30	20	4.29	\$0.03
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	1.07	\$0.36	20	4.21	\$0.03
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1.28	\$0.57	20	3.25	\$0.04
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1.33	\$0.63	20	3.06	\$0.04
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1.44	\$0.69	20	3.01	\$0.04
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.27	\$0.03	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	0.55	\$0.04	15	1.00	\$0.01
Cooling	Roof top AC	EER 12.0	0.72	\$0.12	15	2.20	\$0.02
Cooling	Roof top AC	Ductless Minisplit	0.90	\$0.40	15	1.06	\$0.05
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.25	\$0.03	15	-	\$0.01
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.40	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.53	\$0.13	15	1.24	\$0.02
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.58	\$0.19	15	1.15	\$0.03
Cooling	Air Source Heat Pump	Ductless Minisplit	0.74	\$0.32	15	1.25	\$0.04
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.14	\$0.07	15	2.31	\$0.05
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.26	\$0.15	15	2.05	\$0.06
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.63	\$0.20	15	3.69	\$0.03
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.09	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.20	\$0.03	15	9.22	\$0.01
Cooling	PTAC	EER 11	0.23	\$0.03	15	9.85	\$0.01
Cooling	PTAC	EER 11.5	0.31	\$0.03	15	> 10	\$0.01
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.09	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.20	\$0.03	15	9.22	\$0.01
Cooling	PTHP	EER 11	0.23	\$0.03	15	9.85	\$0.01
Cooling	PTHP	EER 11.5	0.31	\$0.03	15	> 10	\$0.01
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.25	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.65	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.15	\$0.02	15	-	\$0.01
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.30	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.43	\$0.06	15	1.22	\$0.01
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.43	\$0.09	15	0.81	\$0.02
Heating	Air Source Heat Pump	Ductless Minisplit	0.56	\$0.15	15	0.93	\$0.03
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.33	\$0.04	15	3.86	\$0.01
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.76	\$0.09	15	4.33	\$0.01
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.97	\$0.12	15	8.21	\$0.01

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.02	15	-	-
Heating	PTAC	EER 11	-	\$0.02	15	-	-
Heating	PTAC	EER 11.5	-	\$0.03	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.24	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.56	\$0.02	15	> 10	\$0.00
Heating	PTHP	EER 11	0.66	\$0.02	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.89	\$0.02	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	1.00	(\$0.27)	10	1.00	(\$0.04)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.00	15	2.45	\$0.03
Water Heating	Water Heating	EF 2.0	0.83	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.94	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.96	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.26	\$0.01	3	2.46	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.40	\$0.01	3	3.36	\$0.01
Interior Lighting	Screw-in	CFL	0.74	\$0.00	2.2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	0.81	\$0.06	20	7.25	\$0.01
Interior Lighting	Screw-in	LED (2020)	0.93	\$0.02	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.20	\$0.07	15	0.08	\$0.03
Interior Lighting	High-Bay Fixtures	T8	0.20	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.21	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.25	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.26	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.38	\$0.01	15	-	\$0.00
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	1.20	\$2.28	15	1.00	\$0.19
Interior Lighting	Linear Fluorescent	T8	1.25	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.74	\$0.33	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	T5	2.01	\$0.25	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	3.76	\$0.63	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.14	\$0.00	3	2.66	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.21	\$0.01	3	3.39	\$0.01
Exterior Lighting	Screw-in	CFL	0.40	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.43	\$0.08	20	2.98	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.50	\$0.02	20	-	\$0.00
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.33	\$0.29	15	0.28	\$0.09
Exterior Lighting	HID	T8	0.34	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.36	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.42	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.43	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.63	\$0.08	15	-	\$0.01

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.19
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.06	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.04	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.04	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.05	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.00	12	-	\$0.01
Refrigeration	Glass Door Display	8400 kWh/yr	0.06	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.08	\$0.00	12	5.25	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.01	\$0.00	12	-	\$0.02
Refrigeration	Open Display Case	4330 kWh/yr	0.02	\$0.00	12	2.14	\$0.01
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.00	10	0.86	\$0.06
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.01	\$0.01	10	0.86	\$0.06
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.02	\$0.01	10	0.86	\$0.06
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	4.75	\$0.01
Refrigeration	Vending Machine	2400 kWh/year	0.03	\$0.00	12	4.75	\$0.01
Refrigeration	Vending Machine	1700 kWh/year	0.03	\$0.00	12	> 10	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	4.94	\$0.01
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.03	\$0.00	12	4.33	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.18	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.03	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.06	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.02	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.04	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.04	\$0.01	4	0.78	\$0.05
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	6.49	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	6.49	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	\$0.00	15	2.12	\$0.03
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	\$0.00	15	1.24	\$0.05
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.00	\$0.00	15	2.70	\$0.02
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-20 Energy Efficiency Equipment Data, Natural Gas-College, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.02	\$0.04	16	3.00	\$0.19
Heating	Furnace	EF .82	0.03	\$0.10	16	1.62	\$0.36
Heating	Furnace	EF .90	0.06	\$0.08	16	3.94	\$0.15
Heating	Furnace	EF .96	0.07	\$0.12	16	3.64	\$0.16
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.03	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.05	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.07	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.10	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.04	-	15	-	-
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.01	12	2.49	\$0.22
Water Heating	Water Heating	Tankless	0.01	\$0.03	12	1.86	\$0.29
Water Heating	Water Heating	Indirect Fired	0.02	\$0.02	12	4.87	\$0.11
Water Heating	Water Heating	EF 0.94	0.03	(\$0.01)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.02	\$0.01	12	> 10	\$0.03
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.02	\$0.00	12	> 10	\$0.02
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.06	\$0.00	12	> 10	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.00	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	0.00	-	5	-	-
Miscellaneous	Pool Heater	EF .95	0.00	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-21 Energy Efficiency Equipment Data, Electric-College, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.48	\$0.55	20	1.26	\$0.10
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.57	\$0.62	20	1.34	\$0.09
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.20	\$0.69	20	2.50	\$0.05
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.27	\$0.76	20	2.41	\$0.05
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.68	\$0.28	20	3.56	\$0.04
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.77	\$0.30	20	3.77	\$0.03
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.91	\$0.35	20	3.70	\$0.03
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1.09	\$0.55	20	2.85	\$0.04
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1.14	\$0.61	20	2.68	\$0.05
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1.23	\$0.67	20	2.64	\$0.05
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.24	\$0.03	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	0.49	\$0.04	15	1.00	\$0.01
Cooling	Roof top AC	EER 12.0	0.63	\$0.12	15	2.00	\$0.02
Cooling	Roof top AC	Ductless Minisplit	0.80	\$0.39	15	0.96	\$0.05
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.22	\$0.03	15	-	\$0.02
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.35	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.47	\$0.12	15	1.13	\$0.03
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.52	\$0.19	15	1.04	\$0.04
Cooling	Air Source Heat Pump	Ductless Minisplit	0.65	\$0.31	15	1.13	\$0.05
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.16	\$0.09	15	2.10	\$0.06
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.29	\$0.18	15	1.87	\$0.06
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.71	\$0.25	15	3.36	\$0.04
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.08	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.18	\$0.03	15	8.42	\$0.01
Cooling	PTAC	EER 11	0.21	\$0.03	15	9.00	\$0.01
Cooling	PTAC	EER 11.5	0.28	\$0.03	15	9.98	\$0.01
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.08	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.18	\$0.03	15	8.42	\$0.01
Cooling	PTHP	EER 11	0.21	\$0.03	15	9.00	\$0.01
Cooling	PTHP	EER 11.5	0.28	\$0.03	15	9.98	\$0.01
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.25	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.65	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.15	\$0.02	15	-	\$0.01
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.29	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.42	\$0.08	15	0.88	\$0.02
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.42	\$0.12	15	0.59	\$0.03
Heating	Air Source Heat Pump	Ductless Minisplit	0.54	\$0.20	15	0.67	\$0.04
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.32	\$0.06	15	2.81	\$0.02
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.75	\$0.12	15	3.15	\$0.02
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.93	\$0.17	15	5.98	\$0.01

