Getting the Savings You Want: Strategies for Ensuring Real Energy Savings in New Construction and Existing Building Retrofits

May 28, 2015
Today’s Presenters

- **Corey Zarecki**, Director of Envision® Engineering and Operations, Gundersen Health System
- **Paul Torcellini**, Principal Engineer – Commercial Buildings Research Group, National Renewable Energy Laboratory (NREL)
- **Christopher Lohmann**, Vice President of Alternative Energy Solutions, Energi
Overview and Agenda

- Welcome and Overview
- Setting Energy Design Goals, Gundersen Health System
- Performance-based Design Build Procurement, NREL
- Ensuring Energy Performance, Energi
- Q&A/ Discussion
Setting Energy Design Goals

Corey Zarecki, Gundersen Health Systems
Gundersen Health System

115 kBtu/sqft New Hospital

Better Buildings Summit

Corey Zarecki, Director – Envision, Gundersen Health System

May 28, 2014
• Mission: We distinguish ourselves through excellence in patient care, education, research, and improved health in the communities we serve
• GL Health System
  – Physician-led Integrated delivery system
    • ~750 providers and ~7,000 employees
  – 325 bed tertiary care hospital
  – 51 clinic locations
  – Western Campus of the University of Wisconsin School
  – Residency and medical education programs
  – Multiple Top 100 Hospital & Service Line recognition
  – A variety of affiliate organizations including EMS air and ground ambulance service, rural hospitals, nursing homes, hospice, etc.
  – Health Plan
Primary Objective

Energy Independence in 2014

Produce more power than Gundersen consumes from fossil fuel source

- Makes our healthcare delivery more affordable to patients
- Benefits human health
- Strengthens our regional economy
- Improves our environment
About me...

• Corey Zarecki
  – 15 years in industry
    • 8 years in HVAC (Trane) and 7 years in the chemical industry
      – Various roles in engineering, process improvement, customer satisfaction, and leadership
  – Last 7 years at Gundersen Health System
    • Healthcare process improvement opportunities
      – Reduce cost/waste
      – Improve efficiency and quality
  • Energy
Why Health Care Providers Should Care About Clean Energy

- Pollutants from the burning of fossil fuels cause:
  - Birth defects
  - Negative effects on the kidneys, lungs, and nervous system
  - Cardiovascular deaths and stroke
  - Increased carcinogens contributing to cancer risk

- According to the Department of Energy, 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.
  - US Hospitals spend $8 billion dollars on energy each year

- 2-sided green is possible: Environmental and Financial

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2Source: American Heart Association Scientific Statement: DALLAS, May 10, 2010
The need for affordable healthcare compels us to address this trend.
Envision®
Gundersen’s Vision for Energy & Environmental Stewardship

- Energy Management
  - Energy Efficiency
  - Renewable Energy
- Waste Management
- Recycling
- Sustainable Design
GUNDERSEN REACHES FIRST DAYS OF ENERGY INDEPENDENCE
OCTOBER 2014
LEARN MORE

GUNDERSEN REACHES FIRST DAYS OF ENERGY INDEPENDENCE
OCTOBER 2014
LEARN MORE

50% improvement
$2M annual savings from energy efficiency improvements
New Hospital Description

New Construction: 433,000 sf
Renovation: 70,000 sf
182 New Inpatient Rooms

Departments
- TEC, Imaging
- Intervention Suite (ORs)
- ICU/CCU
- Cath and Inter Radiology
- Labor/Delivery, Peds ICU
- Med / Surg
- Inpatient Pharmacy
- Morgue, Support Services

Patient/Visitor Rooftop Terrace
New Hospital Lobby
Rooftop Helicopter Pad
Ambulance Garage – 4-5 vehicles
Underground Access to Parking
Several of our newest buildings were our worst performers.
New Hospital Energy Target

First Model
Target = 273

Average = 253

2nd Model
Target = 220

“Achievable”
Target = 200

Model limits = 135

Target = 115
Why So Much Energy

- High ACH/OA
  - OR’s 25/5
  - ER Waiting 12/2
  - Infection Iso. 12/2
  - Patient Rms 6/2

- Energy intensive equipment
- High filtration requirements
- Pressure Relationships
- 24/364 Operations

- Data centers
- Food service
- Sterilization
- Laundry services
- Over 4000 patients, visitor and staff entering & leaving the facility everyday

