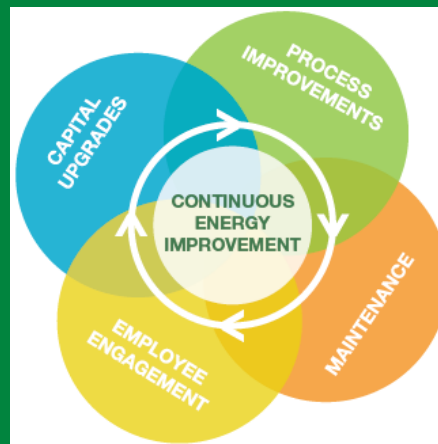


Efficiency Vermont

Version 3



Energy “Treasure Hunts” and Kaizen Events: Finding Energy Savings in Commercial and Industrial Accounts



What will you learn today?

- What is Efficiency Vermont's CEI Program?
- What are the benefits from a CEI approach?
- What is a Kaizen event?
- What have been a some efficiency opportunities identified using kaizens?
- What have been the benefits from conducting a kaizen?

Presentation Team

- Greg Baker
 - ✓ representing Efficiency Vermont
- Jenna Pugliese
 - ✓ representing Stratton Mountain Resort
- DeWayne Howell
 - ✓ representing Husky Injection Molding Systems
- Greg Liebert
 - ✓ representing Central Vermont Medical Center

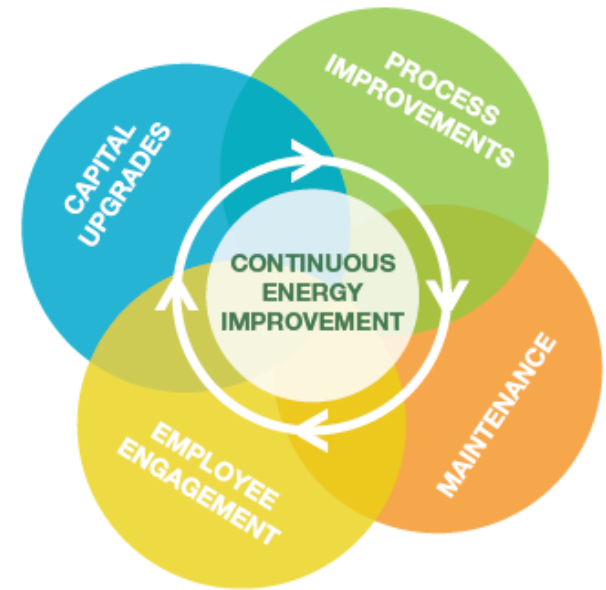
Continuous Energy Improvement (CEI)

“Continuous improvement process is an ongoing effort to improve products, services or processes. These efforts seek “incremental’ improvement over time...” *Wikipedia*

Continuous Energy Improvement (CEI) is the application of incremental steps to improve the energy use of a process, building or group of buildings and processes.

CEI - Cohort 1

- Husky Injection Molding Systems
- Weidmann
- Energizer Battery Manufacturing Company
- Stratton Mountain Resort
- Keurig Green Mountain
- Ben & Jerry's
- Central Vermont Medical Center
- Mack Molding



CEI – *the long view*

Familiarity with Continuous Improvement in areas such as

1. Safety (ISO 13100)
2. Quality (ISO 9001)
3. Environmental (ISO 14001)
 - ***Mainly focused on proper documentation***

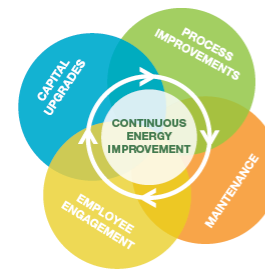
New established framework that enables companies to improve the way energy is managed

4. Energy (ISO 50001)
 - ***Mainly focused on improvement***

Continuous Energy Improvement (CEI) Framework

- ✓ Capital Upgradesnothing new.
- ✓ Process Improvements.....taking a fresh look.
- ✓ Maintenanceimprove the focus.
- ✓ Employee Engagement..... creating the culture.

Continuous Energy Improvement: Strategic planning for maximum results



Take your energy management approach to the next level

HVAC, lighting, and other energy saving opportunities are a piece of it, but there's a larger picture. Continuous energy improvement strategies help companies permanently embed energy management into their business model. The result? An energy approach that integrates seamlessly with day-to-day operations, and deeper, more sustainable savings.

PARTNER WITH YOUR ACCOUNT MANAGER TO:

- Compare all proposed upgrades to determine the best return on investment
- Involve the purchasing department in the plan
- Evaluate the life cycle costs of all equipment choices

- Evaluate current processes
- Take a critical look at each process step
- Set improvement goals and monitor progress

- Tune, clean, and calibrate all equipment regularly
- Replace worn fixtures or parts with energy-efficient models
- Incorporate energy efficiency into regular maintenance protocols

- Empower employees to identify and suggest energy saving ideas
- Provide programs and incentives for employees to save energy at home
- Recognize employee contributions to saving energy

CEI – Benefits

Reduced operating costs

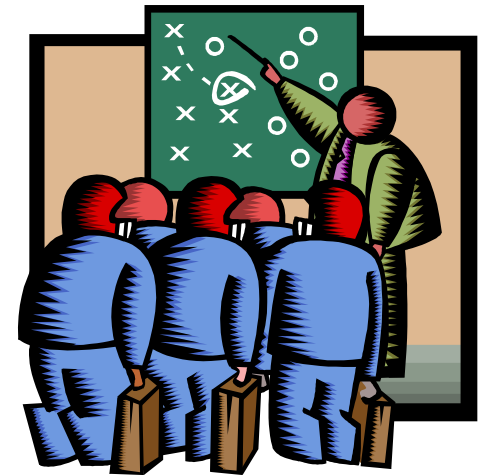
- Increased productivity of every unit of energy purchased
- Ensuring long term benefits from all energy efficiency activities

Increased operational knowledge and control

- Discovering new energy efficiency opportunities (O&M, behavioral)
- Understanding the drivers of energy consumption throughout operations (weather, raw materials, employee practices, product mix)
- Enabling detailed energy reporting and costing within the organization
- Empowering staff to manage energy consumption

