



# INVICTUS ENERGY SOLUTIONS

*Beyond Energy Efficiency.  
We deliver sustainability.*



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Welcome to Invictus Energy Solutions – your dynamic source for energy efficiency excellence.

At Invictus Energy Solutions, we're dedicated to providing cost-effective energy solutions across diverse industries and customer verticals, driven by our experienced professionals' project execution and adaptability to your evolving needs.

I am thrilled and deeply honored to announce that Invictus Energy Solutions has been awarded the prestigious title of HVAC of the Year 2023, under Small Medium Business Category, by ConEdison in February 2024. This recognition not only acknowledges our relentless dedication to excellence but also serves as a testament to the hard work and commitment of every member of Invictus team.

Since our inception in 2022, we have made remarkable strides that have garnered recognition and appreciation from our stakeholders. To date, we have successfully completed over 400 projects, resulting in significant energy savings of approximately 20,833,174.29 KWh and 194,059.8 Therms. These efforts have led to a substantial reduction in CO2e emissions by around 12,620 metric tons annually, equivalent to removing about 2,743 cars from the road.

These efforts have also yielded approximately ~\$7 million in cost savings for our valued customers. This success underscores our commitment to sustainability and innovation. As we stride forward, rest assured of our dedication to pioneering energy solutions that benefit both our clients and the environment.

In expanding our presence beyond New York ConEdison territory to areas such as New Jersey, Pennsylvania, Connecticut, and beyond, we are dedicated to empowering more small businesses to realize significant energy cost savings while enhancing grid stability.

Thank you for joining us on this exciting path. Together, let's lead the charge toward a more sustainable future.

Best regards,

A handwritten signature in black ink, appearing to read "Carlos M. Infante", is positioned above the name block.

**CARLOS M. INFANTE, MS, CEM**

Invictus Energy Solutions, LLC

# PACKAGED TERMINAL HEAT PUMPS



PTHP stands for “Packaged Terminal Heat Pump.” It is a type of heating, ventilation, and air conditioning (HVAC) system that is commonly used in buildings with individual rooms, such as hotels, motels, apartments, and offices. PTHPs are often installed through the wall and provide both heating and cooling functions.

By upgrading to PTHP units, you can achieve both short and long-term benefits, a remarkable up to **~50% reduction in energy costs**. The superior energy efficiency of PTHP functionality not only ensures

substantial savings but also enhances comfort levels, ensuring maximum satisfaction for occupants.

While PTHP and PTACs (Package Terminal Air Conditioner) share some similarities, they have distinct differences in terms of functionality and features. We work with name brand manufacturers to provide high quality equipment. Our PTHP use reverse cycle technology to provide most of their heat and cooling. PTHPs can also provide heat pump heating, which is more energy efficient than heating in other modes.

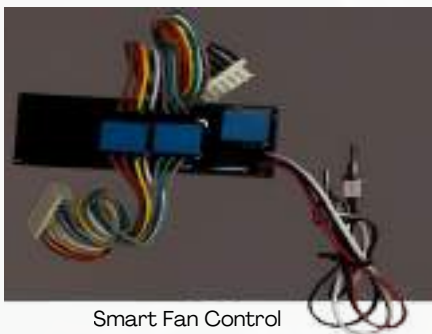
Characteristics	PTHPs	PTACs
Heating and Cooling	Provides both heating and cooling functions. It operates as a heat pump, capable of both heating and cooling the air.	Primarily designed for cooling, but some models may have electric heating elements (electric resistance) for supplemental heat. They can also be designed to use hot water or steam from a boiler for heating.
Energy Efficiency	Generally more energy-efficient as it operates as a heat pump, transferring heat rather than generating it.	Less energy-efficient, especially in colder climates, as it relies on electric resistance heating for warmth.
Seasonal Use	Suitable for year-round use, providing heating in winter and cooling in summer.	More commonly used in climates where heating needs are minimal, and cooling is the primary concern.
Noise Level	Tends to operate more quietly, providing a quieter environment for occupants.	Can be noisier, especially when the compressor is running.
Cost	Initial installation costs may be higher, but operational efficiency can lead to long-term energy savings.	Typically has lower upfront costs, but the higher energy consumption may result in increased long-term operational costs.
Installation and Maintenance	Maintenance requirements are generally low.	Relatively easy to install and maintain.

