Better Buildings®
U.S. DEPARTMENT OF ENERGY

# Finding Savings in Heating and Cooling Applications

**Tim Kolp**
Session Lead

U.S. DEPARTMENT OF ENERGY

# HVAC continues to bring energy saving opportunies

- Industrial Savings
  - We have seen upwards of 35% savings in industrial facilities
  - Today we will explore three approaches.
  - Let's keep this an open and interactive discussion

# Presentations From

- General Electric – David Sudbeck
- Briggs & Stratton – Steve Hinkens
- Volvo – Bert Hill

# GE Power – Greenville, SC HVAC Enthalpy Controls

David Sudbeck

May 10, 2016

**Imagination at work**

# We Are GE

We are the world’s first and only digital industrial company.

350,000 employees operating in 175 countries.

version 11/2015

# GE is transforming

Divest

Invest + Disrupt

| Consumer | Financing | Industrial | | Alstom | Digital |
|---|---|---|---|---|---|
| Appliances | Capital | GE Aviation | GE Power | Renewables | GE Digital |
| | Synchrony | GE Transportation | GE Energy Mgmt | Thermal | Predix |
| | | GE Healthcare | GE Oil & Gas | Grid | current powered by GE |
| | | Vertical Finance | GE Lighting | | |

Culture + Transformation

The first Digital Industrial company

# Brilliant Factory …


$$

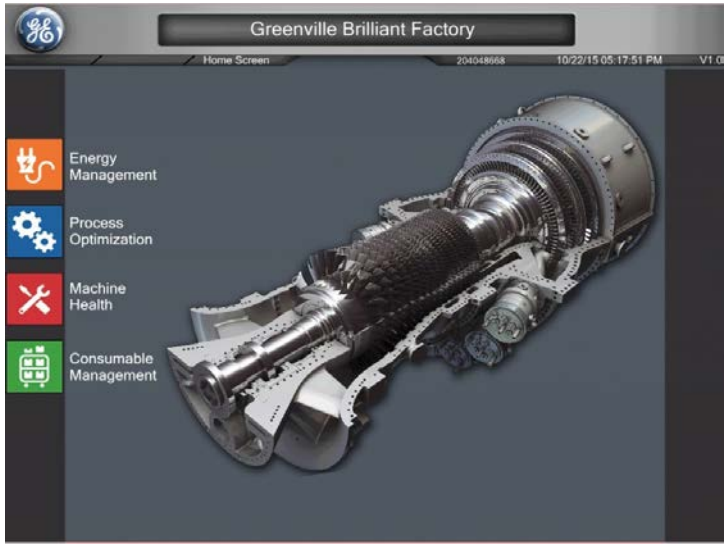
Big Data → Information → Action → Savings

