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Société canadienne d'ingénierie des services de santé

2012 Webinar Series

Topic:

The Building Automation System – A Powerful Energy Management Tool

October 17, 2012

Overview

Presenters:

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Agenda

- Introductions
- Current Trends / Business Pressures
- Typical BAS Controls Strategies
- Energy Tracking / Operational Monitoring through BAS
- Additional Supporting Functions
- Questions and Closing

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Discussion on Needs:

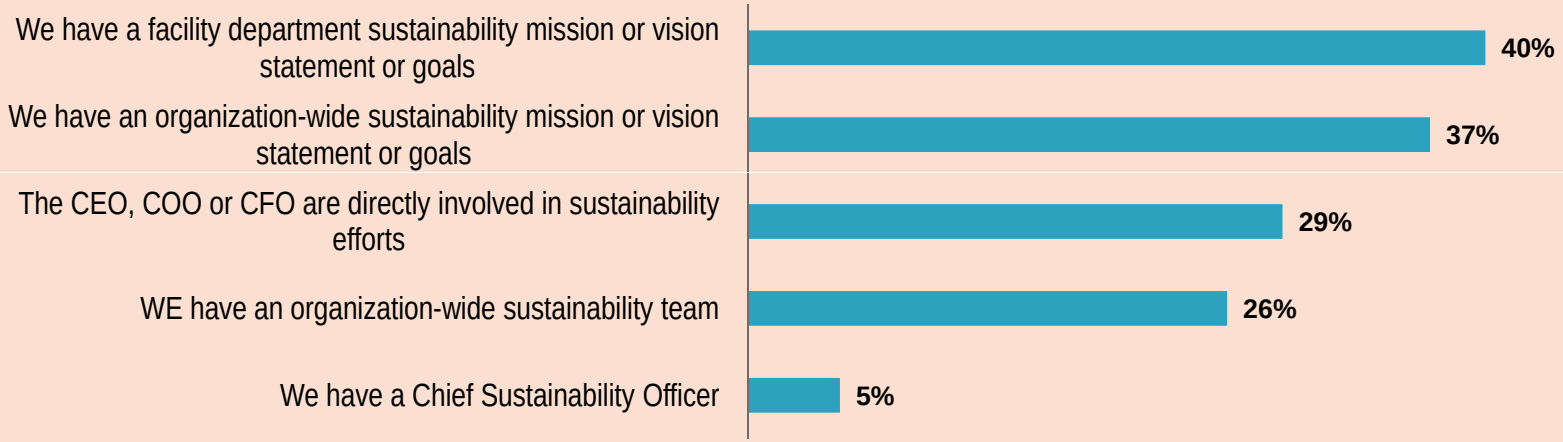
Internal and external pressures are driving Healthcare Facilities to:

1. Complete utilities cost accounting and reporting
2. Track energy consumption patterns and communicate irregularities
3. Establish energy reduction targets and measure results
4. Implement energy conservation programs
5. Report on carbon footprint and GHG emissions
6. Communicate internally / externally on sustainability initiatives
7. Educate the public about energy conservation
8. Make a “GREEN” statement

Many of these pressures can be supported by utilizing existing features of your Building Automation System (BAS).

Current Facts / Business Pressures:

Which of the following is true of your organization?



- **There is a corporate interest in being "sustainable" in Healthcare**
- **Sustainability undertakings improve the public image of the organization and increase occupant satisfaction**

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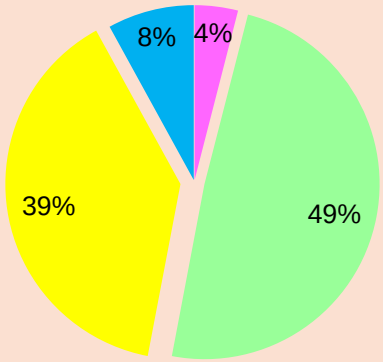
Current Facts / Business Pressures:

BUT?

How committed is top management in your organization to sustainability?

- Not interested and not willing to pay for sustainable products and features (4%)
- Interested but is rarely willing to pay a premium for sustainable products and features (49%)
- Committed and is sometimes willing to pay a premium for sustainable products and features (39%)
- Very committed and is frequently willing to pay a premium for sustainable products and features (8%)



- Financial Considerations still drive decisions
- Senior Management does not believe sustainability translates to Improved Ability to Market Products or Services, or Increase Occupant Productivity
- Payback criteria is becoming lower