Efficiency Vermont's CEI Program

- Outlines minimum elements of an energy management system in three major groupings
 - Customer commitment
 - Energy Management Planning & Implementation
 - System for Monitoring, Tracking & Reporting Performance



Energy Management Planning

- Planning lays the foundation for energy management, enabling the energy champion to implement critical elements of the system
 - Energy Management Assessment
 - Baseline Energy Use
 - Set Goals
 - Savings Opportunity Assessment



Energy Management Tracking

- Tracking with data driven tools enables the energy champion monitor and understand the drivers of energy use.
 - Measuring key factors of influence
 - Data Collection and Review
 - Data analysis to guide decision making



Energy Savings

Savings still claimed for retrofit measures

Time Frame:
10 years

Capital
Projects

Annual

Retrofits

Monthly

Maintenance

Daily

Behavioral change

Operational and Maintenance savings claimed

EE Opportunity Identification

- Energy Audits
 - Ashrae Level I – Bill review and walk thru
 - Ashrae Level II – Analysis and building scans
 - Ashrae Level III – Long Term Study with metering
- Process Evaluations
 - Support or production equipment
- Energy “Treasure Hunts” Events or Kaizens
 - Cross functional team approach to identifying many “perceived” small improvements

Energy “Treasure Hunt” Kaizen

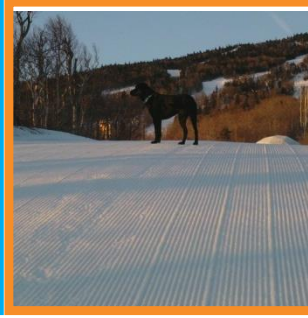
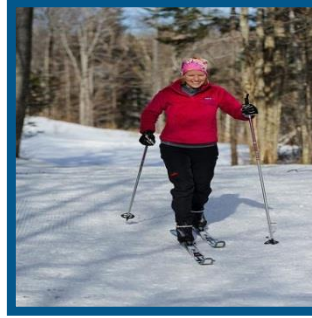
- Kaizen = Kai (Change)

改

+ Zen

善

- Collective Intelligence
- Bringing People Together for a common cause.



Stratton Mountain

Kaizen @ Stratton Mountain Resort



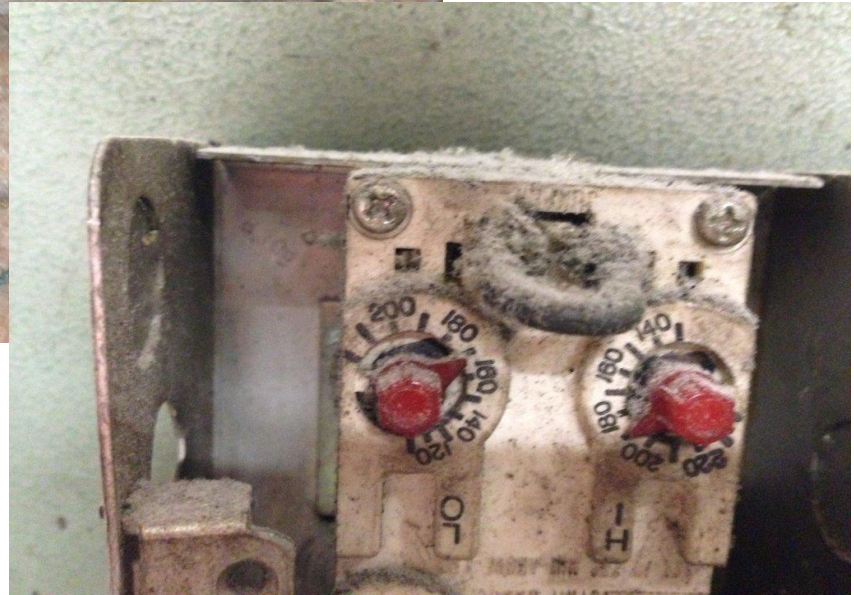
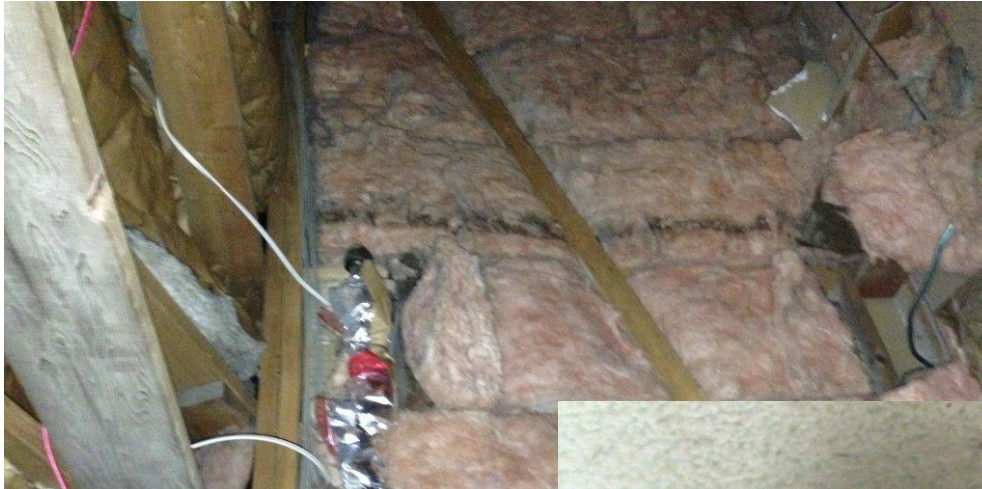
Stratton Mountain Resort

- Stratton's Mission: Creating the Best Memories...Again and Again!
- Environmental Mission: Protect, Conserve and Enjoy
- In 2008-2009 we had achieved multi-year, award winning, reductions in our overall utility consumption
 - NEEP Business Leader for Energy Efficiency
 - National Ski Areas Association Silver Eagle for Energy Efficiency
- Goals : 15% over '14 in '15
- -Our goal is to save 15% (in units) of each utility over our 2014 consumption in fiscal year 2014
- Metrics :
 - We track all utilities by account in usage and dollars
 - As a seasonal business we normalize for heating/cooling degree days
 - In restaurants we track "covers"
 - In hotels we track "room nights"
 - In snowmaking we track acre feet
- **Energy is our second largest expense, after labor**



**FRESH
TRACKS**
PROTECT,
CONSERVE
& ENJOY

How about this.....



