



Renewable Energy Programs at Massachusetts Maritime Academy

*Evaluating Renewable Energy for Colleges and
Universities*

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Massachusetts Maritime Academy

- MMA is a public, co-educational maritime college located on Cape Cod, at the mouth of the scenic Cape Cod Canal.
- It is the ideal location to pursue academics with a love for the ocean, concern for the environment, interest in Math and Sciences, and thirst for adventure.



Renewable Energy and Future Initiatives

- Wind Turbine
- CHP Microturbines
- Solar Lighting
- Solar Photovoltaic Array
- Solar-powered Trash Compactor
- Geothermal
- Solar Thermal
- Tidal turbines
- Vertical Axis Wind Turbine





Wind Turbine Generator

Impact:

- Environmental
- Educational
- Economic

Considerations:

- Environmentally responsible.
- No polluting emissions.
- Great student training in the greatest power growth market.
- Stabilize and reduce power cost.
 - Grants made it cost effective
- Governor Swift's Executive Order 438
- Saves money in conjunction with competitive energy supply contract.



Turbine Facts and Statistics



- Vestas V47 660kW Unit
- Size Characteristics
 - Height to blade tip: 242 feet tall
 - Hub height: 164 feet
 - Blade Sweep: 154 feet
- Generates ~18% campus electricity needs
- Total Generated Electricity
 - Over 2.85M kWh to date
 - \$200,000 annual savings
- Greenhouse Gases Avoided
 - Over 3.4M pounds of CO₂
 - Over 1000 pounds of NO_x



Project Cost and Savings



Project Cost	\$	1,469,371
MTC Grant	-	500,000
Total Project Cost	\$	946,371
Total Cost per Watt	\$	2.23
2007 Savings	\$	229,547
Pay Back (total cost/savings)		4.2 years







Solar Power

- Solar-powered trash compactor
- Solar pathway lighting system
- Photovoltaic system





Trash Compactor



- Big Belly
- Purchased in 2007
 - ~\$4000.00
 - *Price has dropped considerably in 2 years*
 - 55-gallon size
 - Holds ~4x normal capacity
 - Used in high-traffic area
 - Easy maintenance and handling



Pathway Lighting



- Included as part of LEED Gold dormitory expansion project
- 62 Fixtures
 - 1200 lumens per fixture
 - Programmable, LED, extended life
- Cost
 - Cost per fixture: \$9,884
 - Cost of conventional fixture: \$6,000
- Offsetting
 - ~20,000 kWh/yr
 - ~36,000 lbs of green-house gases
 - ~ 1 mile of conduit/cable for wiring and re-wiring



Project Costs and Savings

Project Cost	\$	612,837
MTC Grant	-	30,000
Total Project Cost	\$	582,837
Savings per year	\$	3,200
Pay Back (total cost/savings)	Economically, not great, look to other "E's"	





Photovoltaic Power System

- 450 Evergreen Panel System
 - Part of LEED Gold dormitory expansion project
 - Operating since 11/16/07
- Generated 125,000 kWh of electricity to date
 - Expected to generate 85,000 kWh a year
 - First year exceeded expectation by 10,000 kWh
- Amount of greenhouse gases avoided
 - ~216,000 pounds of CO₂
 - ~314 pounds of NO_x





Project Costs and Savings

Project Cost	\$	817,437
MTC Grant	-	250,000
Total Project Cost	\$	567,437
Total Cost per Watt	\$	9.61
Savings per year	\$	15,000
Pay Back (total cost/savings)	With tax credits the range is 5-10 years	



Combine Heat and Power

- Installation of (3) 65 kW CHP micro-turbines
 - Supply electricity and heat for complex
 - Waste heat is recaptured for domestic hot water
- Reliable systems
 - Onsite generation is more reliable than grid power
- Alternative energy source





Project Incentives

- Educational
 - Installed systems can teach principles of cogen and provide exposure to technology
 - Tracking consumption and energy output show economic and environmental benefits
- Economics
 - Financial incentives/net-metering
 - Increasing rebate opportunities
 - 8 year payback
- Environmental
 - Reduced usage of electricity from “dirty” sources
 - Reduced CO₂ and NOx emissions
 - Increased efficiency
 - 85% to generations
 - 15% to waste heat



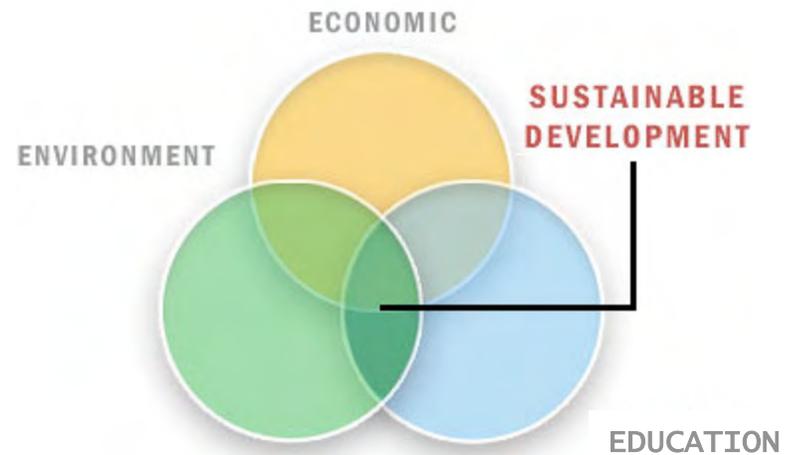
Future Initiatives

- Geothermal
 - Fifty well closed-loop system
 - Part of new Library/Information Commons construction
 - Operation by Fall 2011
- Solar Thermal System
 - Roof mounted system for campus natatorium
- Tidal Turbines
 - Utilize power of Cape Cod Canal
 - Provide real-time analysis of different tidal systems
 - Future addition to Waterfront Protection project
- Vertical Axis Wind Turbine
- Additional 1.5 MW Wind Turbine



Summary

- Always consider the three E's
 - Education
 - Economics
 - Environment





Thank You

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