Massachusetts Collaborative for High Performance Schools

An Overview of Energy Efficiency Measures at Manchester Essex Regional High School

and

other National Grid / MassSave energy efficiency Programs

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National Grid

- **Who we are in the USA:**
- **Transmission and distribution of electricity and gas to over 3.5 million customers**
  - New York (gas and electric)
  - Massachusetts and Nantucket
  - Rhode Island (gas and electric
  - New Hampshire
- **www.nationalgridus.com**

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Energy Efficiency Programs in Massachusetts

- Energy Efficiency Programs have been provided for > 22 years, since the mid 80's
- Reinforced through the MA Green Community Act of 2007, & the Restructuring act of 1997.
- Funded through a "systems benefit charge" on the monthly bill ($0.0025/kWh)
- An additional $0.0005/kWh collected for renewable energy

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Energy Efficiency (EE) Programs in Massachusetts -Providers

- **MassSave sponsors – www.MassSave.com**
  - Bay State Gas Company,
  - The Berkshire Gas Company,
  - Cape Light Compact,
  - National Grid,
  - New England Gas Company,
  - NSTAR,
  - Unitil, and
  - Western Massachusetts Electric Company.
- **Other utility companies may have EE programs**

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Efficiency Programs Benefit the Environment (National Grid data)

- **Equivalent savings in electricity to supply 239,000 homes a year**
- **Reduced smoke stack emissions since 1992**
  - ✓ 350,300 Tons Coal Reduction
  - ✓ 1,288,750 Tons CO_2
  - ✓ 9,315 Tons SO_2
  - ✓ 2,903 Tons NOX

New Construction Programs

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New Construction *plus Program*

(similar to other* MassSave *sponsors)

- Programs deliver a mix of prescriptive and "custom" measures
- Targets time dependent opportunities in new construction, renovation, and equipment replacement
- Promotes comprehensiveness and optimization of energy systems

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New Construction Programs

Barriers to Sustainable Design:

- *First Cost*
- *Lack of knowledge or understanding of technologies*
- *Long term benefits of green design may be difficult to quantify or prioritize*

A large barrier towards achievement of a truly holistic and sustainable approach to building design has been that SBC moneys are targeted at the energy source that the fund is paid from

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Sustainable Design

- **Coordinating resources multiple sources is desired and economical (& required by MA- CHPS)**
  - In Massachusetts, partnerships established by CEC & the electric and gas utilities can meet the needs of an emerging sustainable design marketplace.
    - New buildings can be analyzed in a comprehensive manner
    - Technical assistance and technology incentives can be packaged together achieving economies of scale
    - A consistent message goes out to the marketplace.

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MERSD new CHPS High School

- **Summary of 15 Energy Efficiency Measures (EEM)**
  - R.O.I. / Payback time < one Year
  - Annual Savings $ 67,151
    - And multiply to obtain annual lifetime savings
  - Rebate Incentive $ 319,416
  - Incremental Costs $ 361,558
  - Total proposed cost $ 799,698
  - 15 EEM's – w/ % savings
    - 46 % - Controls
    - 41 % - Lighting Optimization
    - 14 % - other (Chiller, motor, etc..)
    - Plus Gas savings - Condensing boiler w/ controls

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Energy Efficiency Measures

- 1: Optimized Lighting System
- 2: Daylighting Controls
- 3: Enhanced Controls for Auditorium HVAC System
- 4: Enhanced Controls for Stage HVAC System
- 5: Enhanced Controls for Cafeteria HVAC System
- 6: Enhanced Controls for Gymnasium HVAC System
- 7: Optimized HVAC System for Locker Rooms
- 8: CO2-based Demand Ventilation for Chorus & Band Rms

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MERSD HS Energy Efficiency Measures

- 9: Enhanced Controls for HVAC Systems Serving Library and Administration Areas
- 10: VFDs for HW Pumps
- 11: Premium Efficiency Motors
- 12: High Efficiency Air-Cooled Chiller
- 13: Energy Recovery and Optimized Controls for AHU-12
- 14: Kitchen Hoods Controls
- 15: Condensing Boilers

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The Green Buildings Approach in Assists Market Transformation

- Moves the market toward energy efficient design and construction
- Sets stage for high performance buildings
- Makes any future government energy code upgrades technically feasible.