What we found

- Over 150 opportunities
- A lot of dust bunnies
- Energy is like a ton of coal in a second.
- Data and feedback loops (Especially with the campus)
- Asking the 5 “Why’s”
- Some real demon energy reverting to old technology traction



it for a

campus)

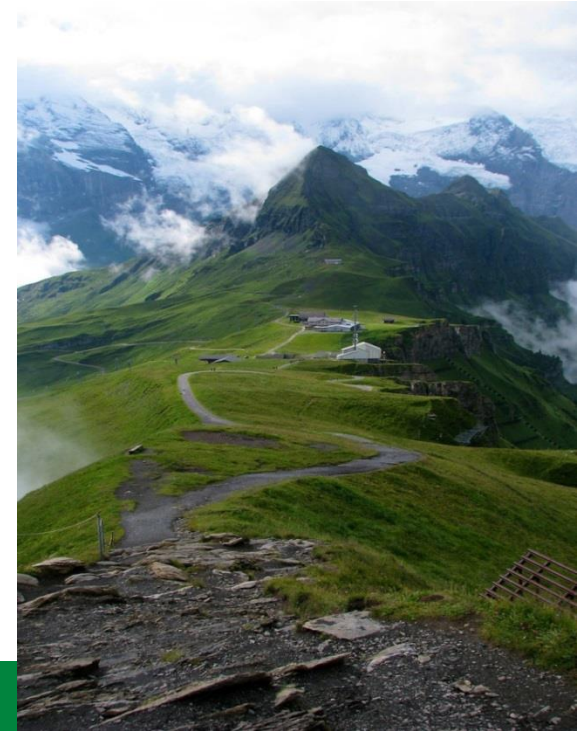
ucets,
cultural

Where we are now!

- We have installed SENSEI Act Software
- We are in the home stretch of getting SENSEI Manage Installed.
- We still have a very long project list (132 projects)
- We installed 350 High Efficiency Snow Guns (thanks to the Great Snow Gun Round Up)
- We are now 100% diesel free in our snowmaking operation
- We are scheduled to conduct leak testing on all air lines before the start of the 2016 snowmaking season
- We have installed low flow sprayer valves in all food and beverage outlets
- We have gone through 3 additional Kaizens
- EVT reps are on every Energy Team Call
- We have begun the renewal of our Education and Outreach

Feeling Good but it has been a bumpy road....

We are glad to have a process and a road map in place to guide us--



Thoughts and Questions?





HUSKY[®]

Keeping our customers in the lead

DeWayne Howell
February 5, 2015

Template structure

- Company Overview
- Energy Use within your facility(s)
- Energy Efficiency
 - Goals
 - Barriers
- Facility Kaizen Overview
 - Target Areas
 - Identified Opportunities
- Kaizen Process Benefits
 - Types of savings opportunities
 - Employee Engagement

Who is Husky?

- World-wide manufacturer of injection molds and systems for the beverage closure, medical, consumer electronics and packaging industry
- In Milton, Vermont we are a 250,000 ft² facility located on 700 acres focused on the manufacture of injection molds and system controllers
- Employ approximately 350 employees across 3 shifts
- Actively participated in energy conservation programs with Efficiency Vermont since 2003
 - Awarded the NEEP Award in 2008
 - Successful member of Energy Leadership Challenge
 - Charter member of CEI Cohort

Company Mission and Goals

Mission/Charter

Aligning energy management responsibility and accountability with those individuals within the business who have the ability to affect change and drive continuous improvement

