

School Energy Management  
Policy/Guidelines and  
Education Plan  
Fall 2011

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**EXECUTIVE SUMMARY**

The Wausau School District (WSD) is working to be a leader in Wisconsin in environmental awareness, energy conservation and sustainable practices. The District is committed to reducing our collective carbon footprint at all levels. The School Energy Management Policy/ Guidelines and Education Plan serves as a framework to help fulfill our commitment to the efficient use of energy resources, to operate our facilities, to reduce the District's reliance on non-renewable energy sources and to engage our students, staff, parents and community in facilitating a cultural change related to energy use. We will implement this plan at Wausau East High School and then the District energy committee will implement it throughout the District.

**Goals**

- 1) To continue our District's efficient and effective use of energy.
- 2) To increase student and staff awareness/knowledge regarding energy usage in our schools.
- 3) To integrate energy management with energy education.
- 4) To apply knowledge gained from classroom experience to the day-to-day operation of District facilities.
- 5) To extend to citizens of the community applicable practices that are developed and maintained within the District.

**Objectives**

- 1) Student and teachers will use our schools as well the Wausau School District Renewable Energy Outdoor Learning Center as "learning laboratories" regarding energy use.
- 2) School building occupants will be able to identify, develop, analyze and use concepts or strategies that reduce energy use.
- 3) Staff and students will know how to access relevant energy information.

### **Rationale**

Understanding the principals of energy use, energy conservation, and natural resources are key components of sustainability. Knowledge is critical in fostering systematic change or facilitating learning the concepts or skills outlined in our District's School Energy Management Policy/Guidelines and Education Plan provides our students and staff with the knowledge base and background to help lead the changes needed to reduce our reliance on non-renewable energy starting in our schools, our homes and our community.

### **Why is energy management important?**

- Energy and resource conservation
- Financial savings/cost
- Reduced pollution, waste, and CO2 emissions/carbon neutrality
- Create an sustainable energy conservation learning environment for students
- Encourage staff and student as they learn about energy conservation
- Provide leadership through practicing/modeling energy conservation

### **Plan Development Process**

The creation of the School Energy Management Policy/ Guidelines and Education Plan is a collaborative effort involving a cross section of Wausau East staff members who are interested in the process of integrating energy conservation into the educational and operational streams within the District. Teachers, administrators, custodians, facilities maintenance personnel, and energy consultants worked collaboratively towards energy conservation to reduce our carbon footprint.

## **ENERGY MANAGEMENT POLICY/GUIDELINES**

### **Background**

In 2001, Steve Hanson received a WEEB Grant to develop a plan for the implementation of a renewable energy program at the new Wausau East High School. He formed an energy education committee who drafted an energy plan for the new high school. In 2004, the new high school opened with solar panels and energy star equipment such as

photocopiers. Although a plan was utilized and three teachers attended the Midwest Renewable Energy Association Energy Fair, there were staff changes in the science department due to unforeseen circumstances. Now as the science department regroups, the staff feels the need to better prepare students to become tomorrow's decision makers on issues such as climate change and alternative energy sources by implementing a school energy policy and education plan. We know that continued success depends on providing students with hands-on authentic learning opportunities that are relevant to issues of today and the future. It was stated in the past that "the main benchmarks of success will be a well developed School Energy Educational plan with the successful completion of installation of alternative energy sources; the success of future grant writing; and essentially having all of the resources, information, and support, in order to implement a renewable energy education program that would include educational equipment such as the Pedal Power display (Energy Cycle), PV panels, wind turbines and curriculum". Our annual utility costs for Wausau East total approximately \$176,054 in 2007 and now \$210,682 at the current rates. We believe that we could reduce this figure by developing an energy plan and implementing it which would lower annual financial costs to the District and reduce our carbon footprint.

### **Purpose**

The number of energy applications that exist within a school district is virtually unlimited. Opportunities for identifying and managing resources assigned to these applications are varied and incalculable. It is the responsibility of the District's Director of Physical Plant, supported by Administration and District's Sustainability Committee, to identify as many of these opportunities as possible. The ultimate goal of such efforts is to motivate all energy users to buy into the challenge of reducing consumption and costs while pursuing educational excellence and achievement.

The ability of the District to successfully reach its goals associated with energy usage and conservation is based on the ability of everyone to participate in the program outlined in the Energy Management Policies/Guidelines. This comprehensive plan must be clearly presented during our in-service in order to foster acceptance and compliance among all staff members.

With the Energy Management Policy/Guidelines as a reference guide, staff and students have the proper direction and tools for the challenge of containing energy consumption and costs. The natural course of action should result in reduced consumption and costs. The policies/guidelines embody the values that the Wausau School District has accepted over time and serves as a model for all to follow. Existing values may be reviewed and deleted if necessary and new entries added to improve and update the

information included therein. Energy management is the primary reason for its existence, but an expansion of scope may be required as newer concepts such as "sustainability" and "renewable energy" are accepted.

### **Responsibilities**

- All staff and students are expected to be "energy savers" as well as "energy consumers".
- All District staff are responsible for implementation of the guidelines.
- Custodians are responsible for control and operation of mechanical, electrical and related systems at each site.
- The night custodians are typically the last people to leave a building in the evening, so they are responsible for verification of the nighttime shutdown.
- The Principal is responsible to oversee and enforce the total energy effort at his/her building.
- The Physical Plant Director performs routine audits of all facilities and will share these results to the appropriate personnel.
- The Physical Plant Director tracks energy consumption and provides regular reports to Principals and Head Custodians indicating performance with regard to energy savings.
- All non-school calendar dates are to be regarded by staff as unoccupied energy shutdown opportunities and treated accordingly.

### **Building Improvements**

1. Repair all areas of water intrusions and eliminate any areas of standing water in older buildings.
2. All doors and windows should be closed during periods of humid weather.

### **Cooling/Air Conditioning**

1. Occupied temperature settings shall **NOT** be set below 74° F.
2. During unoccupied times, the air conditioning equipment shall be **off**.
3. Air conditioning start times may be adjusted (depending on weather) to ensure classroom comfort when school begins.
4. Close outside air dampers during unoccupied times.
5. Relative humidity levels should not exceed 60% at any time.
6. Equipment appropriate filtration shall be utilized and filtration shall be changed or replaced in accordance with an established schedule.
7. Establish a district maintenance program to ensure clean coils and drain pans.

8. Air conditioning should not be utilized in classrooms during the summer months unless the classrooms are being used for summer school or year round school. Relative humidity levels should be monitored to verify level remains below 60%.
9. In all areas which have evaporative coolers such as shops, kitchens and gymnasiums, the doors leading to halls which have air conditioned classrooms or dining areas should be kept closed as much as possible.
10. Classroom doors should remain closed when HVAC is operating. Ensure that doors separating conditioned and unconditioned space remain closed at all times (e.g., between hallways and gym/pool areas).
12. Utilize data loggers to document building humidity, temperature, and light levels to ensure compliance with district guidelines.
13. All exhaust fans should be turned off every day and during unoccupied hours.

