

# *Advancing Carbon Neutrality on Campus*

*A Climate Change on Campus  
New England Sustainability Summit 2010*

*New England Board of Higher Education  
April 23, 2010*

# *Focus of Presentation*

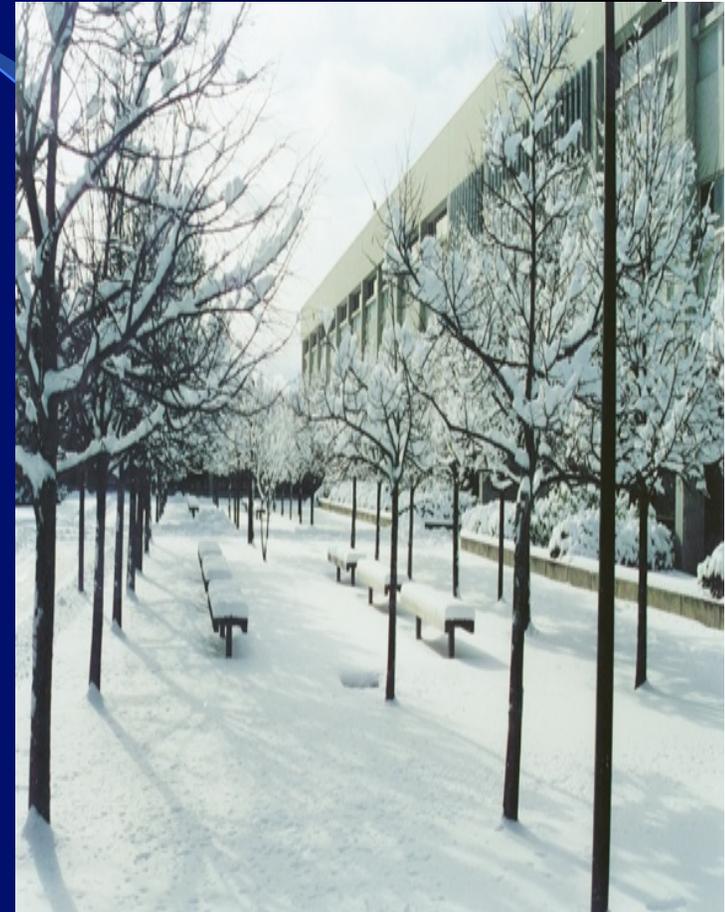
- *There is no one clear cut solution to carbon neutrality – every campus presents its own challenges and possibilities.*
- *How do you balance operational considerations with your approach to carbon neutrality i.e. demand side management?*
- *What are some of the funding options available?*
- *What are the potential Curriculum Implications?*

# *Critical Issues*

- *The rising and disproportionate costs of energy in the Northeast*
- *The Nation's continued dependence on foreign oil & its impact on national security*
- *The obligation to address the need for increased energy production in consort with environmental protection*
- *The need to keep student costs as low as possible*

# Overview of College

- *287acre site located in a snow belt at the highest elevation in north-central Massachusetts*
- *450,000 s.f. of classrooms, laboratories, library, theater, gymnasium, etc.*
- *The College utilized electricity as its sole source of climate control*
- *Enrollment 9,000 day & evening students*



# *MWCC Projects*

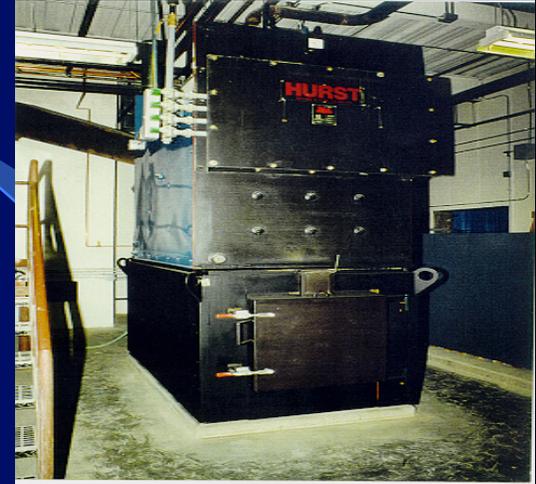
- *Biomass Conversion*
- *Biomass Gasification – Combine Heat & Power*
- *Photovoltaics – 100kW*
- *Solar Thermal –Domestic Hot Water*
- *Energy Conservation Measures (ECMs)*
- *Geothermal (Veteran’s Rehabilitation Center)*
- *Plug in Hybrid*
- *Wind Turbines*

# *Biomass Conversion*

*Conversion of all electric campus to  
to a Closed Loop Hydronic Biomass  
System*