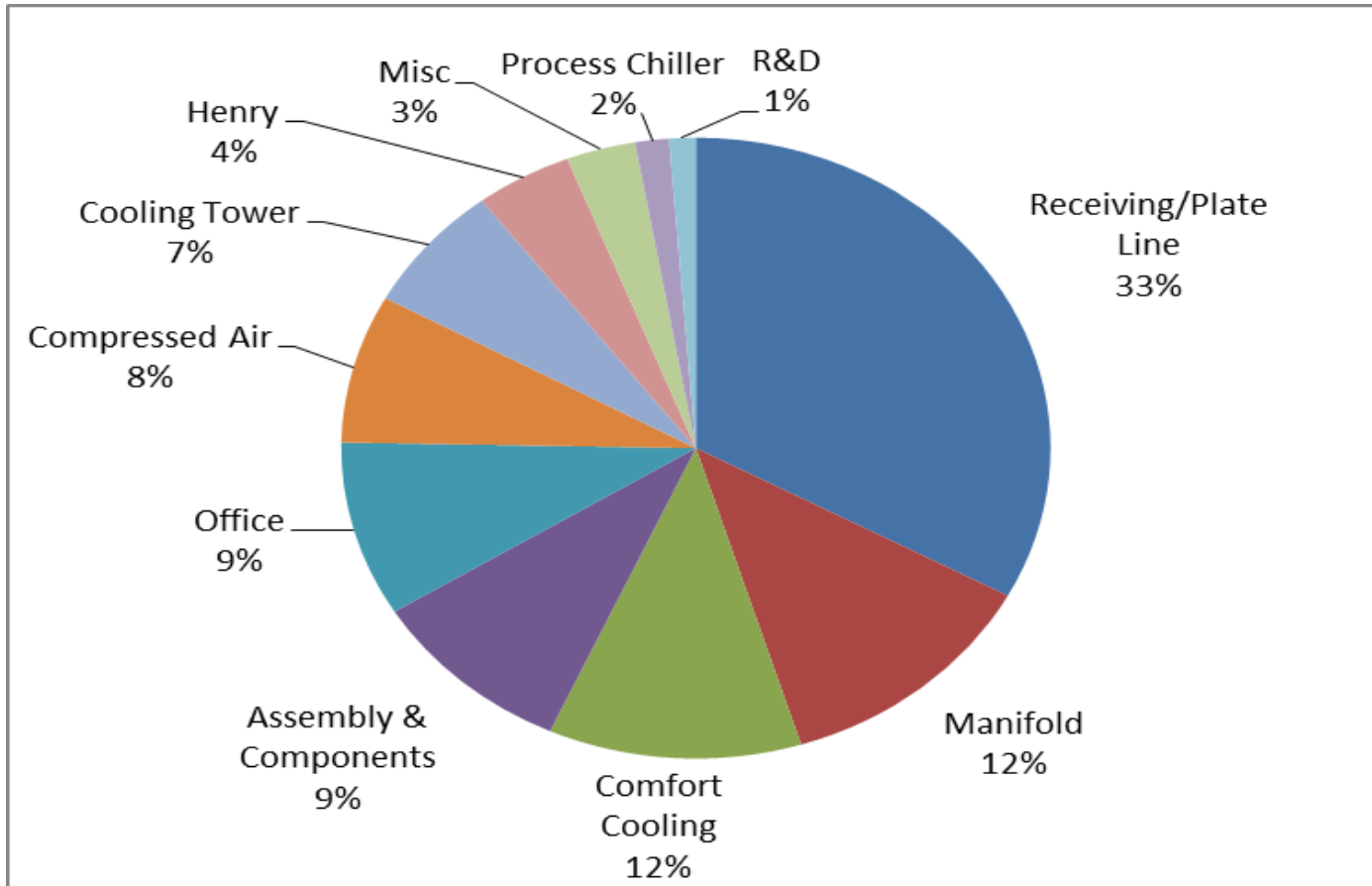
Goals

- Electrical savings of 5% per year = 747 MWh (based on 14,941 MWh/yr. usage)
- Develop an energy per unit model representative of daily production swings

Metrics : This has been one of the most challenging areas

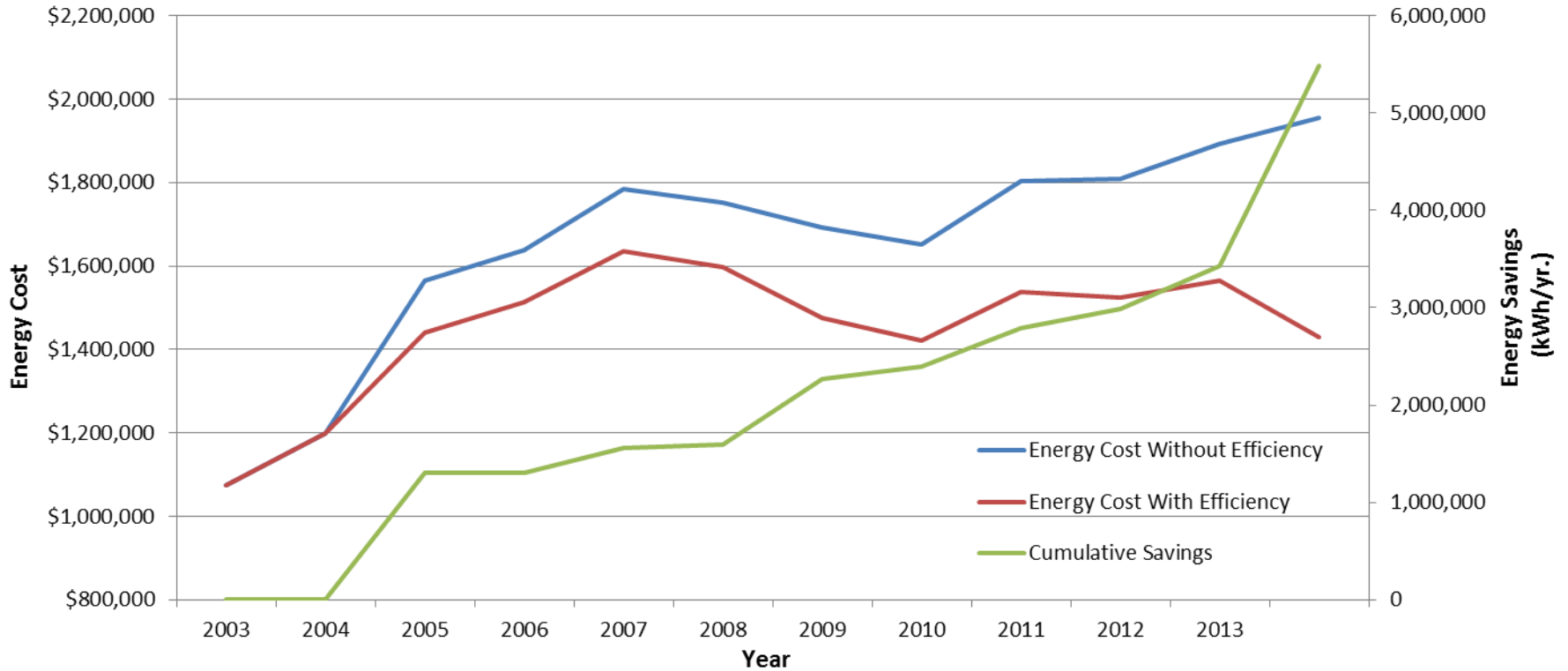
- MWh/Sales dollar
- Base Load
- Peak Load

Breakdown of Energy Use by Process



Project History

Husky Injection Molding Systems - Energy Reduction Impacts



HPEM Team Members

Executive Sponsor – Geoff Glaspie, General Manager

Energy Champion – DeWayne Howell, Manufacturing Manager

Team Members

- Mark Benson, Manufacturing Technology Manager
- Jim Welch, Maintenance and Facilities Project Lead
- Josh Kelman, Efficiency Vermont - Energy Consultant
- Greg Baker, Efficiency Vermont – Account Manager

First Year of CEI Projects

Completed Projects 2014 (so far)

RTU fan vfd's	132 MWh
Groundwater pump replacement	254 MWh

Projects expected to complete in 2014

Henry System accumulator	150 MWh
Office HVAC retrocommission	250 MWh
CAS leaks and machine dryer disconnects	100 MWh
LED Office Lighting and Controls	10 MWh

Longer term projects underway

CAS pressure reduction	40 MWh
Ground source Cooling	2500 MWh
Additional RTU vfd's	500 MWh

