

SAVING ENERGY IN THE HEALTHCARE ENVIRONMENT



Presented to:



MASSACHUSETTS
MEDICAL SOCIETY
Every physician matters, each patient counts.

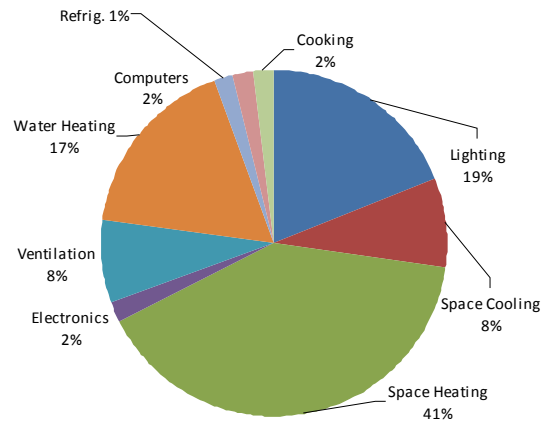


MPA MARGULIES PERRUZZI ARCHITECTS

DIRECT ENERGY COSTS VS. INDIRECT (SOCIETAL) COSTS

- Direct:
 - Heating, lighting, cooling, hot water
 - 40% gas/oil, 60% electric
- Indirect
 - Transportation (employees, patients, etc.)
 - Building materials
 - Renewable energy sources

ENERGY USE IN HEALTHCARE



2003 Commercial Buildings Delivered Energy End-Use Intensities
2008 Buildings Energy Data Book

EXISTING VERSUS NEW BUILDINGS



- New building: more stringent standards
- Energy code requirements for existing building systems may be grandfathered
- ROI on retrofitting is complex: must include delta in energy use, frequency/cost of maintenance, alternative use of capital, acceptable payback period.

Focus on existing building systems

OPPORTUNITIES & CHALLENGES: EXISTING BUILDINGS

1. Controls & Building Systems
2. Operations/Maintenance
3. Policies/Procurement

CONTROLS AND BUILDING SYSTEMS

- Lighting
- Heating & Air Conditioning
- Water heating



CONTROLS AND BUILDING SYSTEMS

- Occupancy and daylighting sensors and timers to control lights



CONTROLS AND BUILDING SYSTEMS

- Occupancy and daylighting sensors and timers to control lights
- Energy management system to maximize control of heating and cooling
 - Upgraded DDC controls (demand controlled ventilation with CO₂ sensors in high occupancy areas)
 - Set-back of OR's during non-use to a reduced airflow rate (from 20 air changes/hour occupied requirement)



CONTROLS AND BUILDING SYSTEMS

- Occupancy and daylighting sensors and timers to control lights
- Energy management system to maximize control of heating and cooling
- Excellent insulation and a tight building



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- Occupancy and daylighting sensors and timers to control lights
- Energy management system to maximize control of heating and cooling
- Excellent insulation and a tight building
- Reflective roof to reduce heat gain



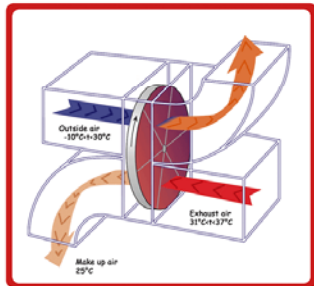
CONTROLS AND BUILDING SYSTEMS



10 zone radiant gas heating system with indirect water heater

- Occupancy and daylighting sensors and timers to control lights
- Energy management system to maximize control of heating and cooling
- Excellent insulation and a tight building
- Reflective roof to reduce heat gain
- Efficient distribution systems for heating and cooling
 - Displacement ventilation
 - Hydronic (water-based instead of forced air) systems

CONTROLS AND BUILDING SYSTEMS



A diagram of a rotary heat exchanger, or "heat wheel" (From Uptime Technology Inc)

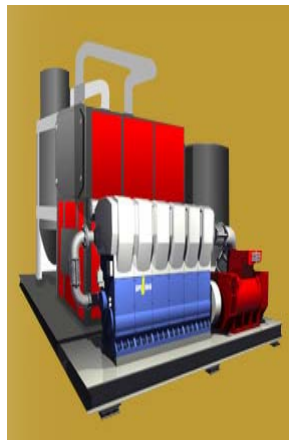
- Occupancy and daylighting sensors and timers to control lights
- Energy management system to maximize control of heating and cooling
- Excellent insulation and a tight building
- Reflective roof to reduce heat gain
- Efficient distribution systems for heating and cooling
- Recovery and reuse of waste heat:
 - Capturing waste heat from chillers or flue gasses, to pre-heat water for heating or domestic hot water
 - Energy Wheel AHU for OR's (allowed a cold and dry design of 60 deg F at 50% RH in the OR's utilizing conventional standard chilled water system)
 - Free winter cooling with water side economizer and air side economizer

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- Combined heat and power
 - Co-generation: re-purpose heat created while generating electricity

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- Recovery and reuse of waste heat
- Solar water heating system
- Combined heat and power
- Photovoltaic systems

POLICIES/ PROCUREMENT



- High efficiency lighting fixtures:
 - High efficiency lighting (reduced density from 1.6W/sf to 1.1W/sf)
 - LED's 6x more efficient than incandescent
 - LED's required replacement every 15 years, fluorescent every 2-3

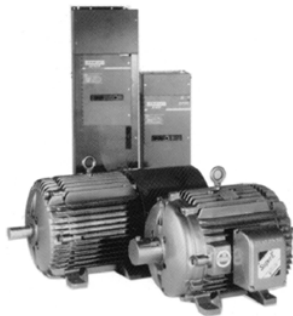


POLICIES/ PROCUREMENT



- High efficiency lighting fixtures
- High efficiency boilers and chillers
 - Variable speed drives on pumps
 - High efficiency chillers
 - Variable speed fans on cooling towers
 - Free winter cooling with water side economizer and air side economizer
 - Variable primary chilled water pumping system

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- Low-flow water fixtures



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- Energy Star equipment: 20% less energy



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- Low-flow water fixtures
- Energy Star equipment
- Power strips with occupancy sensors



OPERATIONS/ MAINTENANCE

- Daytime cleaning
- Lower water temperatures
 - Many modern detergents and bleaches can be used at 120 degrees instead of 160 degrees
- Turn off equipment power at night
- Commission systems to ensure proper operation
 - Evaluations and tune-ups to HVAC systems can cut operating costs by 10-15%
- Off-hours electric usage: laundry, etc.

CONCLUSION

- Substantial energy saving opportunities in existing buildings come from:
 - Controls and Building Systems
 - Policies & Procurement
 - Operations & Maintenance