*Installation includes a 320 bhp  
wood chip boiler with 300 bhp oil  
fired backup*

*Computer controlled  
facility*



# *What did MWCC do?*

- *Converted an all-electric facility to a closed-loop biomass fueled hydronic system*
- *Installed energy efficient lighting*
- *Installed variable frequency drives and premium efficiency motors*
- *Replaced all unit ventilators*
- *Installed a domestic hot water heat exchanger*
- *Implemented domestic water conservation (low GPF toilets/low GPM sinks)*
- *Installed a consolidated compressor farm*
- *Expanded the central chilled water system for cooling*

# *Environmental Impact*

- *The energy savings accomplished by this project provide a significant environmental and health benefit from the reduction of air pollutants and greenhouse gas emissions. For example, we have reduced CO<sub>2</sub> emissions by 14,890 tons, NO<sub>x</sub> by 24.2 tons, and SO<sub>x</sub> by 64 tons.*
- *This reductions would be equivalent to planting 4,079 acres of trees and removing 2,601 automobiles from the roads.*

# *Biomass Conversion*

## *Average Annual Savings 2002-2009*

*Electricity: 4,046,874 (kWh)*

*( 45.97% reduction, enough to serve  
approximately 1200 residential all-  
electric customers per year)*

*Water: 2,222,222 gals ( 52.52% reduction)*

*CO<sub>2</sub> reduction: 24%*

# SUSTAINABILITY

*Sustainability is development that meets today's needs without compromising the ability of future generations to meet their own needs.*

*By incorporating biomass, the College is utilizing a fuel source that is renewable, locally available, cost effective, environmentally friendly and publicly acceptable.*



# Energy Savings 2002- 2009

Year	Saved kWh Peak	Saved kWh off-peak	Total Saved kWh	Total Gals of Water Saved	Total Dollar Savings	Total Dollar Savings Current Rate
2002	1,986,158	902,413	2,888,571	2,222,222	\$ 198,923	\$ 198,923
2003	2,575,626	1,208,478	3,784,104	2,222,222	\$ 272,826	\$ 314,600
2004	3,117,068	1,623,557	4,740,625	2,222,222	\$ 313,839	\$ 402,638
2005	2,966,760	1,523,351	4,490,111	2,222,222	\$ 304,586	\$ 462,214
2006	2,871,270	1,459,691	4,330,961	2,222,222	\$ 294,570	\$ 605,615
2007	3,326,612	1,769,135	5,095,747	2,222,222	\$ 335,310	\$ 682,564
2008	3,022,039	1,560,204	4,582,243	2,222,222	\$ 313,965	\$ 556,370
2009	3,052,190	1,586,187	4,638,377	2,222,222	\$ 307,053	\$ 606,510
	22,917,723	11,633,016	34,550,739	17,777,776	\$2,341,072	\$ 3,829,434

