

While waiting for the workshop to start...

Get ready to participate!

- Turn on your camera
- Find the unmute button and say "Hi" to check your audio



- Find the "raise hand" button



Answer our opening question!

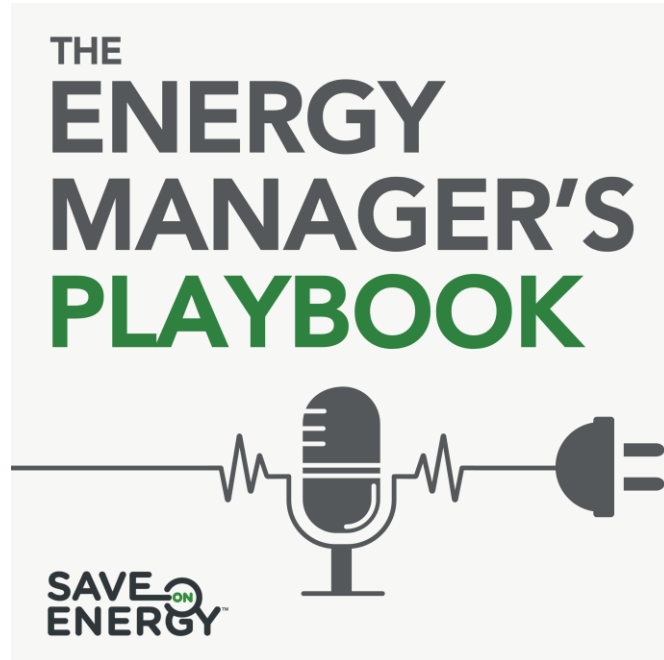
What are you hoping to get from today's session?

Answer in chat or raise hand and unmute

Strategies for Energy Efficiency in Healthcare: Balancing patient safety, reliability, and performance

Stephen Dixon Principal, KnowEnergy
Ed Rubinstein Energy Efficiency Consultant

A podcast by Save on Energy: The Energy Manager's Playbook



Questions or feedback?
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- Presented by IESO's Save on Energy training and support team:
- Features real-world stories from Ontario's energy management community
- Covers industrial, institutional, commercial and municipal sectors
- Focuses on challenges, successes and practical insights
- Bite-sized episodes for quick and impactful learning
- A resource for energy professionals and decision-makers

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Introducing your hosts



Ed Rubinstein has been leading and developing energy management programs and teams for over 25 years including the University Health Network's award-winning Energy & Environment team and as a vice-president at a renewable energy company. Ed and his teams have been honoured with numerous awards, including recognition as a member of the 2018 Clean16.



Stephen Dixon, Principal at TdS Dixon Inc., has over 45 years of experience delivering energy management services to industrial, commercial, institutional, and utility organizations. Widely recognized as a leader in energy management training, Stephen's mission is simple: empower organizations to use energy more effectively through skill development, best practices, and practical tools. His experience includes 950+ energy assessments, 3,000+ workshops, and inspiring over 45,000 individuals across 2,100 organizations.

Our Guest: Eddie Camilleri

Director, Building Services - William Osler Health Services



Eddie Camilleri is a strategic healthcare infrastructure leader with over 9 years of experience in facility operations, energy management, and capital planning within complex acute-care environments. Currently Director of Building Services at William Osler Health System, Eddie leads hospital building services, overseeing third-party facilities management providers to ensure safe, compliant, and high-performing environments that support clinical care delivery.

Eddie has led large-scale operational and capital initiatives, including multi-site energy programs, sustainability strategies, and infrastructure projects aligned with regulatory and organizational priorities. He is recognized for driving operational performance, advancing sustainability, and strengthening partnerships across clinical, executive, and external stakeholders to enhance patient care environments.

