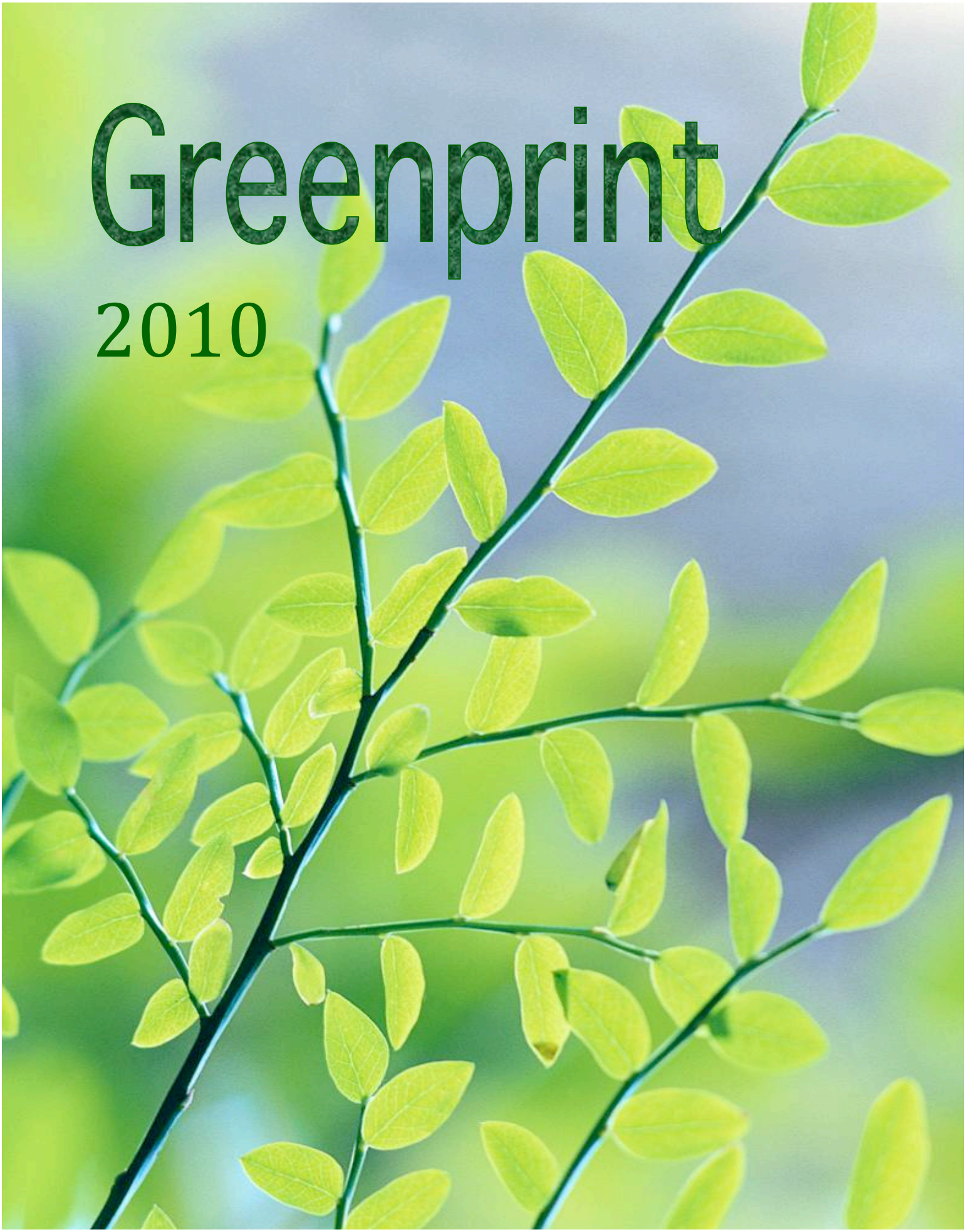
Greenprint
2010

GREENPRINT 2010

Written By the Class of 2013 at The Springfield Renaissance School

In collaboration with Joseph Forest, Facilities Engineer for the City of Springfield

