Energizing Healthcare at Gundersen Lutheran

What footprint will we leave behind?

Why Should a Healthcare System Think About Energy / Environment?

- Pollutants from the burning of fossil fuels cause cancer, liver disease, kidney disease, and reproductive issues.
- According to the D.O.E., hospitals are 2.5 times more energy intensive than other commercial buildings.*
  - This is inconsistent with our mission…we are responsible for contributing to disease through our wasteful consumption.
- Energy costs continue to escalate, making it more difficult to provide affordable care.
- Reducing waste results in an improved bottom line.

*Source: http://www.energy.gov/news2009/7363.htm

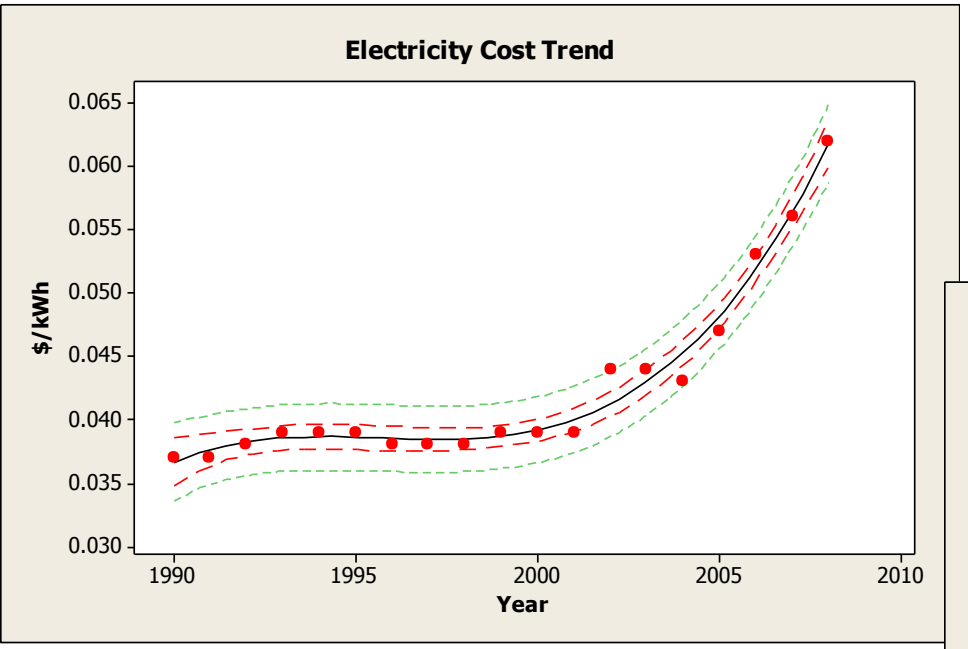
Our Promise

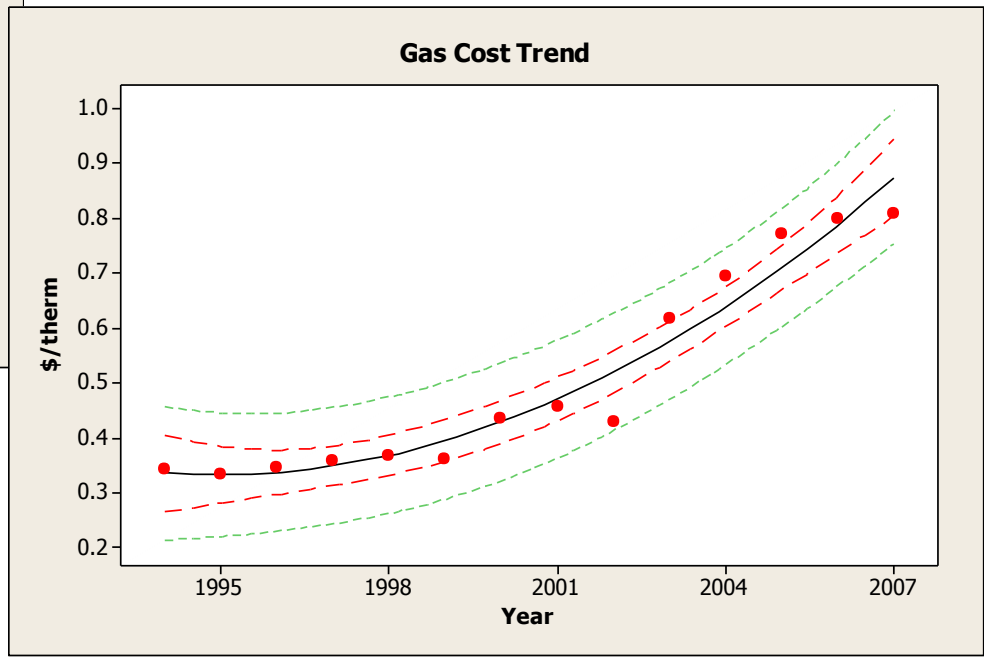
Gundersen Lutheran is committed to environmental stewardship and energy management programs that promote a healthy environment for our patients, their families, our employees, and the communities we serve. We are dedicated to solutions that make environmental and economic sense, creating a healthier environment and lowering healthcare costs.