CEI Kaizen November 2014

- Majority of our previous projects had been facility based
- Event held to identify potential opportunities in our largest manufacturing area
- Participants from Efficiency Vermont, Weidmann, Mack Molding, Keurig Green Mountain, Stratton Mountain, Cascade Energy and Husky Corporate Services took part in the day long event
- Group was broken into teams to investigate each part of the manufacturing cell and identify opportunities
- Time was spent by each group to do a rough cost analysis on their most promising opportunities

Projects Identified

Several opportunities were identified to cycle off equipment sub-systems more frequently or when machines were idle

- Chip augers in CNC mills run 100% of the time but could be turned on and off automatically through the part program based on the metal removal - \$5300/yr
- Install VFD's on mist collector fans to reduce flow while machine is in cycle and turn off when it is idle - \$6200/yr
- Turn off idle chillers and hydraulic pumps while vertical mills are idle - \$12,000/yr

Key Outcomes

- Gave the team the opportunity to take a step back and look at the facility from a new perspective
- More than 100 potential opportunities were identified and graphically categorized based on cost to implement and potential impact
- Several opportunities were presented by each team with cumulative potential savings exceeding \$70,000/year
- If fully realized, this could result in a 5% decrease in our electrical use over the course of a year

Conclusion

- The Kaizen process was a unique opportunity to engage partners in the cohort to identify new opportunities
- The simple process of touring “outsiders” through the facility and explaining how things worked helped us to identify several of the opportunities on our own
- Taking a single day out of our normal schedule to focus on energy efficiency helped us to see many of our processes in a new light

THE
University of Vermont
HEALTH NETWORK

Central Vermont Medical Center



Energy Savings Initiative

$$E = mc^2$$

Company Overview

About CVMC:

Central Vermont Medical Center is the primary health care provider for 66,000 people who live and work in central Vermont. We provide 24-hour emergency care, with a full spectrum of inpatient (licensed for 122 beds) and outpatient services. Our professional staff includes over 121 physicians and more than 60 associate providers. Care is not only provided at the hospital, but also at CVMC's 18 community-based medical group clinics and local physician practices.

Mission:

We work collaboratively to meet the needs and improve the health of the residents of central Vermont.

Vision:

CVMC will be viewed as a significant community asset; a high-performing, high-quality, safe and reliable, community- focused, and cost-effective organization where staff, physicians, volunteers and patients are enthusiastic about services delivered through a model community health system.

Company Overview

Our Energy Goal:

To reduce energy use through conservation and efficiency improvements, and to be the first hospital in Vermont to achieve the Energy Star Designation by the Environmental Protection Agency.

Our Energy Policy:

Central Vermont Medical Center is committed to reducing the consumption of fuel oil electricity, and water through conservation and efficiency, in order to be a good steward within the community and planet, and to contribute to the financial health of the organization. Our commitment will be tested and measured through actions and results as evidenced by reduced consumption and lower facility operating costs. We will achieve the intended results without negatively impacting the patient experience, comfort and satisfaction of staff, and most importantly, the health and security of the institution.

ESI Team Members

Executive Sponsor – Richard Morley, VP Support Services, CVMC

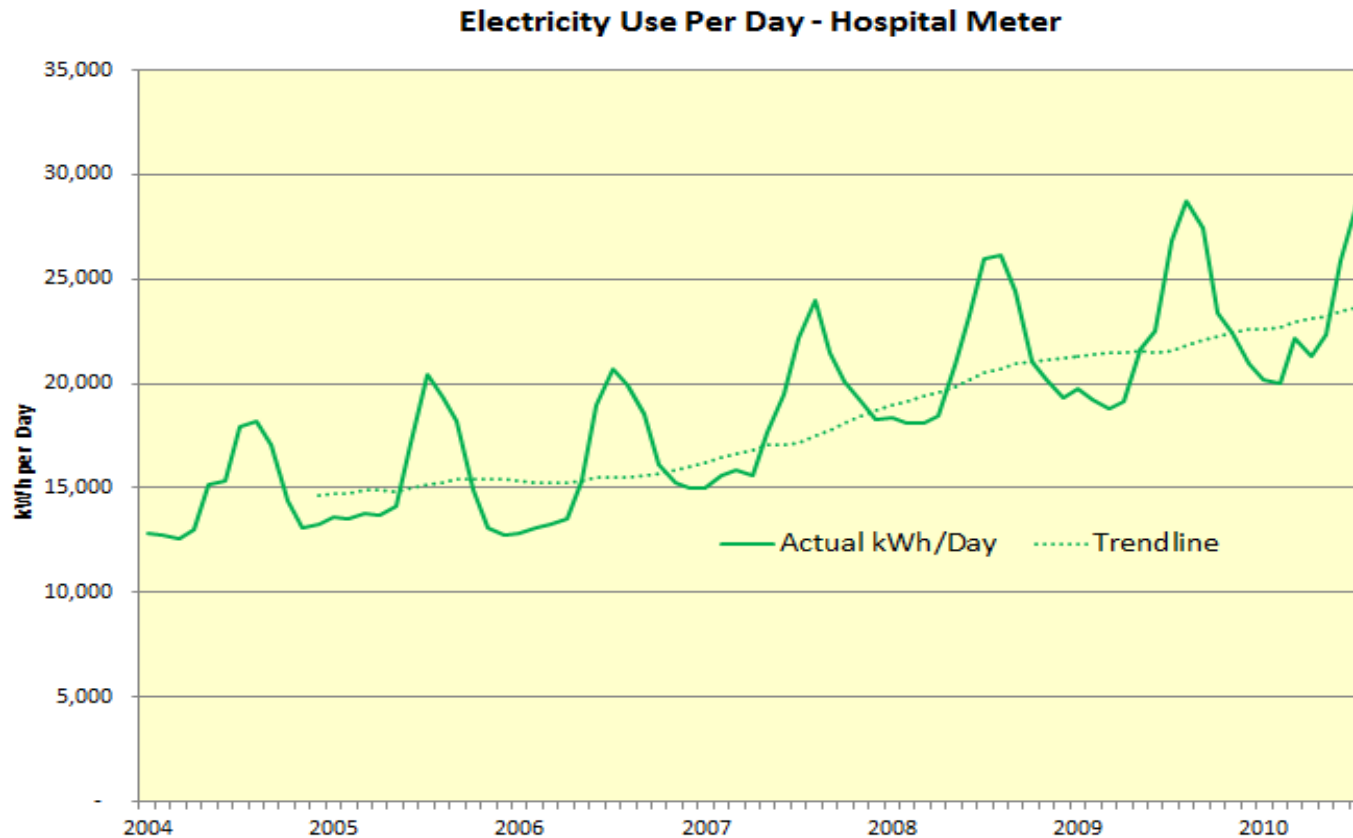
Energy Champion – Leo Martineau, Plant Facilities Foreman, CVMC