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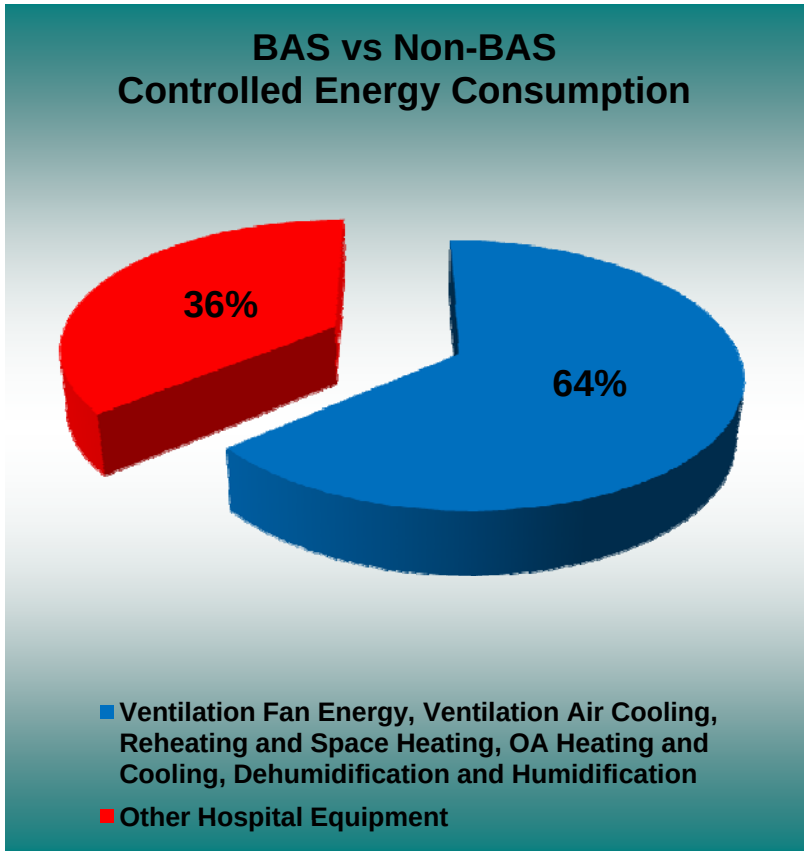
Current Facts / Business Pressures:



Energy Consumption

- In general, Healthcare Facilities are considered to be the largest energy user on an ekWh / sq.ft. basis in the MASH building sector.
- The BAS can control equipment that accounts for nearly 65% of the overall energy consumption of the facility.
- Healthcare Facilities are increasingly becoming engaged in sustainable practices.

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Current Facts / Business Pressures:

Healthcare Engineers and Facility Managers are always searching for cost effective ways to impact energy consumption and support sustainability initiatives.

Is this available through existing infrastructure?

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Webinar Objectives:

The Building Automation System (BAS) is the Nervous System of any building.

The BAS has three primary functions:

- Control
- Monitor
- Report

These functions are rarely taken full advantage of in day-to-day operations of a facility. In many cases, organizations are utilizing external equipment, software and services to provide functionality that is already available in their existing Building Automation System.

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Webinar Objectives:

This webinar aims to explore several ways to maximize the value of your existing BAS through:

- Review of BAS-based energy savings opportunities
- Understanding of how the BAS provides a platform for energy reporting and operational tracking
- Expanding the capabilities of the BAS to support energy and sustainability planning

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BAS-Based Energy Strategies

Overview

- The BAS is directly responsible for control of systems that account for up to 65% of the total energy consumption of the site
- Prior to making significant capital investment to make energy improvements, there are often many “low-hanging” BAS-based opportunities
- BAS Control Improvements can be implemented at low cost, with no impact on space conditions and air quality

Categories

- Fundamental Control Strategies
- Advanced Control Strategies
- Integrated Controls Strategies

BAS-Based Energy Strategies

BEST PRACTICE CONTROLS:

FUNDAMENTAL CONTROL STRATEGIES / OPPORTUNITIES

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Fundamental Control Strategies

Overview

- Base control strategies that should be part of any building control system
- Require little to no capital investment to accomplish
- Considered part of the ASHRAE 90.1 Mandatory controls provisions

Strategies

- Zone Scheduling *(90.1-6.4.3.3.4)*
- Night / Unoccupied Setback *(90.1-6.4.3.3.2)*
- Auto-Shutdown / After-Hours Override *(90.1-6.4.3.3.1)*
- Airside Economizers *(90.1-6.5.1.1)*
- OA Temperature Reset (90.1-6.5.3.4)

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BAS-Based Energy Strategies

BEST PRACTICE CONTROLS:

ADVANCED CONTROL STRATEGIES

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Advanced Control Strategies

Overview

- Base control strategies that should be part of any base control system, but are often excluded or “value-engineered” out
- During initial construction, only a slight cost increase. Post-Construction can impact the ability to cost-effectively implement
- Based on the application, can expect to see paybacks in the 3-7 year range.
- Part of the Prescriptive Controls Provisions under ASHRAE 90.1

Strategies

- Optimum Start/Stop *(90.1-6.4.3.3.3)*
- Ventilation on Demand *(90.1-6.4.3.9)*
- Variable Air Volume Control (90.1-6.4.3.10)
- Hydronic Variable Flow Systems (90.1-6.5.4.1)
- VAV Supply Air Temperature Reset (90.1-6.5.3.4) (also consider Chilled / Hot Water Control)
- Occupancy / Schedule Based Lighting Control

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BAS-Based Energy Strategies

BEST PRACTICE CONTROLS:

INTEGRATED CONTROL STRATEGIES

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Integrated Control Strategies

Overview

- Integrated Control Strategies manage several sub-systems via one enhanced control strategy
- Generally – more capital intensive measures to provide the base infrastructure.
- Typical paybacks on capital intensive retrofits can be 5-8 years.