The Cost of Energy

$5M Spend in 2007

>$350,000 Increase Annually for Gundersen Lutheran





The need for affordable healthcare compels us to address this trend

Our Envision Program

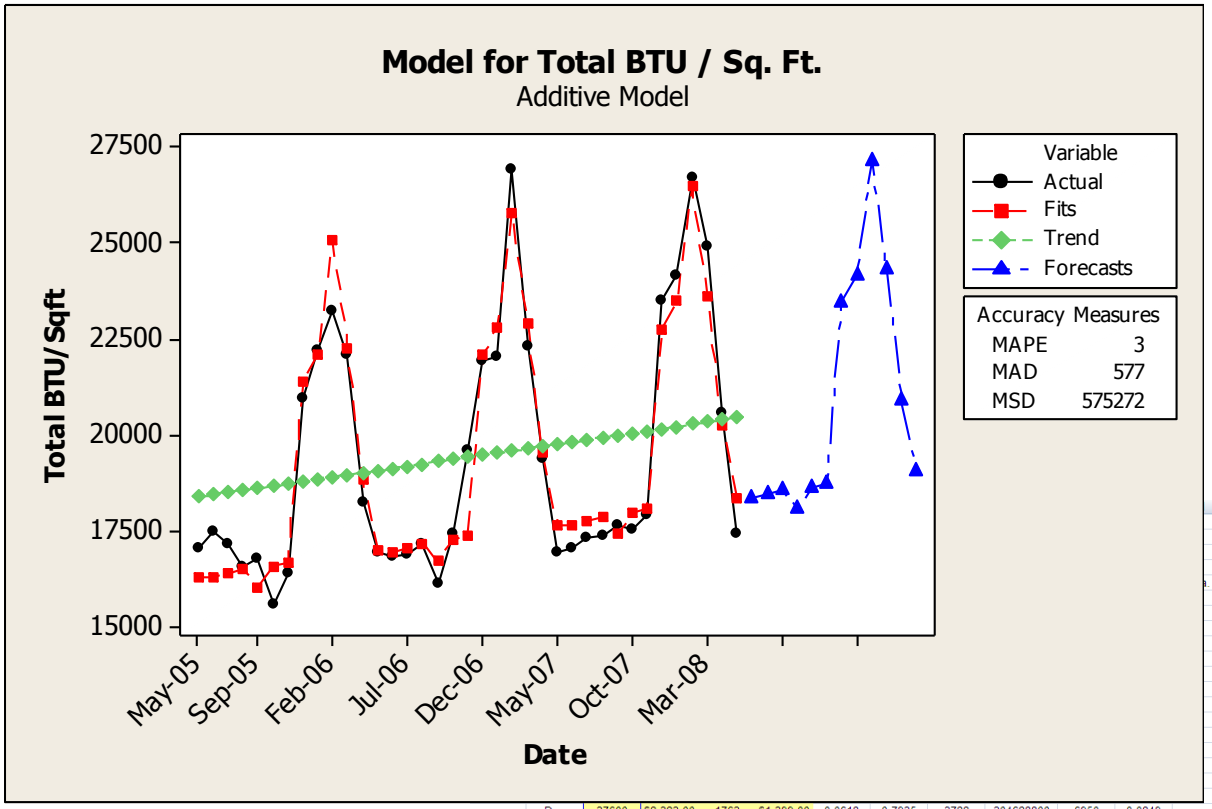
- **Energy Management**
  - Energy Efficiency
    - 30% reduction vs. 2007 baseline by December 2010
  - Renewable Energy
    - Plan for 100% renewable production has been developed
- **Recycling**
- **Waste Management and Control**
  - Comprehensive Waste Management System to include pharmaceutical waste best practice program
- **Sustainable Design of New Facilities**

Energy Conservation

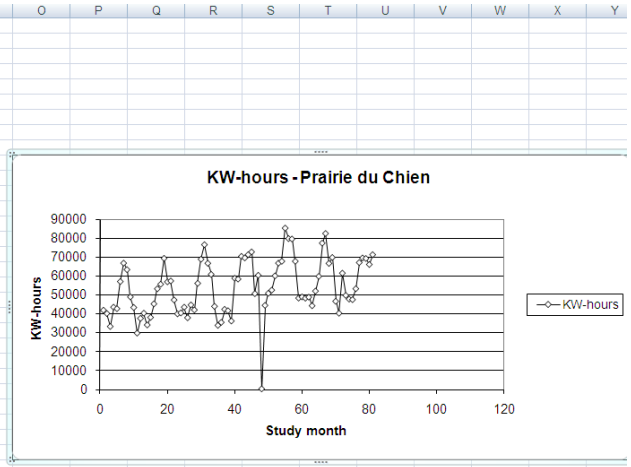
- Best leverage of resources
  - Many conservation measures have paybacks < 2 years
- Immediate benefits to gain momentum
- Reduces the amount spent for renewable energy supply
- Stewardship gains credibility with stakeholders