# 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.

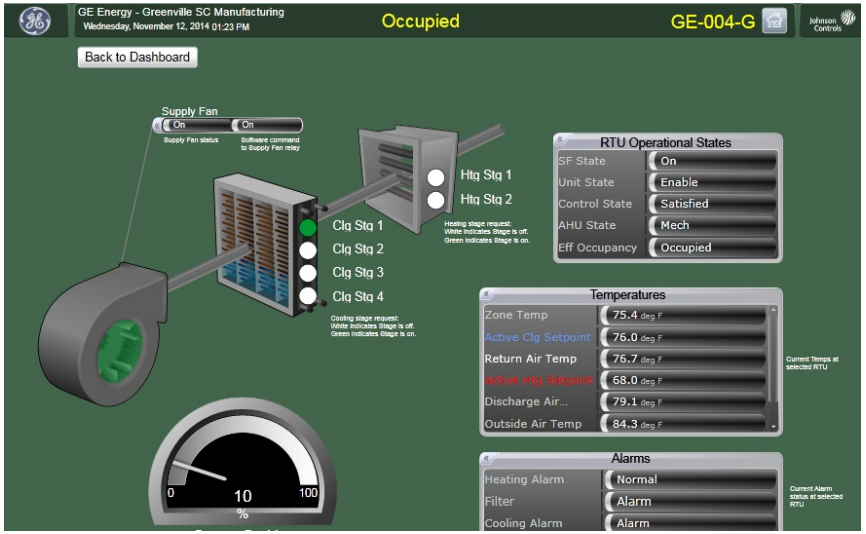
A picture is worth a thousand words…


Sometimes it’s worth a million dollars

Showed 50% reduction…projected $1 million annual savings

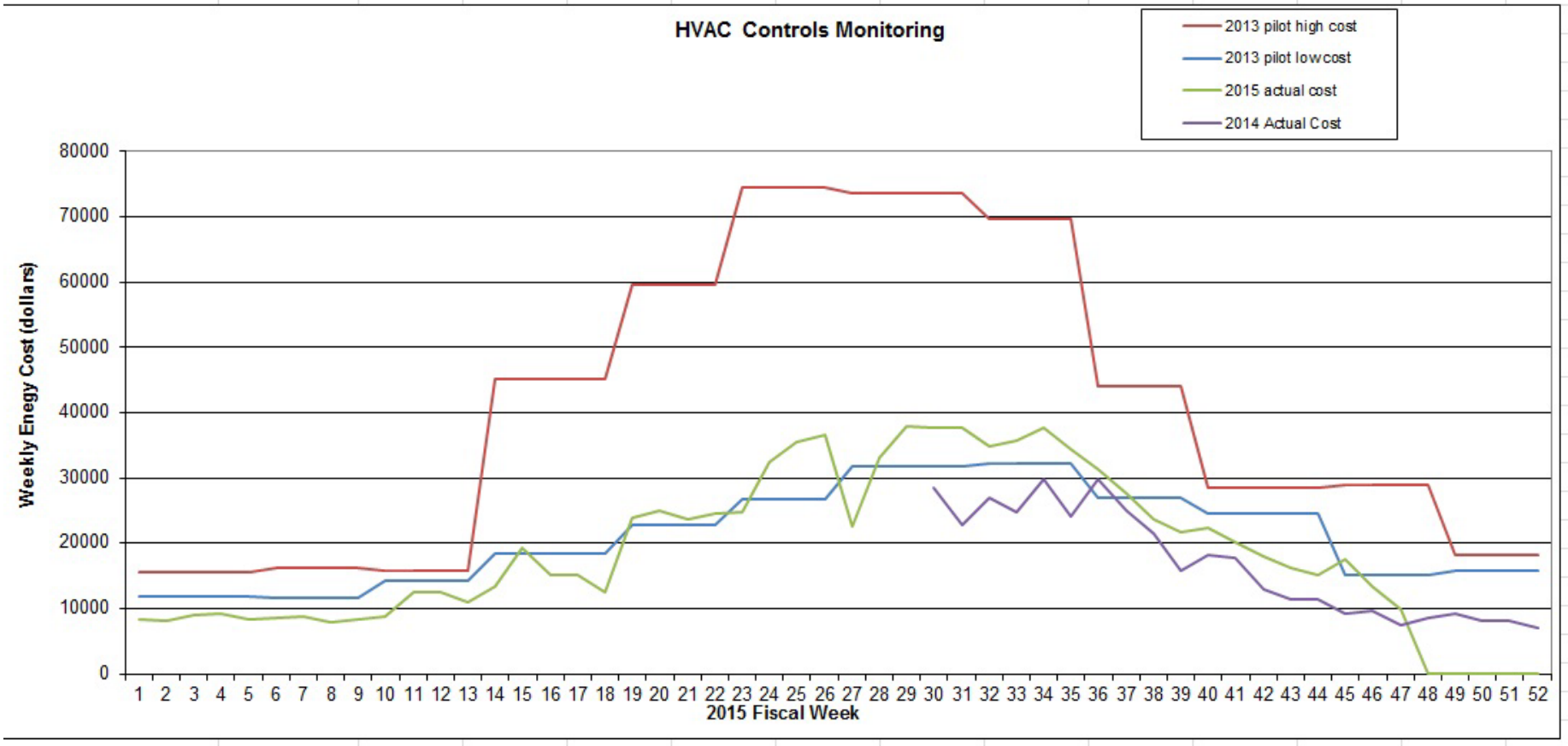