### **Heating (Equipment)**

1. The standard occupied temperature setting (set point) shall be 68 ° F during heating season. The set point may be increased only if circumstances require or justify an adjustment. Occupied temperature setting shall **NOT** exceed 72° F.
2. The unoccupied temperature setting (set point) shall be 65° F unless circumstances require or justify an adjustment.
3. During the spring and fall when there is no threat of freezing, all steam and forced air heating systems should be switched off during unoccupied times. Hot water heating systems should be switched off using the appropriate loop pumps.
4. Ensure that domestic hot water systems are set no higher than 120° F (140° F in food service kitchens) and hot water heaters and pumps turned off during unoccupied periods whenever possible.
5. Classroom doors should remain **closed** when HVAC is operating. Ensure that doors between conditioned and unconditioned space remain closed at all times (e.g., between hallways and gym/pool areas).
6. Utilize data loggers to document building humidity, temperature, and light levels to ensure compliance with district guidelines.
7. All exhaust fans should be turned off every day and during unoccupied hours.
8. Personal space heaters are NOT allowed under any circumstances.

### **Lighting**

1. All unnecessary lighting in unoccupied areas will be set on timers and will be off when no one is present. Teachers should make certain that lights are turned off when leaving the classroom although all classrooms have occupied sensors. Schools should utilize natural lighting where appropriate.
2. All outside lighting shall be off during daylight hours.

3. Lights in gyms should not be left on unless activities are taking place. In multi-station gym facilities, lights should be left off in stations when the space is not being utilized.
4. All lights will be turned off in the hallways during class time and when students and teachers leave school. Custodians will turn on lights only in the areas in which they are working.
5. When possible, all lights should have occupancy sensors. Remember that lights give off heat that places an additional load on the system and thereby increases the use of electricity necessary to cool the room.

### **Water and Bathroom Facilities**

1. Turn the chiller off in water bubblers during unneeded times of the year.
2. Energy efficient plumbing fixtures (urinals, toilets, faucets, etc) shall be installed when replacement is deemed necessary.
3. Energy efficient hand drying mechanisms shall be installed when replacement is deemed necessary (hand dryers, automated toweling dispensers, etc).
4. The domestic hot water system should be set no higher than 120°F.
5. Evaluate domestic hot water heater efficiency on a yearly basis.
6. Shut down domestic hot water re-circulating pumps when unoccupied.
7. Repair leaking faucets, fixtures, valves and piping.

### **Recycling**

1. All building occupants are required to recycle.
2. Recycling containers will be available in each classroom and in all common areas for use.

### **Food Service**

1. Equipment should be started as late as possible and run a minimum of time.
2. Exhaust fans will run only as necessary.
3. Energy-saving equipment will be utilized whenever possible.

### **Computers and Office Equipment/Machines**

1. All office and classroom equipment/machines ("smart boards", copy machines, laminating equipment, etc.) shall be switched **off** each night and during unoccupied times. Fax machines should remain on.
2. All computers and projectors should be turned off at the end of the school day when staff and students leave. It is the goal of the District to have all computers and

projectors networked to the Power Management system which will shut them down at night to ensure energy conservation.

3. All capable computers should be programmed for the "energy saver" mode using the power management feature.

4. All new computers, computer peripherals, and office equipment that are purchased by the District should be "ENERGY STAR®" rated (unless "ENERGY STAR" rated equipment is not available or if there are extenuating circumstances).

### **Other**

1. The domestic hot water temperature set point will be no higher than 120 degrees. Food service operations requiring higher temperature levels by code shall use the state code handbook.

2. The Facilities Services Department may adjust set points to provide the best overall performance of the HVAC system.

4. Vending machines, when their use is permitted by the District, shall be the most energy efficient as possible. The District will require ENERGY STAR rated vending machines whenever possible.

### **Education/Professional Development**

1. Maintenance and custodial personnel should attend relevant training opportunities when they are offered. Instructional and other support staff members should be afforded training whenever applicable.

2. All staff should receive training on energy conservation.

3. Curricular material and presentation should contain relevant and practical information and instruction relating to energy conservation.

### **Summer School & Other Programs during Unoccupied Times**

1. To the greatest extent possible, scheduled classes/non-school programs will be located in an area that affords participants the most comfort for the least amount of energy and cost.

2. The date for the restart of A/C during the summer recess will be preset and announced by Administration prior to the close of the school year.

3. Unless required by special circumstances, the use of A/C is not supplied during the summer.

### **Personal (non-district owned) Appliances**

1. Bringing personal appliances (such as such as electric coffee makers, microwaves, refrigerators, toaster ovens, pizza makers, and/or other cooking or refrigeration appliances) to school is strongly discouraged. If a staff member needs to bring a personal appliance to school, he/she is required to receive approval from their principal or supervisor. Approval granted by the staff member's principal or supervisor will NOT extend beyond the current school year.
2. Approved appliances must be UL-listed, energy efficient and, whenever possible, ENERGY STAR rated (affixed with the ENERGY STAR label).
3. Appliances with a heating element MUST feature an auto shut-off or timer that will automatically shut the unit off when not being used.
4. Appliances are required to be shut off and unplugged during all extended break periods during the school year. All personal appliances shall be taken home following conclusion of each school year.
5. The use of small fans, radios and desk lamps (only with fluorescent or LED lamps) are allowed, but must be turned off when not in use. Incandescent or quartz lamp fixture/bulbs are NOT allowed.
6. Personal space heaters are NOT allowed under any circumstances.

### **District Appliances**

1. District-owned appliances such as refrigerators, stoves, microwaves, and commercial coffee-makers are allowed in designated spaces/rooms including staff break rooms, family & consumer education classrooms, health offices, public meeting spaces and other spaces where the appliance's function is an integral part of the educational or administrative process.
2. Whenever feasible, the District's appliances are to be ENERGY STAR rated for efficiency and cost effectiveness.
3. When replacing an aging or malfunctioning appliance, the District should consider energy efficiency, cost, size, location and number of potential users.

## **ENERGY EDUCATION PLAN**

### **I. Philosophy Statement**

Wausau School District will better prepare students to become tomorrow's decision makers on issues such as climate change and alternative energy sources by implementing a school energy policy and education plan. This Educational Plan will improve the District's operational productivity, reduce costs, and integrate energy education into the district curricula which will serve as a model for other Wisconsin School Districts. It is our primary goal to train 500+ teachers in the district about renewable energy and they in turn will teach thousands of students annually to about energy conservation, sustainable practices, and renewable energy sources and how to become more energy efficient users. These concepts will be taught using hands-on activities such as KEEP activities (K-12 Energy Education Program - UWSP), American Wind Association curricula, KidWind activities, and Solar wise curricula.

## II. Goals

### Phase 1 (2010-11 School Year):

- Establish/create school-based sustainability or energy action teams in at Wausau East High school.
- Promote conscientious use of energy by making all staff aware of the implications of the following conservation measures: turning off lights and closing doors/windows (where applicable based on the mechanical/HVAC system).
- Staff and students, with the assistance of the District Energy coordinator, will establish a baseline of energy conservation practices in their school, and document a 10% increase in practices by the end of the 2010-11 school year.
- Establish a process to review and implement energy conservation suggestions from school-based teams (student and staff, including the head custodians).

### Phase 2 (2011-12 School Year):

- Work with the District committee to establish/create school-based sustainability or energy action teams in 50% of our schools.
- 10% of teaching staff will implement at least one activity from the energy curriculum.
- The Energy committee will annually document collaborations with community (public library, families, non-profits, municipalities) involving energy education.
- Encourage, promote and support energy education opportunities for collaboration among schools/departments.

