



Building Intelligence — an EDGE FiberNet, Inc. Company

EDGE Building Intelligence

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A TOTAL APPROACH to ENERGY REDUCTION

- AI-Driven Dynamic Setpoints automatically program BAS to minimize kWh/Ton
- Intelligent Controls for isolated HVAC & Refrigeration systems (20%-50% savings)
- Thermal Mass Cooling Load Management
- Nano-tech for optimizing heat transfer in fouled refrigeration Coils
- IAQ for Safety and Energy Efficiency through Reduced Outside Air Ratios and Demand Control Ventilation
- IoT & PoE LED & DC-Coupled PV

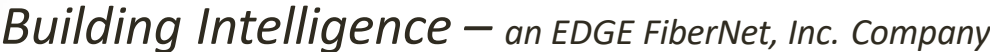




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- Complete Energy Mapping
- Comprehensive design based on High-Impact + High-ROI ECMs
- We profile every building system:
 - Current and optimal states
 - The exercise reveals opportunity for impactful energy conservation measures (ECMs)

Equipment Info			Existing Conditions														Energy Reduction Plan																
System	Serves	Size	Size Units	VFD	Qty	Heating Hours			Cooling Hours			Hours per Year	kW	Load Factor	kWh	\$/Yr	ECM	Size	Size Units	VFD	Qty	Heating Hours			Cooling Hours			Hours per Year	kW	Load Factor	kWh	\$/Yr	
1	Lighting	Exterior Poles	15	kW	N/A	1	60	12	12	60	12	12	4,368	15.0	1.0	65,520	\$9,222	1	6	kW	N/A	1	60	12	12	60	12	12	4,368	6.0	1.0	26,208	\$3,685
2	Air Cleaners	1st Floor	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110	N/A	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110
3	Air Cleaners	1st Floor	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110	N/A	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110
4	Air Cleaners	1st Floor	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110	N/A	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110
5	Air Cleaners	1st Floor	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110	N/A	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110
6	Air Cleaners	1st Floor	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110	N/A	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110
7	Air Cleaners	1st Floor	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110	N/A	0.75	HP	No	1	75	15	4	75	15	4	4,888	0.5	0.3	779	\$110
8	Air Compressor (Vacuum)	Dust Collection	10	HP	No	1	120	24	24	120	24	24	8,736	7.1	0.3	18,574	\$2,614	N/A	10	HP	No	1	120	24	24	120	24	24	8,736	7.1	0.3	18,574	\$2,614
9	Air Door	Loading	15	HP	No	1	10	2	0	10	2	0	624	10.6	1.0	6,633	\$934	N/A	15	HP	No	1	10	2	0	10	2	0	624	10.6	1.0	6,633	\$934
10	Air Door	Loading	15	HP	No	1	10	2	0	10	2	0	624	10.6	1.0	6,633	\$934	N/A	15	HP	No	1	10	2	0	10	2	0	624	10.6	1.0	6,633	\$934
11	Computer Splits (Condenser)	Vault	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775	N/A	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775
12	Computer Splits (Condenser)	Vault	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775	N/A	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775
13	Computer Splits (Condenser)	Command Center	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775	N/A	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775
14	Computer Splits (Condenser Fan)	Command Center	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775	N/A	3	HP	No	1	10	2	2	120	24	24	3,500	2.1	0.7	5,507	\$775
15	Computer Splits (Cooling)	Vault	8	Tons	No	1	120	24	24	120	24	24	8,736	8.0	0.7	51,717	\$7,279	4	8	Tons	No	1	120	24	24	120	24	24	8,736	6.8	0.7	43,960	\$6,187
16	Computer Splits (Cooling)	Vault	8	Tons	No	1	120	24	24	120	24	24	8,736	8.0	0.7	51,717	\$7,279	4	8	Tons	No	1	120	24	24	120	24	24	8,736	6.8	0.7	43,960	\$6,187
180	Unit Heaters	Various	0.1	HP	No	2	75	15	4	0	0	0	3,196	0.1	0.7	335	\$47	N/A	0.1	HP	No	2	75	15	4	0	0	0	3,196	0.1	0.7	335	\$47
181	Unit Heaters	Various	0.1	HP	No	3	75	15	4	0	0	0	3,196	0.2	0.7	503	\$71	N/A	0.1	HP	No	3	75	15	4	0	0	0	3,196	0.2	0.7	503	\$71
182	Unit Heaters	Shipping	0.05	HP	No	6	75	15	4	0	0	0	3,196	0.2	0.7	503	\$71	N/A	0.05	HP	No	6	75	15	4	0	0	0	3,196	0.2	0.7	503	\$71
183	Unit Heaters	Warehouse	0.05	HP	No	7	75	15	4	0	0	0	3,196	0.2	0.7	587	\$83	N/A	0.05	HP	No	7	75	15	4	0	0	0	3,196	0.2	0.7	587	\$83
184	Calcs for DCV	Building	N/A	Tons	No	1	0	0	0	0	0	0	0	0.0	0.7	0	\$0	5	-50	Tons	No	1	0	0	0	75	15	4	1,632	-55.0	0.7	-68,864	-\$9,693
		Electrical Totals												840		2,571,426	\$361,923	Electric ERP Totals												620	--	1,685,026	\$237,16