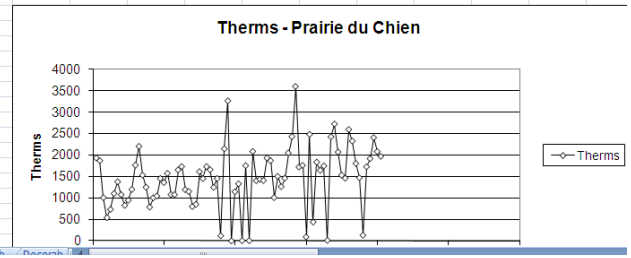
20 – 30% energy reduction can be achieved through conservation measures

Metrics & Baselines

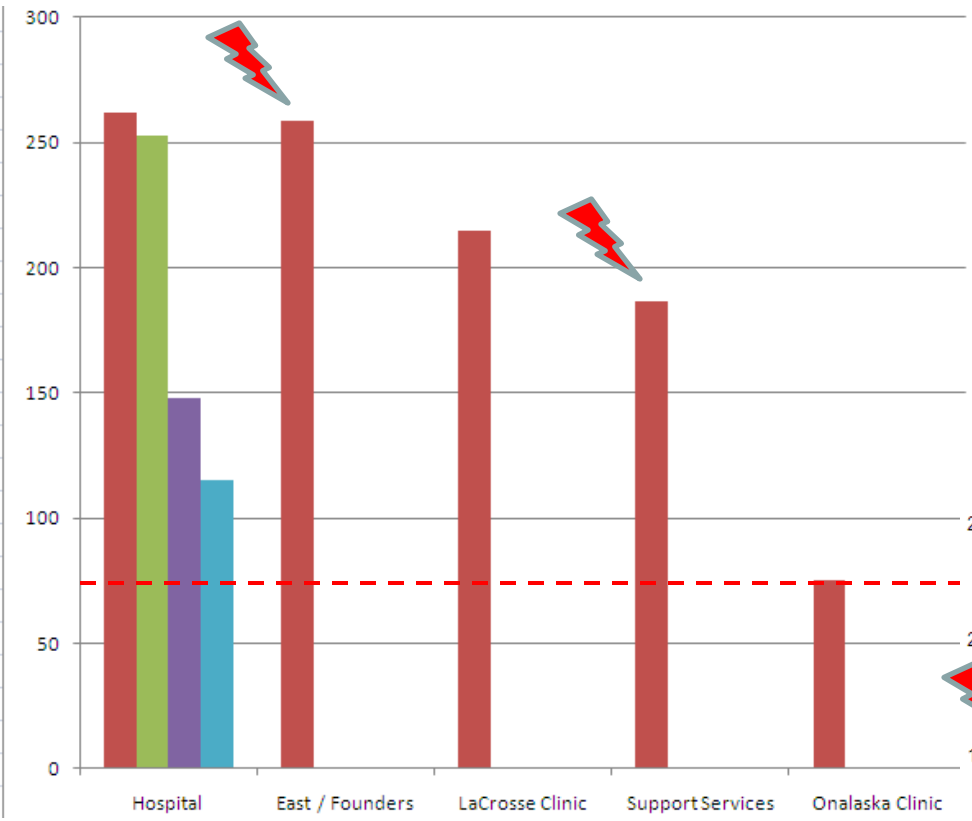


	Dec	37600	$2,323.00	1763	$1,399.00	0.0618	0.7935	3722	304628800	6950	0.0849
2004	Jan	40348	$2,673.00	2202	$1,843.00	0.0662	0.8370	4516	357907724	8166	0.1030
	Feb	34093	$2,427.00	1530	$1,286.00	0.0712	0.8405	3713	269359409	6146	0.0847
	Mar	38089	$2,869.00	1250	$982.00	0.0753	0.7856	3851	254997757	5818	0.0879
	Apr	45282	$3,218.00	787	$622.00	0.0711	0.7903	3840	233247466	5322	0.0876
	May	53280	$3,532.00	1004	$833.00	0.0663	0.8297	4365	282244640	6440	0.0996
	Jun	55680	$4,017.00	1045	$920.00	0.0721	0.8804	4937	294535840	6720	0.1126
	Jul	69440	$4,987.00	1454	$1,257.00	0.0718	0.8645	6244	382398720	8725	0.1425
	Aug	56960	$4,241.00	1361	$1,175.00	0.0745	0.8633	5416	330504480	7541	0.1236
	Sep	57440	$3,984.00	1572	$1,190.00	0.0694	0.7570	5174	353242720	8059	0.1180
	Oct	47360	$3,648.00	1078	$859.00	0.0770	0.7968	4507	269439680	6147	0.1028
	Nov	40000	$3,112.00	1077	$1,083.00	0.0778	1.0056	4195	244220000	5572	0.0957
	Dec	40480	$2,508.00	1654	$1,544.00	0.0620	0.9335	4052	303558240	6926	0.0924
2005	Jan	43520	$2,842.00	1731	$1,458.00	0.0653	0.8423	4300	321633760	7338	0.0981
	Feb	37920	$2,607.00	1193	$1,007.00	0.0688	0.8441	3614	248720960	5675	0.0825
	Mar	44714	$3,519.00	1151	$964.00	0.0787	0.8375	4483	267708882	6108	0.1023
	Apr	42080	$3,056.00	799	$742.00	0.0726	0.9287	3798	223519040	5100	0.0867
	May	56161	$3,797.00	850	$781.00	0.0676	0.9188	4578	276677493	6313	0.1044
	Jun	68960	$5,098.00	1614	$1,328.00	0.0739	0.8228	6426	396760480	9052	0.1466
	Jul	76640	$5,837.00	1451	$1,312.00	0.0762	0.9042	7149	406672320	9278	0.1631
	Aug	66792	$5,044.00	1731	$1,600.00	0.0755	0.9243	6644	401061096	9150	0.1516
	Sep	60893	$4,475.00	1659	$1,960.00	0.0735	1.1814	6435	373727809	8527	0.1468
	Oct	43959	$3,405.00	1246	$1,794.00	0.0775	1.4398	5199	274632067	6266	0.1186
	Nov	33867	$2,805.00	1454	$2,107.00	0.0828	1.4491	4912	260988071	5955	0.1121
	Dec	35480	$3,131.00	120	$167.00	0.0882	1.3917	3298	133093240	3037	0.0752
2006	Jan	42360	$3,327.00	2145	$2,484.00	0.0785	1.1580	5811	359074680	8192	0.1326
	Feb	41655	$3,301.00	3262	$3,399.00	0.0792	1.0420	6700	468368515	10686	0.1529
	Mar	36205	$3,120.00	0	$0.00	0.0862	0.0000	3120	123567665	2819	0.0712