THE SPRINGFIELD RENAISSANCE SCHOOL, GR. 6-12

An Expeditionary Learning School

*Respect *Courage *Responsibility *Friendship *Cultural Sensitivity *Perseverance *Self-Discipline

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INTRODUCTION

The class of 2013 at The Springfield Renaissance School has been doing research in order to create this Greenprint, which will help Springfield to become a more sustainable city. Renaissance is a school that believes in learning through experience. We have gone to four different elementary schools; Glenwood, Talmadge, Dorman, and Brunton, to evaluate the state of the buildings and to come up with ways to make them more sustainable. Sustainability is the main goal we want to achieve in helping the environment. To be sustainable means that we will be able to live and have little to no impact on the environment, or at least an impact that can be managed or offset. This is very important because global climate change is becoming a huge issue. It is a fact that the world is in a state of emergency considering the use of energy in the planet. Cities around the world are trying to become more energy efficient and environmentally friendly in an effort to reduce global climate change. From the high politicians to The Springfield Renaissance School, steps are being taken and initiatives are being created. Global climate change is especially potent due to the way that the Earth is changing, such as changes in temperature and rising sea levels. While the term global warming addresses one issue – rising temperatures – global climate change is the encompassing term that applies to any and all changes in climate. Over time, climate does change naturally. However, the warming and other problems that are occurring now are at a far higher rate than they have been in the past based on trends in collected data. If Springfield were to become more sustainable, it would not only decrease our carbon footprint, it would also save money. Our carbon footprint is the impact that our city's carbon emissions have on the environment. The smaller your carbon footprint, the lower your impact on the environment is. This footprint

is not only from obvious things, like burning greenhouse gases to fuel cars, but from less thought about actions and choices. When you flip a light switch, you may not know where that electricity comes from. It may have been produced in a coal burning power plant with very high emissions. Leaving that light on can cause more energy to be used, and so affect your carbon footprint. Initiatives such as using higher efficiency heating and cooling systems in schools will reduce our CO_2 emissions and our carbon footprint. In 2005, the average carbon footprint of a Springfield resident was 2.45 metric tons of carbon emissions. In the same year, the average for Honolulu, Hawaii was 1.36 metric tons, and the average for Lexington-Lafayette, Kentucky was 3.46 metric tons. This places Springfield solidly in the middle of the average carbon footprints for American cities. However, if we take action now, we can work towards making it into the ranks of cities with the lowest emissions, like Honolulu or Los Angeles.

The city of Springfield has already begun to take action against global climate change. With the initiatives and ECMs from last year's Green Plan and the actions recently taken to make the Barney Carriage House and other locations more energy efficient, Springfield is working toward being a greener city. The purpose of this Greenprint is to help Springfield do this by being more energy efficient, cutting costs, and being more eco-friendly. There are also ECMs (Energy Conservation Measures) from each of the four different Springfield schools we went to that will help to improve the sustainability of the schools. These ECMs are the ways that we will work to conserve energy. With less wasted energy, they will reduce the costs for fuel. With more awareness and more sustainable practices, the city of Springfield can make a difference in fighting global climate change.

Daniel B. Brunton Elementary School

For this school, students from Renaissance's section 9.2 visited Brunton and investigated three systems in need of improvement. Their visit brought to light several problems, which – if not corrected – may cause students to have a work environment not conducive to learning. At the same time, the class observed that these inefficient practices are costing the city more money than necessary, and causing a greater environ-mental impact than other practices would create. If these problems are correc-ted, the city can save money, resources, and help students to learn better.

