



Carolinan HealthCare System

CHS Enterprise Energy Management



Michael Roberts
Roger Boyington
Joseph Ross

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Facilities Management Group
Carolinan HealthCare System



Carolinas HealthCare System Energy Management



Michael Roberts has over 20 years of experience working directly for healthcare systems in a variety of leadership positions and engineering roles. He is currently employed by Carolinas HealthCare System as a Senior Specialist working primarily in energy and sustainability.

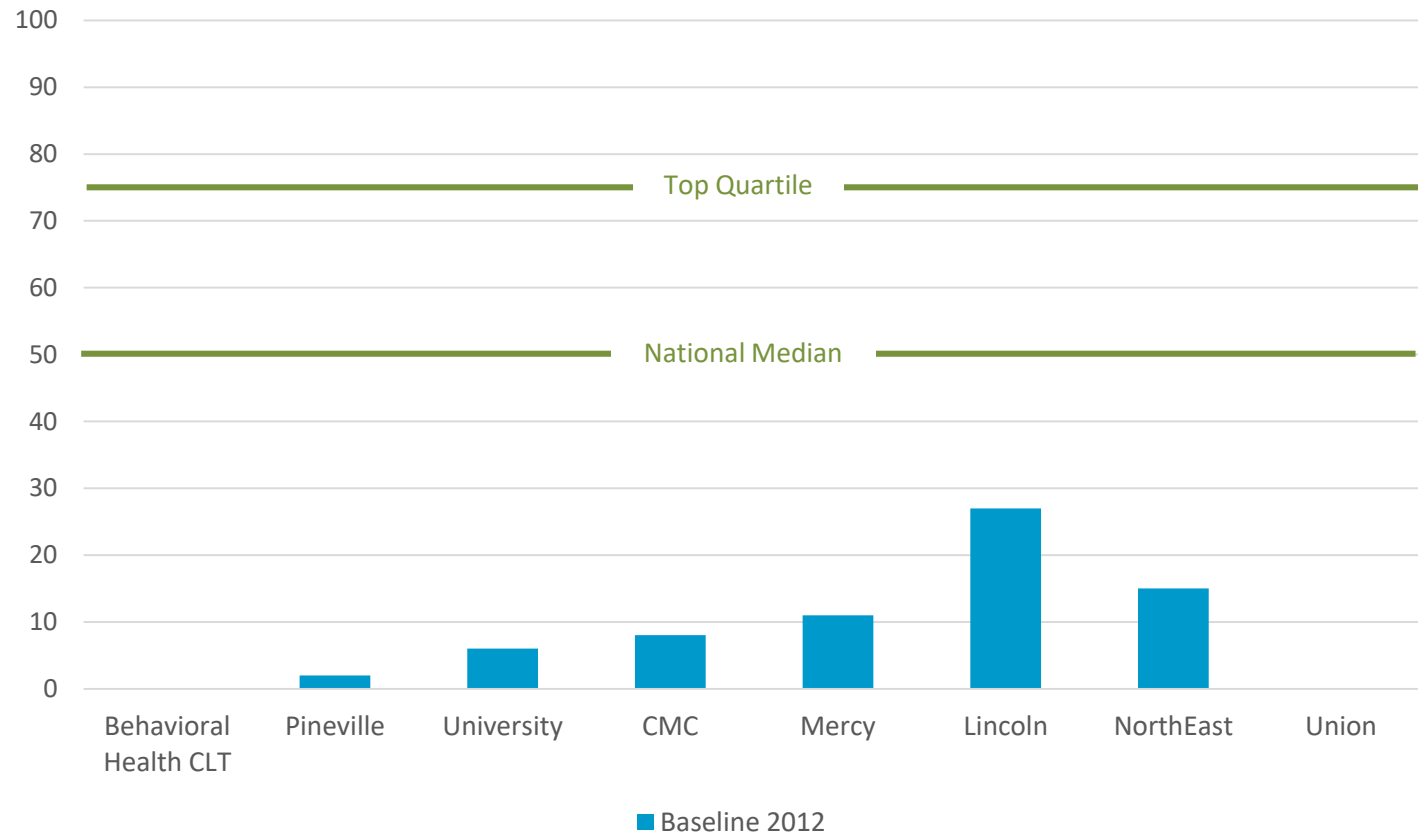
Mr. Roberts earned his Bachelor of Science in Mechanical Engineering from Virginia Tech and is a PE, SASHE, CHFM and CHE.