- Comprehensive design based on high-impact & high ROI ECMs
- Sample project with and without incentives

ECM 1	Outdoor Lighting	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for Outdoor Lighting	\$12,700	\$5,533	2.3	\$10,200	0.5															
ECM 2	Indoor Lighting	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for Indoor Lighting	\$102,000	\$40,836	2.5	\$92,000	0.2															
ECM 3	SMART HVAC CONTROLS (<20 Tons)	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for SMART HVAC (<20 Tons)	\$13,000	\$6,539	2.0	\$13,000	0.0															
ECM 4	Super Heat Recovery	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for Super Heat Recovery	\$67,800	\$10,360	6.5	\$47,800	1.9															
ECM 5	ECORE-CI VAV Box Optimization	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for ECORE-CI VAV Box Optimization	\$87,400	\$32,164	2.7	\$47,400	1.2															
ECM 7	DHW Heat Recovery	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for DHW Heat Recovery	\$24,200	\$2,903	8.3	\$19,200	1.7															
ECM 8	ECORE-CI WL Optimization	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for ECORE-CI WL Optimization	\$138,400	\$32,638	4.2	\$46,166	2.8															
ECM 9	VFDs on CRACs	Total Cost \$	Energy Savings	ROI Years	Incentives	Adjusted ROI Years															
	Total for VFDs on CRACs	\$14,200	\$2,384	6.0	\$2,575	4.9															
<table><tr><td colspan="2">Cost/Savings</td><td rowspan="7">*Capped @ 70% of M&L Cost</td></tr><tr><td>Total Cost</td><td>\$459,700</td></tr><tr><td>Incentives*</td><td>\$257,040</td></tr><tr><td>Net Cost</td><td>\$202,660</td></tr><tr><td>Energy Savings</td><td>\$133,356</td></tr><tr><td>Non-Adjusted ROI</td><td>3.4</td></tr><tr><td>Adjusted ROI</td><td>1.5</td></tr></table>							Cost/Savings		*Capped @ 70% of M&L Cost	Total Cost	\$459,700	Incentives*	\$257,040	Net Cost	\$202,660	Energy Savings	\$133,356	Non-Adjusted ROI	3.4	Adjusted ROI	1.5
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ONLINE ENERGY MANAGER, INC.

The logo for Ecore-CI, featuring the text "ECORE-CI" in a bold, orange, sans-serif font, followed by a registered trademark symbol (®). The text is set against a dark blue rectangular background.

ECORE-CI[®]

Efficient **CO**oling & **RE**frigeration
Platform for **C**ommercial &
Industrial Facilities based on OEM's
Patented Technology