Invictus Energy Solutions’ energy efficiency initiative makes the installation of PTHP units more cost-effective, thanks to the available incentives from local utilities , which could cover up to 80% of the project costs.

# SMART FAN CONTROLS

Invictus' Smart Fan Control is a microprocessor-based efficiency enhancement designed for Packaged Terminal Air Conditioners (PTAC) and Packaged Terminal Heat Pumps (PTHP), the most widely deployed HVAC systems across the United States. These self-contained units are essential to operations in hotels, motels, multi-family housing, student housing, healthcare facilities, senior living communities, schools, and offices, where energy efficiency and equipment longevity directly impact operating budgets.

At the core of Smart Fan Control is an intelligent microprocessor with embedded firmware that continuously evaluates compressor runtime, fan activity, and stored thermal energy within the heat exchanger. Instead of allowing valuable heating or cooling energy to dissipate unused, the system dynamically extends fan operation and strategically manages compressor rest cycles to recover otherwise wasted energy. This adaptive, session-based control typically delivers 15%–18% or greater reductions in energy consumption.

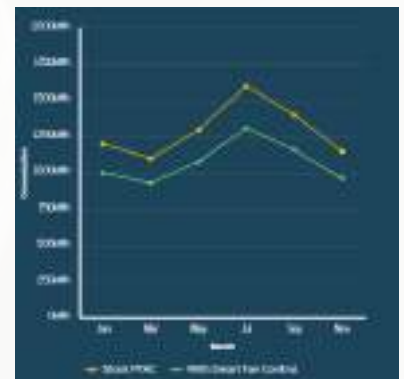


Smart Fan Control  
Microprocessor

Smart Fan Control is designed for seamless compatibility with existing PTAC and PTHP equipment. It installs without altering factory controls, safety features, or thermostat logic, ensuring no compromise to technical functionality. For PTHP units in particular, Smart Fan Control improves heat pump efficiency by reducing excessive compressor runtime and minimizing short cycling.

By delivering more usable heating and cooling energy per kilowatt-hour, Smart Fan Control reduces peak electrical demand, lowers operating costs, and extends equipment service life—making it a practical, scalable efficiency solution across industries that rely on PTAC and PTHP systems.

The energy savings graph compares a typical PTAC/PTHP system operating normally with the same system using Smart Fan Control. The monthly energy use reflects how HVAC systems naturally work harder during hotter and colder times of the year.



Smart Fan Control reduces energy use by capturing heating and cooling that would normally be wasted after the compressor shuts off and by limiting unnecessary compressor run time during long operating periods. This leads to lower energy use every month, with the biggest savings occurring during peak seasons. Overall, the graph shows a consistent 15–18% reduction in annual energy consumption, based on realistic operating conditions commonly found in hotels, apartments, and other commercial buildings.

# GUEST ROOM EMS SYSTEM



Guest Room EMS (Energy Management System) technology solution optimizes energy efficiency and enhances guest comfort in hotel rooms, focusing on efficient control and automation of HVAC, lighting, and electrical devices. With both short-term and long-term advantages, the Guest Room EMS system achieves an impressive **15%-30% reduction in energy costs**.

Key features and benefits include:

1. **Temperature Control:** Guest Room EMS enables precise temperature control based on occupancy and guest preferences, automatically adjusting to save energy during unoccupied periods and swiftly returning to comfort upon guest return.
2. **Occupancy Sensors:** These systems detect guest presence, and adjust room environment and lighting for energy savings.
3. **Lighting Control:** Guest Room EMS manages room lighting, offering automated or guest-controlled adjustments, including dimming or turning off when unnecessary.
4. **Integration with Building Management Systems:** Guest Room EMS seamlessly integrates with the hotel's BMS for centralized energy monitoring and control across the property.

5. **Customization:** Systems are adaptable to individual hotel needs, allowing parameters based on climate, guest behavior, and brand standards.

6. **Energy Efficiency:** Guest Room EMS optimizes device usage, reducing operational costs and aligning with sustainability goals.

7. **Guest Experience:** The system provides convenient controls, allowing guests to customize the room environment for comfort and satisfaction.

8. **Data and Analytics:** Guest Room EMS Systems offer insights into energy usage, system performance, and improvement opportunities.

Invictus Energy Solutions' Guest Room EMS energy efficiency measure becomes more economically viable through strategic implementation, capitalizing on incentives offered by local utility companies.