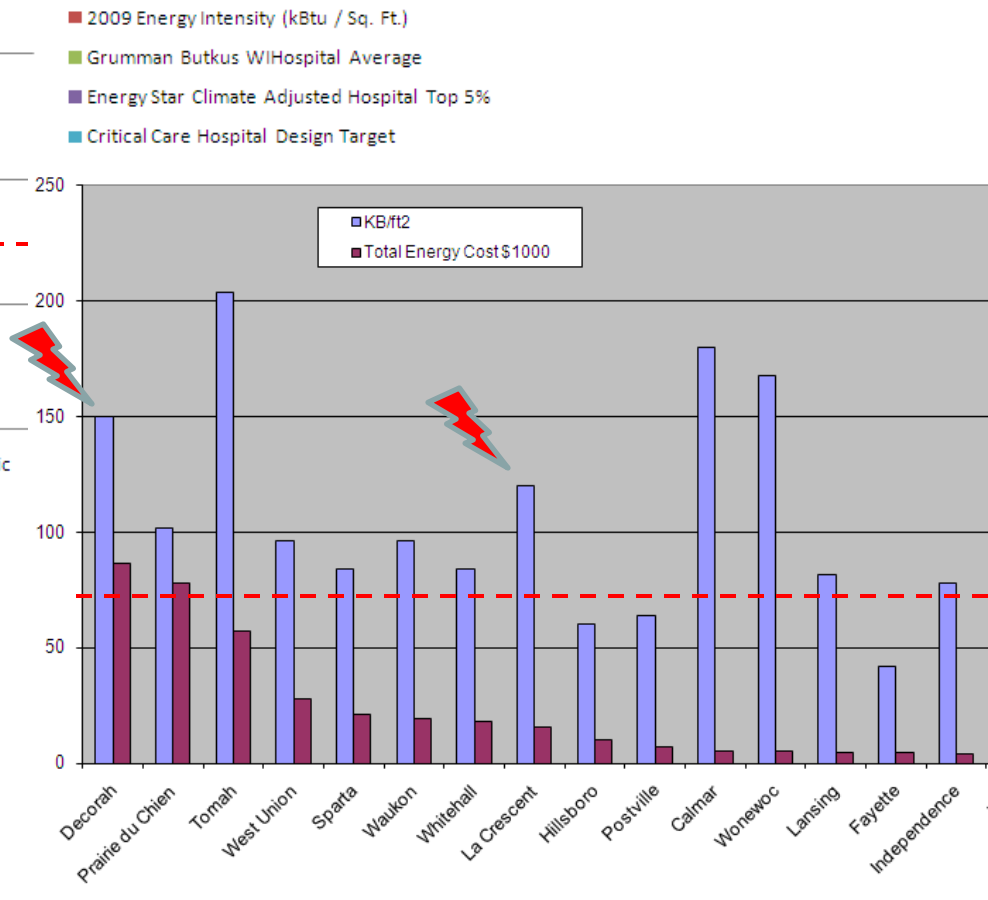




The Value of Commissioning

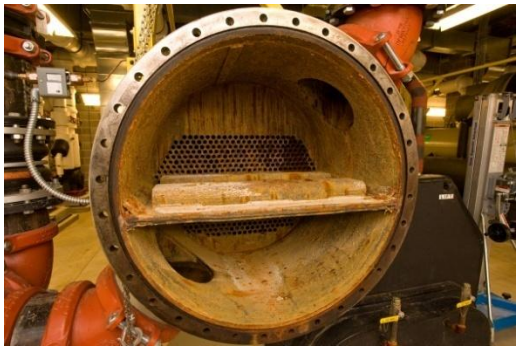


Several of our newest buildings were our worst performers



Retrocommissioning

Retrocommissioning examines heating and cooling systems, lighting systems and employee behavior to identify opportunities to reduce energy demand. Low-cost or no-cost Energy Control Measures (ECMs) are then implemented to improve efficiency.



