



Carolina's HealthCare System

Designing Energy Behavior

Leading Change in Carolina's HealthCare System

Kady Cowan

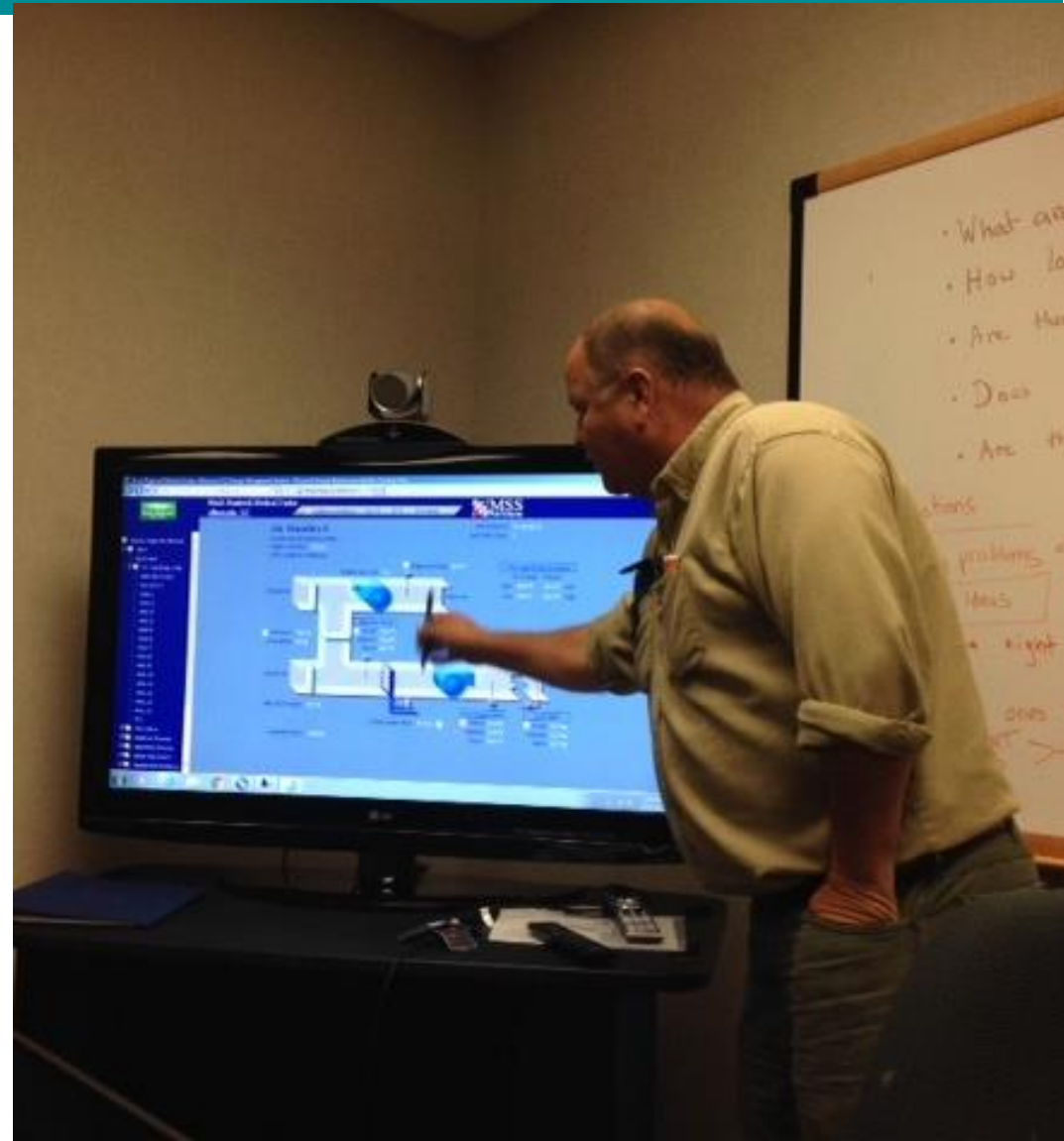
NCHEA Annual Conference

Ashville North Carolina

August 22, 2017

Agenda

- **Environmental Sustainability at Carolinas Healthcare System**
- **Why People Matter in Facility Energy Management**
- **Program Design**
 - Theory
 - Methods
 - Insights
- **CHS Case Study**
 - Energy Connect
- **Q & A**



About Me...

Focus

LEADING ENVIRONMENTAL SUSTAINABILITY

I am an environmental scientist. For 15 years I have been working to make sustainability easy in large complex settings

Goal

MOVE MOUNTAINS

I rely on system thinking, environmental psychology, social innovation and natural resource management

Methods

INNOVATIVE BUSINESS TOOLS

I use strategic and operational tools such as human centered design, developmental evaluation and storytelling

Results

\$2.5M ANNUAL SAVINGS

Our energy behavior program in 4 Canadian hospitals resulted in \$2.5M in annual savings or 10% of system wide utilities