Team Members

- Nicole Duncan, Facility Project Coordinator, CVMC
- Gregory Liebert, Liebert Engineering
- Chris Vintinner / Mike VanHorn , Control Technologies
- Maribella Ibarra, Efficiency Vermont
- Tim Perrin, Efficiency Vermont

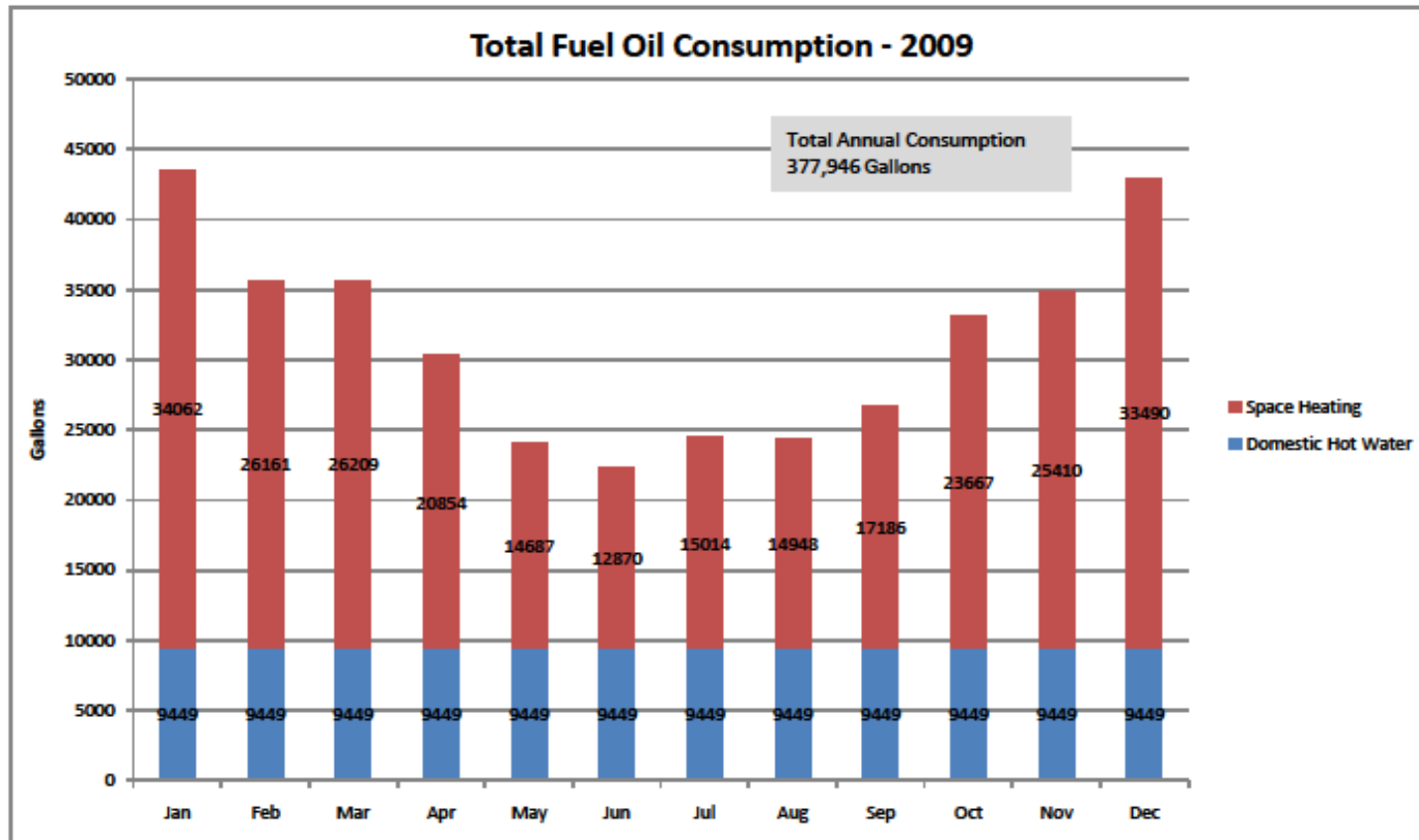
Where we were...

Describe how energy was managed before ESI



Where we were...

Describe how energy was managed before ESI





Central Vermont Medical Center - Energy Action Plan (2014)



Purpose: To reduce operational cost savings, improve building comfort & performance, improve the patient care experience, and reduce our environmental impact through becoming the first Vermont hospital to achieve Energy Star designation.

Current: Annual energy costs (baseline): \$ 1,800,000 Annual energy use per square-foot: 231 kBtu

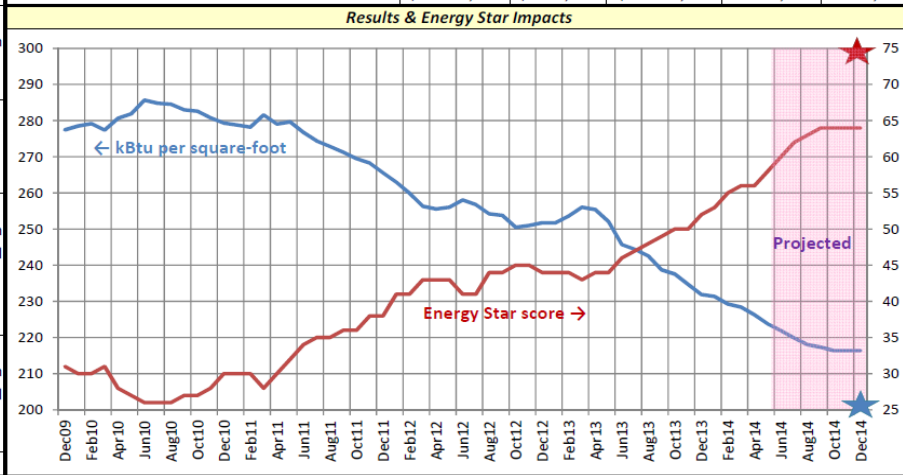
Goals: Reduce energy costs by 15%: \$ 270,000 Reduce energy use per sq-ft by 13%: 200 kBtu