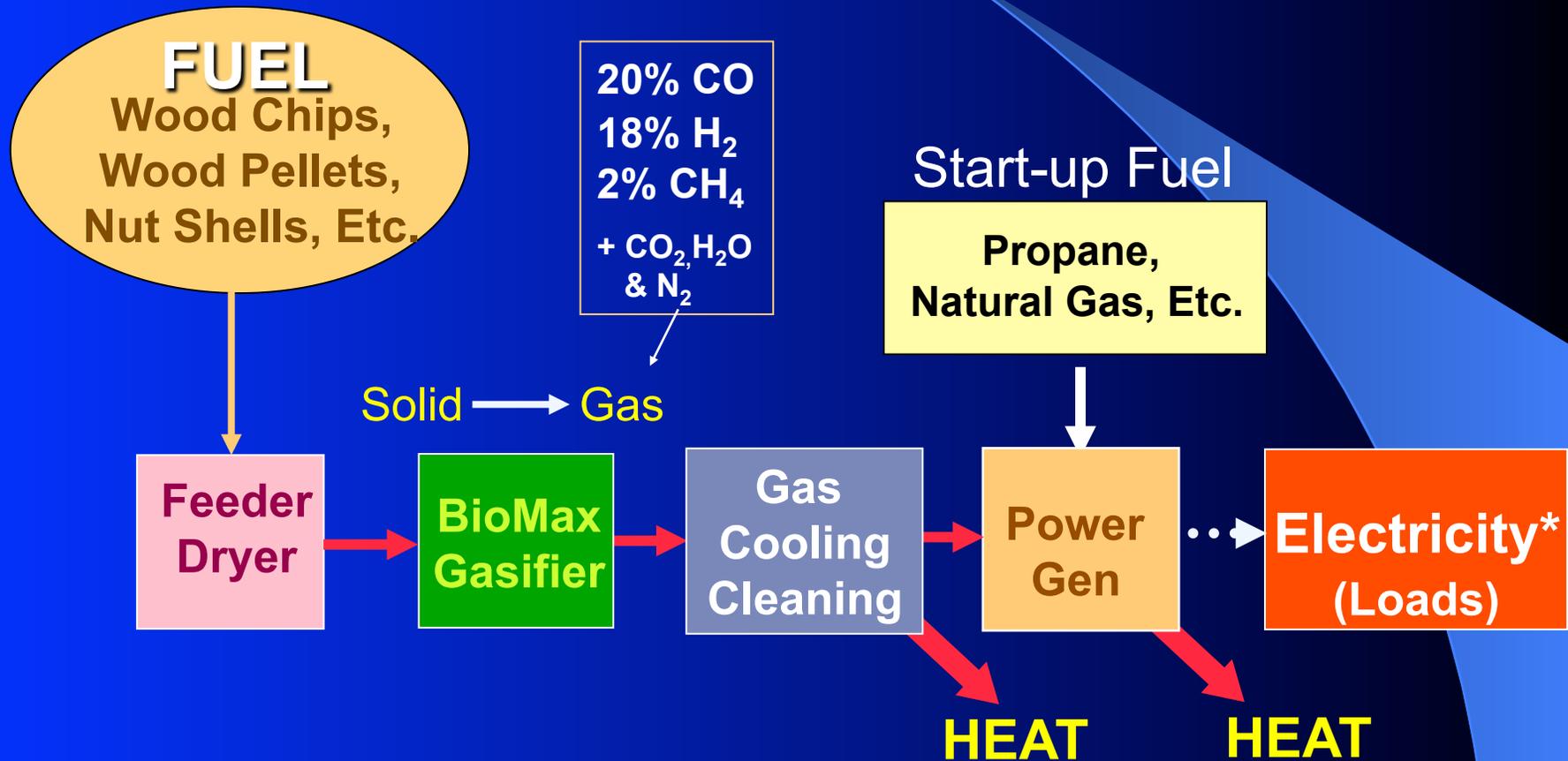
# *BIOMAX -50*

*Installation of a 50 kW gasifier  
and co-gen set*

*The downdraft gasification  
technology employed produces  
the lowest emissions of tars and  
complex hydrocarbons of any  
known wood combustion  
technology*



# BioMax: Gasification Converts Woody Materials to a Clean Fuel Gas for Heat, Power and Cooling



Wood Energy Conversion Efficiency: 80%  
System CH&P Efficiency = +70%

\* and/or shaft power

# Photovoltaic

*The College has recently installed a 100 kW Photovoltaic array. Funding included the use of a Clean Renewable Energy Bond (CREB) as well as funding from the Massachusetts Technology Collaborative.*



# Solar Thermal

- *MWCC has installed a solar thermal array that will provide domestic hot water to the main building. The college is also exploring the feasibility of a similar installation at the gym.*



# *Plug in Hybrid*

- *MWCC received a grant from the Division of Energy Resources to convert its hybrid vehicle to a plug in version which will now get as much as 100 mpg.*



# Wind Turbines

*MWCC has been awarded \$3,000,000 from the U.S. Department of Energy ( Energy and Water Development Appropriation Bill) to install two 1.65 MW wind turbines and to work with surrounding communities to develop implementation strategies for the installation of turbines across the state's northern tier.*



## *Additional Energy Conservation Measures*

- *High Efficiency Heat Pumps, Economizer*
- *DCV for selected spaces*
- *Baseboard Controls*
- *Lighting & Lighting Controls*
- *Kitchen Hood Controls*
- *Occupancy Based Controls*
- *Pool Filter & Pool Cover*
- *Solar Domestic Hot Water*

## *Additional Energy Conservation Measures ECMs*

- *Total Proposed Costs: \$796,620*
- *Electrical Incentives: \$230,667*
- *Annual kWh savings: 846172kWh (14.5% of current energy consumption)*
- *Total annual savings \$129,113*
- *Simple payback: 4.3 years*