Strategies

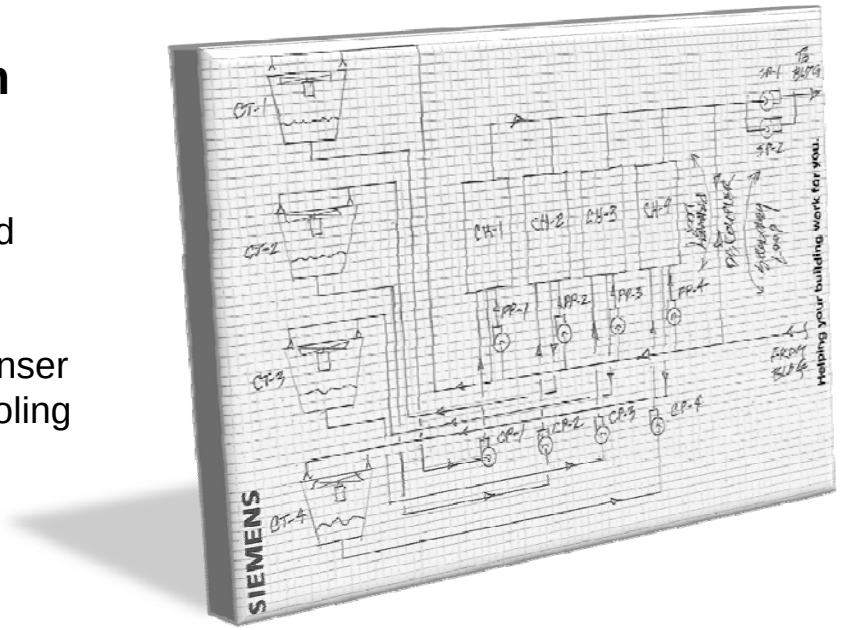
- Chilled Water System Optimization
- Integrated Lighting and HVAC Controls
- Intelligent Load Management
- Variable Air Volume Conversion / Integrated Lab Solutions
- VAV Pressure Reset
- Air Change Optimization / Critical Area Control

Integrated Controls Strategies:

Chiller Water System Optimization

Integrated chilled water system optimization strategies consider all subsystems of the chilled water system including:

- Chillers, Chilled Water Pumps, Condenser Water Pumps, Cooling Towers and cooling valves and coils at the AHU's (or load)



Key Notes:

- Operates the Chilled Water Network as one system, in its most efficient configuration
- Chiller Optimization can dramatically improve seasonal cooling efficiency, while increasing plant deliverable tonnage
- Integrated control expands beyond simple condenser / chilled water reset

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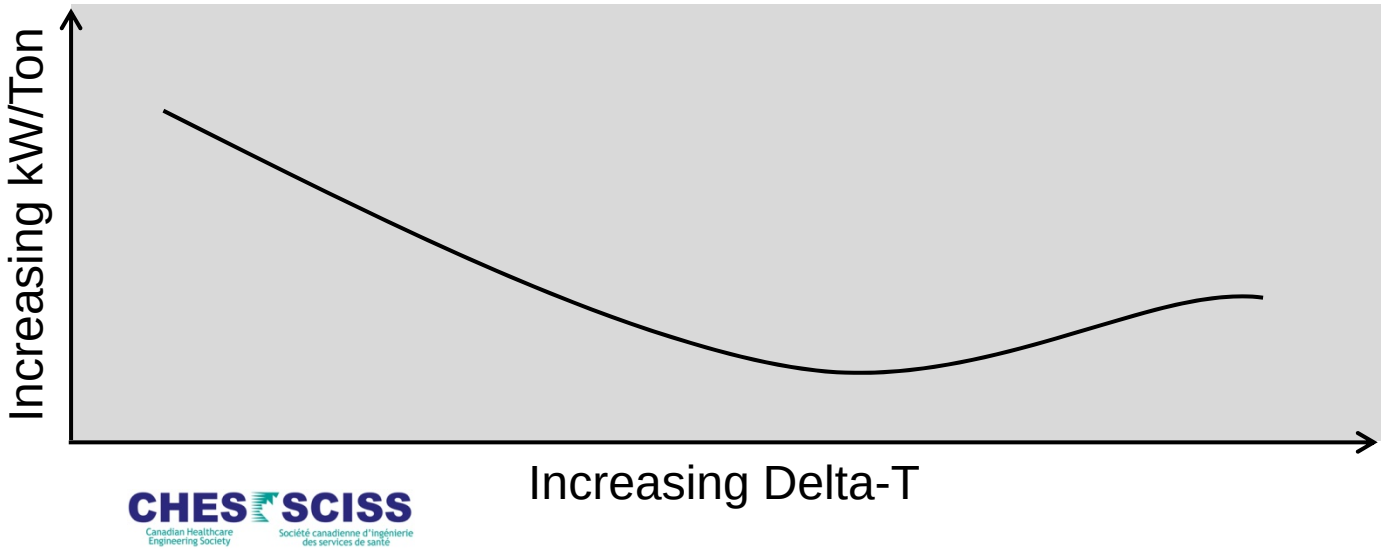
Control Pressure to Manage Delta-T to Design:

Delta - T = Return Water Temperature - Supply Water Temperature



Delivered Capacity

Higher Delta-T

Energy

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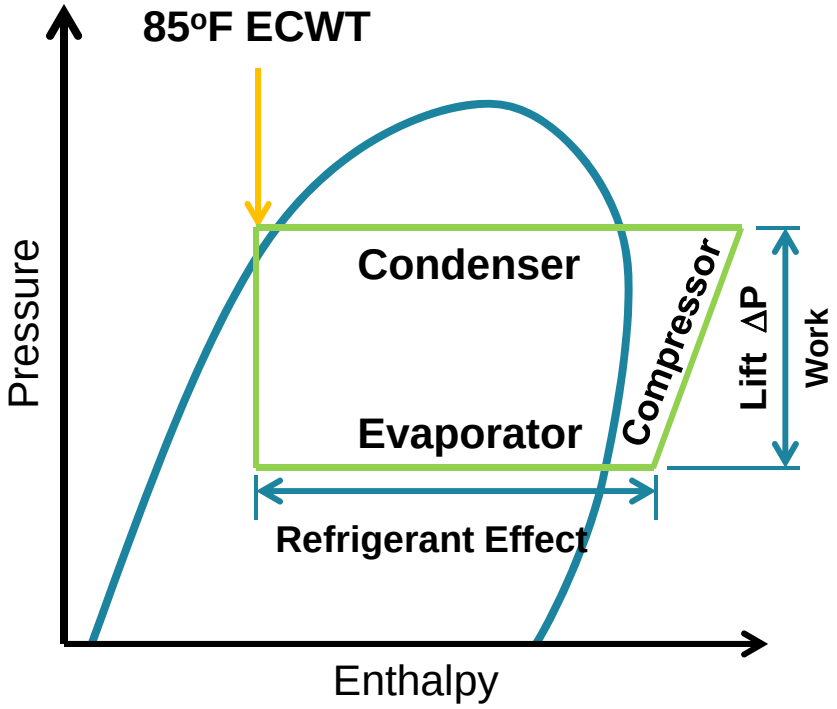
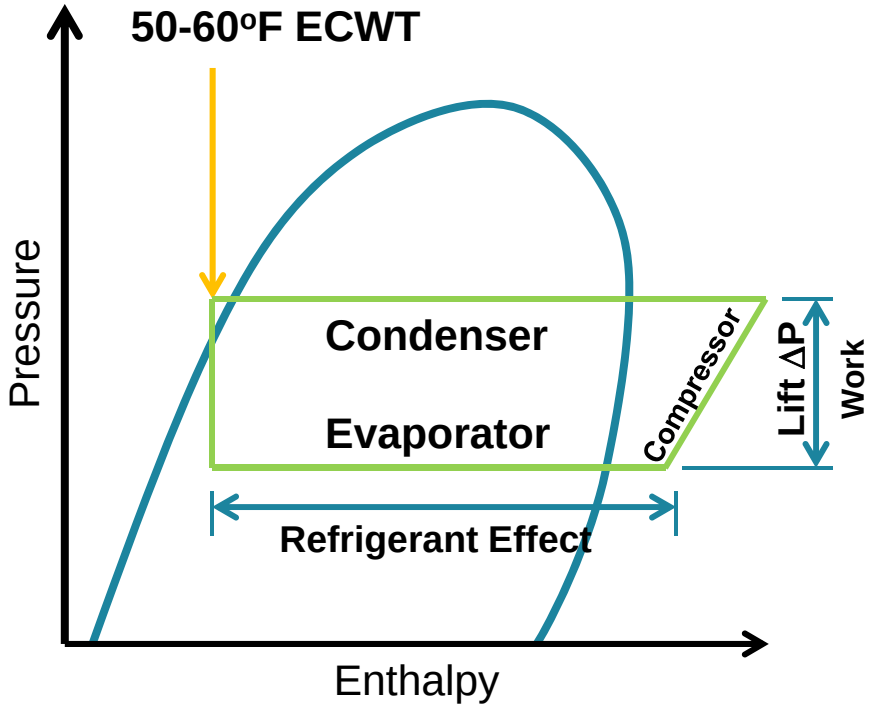
Chiller Optimization Flattens Refrigeration Cycle:

Lowering Energy & Increasing Refrigerant Effect

Lowering Entering Condenser Water Temperature → **Lowers Chiller Lift** → **Reduces Compressor Work** → **Reduces Energy Consumption**





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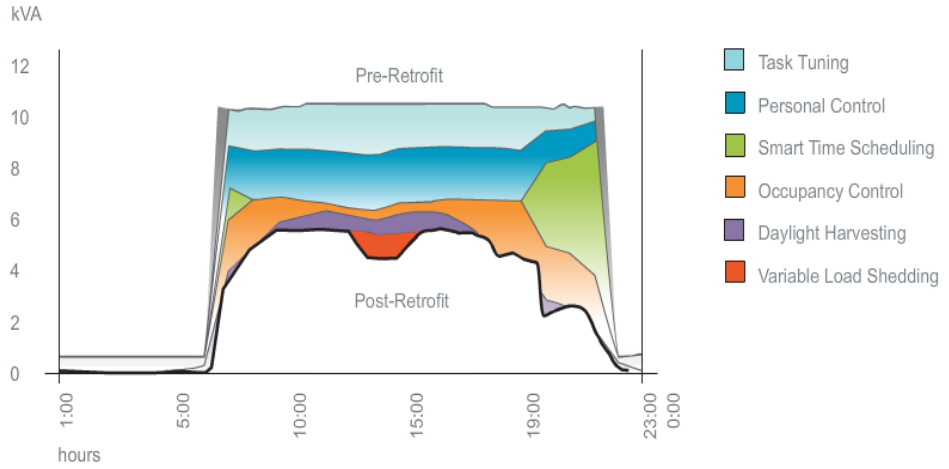
Integrated Control Strategies:

Advanced Lighting Controls

Provides the ability to reduce lighting load levels at all times of the day.