Use only the energy you need, when you need it, where you need it…no more.

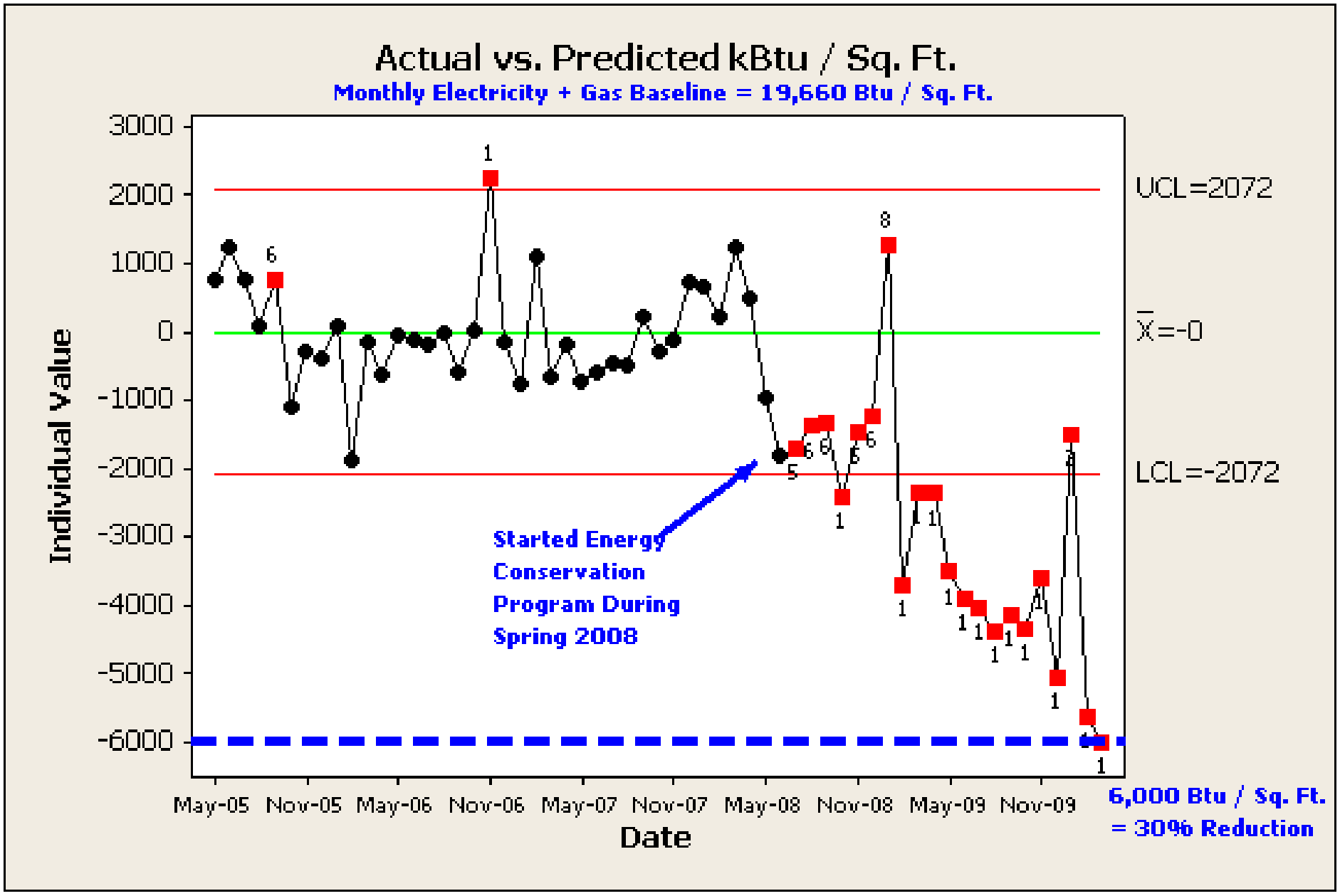
Audits & Project Lists

	Cost	Annual Saving	Payback	Categor	kWh saved	Therm save
Chilled water pump balancing valve	$ -	$ 297	Immediate	Retro	4,950	
Chiller/Tower Optimization	$ -	$ 13,354	Immediate	Retro	222,567	
Exhaust fan scheduling	$ -	$ 4,286	Immediate	Retro	71,431	?
Zone scheduling (Unoccupy VAV boxes/slow down AHU's - phase 1 easy - internal rooms)	$ -	$ 18,535	Immediate	Retro	308,910	?
Zone/AHU scheduling	$ -	$ 25,525	Immediate	Retro	414,860	?
Chiller/Tower Optimization	$ 8,455	$ 15,790	0.5	Retro	263,167	
Chiller/Tower Optimization	$ 58,800	$ 25,932	2.3	Retro	432,200	
Chiller/Tower Optimization	$ 5,680	$ 7,511	0.8	Retro	125,183	
Chiller/Tower Optimization	$ 14,990	$ 2,288	6.6	Retro	38,133	
Zone scheduling (Unoccupy VAV boxes/slow down AHU's - phase 2 - lobbies/hallways/exterior rooms)	$ -	$ 21,568	Immediate	Retro	359,474	?
Condenser water acid feed	$ 2,213	$ 21,504	0.1	Retro	170,000	
AHU scheduling		$ 12,517	Immediate	Retro	208,621	?
Condenser water acid feed	$ 1,258	$ 11,537	0.1	Retro	90,667	
Enthalpy Control, Static Fan Pressure		$ 5,000		Retro	83,333	?
Reducing station for HP boilers & Boiler Economizers	$ 155,326.0	$ 49,433	3.1	Energy Capital		57,480
Shut off one of the hot water motors (??shut off recirc motor too??)		$ 2,000		Retro	33,333	
Energy efficient lighting system	$ 56,702	$ 9,690	5.9	Energy Capital	161,500	
Steam Traps	$ 125,550	$ 35,590	3.5	Energy Capital		41,384
Domestic Hot Water - Heaters	$ 18,411	$ 500	36.8	Infrastructure		
Upgrade boiler controls & VFD drives	$ 125,675.0	$ 14,454	8.7	Energy Capital		16,807
Caulk	$ 3,250	$ 1,000		Retro		1,163
Steam Traps	$ 104,592	$ 6,280	16.7	Energy Capital		7,302
Domestic Hot Water VFD pumps & Controls	$ 5,715	$ 1,689	3.4	Retro	28,144	
Steam Traps	Incl in East	Incl in East		Energy Capital		
Steam Traps	Incl in Hospital	Incl in Hos				
AHU 38, 39, 21, 4, 5, & Phase II Hydronic Heating Controls	$ 76,718	$				
Condenser water acid feed	$ 10,720	$				
Condenser water acid feed	$ 4,951	$				
Domestic Hot Water - Controls	$ 3,240	$				
Domestic Hot Water - Controls	$ 1,950	$				
Controls	$ 121,200	$				
Controls	$ 228,110	$				
Replace OA Damper AHU 5	$ 4,850	$				
Controls	$ 161,325	$				
Energy efficient lighting system	$ 277,049	$				
Energy efficient lighting system	$ 124,812	$				
Energy efficient lighting system	$ 59,758	$				
Energy efficient lighting system	$ 253,470	$				
AHU scheduling		$				
AHU scheduling		$				
Energy efficient lighting system	$ 711,173	$				
Chiller replacement	$ 500,000	$				
Domestic Hot Water - Controls	$ 3,525	$				
AHU scheduling		$				
Exhaust fan scheduling		$				
Exhaust fan scheduling		$				
Vacuum pump	$ 3,500	$				
HP boiler scheduling Different opportunity now with using reducing station						