AI-DRIVEN DYNAMIC SETPOINTS for BAS/BMS/SCADA DRIVEN HVAC

WE DON'T REPLACE THE BMS; WE MAKE IT SMART

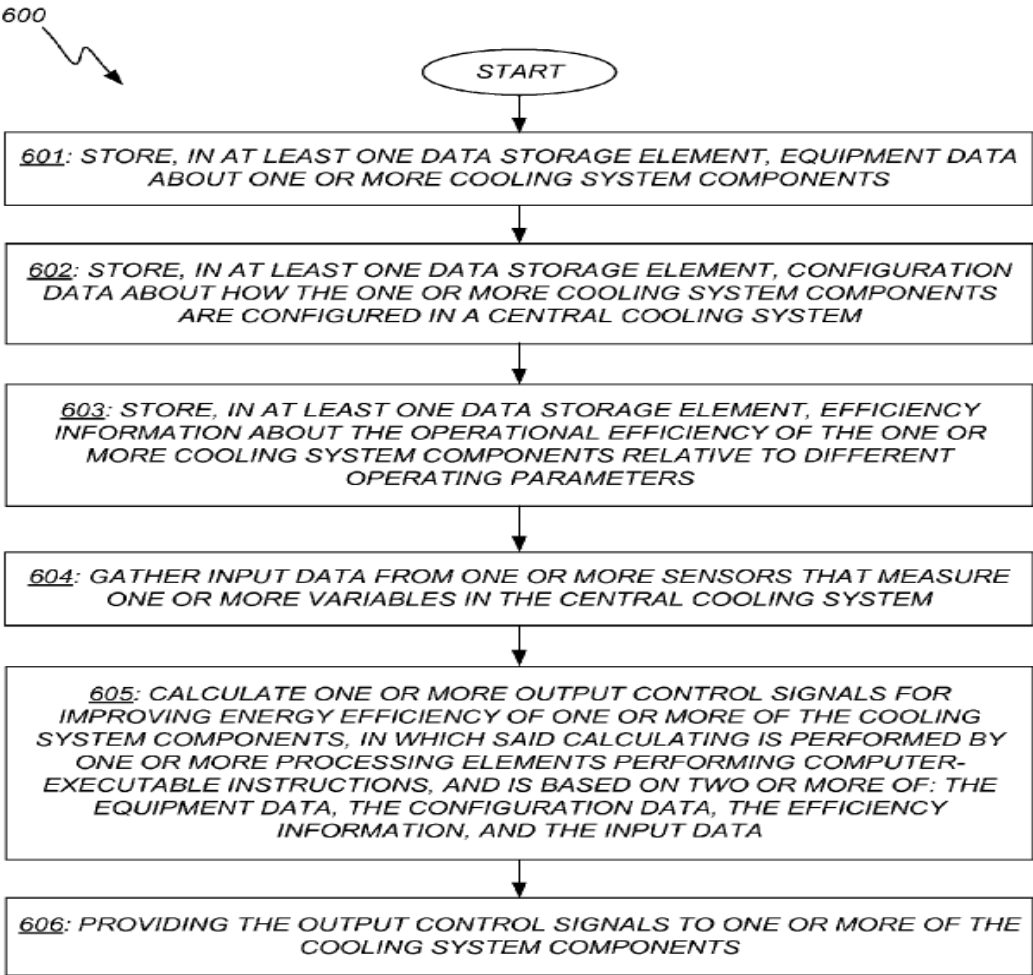
- Samples all conditions in 5-15 minute intervals
- Continuously optimizes and balances key system variables
- 23%-40% energy reduction
- Minimal construction efforts
- No impact on warranties or cooling load

ECORE-CI - Patented Technology

United States Patent

(10) **Patent No.:** **US 8,660,702 B2**
(45) **Date of Patent:** **Feb. 25, 2014**

CENTRAL COOLING AND CIRCULATION ENERGY MANAGEMENT CONTROL SYSTEM



7,174,732	B2 *	2/2007	Taniguchi et al.	62/183
7,664,573	B2 *	2/2010	Ahmed	700/276
7,908,117	B2 *	3/2011	Steinberg et al.	702/182
2010/0076605	A1 *	3/2010	Harrod et al.	700/276

ABSTRACT

A novel central cooling and circulation energy management control system is provided, including an energy management controller device, a central cooling system, and associated methods, according to various embodiments. In one illustrative embodiment, a central cooling energy management controller device includes one or more signal connections, one or more electronic memory elements, and one or more processors. The controller device has access to resources that are either stored on the electronic memory elements or are accessible via the signal connections. The resources include an equipment data table, an equipment and operational configuration table, an operational efficiency matrix, and executable instructions. The processor determines operational control signals for energy-efficient operation of a central cooling system, based on sensor input from the central cooling system, and on data from the equipment data table, the equipment and operational configuration table, and the operational efficiency matrix; and provides the operational control signals via the signal connections.