## III. Curricular Framework

### GRADE LEVEL: 9-12 MATH

KEY CONCEPTS	ACTIVITY-	SITE	ALIGNMENT	ASSESSMENT	RESOURCES
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	<b>CLASSROOM CONNECTIONS</b>	<b>CONNECTIONS USING OF BUILDING</b>	<b>WITH STATE STANDARDS</b>		
To find equations of quadratics from their graphs.	Use three points to generate the quadratic equation using the form $y=ax^2+bx+c$ .	The data is from the 2k fixed PV panel array at Wausau West High School. Quantities ( time of day ,Watts) KWH converted to watts.	A-CED, F-LE	A test question will have a similar problem with three points.	Smart Board with projector. TI-84 Calculator, 2k PV panel data
To use variables and mathematical calculations and algorithm to find cost.	Write an application to find the cost of lighting a room at school or home using Visual Basic.net.	Using Light and your load example from Energy and Your School guide.	F-BF, A-CED, A-REI	Students will be asked to follow this example plus do an assignment similar.	Visual Basic.net, Projector and screen, Energy and Your school book.
To use variables and mathematical calculations and algorithm to find cost.	Write the application to find the cost to run laundry loads and run TV's of different energy types.	Use charts from Energy and Your school book for Washing Machines and LCD and plasma TV's.	F-BF, A-CED, A-REI	Students will be asked to follow this example plus do an assignment similar	Alice 2.2 3D programming language, projector and Energy and Your school book.
Be able to plot and graph points. Understand the independent and dependent variables.	Create a graph of point provided. Be able to label and scale your graph to plot the points.	The data is from the 100K wind turbine. Wind speed and Energy created.	A-REI, F-IF	A test question will have a similar problem with data to be graphed	Using a smart board with a projector. TI-83 and above graphing calculators.
Create multiple graphs to model the energy output. To understand the wind turbine has mechanical limits.	We will use two to three classes to look at different models to determine the best regression equation.	The data is from the 100K wind turbine. Wind speed and Energy created.	F-IF, A-CED	The students will have to write a paper on this task.	IB task list, IB grading rubrics, Using a smart board with a projector. TI-83 and above graphing calculators

**GRADE LEVEL:** (Design & Drawing Foundations / 9-12)

## **East Art Energy Curriculum**

<b>KEY CONCEPTS</b>	<b>ACTIVITY-CLASSROOM</b>	<b>SITE CONNECTIONS</b>	<b>ALIGNMENT WITH STATE</b>	<b>ASSESSMENT</b>	<b>RESOURCES</b>
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	<b>CONNECTIONS</b>	<b>USING OF BUILDING</b>	<b>STANDARDS</b>		
Art & Design Impact on Environmental Designs (How aesthetics can impact consumers)	Students will re-design existing energy saving equipment to be more visually appealing.	Students will look at energy saving equipment implemented in school building.	B.12.1, B.12.4, B.12.7, C.12.2, D.12.2, D.12.4, K.12.1, K.12.2, K.12.3	Students will be able to identify energy saving equipment used at their school.  Students will examine form and function.  Students will know that design can impact behavior and be a proponent of change.	
Illustrating Energy	Students will illustrate energy sources, production, and consumption through a sequenced comic style illustration.	Students will use the school building and home to identify types of energy used.	E.12.4, H.12.3, K.12.1, K.12.2, K.12.3	Students will know more about energy sources, production, and consumption.	Global Footprint
Technical Illustration	Students will create a technical illustration showing the components of an energy consuming or producing device using symbols, lettering, and statistics.	Students will use school building and home to investigate energy use.	C.12.6, D.12.2, D.12.4, H.12.3, H.12.4, H.12.5, K.12.1, K.12.2, K.12.3	Students will evaluate the different types of energy used/ generated and then learn ways to save energy.	Way Things Work Text
Inventing Energy	Students will sketch designs and plans for new ways of producing or reclaiming energy.	Students will look at energy saving equipment implemented in school building and within community.	C.12.2, C.12.5, C. 12.6, D.12.2, D.12.4, K.12.1, K.12.2, K.12.3	Students will examine energy production and consumption.  Students will learn methods of renewable energy.	
Energy Wise Logos & Product	Students will research and design images &		C.12.2, C.12.5, C. 12.6, D.12.2, D.12.4, K.12.1,	Students will learn that visual is a persuasive and	Green company logos

Designs	logos that communicate & promote energy wise message.		K.12.2, K.12.3	effective form of communication.  Students will be aware of marketing strategies employed by graphic /commercial design.	
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**GRADE LEVEL:** (Sculpture & Ceramics/ 9-12)

## East Art Energy Curriculum

KEY CONCEPTS	ACTIVITY-CLASSROOM CONNECTIONS	SITE CONNECTIONS USING OF BUILDING	ALIGNMENT WITH STATE STANDARDS	ASSESSMENT	RESOURCES
Energy Consumption In Art	Students will collect information on the energy consumed by electric kilns, potter's wheels, and pug.  Students will learn about non-electric kiln firing "fuels" and operation and determine efficiency and renewability.	School Art Department	K.12.1, K.12.2, K.12.3	Students will know consumption of each piece of equipment and be mindful of turning off power switches and loading kilns for more efficiency/fewer firings.	Maintenance & Operations
Kinetic Sculpture	Students will design and construct a moving work of sculpture that is powered by renewable energy sources.	Students will look at energy saving equipment implemented in school building.	H.12.3, H.12.4, K.12.1, K.12.2, K.12.3	Students will be aware of renewable energy sources and have hands-on experience attempting to work with them.	
Recycled Art Possible Theme-Energy and Environment	Students will design and create a work of sculpture from salvage and	Students will photo and document the amount of trash versus	H.12.3, H.12.4, K.12.1, K.12.2, K.12.3	Students will learn to think of "trash" differently and be more aware of	

	scrap recyclable materials.	recyclables their family produced in one week.		the trash their family generates.  Re-purpose objects rather than discard them.	
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**GRADE LEVEL:** (Architectural Drawing / 9-12)

## East Art Energy Curriculum

KEY CONCEPTS	ACTIVITY-CLASSROOM CONNECTIONS	SITE CONNECTIONS USING OF BUILDING	ALIGNMENT WITH STATE STANDARDS	ASSESSMENT	RESOURCES
Efficient Design	Students will design a green dwelling.	Students will look at energy saving equipment implemented in school building.	C.12.2, C.12.6, D.12.4, E.12.4, H.12.5, K.12.1, K.12.2, K.12.3	Students will be able to identify the components of a green home.  Students will re-examine living space for maximum efficiency and lower consumption.  Students will review floor plans and designs from around the world.	MREI, KEEP
Examine Building Materials/Components, Art & Design Impact on Environmental Designs (How aesthetics can impact consumers)	Students will collect and examine images of new home designs from around the world.		B.12.1, B.12.4, B.12.7, D.12.4, K.12.1, K.12.2, K.12.3	Students will evaluate whether art and design can make “greener” home design popular and in demand/marketable	MREI, KEEP, Local Construction Companies and Builders Association
Examining Homes & Structures in terms of energy consumption		Student may examine or assess their home.	D.12.4, K.12.1, K.12.2, K.12.3		MREI, KEEP, WPS, Local Construction

					Companies and Builders Association
Earth Design	Students will learn about passive solar design, thermal mass, earth homes,		D.12.4, K.12.1, K.12.2, K.12.3	Students will be able to define thermal mass and “solar south”  Students will be able to identify how building materials collect, store, and release heat.	