# EXHAUST FAN ADVANCED CONTROLS

Do you know that you're literally throwing money out because of your uncontrolled bathroom exhaust?

Invictus' Exhaust Fan Advanced Controls (EFAC) represent a significant leap in energy efficiency, stopping buildings from wasting energy through uncontrolled exhaust systems. Traditional exhaust systems operate at full speed 100% of the time, needlessly driving up operational costs. Our Advanced Bathroom Exhaust Controls offer a smarter, more cost-effective solution that optimizes power usage without compromising comfort or air quality. By integrating cutting-edge technology, these controls reduce energy consumption by up to 50%, translating into substantial savings.

## Smarter Ventilation for Better Efficiency

Our innovative controls utilize Variable Frequency Drive (VFD) technology combined with intelligent algorithms to optimize fan speed. Instead of operating at full capacity continuously, the system adjusts fan speed based on demand, strategically reducing speed by up to 20% during idle or low-use periods and schedule. This dynamic adjustment delivers up to 50% energy savings compared to conventional systems while maintaining effective ventilation, humidity control and high levels of occupant comfort.

## Dual Benefits: Exhaust Fans and HVAC Systems

The benefits of our advanced controls extend beyond the energy consumption of the exhaust fans themselves. By optimizing airflow, these controls reduce the load on the building's HVAC systems (e.g. PTACs, PTHPs, AHU, RTU). With less conditioned air being unnecessarily vented, your heating and cooling systems operate more efficiently, amplifying the overall energy savings across the building.

## Key Features:

### Demand-Based Operation:

- Sensors monitor humidity and occupancy levels, ensuring fans only operate at the necessary capacity.

### Energy Efficiency:

- Reduced motor speed during low-demand periods translates to significant energy savings.

### Quiet Operation:

- Lower fan speeds during idle times contribute to a quieter, more comfortable environment.

### Seamless Integration:

- Designed to work with existing ventilation systems or as part of new installation. Smart integration with Building Automation System.

## Why Choose Invictus' Solution?

### 1. Energy Savings:

Cut energy consumption for both exhaust fans and HVAC systems.

### 2. Sustainability:

Meet green building standards (Local Laws compliance) and reduce your carbon footprint.

### 3. Cost-Effective:

Lower utility bills and potentially qualify for energy rebates.

### 4. Comfort:

Maintain a pleasant indoor environment with no compromise on air quality.

## Estimated Energy Savings:

No of Unit	Annual Electric Savings (kWh)	Annual Gas Savings (Therms)	Annual Electric Savings (\$)*	Annual Gas Savings (\$)**	Total Annual Savings (\$)
9	85,617.30	21,009.17	\$ 17,123.46	\$ 25,211.00	\$ 42,334.46

- estimate based on \$0.20 per Kwh; and \$1.20 per Therms ;
- Nursing home building facility located in New York; Exhaust fan motor baseline 8760 EFLH

*Drawing from our recent Exhaust Fan Advanced Control (bathroom exhaust) project conducted in a Nursing Home facility operating its exhaust fans 24/7. On average, each unit demonstrates a reduction of 9,513 kWh in electricity consumption and 2,334.35 Therms in gas usage - translating to \$4,703.83 annual savings per unit retrofitted.*

# BOILER ADVANCED CONTROLS



Invictus' Boiler Heating System Advanced Controls is designed to revolutionize energy efficiency and streamline your heating operations. This innovative solution integrates seamlessly with your existing boiler and heat pump setup, providing unparalleled control, optimization, and energy savings.

Commercial boiler heating systems are extensively used in large buildings for efficient space heating. They consume significant energy, making energy efficiency crucial. Improving efficiency not only reduces operational costs but also lowers carbon emissions, aligning with sustainability goals and regulatory requirements for businesses and industries.

## Key Features and Benefits:

### Valve Pressure Control

**Precise Regulation:** Ensures optimal pressure for consistent heating.

**Safety Mechanism:** Prevents overpressure situations, enhancing safety.

**Energy Efficiency:** Adjusts pressure dynamically to reduce energy consumption.

### Variable Frequency Drive (VFD) Integration

**Optimized Motor Speed:** Adjusts motor speed to match heating demand, improving efficiency.

**Reduced Wear and Tear:** Minimizes mechanical stress on pumps and fans, extending equipment lifespan.

**Energy Savings:** Lowers energy usage by matching motor speed to real-time heating requirements.

VFDs automatically throttle the motor when they detect lower loads, reducing the amount of time the motor needs to be running at full speed. This attains better control and less energy consumption, translating to increased overall boiler system efficiency.