OPERATING PRINCIPLES

ECORE-CI

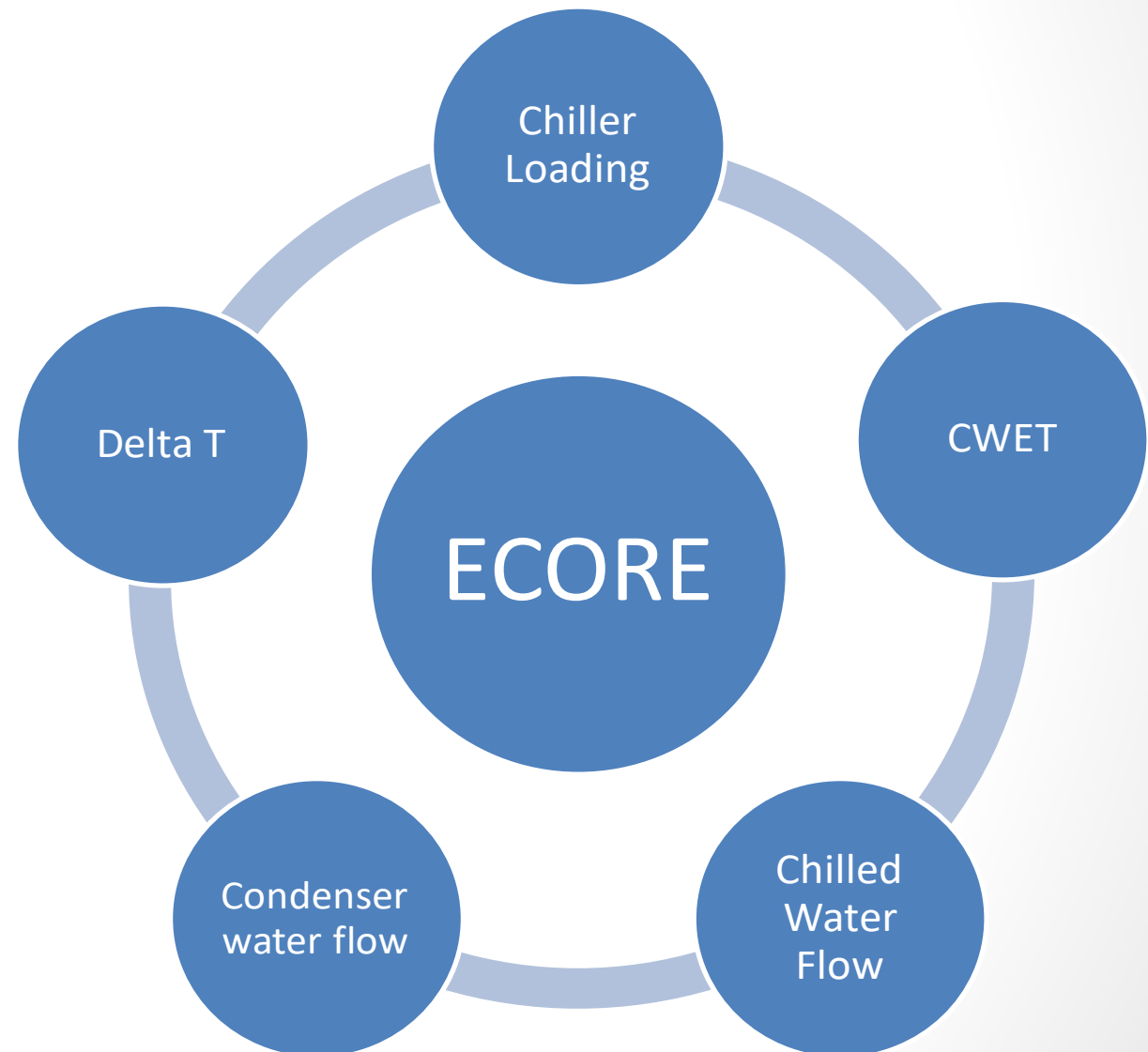
Dynamically adjusts operational parameters in consideration of constantly changing:

- Cooling loads (user requirements)
- Ambient temperature and relative humidity

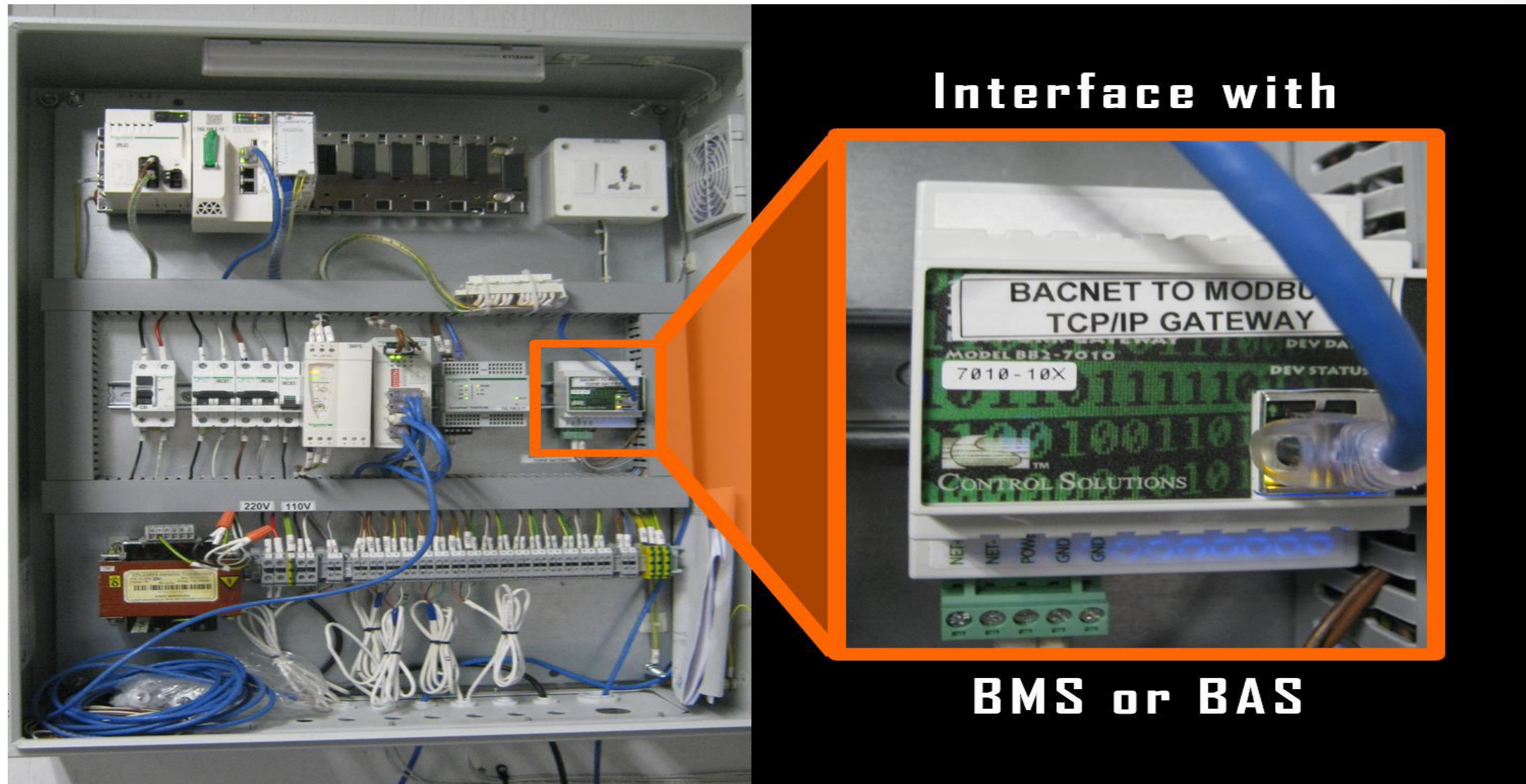
PRIMARY MANAGED VARIABLES

- CWET - best level permissible under ambient conditions
- Chiller Loading – Partial loads balanced and optimized across multiple chillers
- Delta T – Chilled water temperature difference
- Condenser water flow rate
- Chilled water flow rate

ACTIVELY MANAGE HIGH-IMPACT VARIABLES (among others)



ILLUSTRATIVE Ecore-CI INSTALLATION



- Ecore-CI may be implemented as a “bolted on brain” that interfaces with the BMS via a standard interface or
- Ecore-CI may be programmed directly into the BMS/BAS.

TARGET OPPORTUNITIES

Hotels



**Cold Storage
Warehouses**



**Shopping
Malls**



**Hospitals &
Commercial Prop.**



**Colleges/
Universities**



**Industrial
Facilities**



Norristown Area School District

- **Location:** Norristown, PA
- **Building Type(s):** K-12 Schools and Administration Buildings
- **Number of Buildings:** Fifteen (15)
- **Services Provided:**
 - Investment Grade Energy Audit
 - Energy Reduction Plan
 - Engineering and Design of ECMs
 - Drawings and Specifications
 - Project Engineering During Construction Phase
- Norristown Area School District was seeking to replace failing mechanical, electrical and plumbing systems, save energy, and improve student comfort for the 1.3 million square-foot district.

Norristown Area School District

- OEM's Engineer, Robert McGreevy, provided design and engineering services and installation support for efficient boiler and chiller installation, electric to gas conversion, lighting retrofit and controls, DDC controls, and rooftop solar installation.
- **The ECORE TAM Solution:**
- The ECORE Control Module was designed, applied and programmed directly into the BAS to algorithmically manage dynamic setpoints for optimum HVAC plant efficiency. ECORE optimizes the heat rejection from the facility by continuously controlling the cooling tower fans, condenser water pump, and chilled water pump to implement the dynamic setpoints so as to provide the minimum total power consumption in the system at all times.
- **Summary of Results:**
- Annual Cost Savings: \$3.77M
- No financial risk to owner per GESA financing terms