Utilize several feedback options as well as user-interaction to realize full savings potential



*(actual results taken from an Encelium retrofit project – Toronto, Canada).

Key Notes:

- Advanced Lighting controls can provide an additional 15-20% savings in comparison to a typical lighting retrofit and occupancy based control
- Integrate lighting controls to HVAC BAS to utilize the feedback to enhance the BAS capabilities to generate additional savings

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Integrated Control Strategies:

Air Change Optimization / Critical Area Control

- OR's, Isolation Rooms, Labs, and Emergency Rooms all operate to fixed air change rates
- Critical Area Control provides Nurses / Doctors / Bldg Operaters the ability to schedule rooms based on occupancy.
- Touch screen control can be introduced right into the Hospital areas to assist hospital staff with coordination of occupied / unoccupied rooms.
- Significant potential reduction in costs related to conditioning of air by reducing to minimum allowable unoccupied ventilation rates.
- ***Always maintain required differential pressures!***

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Integrated Control Strategies:

Air Change Optimization / Critical Area Control

Additional Considerations:

- Ensure non-critical areas in the same zone receive only the required ACH rates (i.e. storage areas, etc)
- Where available integrate the surgical scheduling application with the building automation system. Control rooms to operating conditions only when they are scheduled to be occupied.
- Ensure older facilities are operating to the current code requirements:

  EX: CSA 317.2: Ventilation in Healthcare –

  - Used to require 10 OACH and 10 TACH, Now require 6 OACH and 20 TACH
  - No longer require continual ventilation, Unoccupied requirements are 0 OACH and 6 TACH

OACH – Outdoor Air Changes Per Hour
TACH – Total Air Changes Per Hour

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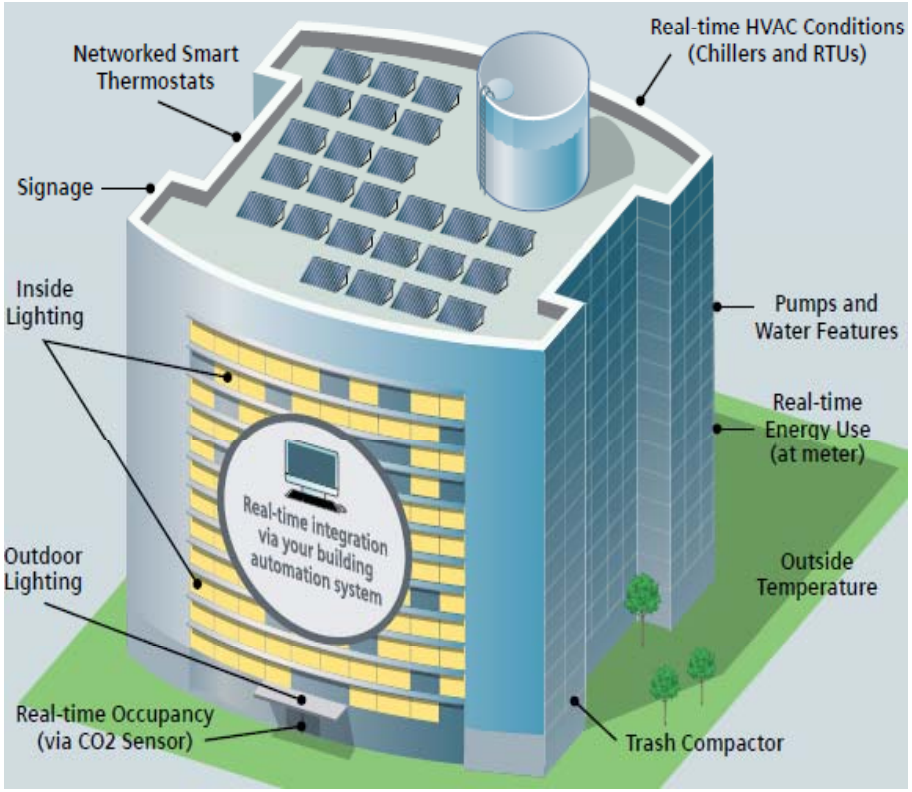
Integrated Control Strategies:

Intelligent Load Management

- Leverages existing BAS equipment through automated load management
- Allows building operators to participate in Demand Response, Peak Pricing Reduction and Smart Grid programs (as they become available)
- Customized Solution which can be monitored directly through you existing BAS
- Incorporates several parameters including market price for electricity, or mandatory calls for reduction if operating under a DR program to control the peak strategies



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Other Options?

Is there a solution that will uncover fundamental BAS opportunities and provide immediate corrective actions?

Existing Building Commissioning (EBCx)

What is EBCx?

"…a systematic process for investigating, analyzing, and optimizing the performance of building systems through the identification and implementation of low/no cost and capital intensive Facility Improvement Measures and ensuring their continued performance over time. The Existing Building Commissioning process assists in making the building systems perform interactively to meet the Current Facility Requirements.

The term Existing Building Commissioning is intended to be a comprehensive term and process that encompasses the more narrowly focused process variations such as retro-commissioning, re-commissioning and ongoing commissioning that are commonly used in the industry."

BCxA definition

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What is EBCx?

Why is EBCx an effective means to drive energy savings at a facility through the Building Automation System?

