

DMACC ENERGY CONSERVATION



WHY PERFORM ENERGY CONSERVATION MEASURES?

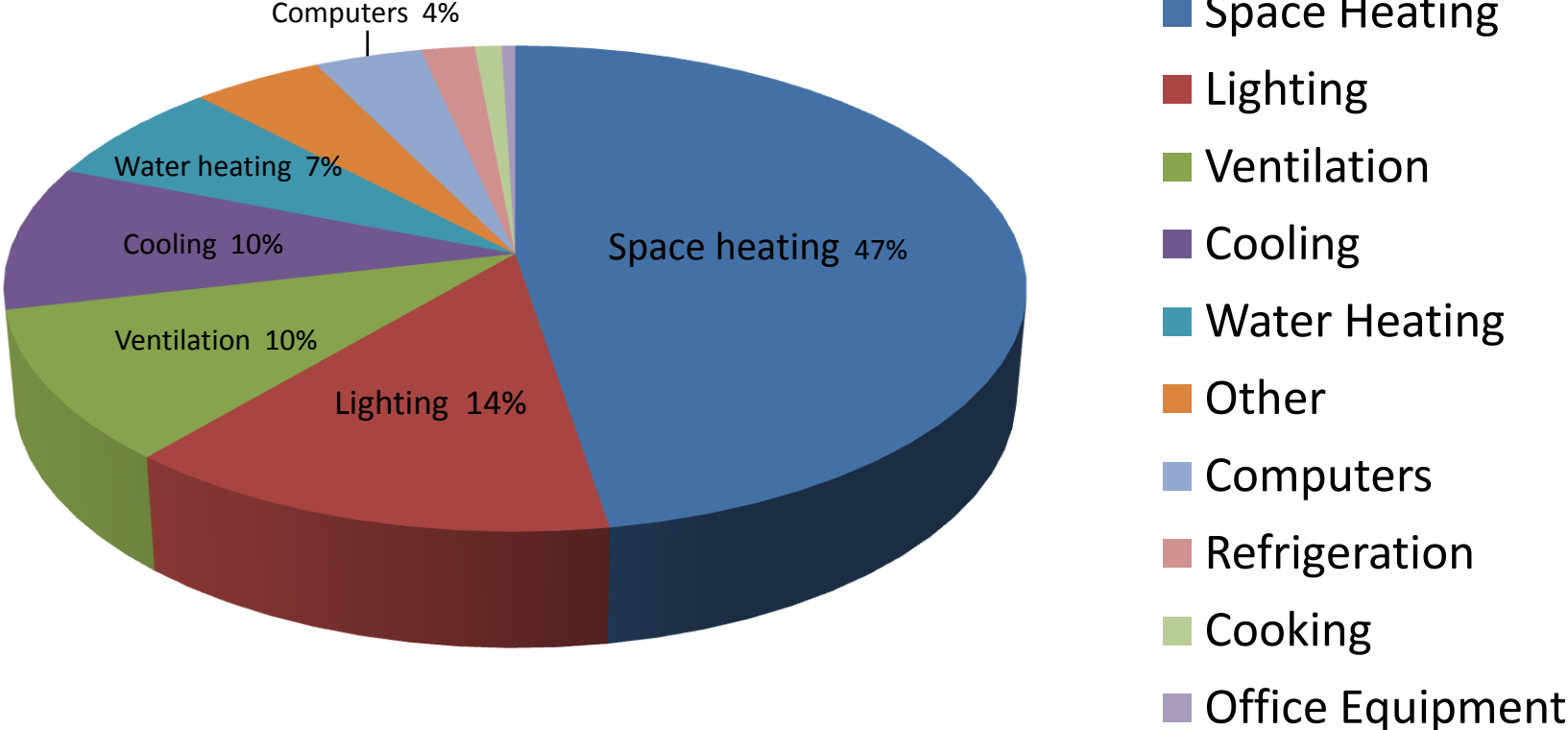
Reduce DMAACC's utility cost

Reduce DMAACC's carbon footprint

Reduce Iowa's dependence on energy imported from other states
(Received grants from the Iowa Office of Energy Independence)