# New Controls Implemented


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

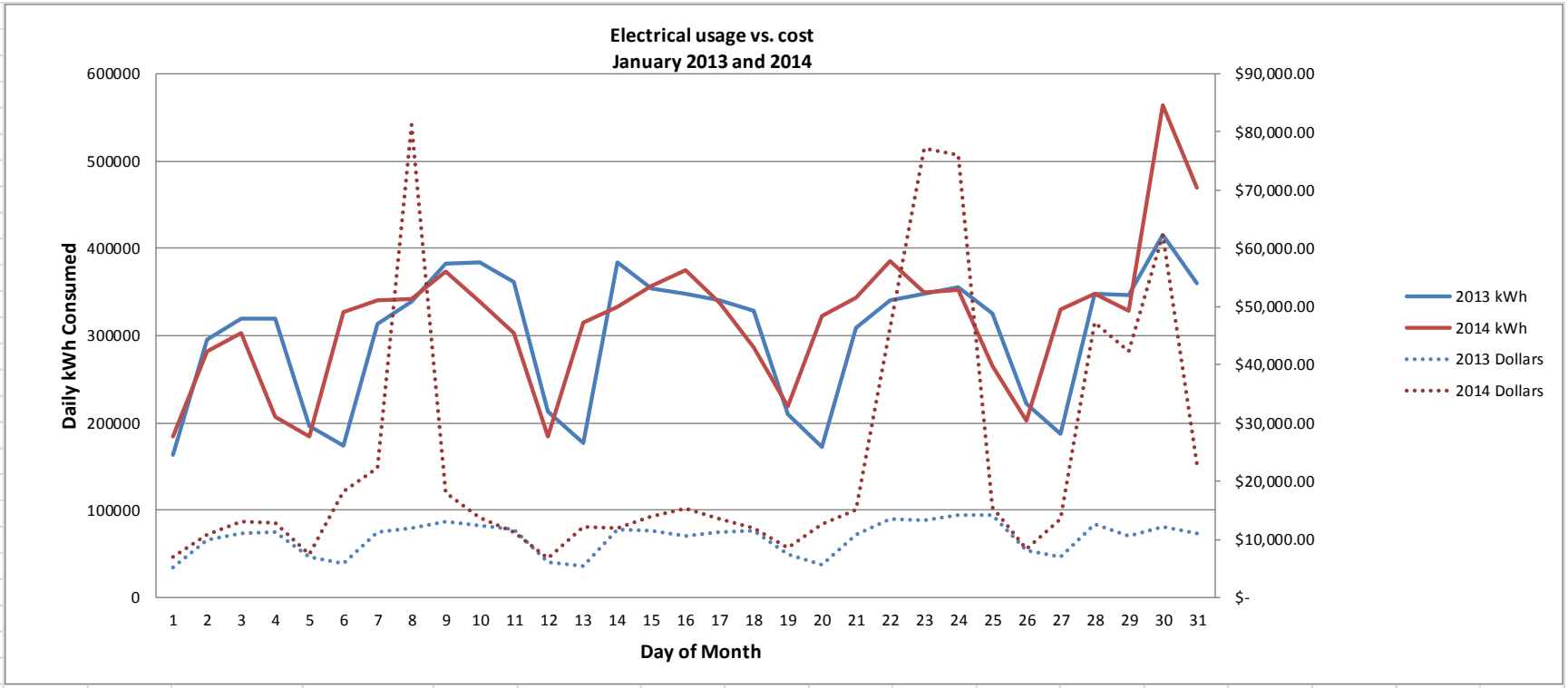


# Energy Price Forecasting

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

Can we predict and react?