**GRADE LEVEL:** (Global Languages 9-12)

## **Wind Energy Curriculum in the Global Languages Department**

<b>KEY CONCEPTS</b>	<b>ACTIVITY-CLASSROOM CONNECTIONS</b>	<b>SITE CONNECTIONS USING OF BUILDING</b>	<b>ALIGNMENT WITH STATE STANDARDS</b>	<b>ASSESSMENT</b>	<b>RESOURCES</b>
To compare energy use in countries throughout the world as well as the United States.	Investigate and gather data on energy use in countries throughout the world which correspond to the target language as well as the United States.	Information gained via the internet and research articles.	B.4 E.4 F.1 G.2 I.2	Students will compare (through oral and written work) amounts of energy used by each country and evaluate top energy consumers.	Smart Board with projector, Calculators, Computers, Dictionaries.

To compare cost of energy to consumers vs. cost of energy to the environment.	Investigate and gather data on energy use and the impact on the environment in countries throughout the world which correspond to the target language.  Students will develop a cost effectiveness spreadsheet for energy use and the impact on the environment.		A.3 B.4 F.1 G.2	Students will state (through oral and written work) their preferred form of energy in order to protect the environment and give supporting data.	Smart Board with projector, Calculators, Computers, Dictionaries.
To research and understand the benefits of wind energy.	Read a minimum of 3 articles on wind energy, at least one of those being in the target language.	Statistics gained from the science and math departments on the wind turbine at Wausau East HS.	B.4 C.5 D.3 G.2	Students will write a reflection paper about the benefits of the wind turbine at Wausau East HS.	Library, Internet, Dictionaries.
To investigate high schools abroad which use turbines for energy cost reduction, then comparing them to Wausau East HS.	Web search for high schools using wind turbines.		B.4 C.2 G.2 E.4	Students will report on a high school which uses wind energy and compare it to Wausau East HS.	Smart Board with projector, Internet, Dictionaries.

**GRADE LEVEL:** ( English 9-12)

## **East English Energy Curriculum**

<b>KEY CONCEPTS</b>	<b>ACTIVITY-CLASSROOM CONNECTIONS</b>	<b>SITE CONNECTIONS USING OF BUILDING</b>	<b>ALIGNMENT WITH STATE STANDARDS</b>	<b>ASSESSMENT</b>	<b>RESOURCES</b>
<p><b>1.</b> Cite strong and thorough textual analysis of the explicit and inferential meaning of texts.</p> <p><b>2.</b> Determine an author’s point of view or purpose.</p> <p><b>3.</b> Integrate and evaluate multiple sources of information presented in different media.</p> <p><b>4.</b> Write arguments to support claims using valid reasoning and relevant and sufficient evidence.</p> <p><b>5.</b> Write informative texts to examine and convey complex ideas, concepts and information clearly and accurately.</p> <p><b>6.</b> Conduct a sustained research project to answer a question or solve a problem;</p> <p><b>7.</b> Gather relevant information from multiple authoritative print and digital sources</p>	<p>Research project which includes the option of developing an arguable thesis related to renewable and/or alternative energy sources and proving the thesis through the presentation of relevant, authoritative primary and secondary sources.</p>	<p>Primary sources including data from the District Wind Turbine and Solar Energy panels located at Wausau East High School.</p>	<p><u>Standards for Informational Text, Grades 11-12: 1-7</u></p> <p><u>Standards for Writing, Grades 11-12: 1, a.—e. ; 2, a.—f. ; 7 and 8</u></p>	<p>Research Paper</p>	<p>1. Wausau East HS- Environmental Science Web Page</p> <p>2.WSD Website- District Wind Turbine Data</p> <p>3.Wausau East Library-Books, Databases, E-Books, References (especially Global Issues in Context, CQ Researcher, Badgerlink, and Salem Science)</p>

**GRADE LEVEL:** (Social Studies 9-12)**East Social Studies Energy Curriculum**

<b>KEY CONCEPTS</b>	<b>ACTIVITY-CLASSROOM CONNECTIONS</b>	<b>SITE CONNECTIONS USING OF BUILDING</b>	<b>ALLIGNMENT WITH STATE STANDARD</b>	<b>ASSESSMENT</b>	<b>RESOURCES</b>
Resource use by Native Americans (US History I)	Examination of tribal resource use and environmental impact of Native American tribe in different regions of the United States.	Compare resource use of Native Americans to current daily energy use in schools and households.	A.12.11, B.12.12,	Compare / contrast discussion	Text, Ch. 1 Section 2
19 <sup>th</sup> Century transformation of energy use (US History I)	Understanding the use of various sources of energy in the early steam age	Examine point and non-point carbon use	A.12.11, B.12.13	Statistical analysis of energy use in 19 <sup>th</sup> Century American vs. Today	Text, Ch. 9 Section 1
Industrial Revolution in the United States (US History II)	Studying the development of a fossil-fuel based economy	Impact of fossil fuels—what alternatives are used by our school today?	A.12.11, B.12.9	Graded discussion of pros and cons of fossil fuels and alternatives	Text, Ch. 14, Section 1-2
Development of Electricity during the 1920s and the New Deal (US History II)	Spread of availability and use of electrical appliances and conveniences	How is electricity used in our building today? What is the electricity use of our building? Electricity saving devices used in our building.	A.12.11, B.12.9, D.12.4	Completion of charts on the growth of electrification in the 1920s and 1930s	Text, Ch. 21, Section 1; Ch. 23, Section 5
1970s Energy Crisis and Challenges (US History II)	Causes and consequences of the Energy Crisis	Alternative energy development and demand	A.12.11, D.12.4	Alternative energy use since the 1970s	Text, Ch. 32, Section 4
Industrial Revolution in Early Modern Europe (World History)	Impact of Industrial Revolution on energy use in Europe	Impact of early uses of steam compared to energy use today	A.12.5, B.12.9, D.12.4	Critiquing results of the industrial revolution and worldwide energy demand	Text, Ch. 25
International Energy Consumption / Globalization	Global concerns and debates	Carbon footprint of schools throughout the Wausau School District	A.12.7, A.12.15, B.12.16, C.12.13	Globalization and its impacts	Text, Ch. 36, Section 1-2

**GRADE LEVEL:** (Physics 9-12)

## East Physics Energy Curriculum

KEY CONCEPTS	ACTIVITY-CLASSROOM CONNECTIONS	SITE CONNECTIONS USING OF BUILDING	ALIGNMENT WITH STATE STANDARDS	ASSESSMENT	RESOURCES
Energy Production	Wind Turbine lab- test variables of blade type, number of blades, blade pitch vs. output voltage	None	Topic 8 Energy power, climate check 8.1 – 8.6	Effective lab write up using IB lab procedure	Wind turbine kits
Energy Production	Wind velocity vs. Energy out lab	Use data from on-site wind turbine	Topic 8 Energy power, climate check 8.1 – 8.6	Effective lab write up using IB lab procedure	On site wind turbine data

### Websites that curriculum was adopted from:

<http://www.earth.uni.edu/EECP/>

<http://apps1.eere.energy.gov/education/lessonplans/>

<http://www.eia.doe.gov/kids/classactivities/teachers&students.html#primary>

[http://www.kidwind.org/lessons/LESSON\\_energynotions.html](http://www.kidwind.org/lessons/LESSON_energynotions.html)

<http://www.eia.doe.gov/kids/>

[http://www.hmns.org/exhibits/permanent\\_exhibits/energy.asp?r=1](http://www.hmns.org/exhibits/permanent_exhibits/energy.asp?r=1)

### IV. Staff Development Plan

Staff/professional development is a key component of the District's overall energy management program. Staff/professional development opportunities will be made available for faculty members and for employees with operational responsibilities (i.e. custodial/maintenance staff). Potential staff/professional development opportunities for faculty (and other interested staff that help support the program) include:

- Courses, workshops, seminars offered by KEEP
- Courses, workshops, seminars offered by Wisconsin Focus on Energy
- Selected conferences

In addition, the District's website will be utilized to increase student, staff and community awareness of energy conservation/sustainability and provide helpful energy-related information/resources.