Energy Efficiency in Healthcare: Agenda

Why healthcare energy is different

Energy use profile, key drivers and key constraints

Highlight areas

- Operating rooms
- Lighting systems
- Chillers & cooling plants
- Laboratory spaces

What works in practice:
program strategies

Key takeaways

Understanding the Unique Energy Profile of Healthcare Facilities

Why Healthcare Is Different - Overview of Healthcare Facility Operations

Healthcare facilities are fundamentally different from other commercial buildings:

- **Operate 24/7 with no downtime tolerance.**
The power supply must be reliable and uninterrupted.
- **Mission-critical environments** where failure is not an option. Reliability and safety take priority over simple energy reduction
- **Strict clinical, infection control,** and accreditation requirements
- Often **big buildings**, which also bring challenges

Multiple Facility Types Under One Roof

- Hospitals function as clinical, administrative, and support facilities combined
- Each function has distinct operating schedules, systems, and energy profiles

Highly Variable Clinical Spaces

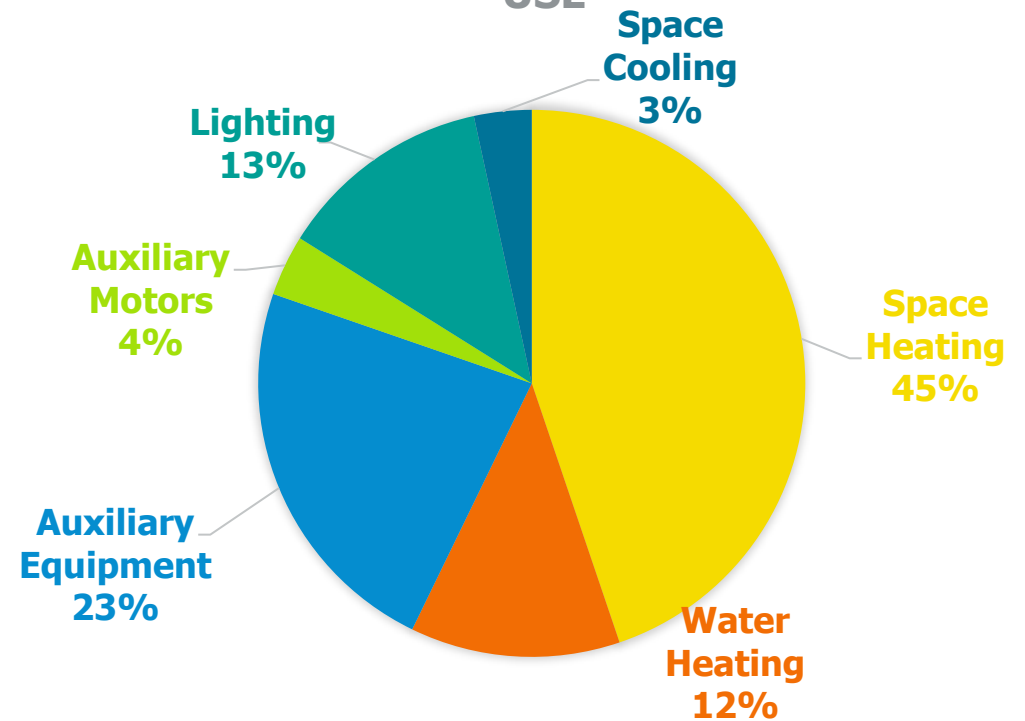
- In-patient floors can differ significantly by clinical service (e.g., ICU vs. med-surg)
- Each service type has unique energy intensity and reliability requirements

Unique energy profile for healthcare facilities

- **Typical characteristics of healthcare energy consumption:**

- HVAC dominates total energy use
- Simultaneous heating and cooling is common
- Equipment and auxiliary loads are significant
- Lighting is important but not the primary driver

HEALTH CARE AND SOCIAL ASSISTANCE
SECONDARY SHARE OF ENERGY USE BY END
USE



Source: NRCan 2022

Key Characteristics and Challenges in Healthcare Energy Management

Rigorous Constraints in Healthcare

Safety

- Continuous, uninterrupted power for life-support, critical care, and ventilation

24/7 Operations = High, Inflexible Load

- Facilities operate continuously, with steady, high baseload demand
- Minimal ability to shed load or schedule shutdowns
- Shutdowns require planning and complex strategy

Heating, Cooling & Environmental Constraints

- Strict humidity and thermal control requirements
- Systems must balance infection control, comfort, and equipment reliability
- Requirements vary within a building

What This Means for Energy Strategy

Objectives

- Reduce energy use without compromising care
- Regulatory requirements
- Accreditation leadership standards
- Improve resilience and system capacity
- Control operating costs and emissions

Constraints

- Continuous operation
- Redundancy requirements
- Minimum airflow, humidity, and pressure relationships
- Infection prevention and patient safety standards