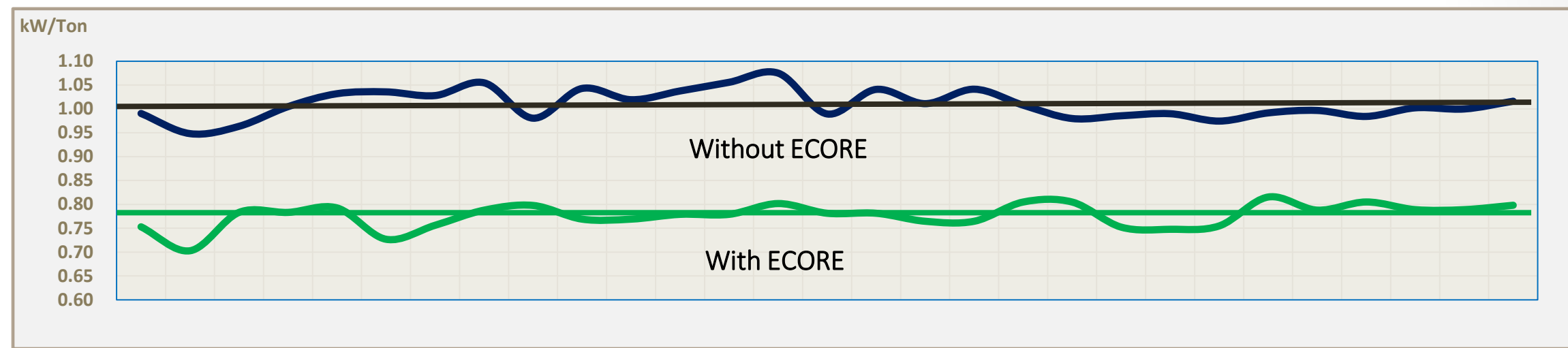
Yale Science Park New Haven, CT - 2020

- **Building Size:** 106,000 square feet
- **Property Type:** Mixed use, offices and laboratories
- **Building Management System:** Automated Logic (ALC)
- **ECORE Chiller System Optimization** - implemented by strategic partner: EIC IN JV WITH ESCO
- **Savings Achieved:** ~35%
- **ENERGY INTELLIGENCE CENTER POC - EIC**

Related Properties: CT Office Building - 2020

- 180,000 Feet² office building
- Dynamic Set-Points for Heat Pumps
- Optimized Cooling Tower Supply Temperature
- Controlled VFDs
- Demand Controlled outside air intake
- Cooling Energy Savings ~ 35%
- Heating Energy Savings ~ 20%
- Implemented by EIC

SAUDI DISTRICT COOLING PLANT



LOCATION	THE KINGDOM of SAUDI ARABIA
CONFIGURATION	10 chillers & 23 energy transfer stations
FACILITIES SERVED	Data Center, process cooling and comfort cooling
COOLING CAPACITY	25,000 tons
ENERGY PRICE	4.0 cents/kWh
FACILITY ENERGY COST	US \$3.2 million
ANNUAL SAVINGS	15 million kWh (~US\$ 600,000)

TESTIMONIALS

- Frost and Sullivan – Practice Leader, Technology Innovation Group

“Patent landscape analysis was conducted...

...search results were reviewed by our subject matter experts to identify and review relevant document...

...Detailed review of these documents showed that no direct technological overlap was present with OEM’s patent and hence OEM has a unique solution in the market”

Tactical Controls for Cooling Systems

- 20-50% Energy Savings

THE CHALLENGE: HVAC and other cooling systems use 50% of building energy and do not self-manage for energy efficiency.

THE SOLUTION for HVAC, PTEC, reach-in/walk-in coolers, and freezers:

- Intelligent, cost-effective energy reduction controls for deployed systems – *that work really well!*
- Easy to implement
- Reduce energy, cost and mechanical wear & tear.

IntelliHVAC is the most effective way to reduce energy consumption in isolated HVAC systems 25 Ton and less split systems, heat pumps and package systems. It adds intelligent management in **heating** and **cooling** modes.

- Reduces Energy 20%-30%
- Reduces Compressor Cycles by 20%
- Prevents Wear & Tear - Extends Equipment Life
- 12-18 Month ROI
- Lifetime Warranty



60 Location McDonalds Franchise

Total Combined Annual Savings:
\$284,689

Total Projected 10 Year Savings:
\$2,846,890

ROI: 8.4 Months



87 Location Pizza Hut Franchise

Total Combined Annual Savings:
\$85,956

Total Projected 10 Year Savings:
\$859,560

ROI:



120 Location Subway Franchise

Total Combined Annual Savings:
\$240,055

Total Projected 10 Year Savings:
\$2,400,550

ROI: 14.9 Months



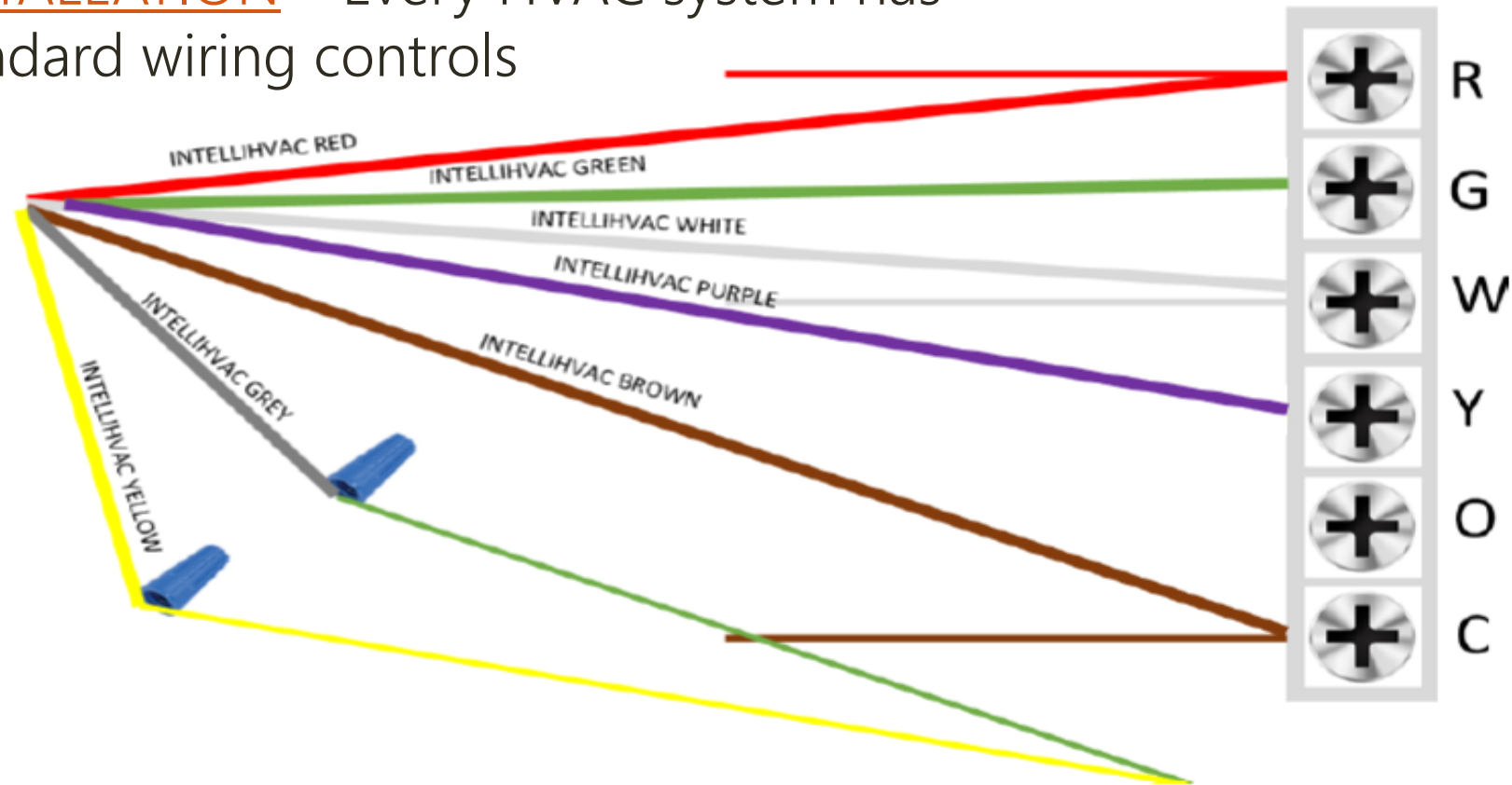
Commercial



"The majority of our energy bill comes from our use of heating and air. It's great to have found a simple to install device that can reduce energy consumption on our HVAC systems." – Jeff, Faire

"We continue to see a decrease in our energy bills month after month. Well worth the investment and highly recommended!" Tom— 518 West

- INSTALLATION – Every HVAC system has standard wiring controls



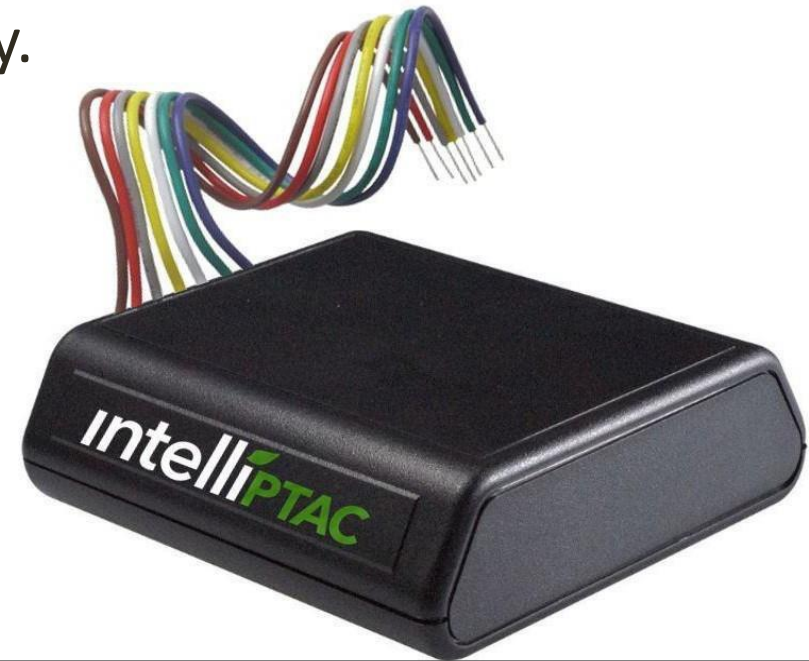
Connect IntelliHVAC wires as shown.