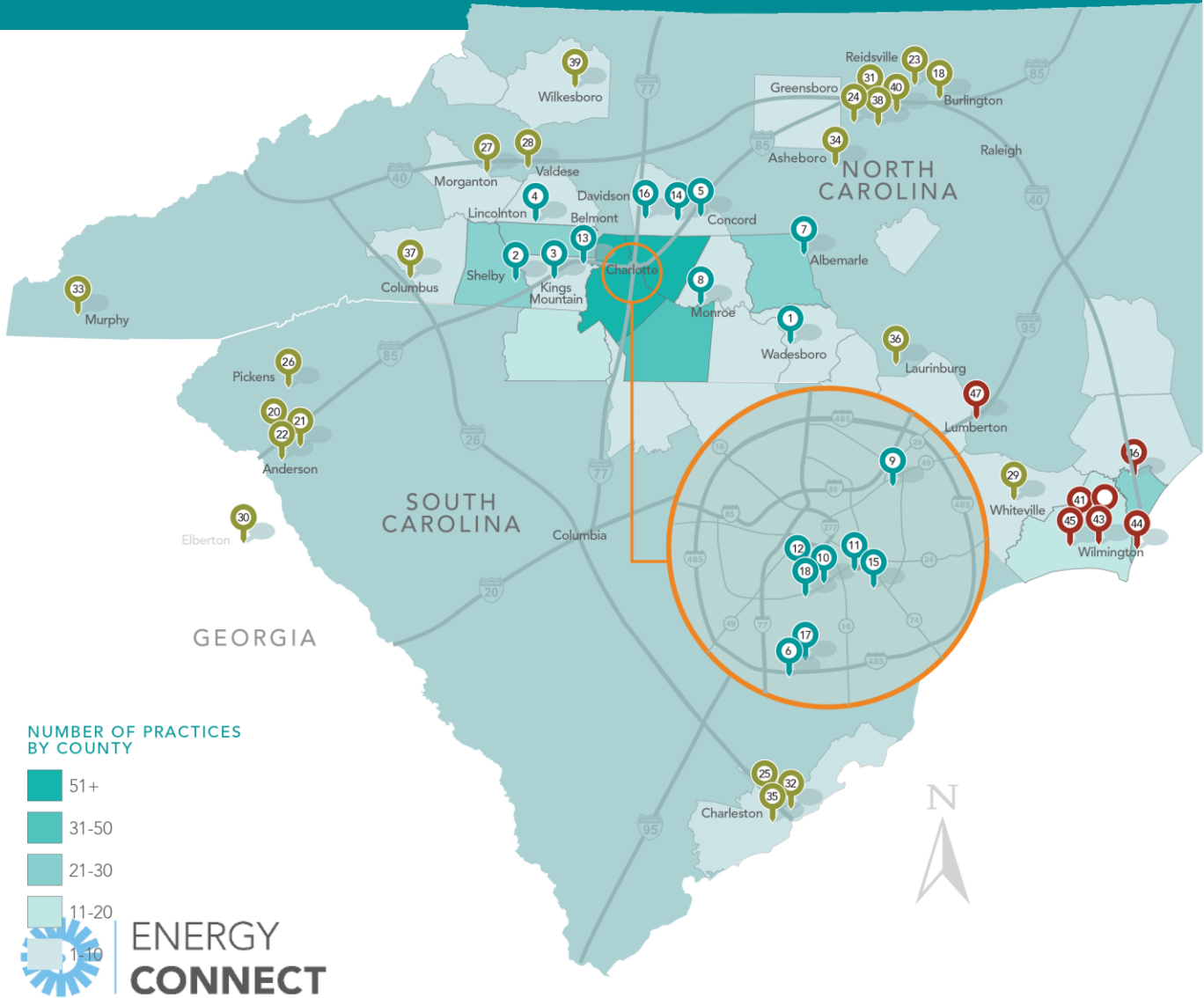
Carolinas HealthCare System

- 940 care locations
- 62,000+ staff
- 7500 beds
- 17.5 M ft²
- 12.5 M patient encounters/year
- Utilities \$37M
- Energy Management born in 2012



TOTAL ENTERPRISE HOSPITALS

GREATER CHARLOTTE REGIONAL PROVIDER PRACTICE HEAT MAP



PRIMARY ENTERPRISE

1. Carolinas HealthCare System Anson
2. Carolinas HealthCare System Cleveland
3. Carolinas HealthCare System Kings Mountain
4. Carolinas HealthCare System Lincoln
5. Carolinas HealthCare System NorthEast
6. Carolinas HealthCare System Pineville
7. Carolinas HealthCare System Stanly
8. Carolinas HealthCare System Union
9. Carolinas HealthCare System University
10. Carolinas Medical Center
11. Carolinas Medical Center-Mercy
12. Carolinas Rehabilitation
13. Carolinas Rehabilitation-Mt. Holly
14. Carolinas Rehabilitation-NorthEast
15. CHS Behavioral Health-Charlotte
16. CHS Behavioral Health-Davidson
17. CHS Rehabilitation (Pineville)
18. Levine Children's Hospital

REGIONAL ENTERPRISE

19. Alamance Regional Medical Center
20. AnMed Health Medical Center
21. AnMed Health Rehabilitation Hospital
22. AnMed Health Women's and Children's Hospital
23. Annie Penn Hospital
24. Behavioral Health Hospital (Cone Health)
25. Bon Secours/St. Francis Hospital
26. Cannon Memorial Hospital
27. CHS Blue Ridge-Morganton
28. CHS Blue Ridge-Valdese
29. Columbus Regional Healthcare System
30. Elbert Memorial Hospital
31. Moses H. Cone Memorial Hospital
32. Mount Pleasant Hospital
33. Murphy Medical Center
34. Randolph Hospital
35. Roper Hospital
36. Scotland Memorial Hospital
37. St. Luke's Hospital
38. Wesley Long Hospital
39. Wilkes Regional Medical Center
40. Women's Hospital (Cone Health)

AFFILIATED ENTERPRISE

41. Betty H. Cameron Women's and Children's Hospital
42. New Hanover Regional Medical Center
43. New Hanover Regional Medical Center Behavioral Health
44. New Hanover Regional Orthopedic Hospital
45. New Hanover Regional Rehabilitation Hospital
46. Pender Memorial Hospital
47. Southeastern Health

Ask Yourself?



Does
health care
create
health
problems?

Environmental Sustainability Solutions (ES2)

Collaborate ♦ Innovate ♦ Accelerate



Less Waste



**Energy
Connect**



Wiser Water



**Healthy Food
Systems**



**Climate and
Health**



**Safer
Chemicals**



**Better
Buildings**



**Smarter
Purchasing**

Why Hospitals?

- There are about 6000 hospitals nationwide
- U.S. hospitals use more than 8% of the nation's energy
- Financial rule of thumb
 - Every \$1 saved on utilities equals \$20 in revenue
- Examples from hospitals of how humans interact with their socio-technical environment to make energy decisions is scarce



CHS Technical Energy Saving Success

Goal 2012-2017

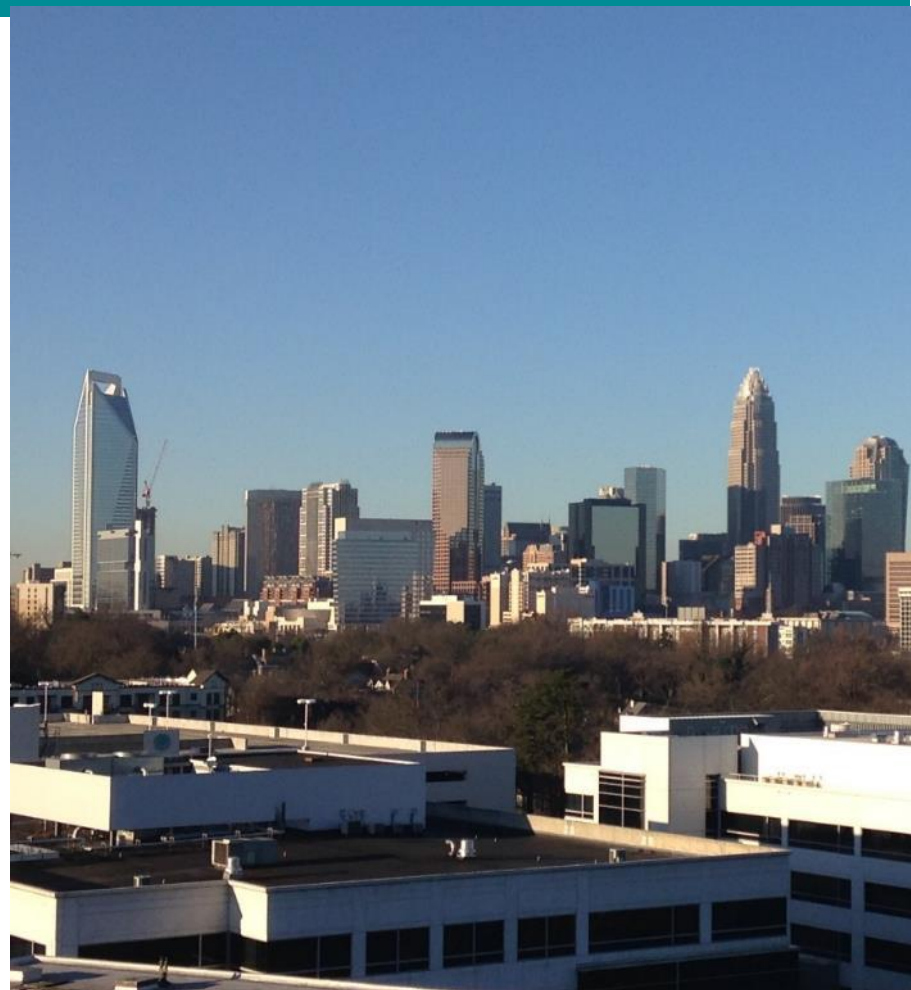
- Reduce Energy Use Intensity (EUI) by 20% in 11 Charlotte area hospitals
 - Baseline EUI 283
 - Current EUI 237