Legacy Salmon Creek Medical Center
456,000 sqft. Complete 2005
New Hospital Energy Target

Deciding Factors
- Payback
- Progress toward goal
- Maintenance costs
- Future flexibility
- Standardization
New Hospital Energy Target

**Chiller Plant Upgrades (8-10 kBtu/sqft)**
- New Chillers
- Tower optimization
- 14° delta T on Chilled water

**Lighting (4-6 kBtu/sqft)**
- Daylight harvesting
- Occupancy sensors
- LED where applicable

**Fenestration (8-10 kBtu/sqft)**
- Windows
- Walls
- Ceiling

**Geothermal Heat Pump (70-80 kBtu/sqft)**

**Other (11-15 kBtu/sqft)**
- OR Air Handlers w/ desiccant wheel
- VFD’s
- Premium efficiency motors
- Scheduling (OR’s, lobbies, offices, etc.)
- White roof
2014 EUI = 136 kBtu/sqft

Work in Progress
- Optimizing Geo Heat Pump
- DE lamping “Back of House” Space
- Increase Area’s to Schedule
- Temperature Guidelines and Control
- Not Allow Personal Devices
Cost of Achieving Energy Goal

Payback ~ 7 Years!

Life Cycle Cost Analysis - David S. Haviland
Energy Intensity (kBtu/sqft/yr)

~$700k Savings/year
Key Learnings

- BHAG and unknown leads to creative solutions
- Leadership support is key to success
- Owners interest is not in the best interest of Architect
- Scope creep
- Review energy model often
- Measurement
- Building thermal
- Precommissioning
- Hot water, not steam
- **Set a goal and stick to it!**
What Next....

Zero Energy New Construction
Why Health Care Providers Should Care About Clean Energy

- Reduce the Cost of Healthcare
- Decrease Emissions Harmful to Health
- Decrease Emissions Harmful to Environment
- Provide Benefit to Regional Economy
- Achieve Energy Independence
- Use Renewable Resources
- Reduce our Dependence on Fossil Fuel
- Local Jobs
- Improve Patient Experience & Cost
- Partner with Public and Private Organizations
- Make Cost Effective and Sound Investments
- Hedge against inflation
- Power Security/Reliability
- Wisconsin imports ~$15B in fossil fuels each year...... every bit of local production keeps dollars in our region
Performance-based Design Build Procurement

Paul Torcellini, NREL
Performance Based Procurement: Getting the Savings You Want

Better Buildings Summit
Washington, DC
May 28, 2015

Paul A. Torcellini, Ph.D., P.E.
Principal Engineer
• RSF uses 50% less energy than if it were built to current commercial codes at no extra capital cost
Many Pieces

• So many ways to assemble the pieces

• Design is about making decisions – need motivation to make the right decisions

• Who are the decision makers?

Used by permission: Paul Torcellini/NREL
Setting Goals

• **Measurable goals are better**
• **From bad to good...**
  – I want a green building
  – Design a LEED <rating> building
  – Design a building to use 30% less energy than ASHRAE 90.1-2013
  – Design a building to use less than 25,000 BTU/sqft
  – Design a [NET] ZERO ENERGY BUILDING

• **Influencing purchasing decision—the owner**
• **Effective goal setting applies to any project: new or retrofit**
• **Goal setting is independent of owner type**
Goal
Goal
Goal
Real Value Added
Owner Defines Desires

• Creating a list of what the building could accomplish.

- **MISSION CRITICAL**
- **DESIRABLE**
- **IF POSSIBLE**

• Critical: Project cannot succeed without this element
• Desirable: What the owner wants
• If Possible: The wish list
Problem Definition: RFP Objectives

**MISSION CRITICAL**
Attain safe work performance/Safe Design Practices

**LEED Platinum**
ENERGY STAR “Plus”

**HIGHLY DESIRABLE**
800 staff Capacity

25kBtu/sf/year

Architectural integrity
Honor future staff needs
Measurable ASHRAE 90.1
Support culture and amenities
Expandable building
Ergonomics
Flexible workspace
Support future technologies
Documentation to produce a “How to” manual
“PR” campaign implemented in real-time
Allow secure collaboration with outsiders
Building information modeling
Substantial Completion by 2010