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.02	15	-	-
Heating	PTAC	EER 11	-	\$0.02	15	-	-
Heating	PTAC	EER 11.5	-	\$0.03	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.23	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.54	\$0.02	15	> 10	\$0.00
Heating	PTHP	EER 11	0.64	\$0.02	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.86	\$0.02	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	1.77	(\$0.47)	10	1.00	(\$0.04)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.00	15	2.55	\$0.02
Water Heating	Water Heating	EF 2.0	0.79	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.89	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.92	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.26	\$0.01	3	2.46	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.40	\$0.01	3	3.36	\$0.01
Interior Lighting	Screw-in	CFL	0.74	\$0.00	2.2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	0.81	\$0.06	20	7.25	\$0.01
Interior Lighting	Screw-in	LED (2020)	0.93	\$0.02	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.20	\$0.07	15	0.08	\$0.03
Interior Lighting	High-Bay Fixtures	T8	0.20	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.21	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.25	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.26	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.38	\$0.01	15	-	\$0.00
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	1.20	\$2.28	15	1.00	\$0.19
Interior Lighting	Linear Fluorescent	T8	1.25	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.74	\$0.33	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	T5	2.01	\$0.25	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	3.76	\$0.63	15	-	\$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.14	\$0.00	3	2.66	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.21	\$0.01	3	3.39	\$0.01
Exterior Lighting	Screw-in	CFL	0.40	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.43	\$0.08	20	2.98	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.50	\$0.02	20	-	\$0.00
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.33	\$0.29	15	0.28	\$0.09
Exterior Lighting	HID	T8	0.34	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.36	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.42	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.43	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.63	\$0.08	15	-	\$0.01

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.19
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.02
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.06	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.04	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.04	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.05	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.00	12	-	\$0.01
Refrigeration	Glass Door Display	8400 kWh/yr	0.06	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.08	\$0.00	12	5.25	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.01	\$0.00	12	-	\$0.02
Refrigeration	Open Display Case	4330 kWh/yr	0.02	\$0.00	12	2.14	\$0.01
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.00	10	0.86	\$0.06
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.01	\$0.01	10	0.86	\$0.06
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.02	\$0.01	10	0.86	\$0.06
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	4.78	\$0.01
Refrigeration	Vending Machine	2400 kWh/year	0.03	\$0.00	12	4.78	\$0.01
Refrigeration	Vending Machine	1700 kWh/year	0.04	\$0.00	12	> 10	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	4.94	\$0.01
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.03	\$0.00	12	4.33	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.18	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.03	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.06	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.02	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.04	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.04	\$0.01	4	0.78	\$0.05
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	6.49	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	6.49	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	\$0.00	15	2.12	\$0.03
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	\$0.00	15	1.24	\$0.05
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.00	\$0.00	15	2.70	\$0.02
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-22 Energy Efficiency Equipment Data, Natural Gas-College, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.02	\$0.03	16	3.06	\$0.19
Heating	Furnace	EF .82	0.03	\$0.09	16	1.66	\$0.35
Heating	Furnace	EF .90	0.06	\$0.08	16	4.03	\$0.14
Heating	Furnace	EF .96	0.08	\$0.12	16	3.72	\$0.16
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.02	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.04	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.06	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.08	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.04	-	15	-	-
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.01	12	2.59	\$0.21
Water Heating	Water Heating	Tankless	0.01	\$0.03	12	1.94	\$0.28
Water Heating	Water Heating	Indirect Fired	0.02	\$0.02	12	5.07	\$0.11
Water Heating	Water Heating	EF 0.94	0.03	(\$0.01)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.02	\$0.01	12	> 10	\$0.03
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.02	\$0.00	12	> 10	\$0.02
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.06	\$0.00	12	> 10	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.00	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	0.00	-	5	-	-
Miscellaneous	Pool Heater	EF .95	0.00	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-23 Energy Efficiency Equipment Data, Electric-School Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.41	\$0.39	20	2.54	\$0.08
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.50	\$0.44	20	2.70	\$0.08
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.03	\$0.49	20	5.05	\$0.04
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.09	\$0.54	20	4.85	\$0.04
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.61	\$0.22	20	6.73	\$0.03
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.69	\$0.23	20	7.12	\$0.03
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.82	\$0.28	20	6.99	\$0.03
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.98	\$0.43	20	5.39	\$0.04
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1.02	\$0.48	20	5.07	\$0.04
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1.10	\$0.53	20	5.00	\$0.04
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.21	\$0.03	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	0.42	\$0.03	15	1.00	\$0.01
Cooling	Roof top AC	EER 12.0	0.55	\$0.09	15	3.65	\$0.02
Cooling	Roof top AC	Ductless Minisplit	0.69	\$0.31	15	1.75	\$0.05
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.19	\$0.03	15	-	\$0.01
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.31	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.41	\$0.10	15	2.05	\$0.02
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.45	\$0.15	15	1.90	\$0.03
Cooling	Air Source Heat Pump	Ductless Minisplit	0.56	\$0.25	15	2.06	\$0.04
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.11	\$0.05	15	3.83	\$0.05
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.20	\$0.11	15	3.40	\$0.06
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.48	\$0.15	15	6.11	\$0.03
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.07	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.16	\$0.02	15	> 10	\$0.01
Cooling	PTAC	EER 11	0.18	\$0.02	15	> 10	\$0.01
Cooling	PTAC	EER 11.5	0.24	\$0.03	15	> 10	\$0.01
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.07	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.16	\$0.02	15	> 10	\$0.01
Cooling	PTHP	EER 11	0.18	\$0.02	15	> 10	\$0.01
Cooling	PTHP	EER 11.5	0.24	\$0.03	15	> 10	\$0.01
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.19	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.50	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.09	\$0.01	15	-	\$0.01
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.17	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.25	\$0.03	15	1.22	\$0.01
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.25	\$0.05	15	0.81	\$0.02
Heating	Air Source Heat Pump	Ductless Minisplit	0.32	\$0.09	15	0.93	\$0.03
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.19	\$0.03	15	3.86	\$0.01
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.44	\$0.05	15	4.33	\$0.01
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.13	\$0.07	15	8.21	\$0.01

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.01	15	-	-
Heating	PTAC	EER 11	-	\$0.01	15	-	-
Heating	PTAC	EER 11.5	-	\$0.01	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.14	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.32	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11	0.38	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.51	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	0.63	(\$0.17)	10	1.00	(\$0.04)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.01	\$0.00	15	2.22	\$0.03
Water Heating	Water Heating	EF 2.0	0.54	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.61	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.63	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.05	\$0.00	3	1.06	\$0.02
Interior Lighting	Screw-in	70W HIR PAR-38	0.08	\$0.00	3	1.40	\$0.02
Interior Lighting	Screw-in	CFL	0.15	\$0.00	2.2	6.49	\$0.01
Interior Lighting	Screw-in	LED (2010)	0.16	\$0.03	20	3.10	\$0.01
Interior Lighting	Screw-in	LED (2020)	0.19	\$0.01	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.12	\$0.09	15	0.27	\$0.08
Interior Lighting	High-Bay Fixtures	T8	0.12	(\$0.01)	10	1.00	(\$0.01)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.13	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.15	\$0.01	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.15	\$0.01	10	1.00	\$0.01
Interior Lighting	High-Bay Fixtures	LED (2020)	0.23	\$0.02	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.99	\$4.52	15	1.00	\$0.47
Interior Lighting	Linear Fluorescent	T8	1.03	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.43	\$0.66	10	1.00	\$0.06
Interior Lighting	Linear Fluorescent	T5	1.66	\$0.50	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	LED (2020)	3.10	\$1.24	15	-	\$0.04
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.05	\$0.00	3	1.10	\$0.02
Exterior Lighting	Screw-in	70W HIR PAR-38	0.07	\$0.00	3	1.41	\$0.02
Exterior Lighting	Screw-in	CFL	0.14	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.15	\$0.06	20	1.24	\$0.04
Exterior Lighting	Screw-in	LED (2020)	0.17	\$0.02	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.30	\$0.64	15	0.12	\$0.22
Exterior Lighting	HID	T8	0.31	(\$0.02)	10	1.00	(\$0.01)
Exterior Lighting	HID	High Pressure Sodium	0.33	\$0.01	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.38	\$0.02	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.39	\$0.02	10	1.00	\$0.01
Exterior Lighting	HID	LED (2020)	0.58	\$0.17	15	-	\$0.03