Exhaust fan scheduling		$				
Exhaust fan scheduling		$				
Heat Wheel	$ 350,000	$				
Steam to Founders	$ 200,000					
Replace s-1 Coil	$ 60,000	$				

Energy Conservation Project Priority Matrix

Project Name				
Establish enforce new temp range guidelines to support energy efficiency (non-patient areas)	9	1	9	132
Shut down / reduce regional site signage and/or parking lot lights	3	9	9	120
Hot Water Scheduling, upgrades, design better than current (Hx Pneum/DDC Clinic) underway	9	3	3	120
Eliminate hot water boiler-Founders, bring over from Domestic East Building	9	3	3	120
Decrease pressure in HP boilers	3	9	9	120
Heat recovery off of our boiler stacks ORC?	9	3	3	120
Finish scheduling areas in LaCrosse that have not been addressed (i.e. LaX clinic, Foundation, GBB)	3	9	9	120
Connect steam loop on LaCrosse Campus	9	3	3	120
Install motion sensors for lights in offices and conf. Rooms (analyze appropriate)	9	1	3	108
Lighting controls where needed (i.e. region too)	9	1	3	108
Relamp regional clinics and smaller buildings with retrofit lighting	9	1	3	108
Alternative heat source for regional clinics (solar heating, new furnace, gshp, wood?)	9	1	3	108
Replace hospital AHU-1 & heat recovery wheel	9	1	3	108
With older regional clinics, audit insulation and supplement with additional insulation as needed	9	1	3	108
More VAV's rooms in existing buildings	9	1	3	108
Use on Emergency generators to supplement electrical load and turn over fuel	9	1	1	100
Natural gas stand by generators (load shed)	9	1	1	100
Elevator Analysis	1	9	9	100
Sweater day turn down heat (non-patient care areas)	1	9	9	100
Add Biomass Boiler	9	1	1	100
Sell the old Viroqua Clinic so we don't have to heat it	1	9	9	100
Meters	3	9	3	96
Daylight harvesting (East, Clinic, Hospital Lobby, SSB, Stukins, Onal. Clinic, new Regional clinics)	3	3	9	84
Establish appliance policy / control plan to limit personal appliance use (i.e. space heaters, fridges, etc.)	3	3	9	84
Unoccupied individual rooms HVAC during day when not occupied (GLMF)	3	3	9	84
Ceiling fans in high ceilings (Distribution ctr., laundry, power plant, lobbies)	1	9	3	76
Develop specs. (for old stuff too) For motors and other energy using equipment (i.e.. Haworth lighting, etc.)	3	1	9	72
LED lighting on outside signage (regional sites)	3	3	3	60
LED lighting for parking lots or reduce during certain hours	3	3	3	60
Night light retrofit in the hospital (dimmer switch?)	3	3	3	60
Upgrade older / non-efficient kitchen equipment	3	3	3	60
Replace exhaust hood kitchen ventilation control	3	3	3	60
Install VFD's on hospital chilled water pumps	3	3	3	60
Install differential pressure valves on chilled water distribution	3	3	3	60
Reduce lighting at AVS warehouse	3	3	3	60
Unoccupied HVAC & lighting / coordinate with cleaning staff	3	3	3	60