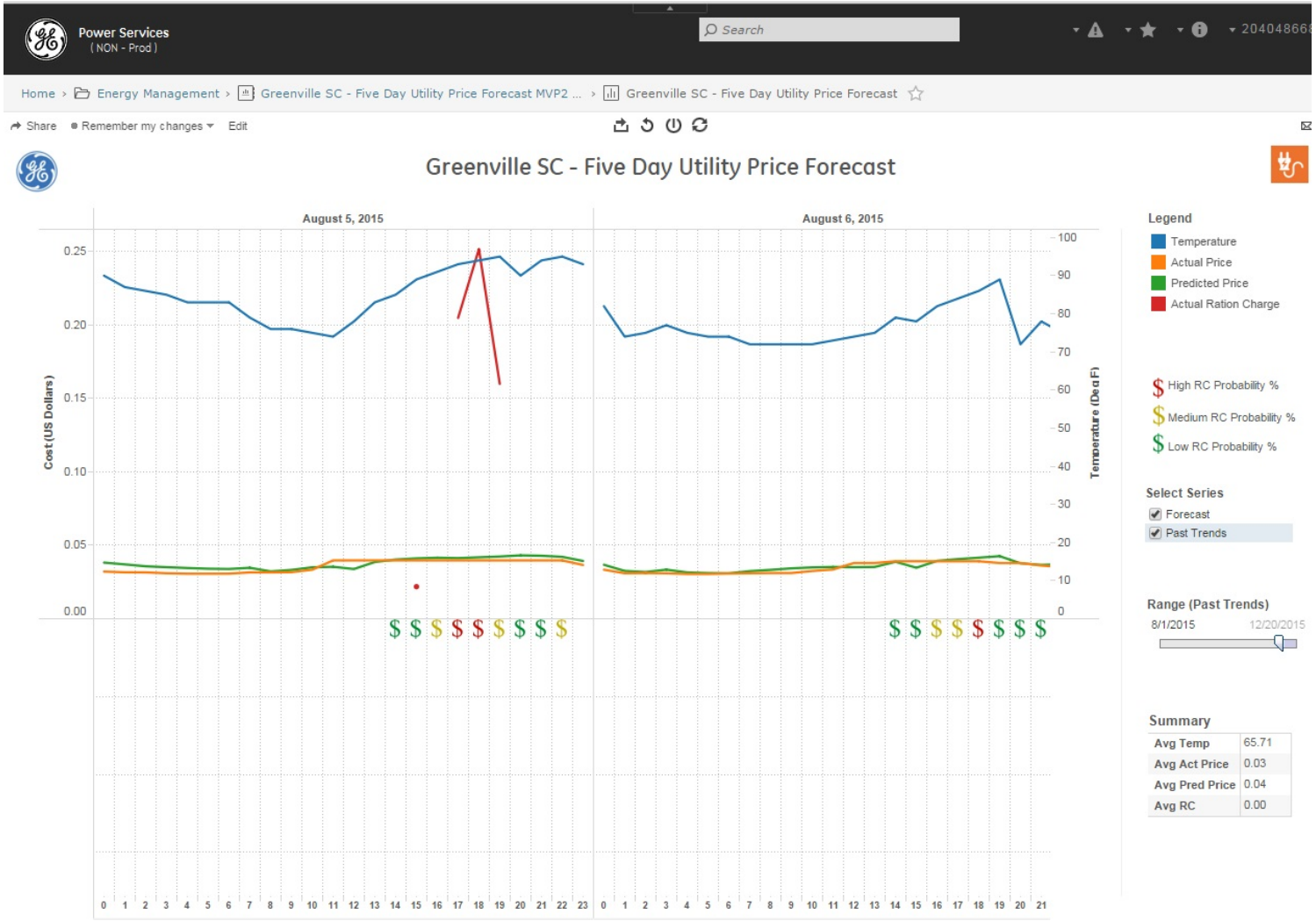
# Extreme weather events push short term energy costs up 5X to 10X




| 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



# Briggs & Stratton

## Innovative Thermal System Projects

## Burleigh Ventilation Project

**Steve Hinkens**

Corporate Energy Manager

# Briggs & Stratton

- World's largest producer of gasoline engines for outdoor power equipment.
- North America's number one manufacturer of portable generators and pressure washers.
- Leading designer, manufacturer and marketer of lawn and garden and turf care through our Simplicity®, Snapper®, Ferris® and Murray® brands.
- Briggs & Stratton products are designed, manufactured, marketed and serviced in over 100 countries on six continents.
- We employ 6,000 employees worldwide, 5,000 US employees
- Manufacturing Facilities in Auburn, AL; Statesboro, GA; Milwaukee, WI; Murray, KY; Poplar Bluff, MO; Munnsville, NY; Holdrege, NE; Kansas City, MO; Chongquing, China; Sydney, Australia