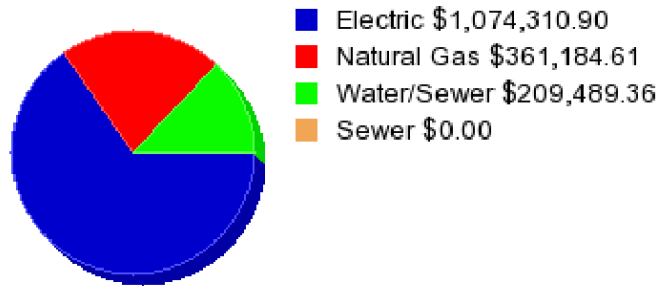
TYPICAL EDUCATIONAL BUILDING ENERGY USAGE



DMACC'S UTILITY COSTS

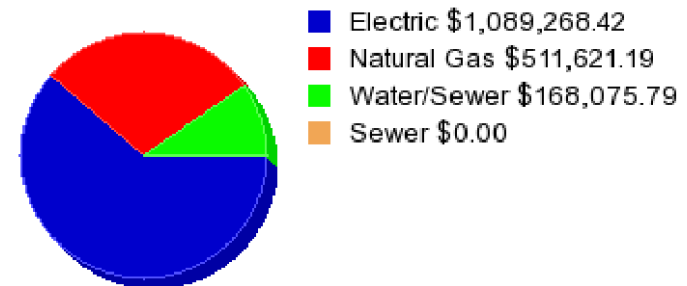
Last year DMACC spent \$1,645,000 on utilities