Michael is an active member of the North Carolina Healthcare Engineers Association, Inc. (NCHEA) and the American Society of Healthcare Engineers (ASHE). He is a member of an ASHE Sustainability Task Force, the NCHEA Sustainability Liaison to ASHE and a NCHEA Past President.

Energy Management 2011 – Why NOW?

- Costs were increasing over 6% a year
- With no plan consumption has been shown to rise 5-7%
- Healthier Hospital Initiative and Health Care without Harm
- Demonstrated Best Practice
- Proactive management tool—AHA is educating the C-Suite

Energy Star Score Benchmarking 2012



Energy Star Score Impacts

- Low cost of electricity
- Construction/renovation based on first cost
- Value Engineering
- Other priorities - TJC compliance, safety, etc.
- Lack of capital renewal program
- Reduced maintenance or maintenance contracts

CHS Energy Management Program

- There have been three major capital projects initiated to reduce energy consumption – 2012, 2014 and 2016
- Each facility has been challenged with implementing these projects and continuing to find ways to reduce energy consumption
- A forum was created to create ideas, share thoughts, pass along information and celebrate successes among all the facilities
- Capital competition for energy funds

Carolinas HealthCare System NorthEast Energy Efficiency Improvements



Roger Boyington has over 23 years of experience working directly for large healthcare systems in a variety of leadership positions and engineering roles including Director of Plant Engineering. Roger is currently employed by Carolinas HealthCare System as a Senior Market Leader and responsible for the CHS NorthEast campus and associated facilities.

Mr. Boyington earned his Bachelor of Science in Marine Engineering from Maine Maritime Academy and is a registered Professional Engineer, Certified Healthcare Facilities Manager and Certified Energy Manager. Roger is an active member of the American Society of Healthcare Engineers.

Carolinas HealthCare System NorthEast Energy Efficiency Improvements

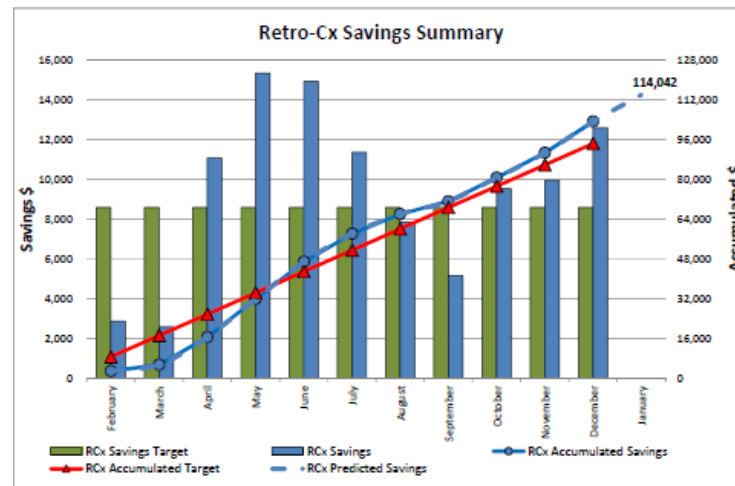


- Concord, NC
- 1,030,000 SF
- 457 Licensed beds
- 23 Operating rooms
- Level III trauma



Enterprise Energy Management Project

- Completed retro-commissioning and DDC upgrades
 - 12 months of data shows the following results
 - 19,128 MMBTU (58% above target)
 - 8.2% overall reduction in energy use
 - \$118,536 (16% above target)
 - 4.7% overall reduction in costs



8/20/2016

Chilled Water Optimization

- The existing configuration of the chilled water system were causing issues at the air handling units (AHU).
 - ΔT 's at AHU's ranged from 2 deg F to 23 deg F.
 - ΔT 's at CEP were between 4 and 6 deg F.
 - Chiller and pumping capacity was a concern (summer rental chiller)
- Dynamic, pressure independent balancing valves were installed at 5 locations (one per wing).
 - ΔT 's at AHU's at within design parameters.
 - ΔT 's at CEP are within design parameters.
 - Plant capacity/redundancy has been restored.
 - Achieved consistent control of the environment (T&Rh)
 - Annual savings are \$99,574/year

Visitor Parking Deck LED Lighting

- Installation of LED lighting at the Visitor Parking Garage
 - Installation of 308 surface mounted fixtures
 - 34 pole light fixtures
 - 42 Stair tower fixtures
- Total Project cost was \$162,000
 - Energy savings=\$34,464
 - Labor Savings=\$11,317
 - Duke incentive \$27,720
- The implementation of a similar (scope and scale) project in the Teammate Garage will be completed in 2016.