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.47
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.06
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.04
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.07	\$0.00	12	8.17	\$0.01
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.08	\$0.01	12	5.16	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.04	\$0.00	12	8.87	\$0.01
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.04	\$0.00	12	7.97	\$0.01
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.06	\$0.00	12	9.51	\$0.01
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.00	12	-	\$0.02
Refrigeration	Glass Door Display	8400 kWh/yr	0.07	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.09	\$0.00	12	2.12	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.01	\$0.01	12	-	\$0.05
Refrigeration	Open Display Case	4330 kWh/yr	0.03	\$0.01	12	0.87	\$0.03
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.01	10	0.35	\$0.15
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.02	\$0.02	10	0.35	\$0.15
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.02	\$0.03	10	0.35	\$0.15
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	1.92	\$0.03
Refrigeration	Vending Machine	2400 kWh/year	0.03	\$0.01	12	1.92	\$0.03
Refrigeration	Vending Machine	1700 kWh/year	0.04	\$0.00	12	4.15	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.02	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.11	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.07	\$0.00	12	7.37	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.08	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.05	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.04	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.01	\$0.00	4	1.14	\$0.03
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.00	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-24 Energy Efficiency Equipment Data, Natural Gas-School, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.02	16	3.00	\$0.19
Heating	Furnace	EF .82	0.01	\$0.04	16	1.62	\$0.36
Heating	Furnace	EF .90	0.03	\$0.04	16	3.94	\$0.15
Heating	Furnace	EF .96	0.03	\$0.05	16	3.64	\$0.16
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.01	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.02	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.03	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.04	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.02	\$0.00	15	> 10	\$0.01
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.00	\$0.01	12	2.49	\$0.22
Water Heating	Water Heating	Tankless	0.01	\$0.02	12	1.86	\$0.29
Water Heating	Water Heating	Indirect Fired	0.01	\$0.01	12	4.87	\$0.11
Water Heating	Water Heating	EF 0.94	0.02	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	> 10	\$0.04
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.01	\$0.00	12	> 10	\$0.04
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.02	\$0.00	12	> 10	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.00	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.00	\$0.00	5	1.00	\$0.04
Miscellaneous	Pool Heater	EF .90	0.00	\$0.00	5	1.35	\$0.23
Miscellaneous	Pool Heater	EF .95	0.00	\$0.00	5	1.81	\$0.19
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-25 Energy Efficiency Equipment Data, Electric-School, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.37	\$0.42	20	2.10	\$0.10
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.44	\$0.47	20	2.23	\$0.09
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.92	\$0.53	20	4.16	\$0.05
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	0.97	\$0.58	20	3.99	\$0.05
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.52	\$0.21	20	5.91	\$0.04
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.59	\$0.23	20	6.26	\$0.03
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.70	\$0.27	20	6.14	\$0.03
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.84	\$0.42	20	4.73	\$0.04
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.87	\$0.47	20	4.46	\$0.05
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.94	\$0.51	20	4.39	\$0.05
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.19	\$0.02	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	0.37	\$0.03	15	1.00	\$0.01
Cooling	Roof top AC	EER 12.0	0.49	\$0.09	15	3.32	\$0.02
Cooling	Roof top AC	Ductless Minisplit	0.61	\$0.30	15	1.60	\$0.05
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.17	\$0.03	15	-	\$0.02
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.27	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.36	\$0.10	15	1.86	\$0.03
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.40	\$0.14	15	1.73	\$0.04
Cooling	Air Source Heat Pump	Ductless Minisplit	0.50	\$0.24	15	1.88	\$0.05
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.12	\$0.07	15	3.49	\$0.06
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.22	\$0.14	15	3.10	\$0.06
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.54	\$0.19	15	5.56	\$0.04
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.06	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.14	\$0.02	15	> 10	\$0.01
Cooling	PTAC	EER 11	0.16	\$0.02	15	> 10	\$0.01
Cooling	PTAC	EER 11.5	0.21	\$0.02	15	> 10	\$0.01
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.06	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.14	\$0.02	15	> 10	\$0.01
Cooling	PTHP	EER 11	0.16	\$0.02	15	> 10	\$0.01
Cooling	PTHP	EER 11.5	0.21	\$0.02	15	> 10	\$0.01
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.19	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.50	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.09	\$0.01	15	-	\$0.01
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.17	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.24	\$0.05	15	0.88	\$0.02
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.24	\$0.07	15	0.59	\$0.03
Heating	Air Source Heat Pump	Ductless Minisplit	0.31	\$0.11	15	0.67	\$0.04
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.19	\$0.03	15	2.81	\$0.02
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.43	\$0.07	15	3.15	\$0.02
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.11	\$0.10	15	5.98	\$0.01

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.01	15	-	-
Heating	PTAC	EER 11	-	\$0.01	15	-	-
Heating	PTAC	EER 11.5	-	\$0.01	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.13	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.31	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11	0.37	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.50	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	1.13	(\$0.30)	10	1.00	(\$0.04)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.01	\$0.00	15	2.31	\$0.02
Water Heating	Water Heating	EF 2.0	0.51	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.58	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.59	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.05	\$0.00	3	1.06	\$0.02
Interior Lighting	Screw-in	70W HIR PAR-38	0.08	\$0.00	3	1.40	\$0.02
Interior Lighting	Screw-in	CFL	0.15	\$0.00	2.2	6.49	\$0.01
Interior Lighting	Screw-in	LED (2010)	0.16	\$0.03	20	3.10	\$0.01
Interior Lighting	Screw-in	LED (2020)	0.19	\$0.01	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.12	\$0.09	15	0.27	\$0.08
Interior Lighting	High-Bay Fixtures	T8	0.12	(\$0.01)	10	1.00	(\$0.01)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.13	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.15	\$0.01	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.15	\$0.01	10	1.00	\$0.01
Interior Lighting	High-Bay Fixtures	LED (2020)	0.23	\$0.02	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.99	\$4.52	15	1.00	\$0.47
Interior Lighting	Linear Fluorescent	T8	1.03	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.43	\$0.66	10	1.00	\$0.06
Interior Lighting	Linear Fluorescent	T5	1.66	\$0.50	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	LED (2020)	3.10	\$1.24	15	-	\$0.04
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.05	\$0.00	3	1.10	\$0.02
Exterior Lighting	Screw-in	70W HIR PAR-38	0.07	\$0.00	3	1.41	\$0.02
Exterior Lighting	Screw-in	CFL	0.14	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.15	\$0.06	20	1.24	\$0.04
Exterior Lighting	Screw-in	LED (2020)	0.17	\$0.02	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.30	\$0.64	15	0.12	\$0.22
Exterior Lighting	HID	T8	0.31	(\$0.02)	10	1.00	(\$0.01)
Exterior Lighting	HID	High Pressure Sodium	0.33	\$0.01	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.38	\$0.02	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.39	\$0.02	10	1.00	\$0.01
Exterior Lighting	HID	LED (2020)	0.58	\$0.17	15	-	\$0.03