2010 Cost by Utility Type



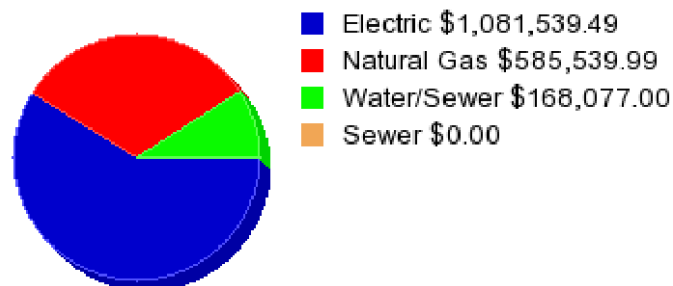
Fiscal Year 2010

2009 Cost by Utility Type



Fiscal Year 2009

2008 Cost by Utility Type

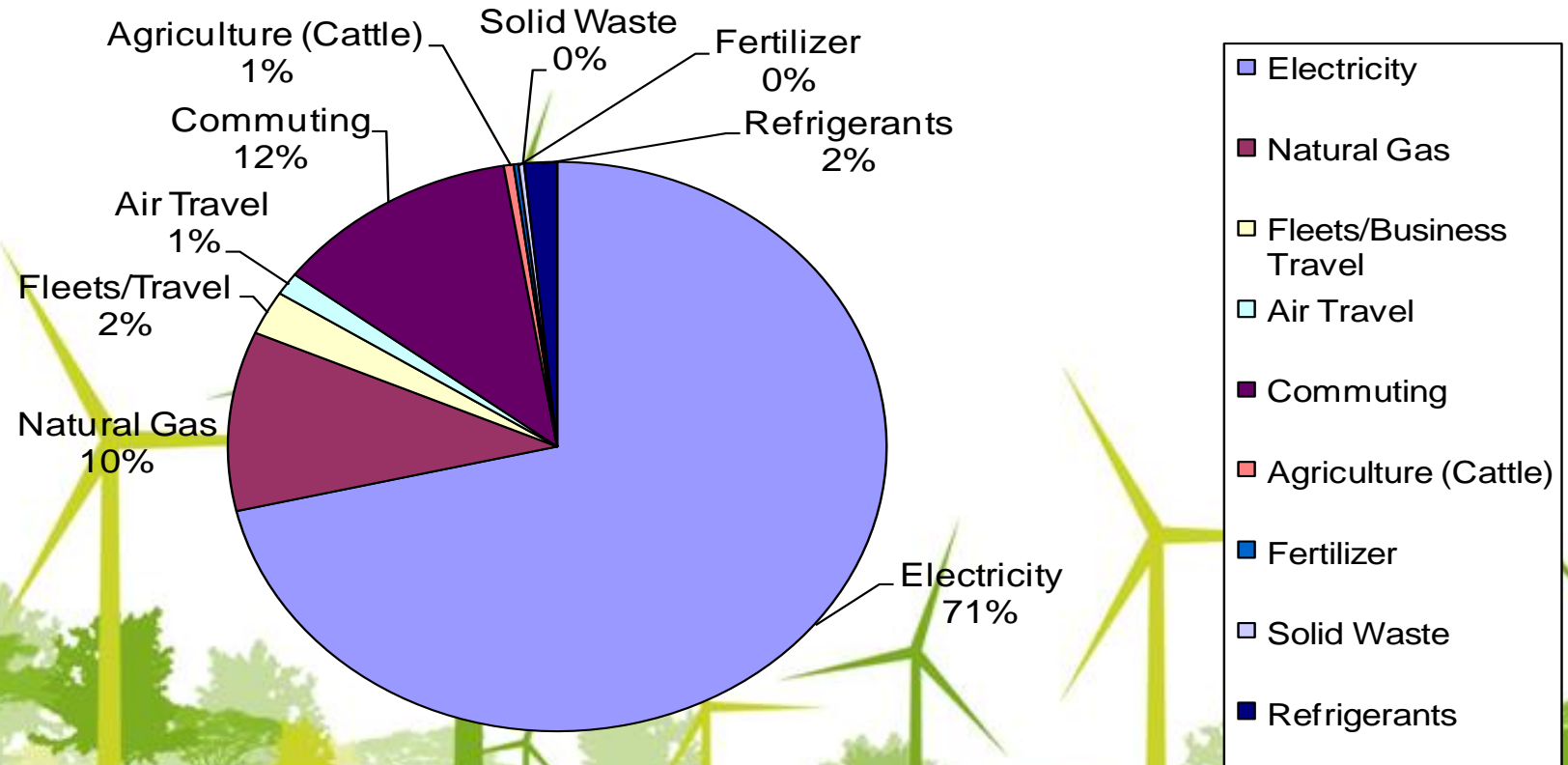


Fiscal Year 2008

DMACC'S CARBON FOOTPRINT

From March 10, 2008 Presidents Climate Commitment Presentation

DMACC Greenhouse Gas Emissions



Past Energy Conservation Activities

- DMACC has been proactively implementing energy savings measures since the mid 1970s and the first “Energy Crisis”
- 1980 installed a building automation system
 - Network of microprocessors in DMACC buildings to control HVAC equipment
 - Prior to building automation systems, HVAC equipment would operate 24/7
 - This automation system has been expanded and enhanced over the years and is in all DMACC buildings and monitors and controls over 30,000 pieces of equipment for energy management, building temperature control, life safety, critical alarming 24/7 and HVAC equipment maintenance.

Past Energy Conservation Activities

- Implemented traditional measures such as better insulation in roofs, walls, windows, etc.
- In 1990 replaced 25,000 old lamps with energy efficient lamps and electronic ballasts, LED lighting in parking lots, CFLs, HID, etc.