# Products

## Engine Power Products

## Power Products



# Why Energy Matters?

- Responding to our customers' demands.
- We spend $16,000,000 a year on energy.
- Energy prices will continue to go up over time
- Efficiency and Value Creation are core strategies at Briggs & Stratton.

# Energy Policy and Goal

- Signed Energy Policy in 2009, incorporated into Employee Business Integrity Program
- First Sustainability Report published July 2009
- Tracking and publishing energy related metrics according to the Global Reporting Initiative
- Dept. of Energy's (DOE) Save Energy Now LEADERS Pledge helped define our goal
- Projects and Opportunities define our savings

# Energy Project Decision Making

- Facility Energy Teams develop and discuss efficiency projects throughout the year at monthly meetings.
- Energy Projects are viewed equally with other cost reductions in the lean manufacturing environment and help to support our commitment to sustainability.

# Barriers to Efficiency Projects

- Global Economic Conditions
- Energy projects must compete with future product line enhancements including marketplace demands and environmental regulations
- Advanced technology has unknown costs

# Burleigh Ventilation Project

- Opportunity:  Reduce the cost of heating and ventilating a 1MM SF manufacturing facility
- Study initiated in conjunction with WE Energies, Franklin Energy and Wisconsin's Focus on Energy
- Outside engineering firm performed thermal energy audit to determine baseline and opportunities for improvement
- Study showed that many fans and MAU's were running during unoccupied times

# Project Overview

- Add eight new direct fired MAU's to the plant, shutting down eight older less efficient units
- Add new control system to existing BAS in order to enable and monitor operation of 18 MAU's and 40 exhaust fans.  Units previously on manual control.
- New controls will operate with Wi-Fi wireless relays communicating over Briggs' guest network
- Allows facility staff to schedule runtimes and to shut equipment down when facility is not in operation

# Project Overview

- Previously, equipment was operated with manual controls
- Airflow sensors will be installed throughout the plant to control air balance and create a more comfortable environment