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.47
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.06
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.04
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.07	\$0.00	12	8.17	\$0.01
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.08	\$0.01	12	5.16	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.04	\$0.00	12	8.87	\$0.01
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.04	\$0.00	12	7.97	\$0.01
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.06	\$0.00	12	9.51	\$0.01
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.00	12	-	\$0.02
Refrigeration	Glass Door Display	8400 kWh/yr	0.07	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.09	\$0.00	12	2.12	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.01	\$0.01	12	-	\$0.05
Refrigeration	Open Display Case	4330 kWh/yr	0.03	\$0.01	12	0.87	\$0.03
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.01	10	0.35	\$0.15
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.02	\$0.02	10	0.35	\$0.15
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.02	\$0.03	10	0.35	\$0.15
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	1.92	\$0.03
Refrigeration	Vending Machine	2400 kWh/year	0.03	\$0.01	12	1.92	\$0.03
Refrigeration	Vending Machine	1700 kWh/year	0.04	\$0.00	12	4.15	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.02	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.11	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.07	\$0.00	12	7.37	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.08	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.05	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.04	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.01	\$0.00	4	1.14	\$0.03
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	\$0.00	15	> 10	\$0.00
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.00	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-26 Energy Efficiency Equipment Data, Natural Gas-School, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.02	16	3.06	\$0.19
Heating	Furnace	EF .82	0.01	\$0.04	16	1.66	\$0.35
Heating	Furnace	EF .90	0.03	\$0.04	16	4.03	\$0.14
Heating	Furnace	EF .96	0.03	\$0.05	16	3.72	\$0.16
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.01	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.02	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.02	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.04	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.02	\$0.00	15	> 10	\$0.01
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.00	\$0.01	12	2.59	\$0.21
Water Heating	Water Heating	Tankless	0.01	\$0.01	12	1.94	\$0.28
Water Heating	Water Heating	Indirect Fired	0.01	\$0.01	12	5.07	\$0.11
Water Heating	Water Heating	EF 0.94	0.02	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.01
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	> 10	\$0.04
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.01	\$0.00	12	> 10	\$0.04
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.02	\$0.00	12	> 10	\$0.01
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.00	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.00	\$0.00	5	1.00	\$0.04
Miscellaneous	Pool Heater	EF .90	0.00	\$0.00	5	1.35	\$0.23
Miscellaneous	Pool Heater	EF .95	0.00	\$0.00	5	1.81	\$0.19
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-27 Energy Efficiency Equipment Data, Electric-Health, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.66	\$0.57	20	1.11	\$0.08
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.79	\$0.65	20	1.17	\$0.07
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.64	\$0.72	20	2.20	\$0.04
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.74	\$0.80	20	2.11	\$0.04
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.75	\$0.22	20	3.32	\$0.03
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.85	\$0.23	20	3.51	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	1.00	\$0.28	20	3.45	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1.20	\$0.44	20	2.66	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1.25	\$0.48	20	2.50	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1.35	\$0.53	20	2.46	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.54	\$0.03	15	-	\$0.01
Cooling	Roof top AC	EER 11.2	1.08	\$0.03	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	1.41	\$0.11	15	3.36	\$0.01
Cooling	Roof top AC	Ductless Minisplit	1.77	\$0.35	15	1.62	\$0.02
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.60	\$0.04	15	-	\$0.01
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.96	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	1.27	\$0.14	15	1.89	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	1.40	\$0.20	15	1.75	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	1.77	\$0.34	15	1.90	\$0.02
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.34	\$0.07	15	3.53	\$0.02
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.61	\$0.15	15	3.13	\$0.03
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	1.50	\$0.21	15	5.63	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.17	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.40	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.46	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.61	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.17	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.40	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.46	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.61	\$0.02	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.50	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	1.28	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.08	\$0.01	15	-	\$0.01
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.15	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.21	\$0.02	15	1.72	\$0.01
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.21	\$0.03	15	1.15	\$0.01
Heating	Air Source Heat Pump	Ductless Minisplit	0.28	\$0.05	15	1.31	\$0.02
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.17	\$0.02	15	5.75	\$0.01
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.40	\$0.03	15	6.45	\$0.01
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.03	\$0.04	15	> 10	\$0.00

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.02	15	-	-
Heating	PTAC	EER 11	-	\$0.02	15	-	-
Heating	PTAC	EER 11.5	-	\$0.02	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.12	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.28	\$0.01	15	9.98	\$0.01
Heating	PTHP	EER 11	0.34	\$0.02	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.45	\$0.02	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	2.04	(\$0.14)	10	1.00	(\$0.01)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.00	15	4.29	\$0.01
Water Heating	Water Heating	EF 2.0	1.10	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	1.23	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	1.27	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.38	\$0.01	3	1.70	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.59	\$0.02	3	2.28	\$0.01
Interior Lighting	Screw-in	CFL	1.11	\$0.01	2.2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	1.20	\$0.12	20	4.99	\$0.01
Interior Lighting	Screw-in	LED (2020)	1.38	\$0.03	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.17	\$0.08	15	0.26	\$0.05
Interior Lighting	High-Bay Fixtures	T8	0.17	(\$0.01)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.18	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.21	\$0.01	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.22	\$0.01	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.32	\$0.02	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.94	\$2.63	15	1.00	\$0.29
Interior Lighting	Linear Fluorescent	T8	0.98	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.36	\$0.38	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	T5	1.58	\$0.29	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	2.94	\$0.72	15	-	\$0.03
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.01	\$0.00	3	1.80	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.01	\$0.00	3	2.29	\$0.01
Exterior Lighting	Screw-in	CFL	0.03	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.03	\$0.01	20	2.01	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.03	\$0.00	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.17	\$0.23	15	0.19	\$0.14
Exterior Lighting	HID	T8	0.18	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.19	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.22	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.23	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.33	\$0.06	15	-	\$0.02

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.29
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.03
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.08	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.09	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.01	12	-	\$0.02
Refrigeration	Glass Door Display	8400 kWh/yr	0.08	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.09	\$0.01	12	1.60	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.02	\$0.01	12	-	\$0.07
Refrigeration	Open Display Case	4330 kWh/yr	0.03	\$0.01	12	0.65	\$0.04
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.01	10	0.26	\$0.20
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.02	\$0.02	10	0.26	\$0.20
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.02	\$0.04	10	0.26	\$0.20
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	1.55	\$0.04
Refrigeration	Vending Machine	2400 kWh/year	0.03	\$0.01	12	1.55	\$0.04
Refrigeration	Vending Machine	1700 kWh/year	0.05	\$0.01	12	3.35	\$0.02
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.07	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.36	\$0.01	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.23	\$0.01	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.13	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.02	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.03	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.05	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.04	\$0.02	4	0.28	\$0.14
Miscellaneous	Non-HVAC Motors	Standard (EPAAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAAct 2015)	0.01	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.01	\$0.00	15	7.43	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.02	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.02	\$0.00	15	7.43	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.03	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.01	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-28 Energy Efficiency Equipment Data, Natural Gas-Health, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.03	\$0.04	16	4.39	\$0.13
Heating	Furnace	EF .82	0.04	\$0.10	16	2.37	\$0.25
Heating	Furnace	EF .90	0.08	\$0.09	16	5.78	\$0.10
Heating	Furnace	EF .96	0.11	\$0.12	16	5.33	\$0.11
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.05	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.08	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.12	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.17	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.06	-	15	-	-
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.02	\$0.02	12	5.06	\$0.11
Water Heating	Water Heating	Tankless	0.03	\$0.03	12	3.80	\$0.14
Water Heating	Water Heating	Indirect Fired	0.05	\$0.02	12	9.91	\$0.05
Water Heating	Water Heating	EF 0.94	0.08	(\$0.01)	12	1.00	(\$0.01)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.05	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.08	\$0.04	12	8.47	\$0.06
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.07	\$0.00	12	> 10	\$0.01
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.19	\$0.00	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.02	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.01	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	0.03	-	5	-	-
Miscellaneous	Pool Heater	EF .95	0.04	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-29 Energy Efficiency Equipment Data, Electric-Health, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.58	\$0.50	20	1.11	\$0.08
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.69	\$0.57	20	1.18	\$0.07
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	1.44	\$0.63	20	2.21	\$0.04
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	1.53	\$0.70	20	2.12	\$0.04
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.72	\$0.21	20	3.29	\$0.03
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.81	\$0.23	20	3.48	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.96	\$0.27	20	3.41	\$0.03
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1.15	\$0.42	20	2.63	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1.20	\$0.47	20	2.47	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1.30	\$0.51	20	2.44	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.47	\$0.02	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	0.94	\$0.02	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	1.23	\$0.06	15	4.99	\$0.01
Cooling	Roof top AC	Ductless Minisplit	1.55	\$0.21	15	2.40	\$0.01
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.60	\$0.02	15	-	\$0.00
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.96	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	1.27	\$0.09	15	2.80	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	1.40	\$0.14	15	2.60	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	1.77	\$0.23	15	2.82	\$0.01
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.34	\$0.05	15	5.24	\$0.02
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.61	\$0.10	15	4.66	\$0.02
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	1.50	\$0.14	15	8.36	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.16	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.37	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.42	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.56	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.16	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.37	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.42	\$0.02	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.56	\$0.02	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.50	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	1.28	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.05	\$0.01	15	-	\$0.01
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.09	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.14	\$0.02	15	1.12	\$0.02
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.14	\$0.03	15	0.75	\$0.02
Heating	Air Source Heat Pump	Ductless Minisplit	0.19	\$0.06	15	0.88	\$0.03
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.16	\$0.01	15	8.58	\$0.01
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.37	\$0.02	15	9.63	\$0.01
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.97	\$0.03	15	> 10	\$0.00