**IF POSSIBLE**
Net Zero/design approach
Most energy efficient building in the world
LEED Platinum Plus
ASHRAE 90.1 + 50%
Visual displays of current energy efficiency
Support public tours
Achieve national and global recognition and awards
Support personnel turnover
Owner Role

• **Spend the time to get RFP right**
  • Design/build team will study to pass the test

• **Set up acquisition process to “force” integrated design**
  • Energy modeling guides conceptual design decisions
  • Architecture and envelope are also efficiency measures
Owner Role

• Unwavering commitment to problem statement
  • Unleash power of design/build team of experts to meet your needs
    • true value engineering
  • Commit to your objectives and the prioritization and don’t adjust

Clockwise from top:
NREL/18784, 24690, 17823
Process

- Owner made tough decisions up-front
  - Set budget
  - Sought maximum value for that budget
  - Prioritized goals

- Design-Build procurement process
  - Managed the team to the RFP and its substantiation criteria
  - Rewards

- Allowed design-build team to use creativity to maximize value—innovation

- Owner did not solve the problem (but knew the solution existed)
COMMERCIAL BUILDING CONSTRUCTION COST

PERSQUARE FOOT COST

PROJECTS AND LEED CERTIFICATION

LEGEND:
- NOT RATED
- LEED CERTIFIED
- LEED GOLD
- LEED SILVER
- LEED PLATINUM

SOURCES:
- www.fayobserver.com
- www.dba.com
- www.nasa.gov
- www.eomega.org
- www.oregonsustainabilitycenter.org
- www.americas.rlb.com
- http://greensource.construction.com
- www.1800larimer.com
- www.usgbc.org
- www.smithgroup.com
- www.cronkite.asu.edu

RSF II Platinum $246
RSF Platinum $259
Average $335/sqft
Moving to the Mainstream...

- Assistance available to implement process
- Works for any owner willing to set goals early and prioritize needs
- Fix the budget upfront
- Competitively procure for meeting prioritized needs
Resources...

- **[www.nrel.gov/rsf](http://www.nrel.gov/rsf)**
  (full procurement information)

- **Design Build Institute of America (dbia.org)**
  - Training, conferences, workshops

- **[Buildingdata.energy.gov](http://www.buildingdata.energy.gov)**
  - [https://buildingdata.energy.gov/cbrd/search/resources/?f[0]=im_field_collections%3A16](https://buildingdata.energy.gov/cbrd/search/resources/?f[0]=im_field_collections%3A16)
  - Energy Performance Based Acquisition
Questions and Comments

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Insuring Energy Performance

Christopher Lohmann, Energi
Strategies for Ensuring Real Energy Savings in New Construction and Existing Building Retrofits

Energy Savings Warranties
Energi Insurance

Energi is a leading provider of specialty risk management solutions, including insurance and reinsurance, to niche sectors of the energy industry.

Energi’s competitive strength lies in doing the hard work to truly understand the risks faced by operators and investors, and then developing proprietary mitigation, loss prevention, and operational risk management techniques to best serve them.

Energi is licensed to do business in all 50 states and Canada, and, through its strategic partners, can provide risk management services globally.
Alternative Energy Solutions

- Pioneered the development of performance warranty solutions for the alternative energy sector
- 24 master policies since January 2011, with steady geometric growth each year
- Over 100 projects insured, ranging from <$50k to >$70mm
- International: Canada office open Q2 2014, UK office open Q4 2014

AES Product Offerings

- **Energy Savings Warranty**
  Backstops savings guarantees offered to building or project owners

- **Output Performance Warranty**
  Provides payment of shortfalls in cash-flow due to underperformance of project
Energi’s Energy Savings Warranty

Guarantee energy savings of kWh, BTU’s, Therms, etc.

Insurance policy pays shortfalls between Guaranteed Savings and Actual Savings

Takes the risk of savings being realized away from the building owner and capital provider
The Path to Precision

1. Project Screening
   - Identify strong project proposals, designs, & teams

2. Design Review
   - Check for errors & omissions
   - Check for over- or under-sizing of equipment
   - Demand full measurements and calculations over shortcuts and rules of thumb

3. Inspection
   - Ensure all measures have been installed per the project design
   - Ensure all measures all functioning as intended at commissioning

4. Real-Time M&V
   - Monitor performance data remotely in near real-time
   - Identify deviations from normal parameters and remedy issues before they become problems that impact savings
Questions? Stories?