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Overview of Technologies for New Schools

- **Lighting**
  - Promote the use of high quality “energy effective lighting systems
    - Promote a healthier more productive learning environment
    - Save energy = **MERSD HS is < 0.95 watts/ft2**
  - Better lighting is most often “value engineered” out of a project
  - Typical lighting meets, not exceeds code.

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Plenty Of Room For Improvement

- Standard Practice
- Poor Visual Environment
- Uncontrolled Day lighting
- Glare
- Inefficient-too much light in the wrong places

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Overview of Technologies for New Schools

- **For example: Energy Efficient**

Classroom
< 0.95 w/sq ft

Direct/indirect low glare lighting

Occupancy controls are included

Possible consideration for daylight controls.

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What to Promote

- **Best Practices**
- **Uniform Brightness**
- **Daylight Harvesting**

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Overview of Technologies for New Schools

Lighting Opportunities

Direct indirect – recessed or pendant fixtures for classrooms and offices

Gymnasium or shops- "High intensity fluorescent"

Even hallways Direct indirect – recessed fixtures.

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High Intensity Fluorescent

Save 35% to 40%

Ability to turn off without worrying about restrike time

Better color rendering.

Possible daylight control options

Bryant College – Smithfield, RI

(image from Sportlite web site)

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Overview of Technologies for New Schools

- **HVAC Systems**
  - *Standard practice*
    - *Unit Ventilators in Classrooms*
    - *Constant Volume Air Distribution in common areas*
    - *Possibly local controls throughout*
    - *Air cooled A/C units*
    - *Standard efficiency boilers.*

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Overview of Technologies for New Schools

- **HVAC Systems**
  - *Energy Management Systems*
    - *Better control of classrooms and other spaces after hours*
    - *Can be used to monitor HVAC performance*
  - *Variable air Volume Distribution in common areas with CO2 sensing*
  - *Displacement HVAC systems*
  - *Air Conditioning properly sized for level of activity and with CHW controls*
  - *High efficient boilers (staged, condensing or low volume) with controls*

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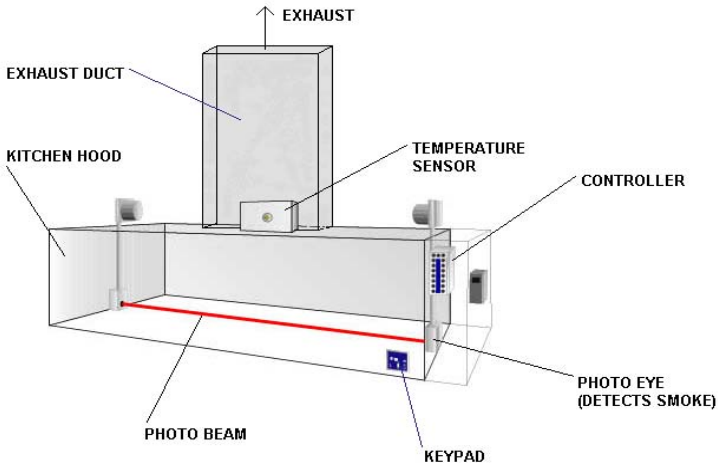
Overview of Technologies for New Schools

Other Technologies – Kitchen Exhaust Hood Systems



Used in commercial kitchens and super markets

May be cost effective in schools with long kitchen hours like a central food service.

Heating savings could be significant.

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For more information on Utility Programs

- **MassSave**
  - **www.MassSave.com**

- **Cape Light Compact**
  - www.capelightcompact.org
- **Fitchburg Gas and Electric**
  - www.unitil.com
- **National Grid**
  - www.nationalgrid.us.com
- **NSTAR**
  - www.nstar.com
- **Western Massachusetts Electic**
  - www.wmeco.com
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