THIS YEAR, DES MOINES AREA
COMMUNITY COLLEGE WILL CUT
ITS ENERGY BILL BY \$109,381

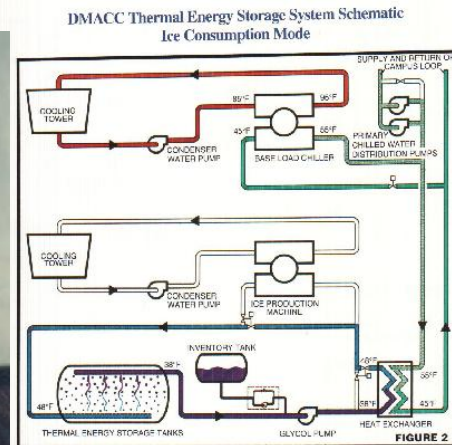
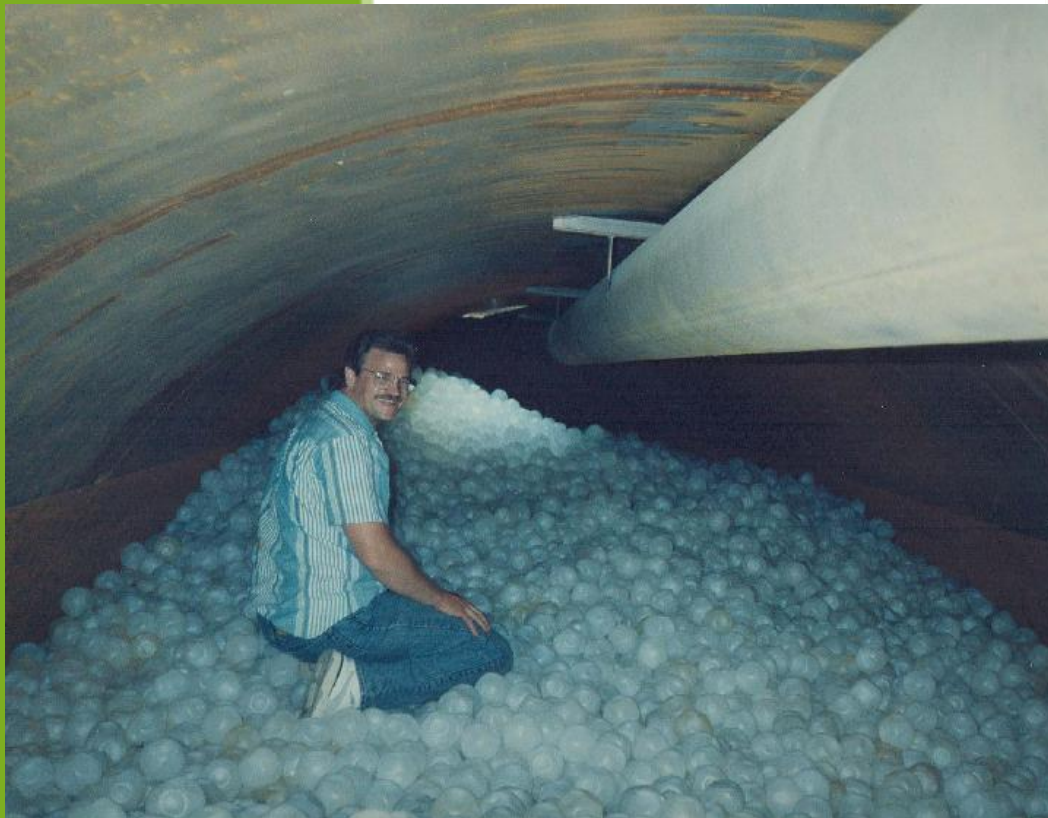
Acting on advice from MidAmerican Energy, Des Moines Area Community College installed high-efficiency lighting and a new cooling system and dramatically reduced its energy bill. In fact, since 1990, our EnergyAdvantage® efficiency programs have saved customers over \$189 million! On the average, these programs cost customers just twenty cents a day. MidAmerican Energy makes it easy to save big money with small change. ■ Call the EnergyAdvantage® Hotline at (800) 233-7498 to learn what you can do at work and at home to save energy and money.

How much can you save?



Past Energy Conservation Activities

- 1992 installed a Thermal Energy Storage System (300,000 iceballs) reducing electricity costs



Project Cost Summary

The total cost of the project should be considered with respect to a number of factors, including the alternative cost of replacing the existing chilled water plant equipment and systems. The total project cost was minimized because existing piping, pumping, and distribution equipment were utilized where possible. Significant savings were realized from Midwest Power's permanent demand reduction incentives of \$250 per kilowatt use additional incentives for the installation of high-efficiency equipment. An insurance reimbursement for the failure of the original chiller also adjusted the project cost. DMACC was able to use the Iowa Department of Natural Resources School Energy Bank Program as a source of funding and plans repayment through energy cost savings.