Validating Results

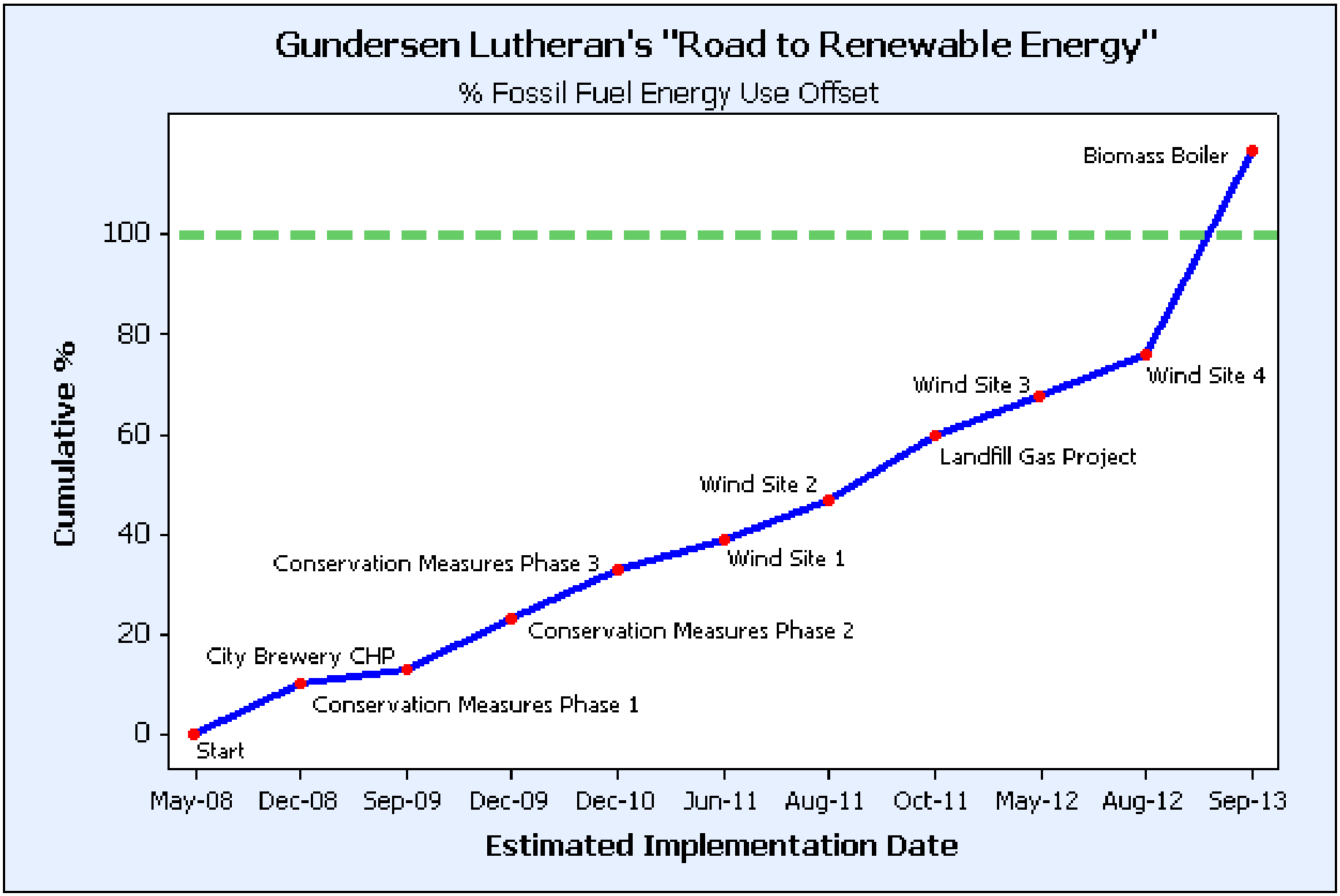


Renewable Energy Supply

- Proven technologies exist today
- Investment mentality
  - Expect 5 -15 year paybacks for many projects
  - Hedge against inflation
  - Highly variable depending upon project specific parameters
    - **Feasibility studies recommended**
  - Significant tax incentives exist for those who qualify
  - Renewable Energy Credits add financial value
- Great opportunity to form mutually beneficial partnerships

Wind ***Hydro*** ***Biogas*** ***Solar*** ***Biomass*** ***Geothermal***

We will always need to consume some energy to fulfill our mission.
Clean, renewable sources of energy can offset this consumption.