High Impact Situations and Space-Specific Retrofits

- **Operating Room (ORs) Retrofits**
 - Retrofitting operating rooms improves energy efficiency while meeting strict medical standards and airflow requirements.
- **Laboratory Upgrades**
 - Laboratory retrofits address specialized energy needs and ensure safe, controlled environments
- **Patient Room Enhancements**
 - Retrofitting patient rooms enhances comfort and optimizes energy use without compromising care quality.
- **Chillers and central cooling plants**
 - Upgrades focus on system optimization, control strategies, and capacity recovery to reduce energy use while maintaining reliability and redundancy.
- **Data Closet Optimization**
 - Data closet retrofits improve cooling efficiency and space utilization for critical IT infrastructure.

Targeting Energy Efficiency in Operating Rooms

Operating Room Energy Use Overview

High Ventilation Requirements

- Operating rooms need high ventilation rates to maintain air quality and prevent infections.

Specialized Lighting Needs

- Surgical procedures require specialized, intense lighting for precision and safety.

Plug Loads

- Surgical equipment and monitoring devices create substantial always-on energy demand.



Unique Challenges: Infection Control, Ventilation, Uptime

- Infection Control Protocols
 - Strict infection control protocols limit the use of conventional energy-saving strategies to maintain sterile environments.
- Ventilation Requirements
 - Specialized ventilation systems are necessary to control air quality, restricting typical energy-saving ventilation adjustments.
- Continuous Operation Necessity
 - Operating rooms must run continuously to be ready for emergencies, limiting downtime and energy conservation opportunities.
- Legacy Systems
 - May limit operational and retrofit opportunities

Solutions: Scheduling Optimizations, Occupancy Sensors, Ventilation Setbacks

- Setbacks & Scheduling
 - Smart scheduling optimizes system operation times to reduce energy use during low-demand periods.
 - Ventilation setbacks reduce airflow during unoccupied times while maintaining safe indoor air quality.
- Occupancy Sensors
 - Occupancy sensors detect presence to adjust HVAC and lighting, saving energy when spaces are unoccupied.
- Dedicated Cooling and Dehumidification Systems

Optimizing Lighting Systems for Healthcare Facilities

Healthcare Lighting Demands and Quality Considerations

Appropriate Brightness Levels

- Healthcare lighting must provide sufficient and appropriate brightness for accurate clinical tasks and comfortable administrative work.

Color Rendering Importance

- High color rendering in healthcare lighting is essential for accurate diagnosis and treatment.

Minimizing Glare

- Lighting design should minimize glare to reduce eye strain and improve comfort for staff and patients.

24/7 Operations



Healthcare opportunities: Enhancing Patient Experience & Safety

Energy Efficiency

- Upgrading lighting systems improves energy savings while maintaining necessary healthcare lighting standards.

Comfort

- Well-designed lighting enhances patient comfort by reducing glare and creating a soothing environment.

Safety and Security

- Proper lighting reduces risks of accidents and improves visibility for both patients and healthcare staff.



Solutions: LED Upgrades, Daylight Integration, Smart Controls

LED Lighting Upgrades

- Replacing traditional lighting with LED reduces energy consumption and increases system longevity.

Daylight Integration

- Incorporating natural daylight reduces reliance on artificial lighting and enhances indoor environment quality.

Smart Lighting Controls

- Dimmers and occupancy sensors optimize lighting use by adjusting brightness and automating on/off functions. Colour adapting lighting can support both emotional regulation and accessibility



Project Highlights - Lighting retrofit – Brampton Civic Hospital

- Estimated Cost - \$321,352
- Estimated Savings - \$102,013
- Save on Energy Retrofit Incentive
 - Required for project to move forward
- Estimated annual savings – 755,655 kWh
- Simple payback (years) -2.63
- Year of implementation - 2017
- Lifecycle of measure – 10 years
- *Lighting no longer eligible through the retrofit program but available through Instant Discounts Program
- Partnered with FM provider to retrofit all interior lighting in public and clinical space to LED.
- Worked with clinical teams to confirm colour temperature of new lights. – Mocked up patient rooms to see how lighting affected skin tone colour
- Extensive work scheduling to gain access to clinical areas and logistics of storing lighting in the loading docks.
- Work through staff complaints about the lighting being too bright. Lighting levels were confirmed to be within specification, but the old lights lighting output over time is not sufficient.