### Efficiency and Sustainability

**Energy Optimization:** Maximizes energy use while minimizing waste.

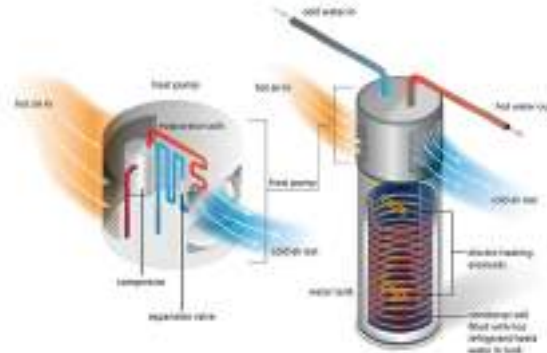
**Reduced Emissions:** Designed to lower carbon footprint and meet environmental standards.

**Cost Savings:** Lower operational costs through improved efficiency and reduced energy consumption.

**Scalability:** Adaptable to various building sizes and heating demands.

These features ensure that the boiler heating system operates efficiently, safely, and sustainably, providing reliable heating while minimizing energy costs and environmental impact.

# DOMESTIC HOT WATER (DHW) HEAT PUMPS



Installing domestic hot water (DHW) heaters is a critical energy efficiency measure for business facilities across various sectors. This measure enhances energy conservation, reduces operational costs, and supports sustainability goals. DHW heaters provide hot water for a variety of applications, including sanitation, cooking, cleaning, and space heating, making them essential for business operations in numerous industries.

Heat pumps work by drawing in ambient air and extracting heat from it using a fan and heat exchanger. The heat is then transferred to a refrigerant, which is then compressed to raise its temperature. Finally, the energy is passed through another heat exchanger to heat the water. This process is similar to how an air conditioner works, but instead of producing cold air, the heat pump transfers the heat to the water and releases cold air as a byproduct.

Heat pumps are often more energy efficient than traditional water heaters and can have a lifespan of 15–20 years, which is longer than many other types of water heaters. They also require less maintenance, which can lead to long-term cost savings.

Some of the key features of DHW heat pumps:

**Energy Savings:** Modern, energy-efficient designs reduce energy consumption by minimizing standby heat losses and optimizing water heating cycles.

**Cost Reduction:** Lower energy use leads to reduced utility bills, with substantial savings for businesses with high hot water demands.

**Environmental Impact:** Efficient heaters lower greenhouse gas emissions, aiding businesses in meeting sustainability goals and enhancing environmental stewardship.

**Operational Efficiency:** Reliable hot water supply improves operational efficiency, crucial for guest satisfaction in hospitality and hygiene in healthcare.

Installing and upgrading domestic hot water (DHW) heaters can qualify for incentives from utility companies. These incentives, which may include rebates or grants, help offset the initial investment costs, making the adoption of energy-efficient technologies more affordable for businesses while promoting reduced energy consumption and environmental sustainability.

## Indicative Estimated Energy Savings:

	Units	1
	Heating Type	Hotel Heating
	Baseline Scenario	Electric Heating
	or Voltage range	100
	Equipment Type	Home Hot Water Tank
Hot Water Used	Gallons Per Day	9160
	Inlet Temperature (F)	140
	Supply Water Temp (F)	80
	Annual hot water used	3,214,400
Domestic Hot Water	Electric water heating factor	1
	Uniform energy factor of baseline unit	0.8216
	Coefficient of Performance of efficient unit	4.3
	Efficiency savings factor	0.000925
Cooling	200% Annual domestic hot water electric energy savings	13,491.81
	Baseline electric factor	0.000925
	Cooling factor	0.91
	Space cooling integrated energy efficiency ratio	12.7
Heating	Annual cooling electric energy savings	2.88
	Electric heating factor	1
	Heating factor	0.48
	Lower heating COP	3
Estimate of Savings	Annual heating electric energy savings	7.41
	Annual electric energy savings (AEE)	17,383.69
	Annual electric energy savings (\$)	\$9,547.80

# Energy Management System (EMS)



Invictus Energy Solutions leverages ENASTAT Full Circle to offer a cutting-edge solution designed to revolutionize energy management for businesses and organizations. By integrating advanced analytics, real-time monitoring, and automation, ENASTAT Full Circle delivers unparalleled benefits that enhance operational efficiency and sustainability. Additionally, given the significant energy efficiency achieved by implementing Energy Management System, businesses may qualify for incentives from the utility companies.