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	0.00	\$0.00	15	0.31	\$0.17
Heating	PTAC	EER 10.8	0.00	\$0.01	15	0.10	\$0.53
Heating	PTAC	EER 11	0.00	\$0.01	15	0.09	\$0.57
Heating	PTAC	EER 11.5	0.00	\$0.01	15	0.08	\$0.67
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.11	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.26	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11	0.30	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.41	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	3.17	(\$0.22)	10	1.00	(\$0.01)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.00	15	4.51	\$0.01
Water Heating	Water Heating	EF 2.0	1.04	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	1.17	\$0.01	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	1.21	\$0.01	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.38	\$0.01	3	1.70	\$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	0.59	\$0.02	3	2.28	\$0.01
Interior Lighting	Screw-in	CFL	1.11	\$0.01	2.2	> 10	\$0.00
Interior Lighting	Screw-in	LED (2010)	1.20	\$0.12	20	4.99	\$0.01
Interior Lighting	Screw-in	LED (2020)	1.38	\$0.03	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.17	\$0.08	15	0.26	\$0.05
Interior Lighting	High-Bay Fixtures	T8	0.17	(\$0.01)	10	1.00	(\$0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.18	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.21	\$0.01	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.22	\$0.01	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.32	\$0.02	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.94	\$2.63	15	1.00	\$0.29
Interior Lighting	Linear Fluorescent	T8	0.98	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	1.36	\$0.38	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	T5	1.58	\$0.29	10	1.00	\$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	2.94	\$0.72	15	-	\$0.03
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.01	\$0.00	3	1.80	\$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.01	\$0.00	3	2.29	\$0.01
Exterior Lighting	Screw-in	CFL	0.03	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.03	\$0.01	20	2.01	\$0.02
Exterior Lighting	Screw-in	LED (2020)	0.03	\$0.00	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.17	\$0.23	15	0.19	\$0.14
Exterior Lighting	HID	T8	0.18	(\$0.01)	10	1.00	(\$0.00)
Exterior Lighting	HID	High Pressure Sodium	0.19	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.22	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.23	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.33	\$0.06	15	-	\$0.02

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.29
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.03
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.07	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.08	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.09	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.01	12	-	\$0.02
Refrigeration	Glass Door Display	8400 kWh/yr	0.08	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.09	\$0.01	12	1.60	\$0.01
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.01	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.02	\$0.01	12	-	\$0.07
Refrigeration	Open Display Case	4330 kWh/yr	0.03	\$0.01	12	0.65	\$0.04
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.01	10	0.26	\$0.20
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.02	\$0.02	10	0.26	\$0.20
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.02	\$0.04	10	0.26	\$0.20
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	1.03	\$0.05
Refrigeration	Vending Machine	2400 kWh/year	0.02	\$0.01	12	1.03	\$0.05
Refrigeration	Vending Machine	1700 kWh/year	0.03	\$0.01	12	2.23	\$0.03
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.07	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.36	\$0.01	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.23	\$0.01	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.13	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.02	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.03	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.01	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.05	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.04	\$0.02	4	0.28	\$0.14
Miscellaneous	Non-HVAC Motors	Standard (EPAAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAAct 2015)	0.01	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.01	\$0.00	15	7.43	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.02	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.02	\$0.00	15	7.43	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.03	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.01	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-30 Energy Efficiency Equipment Data, Natural Gas-Health, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.02	\$0.03	16	3.85	\$0.15
Heating	Furnace	EF .82	0.03	\$0.09	16	2.08	\$0.28
Heating	Furnace	EF .90	0.06	\$0.08	16	5.07	\$0.12
Heating	Furnace	EF .96	0.09	\$0.11	16	4.67	\$0.12
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.02	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.03	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.05	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.07	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.06	-	15	-	-
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.02	\$0.02	12	4.67	\$0.12
Water Heating	Water Heating	Tankless	0.03	\$0.03	12	3.50	\$0.15
Water Heating	Water Heating	Indirect Fired	0.05	\$0.02	12	9.18	\$0.06
Water Heating	Water Heating	EF 0.94	0.08	(\$0.01)	12	1.00	(\$0.01)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.05	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.08	\$0.04	12	8.47	\$0.06
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.07	\$0.00	12	> 10	\$0.01
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.19	\$0.00	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.02	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.01	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	0.03	-	5	-	-
Miscellaneous	Pool Heater	EF .95	0.04	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-31 Energy Efficiency Equipment Data, Electric-Lodging, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.11	\$0.07	20	1.80	\$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.13	\$0.07	20	1.92	\$0.05
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.27	\$0.08	20	3.58	\$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	0.28	\$0.09	20	3.44	\$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.13	\$0.03	20	4.58	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.15	\$0.03	20	4.84	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.18	\$0.04	20	4.75	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.21	\$0.06	20	3.66	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.22	\$0.07	20	3.45	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.24	\$0.08	20	3.40	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.07	\$0.00	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	0.14	\$0.00	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.18	\$0.01	15	4.66	\$0.01
Cooling	Roof top AC	Ductless Minisplit	0.22	\$0.04	15	2.24	\$0.02
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.07	\$0.00	15	-	\$0.01
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.12	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.15	\$0.01	15	2.61	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.17	\$0.02	15	2.43	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	0.21	\$0.03	15	2.63	\$0.02
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.15	\$0.01	15	> 10	\$0.00
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.28	\$0.01	15	> 10	\$0.00
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.69	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.07	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.16	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.18	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.24	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.07	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.16	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.18	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.24	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.20	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.50	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.02	\$0.00	15	-	\$0.01
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.04	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.06	\$0.01	15	1.27	\$0.01
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.06	\$0.01	15	0.84	\$0.02
Heating	Air Source Heat Pump	Ductless Minisplit	0.08	\$0.02	15	0.96	\$0.03
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.09	\$0.00	15	> 10	\$0.00
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.20	\$0.00	15	> 10	\$0.00
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.53	\$0.01	15	> 10	\$0.00

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.01	15	-	-
Heating	PTAC	EER 11	-	\$0.01	15	-	-
Heating	PTAC	EER 11.5	-	\$0.01	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.06	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.14	\$0.01	15	9.98	\$0.01
Heating	PTHP	EER 11	0.16	\$0.01	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.22	\$0.01	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	0.40	(\$0.06)	10	1.00	(\$0.02)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.01	15	1.56	\$0.04
Water Heating	Water Heating	EF 2.0	1.11	\$0.02	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	1.25	\$0.02	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	1.29	\$0.02	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	1.19	\$0.06	3	1.37	\$0.02
Interior Lighting	Screw-in	70W HIR PAR-38	1.82	\$0.08	3	1.81	\$0.02
Interior Lighting	Screw-in	CFL	3.41	\$0.03	2.2	8.44	\$0.00
Interior Lighting	Screw-in	LED (2010)	3.70	\$0.48	20	4.01	\$0.01
Interior Lighting	Screw-in	LED (2020)	4.27	\$0.13	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.05	\$0.03	15	0.32	\$0.06
Interior Lighting	High-Bay Fixtures	T8	0.05	(\$0.00)	10	1.00	(\$0.01)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.06	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.07	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.07	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.10	\$0.01	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.24	\$0.83	15	1.00	\$0.36
Interior Lighting	Linear Fluorescent	T8	0.25	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	0.34	\$0.12	10	1.00	\$0.05
Interior Lighting	Linear Fluorescent	T5	0.40	\$0.09	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	LED (2020)	0.74	\$0.23	15	-	\$0.03
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.11	\$0.01	3	1.43	\$0.02
Exterior Lighting	Screw-in	70W HIR PAR-38	0.17	\$0.01	3	1.82	\$0.02
Exterior Lighting	Screw-in	CFL	0.31	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.34	\$0.11	20	1.60	\$0.03
Exterior Lighting	Screw-in	LED (2020)	0.39	\$0.03	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.11	\$0.18	15	0.15	\$0.17
Exterior Lighting	HID	T8	0.11	(\$0.00)	10	1.00	(\$0.01)
Exterior Lighting	HID	High Pressure Sodium	0.12	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.14	\$0.00	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.15	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.21	\$0.05	15	-	\$0.02