Instant Discounts overview

Upfront, point-of-sale discounts for energy-efficient lighting products to help businesses lower energy costs and improve their space. No paperwork required.

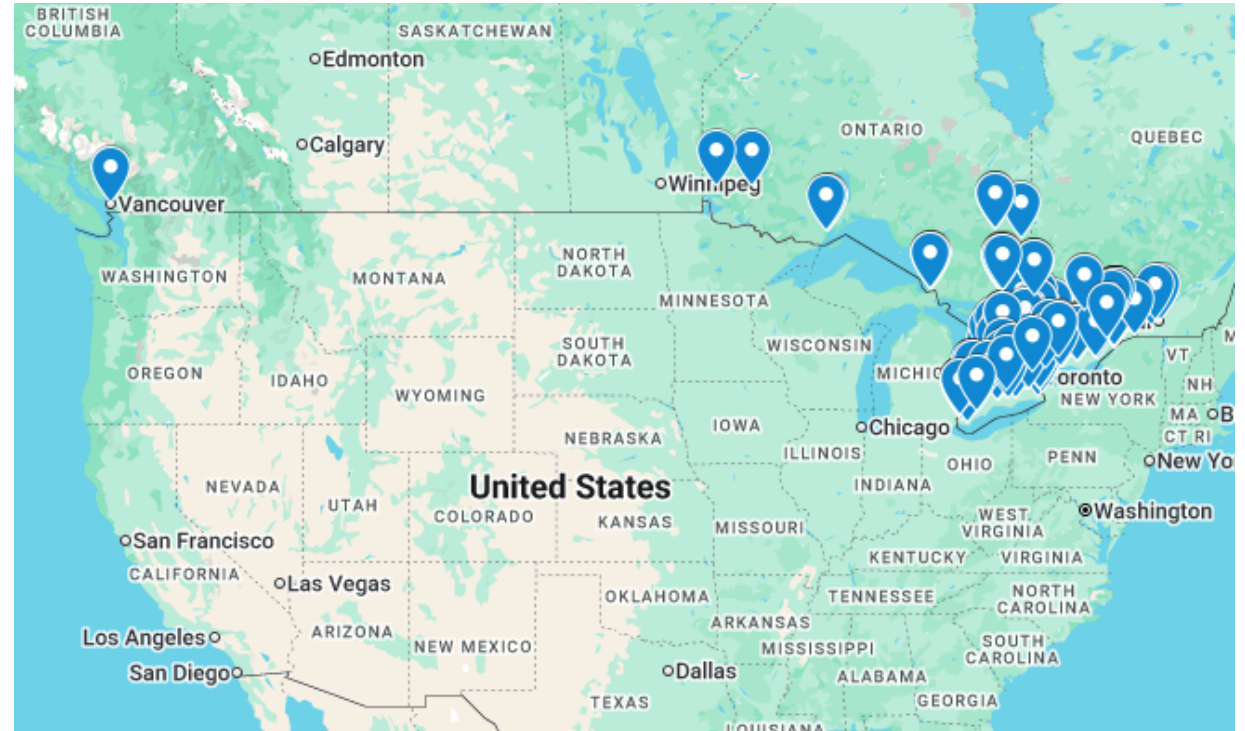
Who's eligible?

- Existing commercial, agricultural, industrial, institutional, and multi-unit residential buildings in Ontario
- Only for retrofit projects; not eligible for new construction

Instant Discounts overview

How does it work?

- Visit a participating distributor or dealer (discounts available at 133 main distributors and 450+ branches across 52 Ontario cities; see map at saveonenergy.ca/instantdiscounts)
- Purchase eligible lighting and provide business details at checkout
- Receive your discount instantly



Chiller Plant Efficiency and HVAC Strategies

HVAC Highlight: Cooling Loads in Healthcare Settings

High Ventilation Rates

- Fresh air requirements

Heat Sources in Healthcare

- Medical equipment and personnel generate significant heat that increases cooling needs in healthcare facilities.

Environmental Requirements

- Strict environmental controls in healthcare settings require precise and effective cooling solutions.