To date achieved **16%** savings

Saved over **\$5.4** million

Projects include

- OR setbacks
- Upgrade to digital controls
- Chiller optimization
- Fault detection software



Why People Matter in Facility Energy Management

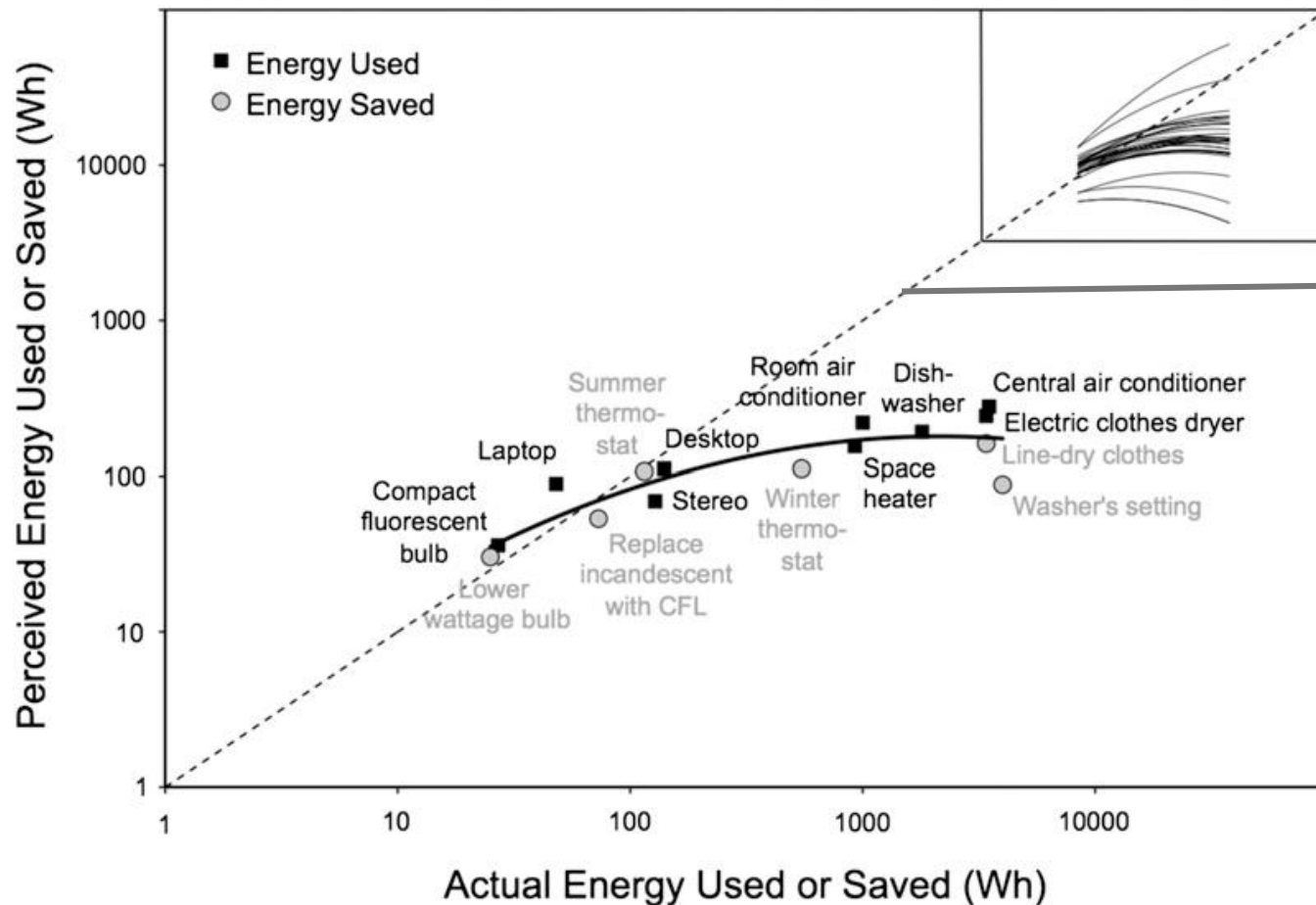


Think about your work place....

What energy related process or technical change is not performing as you would have hoped over the long term?



Perception and Energy Savings



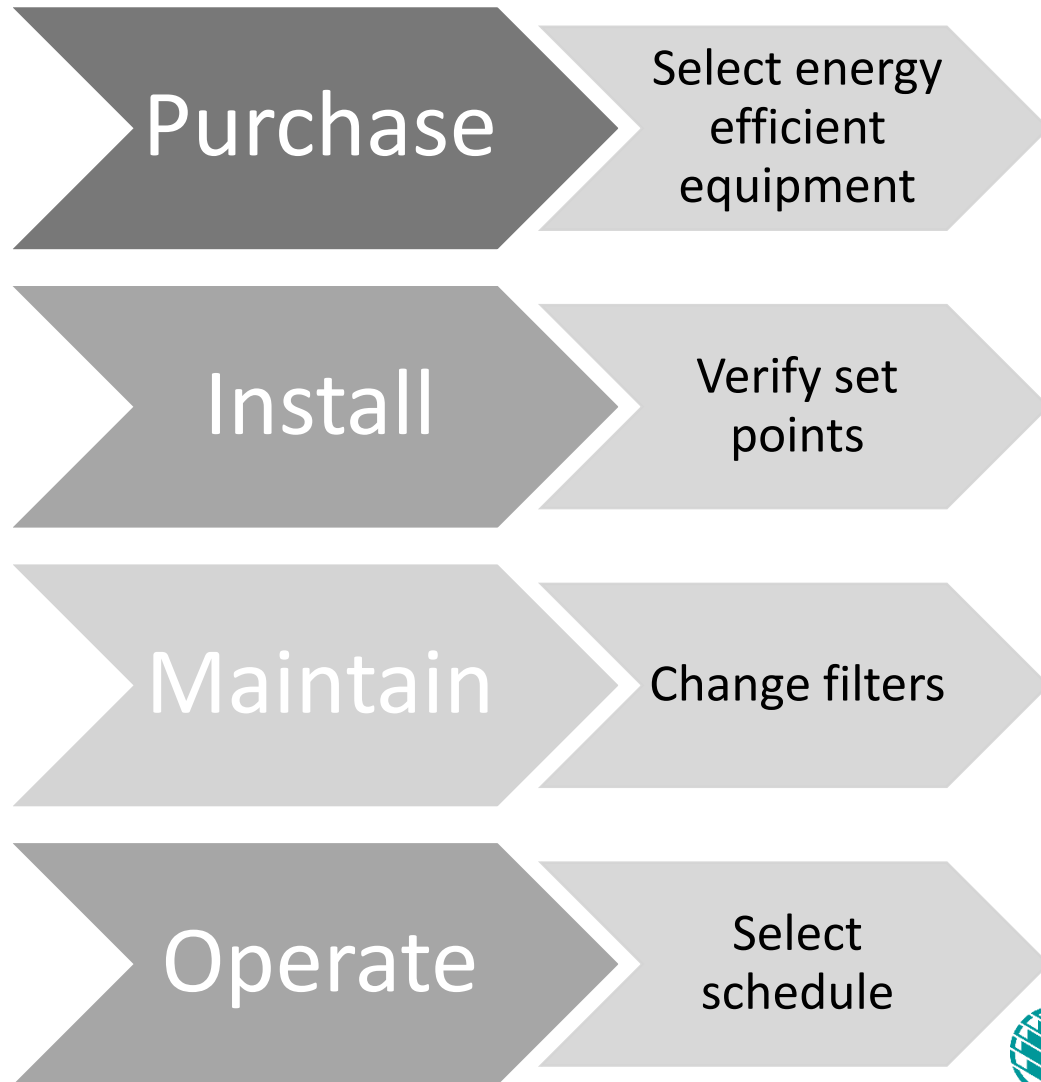
1:1
relationship is
perceptions
were accurate