Daniel B. Brunton Elementary School is located at 1801 Parker Street in Springfield, MA. The school offers classes for children from preschool to fifth grade. Their hours are 8:55 am to 3:10 pm, Monday through Friday. Custodians are there from 6 am to 11 pm. The school has around 610 students and 52 teachers. The building is one floor with a basement for the boiler room and pipes, and in total it is 53,812 square feet. It was built around the year 1959, with an addition created in 1974. Many fixtures in the building are the originals from 1959. Others from 1974 are still outdated. On the walk through, we started by investigating the building envelope, which consists of all of the windows and doors on the building, whose job is to protect the school from the elements. Many doors are broken or lacking weather stripping. Without stripping, there are large gaps between the door and the floor, which allows cold air in. While the single pane windows in the building have sufficient caulking, several are cracked or broken. In

addition to this, many were open during the walk through. The walk through was on January 26, 2010. The open windows in the middle of winter were a hint at another problem within the building; it was overheated. Inside, the boiler was still being run at 9:17 in the morning, even though the temperature was comfortable or too hot in every room. On the clock system that was intended to control the boiler, the tabs were broken off, meaning that the boiler was always on unless manually turned off. Another problem, if a slight one, was the lack of a vending miser for the soda machine in the teachers' lounge. This means that the machine was constantly keeping sodas cool, even when no one was around.

Because of these inefficiencies, the class has decided on two ECMs. The first is to install a vending miser in the teachers' lounge. The second and perhaps most important ECM is to put all of the current heating and cooling components on a web-based energy management system. The main point of all of these things is to save energy and money, and to go green.

Energy Conservation Measure 1: Vending Miser

Existing Conditions:

One soda machine in the teachers' lounge has no vending miser. This means that it is constantly running when no one is there.

Proposed System:

A vending miser should be installed. This has a motion sensor, which will make it so the machine only cools drinks when necessary, and doesn't waste energy.

Proposed Scope Of Work:

- Install vending miser

Energy Savings Calculations:

750 kwh X $0.20 = $150/yr

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Cost Savings Analysis:

Installation cost	$300
WMECo Rebate	$50
Total	$250
Annual Savings	$150
Payback/years	1.67yrs

Energy Conservation Measure 2: Energy Management System

Existing Conditions:

There are two boilers, one regularly used and one as a backup. These both run at 100% power, which means they heat the entire school with one boiler. They can run on either oil or natural gas. The one used regularly is on 24/7 in the winter in order to keep the pipes from freezing and maintain the building's temperature. It is manually controlled. In the gym, there are two Air Handling Units and two Exhaust Fans, also manually controlled. AHUs are used to maintain temperature in the 1974 addition. These are also manually controlled. The upper and lower fresh air make up in the boiler room are both broken and rusted. The boilers are currently only 75% efficient, which means a quarter of the heat they produce is wasted.

Proposed Systems:

For this situation, a web-based energy management system is needed. With this system, all of the heating and cooling features will be controlled through a computer. Twelve averaging sensors would be placed throughout the building to monitor temperature throughout the building. There would also be a way to monitor the stop/start/status, so they can tell whether or not it is running.

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Cost-Savings Analysis:

Install web based EMS	$62,855
Mechanical Contractor	$5,000
Asbestos Abetment testing	$4,500
Estimated Bay State Gas Incentive	$10,000
Estimated Western Mass Rebate	$5,000
Total Cost	$57,355

Estimated Energy Savings

Oil Reduction: 2,300 gallons @ $2.00/gallon = $4,600

Electrical:

Media Center AHU 2 -3hp motor @ 4.222kw X $0.20/kwh X 2,555 hrs= $2,157

East Quad AHU 2 -3hp motor @ 4.222kw X $0.20/kwh X 2,555 hrs= $2,157

West Quad AHU 2 -3hp motor @ 4.222kw X $0.20/kwh X 2,555 hrs= $2,157

Gym AHU 1- 5hp motor @ 3.060kw X $0.20/kwh X 2,555 hrs = $1,564

Natural Gas	$4,600
Electricity	$8,035
Total Energy Saving	$12,635
Payback in Years	4.5 years

Hiram L. Dorman Elementary School

Hiram L. Dorman Elementary School is located at 20 Lydia Street in Springfield, MA 01109. The school was built in 1926 and the annex building was added in 1954 made with 8" concrete walls. The operating hours of the facility are 8:30 am to 3:45 pm.

Dorman School is about 34, 309 square feet and can hold between 200 and 300 students. The building is constructed of a brick exterior and has updated doors and windows with strong weather stripping. The two story building is heated by steam, and had two high efficiency boilers installed a few years back.