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.36
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.05
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.03
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.08	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.09	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.10	\$0.01	12	7.59	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.04	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.00	12	-	\$0.02
Refrigeration	Glass Door Display	8400 kWh/yr	0.09	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.11	\$0.00	12	2.35	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.02	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.02	\$0.01	12	-	\$0.05
Refrigeration	Open Display Case	4330 kWh/yr	0.03	\$0.01	12	0.96	\$0.03
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.01	10	0.39	\$0.14
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.01	\$0.01	10	0.39	\$0.14
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.01	\$0.01	10	0.39	\$0.14
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.01	\$0.00	12	2.03	\$0.03
Refrigeration	Vending Machine	2400 kWh/year	0.04	\$0.01	12	2.03	\$0.03
Refrigeration	Vending Machine	1700 kWh/year	0.05	\$0.00	12	4.39	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.03	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.02	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.00	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.01	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.00	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.00	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.00	\$0.00	4	0.33	\$0.12
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	5.88	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	5.88	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	\$0.00	15	3.49	\$0.02
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	\$0.00	15	2.05	\$0.03
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-32 Energy Efficiency Equipment Data, Natural Gas-Lodging, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.01	16	6.59	\$0.09
Heating	Furnace	EF .82	0.01	\$0.02	16	3.56	\$0.16
Heating	Furnace	EF .90	0.03	\$0.02	16	8.68	\$0.07
Heating	Furnace	EF .96	0.04	\$0.03	16	8.00	\$0.07
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.01	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.02	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.03	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.05	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.02	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.03	12	1.70	\$0.32
Water Heating	Water Heating	Tankless	0.02	\$0.06	12	1.28	\$0.42
Water Heating	Water Heating	Indirect Fired	0.03	\$0.04	12	3.34	\$0.16
Water Heating	Water Heating	EF 0.94	0.05	(\$0.01)	12	1.00	(\$0.03)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.02	\$0.01	12	> 10	\$0.03
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.02	\$0.00	12	> 10	\$0.01
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.06	\$0.00	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.00	\$0.00	5	1.00	\$0.18
Miscellaneous	Pool Heater	EF .90	0.00	\$0.01	5	0.26	\$1.17
Miscellaneous	Pool Heater	EF .95	0.00	\$0.01	5	0.35	\$0.99
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-33 Energy Efficiency Equipment Data, Electric-Lodging, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.10	\$0.06	20	1.86	\$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.12	\$0.07	20	1.97	\$0.05
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.25	\$0.07	20	3.69	\$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	0.26	\$0.08	20	3.54	\$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.12	\$0.03	20	4.69	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.14	\$0.03	20	4.96	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.17	\$0.04	20	4.86	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.20	\$0.06	20	3.75	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.21	\$0.06	20	3.53	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.22	\$0.07	20	3.48	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.07	\$0.00	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	0.14	\$0.00	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.18	\$0.01	15	4.90	\$0.01
Cooling	Roof top AC	Ductless Minisplit	0.23	\$0.04	15	2.36	\$0.02
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.07	\$0.00	15	-	\$0.00
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.12	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.16	\$0.01	15	2.75	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.17	\$0.02	15	2.55	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	0.22	\$0.03	15	2.77	\$0.02
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.14	\$0.01	15	> 10	\$0.00
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.26	\$0.01	15	> 10	\$0.00
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.65	\$0.02	15	> 10	\$0.00
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.06	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.14	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.17	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.22	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.06	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.14	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.17	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.22	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.20	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.50	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.02	\$0.00	15	-	\$0.02
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.04	\$0.00	15	1.00	\$0.00
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.06	\$0.01	15	0.85	\$0.02
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.06	\$0.02	15	0.56	\$0.03
Heating	Air Source Heat Pump	Ductless Minisplit	0.07	\$0.03	15	0.64	\$0.04
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.08	\$0.00	15	> 10	\$0.00
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.19	\$0.01	15	> 10	\$0.00
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.50	\$0.01	15	> 10	\$0.00

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	0.00	\$0.00	15	0.31	\$0.17
Heating	PTAC	EER 10.8	0.00	\$0.00	15	0.10	\$0.53
Heating	PTAC	EER 11	0.00	\$0.00	15	0.09	\$0.57
Heating	PTAC	EER 11.5	0.00	\$0.01	15	0.08	\$0.67
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.05	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.12	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 11	0.15	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.20	\$0.00	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	0.29	(\$0.11)	10	1.00	(\$0.05)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.02	\$0.01	15	1.56	\$0.04
Water Heating	Water Heating	EF 2.0	1.06	\$0.02	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	1.19	\$0.02	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	1.22	\$0.02	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	1.19	\$0.06	3	1.37	\$0.02
Interior Lighting	Screw-in	70W HIR PAR-38	1.82	\$0.08	3	1.81	\$0.02
Interior Lighting	Screw-in	CFL	3.41	\$0.03	2.2	8.44	\$0.00
Interior Lighting	Screw-in	LED (2010)	3.70	\$0.48	20	4.01	\$0.01
Interior Lighting	Screw-in	LED (2020)	4.27	\$0.13	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.05	\$0.03	15	0.32	\$0.06
Interior Lighting	High-Bay Fixtures	T8	0.05	(\$0.00)	10	1.00	(\$0.01)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.06	\$0.00	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.07	\$0.00	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.07	\$0.00	10	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	0.10	\$0.01	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.24	\$0.83	15	1.00	\$0.36
Interior Lighting	Linear Fluorescent	T8	0.25	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	0.34	\$0.12	10	1.00	\$0.05
Interior Lighting	Linear Fluorescent	T5	0.40	\$0.09	10	1.00	\$0.03
Interior Lighting	Linear Fluorescent	LED (2020)	0.74	\$0.23	15	-	\$0.03
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.11	\$0.01	3	1.43	\$0.02
Exterior Lighting	Screw-in	70W HIR PAR-38	0.17	\$0.01	3	1.82	\$0.02
Exterior Lighting	Screw-in	CFL	0.31	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.34	\$0.11	20	1.60	\$0.03
Exterior Lighting	Screw-in	LED (2020)	0.39	\$0.03	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.11	\$0.18	15	0.15	\$0.17
Exterior Lighting	HID	T8	0.11	(\$0.00)	10	1.00	(\$0.01)
Exterior Lighting	HID	High Pressure Sodium	0.12	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.14	\$0.00	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.15	\$0.01	10	1.00	\$0.00
Exterior Lighting	HID	LED (2020)	0.21	\$0.05	15	-	\$0.02

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.36
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.05
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.03
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.03
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.08	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.09	\$0.00	12	> 10	\$0.00
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.10	\$0.01	12	7.59	\$0.01
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	0.02	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	0.03	\$0.00	12	> 10	\$0.00
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	0.04	\$0.00	12	> 10	\$0.00
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	0.03	\$0.00	12	-	\$0.02
Refrigeration	Glass Door Display	8400 kWh/yr	0.09	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	0.11	\$0.00	12	2.35	\$0.00
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	0.02	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	0.02	\$0.01	12	-	\$0.05
Refrigeration	Open Display Case	4330 kWh/yr	0.03	\$0.01	12	0.96	\$0.03
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.01	\$0.01	10	0.39	\$0.14
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.01	\$0.01	10	0.39	\$0.14
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.01	\$0.01	10	0.39	\$0.14
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.02	\$0.00	12	3.18	\$0.02
Refrigeration	Vending Machine	2400 kWh/year	0.06	\$0.01	12	3.18	\$0.02
Refrigeration	Vending Machine	1700 kWh/year	0.07	\$0.00	12	6.88	\$0.01
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.04	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	0.03	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.02	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.00	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.01	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.00	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.00	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.00	\$0.00	4	0.33	\$0.12
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	5.88	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	5.88	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.01
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	0.00	\$0.00	15	3.49	\$0.02
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	0.00	\$0.00	15	2.05	\$0.03
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	0.01	\$0.00	15	> 10	\$0.00
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-34 Energy Efficiency Equipment Data, Natural Gas-Lodging, New Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.00	16	8.88	\$0.07
Heating	Furnace	EF .82	0.01	\$0.01	16	4.81	\$0.12
Heating	Furnace	EF .90	0.02	\$0.01	16	> 10	\$0.05
Heating	Furnace	EF .96	0.03	\$0.01	16	> 10	\$0.05
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.01	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.02	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.02	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.04	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.02	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.01	\$0.02	12	1.71	\$0.32
Water Heating	Water Heating	Tankless	0.01	\$0.05	12	1.28	\$0.42
Water Heating	Water Heating	Indirect Fired	0.03	\$0.04	12	3.35	\$0.16
Water Heating	Water Heating	EF 0.94	0.04	(\$0.01)	12	1.00	(\$0.03)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.02	\$0.01	12	> 10	\$0.03
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	0.02	\$0.00	12	> 10	\$0.01
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	0.00	\$0.00	12	> 10	\$0.01
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	0.06	\$0.00	12	> 10	\$0.00
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	0.01	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	0.00	\$0.00	5	1.00	\$0.18
Miscellaneous	Pool Heater	EF .90	0.00	\$0.01	5	0.26	\$1.17
Miscellaneous	Pool Heater	EF .95	0.00	\$0.01	5	0.35	\$0.99
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-35 Energy Efficiency Equipment Data, Electric-Warehouse, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.22	\$0.09	20	7.60	\$0.04
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.27	\$0.10	20	8.07	\$0.03
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.56	\$0.11	20	> 10	\$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	0.59	\$0.13	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.34	\$0.05	20	> 10	\$0.01
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.39	\$0.06	20	> 10	\$0.01
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.46	\$0.07	20	> 10	\$0.01
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.55	\$0.11	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.57	\$0.12	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.62	\$0.13	20	> 10	\$0.02
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.25	\$0.01	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	0.51	\$0.01	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.66	\$0.03	15	> 10	\$0.00
Cooling	Roof top AC	Ductless Minisplit	0.83	\$0.09	15	8.98	\$0.01
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.28	\$0.01	15	-	\$0.00
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.44	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.58	\$0.04	15	> 10	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.64	\$0.05	15	9.73	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	0.81	\$0.09	15	> 10	\$0.01
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.15	\$0.02	15	> 10	\$0.01
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.28	\$0.04	15	> 10	\$0.01
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.69	\$0.05	15	> 10	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.08	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.19	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.22	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.29	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.08	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.19	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.22	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.29	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.24	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.60	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.00	\$0.12	15	-	\$2.82
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.01	\$0.01	15	1.00	\$0.21
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.01	\$0.43	15	0.00	\$5.12
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.01	\$0.63	15	0.00	\$7.59
Heating	Air Source Heat Pump	Ductless Minisplit	0.01	\$1.07	15	0.00	\$12.39
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.18	\$0.22	15	0.42	\$0.13
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.41	\$0.45	15	0.47	\$0.11
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1.06	\$0.61	15	0.90	\$0.06