Signed: _____
Richard Morley, VP Support Services

Team: Leo Martineau, Richard Morley, Nicole Duncan, Greg Liebert (LEI), Chris Vintinner (CTI), Maribella Ibarra (EVT), Tim Perrin (EVT)

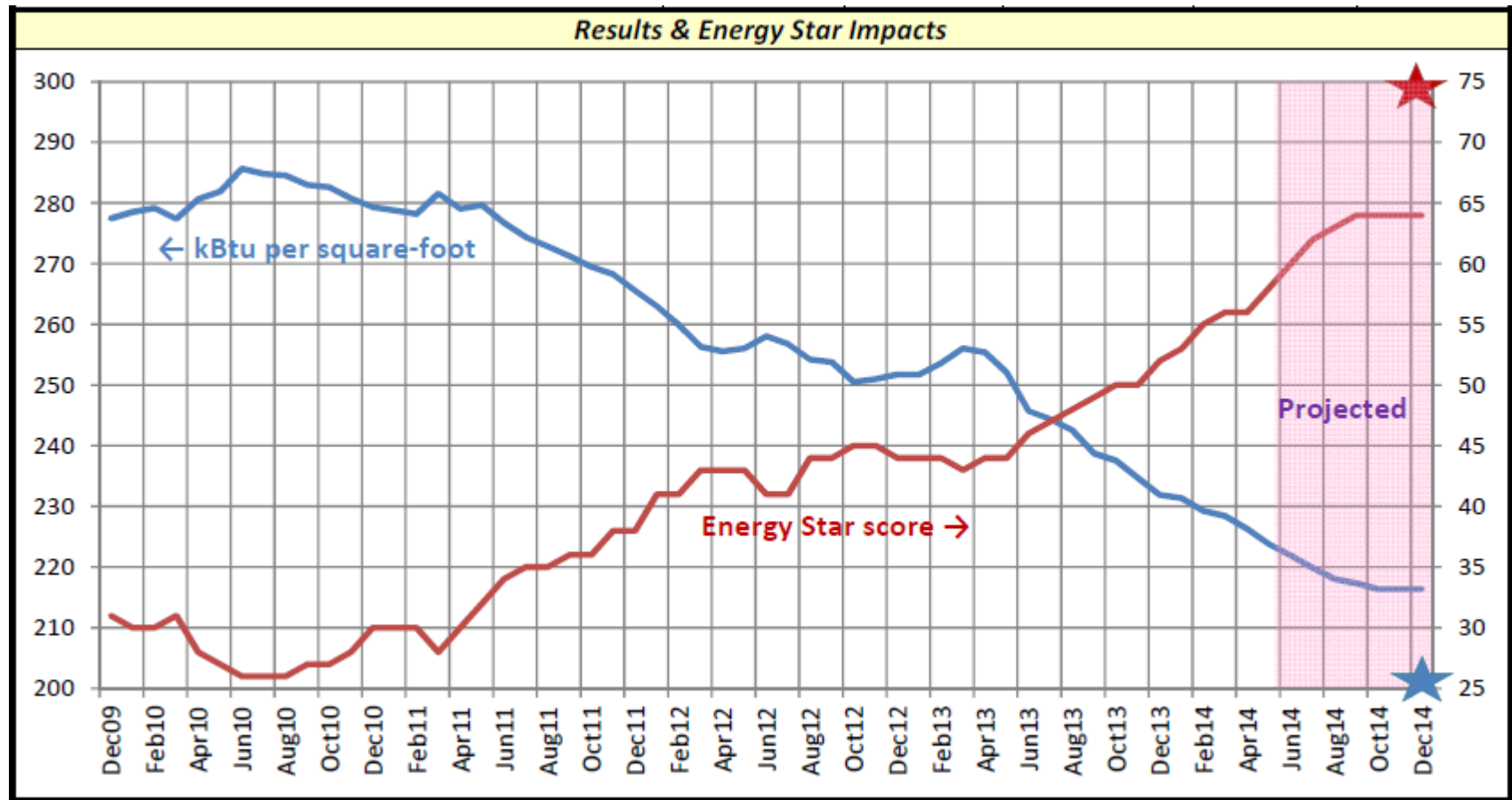
Signed: _____
Timothy Perrin, Senior Account Manager