- Red, White, and Brown are added to the corresponding R, W, and C terminals. Existing connections remain.
- Tstat green is disconnected and then reconnected to IntelliHVAC grey wire. IntelliHVAC green wire is connected to G terminal.
- Tstat yellow is disconnected and then reconnected to IntelliHVAC yellow wire. IntelliHVAC purple wire is then connected to Y terminal.
- * Orange wire not applicable if existing.



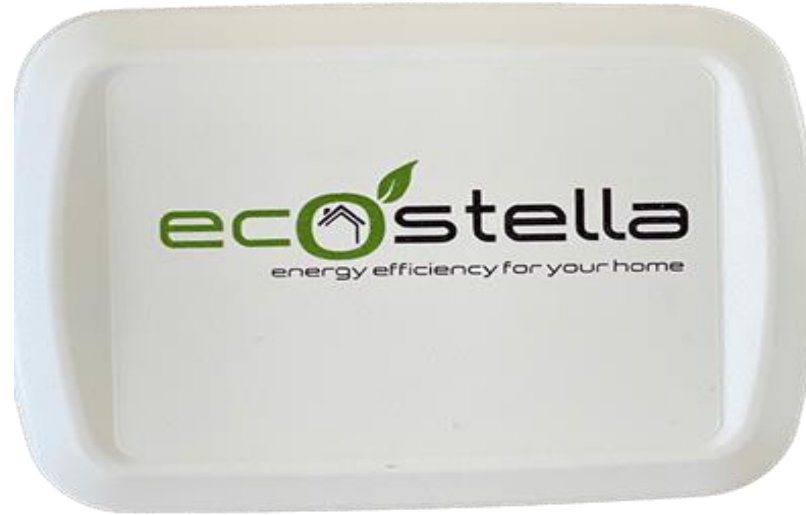
IntelliPTAC for PTAC HVAC systems is an extension of the IntelliHVAC technology.

- Reduce energy 15%-20%
- Reduces compressor cycles by 15%
- Prevents wear and tear
- Extends life of equipment
- 18-month ROI



“The energy consumption from our PTAC units is significant, especially during peak guest hours. The savings from the IntelliHVAC PTAC technology has really helped our bottom line.” –
Ajith, Holiday Inn

“Our hotel has over 100 rooms and we struggle with energy concerns. The reduction in energy from the PTACs is great. Very impressed.” Ram, Sleep Inn



Residential Only

Ecostella is the most effective way to reduce energy consumption in residential VRF HVAC systems - efficiently manages fan, purge and compressor cycles and works in both heating and cooling modes.

- Reduces Energy 20-30%
- Reduces Compressor Cycles >20%
- Prevents Wear & Tear - Extends Equipment Life
- 12-18 Month ROI
- <https://vimeo.com/435141054>
- <https://vimeo.com/435141783>



Anti-Sweat Heater Controls reduce energy 20-80% by modulating the Anti-Sweat Heaters with sensor-based technology so that they only operate when needed.

The built-in programmed maintenance cycle (PMC) technology assures that all display cases remain sweat, frost and ice free.

- Reduces energy costs 30%-60%
- Installation is simple
- <12 month ROI
- Components exceed UL standards



EnerG²

EnerG² reduces energy consumption and compressor cycles in walk-in coolers and freezers by providing a more accurate temperature measurement through a specialized gel compound that simulates the food product temperature instead of the air temperature, which fluctuates with more volatility. It retrofits to the existing thermostat air probe and requires no additional maintenance.

- Reduce Energy Costs 15-30%
- Reduces Compressor Cycles by 30-50%
- Extends Life of Equipment
- 12-Month ROI
- Lifetime Warranty



"I am very happy with the energy savings I've seen from installing the EnerG² device in my walk-ins and would recommend it" – Joel, McDonalds Owner

"You will hard pressed to find another energy saving product this affordable, easy to install and with as quick of an ROI. Amazing job!" Calvin, 42 St. Bistro

ECMTEK is a dual solution of EC (electrically commutated) evaporator fan motors and controllers that allows for motors to be operated at variable speeds at reduced Wattage.

- Reduces energy 50-90%
- Decreases fan motor heat output
- ~12 Month ROI
- 2-year motor warranty
- Lifetime controller warranty





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Let's create a successful partnership!

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Thank you!