



GE Power – Greenville, SC HVAC Enthalpy Controls

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Imagination at work

We Are GE



We are the world's first and only digital industrial company.
350,000 employees operating in 175 countries.

GE is transforming

Divest

Consumer

Financing

Appliances

Capital

Synchrony

Invest + Disrupt

Industrial

GE Aviation

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GE Healthcare

Vertical Finance

GE Power

GE Energy Mgmt

GE Oil & Gas

GE Lighting

Alstom

Renewables

Thermal

Grid

Digital

GE Digital

Predix

current
powered by GE

Culture + Transformation



The first Digital Industrial company

Brilliant Factory ...



Greenville Gas Turbine Manufacturing



- Factory built in 1968 (48 years old)
- 1.5MM square feet of manufacturing space
- 6000 refrigeration tons of HVAC capacity
- 3300hp compressed air capacity
- 2600 high bay fixtures
- \$20MM annual utilities cost

Sensor Enabled Improvements

- Upgraded to high efficiency HVAC controls
- Installed smart utility metering
- Integrated plant wide monitoring and diagnostic network
- Reduced leaks and non-productive loads
- Developed predictive energy cost models



HVAC Enthalpy Controls

Problem: Rooftop HVAC units, ~6000 tons (72MM BTU) capacity, were past their efficient life cycle.

Should we replace or
upgrade?



Proof of Concept on Two Units

Smart power meters installed on two 60 ton HVAC units on manufacturing roof.

Unit 1:
Upgraded the controls for enthalpy “free cooling”

Unit 2:
Maintained existing controls.

Monitored the power consumption for 6 months.

A picture is worth a thousand words...



Sometimes it's worth a million dollars



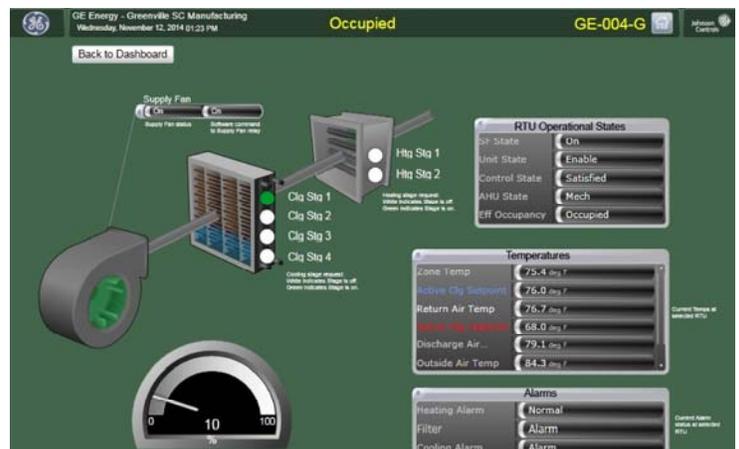
Showed 50% reduction...projected \$1 million annual savings

