



# Reducing School Carbon Footprints

## *Lessons from Minnesota Schools Cutting Carbon Reviews*

Meghan Sweeney Pendray, ERM

# Minnesota Schools Cutting Carbon

- **Minnesota Schools Cutting Carbon is a joint program of:**
  - Clean Energy Resource Teams (CERTs)
  - Minnesota Pollution Control Agency (MPCA)
  - Minnesota Office of Energy Security



- **Funding provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR)**

# Overview of presentation

- 1. School Costs and Energy Use**
- 2. Why Implement Energy Efficiency Programs**
- 3. Why Efficiency Programs are Avoided in Schools**
- 4. Schools Cutting Carbon Project**
- 5. School Projects to Reduce Energy Use**
- 6. Recommendations**

# Energy Efficiency



- **Energy Efficiency Should**
  - Improve Economical Efficiency
  - Promote Well-Being of the Occupants
  - Incorporate the Environment
- **Energy Efficiency Should Not**
  - Reduce Safety, Health, Security, or Comfort

# School Energy Costs

- **Typical costs of energy per year for schools (national average)**
  - Elementary Schools
    - \$70,000 to \$150,000
  - Middle Schools
    - \$100,000 to \$200,000
  - High Schools
    - \$200,000 to \$650,000
- **Participating Minnesota schools average - \$408,000/year**
- **Just a 10% reduction can result in \$40,000 in savings per year**

Source: USGBC

# Why Implement Energy Efficiency Changes?

- **America's schools spend more than \$7.5B annually on energy – more than textbooks and computers combined**
- **As much as 25% of building energy is wasted**
- **Energy costs can be reduced by 5-20% by effectively managing, maintaining and operating school physical plants regardless of school age**

# Why Energy Efficiency Programs are Avoided

- **Energy costs represent only 2-4% of a district's budget**
  - Administration officials may be tempted to pay little attention to managing or monitoring energy costs at a facility level
- **Lack of perceived technical expertise**
- **Perception that efficiency programs are expensive (i.e. require new equipment)**

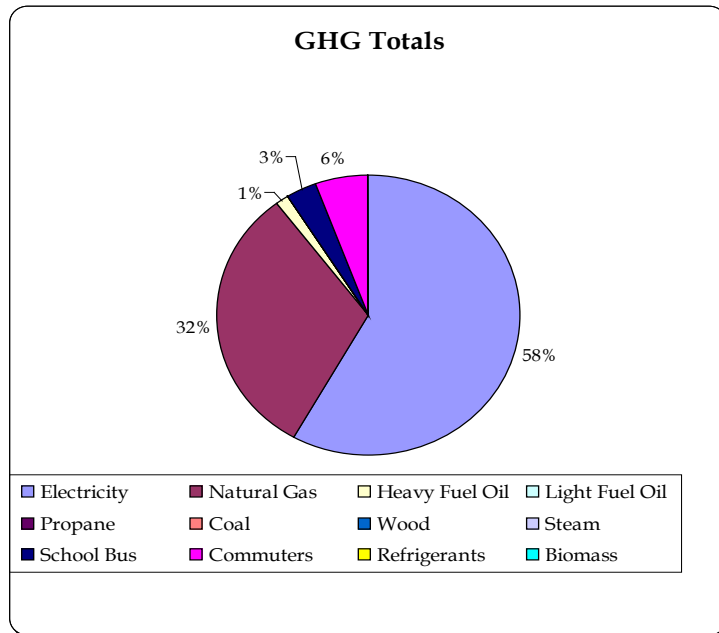
# ERM Site Visits



## Sample Baseline Carbon Footprint

### Baseline Carbon Footprint

3,943.93 tons CO<sub>2</sub> equivalents



- We collected data on building specifications and student demographics, electricity, fuel and gas use, water, waste and recycling information, lighting and HVAC infrastructure, and computer power management systems
- We calculated a baseline carbon footprint for each school
- We benchmarked each school against other participating schools