Challenges: Redundancy, Critical Cooling, Seasonal Variation

System Redundancy

- Redundancy ensures continuous operation by providing backup systems for critical cooling functions.

Critical Cooling Requirements

- Maintaining critical cooling is essential to protect equipment and prevent system failures.

Seasonal Load Variation

- Seasonal changes cause fluctuations in cooling demand, complicating efficiency optimization.



Solutions: High-Efficiency Chillers, Variable Speed Drives, Advanced Controls

High-Efficiency Chillers

- Using high-efficiency chillers reduces energy consumption while maintaining cooling performance and system reliability.
- Variable speed drives adjust motor speed to match cooling loads, optimizing energy use and reducing waste.

Advanced Control Strategies

- Advanced controls integrate system components to maximize efficiency and maintain stable operation under varying conditions.

Multi-chiller Cooling Plant

- Optimize turndown to match supply and demand



Project Highlight - Chiller Plant optimization – Etobicoke General Hospital

- Estimated Cost - \$288,000
- Estimated Savings - \$88,399
- Save on Energy Retrofit Incentive – \$9,770
- Estimated annual savings – 645,768 kWh
- Simple payback (years) - 3.26
- Year of implementation - 2018
- Lifecycle of measure – 10 years
- Removed controls from the current BAS provider after years of working through issues and costly surges of chillers
- Utilized the MOE optimization software package to unify the central plant components to efficiently provide chilled water.
- Operationally, we had to plan and schedule the project without impacting operations. Controls switchover planned for winter months (low cooling demand) operated the chiller 24/7 on manual to satisfy the load and had back up capacity if issues arose.

Retrofit Program overview

The Retrofit Program helps Ontario businesses save energy, lower costs, and increase productivity by providing financial incentives for energy-efficient equipment upgrades. Eligible participants include commercial, industrial, institutional, multi-residential, and agricultural businesses.

Key benefits:

- Reduced electricity costs
- Operational and maintenance savings
- Up-to-date, energy-efficient equipment and technology
- Greater employee comfort and productivity



Learn more at: saveonenergy.ca/retrofit

How it works

The Retrofit Program offers two streams of incentives to help businesses reduce energy use and costs.

Prescriptive stream

- Streamlined incentives for common equipment upgrades
- Pre-defined incentives ([see Save on Energy worksheets](#))
- Minimum \$500 project incentive

Custom stream

- Flexible incentives for larger or more complex projects
- \$1,800/kW and \$0.20/kWh rates
- Minimum \$1,500 project incentive
- Projects must save at least 1 kW or 2,000 kWh

Adders and incentives

- **Regional adders:** Double incentive for non-lighting prescriptive measures in constrained areas (Niagara, Kingston, Pembroke, Kenora, Waubushene, Barrie/Muskoka, Elmira, and Peterborough/Belleville)

Eligibility

The Retrofit Program supports projects that deliver measurable reductions in peak electricity demand and overall consumption. Incentives include both custom and predefined rates and are offered based on project type and energy savings.

Examples of eligible projects

HVAC equipment: rooftop units, chillers, heat pumps, fan motors, computer room ACs, HVAC controls, demand control ventilation

Industrial and manufacturing: variable-speed drives, motors, process upgrades, compressed air systems, injection molding machines, process chillers

For a complete list, visit saveonenergy.ca/retrofit

How to apply

To participate in the Retrofit Program, projects must be pre-approved with minimum incentives of **\$500 for prescriptive projects** and **\$1,500 for custom projects**.

Next steps:

- Visit saveonenergy.ca/retrofit for incentives, eligibility, participant agreements, and program requirements
- Fill in your details at saveonenergy.ca/en/start-your-retrofit-project
- Access program guides, worksheets, and “how-to” videos at saveonenergy.ca/retrofit-resources
- Find answers to frequently asked questions at saveonenergy.ca/retrofit-faqs
- Need help with your application? Email us at retrofit@ieso.ca or call the Retrofit support line at 1-844-303-5542.

Energy Efficiency in Laboratory Spaces

Energy-Intensive Processes in Labs

Ventilation Systems

- Ventilation systems maintain air quality but result in increased and variable energy loads in lab environments.
- Fume hoods are significant contributors to energy consumption due to continuous airflow and ventilation needs.