# *Funding Options*

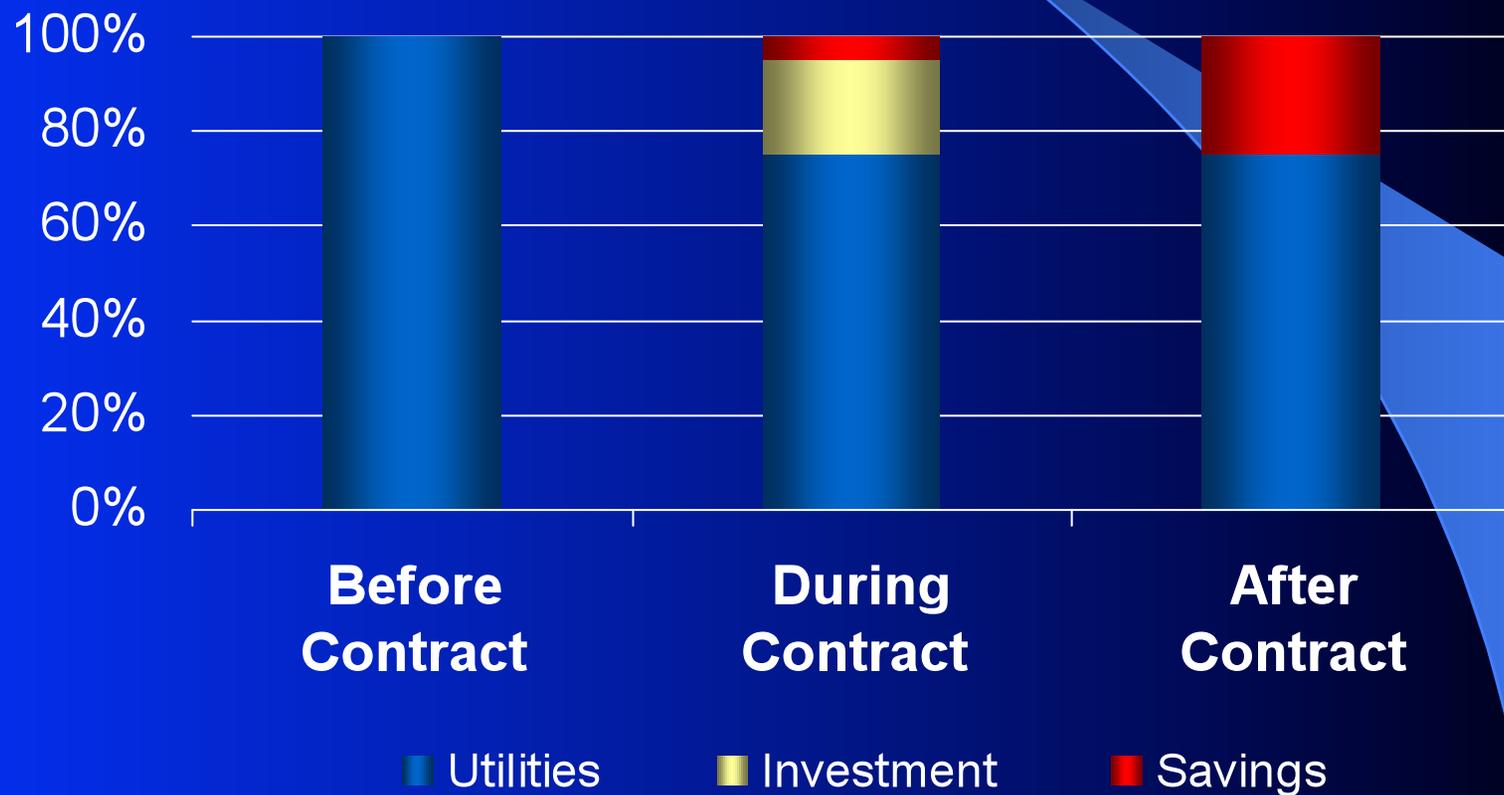
- *U.S Department of Energy*
- *Mass Technology Collaborative & Renewable Energy Trust Funds*
- *Utility Rebates*
- *Clean Renewable Energy Bonds (CREBs)*
- *Renewable Energy Credits*
- *Clean Energy Investment Program - General Obligation Bonds*
- *Performance Contracting*

# *What is Performance Contracting?*

- *Performance contracting is a unique and extremely effective approach to installing innovative energy efficiency and infrastructure improvements by leveraging the current operating budget.*
- *Investments are self-funding, paid for over time from the guaranteed energy savings delivered.*

# Performance Contracting Benefits

*Project Costs are Paid from Existing Budgets*



# *Climate Commitment*

- *“By addressing the College’s responsibility to minimize its own contributions to global warming and by emphasizing the importance of making the transition to a low carbon, sustainable economy, the College has defined a new mission for the school; one that creates educational and professional opportunities for students, supports the professional development of faculty and staff while also encouraging a sustainable quality of life for residents in our service delivery area.”*