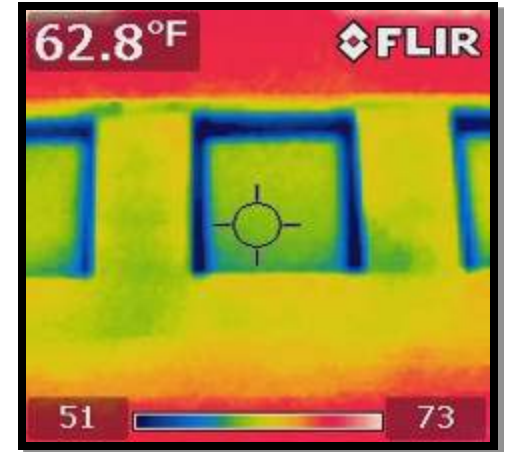
# ERM Site Visits



Students worked with ERM to operate an infrared camera, thermal anemometer, lumen meter, and infrared thermometer



Vending machines with sensors



Thermal image of vending misers in use

A vending miser was provided by the Minnesota Pollution Control Agency to each school during the ERM visit. Each vending miser saves about \$100 in electricity costs per year by idling and cycling the system when no one is present.

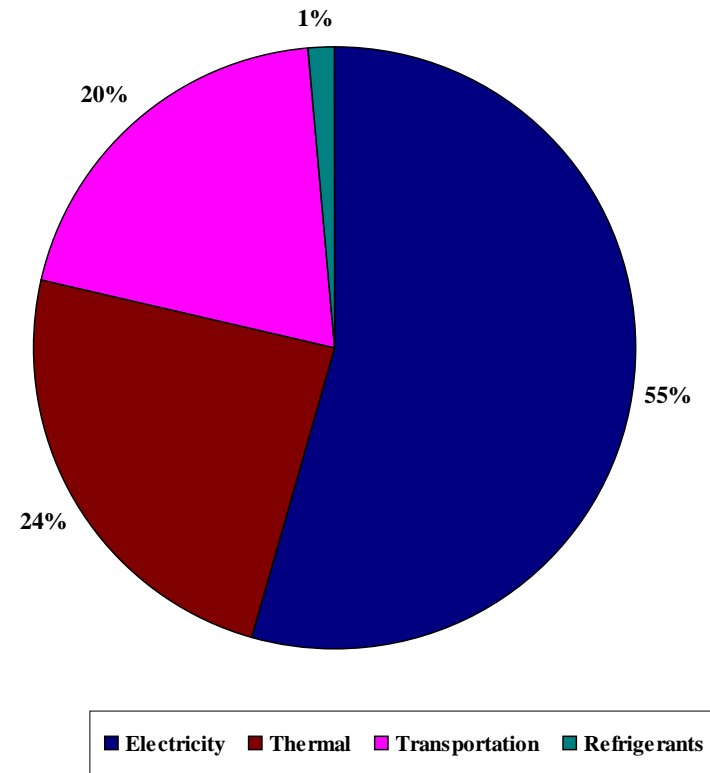
# Some Observations

- **Total Electricity cost of schools/buildings reviewed: *\$20 million/year***
- **Total Natural Gas cost of schools/buildings reviewed: *\$16 million/year***
- **Impact of reducing the energy use per square foot of all buildings that are above average to the average: *\$10 million/year***
- **Water use – most facilities used around 5 gallons per student per day, but several used over 20 gallons per student per day**

# Carbon Footprints

- **Most schools had footprints between 2 and 4 tons per student per year**
  - Includes building energy and transportation
- **Colleges and Universities slightly higher – ranging between 2 and 5 tons per student per year**

Average School's Carbon Footprint Breakdown



# Example – Willmar Public School Community Greenhouse

- **Decrease fossil fuel dependence**
  - Local production of produce
  - Use of alternative transportation to haul produce