SYSTEM DESIGN CRITERIA	
Thermal energy storage capacity	4,700 ton-hours
Campus demand cooling load	880 tons
Midwest Power peak demand reduction	385 kw
Equipment specifications	
Base load chiller	400 tons at 240 kw 960 gpm — 55°F in 45°F
Ice production machine	400 tons at 390 kw 1,700 gpm — 29°F to 23°F 25% glycol solution
Thermal energy storage tanks (2)	35,000 gallons each 155,000 ice balls each 2,350 ton-hours each
Heat exchanger	800 tons 1,200 gpm — 55°F to 45°F designed for an additional 150 tons
Primary chilled water pumps (2)	2,160 gpm at 50 hp each
Glycol pump	1,700 gpm at 40 hp
Condenser water pumps (2)	1,200 gpm at 30 hp each
Cooling towers (2)	6,200 MBH — 95°F to 85°F 124,000 cfm at 30 hp each

PROJECT COST FIGURES	
Equipment costs	\$519,887
Installation costs	214,548
Design costs	62,500
Subtotal	\$826,935
Iowa Power incentives	(116,832)
Insurance reimbursement	(90,000)
Net project cost	\$670,083
Alternative cost to replace existing system	\$530,000
Net incremental TESS cost	\$120,083
Annual energy cost savings	\$ 47,000
Simple payback on TESS net incremental cost	2.6 years

Past Energy Conservation Activities

- Geothermal heat pumps at West Campus in 2001 and more recently in Building #24, FFA and Perry

2004 ASHRAE Technology Award Winner



Figure 1: West Campus installation with its geothermal system using a 4 acre (1.6 ha) pond.

can be relocated and adjusted as necessary to accommodate changes in the room. Fan-powered boxes with heating coils that are controlled by independent thermostats provide perimeter heating during occupied mode only (or as backup should a heat pump fail).

Several spaces have 25 ft (7.5 m) high ceilings. Because air is supplied low and returned high, the occupied zone is properly conditioned, and the stratification effects go unnoticed. Energy is conserved because there is no need to move air down in these large spaces.

An in-floor radiant heating system using heated water supplied by water-to-water heat pumps was installed in the concrete floor of the commons area and vestibules. This provides warmth and comfort at the floor of these high ceiling areas without requiring exposed perimeter heating equipment.

The West Campus site incorporates a geothermal water source heat pump system using a 4-acre (1.6 ha) pond that rests on the campus's foreground. *Figure 1* illustrates the prominent features of the building's geothermal system. The pond provides 168 tons (590 kW) of cooling and capable of providing 420 tons (1477 kW) of cooling for future expansion. This system captures and dissipates heat from the pond and provides an energy-efficient and cost-effective means of heating and cooling the entire facility.

Excellent indoor air quality is maintained throughout the building by using energy recovery ventilators (ERVs). Ventilation air is supplied to occupied areas of the building at rates of 15 cfm/person (7 L/s per person) in classrooms and 20 cfm/person (9.5 L/s per person) in offices, in accordance with ANSI/ASHRAE Standard 62-1999, *Ventilation for Acceptable Indoor Air Quality*. A carbon diox-

Past Energy Conservation Activities

- Since 1995 we have partnered with the Iowa Energy Center and the Energy Resources Station staff located in Building #23 on the Ankeny Campus.



Past Energy Conservation Activities

- First installed room occupancy sensors to turn lights off in classrooms in 1992 and have continued to expand to over 1,500.



Past Energy Conservation Activities

- Installed high efficiency motors, pumps, fans, boilers and air conditioning systems
- Installed energy recovery ventilators
- New buildings are built with newer energy efficient technologies and to new energy efficiency standards

Past Energy conservation Activities

- Turn off exhaust fans, lab fume hoods, kitchen exhaust hoods and paint booth exhaust fans when they are not being used.
- In the last 20 years, DMACC has received over \$500,000 in energy rebates from our utility companies for implementing energy conservation measures.