Lab Instruments Impact

- Various laboratory instruments add to the overall energy demand with differing power requirements.
- Significant cooling loads



Constraints: Ventilation Rates, Equipment Loads, Safety Requirements

Safety Compliance Importance

- Energy strategies in labs must prioritize safety by adhering to mandated minimum airflow rates and operational parameters.

Ventilation Rate Constraints

- Minimum ventilation rates are required to ensure safe air quality and proper functioning of lab equipment.

Equipment Load Limits

- Equipment operational parameters must be managed to prevent overload and maintain lab safety standards.

24/7 Operation



Solutions: Energy Recovery Ventilation, Fume Hood Containment, Right-Sizing Equipment

Energy Recovery Ventilation

- Energy recovery ventilation systems reclaim energy from exhausted air to reduce overall energy consumption efficiently.

Demand Control Ventilation

- Improving fume hood containment minimizes hazardous emissions while preserving lab safety and energy efficiency.
- Dynamically and properly sizing equipment ensures optimal performance and reduces unnecessary energy use in various applications.

Vacuum and Compressor Scheduling

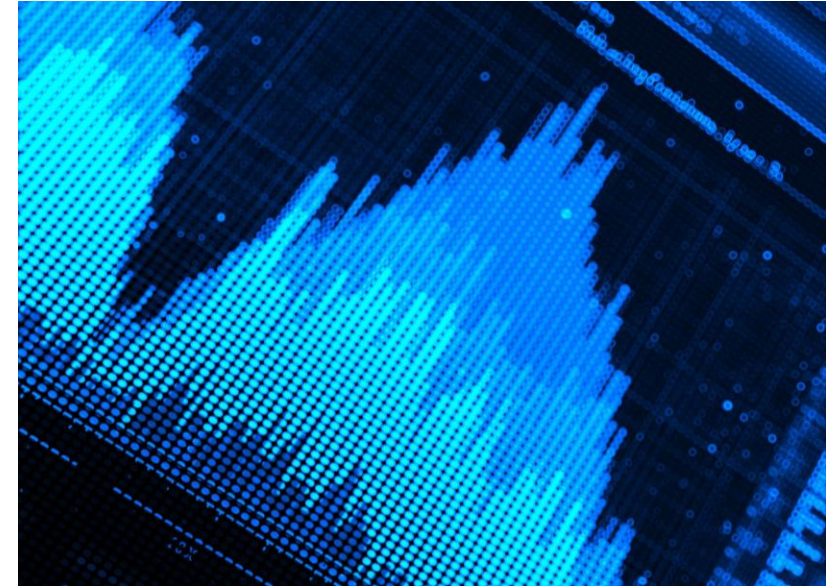


Program Highlight:
Retrofit Program – VFDs &
Energy Recovery

Programmatic Approaches and Implementation Strategies

Strategies for success: program alignment, energy audits and benchmarking

- Program Alignment
 - Ensure alignment between energy projects, facility & safety priorities, and clinical requirements.
 - Understand building operations and energy use
 - Energy audits will reveal how a building is being operated and its energy use; it's just as important to understand the "why".
- Role of Benchmarking
 - Benchmarking tracks energy performance over time and compares it against standards or peers.
 - Can be challenging to directly compare different facilities to each other.



From the field: Implementation Strategy & Delivery Model

Implementation Challenges

- Downtime needs to be carefully planned and implemented
- Strict infection control requirements
- Evolving conditions

Delivery & Funding

- Limited funding
- Consideration of energy performance contracts or power purchase agreements
- Public Private Partnerships vs owner-operator approaches

Collaboration, Staff Engagement and Behavior Change Programs

- Collaboration between energy teams, facilities, contractors and clinicians is essential.
 - Clinical engagement enables buy-in and support.
- Shared ownership supports sustained behavior change and long-term system performance.
- Staff Engagement Importance
 - Involving healthcare staff is crucial to foster energy-conscious habits and improve system efficiency.
- Behavior Change Impact
 - Adopting sustainable behaviors by staff helps achieve energy efficiency and enhances overall system performance.