When the class of 2013 visited Dorman, we noticed many faults such as un-controlled, inconsistent temperatures, and vending machines constantly running without shutting off. On a

CONDITIONS AT THIS SCHOOL WERE INVESTIGATED BY SECTION 9.3. LIKE THE STUDENTS WHO VISITED BRUNTON, STUDENTS WHO SAW CONDITIONS HERE WERE ALSO NOT IDEAL FOR LEARNING. THEY SAW MUCH ROOM FOR IMPROVEMENT IN THE SCHOOL'S SYSTEMS, AND THEY PREPARED ECMS WITH WAYS TO DO SO.

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cold day in late January, we visited Dorman. While the school was warm, some parts of the building on the south side are warmer than others. This problem is caused because the heat is currently controlled by the custodian, and needs to be turned on and off manually. If an EMS (energy management system) were installed, the heating and cooling in the building would be able to be controlled by the web-based program. The second fault observed was when the vending machine was constantly running, wasting lots of energy when not in use.

Two energy conservation measures were reviewed at Dorman. The first area was the energy management system, and the second was the vending machine controls.

- The first energy conservation measure is to install an EMS, so the air in the building can be controlled easier. The proposed temperatures when the building is occupied would range from 68-72 degrees, and when the building is not occupied, the desired temperature would be 58-62 degrees.
- The second energy conservation measure is to install a vending miser so that when the vending machine is not in use, the miser will control the compressor to save energy.

Energy Conservation Measure 1: Energy Management System

Existing Conditions:

Dorman currently has two new boiler systems that are energy efficient and environmentally safe. The steam boilers are fueled by natural gas.

Proposed Conditions:

- Start, stop, stall, steam pressure to control boiler.
- Have classrooms become 68-72 degrees when occupied.
- 58-62 degrees when NOT occupied
- Control for uni-vent motors.
- Control of bathroom exhaust fans
- Uni-vents bring in cold air when boiler is not running.
- Replace compressor
- Need fresh-air make ups.

OPTION A - PARTIAL EMS:

NETWORKING TO THE CITY-WIDE EMS:

YANKEE TECHNOLOGY IS PROVIDING:

1. Automated Logic LGR (Lan Gate Router) networked to the building Ethernet for communications to the City-Wide EMS
2. Map all system points to the new WebCTRL with graphics on equipment and floor plans
3. Engineered drawings and as-builts
4. Owner training

EXISTING STEAM BOILERS (TYPICAL FOR 2):

YANKEE TECHNOLOGY IS PROVIDING:

1. Remove the existing pneumatic controls that will be replaced with DDC and cap the associated air lines
2. Map all new systems points to the new WebCTRL with the following hard wired points all listed below
3. (2) new combustion air dampers and actuators

YANKEE TECHNOLOGY IS **NOT** PROVIDING:

1. Existing boilers' factory safeties and operating controls will remain
2. Combustion air dampers to be installed by others

EXISTING DAY/NIGHT ZONING (TYPICAL FOR 8):

YANKEE TECHNOLOGY IS PROVIDING:

1. Provide a space temp sensor for each zone

PRICING:

	Parts and Panel Fab	$6,900
	Electrical Installation Labor and Materials	$17,570
	PM, Engineering, Software, Field Tech	$5,160
	Total	**$29,630**

ANNUAL ENERGY SAVINGS:

Oil reduction 2,000 gallons at $2.00 per gallon for an annual savings of $4,000

Cost Savings Analysis:

Installation cost	$29,630
Estimated Bay State Gas Incentive	$10,000
Total	$19,630
Annual Savings	$ 4,000
Payback/years	4.9 yrs

OPTION B – FULL EMS:

EXISTING UNIT VENTILATORS:

YANKEE TECHNOLOGY IS PROVIDING:

1. Remove the existing pneumatic controls that will be replaced with DDC and cap the associated air lines
2. Map all new system points to the City wide ALC WebCTRL
3. Furnish new Belimo 3-way modulating valve and actuator
4. Furnish and install (2) new damper actuators for OA, MA, and EA

YANKEE TECHNOLOGY IS **NOT** PROVIDING:

1. HW control valve to be installed by others
2. Dampers are existing and will be removed

EXISTING MISC. EXHAUST FANS (TYPICAL FOR 10)

YANKEE TECHNOLOGY IS PROVIDING:

1. Remove the existing pneumatic controls that will be replaced with DDC and cap the associated air lines
2. Map all new system points to the City wide ALC WebCTRL

CLASSROOM FINTUBE RADIATION (TYPICAL FOR 14)

YANKEE TECHNOLOGY IS PROVIDING:

1. Remove the existing pneumatic controls that will be replaced with DDC and cap the associated air lines
2. Map all new system points to the City wide ALC WebCTRL
3. Furnish new Belimo modulating valve and actuator

YANKEE TECHNOLOGY IS **NOT** PROVIDING:

1. HW control valve to be installed by others

PRICING:

Parts and Panel Fab	$13, 785
Electrical Installation Labor and Materials	$16, 560
PM, Engineering, Software, Field Tech	$6, 970
Total	**$37, 315**

ANNUAL ENERGY SAVINGS

10 - 1 HP motors @ 1.008 kwatts X 1,800 hrs/yr = 1,814.40 X $0.20 X 10 motors = $3,628.80

14 – ¼ HPmtors @ .300 kwatts X 3500 hrs/yr = 1,050 X $0.2 X 14 Motors = $2,940

Oil reduction 200 gallons @ $2.00 = $400

Total savings = $6,968.80

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Cost Savings Analysis:

Installation cost	$37,315.00
Estimated WMECO Incentive	$ 3,000.00
Total	$34,315.00
Annual Savings	$ 6,968.80
Payback/years	4.93 yrs

Energy Conservation Measure 2: Vending Miser

Existing Conditions:

Dorman currently has one vending machine which runs nonstop.

Proposed Conditions:

- Put a vending miser on the machine so when not occupied it saves energy.

Energy Savings Calculations:

750kwhs/ yr @ $0.20 = $150

Cost Savings Analysyis:

Cost: $300

Annual savings: $150

WMECO Rebate $ 50

Pay back 1.67 yrs

The total cost for a vending mister to be installed would be about $150 without the cost of installation included.

Glenwood Elementary School

When section 9.1 visited this school, they found conditions there in dire need of change. Working with Mr. Forest, they now propose two ECMs to help fix these problems. As you read these ECMs, as you plan the future of our city, think – if we do not act now, where will we be in the future? If we do not take action to help the environment and save money through conservation, will we be further in debt and in climate change within the next five years? As holders of the city's future, it is up to you to decide.

Glenwood Elementary School is located on 50 Morrison Terrace in Springfield, Massachusetts. This building's occupying hours are between 6:00am to 8:00pm due to both the custodians and school operating hours. This can change depending on if there are after school activities or other things. Glenwood was built in 1930. There are around 400 students and around 60 staff members in Glenwood Elementary.

As a class, we went to Glenwood and found some things that need to be changed. The building envelope was in good shape due to recently changed windows. However,

there were still some things inside that needed to improvement. For example, the vending machine needed a vending machine miser. Also, the school is in need of a city-wide energy management system for the boiler. Finally, controls for existing steam boilers, existing miscellaneous exhaust fans, and controls for fin tube radiation are needed.

Fixing these issues will help the school save a lot of money as well as help the environment. It will help the environment because less energy will be used and less energy will be wasted. This will also translate into saving money. As students, we think this is a great idea because everyone needs to be a part of helping our environment and saving our city money.

Energy Conservation Measure 1: Vending Miser

Existing Conditions:

There is one vending machine in the teachers' lounge that runs nonstop.

Proposed System:

A vending miser should be installed. The vending miser will help raise the temperature when needed and will control whether or not the vending machine will run by using a motion sensor to detect when someone is in the room.

Proposed scope of work:

1) Install vending miser.

Energy Savings Calculations:

750 kwh X $0.20 = $150/yr

Cost Savings Analysis:

Installation cost	$300
WMECo Rebate	$50
Total	$250
Annual Savings	$150
Payback/years	1.67yrs

Energy Conservation Measure 2: Energy Management System

Existing Conditions:

The current boiler is manual which has no controls and is frequently overheating. Existing pneumatic systems are obsolete and are not working properly. The unit ventilator motors work 24/7 with the exhaust fans as well.