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Heating	Electric Room Heat	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Heating	PTAC	EER 9.8	-	-	15	1.00	-
Heating	PTAC	EER 10.2	-	\$0.00	15	-	-
Heating	PTAC	EER 10.8	-	\$0.02	15	-	-
Heating	PTAC	EER 11	-	\$0.02	15	-	-
Heating	PTAC	EER 11.5	-	\$0.02	15	-	-
Heating	PTHP	EER 9.8	-	-	15	1.00	-
Heating	PTHP	EER 10.2	0.13	\$0.00	15	> 10	\$0.00
Heating	PTHP	EER 10.8	0.30	\$0.02	15	9.98	\$0.01
Heating	PTHP	EER 11	0.35	\$0.02	15	> 10	\$0.00
Heating	PTHP	EER 11.5	0.47	\$0.02	15	> 10	\$0.00
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	0.17	(\$0.06)	10	1.00	(\$0.05)
Water Heating	Water Heating	EF .97	-	-	15	1.00	-
Water Heating	Water Heating	EF .98	0.00	\$0.00	15	3.09	\$0.02
Water Heating	Water Heating	EF 2.0	0.11	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.3	0.13	\$0.00	15	> 10	\$0.00
Water Heating	Water Heating	EF 2.4	0.13	\$0.00	15	> 10	\$0.00
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	0.11	\$0.01	3	1.15	\$0.02
Interior Lighting	Screw-in	70W HIR PAR-38	0.17	\$0.01	3	1.60	\$0.02
Interior Lighting	Screw-in	CFL	0.32	\$0.00	2.2	7.72	\$0.00
Interior Lighting	Screw-in	LED (2010)	0.35	\$0.05	20	3.39	\$0.01
Interior Lighting	Screw-in	LED (2020)	0.40	\$0.01	20	-	\$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	0.27	\$0.19	15	-	\$0.07
Interior Lighting	High-Bay Fixtures	T8	0.27	(\$0.01)	10	1.00	(\$0.01)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	0.29	\$0.01	6	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	0.34	\$0.01	15	1.00	\$0.00
Interior Lighting	High-Bay Fixtures	T5	0.35	\$0.01	10	1.00	\$0.01
Interior Lighting	High-Bay Fixtures	LED (2020)	0.52	\$0.04	15	-	\$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	0.36	\$1.43	15	1.00	\$0.41
Interior Lighting	Linear Fluorescent	T8	0.37	(\$0.00)	10	1.00	(\$0.00)
Interior Lighting	Linear Fluorescent	Super T8	0.52	\$0.21	10	1.00	\$0.05
Interior Lighting	Linear Fluorescent	T5	0.60	\$0.16	10	1.00	\$0.04
Interior Lighting	Linear Fluorescent	LED (2020)	1.12	\$0.39	15	-	\$0.04
Exterior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.00	\$0.00	3	1.27	\$0.02
Exterior Lighting	Screw-in	70W HIR PAR-38	0.00	\$0.00	3	1.61	\$0.02
Exterior Lighting	Screw-in	CFL	0.00	\$0.00	6	> 10	\$0.00
Exterior Lighting	Screw-in	LED (2010)	0.00	\$0.00	20	1.42	\$0.03
Exterior Lighting	Screw-in	LED (2020)	0.00	\$0.00	20	-	\$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	0.18	\$0.33	15	0.14	\$0.19
Exterior Lighting	HID	T8	0.18	(\$0.01)	10	1.00	(\$0.01)
Exterior Lighting	HID	High Pressure Sodium	0.19	\$0.00	6	1.00	\$0.00
Exterior Lighting	HID	Light Emitting Plasma	0.23	\$0.01	15	1.00	\$0.00
Exterior Lighting	HID	T5	0.23	\$0.01	10	1.00	\$0.01
Exterior Lighting	HID	LED (2020)	0.34	\$0.09	15	-	\$0.03

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.00	\$0.00	15	1.00	\$0.41
Exterior Lighting	Linear Fluorescent	T8	0.00	(\$0.00)	10	1.00	(\$0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.00	\$0.00	10	1.00	\$0.05
Exterior Lighting	Linear Fluorescent	T5	0.00	\$0.00	10	1.00	\$0.04
Exterior Lighting	Linear Fluorescent	LED (2020)	0.00	\$0.00	15	-	\$0.04
Refrigeration	Walk-in Refrigerator	14600 kWh/yr	-	-	12	1.00	-
Refrigeration	Walk-in Refrigerator	10800 kWh/yr	0.37	-	12	-	-
Refrigeration	Walk-in Refrigerator	10000 kWh/yr	0.41	-	12	-	-
Refrigeration	Walk-in Refrigerator	9000 kWh/yr	0.46	-	12	-	-
Refrigeration	Reach-in Refrigerator	3800 kWh/yr	-	-	12	1.00	-
Refrigeration	Reach-in Refrigerator	3100 kWh/yr	-	-	12	-	-
Refrigeration	Reach-in Refrigerator	2500 kWh/yr	-	-	12	-	-
Refrigeration	Reach-in Refrigerator	2400 kWh/yr	-	-	12	-	-
Refrigeration	Reach-in Refrigerator	1500 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	14480 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	11700 kWh/yr	-	-	12	-	-
Refrigeration	Glass Door Display	8400 kWh/yr	-	-	12	1.00	-
Refrigeration	Glass Door Display	6800 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	6500 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	5350 kWh/yr	-	-	12	1.00	-
Refrigeration	Open Display Case	5300 kWh/yr	-	-	12	-	-
Refrigeration	Open Display Case	4330 kWh/yr	-	-	12	-	-
Refrigeration	Icemaker	7.0 kWh/100 lbs	-	-	10	1.00	-
Refrigeration	Icemaker	6.3 kWh/100 lbs	0.10	\$0.03	10	1.28	\$0.04
Refrigeration	Icemaker	6.0 kWh/100 lbs	0.17	\$0.05	10	1.28	\$0.04
Refrigeration	Icemaker	5.5 kWh/100 lbs	0.25	\$0.08	10	1.28	\$0.04
Refrigeration	Vending Machine	3400 kWh/year	-	-	12	1.00	-
Refrigeration	Vending Machine	3000 kWh/year	0.10	\$0.01	12	6.90	\$0.01
Refrigeration	Vending Machine	2400 kWh/year	0.33	\$0.02	12	6.90	\$0.01
Refrigeration	Vending Machine	1700 kWh/year	0.43	\$0.01	12	> 10	\$0.00
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	0.00	-	12	-	-
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	0.00	\$0.00	12	> 10	\$0.00
Food Preparation	Dishwasher	Standard	-	-	12	1.00	-
Food Preparation	Dishwasher	Energy Star	0.01	\$0.00	12	> 10	\$0.00
Food Preparation	Hot Food Container	Standard	-	-	12	1.00	-
Food Preparation	Hot Food Container	Energy Star	-	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Office Equipment	Desktop Computer	Standard	-	-	5	1.00	-
Office Equipment	Desktop Computer	Energy Star	0.04	\$0.00	5	> 10	\$0.00
Office Equipment	Laptop	Standard	-	-	4	1.00	-
Office Equipment	Laptop	Energy Star	0.00	\$0.00	4	> 10	\$0.00
Office Equipment	Server	Standard	-	-	3	1.00	-
Office Equipment	Server	Energy Star	0.03	\$0.00	3	> 10	\$0.00
Office Equipment	Monitor	Standard	-	-	4	1.00	-
Office Equipment	Monitor	Energy Star	0.00	\$0.00	4	> 10	\$0.00
Office Equipment	Printer/Copier/Fax	Standard	-	-	6	1.00	-
Office Equipment	Printer/Copier/Fax	Energy Star	0.00	\$0.00	6	> 10	\$0.00
Office Equipment	POS Terminal	Standard	-	-	4	1.00	-