# Makeup Air Units

- Old

- New

# Control Modules

- Old Controls

- New controls


# Cost and Performance Data

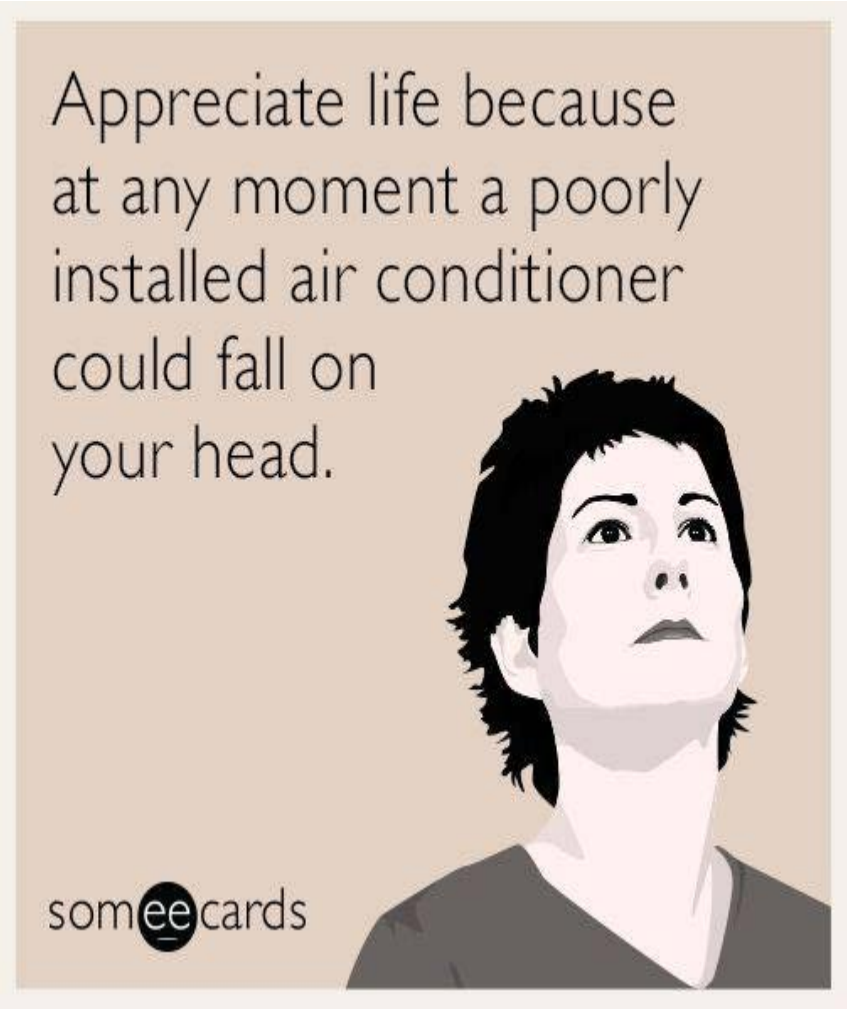
- Project Cost:  $494,000
- Energy Savings: 345,373 kWh and 176,817 Therms
- Equivalent to 18,860 MMBtu or 6.3% of plant wide energy use
- Cost Savings: $137,600
- Wisconsin's Focus on Energy incentive $155,300
- Simple payback 3.6 yrs without grant 2.4 yrs with grant

# Implementation Challenges

- Getting buy-in from Corporate IT to use their wireless network for communication link between devices
- Physically improving the network to handle the additional traffic – required capital funding
- Convince maintenance that this project would make their job easier and improve operations – manual to automated controls

# Non-Energy benefits

- New controls will allow automated programming control of the equipment vs. manual control
- Environment of the plant will be improved with better ventilation due to more precise temperature and airflow control
- IT will be able to use the improved WiFi network to automate production and inventory control functions


Appreciate life because at any moment a poorly installed air conditioner could fall on your head.
someecards