# Climate Commitment

- *“Heading Toward Zero: Climate Action at the Mount represents a collaboration of multiple stakeholders including MWCC faculty, staff, students, alumni, industry partners, business owners, government officials and other community members. It promotes the development of education tools, research opportunities and institutional support required to generate solutions for the challenges of global climate change within the context of the college.”*

# *Examples of Climate Action Projects*

- *Commuter Transportation Initiative*
- *Integrate Sustainability Within Strategic Planning Process*
- *Deploy Energy Efficiency Awareness & Behavior Campaigns (ABCs)*
- *“Living Machine” Research*
- *Stormwater Management*
- *Community Gardens, Composting Program, Kitchen Garden*
- *City of Gardner Energy Audit Pilot*

# *Curriculum Development*

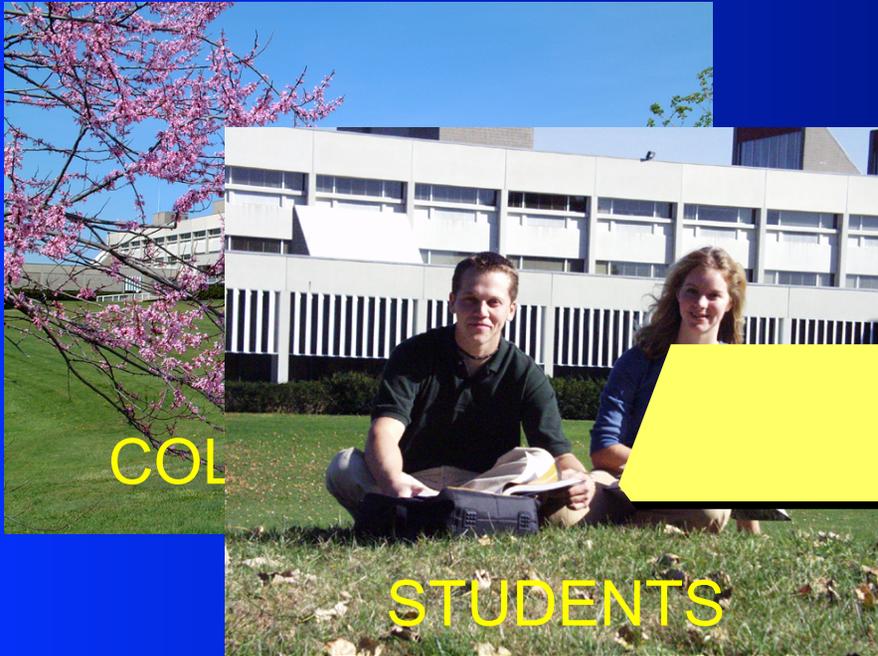
- *In December (2009) the Massachusetts Department of Higher Education approved MWCC's proposal for a Certificate Program and an Associate of Science Degree in Energy Management.*
- *The degree in Energy Management is the only known program of its kind within the Massachusetts Community College system or within any community college located along the entire east coast.*

# *Curriculum Development*

- *“ For the past decade, MWCC has been recognized for its institutional successes in renewable energy and conservation. These energy initiatives will now serve as a learning laboratory to enhance the academic experience for emerging professionals in a new clean energy economy.”*

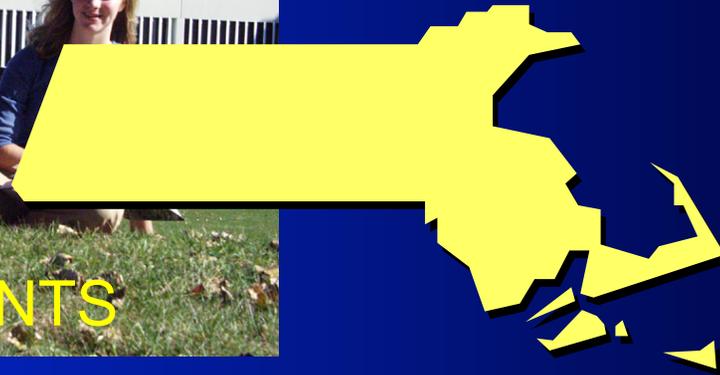
*Daniel M. Asquino, President MWCC*

WIN → WIN → WIN → WIN



COL

STUDENTS



MASSACHUSETTS

COUNTRY

*“The fundamental challenge facing today’s society is to create political, economic, and social systems that promote peace, human welfare and sustainability of the environment on which life depends.” We feel, and we trust you will agree, that MWCC's initiatives are providing unique opportunities to meet this challenge.*



## *For Additional Information*

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