General Lighting Improvements

- Eliminated all T-12 lamps campus-wide. Replaced with T-8 (High Efficiency). Includes areas:
 - Corridors
 - Patient Rooms
 - Support Areas
 - Stair Towers
 - Mechanical Spaces
- Replacement of all non-LED exit signs with LED units
- Installation of lighting controls in conference rooms, staff bathrooms, offices, classrooms, etc.....

LED Lighting

- LED lighting is being used as a direct replacement in many difficult to access locations or in areas that have high burn rates. Examples include:
 - Loading dock (Fixture Replacement)
 - Medical Arts community art exhibit
 - JGCH Waiting Room
 - Surgery Center Lobby and Waiting Area
 - Elevator cabs
 - Community Art Exhibit

Central Energy Plant

- Installation of a high efficiency 1200 ton chiller that replaced a failed 800 ton unit that had failed and reached its end of life (23 years).
- Increased use of an existing 800 ton plate & frame cooler to achieve ‘free cooling’ as weather conditions permit.
- Reduced steam pressure from 100 psig to 80 psig.
 - Estimated annual savings are approx. \$20,000/year
 - Lay up of 2 boilers during the summer months
- Installation (in process) of real time metering to determine and monitor real time CEP efficiency's for steam and chilled water.

White Roofs

- Installation of white (reflective) roofs as replacements are installed:
 - Clinical Services/ED Roof
 - Dietary Roof
 - Connector Roof
 - Medical Arts (lower) Roof



Miscellaneous Improvements

- Installation of fan wall (w/VSD) technology in AHU replacements & rebuilds:
 - G/H/J Wing- GF-3 and GF-4
 - Hayes Family Center-AHU 1&2
- Consolidation of Building Automation Systems (BAS) on to a single platform.
 - Replaced existing legacy Andover/Schneider with Johnson Controls in Surgery Center and Family Center.
- Elimination of redundant medical air compressor installation in Cabarrus Memorial Building.
 - Piped to Clinical Services Building

Energy Efficiency Success-CHS Northeast

- Energy Use decrease: 13%
- Energy Star: From 15 to 41
- Dollars avoided: **\$381,807**

Carolinas HealthCare System Pineville Energy Efficiency Improvements



Joe Ross has over 25 years of experience in Plant Engineering, Operations and Maintenance including Director level leadership in various industrial and healthcare settings.

Mr. Ross is currently employed by Carolinas HealthCare System as a Senior Market Leader and responsible for 2 acute care campus sites, a free standing ambulatory care ED and an LTACH/Inpatient Rehabilitation.

Mr. Ross has a BS in Mechanical Engineering from The University of South Carolina and an MBA from Winthrop University. Mr. Ross is a member of the American Society of Healthcare Engineers.

Carolinas HealthCare System Pineville Energy Efficiency Improvements



- Pineville, NC
- 506,000 SF
- 206 Licensed beds
- 13 Operating rooms
- Level III trauma



The Challenge

- Challenge to improve Energy Star by Vice President.
- The Office of Healthy Environment factor. (Tracking, focus, follow up)
- Different approaches to the same result (carbon credits, Energy Star, efficiency, etc. all lead to the same result- bottom line savings!
- Challenge to POM team to look for and offer ideas for energy efficiency.
- Asked Corporate Services to help understand what impact our efforts could have on projected ES rating.
- Challenge to develop consumption comparison vs goal charts.

The Foundation

- Patients First, Always
- No compromising CHS Values.
- No compromising patient care, safety or experience.
- No compromising employee safety or comfort.
- No compromising regulatory requirements.
- Look at all ideas large or small “Pennies add up to dollars”
- Reviewed how to leverage \$1 in energy savings to counter \$15-20 in lost revenue.