#### **V. Involving Building Occupants**

- Teachers incorporating energy into lessons
- Involve custodians in energy tours of their schools and, where applicable, use of renewable energy technologies (i.e. wind turbines and Photovoltaic Panels at East)
- Incorporate school nurse and office personnel
- Students will be more energy aware and ask teachers to turn down lighting, etc. i.e. act as energy police
- Involve school nutrition service personnel in use of energy in the preparation of food
- Involve facilities service personnel in presentation about different lighting options in school
- Involve coaches, club advisors and other non-staff user of District facilities in reducing energy use
- Custodians inform users of recycling rules
- Administrators are supportive of energy conservation initiatives

#### **MONITORING AND REPORTING**

##### **Energy Management**

For a school district, the process of gathering, sorting, evaluating and disseminating energy information is a critically important aspect of building management - one that routinely requires diligence at every turn. In the Wausau School District (WSD), these responsibilities fall mainly to the District Energy coordinator and the Director of Maintenance. There exist some database functions that require close attention on a daily and monthly basis. Currently, the energy coordinator is working with the energy committee to put in a user friendly energy monitoring system that can be accessed by anyone on the web. The cost of the hardware and software is approximately \$20,000. To date, \$6196 have been raised.

Specific information will include feedback on energy education plan, use of lesson plans provided to teachers, feedback on KEEP 734 course, and continual monitoring of webpage access. Initial data will be gathered at the beginning of the 2012-2013 school year through surveys provided to teachers. Energy Committee members will meet and discuss progress quarterly. Teachers will be surveyed again at the end of the 2012-2013 school year and committee will determine whether or not more surveys need to occur. It is the goal of the Committee to be involved with tracking information for 2

school years. After that period of time, it is expected that teachers will take the initiative to research additional lessons or resources needed to implement added energy education topics. Results involving energy education will be shared with staff, administration and school board members. Information will be posted on the Wausau School District Web page and articles will be submitted to the local newspaper.

Reports will be created using pre and post surveys given to Wausau staff members. After these surveys are completed, results will be posted on the Wausau School Web page. Information will also be shared with principals and superintendent, as well as school board members.

Data-based utility information is compared against baseline figures every month and pertinent reports are subsequently distributed amongst a host of users. Percentage increases and/or decreases are given to school principals, head custodians and maintenance personnel for the purpose of keeping these groups up-to-date on the progress being made at their individual sites. The Director of Maintenance is responsible for the utility information and keeps us updated. In addition, data on meters and trending patterns serve as appropriate indicators of possible problems, allowing for scheduling changes or repairs to energy systems such as HVAC and lighting systems. Also, reports are filed with the senior administrators and the Board of Education for their review and analysis. Inevitably, this function should be extended to the educational sector for use by teachers and students in the classroom setting.

Data is transferred to user groups in various ways. General staff meetings and e-mails are currently the preferred methods used to inform staff of both performance and operational directives. In the future, the District's website will be a more active vehicle for the delivery and availability of information relating to the District's mission with regard to energy conservation and such concepts as sustainability and renewable energy. The Energy coordinator's role in monitoring, reporting and coordinating this effort is central to the overall success of the District's energy program. The advent of the KEEP program and its connection to this mission could bring many more stakeholders closer to this ongoing project and increase involvement in all areas.

### **Energy Education Initiatives/Plan**

The Assistant Superintendent of Educational Services will have the responsibility of overseeing the District's energy education initiatives with assistance from the Energy Committee and coordinate the energy education initiatives/plan with

the appropriate curriculum committees. The Wausau East Principal, Dr. Brad Peck, will be responsible for supporting, monitoring and reporting on energy education initiatives at the school level. The Energy Committee is currently seeking teachers from each school in the District to be on the Energy Committee.

## **SUSTAINING ENERGY INITIATIVES**

The Wausau School District has a long-standing commitment to energy conservation. This commitment includes the allocation of appropriate resources needed to support the District's energy initiatives. One of the most important investments made by WSD to coordinate its energy initiatives is the position of Energy coordinator. The District's Energy coordinator will be responsible, with support and guidance from the District's Sustainability Committee and consultants/partners (i.e. Seventh Generation, North Central Technical College), for facilitating the implementation of the School Energy Policy and Education Plan.

Additional funding, derived from grants will be allocated to provide on-going support for and to sustain energy initiatives. The Energy Coordinator and Assistant Superintendent of Educational Services will develop, with input from the Energy Committee, a budget to support energy education and other sustainability initiatives. The budget should include funding to support:

- ✓ Periodic meetings of the Energy Committee
- ✓ Professional Development
- ✓ Curriculum Development
- ✓ Grants for pilot energy projects or initiatives (student-focused)
- ✓ Start-up costs (i.e. supplies, equipment) for implementation of curriculum resulting from the energy education plan

***NR 734: School Building Energy Efficiency  
WI K-12 Energy Education Program (KEEP)***

***Action Plan***

*Submitted by: Lauren A. Ebbecke*

*Wausau East High School*

*Science*

*November 13, 2011*

***Action Plan Summary:***

The purpose of my plan is to work with the task force to complete the School Energy Policy and Education Plan by December 31, 2011. My plan will also include working with the School Energy committee (comprised of one faculty member from each department) in identifying what is currently being taught regarding energy and identify the gaps. We as a staff will be looking at ways to incorporate teaching energy conservation as well as review all renewable energy curricula currently being taught at Wausau East.

***Introduction to the Audience:***

Wausau High School is a school that has an enrollment around 1300 students and approximately 60 staff. Teachers, administrators, custodial, students, and parents can use the data from our website to not only learn about energy conservation but alternative renewable energy specifically wind and solar.

***Statement of Problem:***

In 2010, Wausau East was fortunate to establish the Wausau School District Renewable Energy Outdoor Learning Center which includes a Northwind 100 kwh, Bergey 10 kwh, a2 kwh fixed solar PV system and 2 kwh tracking solar PV system. This equipment will be used by Wausau East students and teachers, as well as by students and teachers across the District and central Wisconsin to study lessons in science, technology, and mathematics. While this Center was established because of a generous gift from the Walter Alexander Foundation, there is no energy education plan in place. The staff feels the need to better prepare students to become tomorrow's decision makers on issues such as climate change and alternative energy sources by implementing a school energy policy and education plan. We know that continued success depends on providing students with hands-on authentic learning opportunities that are relevant to issues of today and the future. It was stated in the past that "the main benchmarks of success will be a well-developed School Energy Educational plan with the successful completion of installation of alternative energy sources; the success of future grant writing; and essentially having all of the resources, information, and support, in order to implement a renewable energy education program that would include educational equipment such as the Pedal Power display (Energy Cycle), PV panels, wind turbines and curriculum". Once the School Energy Policy and Education Plan is completed for Wausau East, we will use it as a template for the rest of the school district as we assist other schools in managing their energy use wisely and efficiently.