# Example – Willmar Public School Community Greenhouse

- **Waste composting and vermiculture**



# Example – Willmar Public School Community Greenhouse

- **Recycle water with use of rain barrels**



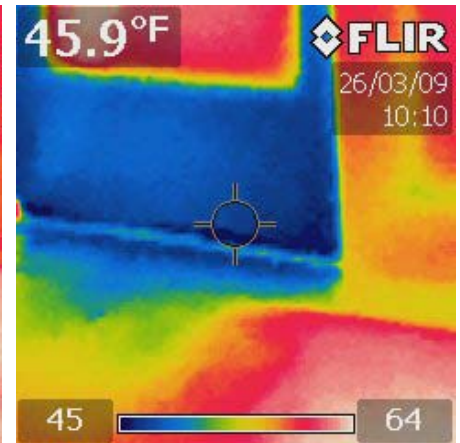
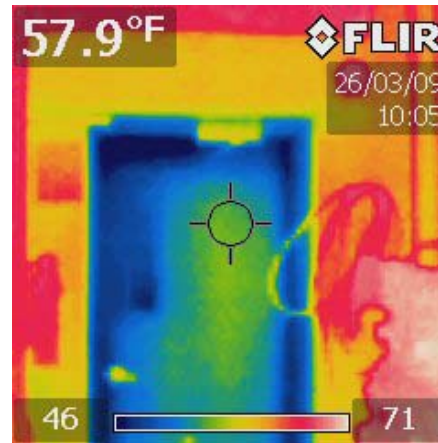
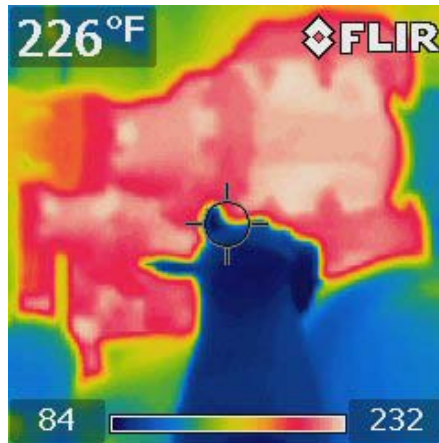
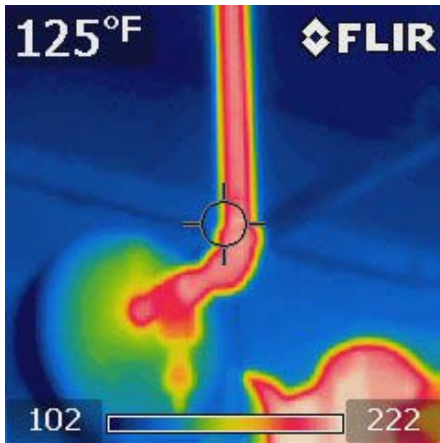
# Example – Winona State University Reducing Transportation Footprint

- **Expand bike rental program**
  - 9/2009-7/2010 (10 months): 781 rentals
  - 7/2010-11/2010 (4 months): 1,360 rentals
- **Develop bike station for repairs**
- **Education and awareness**



# Example - Crosby-Ironton High School Reducing Heat Loss

- Purchase infrared camera
- Inspect school for energy efficiency
- Repair/replace materials contributing to energy loss



# Example – Ortonville High School Reducing Electricity Use

- **Retrofit 182 light fixtures from T12 to T8 fixtures**
  - Saved 18,346 kWh or 16.8 tons CO<sub>2</sub> (1.9% of electricity use)
  - Costs savings of \$917/annually
- **Decrease wattage of bulbs used from 40W to 28W**
  - Saved 40,274 kWh or 36.9 tons CO<sub>2</sub> (4.1% of electricity use)
  - Cost savings of \$2,013/annually



## Example – Ortonville High School Reducing Electricity Use

- **Install energy misers for vending machines**
  - Saved 17,000 kWh or 15.57 tons CO<sub>2</sub> (1.7% savings)
  - Cost savings of \$850/annually



# Common Recommendations

- **Control classroom thermostats: 1 degree = 1% energy cost**
- **Improve plug-in management: 1-3% reduction**
- **Keep doors and windows closed: 1-6% reduction**
- **Shut off exhaust fans when not in use: 1-2% reduction**
- **Utilize day-lighting whenever possible: 5% reduction**
- **For average participating Minnesota high school, 1% electricity reduction means 16,000 kWh or \$1,000 annually**

# Common Recommendations

- **Use a cover on a heated pool when not in use: 50 - 70% reduction of pool energy costs**
- **Change from T12 fluorescent lamps to T8 and electric ballasts: up to 35% lighting energy reduction**
- **Change to CFLs where possible: up to 66% lighting energy reduction per lamp**
- **Utilize occupancy sensors for lighting: 2-5% reduction in electricity use**

# More Information

- **ENERGY STAR for K-12 School Districts**
  - <http://www.energystar.gov/k-12>
- **USGBC Webinar Series – Energy Efficiency Strategies for Schools**
  - <http://www.usgbc.org/webinars>



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