Energy Savings and Payback from Energy Retrofits of Various Types

Energy Retrofit Type	% Energy Savings	Simple Payback from Energy Cost Savings	Cost $/SF
Existing Building Commissioning	10 to 20	4 months to 2.5 years	$0.30
ESCO Model	20 to 40	3 to 12 years	$2.50
Integrated Design	30 to 60	7 to 12 years	$2.50
Net Zero Energy	50 to 90	8 to 20 years	$10?

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BAS-Based Energy Strategies

ENHANCING YOUR BAS SYSTEM:

A PLATFORM FOR ENERGY TRACKING AND OPERATIONAL MONITORING

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Enhancing Your Existing BAS:

Energy Reporting

- Real-time access to energy consumption data
- Ability to use operational data to calculate energy consumption, establish baselines and end-use, etc
- Ability to generate reporting on actual vs. past consumption

Operational Tracking

- Tracking of key hospital operating parameters
- Comprehensive overview of the building areas
- Ability to identify real-time issues at the facility and take corrective actions

Existing BAS Providers can provide Enhanced Graphics to meet a variety of facility needs.

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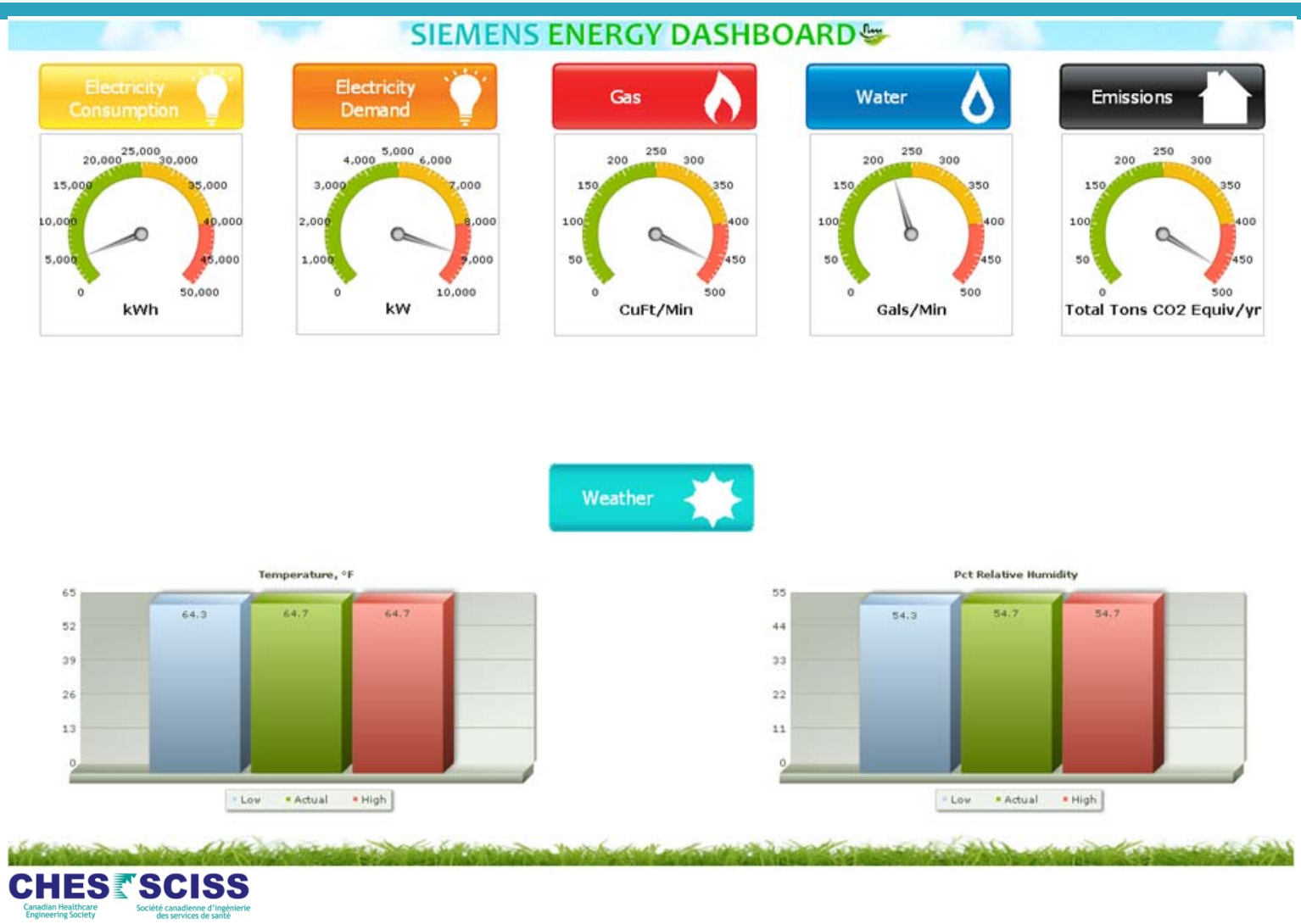
Energy Performance Dashboard: Example “Home Screen” Graphic