***Project Goals and Objectives:***

The main goal of this action plan is to complete the School Energy Policy and Education Plan by December 31, 2011 and establish a K-12 subcommittee to review energy curricula in the District. This will be done by:

- Working with the School Education Task Force to complete the plan and present both the plan and the policy to the Board of Education.
- Work with the Wausau East Energy Committee in identifying current energy curricula as well as gaps.
- Finish fund raising for the monitoring/website for the Wausau Renewable Energy Outdoor Learning Center for everyone to access and use the data.
- Establish the K-12 Energy Education subcommittee in the Wausau School District.

***Methods and Timeline:***

I will meet with my task force weekly as we complete the Energy Policy and Educational Plan for Wausau East as well as the School Energy Committee.

**November:** Continue working with committees on Energy Policy and Educational Plan

**December:** Finalize Energy Policy and Educational Plan and present it to the Board of Education.

**January-May:** On-going work with Energy Committee to implement the plan.

One hour of in-service for the Task Force to report Progress and where we are going with the Energy Educational Plan.

**April:** Earth Day celebration with Energy Theme and possible Energy training workshops. Inservice or District wide science committee to discuss and evaluate progress of the Educational Plan.

**May:** Articles in newspaper and school paper

***Evaluation Criteria and Process:***

Once a month we will meet with the k-12 Energy Committee to discuss progress on implementing the plan and evaluate current energy curricula. In addition, I will survey all members involved and provide feedback as we implement the plan. Finally, we have submitted articles to the District News as well as the School Newspaper describing this project.

***Budget:***

There is no existing budget to support this plan, however most of the work would be done in house with our own district employees. For the monitoring costs, it has been bid out and came back at approximately \$21,000. Our administration currently has the bids and I can certainly send them to you in January once they make a final decision on who wins the bid. Currently, I have raised \$6,800 and I am working with our partner Northcentral Technical College to help fundraise the rest.

January 3, 2012

Dennis Wald  
East High School  
650 S 7th Ave  
Wausau, Wisconsin 54403

Re: Energy Audit Result

Dear Mr. Wald:

Thank you for participating in the Focus on Energy Schools and Government Program. Focus on Energy works with eligible Wisconsin residents and businesses to install cost effective energy efficiency and renewable energy projects. Focus information, resources and financial incentives help to implement projects that otherwise would not be completed, or to complete projects sooner than scheduled. Its efforts help Wisconsin residents and businesses manage rising energy costs, promote in-state economic development, protect our environment and control the state's growing demand for electricity and natural gas.

Not only can Focus on Energy help you reduce costs and save energy, but by making energy efficient improvements, you can improve occupant comfort and productivity and enhance your reputation as an environmentally friendly organization. The following energy survey is the first step in understanding your energy savings potential. Based on our site assessment, we have identified some opportunities for you to address; it examines miscellaneous systems and operations as well as overall energy consumption at your facility. It also gives us a better understanding of the opportunities to determine what next steps should be considered to accomplish your energy efficiency objectives.

For some it is getting a quote or estimating the costs for a specific upgrade; for others it is integrating the opportunities into an overall facility plan that can now include the following energy efficient recommendations. In either case, Wisconsin Focus on Energy staff is available to answer additional questions and/or to help facilitate the implementation of energy efficient measures.

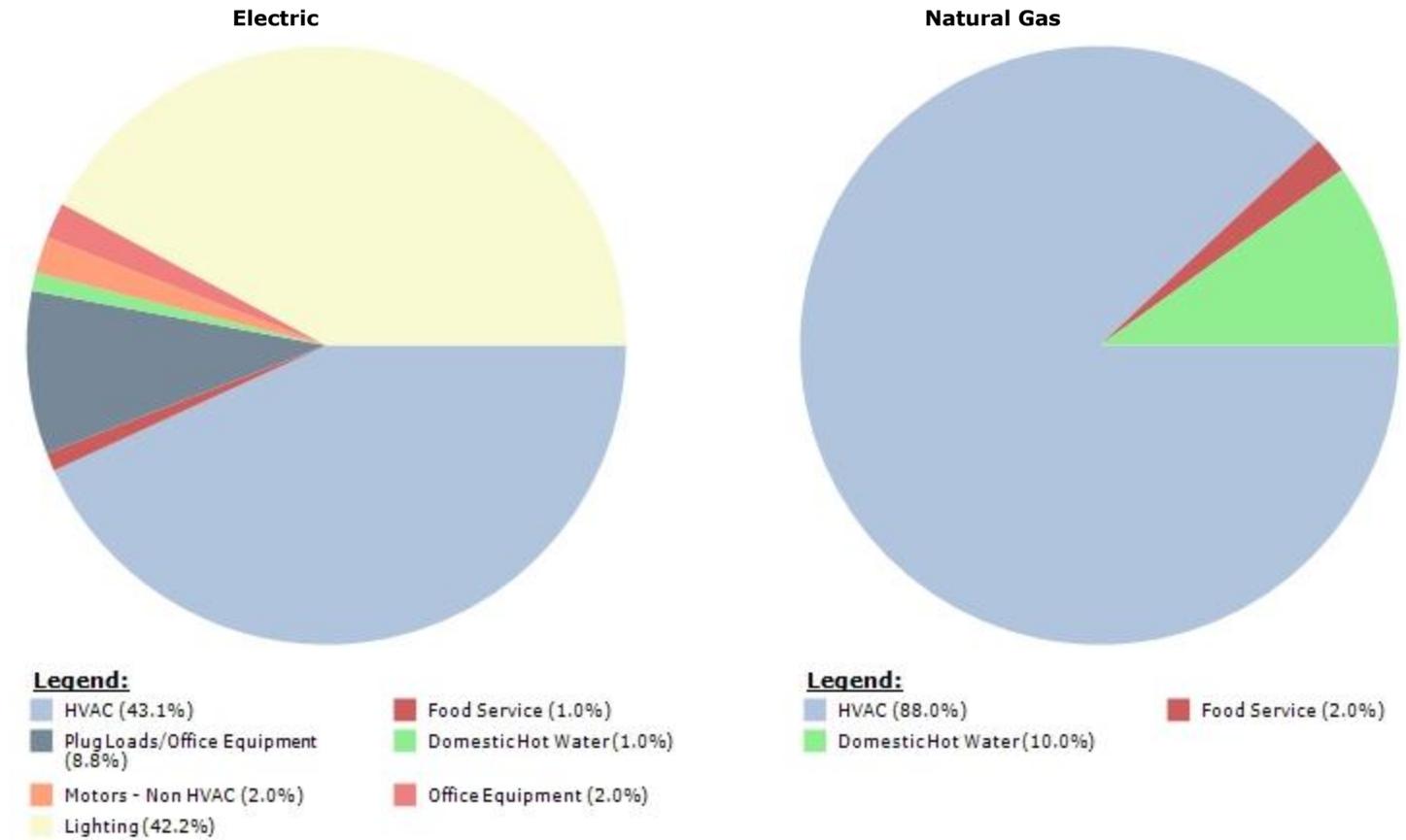
Please contact me with any questions regarding our energy survey or potential projects. Again, thank you for your participation in the Schools and Government Program; we appreciate your support and interest to control energy consumption at your facility.

Sincerely,

Don Keck  
Energy Advisor

About Focus on Energy - Focus on Energy works with eligible Wisconsin residents and businesses to install cost-effective energy efficiency and renewable energy projects. Focus information, resources, and financial incentives help to implement projects that otherwise would not be completed, or to complete projects sooner than scheduled. Its efforts help Wisconsin residents and businesses manage rising energy costs, promote in-state economic development, protect our environment, and control the state's growing demand for electricity and natural gas. For more information, call 800.762.7077 or visit [focusonenergy.com](http://focusonenergy.com).