The Process

Team immediately offered great ideas for energy efficiency:

- Dietary/Dining lighting (never programmed)
- Dietary equipment (always on)
- Maternity and lobby incandescent bulbs (CFL's stolen)
- Elevator halogen lighting
- Dietary, Administration and Conference room HVAC set backs.
- Setting the example (POM lighting, office and work space set back)
- Corridor and mechanical rooms occupancy lighting (difficult areas)

Immediate Actions

- Programmed Dietary/Dining lighting.
- Worked with Dietary staff to develop a daily equipment shutdown list.
- Met with lighting vendors. Found LED bulbs and LED replacements for elevators. Also demonstrated smart wireless occupancy sensors to use in hard to wire locations. Replacing T8 Fluorescent and CFL recessed lights to LED (LED replacement standard). Replaced quartz halogen canopy lights with LED. Adding remote control occupancy sensors in staff corridors

Immediate Actions

- Met with Corporate Services to help provide education on BMS features and capabilities (no occupancy schedules set up). Set up for Admin, Dietary/Dining, Conference as well as POM work area, waiting rooms, etc.
- Real Time COP for CEP chiller, boiler and condenser water efficiency.

Immediate Actions Continued

- Corporate Services developed a wonderful comparison showing what impact each percent decrease in consumption would have on dollars saved and subsequent ES rating change.
- Developed daily comparison for electricity and gas consumption. Compared this with known activities to help evaluate impact of successes and determine cause in spikes in consumption.
- Developed monthly consumption charts vs goal and posted in POM.

Immediate Actions

- Steam
 - Reduced/eliminated summertime clean steam system generators
 - Conducted steam trap survey to identify and replace defective traps.
 - Sewer credit meters for cooling towers, boilers and steam generators
 - One boiler in dry layup during summer months. (CEP)
- Utilize thermostat with integrated occupancy sensor

Challenged “it’s always been that way”

- Electrical room cooling (why is 70 degrees needed?)
- Elevator machine rooms (why is 68 degrees needed?)
- Clean steam generators (why are they left on all summer?)
- Heating hot water (why does it need to be as hot as it is?)
- VAV re-heat (why are we reheating in June, July and August?)
- Why do we pay for sewer on CEP cooling towers and boilers?

Questioning the Norm Continued

- Why do we pay sewer for water used in clean steam generators at the hospital?
- Why do we not utilize OR set backs built into the system?
- What can we do to raise chilled water set points?
- Why do we use domestic water for CEP with well water backup rather than well water as primary source?
- What can we do in partnership with CEP to reduce overall demand as well as spikes in demand?

Energy Reduction Success— CHS Pineville

CHS Pineville - Prior to capital investment

- Energy Use decrease: 15%
- Energy Star: 2 to 8
- Dollars avoided: **\$8385 per month**