People have
poor
perceptions
about energy
consumption
and savings

Examples of Energy Waste

1. Consultant recommends industrial pump retrofit with 15% rate of return. Client declines.
 2. School envelope upgraded, but gas consumption does not decrease.
- These scenarios are normal
 - Rational economics only partly explains actions related to energy consumption
 - **People are not always rational !!**

Multiple Entry Points for Behavior



Examples of Energy Saving Behavior

Energy actions - carrying out the tasks that save energy

Process and equipment operation modifications/optimization

- Temperature, pressure, flow, speed set points or modulating control
- Changing sub-components for size, accurate operations
- Staging equipment for maximum efficiency

Maintenance activities

- Leak tag of steam, condensate, air
- Tuning: repair/replacement of broken components, cleaning, adjusting, lubricating

Process scheduling and throughput improvement

- Match runtime to needs, maximize parts/batch
- Programing boiler controls

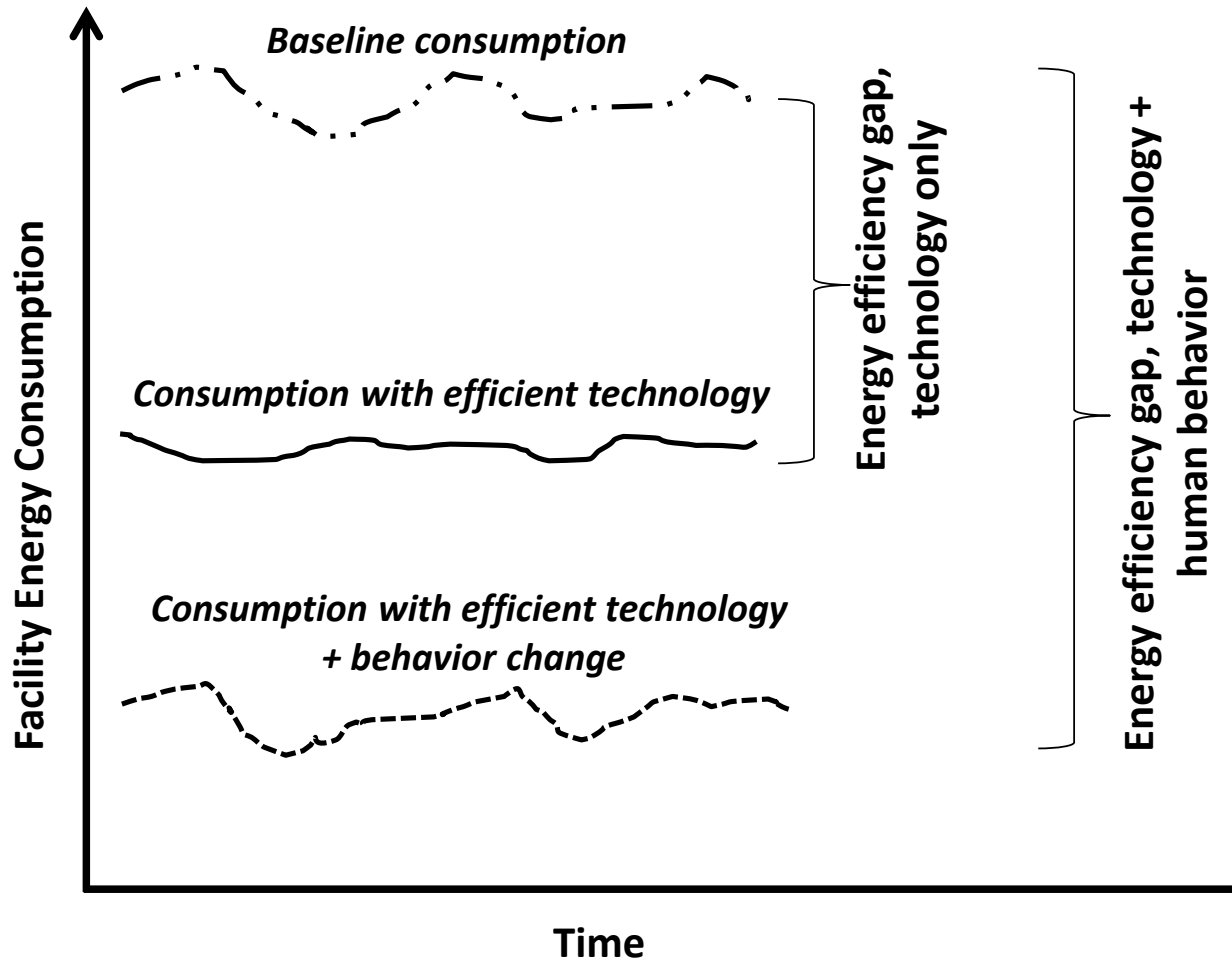
Shutdown procedures

- Off hours, or unneeded equipment

Productivity and quality improvements

- Time, space utilization

Efficiency Gap



Close the gap with behavior

Program Design

::: Theory Methods Insights :::



Behavior Change Programs

“The energy system begins and ends with the human need for services”

source: TASK 24 - IEA DSM Behavior Change Task Force

Programs refer to the various techniques, organizational rules and interventions which are designed to influence people to increase the occurrence of desired energy-saving actions.

Interventions are only limited by your imagination; legislation, incentives, social norms, feedback, training, competition, awards, champions, dashboards.....



ENERGY **CONNECT**

- Connect teammate activities to energy savings at work
- Connect teammates by talking about energy savings at work
- Connect teammate values to energy actions at work

Impact: Energy Connect at CHS will help link human actions to energy savings, natural resource conservation and patient experience.



Behavior is a Design Challenge

“As designers we must remember that behavior comes first always. The quirky, the obscure, the vain, the annoying, the wonderful.”