RECENT ACTIVITY

- Working with Utility providers and engineers performed building energy audits in 35 older DMACC buildings that will qualify for over \$200,000 in additional energy rebates

GRANTS

- | | | |
|---------------------------------|-----------|--------------|
| • Wind Turbine | \$131,500 | 1 to 1 match |
| • 1,100 occupancy sensors | \$ 44,000 | 1 to 2 match |
| • Ankeny Energy Conservation | \$186,844 | 1 to 1 match |
| • All DMACC Energy Conservation | \$639,494 | 1 to 2 match |

FUNDING FUTURE WORK

FUTURE ACTIVITY

- This will reduce energy consumption by approximately 20% and carbon footprint approximately 16% .
- Conservation projects visible to public
 - Energy efficient lighting (T-8, T-5, CFLs, LED), more room occupancy sensor for lighting and HVAC control, de-lamping over light rooms , day time space temperature set points –
- Conservation projects less visible to public
 - Geothermal heating and cooling, high efficiency motors, pumps, fans, boilers, chillers; computer power management, energy recovery ventilators, vending misers, daylighting, enthalpy controls, additional digital temperature controls, retro-commissioning HVAC systems, new RTUs, LED parking lots lights

Boiler Replacement



Replacing Chillers Modifying Cooling Towers



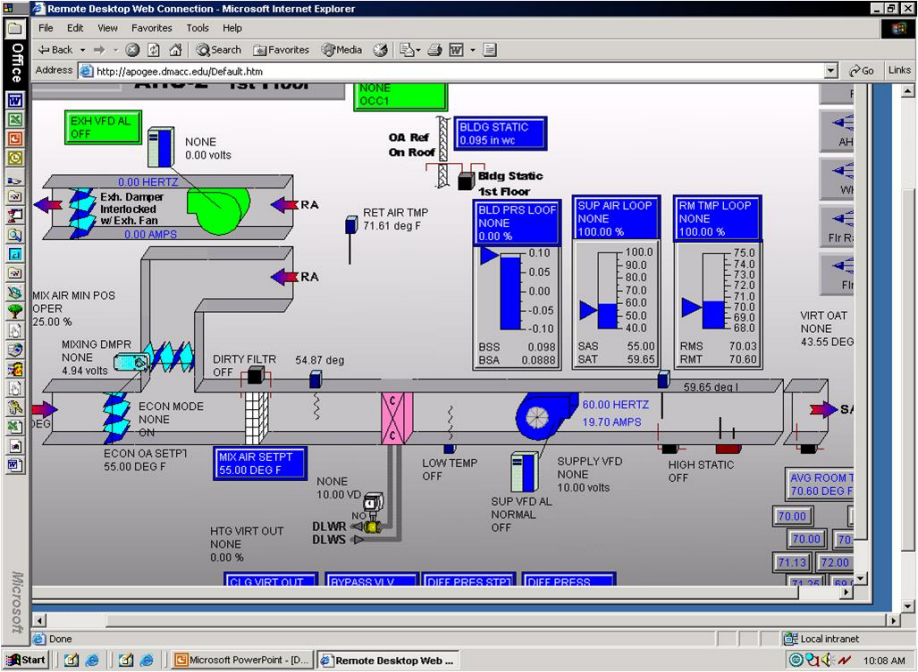
Roof Top Unit Replacement



Fumehood Replacement With Low Flow Hoods



Enhance Digital Temperature Controls



Challenging but high impact opportunities

Turning off the lights in the large labs and gyms

Optimizing the use of kitchen hoods and fume hoods

Optimizing welding exhaust ventilation

Optimizing the operation of paint booths

Turn off computers and other energy vampires when not in use

Consolidate where classes are held to reduce the need for HVAC
(especially at nights, weekend, break periods)

(new scheduling software will help **IF** used efficiently)

Closing overhead doors

Implement an energy diet – some behavior changes are required

Reducing water consumption

OTHER SUSTAINABLE ACTIVITIES

- Future buildings built to LEED Silver standards
- Appointing a Sustainability Task Force
- Recycling lamps, ballasts, waste oil, oil filters, cleaning solvents, electronic waste, PCB removal
- Purchasing E85 vehicles, electric vehicles and using bio diesel fuel.
- Cafeteria – begin purchasing biodegradable tableware and cups.



OTHER SUSTAINABLE ACTIVITIES

- Implemented single stream recycling



LOOK FOR THE NEW large blue **RECYCLING containers—and Help DMACC Green Up**

We've improved our recycling program, making it easier to dispose of your recyclable items. Our new single container recycling program lets you place papers and recyclable bottles and other containers in the area recycling receptacle, rather than being sorted into separate containers for newspaper, cardboard, plastic and glass.