Integration of Energy Management Systems

Centralized Energy Control

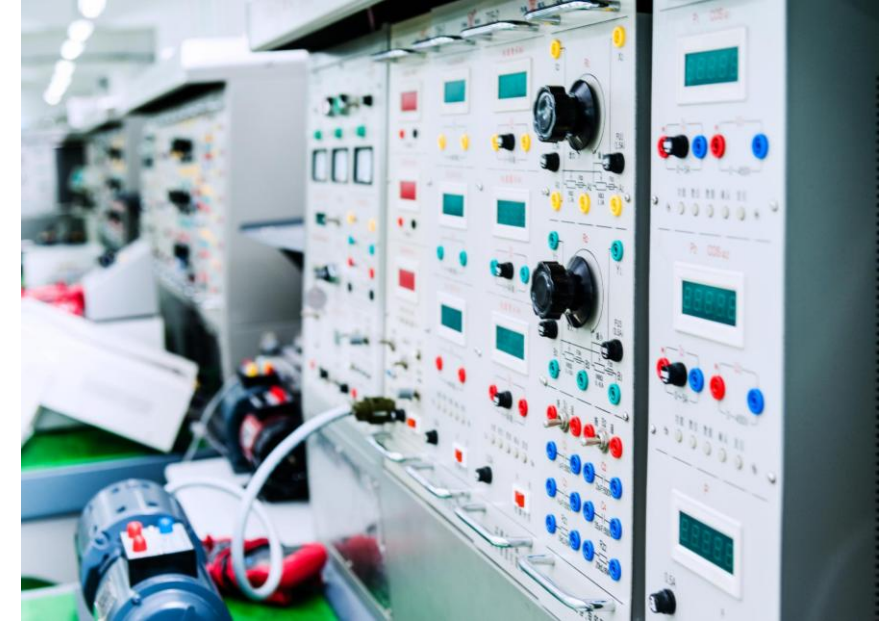
- Centralized systems provide comprehensive control over energy usage across different facility areas.

Real-Time Monitoring

- Real-time data tracking enables immediate adjustments to optimize energy consumption.

Energy Optimization

- Optimizing energy use reduces waste and improves operational efficiency throughout the facility.



Unique energy profile for healthcare facilities

Aging & Complex Infrastructure

- Many facilities are older and often “Frankenstein-like” due to decades of renovations.
- System layouts are poorly documented; staff may not know which AHU or circuit serves which area.

Renovation Challenges

- Budget constraints often mean functional but sub-optimal solutions.
- Adding new spaces (e.g., treatment rooms) often requires extra ventilation and energy-intensive fixes.

High Plug Loads

- Specialized equipment (diagnostic imaging, sterilizers, dialysis machines) drives significant electrical demand.

Multiple Micro-Environments

- Hospitals operate like many businesses under one roof, each with unique energy needs.
- Simultaneous heating and cooling: ORs cooler, dialysis warmer. Isolation rooms and labs require pressure differentials.

Mission-Critical Operations

- 24/7 public access with strict temperature, humidity, and airflow standards; failure is not an option.
- Emergency power systems (generators, dual feeds) add complexity and opportunity.

Air & Water Demands

- High filtration requirements increase fan energy.
- Large volumes of hot water for handwashing, laundry, and sterilization.

Key Takeaways: Practical Insights for Consultants & Utilities

- **Technical Opportunities**
 - Identify and understand energy-saving technologies to maximize hospital efficiency and reduce costs.
- **Operational Constraints**
 - Address challenges in hospital operations that may limit energy efficiency improvements and solutions.
- **Leveraging Incentives**
 - Utilize available incentives and rebates to support energy efficiency projects in hospitals.
- **Collaborative Approach**
 - Promote cooperation between consultants and utilities to achieve effective energy efficiency outcomes.



Conclusion: Advancing Energy Efficiency in Healthcare

Unique Healthcare Challenges

- Healthcare facilities require specialized energy solutions due to critical patient care needs and operational demands.

Maintaining Healthcare Functions

- Energy improvements are designed to support uninterrupted critical healthcare services and patient safety.

Tailored Energy Solutions and Practical Energy Strategies

- Implementing actionable energy efficiency measures tailored to hospital needs improves sustainability and reduces costs.
- Customized energy efficiency measures can enhance sustainability without compromising healthcare quality.

Sustainability and Patient Care

- Balancing sustainability with patient safety ensures long-term benefits for healthcare facilities and communities.

Thank you

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