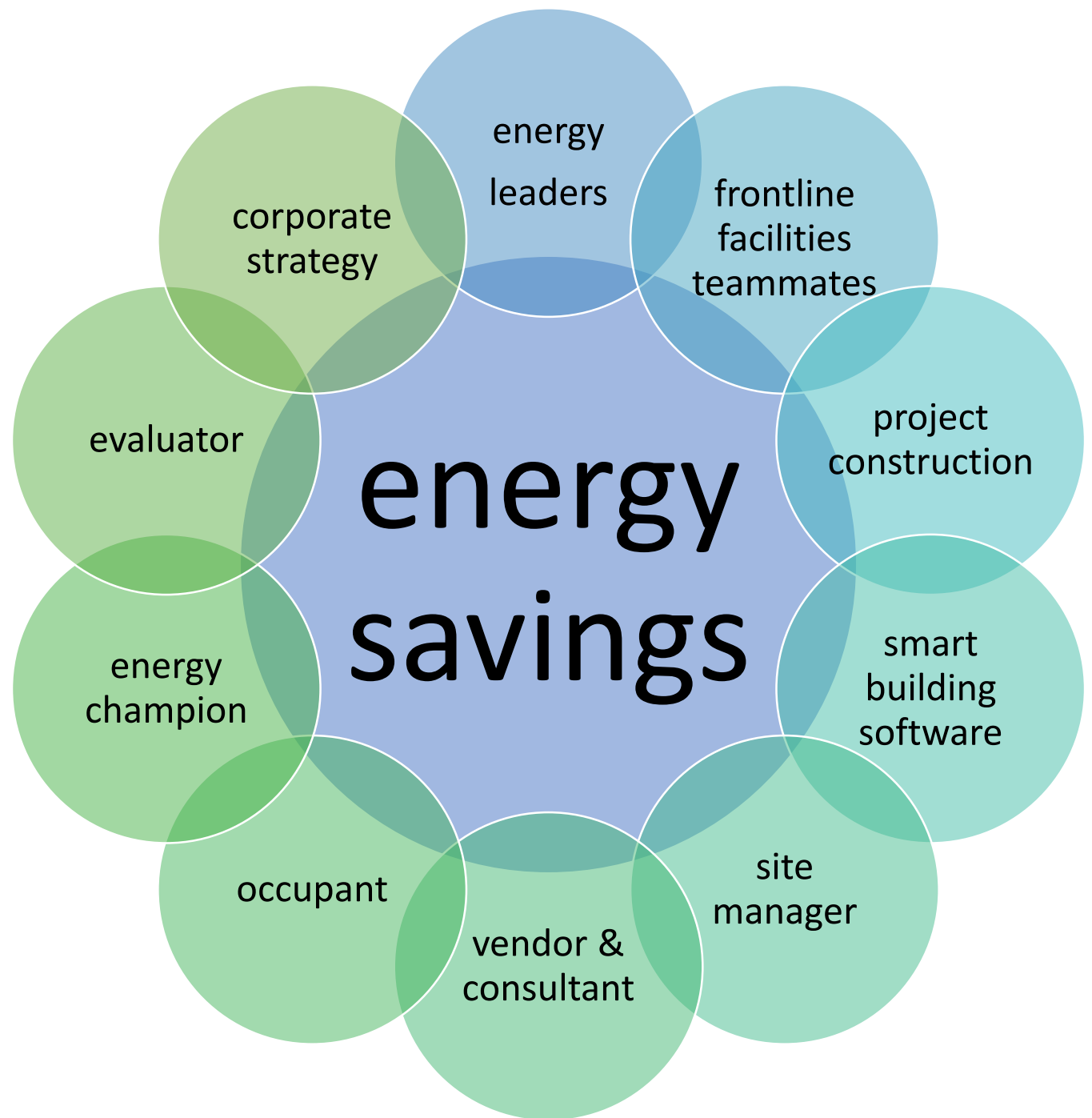


Energy EcoSystem

Energy EcoSystem is the interaction of all processes, actors and technical parts of the energy landscape. It acknowledges and accounts for variability, unpredictability and interdependence.



Actors in the CHS Energy Ecosystem



How Much Does Energy Behavior Save?

- 2% utility wide?
- 30% facility wide?
- How much can an engaged building mechanic save you?
- A security guard?
- A CFO?



HEALTH CARE BUILDINGS

2,083 bBtus
OF ENERGY

Is used in health care buildings annually. This is 7.7% of Charlotte's total commercial energy demand.

**5.1%
REDUCTION**

of current energy use in health care buildings is possible through the behavior related actions and choices identified in the following pages.

	Annual Energy Demand by Energy End Use		Annual Savings Opportunity by Energy End Use	
	(bBtu)	(Percent)	(bBtu)	(Percent)
Space Heating	283	13.6%	16.9	16.0%
Space Cooling	190	9.1%	10.0	9.5%
Ventilation	207	9.9%	7.2	6.8%
Water Heating	470	22.6%	28.8	27.4%
Lighting	515	24.7%	21.1	20.0%
Cooking	54	2.6%	0.6	0.6%
Refrigeration	40	1.9%	0.4	0.3%
Office Equipment	19	0.9%	3.5	3.3%
Computers	53	2.5%	15.1	14.3%
Other	251	12.0%	1.8	1.7%
Total	2,083	100.0%	105.4	100.0%

According to modeling estimates, health care buildings in Charlotte could reduce their energy consumption by an estimated 5.1% or 105 bBtu. As shown in this table, the combined energy demand for space heating, ventilation and space cooling represents the largest end uses for energy in health care buildings (nearly 1/3 of total demand). Lighting and water heating also contribute substantially. These same energy end uses also represent the largest savings opportunities. According to model estimates, savings from HVAC-related actions could reduce consumption by 34 bBtu, while savings from water heating and lighting could add up to an additional 50 bBtu of savings. Finally, computer-related actions offer the opportunity to save an additional 15 bBtu. Estimated energy savings from the top 24 actions/choices are presented on the next page.

HealthCare Energy Savings in Charlotte (2015)

“up to 5% with minimal investment”

Three Myths of Behavior Change

1. Behavior change is mind-control and manipulation
We design behaviors together
2. Access to information will result in desired behaviors
Rational economics only partly explains actions related to energy consumption - people are not always rational
3. Attitudes predict action
People have poor perceptions about their energy habits