New Controls Implemented

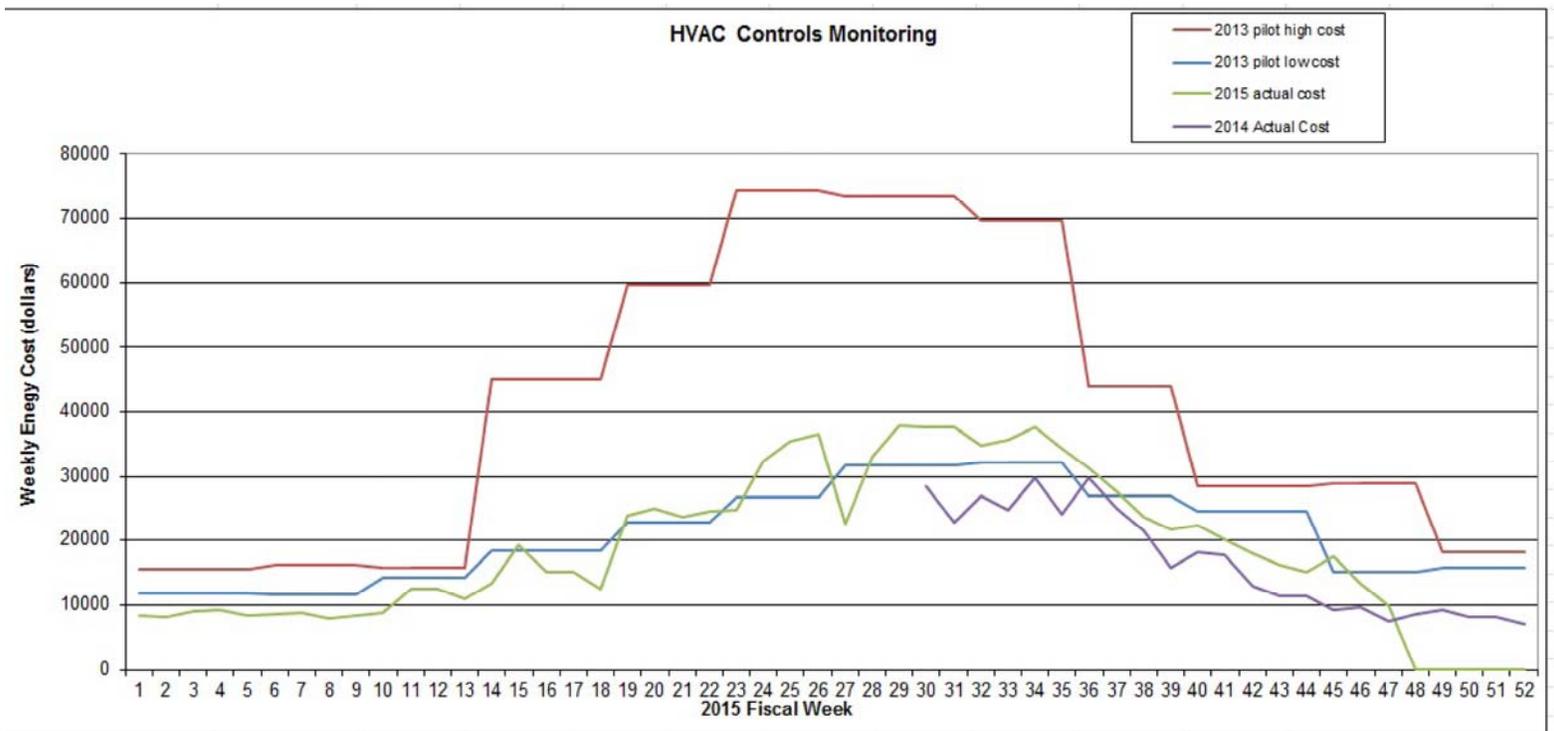


HVAC status at a glance

Detailed view of mechanical, temperature and alarm state for individual units only a single click away



\$960K saved in 2014, \$1MM saved in 2015
~50% energy reduction from 2013



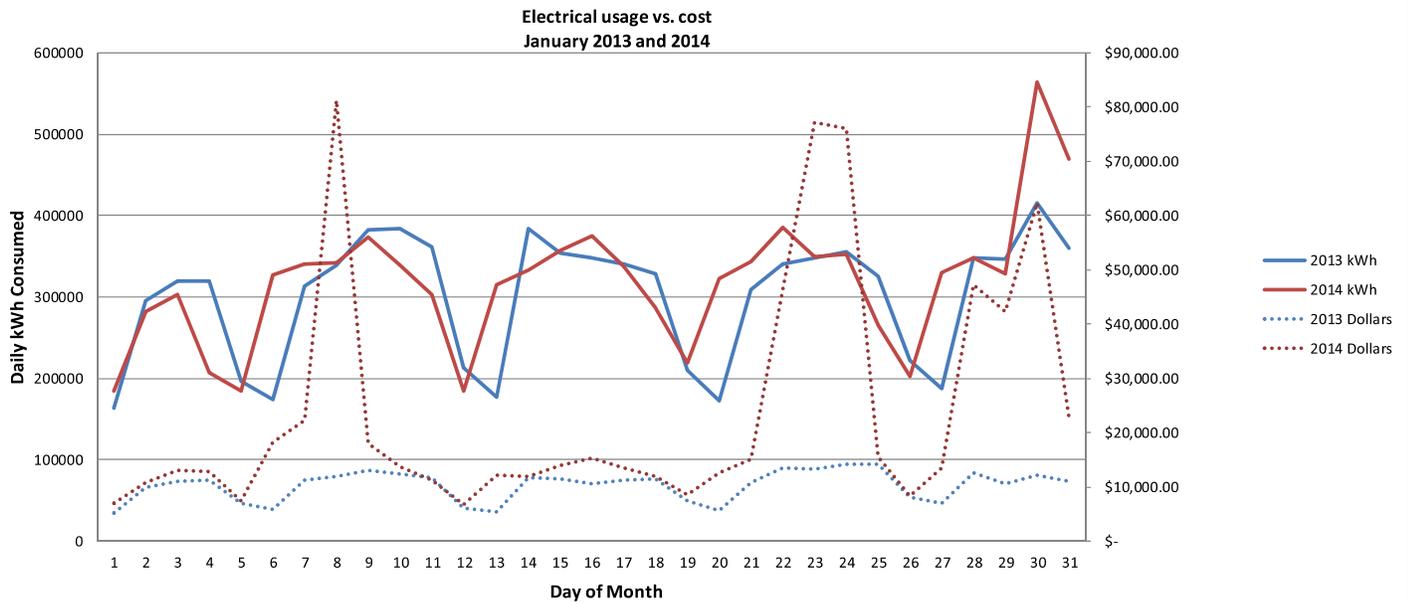
Energy Price Forecasting

Problem: Volatile day-to-day pricing has big \$ impact

Can we predict and react?



Extreme weather events push short term energy costs up 5X to 10X



Year	2013	2014	%change	# change
kWh Used	10,270,932	9,133,044	-12%	(1,137,888)
Cost	\$ 524,516.63	\$ 626,376.65	16%	\$ 101,860.02
\$/kWh	0.0511	0.0686	26%	0.0175

Utility provides the next days rates approximately 9 hours before they are applied



Five Day Energy Forecast for Energy Cost Avoidance