Gundersen Lutheran's "Road to Renewable Energy"
% Fossil Fuel Energy Use Offset
Cumulative %
0
20
40
60
80
100
Start
City Brewery CHP
Conservation Measures Phase 1
Conservation Measures Phase 3
Conservation Measures Phase 2
Wind Site 2
Wind Site 1
Landfill Gas Project
Wind Site 3
Wind Site 4
Biomass Boiler
May-08
Dec-08
Sep-09
Dec-09
Dec-10
Jun-11
Aug-11
Oct-11
May-12
Aug-12
Sep-13
Estimated Implementation Date

Energy Status

Implemented Energy Benefit

- ~ 25% offset through conservation achieved by 12/31/09
  - 10,000,000 kWh
  - 40,000,000 cu. ft.
  - $1,250,000 annualized benefit

Sustainable Design of New Facilities

- Underground Parking Ramp
  - Solar photovoltaic, paint on concrete, green space, etc
  - LEED Certified
- Stukins Building
  - Renovated a building that dated back to late 1800's
  - 90% diversion rate of construction waste
    - Recycled lumber for paneling
  - Rain garden for storm runoff
- Critical Care Tower – in design
  - 115 KBTU/sqft Energy Goal
  - Geothermal

Why isn't everyone doing this?

- Financial
  - Energy is typically 1-2% of a hospital's budget
  - Energy competes with other mission-critical investments
  - Little to no documented results for value on some technologies
  - Difficult to verify results of implemented improvements
  - Grants/Incentives
    - Nonprofits
      - Can not use tax incentives
      - Can not enjoy depreciation expense tax benefits on capital investments
      - Are excluded in many federal stimulus grants (ARRA)
    - Hospitals and Universities consume a great deal of heat energy which is not incented as strongly as electricity projects
    - Some competitive grants are focused on large scale projects beyond the capacity of smaller organizations

Why isn't everyone doing this?

- Personnel (especially smaller and rural hospitals)
  - Not a lot of engineers or technical people
  - Limited training on energy efficiency or renewable energy
  - Need to maintain the comfort
  - Communicating payback to decision-makers
    - Personnel don't know what to ask the suppliers
    - Personnel don't know how to sell to leadership
    - Personnel don't sit in the same meetings

Why isn't everyone doing this?

- Buildings
  - Checkerboard construction/disconnected systems
    - Brand new buildings connected to 100+ year old buildings
      - Equipment and controls that span as well
  - Aesthetics
  - Many codes/regulations
    - Infection control, Indoor Air Quality
  - Limited onsite renewable opportunities
  - Larger renewable energy projects take years
  - Untapped sustainable opportunities
    - Waste Heat Recovery
    - Combined Heat and Power
      - Energy security

Jeff Rich

Executive Director
Major Projects and Efficiency Improvement
Gundersen Lutheran Health System
E-mail: jjrich@gundluth.org
Phone: (608) 775-6970
Executive assistant: Jean Hougom, (608) 775-6329

Jeff Rich joined Gundersen Lutheran Health System in October 2006 to lead the department of Major Projects and Efficiency Improvement. As the executive director, his major responsibilities include project identification, project delivery and coaching of project leaders on process improvement. Jeff facilitates project reviews and helps manage the project portfolio to achieve Gundersen Lutheran's strategic and operational goals. In this work, Jeff utilizes Lean-Six Sigma tools and partners with other leaders to direct change. Jeff was previously employed as the director of Customer Satisfaction and Six Sigma for Trane's Global Marketing Division. During his 10-year career with Trane, he also held a variety of quality engineering, Lean-Six Sigma and
engineering management positions. Jeff was also employed for six years with the John Deere Waterloo Works Drive Train Division as an industrial engineer and quality engineer. Jeff holds a Bachelor of Science in Mechanical Engineering and is a certified Lean-Six Sigma black belt and master black belt. He is also a senior member of the American Society for Quality (ASQ) and an ASQ-certified quality engineer.

Corey Zarecki

Efficiency Improvement Leader
Gundersen Lutheran Health System

E-mail: cjzareck@gundluth.org
Phone: (608) 775-0148
Senior office assistant: Shari Krause (608) 775-2780

Corey Zarecki's primary responsibility is to develop, manage and coordinate the energy efficiency and renewable energy projects for Gundersen Lutheran Health System. He also initiates and leads business solutions and process improvement.

Corey joined Gundersen Lutheran in March 2008 as an efficiency improvement leader. He was previously employed as the director of Customer Satisfaction and Six Sigma for Trane Commercial Systems. During his eight-year career with Trane, he also held positions of Six Sigma-Lean leader and certified Six Sigma-Lean master black belt driving business solutions through process improvement philosophies. He served as a teacher and mentor to hundreds of peers around the world. Prior to his work at Trane, Corey held a number of engineering and leadership roles at several chemical companies.

Corey received a Bachelor of Science in Chemical Engineering from the University of Wisconsin-Madison and holds a patent for high density printed circuit substrate and method of fabrication.