WE'VE GOT TO START SOMEWHERE



ENERGY
CONNECT



Carolinas HealthCare System

Embrace the Complexity

←
Confusion



→
Clarity

Simple Rules

Good: Solutions that stick

Bad: New problems

Program Elements

target audience and behavior

indicator of success

baseline & goal

interventions

barrier

measurement

co-benefits

feedback

Thinking In Systems

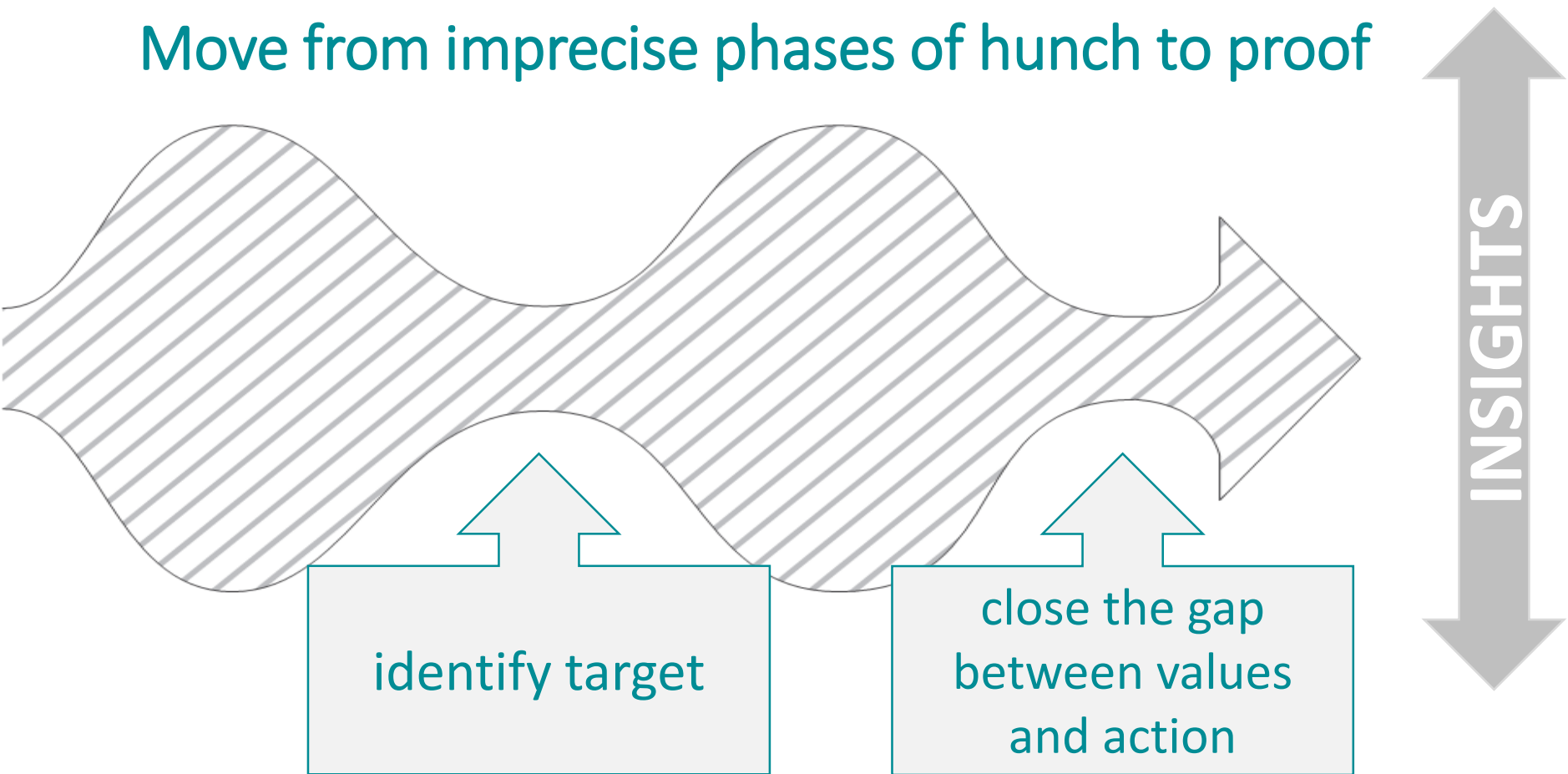


Program Design

- Step 1) **Collaborate** by convening a multidisciplinary team to create a sense of ownership and find solutions faster
- Step 2) **Discovery** phase begins with a deep understanding of the needs and motivations of people
- Step 3) **Sense making** narrow down what you've learned into themes and patterns
- Step 4) **Try something** rapidly evolve your ideas into tangible actions based on real feedback

Cast a Wide Net

Move from imprecise phases of hunch to proof



Program Objectives

- Compliments energy management already in progress
- Systemic solutions that are grounded in human needs
- Integrated focus on people, process and technology
- Habits persist for the long-term
- Looking beyond capital intensive projects
 - operations over upgrade
- Engaging full spectrum of stakeholders executive sponsor to workforce champion
- Establishing a continuous improvement process
- Developing a culture of energy savings

Insights - Hospital Operations

- Extreme operational demands
- Decision making and financial silos
- Highly regulated sector
- Hierarchical and rule based culture
- Standards not consistent nor consistently implemented
- Extreme risk aversion
- Lack of route for right information to the right people at the right time
- 24/7 operations sometimes used as an excuse to take no action or delay action


Insights - Hospital Energy Savings

- Evidence of mixed energy messages across the organization
- Focus on partial solutions in lieu of investigating for root cause
- Stronger willingness to invest in fixing problems than for higher first cost
- Sites and vendors not always connected to same energy goals
- Frontline teammates experience frustration when they see missed energy opportunities
- Frontline staff not engaged in energy actions or decision making
- Inconsistent documentation of issue related to energy

Insights - Building Operators

- Some are very enthusiastic about energy
- They don't want to get in trouble
- They are involved with multiple systems and tasks
- They need permission to take energy actions
- They need a path to acquire technical expertise
- They don't have much bandwidth for new programs

If we get it right....

- Customized program with targeted measureable behavior interventions that yield predictable results
 - Increase energy savings
 - Retain energy savings over the long-term
- 
- Account for energy behavior early and often
 - Turn energy from abstract to personal with stories
 - Reduce building scale complications
 - Count behavior as an asset

CHS Case Study: Energy Connect



Energy Connect

Target:

- Each teammate is aware of and can act in their own role to contribute to energy savings

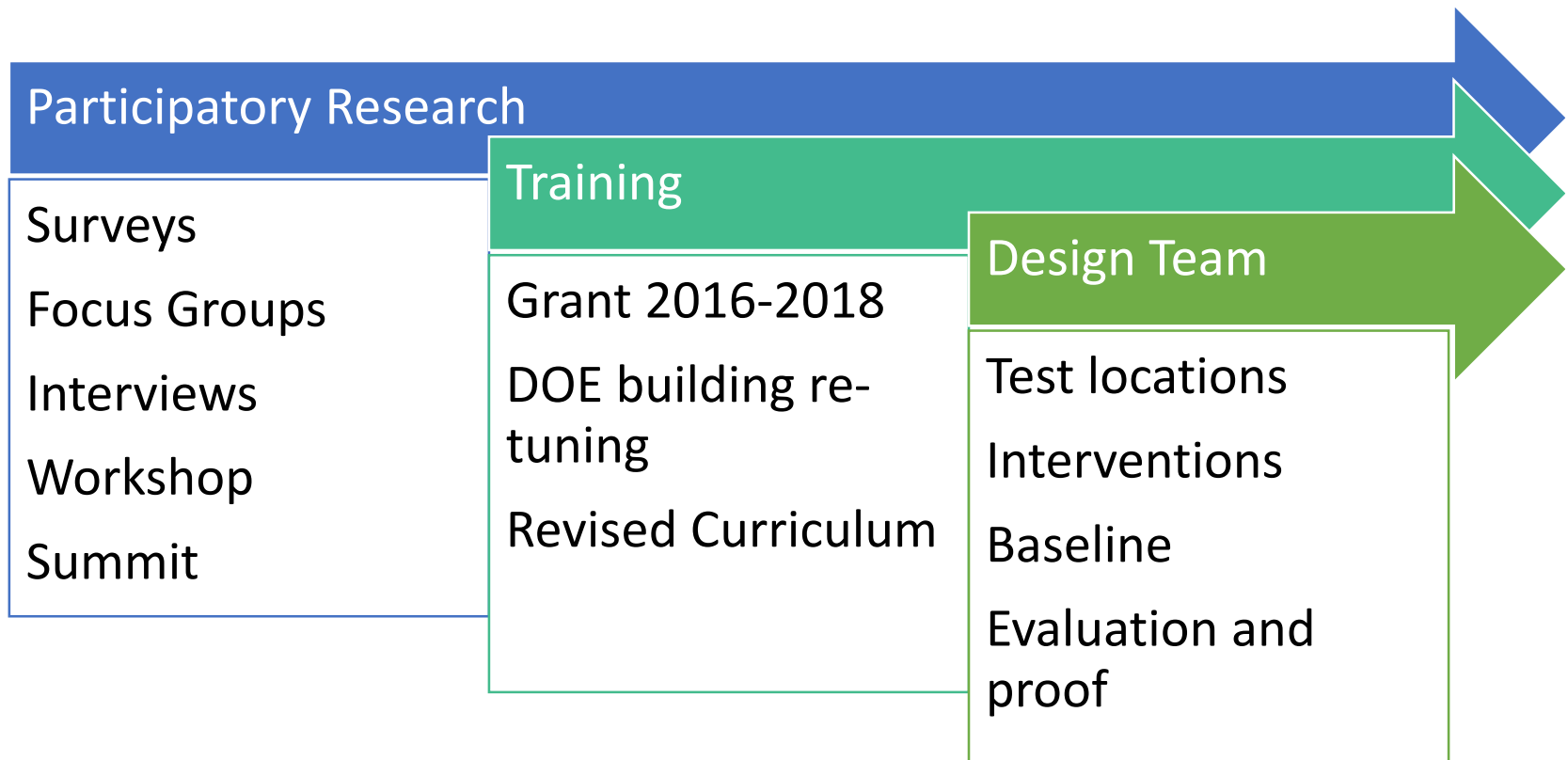
Result:

- Eliminate excess energy waste across the system through simple actions saving \$1.5M year



Equivalent to hiring 25 mechanics


Brief History of Energy Connect





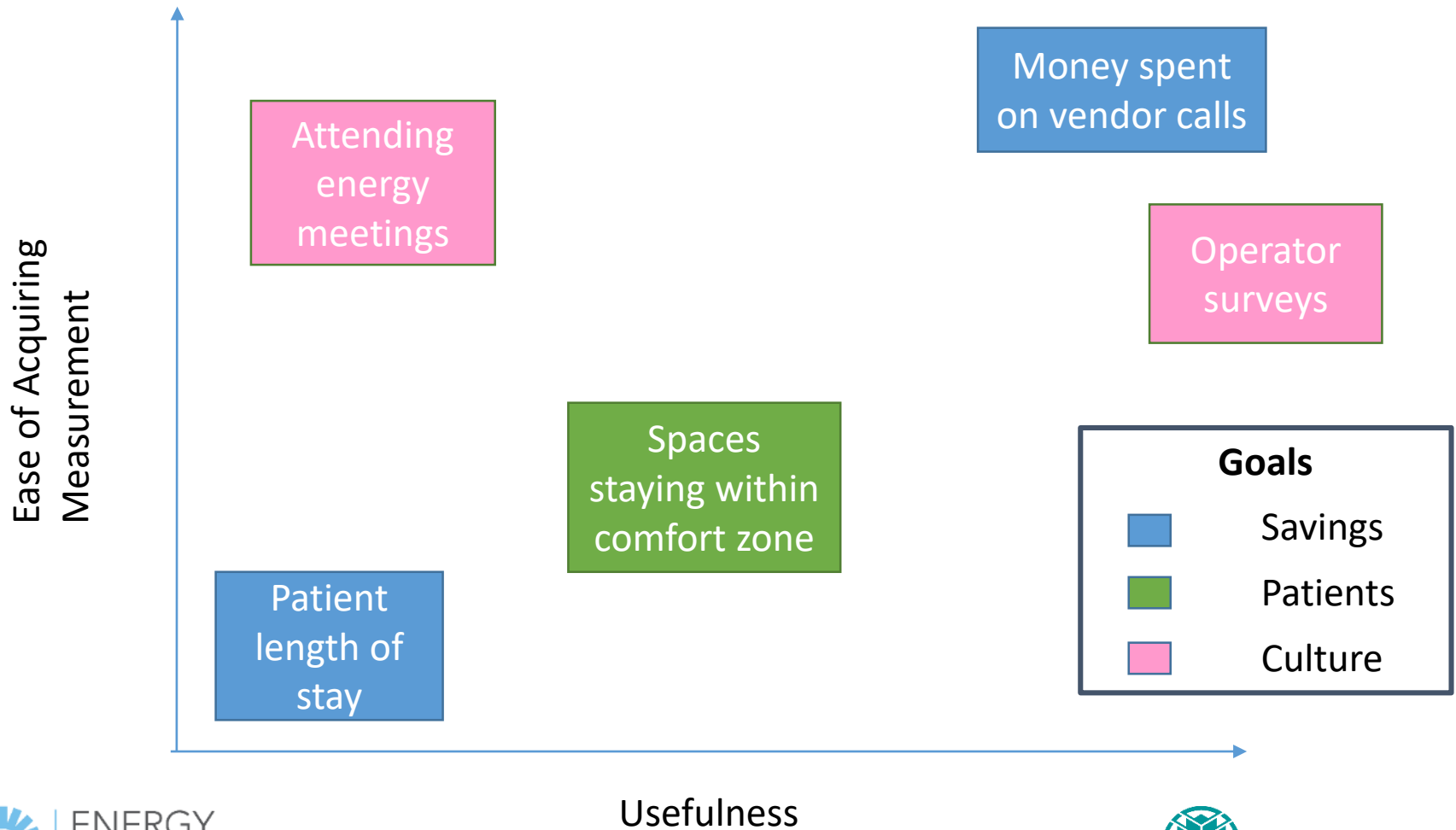
Goals:

1. Save Money and Energy
2. Empower Building Operators and Mechanics
3. Create a Culture of Energy Savings
4. Positively Impact Patient Experience

