

PPL Electric Utilities Energy Efficiency and Conservation Program

Refrigeration Measures

Measure	Qualification	Incentive Amount
High Efficiency Evaporator Fans for Walk-ins	Installation of High-Efficiency Evaporator Fans That have High-Efficiency Permanent Split Capacitor (PSC) Motor or ECM	\$50/fan motor
High Efficiency Compressors	= 15% efficient than the base model (base = 40% Efficiency)	\$280/ton
High Efficiency Case Fans	High-Efficiency Case Fans that have High-Efficiency Permanent Split Capacitor (PSC) Motor or ECM	\$20/fan
Floating Head Pressure Control	Floating Head Pressure Control	\$20/ton
High Efficiency Display Cases	High efficiency Display Cases	\$40/case
Demand Control Defrost – Hot Gases	Refrigerant defrost w/ hot gas	\$85/case door
Compressor variable Speed Drive (VSD) Retrofit	VSD Control	\$70/HP
Anti-Sweat Heating Controls	Variable temperature controls (Humidistat)	\$34/case door
Commercial Reach-In Refrigerator	Energy Star Rated	\$70/unit

All Information Subject to Change

Current as of 3/9/10

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High-Efficiency Evaporator Fans – Walk-Ins

Measure Description: Measure provides an incentive for the installation of a high-efficiency evaporator fan in walk-in refrigeration units with permanent split capacitor (PSC) motors or electronically commutated motors (ECM). PSC and ECM motors are motor types that increase overall motor efficiency.

Equipment Eligibility: Must be a high-efficiency permanent split capacitor (PSC) motor or electronically commutated motor (ECM) to replace a shaded-pole type motor.

Incentive:

Measure	Qualification	Incentive Amount
High-Efficiency Evaporator Fans – Walk-Ins	High-Efficiency Permanent Split Capacitor (PSC) Motor or ECM	\$50/fan motor

Detailed Information: A component of refrigeration systems, high-efficiency evaporator fan motors release less heat into the refrigerated room than conventional induction motors (shaded-pole), reducing the energy draw by the fan motor and the compressor. Walk-in fans utilizing more energy efficient PSC motors or ECM reduce the overall energy consumption of the refrigeration system. PSC motors are a common choice for case fan motors with an efficiency rating between 50% and 70% with efficiency increasing with size. ECM are smaller, more expensive, variable speed and more efficient than PSC motors that operate from a single-phase power source with an electronic controller mounted in or on the motor. Walk-in box refrigeration systems are typically custom built and can be either walk-in cooling or freezer systems. Evaporator fans for walk-ins are typically larger motors than for refrigerated case fans. Compressor-associated refrigeration systems function by removing heat from a desired location, thereby cooling that location. For example, in a walk-in type refrigerator, often, more than 30% of the heat found in the location to be cooled is actually generated by fan motors within the refrigeration system itself.

Permanent split capacitor motor is a capacitor motor in which the starting capacitor and the auxiliary winding remain in the circuit for both starting and running. Abbreviated PSC motor. Also known as capacitor start-run motor.

An electronically commutated motor (ECM) is a (usually) brushless motor which relies on the external power drive to perform the commutation of stationary copper winding on the stator. This changing stator field causes the permanent magnet rotor to rotate. These can also be referred to as a [Brushless DC motor](#).

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High-Efficiency Compressor

Measure Description: Measure provides an incentive for the installation of a high-efficiency compressor as part of a commercial or industrial refrigeration system.

Equipment Eligibility: = 15% efficient than the base model (base = 40% Efficiency) *Note: Efficiency is the ratio of energy into the compressor, to the energy provided by the compressor*

Incentive:

Measure	Qualification	Incentive Amount
High-Efficiency Compressor	= 15% efficient than the base model (base = 40% Efficiency)	\$280/ton

Detailed Information: A component of refrigeration systems, high efficiency compressors operate up to 20% more efficiently than standard-efficiency compressors. Application ranges include all high, medium, and low temperature evaporating conditions. Typical applications include process chillers, supermarket racks, and environmental chambers.