## Key Benefits:

- **Real-Time Monitoring and Control**

**Proactive Management:** Provides real-time data on energy consumption, enabling immediate responses to anomalies and inefficiencies.

**User-Friendly Interface:** Simplified dashboards and intuitive controls ensure easy access to critical information and streamlined management processes.

- **Cost Savings**

**Energy Efficiency:** Identifies and rectifies energy wastage through automated alerts and actionable insights, significantly reducing utility bills.

**Optimized Operations:** Enhances equipment performance and lifespan by maintaining optimal operating conditions, thereby lowering maintenance costs.

- **Sustainability**

**Reduced Carbon Footprint:** Facilitates the adoption of sustainable practices by tracking and optimizing energy use, contributing to environmental conservation.

**Compliance and Reporting:** Ensures compliance with energy regulations and simplifies reporting processes for sustainability initiatives.

- **Advanced Analytics**

**Predictive Maintenance:** Utilizes predictive analytics to foresee potential equipment failures and schedule maintenance proactively, minimizing downtime.

**Data-Driven Decisions:** Leverages big data to provide detailed insights and forecasts, empowering informed decision-making and strategic planning.

- **Scalability and Flexibility**

**Customizable Solutions:** Tailored to meet the specific needs of various industries, from restaurants, manufacturing to commercial real estate.

**Scalable Infrastructure:** Supports expansion and integration with existing systems, ensuring seamless scalability as business needs grow.

## Indicative Estimated Energy Savings:

	Units	\$
	Building Type	Full-Service Restaurant
	Equipment Type	QMS
Cooling and Heating Equipment - Variable Loads	Equivalent Full Load Hours	1,021
	Connected kW	96.7
	Peak kW	4,440
	Summer Demand kW	3.81
	Annual kWh	29,064
Constant Load Factors - Base Supply	Equivalent Full Load Hours	6,803
	Connected kW	18.03
	Peak kW	4,410
	Summer Demand kW	3.81
	Annual kWh	18,693
Total	Total Peak Demand kW	4,440
	Total Connected Load kW	111
	Percent on Peak	0.03%
Estimated Savings	Summer Demand kW	3.81
	Annual electric energy savings (kWh)	15,915.02
	Annual electric energy savings (\$)	\$1,903.83

*\*\*EMS ENASTAT Full Circle is also compatible in controlling gas-fueled equipment (Therms)*

# KITCHEN DEMAND CONTROL VENTILATION (KDCV)



Invictus specializes in retrofitting existing constant-speed kitchen exhaust fans with smart variable-speed technology, resulting in substantial energy savings of 30-50% of your equipment energy usage. Our solution eliminates the need for running exhaust fans at 100% all the time. Instead, the fans adjust their speed based on temperature, optimizing efficiency as you cook. When cooking activity slows down, the fans automatically slow down as well, ensuring energy is used only when needed.

This retrofit offers additional savings by reducing unnecessary ventilation in other mechanical equipment throughout your facility. By implementing our Kitchen Demand Control Ventilation, you can achieve even greater energy efficiency. This proven technology has been successfully deployed in hundreds of thousands of commercial kitchens worldwide, resulting in high customer satisfaction. Our Kitchen Demand Control Ventilation Controller enables the conversion of single-speed AC permanent split capacitor motors (120-240V) into variable-speed motors, controlled via an on/off switch.

The KDCV measure is suitable for a wide range of commercial kitchen settings, including:

- Restaurants
- Hotels/ Motels
- Nursing Homes
- Hospitals
- Schools/Universities
- And various other establishments

Whether you run a bustling hotel kitchen, a healthcare facility, an educational institution, or any other food service establishment, our solution is designed to meet your specific needs.

The installation of the Kitchen Demand Control Ventilation Controller is straightforward and typically takes less than a few hours per unit. Once installed and tested, you will begin experiencing immediate energy savings.