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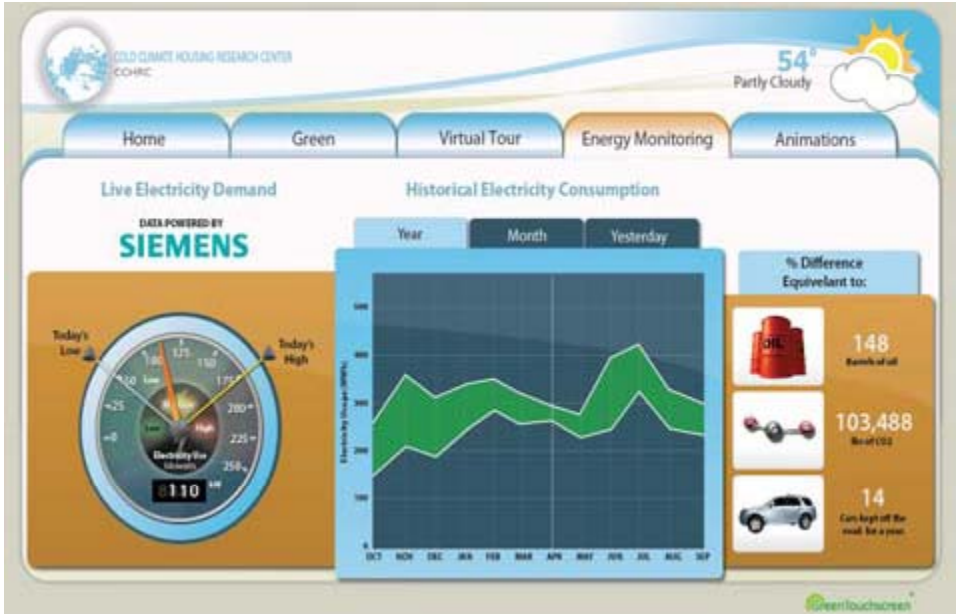
Energy Performance Dashboard: Example Dashboard Graphic



Dashboard Notes:

- A dashboard can be created to map any data which is collected in your Building Automation System, including:
  - Energy Consumption
  - Temperatures, OA Condition
  - Air Change Rates, Diff Pressure
  - Alarms
- Ability to create dashboard solutions for a variety of key facility operational parameters

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Overview – Healthcare Dashboard

Determine what areas and parameters to monitor and display, right down to the medical/surgical floor (area), patient rooms (room), blood storage unit (device) or medical gas (parameter).

Categories include:

- Critical environments
- Critical storage devices
- Infrastructure systems
- Utility consumption

Healthcare Dashboard

- Real-time information on critical environments and building systems for both clinicians and facility personnel.
- Allows you to easily monitor performance parameters by providing a comprehensive overview of the building systems that support your mission – from critical areas to infrastructure systems.
- Displays information on one screen 24/7/365.
- Leverages the power and flexibility of your existing Building Automation System

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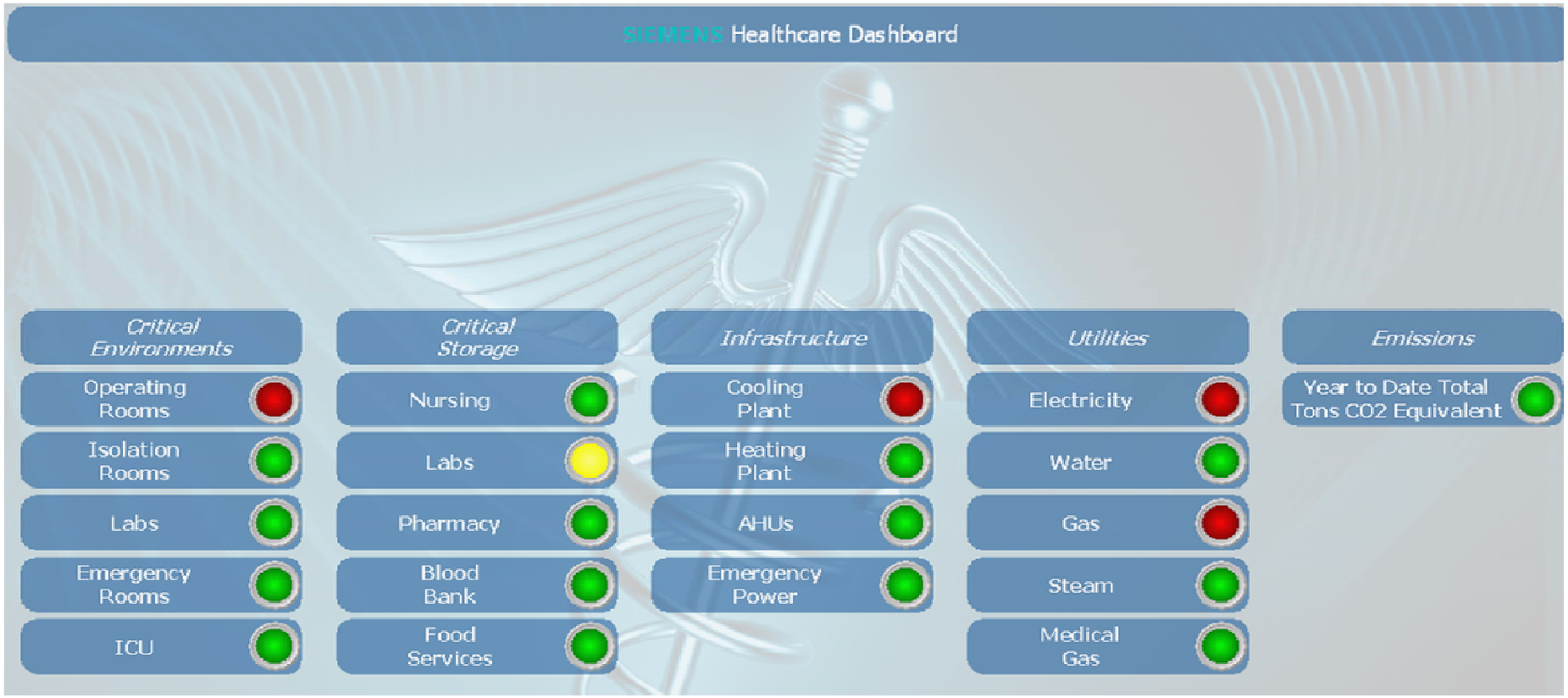
Intuitive Status Indication:



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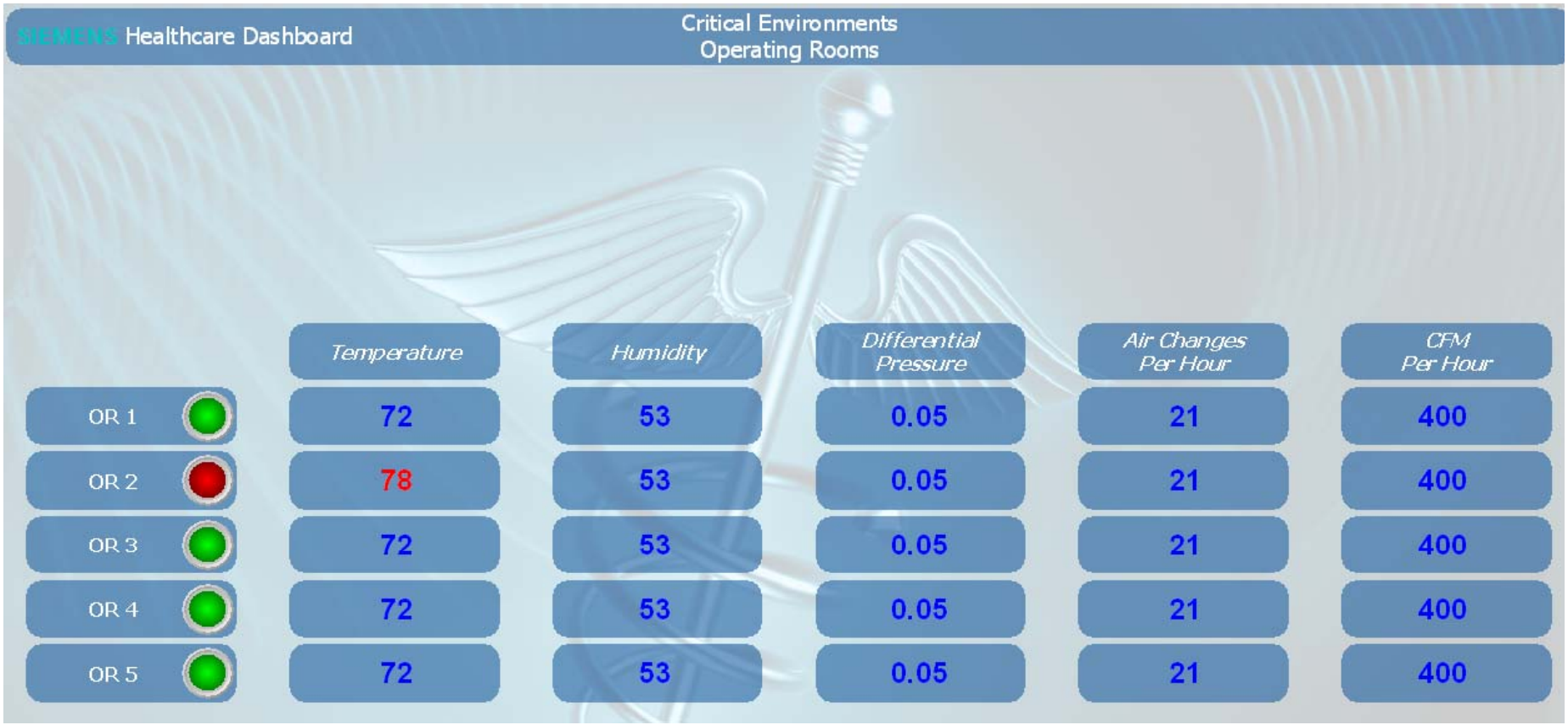
Immediate Access and Response:



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BAS-Based Energy Strategies

WHAT'S NEXT FOR YOUR BAS:

ENERGY AND SUSTAINABILITY PLANNING

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Discussion on Needs:

As a public entity, Healthcare Facilities are required to complete mandatory energy / environmental reporting activities:

1. Establish GHG Baselines and report this data to the Ministry of Energy (already legislated in Ontario)
2. Complete a 5-year Energy Master Plan including base-lining facility operations and establishing targets
3. Report on Carbon Footprint and GHG Emissions annually as well as update the energy master plan every 3-years

This is in addition to existing internal / external pressures to meet energy reduction and sustainability goals

What Else Can Your BAS Do?

Energy Planning? A BAS can be a tool for the following:

- Be the interface for collection and management of your site sub-metering data
- Establishing Goals and Targets for an Energy Program
- Trending operational statistics, monitoring behaviour
- Establishing an Energy Baseline for a facility
- Generating energy opportunities through expansion of existing BAS Capabilities
- Reporting on Energy and GHG consumptions and reductions
- Measurement and Verification

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Questions?

Thank-You!

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