## Typical End Use Profile



**Typical Facility Annual Energy Usage**

	Electric %	Natural Gas %	Electric kWh	Natural Gas Therms	Electric Cost	Natural Gas Cost
HVAC	44.0%	88.0%	708,129	110,124	\$65,148	\$77,197
Food Service	1.0%	2.0%	16,094	2,503	\$1,481	\$1,754
Plug Loads/Office Equipment	9.0%	0.0%	144,845	0	\$13,326	\$0
Domestic Hot Water	1.0%	10.0%	16,094	12,514	\$1,481	\$8,772
Motors - Non HVAC	2.0%	0.0%	32,188	0	\$2,961	\$0
Office Equipment	2.0%	0.0%	32,188	0	\$2,961	\$0
Lighting	43.0%	0.0%	692,036	0	\$63,667	\$0
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>1,609,385</b>	<b>125,141</b>	<b>\$148,063</b>	<b>\$87,724</b>

Your facility uses 4.82 kWh/sq. ft./yr and 0.37 therms/sq. ft./yr and 53.91 kBtu/sq. ft./yr

## Energy Conservation Opportunities Estimated Savings Summary

Opportunity Description	Electric Energy (kWh/yr)	Fuel Energy (therms/yr)	Payback (yrs)	Cost savings	Priority
1.0 Lighting - Classrooms Custom Fluorescent Recommendation	120,000		4-10	\$11,040	High
2.0 Lighting - Hallways Custom Fluorescent Recommendation	120,000		4-10	\$11,040	High
3.0 Lighting - Wing Locker Areas Custom Fluorescent Recommendation	41,000		4-10	\$3,772	High
4.0 Lighting - Bathrooms Custom Fluorescent Recommendation	20,000		4-10	\$1,840	High
5.0 Lighting - Computer Rooms Custom Fluorescent Recommendation	20,000		4-10	\$1,840	High
6.0 Plug Loads/Office Equipment - Turn off the hallway TVs when the building is unoccupied	10,000		0	\$920	High
7.0 Food Service - Kitchen Exhaust System - Reduce operating hours of the exhaust hoods over the warmers	1,300	630	0	\$561	High
8.0 Food Service - Replace the evaporator motors with ECM type in the walk-in cooler and freezer	50,000		1-2	\$5,000	High
<b>TOTALS</b>	<b>382,300</b>	<b>630</b>		<b>\$35617</b>	

The summary list above includes a number of recommended energy conservation measures for your facility. This list may include overlapping conservation measures. For example, replacement of a boiler with a high efficiency boiler would negate the savings of replacing the burner in the current boiler.

The summary list indicates that if all measures are implemented the total kWh savings is 382,300 which equals 24% of the current annual kWh usage of 1,609,385 kWh, and 630 therms which equals 1% of the current annual therm usage of 125,141 therms.

Be aware that the total savings and percentage of savings is an estimate based on average savings for specific measures which may require adjustments based on possible overlapping conservation measures.

### Wisconsin Focus on Energy Program

The Wisconsin Focus on Energy program is designed to assist Wisconsin natural gas and electric utility customers in the identification and implementation of cost effective, energy efficient facility improvements. These services range from assistance in the initial identification of projects through the bidding and installation. Wisconsin Focus on Energy provides an unbiased consultant's perspective when offering assistance.

Wisconsin Focus on Energy is considered a public benefit. Any comments or concern about the program are encouraged, as we hope to continue to better serve the businesses of Wisconsin. We here

at Wisconsin Focus on Energy thank you for becoming a partner and holding an interest in energy efficiency.

Participation in the program is voluntary. Wisconsin Focus on Energy staff pledge to work with participants to the extent that the opportunities exist and that the partner wants to proceed toward implementation. Opportunities presented within the scope of this preliminary report are best opinions of savings and costs. However, further technical assistance is available for detailed studies that might be required for capital investment and decision-making. For more information please visit our website at [www.focusonenergy.com](http://www.focusonenergy.com)

## UTILITY BILLING HISTORY

### Electricity

Billing Month	Account Number	kW	kWh	Total Amount	\$/kWh
30-Dec-2011		401	129,591	\$15,618	\$0.121
29-Nov-2011		362	113,187	\$7,736	\$0.068
29-Oct-2011		588	150,972	\$16,473	\$0.109
28-Sep-2011		655	173,994	\$17,288	\$0.099
28-Aug-2011		474	127,685	\$12,117	\$0.095
28-Jul-2011		555	129,137	\$14,242	\$0.110
29-Jun-2011		597	143,476	\$15,675	\$0.109
29-May-2011		580	135,023	\$11,289	\$0.084
29-Apr-2011		389	117,941	\$9,652	\$0.082
29-Mar-2011		389	123,463	\$8,520	\$0.069
26-Feb-2011		391	134,146	\$8,447	\$0.063
28-Jan-2011		416	130,770	\$10,621	\$0.081
<b>TOTAL</b>			1,609,385	\$147,678	

**Average Electricity Rate: \$0.092**

### Natural Gas

Billing Month	Account Number	Therm	Total Amount	\$/therm
30-Dec-2011		16,816	\$11,227	\$0.67
30-Nov-2011		12,958	\$8,513	\$0.66
30-Oct-2011		6,012	\$3,425	\$0.57
30-Sep-2011		1,324	\$842	\$0.64
30-Aug-2011		379	\$321	\$0.85
30-Jul-2011		346	\$305	\$0.88
30-Jun-2011		2,232	\$1,412	\$0.63
30-May-2011		9,542	\$5,908	\$0.62
29-Apr-2011		13,208	\$10,037	\$0.76
30-Mar-2011		16,460	\$12,288	\$0.75
28-Feb-2011		21,920	\$16,431	\$0.75
31-Jan-2011		23,945	\$16,971	\$0.71
<b>TOTAL</b>		125,141	\$87,678	

**Average Gas Rate: \$0.70**

**1. Lighting - Classrooms Custom Fluorescent Recommendation**

The classrooms are over illuminated. The existing 2' x 4' 3 lamp T8 light fixtures are placed on 8' x 8' or 8' x 6' centers. This is an excessive amount of light for these classrooms. Install lower ballast factor program start ballasts and 25 or 28 watt 5000K lamps to maximize efficiency.

<b>EXISTING CONDITIONS</b>		<b>RECOMMENDATION SAVINGS POTENTIAL</b>	
<b>Location</b>		<b>Location</b>	
Classrooms		Classrooms	
End Use	Lighting	Electric Energy Savings (kWh/yr)	120,000
Type	Fluorescent	Gas Energy Savings (therm/yr)	
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$11,040
Custom Fluorescent Recommendation		Gas Cost Savings (\$/yr)	
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$11,040
% savings electric	30.00000	Payback (yrs)	
% savings gas	0.00000	Electric GHG Savings (tons/yr)	101
Priority	High	Gas GHG Savings (tons/yr)	
<b>Priority Rationale:</b>			
	Acceptable		
	Payback Period		
Grants Available?	Yes		

**2. Lighting - Hallways Custom Fluorescent Recommendation**

The hallways are over illuminated. The existing 1' x 4' 2 lamp T8 light fixtures are not very efficient. 2' x 4' 2 lamp T8 light fixtures let out significantly more light. Have a lighting professional evaluate the design and develop a new lay out that is more efficient with fewer light fixtures. Install light fixtures with lower ballast factor program start ballasts and 25 or 28 watt 5000K lamps to maximize efficiency.