### \*Indicative Estimated Energy Savings

HP	Electric	Gas	Total
1	\$884.60	\$225.00	<b>\$1,109.00</b>
1.5	\$1,326.90	\$337.50	<b>\$1,664.40</b>
2	\$1,769.20	\$450.00	<b>\$2,219.20</b>
2.5	\$2,211.50	\$562.50	<b>\$2,774.00</b>
3	\$2,653.80	\$675.00	<b>\$3,328.80</b>
5	\$4,423.00	\$1,125.00	<b>\$5,548.00</b>
7.5	\$6,634.50	\$1,687.50	<b>\$8,322.00</b>
10	\$8,846.00	\$2,250.00	<b>\$11,096.00</b>

\* Estimate Annual Savings based on:  
 - flat \$0.20 / kWh rate; and \$1.20 / Therm rate  
 --4423 kWh per hp; and 187.5 Therms per hp

# ADVANCED ROOFTOP CONTROLS (RTU)



Advanced rooftop controls are a type of HVAC control system that is designed for commercial rooftop units (RTUs). These control systems are designed to optimize energy efficiency. The use of an RTU economizer can provide significant energy savings by reducing the need for mechanical cooling, particularly during mild or moderate weather conditions. By using outdoor air for cooling, the economizer can also improve indoor air quality by providing fresh air and reducing the build-up of contaminants and humidity inside the building.

Demand-controlled ventilation (DCV) is a RTU control system that adjusts the amount of ventilation provided to a building based on the actual occupancy and indoor air quality (IAQ) conditions, rather than relying on a fixed ventilation rate. The main purpose of DCV is to improve the energy efficiency of the building and maintain a healthy and comfortable indoor environment for occupants.

In the context of HVAC systems, VFD stands for Variable Frequency Drive. A Variable Frequency Drive is an electronic device that is used to control the speed and torque of electric motors, such as those used in rooftop units. In an RTU, the VFD is typically used to control the speed of the fan motor that is responsible for moving air through the HVAC system. By varying the speed of the fan motor, the VFD can adjust the airflow and static pressure in the system, which can improve energy efficiency and performance.

Some of the key features of advanced rooftop controls include:

- Demand Controlled Ventilation (DCV)
- Variable Frequency Drive

### \*Indicative Estimated Energy Savings

RTU SIZE (tons)	Annual (kWh) Savings	Annual Savings (\$)	Gas Savings (Therms)	Annual Gas Savings (\$)	Total Annual Savings
10	6726	\$1,345.20	562.5	\$675.00	\$2,020.00
15	10089	\$2,017.80	843.75	\$1,012.50	\$2,030.00
20	13452	\$2,690.40	1125	\$1,350.00	\$4,040.40
30	20178	\$4,035.60	1687.5	\$2,025.00	\$6,060.60



# REFRIGERATION MEASURES



**Reach-in Door Gaskets.** The refrigerated reach-in gasket maintains an airtight seal, crucial for preserving perishable food quality and safety in commercial kitchens, necessitating regular inspection and replacement to prevent energy inefficiency and food safety risks.

**Strip Curtains.** Also known as strip doors, are flexible, transparent barriers made of overlapping PVC strips. It enhances energy efficiency by minimizing air exchange between different temperature zones, reducing the load on heating and cooling systems. They help maintain consistent indoor temperatures, lowering energy consumption and costs while improving overall thermal comfort in storage facilities and buildings.

**Evaporator Controls.** Evaporator controls enhance energy efficiency in refrigeration by using advanced controls and sensors to optimize temperature regulation, reduce compressor load, and minimize defrost cycles, leading to lower energy consumption and improved performance.

**Electronically Commutated Motors.** EC motors offer enhanced energy efficiency (up to 70% less power usage), adjustable speed control for precise temperature and humidity management, and extended lifespan due to fewer moving parts, making them increasingly favored in walk-in freezers and refrigeration systems.

**Automatic Door Closers.** Automatic door closers utilize a spring-loaded mechanism to ensure proper closure of walk-in freezer doors, preventing cold air loss, maintaining consistent internal temperature, and preserving food quality and safety.

While seemingly insignificant, replacing your gasket is a small step with the potential to yield substantial energy bill savings. Throughout the site assessment, we offer clients a comprehensive overview of feasible refrigeration measures and present estimated energy savings resulting from the proposed projects.

Refrigeration measures are swiftly installed, often in under half an hour per measure, and upon installation and testing, you'll promptly experience enhanced energy efficiency.