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High-Efficiency Case Fans

Measure Description: Measure incentivizes the installation of high-efficiency refrigeration case fans in the form of fans with permanent split capacitor (PSC) motors or electronically commutated motors (ECM). PSC and ECM motors are motor types that increase overall motor efficiency.

Equipment Eligibility: Must be a high-efficiency permanent split capacitor (PSC) motor or electronically commutated motor (ECM) to replace a shaded-pole type motor.

Incentive:

Measure	Qualification	Incentive Amount
High-Efficiency Case Fans	High-Efficiency Permanent Split Capacitor (PSC) Motor or ECM	\$20/fan

Detailed Information: The case fan is one of the components of the refrigeration system. Case fans utilizing more energy efficient PSC motors or ECM reduce the overall energy consumption of the refrigeration system. Permanent split capacitor (PSC) motor is a capacitor motor in which the starting capacitor and the auxiliary winding remain in the circuit for both starting and running. Abbreviated PSC motor and also known as capacitor start-run motor. They are a common choice for case fan motors with an efficiency rating between 50% and 70% with efficiency increasing with size.

An electronically commutated motor (ECM) is a (usually) brushless motor which relies on the external power drive to perform the commutation of stationary copper winding on the stator. This changing stator field causes the permanent magnet rotor to rotate. These can also be referred to as a [Brushless DC motor](#). ECM are smaller, more expensive, variable speed and more efficient than PSC motors that operate from a single-phase power source with an electronic controller mounted in or on the motor.

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Floating Head Pressure Control

Measure Description: This measure applies to grocery refrigeration systems to improve overall efficiency of an existing system by using an advanced control Method is called “floating head pressure control” and is measured on a per ton basis.

Equipment Eligibility: Must have a minimum SCT (Saturated Condensing Temperature) programmed for the float ing head pressure control of = 70°F and include balanced-port expansion valves¹.

Incentive:

Measure	Qualification	Incentive Amount
Floating Head Pressure Control	N/A	\$20/ton

Detailed Information: In common practice, compressor discharge (head) is maintained at a constant, high pressure. This guarantees the performance of the equipment, minimizing the risk of inadequate refrigerant flow, adequate pressure differences across pressure valves and freezing protection for the condenser. However, this strategy is not the only way to achieve these results and is far less energy efficient than a float head control strategy. Floating head pressure controls allow the head pressure to “float” with the ambient wet-bulb (temperature at which relative humidity is at 100%) temperature and therefore the refrigeration system only works as hard as a needs to. The only large change in the performance of the refrigeration system that can be immediately detected is fan operation. In floating head pressure control systems, the fan runs continuously, rather than cycling on and off. Fan energy use increases but this increase is easily offset by the tremendous decrease in compressor energy use. In sum, expected energy saving can be as high as 10%. The use of floating head pressure control would require the use of balanced-port expansion valves which allow satisfactory refrigerant flow over a range of head pressures.

¹ The expansion valve is a device used to meter the flow of liquid refrigerant entering the evaporator at a rate that matches the amount of refrigerant being boiled off in the evaporator.

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Display Cases

Measure Description: Measure incentivizes the installation of high-efficiency display cases. High efficiency display cases incorporate anti-sweat controls, high performance evaporative fans, defrost control, improved insulation, liquid suction heat exchangers, and efficient light systems.

Equipment Eligibility: Must replace an existing, open, multi-deck display case with a new, high efficiency, reach-in unit with standard glass doors with an Electronically Commutated Fan Motor (ECM), T-8 lamps and an electronic ballast or LED lighting.

This is for remote cases only. Deli cases, custom coolers/freezers and walk-in boxes with reach-in doors do not qualify.