Action Plan			Completed Efforts - 2012-13						
	Lead	Impact	Project Description	Date	Proj. Costs	Incentives	Annual Savings	kWh Reduce	Oil (gallons)
1. Optimize end-use HVAC system, components, and controls	G.Liebert	\$ 23,725	Central Sterilizer - Air-handling Unit	Jun12	\$ 44,195	\$ 2,200	\$ 3,421	29,003	87
√ Apr14 New sequence of operations for AHU#1		200000 kWh	LED Parking Lot Lighting	Aug12	\$ 37,030	\$ 11,000	\$ 5,978	45,242	
May14 Ensure proper operation of recent controls changes/upgrades		500 gal oil	Heat Recovery Heat Pump	Aug12	\$ 470,000	\$ 50,000	\$ 175,395		71,246
Jun14 Apply controls to behavior health isolation rooms			Boiler Controls - Variable-speed	Nov12	\$ 33,976	\$ 3,600	\$ 16,031	35,531	3,667
Jun14 Retro-commissioning MOB A HVAC systems			Backup Server Room - Efficient HVAC	Sep13	\$ 13,492	\$ 2,500	\$ 1,944	20,468	
Jul14 Optimize demand-controlled ventilation in cafeteria, conference rooms, lobby			Air-handling Unit #8	Oct13	\$ 4,205	\$ 2,000	\$ 1,094	12,151	
Jul14 AHU-6 offload of Pharmacy & overnight/weekend shutdown			Grundfos Variable-speed Pump	Oct13	\$ 2,400	\$ 2,400	\$ 982	8,465	
Aug14 AHU-20 reduced volume during unoccupied times			HVAC Controls - Air-side Systems	Nov13	\$ 118,680	\$ 28,340	\$ 91,456	521,731	12,804
2. Optimize chilled water plant operations	G.Liebert	\$ 18,175	Totals: \$ 723,978 \$ 102,040 \$ 296,301 672,591 87,804						
√ Apr14 Program sequence of operations for optimized chiller sequencing		150000 kWh							
Oct14 Address chilled water distribution serving as run-around loop in winter		500 gal oil							
3. Pursue targeted upgrades of interior lighting to LEDs with aggressive controls	L.Martineau	\$ 16,650							
√ May14 Upgrade lighting & controls in conference room spaces		150000 kWh							
√ May14 Conduct lighting audit of targeted spaces for potential upgrades/controls									
4. Explore fuel switching and thermal shell improvements	R.Morley	\$ 200,000							
Sep14 Conversion of oil-fired boilers to compressed natural gas, explore summer boiler									
Oct14 Insulation of thermally-exposed wall surfaces in Cancer Center									
5. Employee engagement through energy workshops & campaigns	N.Duncan	\$ 26,775							
√ Mar14 Engagement of all hospital departments in ESI Champs initiative		200000 kWh							
√ Apr14 Host an informational table to communicate ESI results and educate staff		1500 gal oil							
√ May14 Host a Kaizen event to focus on energy waste in targeted hospital areas									
Jun14 Feature Energy Savings Initiative as part of CVMC Annual Plan									
6. Build efficiency into operations & maintenance practices and new designs	L.Martineau	\$ 8,600							
√ Apr14 Development of Energy Policy and purchasing specifications		50000 kWh							
Jun14 Kitchen operational changes & scheduling		1000 gal oil							
Jul14 Large medical equipment - reduce idle operation & cooling									
Sep14 Institute use of SkySpark as a facilities management tool									
Totals: \$ 293,925									





Energy Action Plan - 2014



Facility Kaizen Overview

Targeted Areas:

The following areas were targeted as they were not evaluated / analyzed during the initial ASHRE Level II / III energy audit in 2010 and therefore, were ideal for the Kaizen approach to identify additional savings opportunities.

Kitchen and Serving Lines

Medical Office Building A

Medical Office Building B

Emergency Department

Cancer Center

Data Center

CVMC Kaizen Process

Pre-Kaizen Activities:

- Introduced Department /Practice Leaders to the Energy Savings Initiative (ESI) team and Continuous Energy Improvement (ECI) program, and the Kaizen concept.
- Identify an Energy Stewards for each department / practice.
- Identify departments targeted for a Kaizen.
- Prepare and distribute a schedule of activities for multiple Kaizens.
- Energy Stewards and selected department / practice personnel sign ups for one of the Kaizens.
- Acquire baseline metering and data trends for future analysis.
- Acquire, review, and distribute applicable facility drawings.

CVMC Kaizen Process

Kaizen Activities:

- Assemble before the walk-thru for introductions, explanation of the process, and to answer questions.
- Hand out Energy Savings Opportunity Tags.
- Walk-thru of targeted areas to learn about their functions, activities, schedules, and unique characteristics through questions and answers.
- Question their current practices regarding energy savings.
- Assess, analyze, and identify energy savings opportunities.
- Identify and physically tag energy savings opportunities.
- Participate in brainstorming session after the walk-through to discuss, analyze, validate, and categorize the opportunities.

Facility Kaizen Overview

Opportunities Identified :

Many opportunities were identified as a result of the multiple Kaizens, below are a few of significance:

- Discovered uninsulated steam HX used for boosting dishwasher water temperature.
- Found dishwashing area lighted, cooled, and exhausted 14 hours / day, when used only 4 hours / day.
- Through Q&A identified opportunity for heat pump loop differential pressure control, heat add / reject setpoints, and seasonal loop temperature variation.
- Recognized a need for thermostat and plug load discipline awareness and training.

Facility Kaizen Overview

Opportunities Identified :

- Agreed to reduced lighting levels / density.
- Discovered need for wireless controls to setback HVAC, and to control lighting based on space vacancy.
- Identified VAV units that were causing excessive starts for an AHU during evenings and weekends.
- Identified 5 failed exhaust fan dampers, which required fan operation 24/7/365 during heating season.
- Proceeded with data room optimization through lead-lag CRAC units, raised floor sealing, rearranging perforated floor panels, using rack blank-off panels, and raising room temperature setpoint.

Kaizen Process Benefits

Employees:

- Gained an awareness of the facility, its infrastructure and physical plant, and historic and current energy use.
- Gained an understanding of the hospital's energy policy and goals, what has been accomplished to date, and what is left to accomplish.
- Learned about other department 's operations, energy use, energy savings awareness and activates, and new energy savings opportunities.
- Became aware of barriers to additional energy savings.
- Became empowered and motivated to engage their own departments in discussions and activates to identify energy savings opportunities.

Kaizen Process Benefits

Employees:

- Learned about tools, information, and personnel available to assist them with their departmental energy goals and activities.
- Became aware of the “bottom line” affect from energy savings, its relationship to earnings, and subsequent investment in people, equipment, and property for the benefit of the employees and community.
- Gained knowledge that can be used to find energy savings in their own lives.
- Understanding the synergy among margin improvement and waste reduction programs already in place.
- Became a part of a much larger team.

Kaizen Process Benefits

Energy Savings Initiative Team:

- Moved out from behind the curtain and gained recognition.
- Obtained insights into department activities and energy savings opportunities, and learned their barriers to some energy savings initiatives.
- Gained trust of the department personnel with regard to maintaining a positive patient experience and a safe and healthy environment when implementing changes.
- Obtained new partners that are willing to support and assist in the pursuit of new energy savings.
- Opened up a channel for receiving new opportunities directly from the employees.

Kaizen Process Benefits

Hospital Administration:

- Obtained new multipliers for actions directed at obtaining stated energy and fiscal goals.
- Brought forward new Margin Improvement Strategies (MIS) opportunities that may not have been recognized by department managers.
- Employee awareness of leadership's goals for energy use reduction and margin improvement.

Questions?