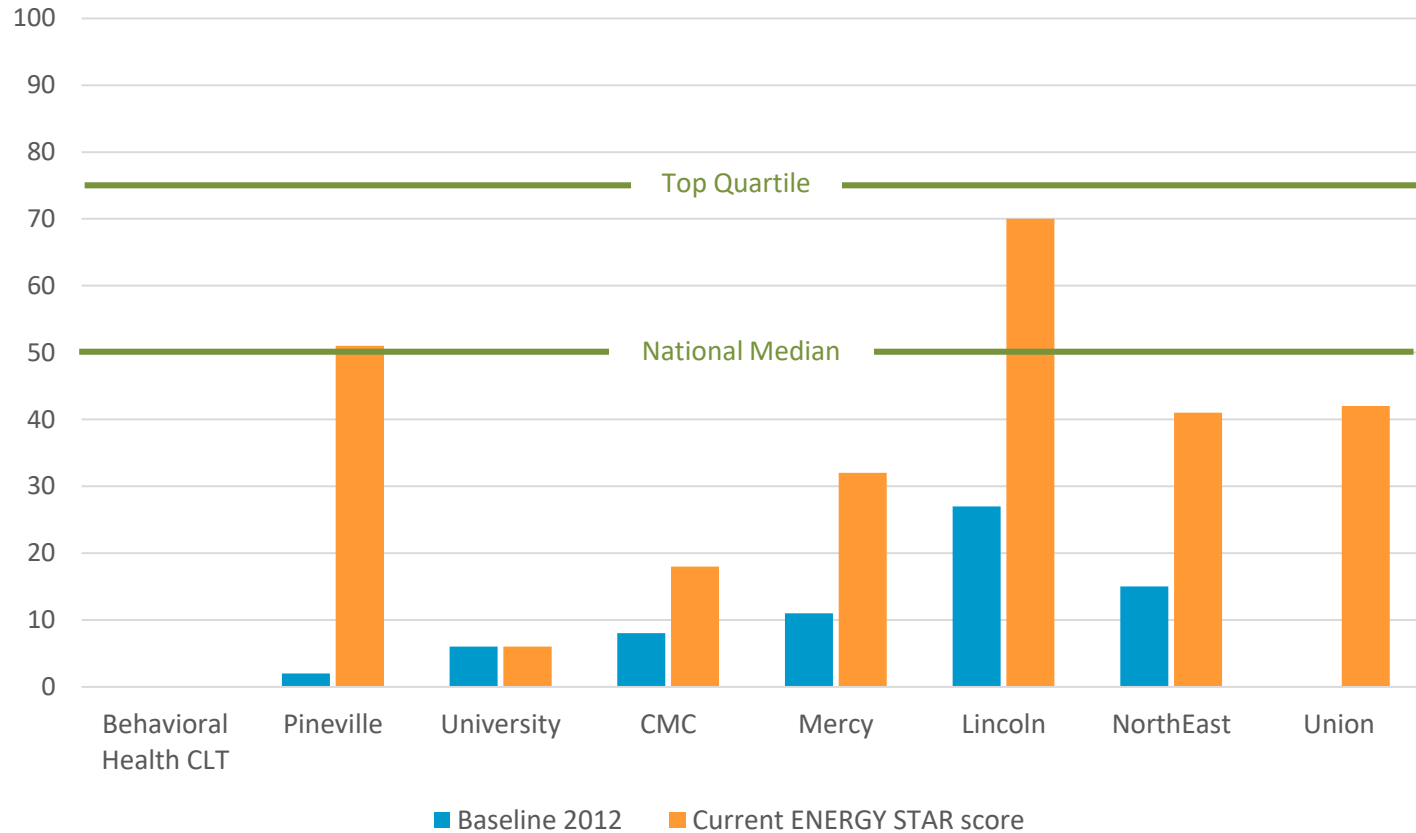
CHS Pineville - Current

- Energy Use decrease: 40%
- Energy Star: 2 to 52
- Dollars avoided: **\$800,139**

ASHE Energy To Care Award - 2016

ASHE Energy To Care Award - 2015

ENERGY STAR Score Comparison April 2016



Overall acute care portfolio 13% reduction in EUI

Awards - Recognition



- 2016:
 - ASHE Energy To Care Awards (Three Total): CHS Pineville (repeat winner), CHS Lincoln (repeat winner), CHS Huntersville MOB and ED
 - Article on CHS Pineville, “*N.C. Hospital Reduces Energy Use by 26 Percent*” in February 2016 issue of Health Facilities Management, a publication of the American Hospital Association
 - Case Study on CHS Pineville “*Efficiency Success Story: How One Hospital Slashed Energy Use*” in February 2016 ASHE Insider
- 2015:
 - ASHE Energy To Care Awards (Four Total): CHS Pineville, CHS Lincoln, CHS Behavioral Health Charlotte and CHS Blue Ridge Morganton
 - Article on CHS Lincoln, “*Hospital Finds Energy-Savings Behaviors Contagious*” in November/December 2015 issue of FMJ, the official magazine of the International Facility Management Association
 - Duke Energy Power Partner of the Year: Carolinas HealthCare System

CHS EEM Success

Energy was reduced enough in
2015 to essentially power CMC
Mercy for FREE!

569,000 sq. foot acute care hospital with 162 licensed beds

(yes, that's right)



Questions / Discussion



NCHEA – Congratulations and Challenges

- ***Congratulations to NCHEA for being among the first chapters to receive the ASHE Elite Chapter Award specifically targeting chapter energy initiatives!!!***
- ***CHALLENGE: NCHEA needs you to benchmark and share your data with Energy to Care to continue this success.***
- ***CHALLENGE: Share your story through a presentation to the NCHEA membership***
- ***CHALLENGE: Get Involved! Support NCHEA by assisting in Energy to Care participation***



Carolinus HealthCare System

Thank You!

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