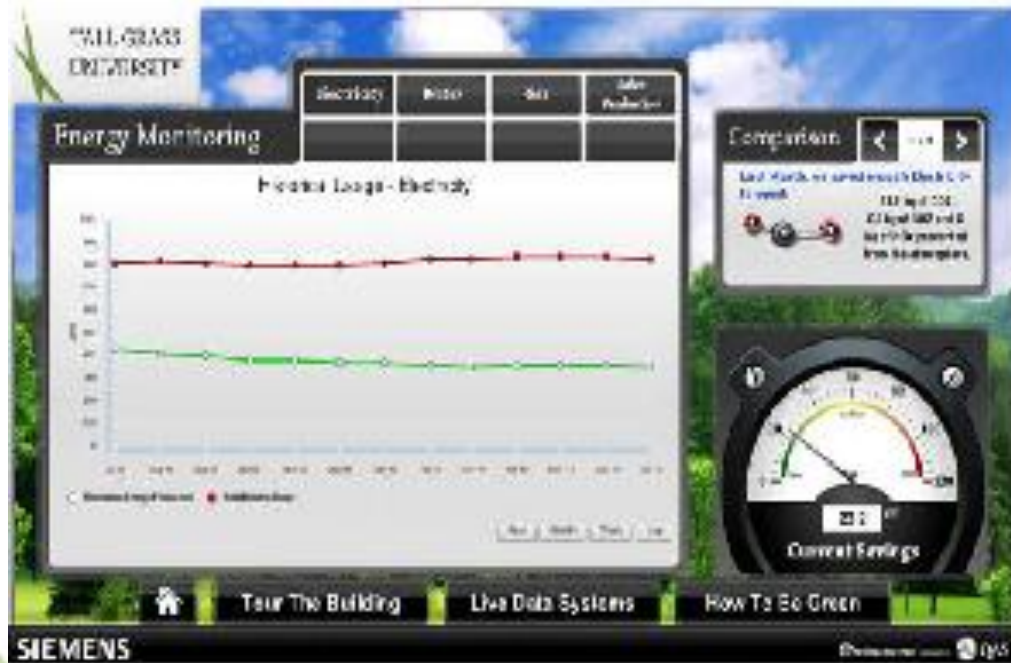
<p>Acceptable items for single container recycling:</p> <ul style="list-style-type: none">• Pizza boxes• Metal coat hangers• Copier paper• Telephone books• Cereal boxes• Catalogs• Magazines• Old corrugated cardboard• All office paper without wax liners• Newspaper• Tin cans• Aluminum food and beverage containers• Glass food and beverage containers—brown, clear or green• Natural plastic containers with symbol #2• Milk bottles• Water bottles• Narrow neck containers only, without caps (detergent, shampoo bottles, etc.)• PET plastic containers with the symbol #1 with screw tops only, without caps	<p>Unaccepted Materials:</p> <ul style="list-style-type: none">• Plastic bags• Cloth rags• Light bulbs• Mirrors• Wood• Batteries• Wire• Styrofoam• Leather• Rubber• Rocks• Concrete• Household items such as cooking pots, toasters, etc.• Glass cookware/bake ware• Ceramics• Porcelain• Window or auto glass• Microwave trays• Clothing• Hazardous Waste	<p>Before you recycle, make sure:</p> <p>All glass containers should be empty and have no metal caps or rings, and should contain less than 5 percent food debris.</p> <p>All tin cans and aluminum cans must be empty and should have less than 5 percent food still in container.</p> <p>All aerosol cans must be empty with less than 5 percent of the original content.</p> <p>All plastic containers must be empty, have caps removed and have less than 5 percent of their original food still in them.</p> <p>All fiber must be dry and contain no food or other contaminating material.</p> <p>Tissues, toilet paper or other paper that has been in contact with food should not be recycled.</p>
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Operation GREEN
at Des Moines Area Community College

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DES MOINES AREA
COMMUNITY COLLEGE
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www.dmacc.edu/

Energy performance monitoring

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- Additional building energy metering
- Energy dashboard graphics at desktops



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Des Moines Area Community College

Weather Normalization Report [WR02]

Building:	Newton B#1
Weather Station:	DES MOINES AP
Base Year:	2006
Evaluation Year:	2010