Incentive:

Measure	Qualification	Incentive Amount
Display Cases	High efficiency	\$40/case

Detailed Information:

Refrigerated display cases achieve higher performance efficiency and reduce overall energy consumption by incorporating anti-sweat controls, high performance evaporative fans, defrost control, improved insulation, liquid suction heat exchangers and efficient light systems.

With energy usage intensity of 43 kWh to 70 kWh per square foot per year, supermarkets are one of the most energy-intensive commercial building types in the United States. A major factor affecting the design and operation of supermarket refrigeration systems is the cooling load requirements of the display cases. Medium-temperature displays cases and, in particular, open vertical display cases, are one of the most thermally vulnerable display cases in supermarkets. These display cases, which are typically used to merchandize meat, dairy and delicatessen, fish and produce, operate at discharge air temperatures of 28°F to 32°F. They also comprise the largest portion of display case line ups.

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Demand Control Defrost – Hot Gas

Measure Description: This measure pertains to the installation of a refrigerant defrost device for an evaporator, used to remove frost from the coils with hot gas and thereby increase energy efficiency.

Equipment Eligibility: Refrigerant defrost w/ hot gas

Incentive:

Measure	Qualification	Incentive Amount
Demand control defrost – hot gas	Refrigerant defrost w/ hot gas	\$85/case door

Detailed Information: When frost collects on the evaporator, it reduces coil capacity by acting as a layer of insulation and reducing the airflow between the fins. In hot gas defrost, refrigerant vapor from either the compressor discharge or the high pressure receiver is used to warm the evaporator coil and melt the frost that has collected there.

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Compressor Variable Speed Drive (VSD) Retrofit

Measure Description: Measure pertains to Variable Speed Drive (VSD) retrofit installations on commercial and industrial refrigeration compressors of any horsepower. A variable speed drive system is more efficient than a single-speed drive, allowing for compressors to run at the optimal speed depending on demand.

Equipment Eligibility: VSD control for refrigeration systems.

Incentive:

Measure	Qualification	Incentive Amount
Compressor VSD Retrofit	VSD Control	\$70/HP

Detailed Information: Variable Speed Drives (VSD) are an economical and efficient retrofit option for existing compressor installations. VSDs are electrical devices that vary the speed of the motor in the compressor by changing the frequency of the motor's electrical power between zero and 60 Hertz (Hertz unit of frequency equal to one cycle per second). VSDs allow the motor to run at lower speeds under part-load conditions, thereby yielding higher levels of overall energy efficiency.

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Anti-Sweat Heating Controls

Measure Description: Typically used in grocery stores enables the user to turn refrigeration display case anti-sweat heaters off when ambient relative humidity (humidity level of the air around the case) is low enough that sweating will not occur. Without the control, the heaters generally run continuously.

Equipment Eligibility: Variable temperature controls (Humidistat). Humidistat is a device used to measure humidity.

Incentive:

Measure	Qualification	Incentive Amount
Anti-Sweat Heater Controls	Variable temperature controls (Humidistat)	\$34/case door

Detailed Information: Customers will receive \$34 for each case door installed with a variable temperature control (Humidistat). The device enable users to turn off anti-sweat heaters when ambient humidity is low, reducing overall power consumption. The anti-sweat heaters are used to stop condensation developing on the display cases. Variable temperature control will turn off these heaters when there is not enough moisture in the air to condensate.

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Commercial Reach-In Refrigerator

Measure Description: Reach-in refrigerators are typically found in restaurants, cafeterias, hospitals, schools and convenience stores. They are medium- (40°F) or low-temperature (0°F), portable devices and range in size from 20 to 90 cubic feet.

Equipment Eligibility: Must be Energy Star rated.

Incentive:

Measure	Qualification	Incentive Amount
Commercial Reach-In Refrigerator	Energy Star	\$70/unit

Detailed Information: ENERGY STAR labeled commercial refrigerators and freezers are more energy efficient because they are designed with components such as ECM evaporator and condenser fan motors, hot gas anti-sweat heaters, or high-efficiency compressors.

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