THE POWER WITHIN™

**Steve Hinkens**
**hinkens.steve@basco.com**
**414-259-5881**



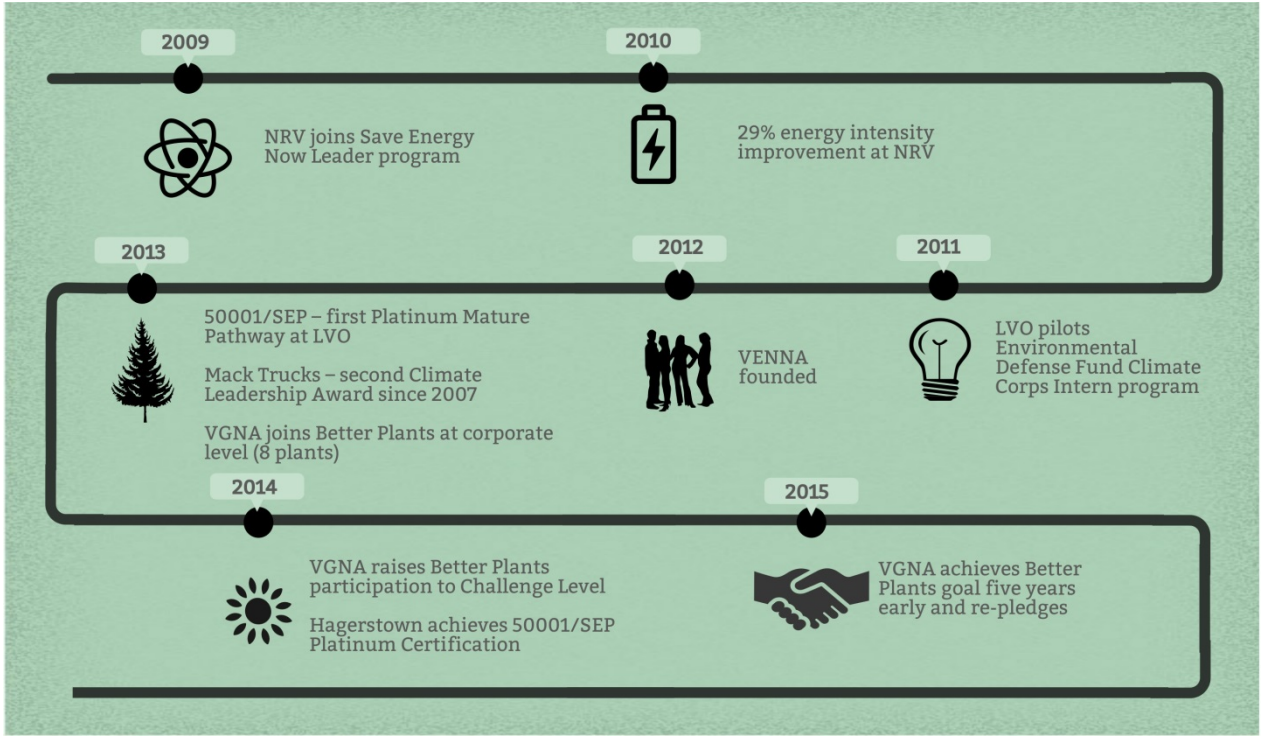

VOLVO

Volvo Group North America


The Volvo Group is one of the world´s leading manufacturers of trucks, buses and construction equipment and drive systems for marine and industrial applications.