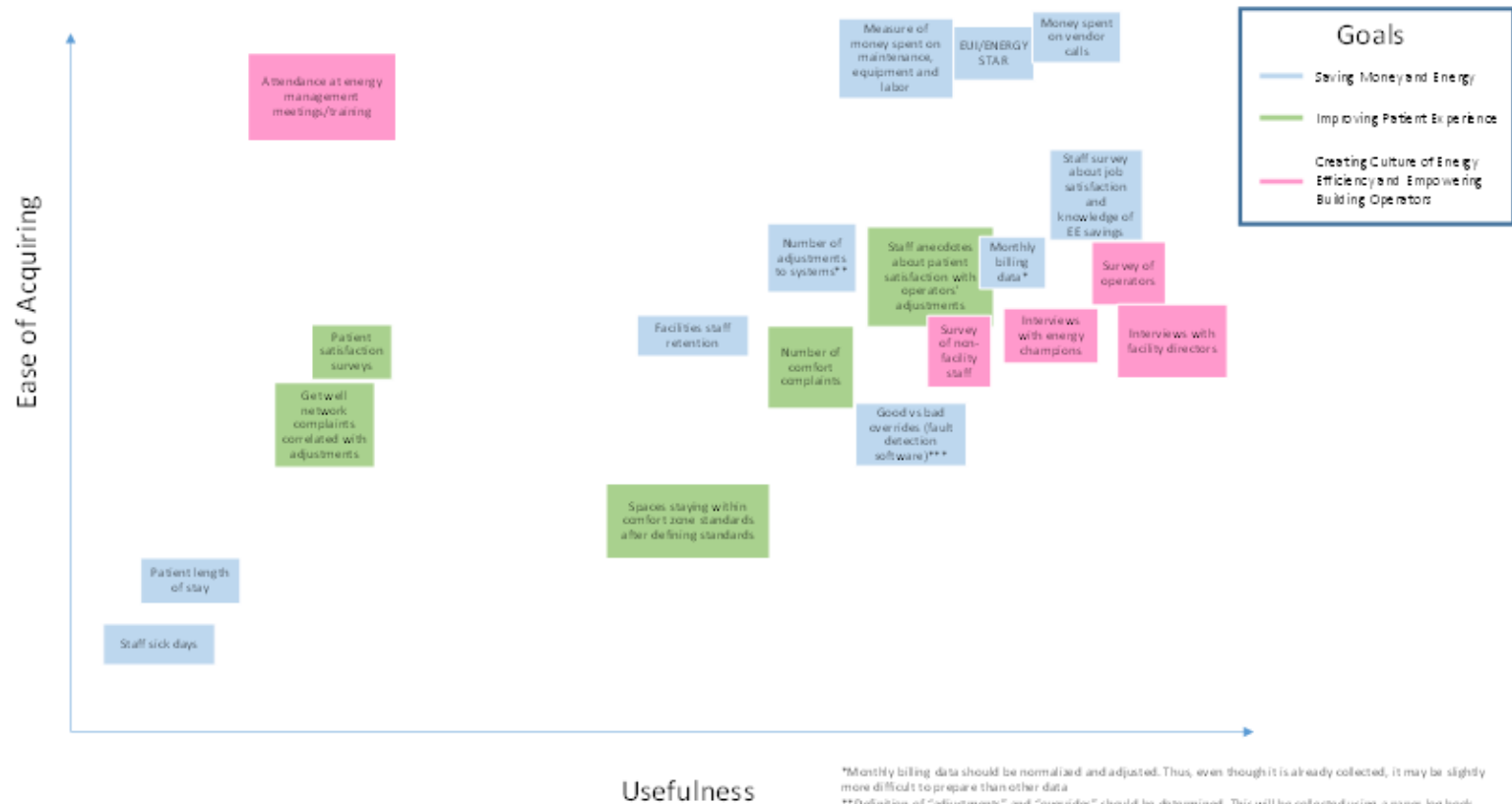


Impact: Energy Connect at CHS will help link human actions to energy savings, natural resource conservation and patient experience.

Measurement and Evaluation



Evaluation Matrix



*Monthly billing data should be normalized and adjusted. Thus, even though it is already collected, it may be slightly more difficult to prepare than other data

**Definition of "adjustments" and "overrides" should be determined. This will be collected using a paper log book until BAS can be automatically programmed to do so (and possibly afterward as well).

***This requires computer programming, therefore it could be difficult

Energy Connect for Building Mechanics

First 5 interventions:

1. Make data visible
2. Select and support a site based energy champion
3. Develop and hot/cold call response process flow
4. Document adjustments in the BAS
5. Promote conversation between occupants and facilities with regard to energy savings



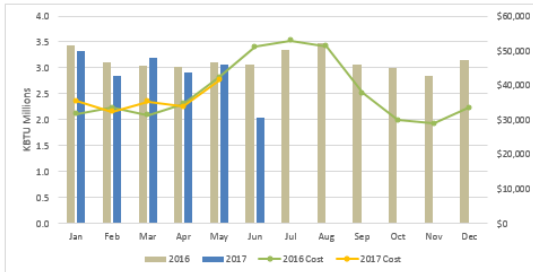
Data Sharing with Frontline Monthly

Lincoln
Data Sharing
May 2017



Monthly Consumption Savings (May 2016 compared to May 2017)	1.55%
Monthly Dollar Savings (May 2016 compared to May 2017)	\$ 812
Energy Use Intensity (12 months)	210
ENERGY STAR Score	75

2016 and 2017 Comparison of Monthly Electricity and Natural Gas Consumption & Cost



Energy Terms

Kilowatt (kW): unit of power used at a specific moment in time. Also known as the "demand"
Kilowatt hour (kWh): unit of energy used over a length of time. Also known as "consumption" or "usage"
British Thermal Units (BTU): a measure of the heat content of fuels or energy sources
Demand: amount of energy the building uses at a given time
Peak load: highest demand you required during a given billing period
Energy Use Intensity (EUI): energy per square foot per year
ENERGY STAR score: see how your building's energy consumption compares to similar buildings nationally. Scores range from 1-100, a building with a score of 75 is a top performer.

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One



Carolinashalthcare System

Monthly Snapshot 2016 compared to 2017

- Consumption Savings
- Dollar Savings
- EUI
- ENERGY STAR score

Monthly Trend 2016 compared to 2017

- Consumption Total
- Cost

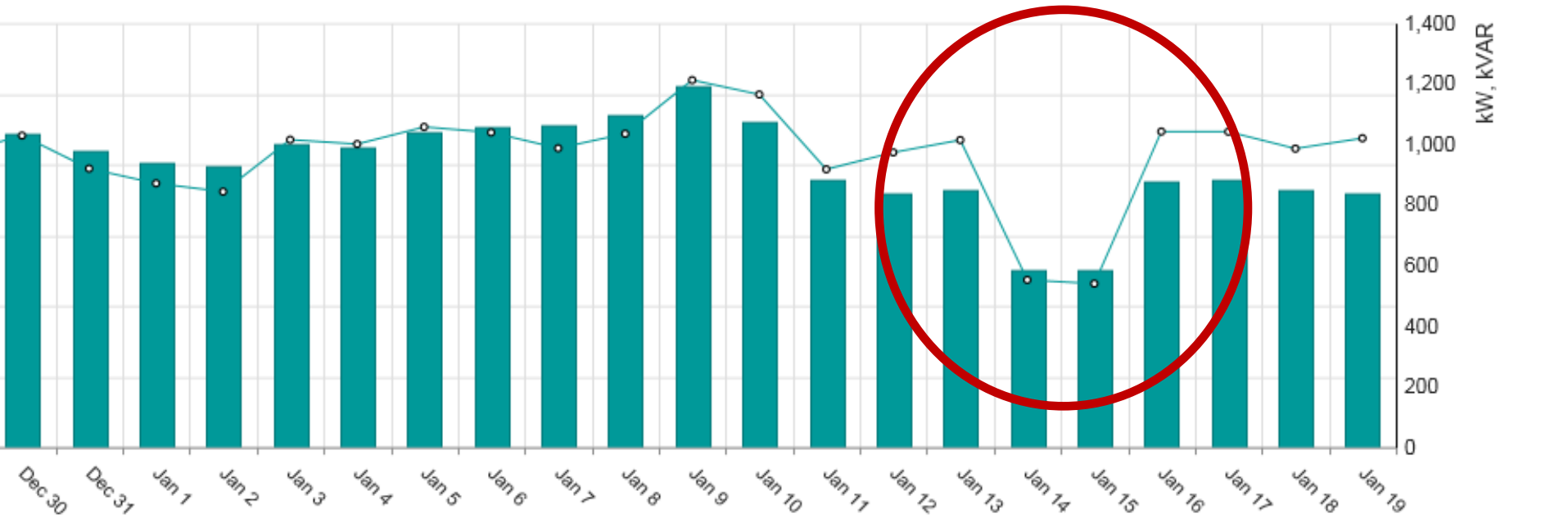
Energy Tips

- Change every month
- Observations about the data

Medical Center Plaza Case Study

Estimated 30%
energy savings in
the building

rough Thursday, January 19, 2017



ENERGY
CONNECT



Carolinas HealthCare System

Co-Benefits: It's all about the people

- Job satisfaction
- Organizational echo
- Social cohesion
- Sense of belonging
- Easy to act
- Sense of pride
- Smoother operations
- Patient and staff comfort
- HCAHPS



Embed energy savings
more deeply into the
fabric of the
organization

Energy Stories...Bring Energy to Life

Everyone has a role to play...

Once upon a time... there was a pediatric building that was always cold during the winter months.

Every day... the peds nurse would set the thermostat to 90F and over all this time, the suite temperature never increased and always stayed freezing.

But, one day... the engineer took a look at the discharge air temperature from the vents and found that the temperature was very cold even though the thermostat was set high. He then checked the attic and found that outside air dampers were left open. He fixed the dampers to operate properly and closed them to the minimum level.

Because of that... the building site began to warm up and make all the nurses and children happy.

Until finally... the engineer and his team now check the dampers every day during the winter.

And ever since then... everyone is warm and happy and thankful to the smart engineer.

You Are Already a Behavior Changer

Thank You

Kady Cowan

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