## Commercial Energy Efficiency Equipment and Measure Data

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Office Equipment	POS Terminal	Energy Star	0.01	\$0.00	4	7.87	\$0.01
Miscellaneous	Non-HVAC Motors	Standard (EPAct)	-	-	15	1.00	-
Miscellaneous	Non-HVAC Motors	Standard (EPAct 2015)	0.00	-	15	-	-
Miscellaneous	Non-HVAC Motors	High Efficiency	0.00	\$0.00	15	> 10	\$0.01
Miscellaneous	Non-HVAC Motors	High Efficiency (2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Non-HVAC Motors	Premium (NEMA)	0.00	\$0.00	15	> 10	\$0.01
Miscellaneous	Non-HVAC Motors	Premium (NEMA 2015)	0.00	\$0.00	15	-	\$0.00
Miscellaneous	Pool Pump	Standard	-	-	15	1.00	-
Miscellaneous	Pool Pump	High Efficiency	-	-	15	-	-
Miscellaneous	Pool Pump	High Efficiency, Multi-Speed	-	-	15	-	-
Miscellaneous	Pool Heater	Standard	-	-	15	1.00	-
Miscellaneous	Pool Heater	Heat Pump	-	-	15	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-36 Energy Efficiency Equipment Data, Natural Gas-Warehouse, Existing Vintage**

End Use	Technology	Efficiency Definition	Savings (Therms/sq ft/yr)	Incre-mental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/Therm)
Heating	Furnace	EF .76	-	-	16	1.00	-
Heating	Furnace	EF .80	0.01	\$0.19	16	0.25	\$2.33
Heating	Furnace	EF .82	0.01	\$0.53	16	0.14	\$4.30
Heating	Furnace	EF .90	0.03	\$0.46	16	0.33	\$1.77
Heating	Furnace	EF .96	0.03	\$0.67	16	0.30	\$1.92
Heating	Boiler	EF .76	-	-	20	-	-
Heating	Boiler	EF .80	0.10	\$0.00	20	1.00	\$0.00
Heating	Boiler	EF .83	0.17	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .90	0.26	\$0.00	20	> 10	\$0.00
Heating	Boiler	EF .96	0.37	\$0.00	20	> 10	\$0.00
Heating	Unit Heater	Standard	-	-	15	1.00	-
Heating	Unit Heater	Condensing	0.02	\$0.01	15	9.09	\$0.06
Water Heating	Water Heating	EF 0.77	-	-	12	1.00	-
Water Heating	Water Heating	EF 0.80	0.00	\$0.00	12	3.18	\$0.17
Water Heating	Water Heating	Tankless	0.00	\$0.00	12	2.39	\$0.23
Water Heating	Water Heating	Indirect Fired	0.00	\$0.00	12	6.26	\$0.09
Water Heating	Water Heating	EF 0.94	0.01	(\$0.00)	12	1.00	(\$0.02)
Food Preparation	Oven	Standard	-	-	12	1.00	-
Food Preparation	Oven	Energy Star	-	-	12	-	-
Food Preparation	Fryer	Standard	-	-	12	1.00	-
Food Preparation	Fryer	Energy Star	-	-	12	-	-
Food Preparation	Broiler	Standard	-	-	12	1.00	-
Food Preparation	Broiler	High Efficiency	-	-	12	-	-
Food Preparation	Griddle	Standard	-	-	12	1.00	-
Food Preparation	Griddle	High Efficiency	-	-	12	-	-
Food Preparation	Range	Standard	-	-	12	1.00	-
Food Preparation	Range	High Efficiency	-	-	12	-	-
Food Preparation	Steamer	Standard	-	-	12	1.00	-
Food Preparation	Steamer	Energy Star	-	-	12	-	-
Food Preparation	Other	Standard	-	-	12	1.00	-
Food Preparation	Other	Energy Star	-	-	12	-	-
Miscellaneous	Pool Heater	EF .78	-	-	5	-	-
Miscellaneous	Pool Heater	EF .82	-	-	5	1.00	-
Miscellaneous	Pool Heater	EF .90	-	-	5	-	-
Miscellaneous	Pool Heater	EF .95	-	-	5	-	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

**Table C-37 Energy Efficiency Equipment Data, Electric-Warehouse, New Vintage**

End Use	Technology	Efficiency Definition	Savings (kWh/sq ft/yr)	Incremental Cost (\$/sq ft)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy (\$/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	0.23	\$0.13	20	5.18	\$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	0.27	\$0.15	20	5.50	\$0.05
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	0.57	\$0.17	20	> 10	\$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	0.60	\$0.19	20	9.87	\$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	0.22	\$0.05	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	0.24	\$0.05	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	0.29	\$0.07	20	> 10	\$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	0.35	\$0.10	20	> 10	\$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	0.36	\$0.11	20	9.80	\$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	0.39	\$0.12	20	9.65	\$0.03
Cooling	Roof top AC	EER 9.2	-	-	15	-	-
Cooling	Roof top AC	EER 10.1	0.19	\$0.01	15	-	\$0.00
Cooling	Roof top AC	EER 11.2	0.38	\$0.01	15	1.00	\$0.00
Cooling	Roof top AC	EER 12.0	0.50	\$0.02	15	> 10	\$0.00
Cooling	Roof top AC	Ductless Minisplit	0.63	\$0.08	15	8.02	\$0.01
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	0.23	\$0.01	15	-	\$0.00
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	0.37	\$0.00	15	1.00	\$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	0.49	\$0.03	15	9.36	\$0.01
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	0.53	\$0.05	15	8.69	\$0.01
Cooling	Air Source Heat Pump	Ductless Minisplit	0.68	\$0.08	15	9.43	\$0.01
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	0.14	\$0.02	15	> 10	\$0.01
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	0.26	\$0.04	15	> 10	\$0.02
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	0.62	\$0.06	15	> 10	\$0.01
Cooling	PTAC	EER 9.8	-	-	15	1.00	-
Cooling	PTAC	EER 10.2	0.07	\$0.00	15	> 10	\$0.00
Cooling	PTAC	EER 10.8	0.17	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11	0.20	\$0.01	15	> 10	\$0.00
Cooling	PTAC	EER 11.5	0.26	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 9.8	-	-	15	1.00	-
Cooling	PTHP	EER 10.2	0.07	\$0.00	15	> 10	\$0.00
Cooling	PTHP	EER 10.8	0.17	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11	0.20	\$0.01	15	> 10	\$0.00
Cooling	PTHP	EER 11.5	0.26	\$0.01	15	> 10	\$0.00
Cooling	Evaporative AC	Direct	-	-	15	1.00	-
Cooling	Evaporative AC	Indirect	0.24	-	15	-	-
Cooling	Evaporative AC	Direct/Indirect	0.60	-	15	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	15	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	0.04	\$0.06	15	-	\$0.17
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	0.07	\$0.01	15	1.00	\$0.01
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	0.11	\$0.23	15	0.09	\$0.21
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	0.11	\$0.33	15	0.06	\$0.31
Heating	Air Source Heat Pump	Ductless Minisplit	0.15	\$0.56	15	0.07	\$0.39
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	15	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	0.16	\$0.10	15	0.79	\$0.07
Heating	Geothermal Heat Pump	EER 18, COP 3.8	0.36	\$0.21	15	0.89	\$0.06
Heating	Geothermal Heat Pump	EER 30, COP 5.0	0.94	\$0.29	15	1.69	\$0.03