Corporate values
Safety
Environmental care
Quality

# Volvo Group North America Energy Milestones



# Facilities in North America

Headquarters

Operations / Manufacturing

Engineering

Mack Trucks

Volvo Trucks North America

Mack Trucks and Volvo Trucks

Truck Development and Testing

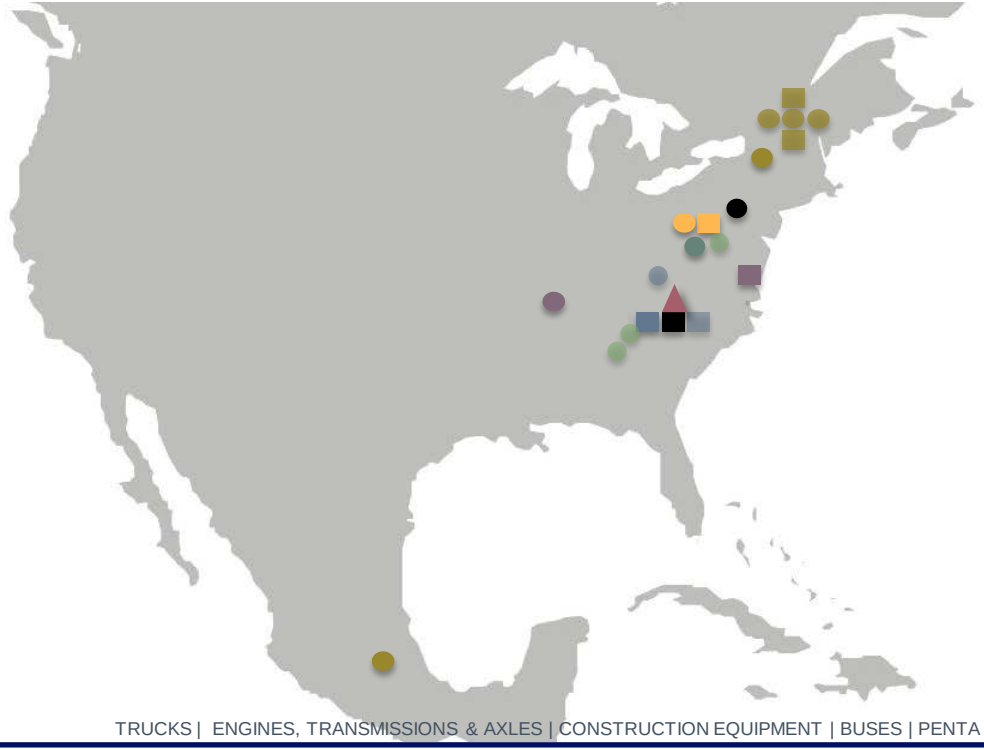
Engines and Transmissions

Volvo Construction Equipment

Volvo Buses: Volvo, Nova & Prevost

Volvo Penta

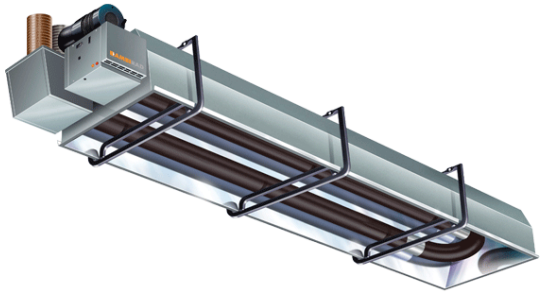
Volvo Financial Services



# Lehigh Valley Operations


- One-million-square-foot plant in Macungie, Pennsylvania, in the Lehigh Valley
- More than 1,100 employees
- Manufactures entire Mack North American product line
- Certified to ISO 9001 Quality, ISO 14001 Environmental Management and OHSAS 18001 Health & Safety standards
- Member of the U.S. Department of Energy Better Plants Program with commitment for 25% energy consumption reduction by 2025
- First facility in the United States certified to ISO 50001/ANSI MSE 50021 (Superior Energy Performance) – Platinum Mature Pathway

# Radiant Heating Project

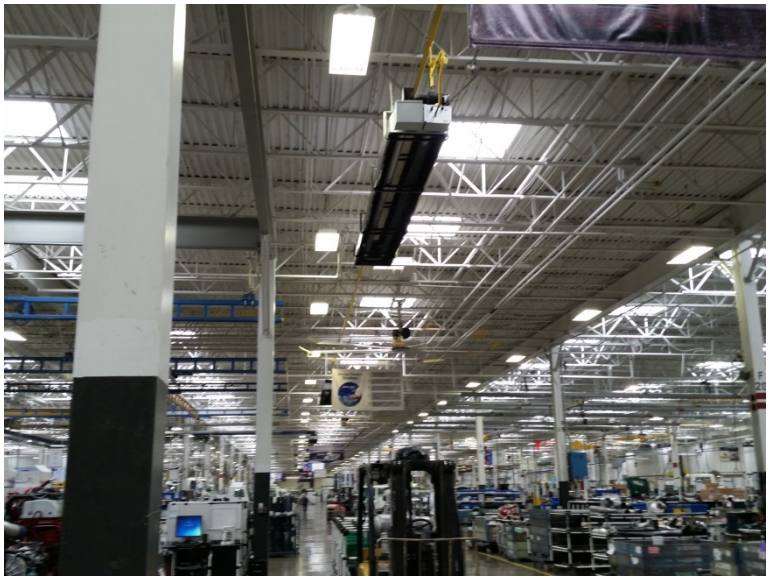


- Forced air/hot water comfort heating system identified as the largest Significant Energy Use (SEU) identified during implementation of ISO 50001/Superior Energy Performance systems
- Comfort heat responsible for ca. 24% of the building's energy use
- Analysis showed forced air/hot water system could be replaced with 123  140,000 Btu Radiant Tube Heating units
- Good success with smaller scale radiant heating applications at other sites

# Radiant Heat Principles and Benefits

- Infrared energy passes inertly through the air, dissipating as heat upon contact with solid objects
- Radiant heat takes only minutes to reach comfort temperatures, so energy is never wasted in prolonged warm-up times
- Ideal in areas of high air infiltration
- Minimizes roof heat losses - reduced stratification

# Project Outcome



- Six additional heaters had to be added to address cool areas
- 97% reduction in electricity and 36% reduction in natural gas used for comfort heating
- $215,000 in annual savings
- 3.5 year simple payback


VOLVO

# Open Discussion - Questions

# Enjoy the Remainder of the Summit

Thank you