<b>EXISTING CONDITIONS</b>		<b>RECOMMENDATION SAVINGS POTENTIAL</b>	
<b>Location</b>		<b>Location</b>	
Hallways		Hallways	
End Use	Lighting	Electric Energy Savings (kWh/yr)	120,000
Type	Fluorescent	Gas Energy Savings (therm/yr)	
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$11,040
Custom Fluorescent Recommendation		Gas Cost Savings (\$/yr)	
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$11,040
% savings electric	30.00000	Payback (yrs)	
% savings gas	0.00000	Electric GHG Savings (tons/yr)	101
Priority	High	Gas GHG Savings (tons/yr)	
<b>Priority Rationale:</b>			
	Acceptable		
	Payback Period		
Grants Available?	Yes		

### 3. Lighting - Wing Locker Areas Custom Fluorescent Recommendation

The wing locker areas are over illuminated. The existing 1' x 4' 2 lamp T8 light fixtures are not very efficient. 2' x 4' 2 lamp T8 light fixtures let out significantly more light. Have a lighting professional evaluate the design and develop a new layout that is more efficient with fewer light fixtures. Install light fixtures with lower ballast factor program start ballasts and 25 or 28 watt 5000K lamps to maximize efficiency.

EXISTING CONDITIONS		RECOMMENDATION SAVINGS POTENTIAL	
<b>Location</b>		<b>Location</b>	
Wing Locker Areas		Wing Locker Areas	
End Use	Lighting	Electric Energy Savings (kWh/yr)	41,000
Type	Fluorescent	Gas Energy Savings (therm/yr)	
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$3,772
Custom Fluorescent Recommendation		Gas Cost Savings (\$/yr)	
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$3,772
% savings electric	10.00000	Payback (yrs)	
% savings gas	0.00000	Electric GHG Savings (tons/yr)	34
Priority	High	Gas GHG Savings (tons/yr)	
<b>Priority Rationale:</b>	Acceptable		
	Payback Period		
Grants Available?	Yes		

### 4. Lighting - Bathrooms Custom Fluorescent Recommendation

The bathrooms are over illuminated. The existing 1' x 4' 2 lamp T8 light fixtures are not very efficient and there are too many of them. 2' x 4' 2 lamp T8 light fixtures let out significantly more light. Have a lighting professional evaluate the design and develop a new layout that is more efficient with fewer light fixtures. Install light fixtures with lower ballast factor program start ballasts and 25 or 28 watt 5000K lamps to maximize efficiency.

EXISTING CONDITIONS		RECOMMENDATION SAVINGS POTENTIAL	
<b>Location</b>		<b>Location</b>	
Bathrooms		Bathrooms	
End Use	Lighting	Electric Energy Savings (kWh/yr)	20,000
Type	Fluorescent	Gas Energy Savings (therm/yr)	
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$1,840
Custom Fluorescent Recommendation		Gas Cost Savings (\$/yr)	
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$1,840
% savings electric	5.00000	Payback (yrs)	
% savings gas	0.00000	Electric GHG Savings (tons/yr)	17
Priority	High	Gas GHG Savings (tons/yr)	
<b>Priority Rationale:</b>	Acceptable		
	Payback Period		
Grants Available?	Yes		

### 5. Lighting - Computer Rooms Custom Fluorescent Recommendation

The computer rooms are over illuminated. The existing 2' x 4' 3 lamp T8 light fixtures are placed on 8' x 6' centers. This is an excessive amount of light for these classrooms. Retrofit the fixtures to 2 lamps and install lower ballast factor program start ballasts and 25 or 28 watt 5000K lamps to maximize efficiency.

EXISTING CONDITIONS		RECOMMENDATION SAVINGS POTENTIAL	
<b>Location</b>		<b>Location</b>	
Computer Rooms		Computer Rooms	
End Use	Lighting	Electric Energy Savings (kWh/yr)	20,000
Type	Fluorescent	Gas Energy Savings (therm/yr)	
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$1,840
Custom Fluorescent Recommendation		Gas Cost Savings (\$/yr)	
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$1,840
% savings electric	5.00000	Payback (yrs)	
% savings gas	0.00000	Electric GHG Savings (tons/yr)	17
Priority	High	Gas GHG Savings (tons/yr)	
<b>Priority Rationale:</b>	Acceptable		
	Payback Period		
Grants Available?	Yes		

### 6. Plug Loads/Office Equipment - Turn off the hallway TV's when the building is unoccupied

These TV's are left on 24/7. This is unnecessary and also decreases the TV life time. Add controls to shut them down when the building is unoccupied.

EXISTING CONDITIONS		RECOMMENDATION SAVINGS POTENTIAL	
<b>Location</b>		<b>Location</b>	
Hallways		Hallways	
End Use	Plug Loads/Office Equipment	Electric Energy Savings (kWh/yr)	10,000
Type		Gas Energy Savings (therm/yr)	
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$920
Custom Plug Load Recommendation		Gas Cost Savings (\$/yr)	
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$920
% savings electric	7.00000	Payback (yrs)	
% savings gas	0.00000	Electric GHG Savings (tons/yr)	8
Priority	High	Gas GHG Savings (tons/yr)	
<b>Priority Rationale:</b>	Low Cost/No Cost		
Grants Available?	No		

### 7. Food Service - Kitchen Exhaust System - Reduce Operating Hours

Reduce operating hours of exhaust systems over the warming ovens. They were running on a day when the school was not in use. The purpose of these exhaust systems is to draw air from the kitchen, but in practice they draw already conditioned air from the interior

EXISTING CONDITIONS		RECOMMENDATION SAVINGS POTENTIAL	
<b>Location</b>		<b>Location</b>	
Kitchen		Kitchen	
End Use	Food Service	Electric Energy Savings (kWh/yr)	1,300
Type		Gas Energy Savings (therm/yr)	630
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$120
Kitchen Exhaust System - Reduce Operating Hours		Gas Cost Savings (\$/yr)	\$442
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$561
% savings electric	8.00000	Payback (yrs)	
% savings gas	25.0000	Electric GHG Savings (tons/yr)	1
Priority	High	Gas GHG Savings (tons/yr)	4
<b>Priority Rationale:</b>			
	Low Cost/No Cost		
Grants Available?	No		

### 8. Food Service - Replace the evaporator motors with ECM type in the walk-in cooler and freezer

A refrigeration system service increases your system efficiency and performance by repairing and maintaining issues which are adversely affecting performance. A typical service will include filter replacement, valve setting, etc and ensure optimal component life.

EXISTING CONDITIONS		RECOMMENDATION SAVINGS POTENTIAL	
<b>Location</b>		<b>Location</b>	
Kitchen		Kitchen	
End Use	Walk-in cooler and freezer	Electric Energy Savings (kWh/yr)	50,000
Type		Gas Energy Savings (therm/yr)	
<b>Recommendation:</b>		Electric Cost Savings (\$/yr)	\$5,000
Refrigeration System Maintenance		Gas Cost Savings (\$/yr)	
% ECM Opportunity	100	Total Cost Savings (\$/yr)	\$5,000
% savings electric	15.0000	Payback (yrs)	1-2
% savings gas	0.00000	Electric GHG Savings (tons/yr)	40
Priority	High	Gas GHG Savings (tons/yr)	
<b>Priority Rationale:</b>			
	Acceptable Payback Period		
Grants Available?	Yes		