Proposed Systems:

The proposed energy management system during the regular 7am-4pm operating hours, five days a week will heat the school at a temperature of 68 through 72 degrees. During unoccupied hours, the school will be heated between 58 through 62 degrees. The controls will be able to monitor whether or not the components of the heating and cooling system are running.

Proposed Scope of Work:

1. Install networking city-wide EMS.

2. Install controls for existing steam boilers.

3. Install existing misc. exhaust fans.

4. Install controls for classroom fin tube radiation.

Energy Saving Calculations:

1,600(gallons/ oil)X $2.00/gallon = $3,200

Option A – Basic EMS

Cost-Savings Analysis:

Basic EMS	$23,545
Bay State Gas Incentive	-$10,000
Total	$13,545
Annual Savings	$ 3,200
Payback/years	4.2 years

OPTION B –FULL EMS:

Full EMS	$38,520
WMECo Rebate	-$3,000
Total cost	$35,520
Annual savings	$6,640

ANNUAL ENERGY SAVINGS

6 - 1 HP motors @ 1.008 kwatts X 2555 hrs/yr = 2,575.440 X $0.20 X 6 motors = $3,090

15 – ¼ HP motors @ .300 kwatts X 3500 hrs/yr = 1,050 X $0.2 X 15 Motors = $3,150

Oil reduction 200 gallons @ $2.00 = $400

Total savings = $6,640

COST SAVINGS ANALYSIS:

Installation cost	$35,520
Annual Savings	$ 6,640
Payback/years	5.35 yrs

Arthur T. Talmadge Elementary School

Arthur T. Talmadge Elementary School is located at 1395 Allen Street in Springfield, Massachusetts. The school's operating hours are from 8:55 AM to 3:55 PM, Monday thru Friday. Built in 1954, it is a single- story building constructed of a concrete block exterior with a brick veneer and single pane windows with aluminum frames. The roof is the original asphalt and gravel built-up roof above tectum plank. All doors and windows are original since construction.

The school is 37,055 square feet and currently holds 314 students along with 25 staff members. The school is heated by oil, with one original H.B. Smith 640 Mills oil-fired hot water

THIS SCHOOL WAS INVESTIGTED BY RENAISSANCE'S SECTION 9.4. WHILE IN THE SCHOOL, THEY HEARD COMPLAINTS FROM STAFF AND STUDENTS ABOUT THE TEMPERATURES IN THE BUILDING. THEY HAVE SINCE WORKED TO FIND COST-EFFICIENT WAYS TO MAKE TIS SCHOOL A BETTER, GREENER, LEARNING ENVIRONMENT.

"IF I WERE IN THE TALMADGE SCHOOL AND I HAD TO DEAL WITH THE HEAT, I WOULD NOT WANT TO LEARN. THIS COULD HAPPEN TO OTHER STUDENTS IF WE DON'T TAKE ACTION ON THE CONTROL OF THE BOILERS."

-A 9.4 STUDENT

boiler that has been used since the school first opened. Our class visited Talmadge in late January 2010 to see many faults throughout the building. The exterior doors have large gaps, causing cold air to seep through. All of the windows are original and need replacement and are also allowing even more cold air inside.

We reviewed three energy conservation measures in this building. The first area is in the school's teacher's lounge to review the vending machine. We found that the machine is running constantly day and night. The second area is the school's exterior to review the current state of all the doors. We found here that all three doors (single & double) have large gaps on the bottom that are allowing cool air indoors. The third area is in the school's basement to review the boilers. We found that the boilers are manually run and are left on from September then turned off in April and run nonstop for that entire time period. If the school installed a vending miser, this control will safely shut off the machine when no one is around without affecting the temperature of beverages, thus solving one situation to make the school eco-friendly. By installing weather stripping on all exterior doors, it could allow less or no cool air in, resulting in having to use less energy to heat the building. By installing an EMS (Energy Management System) to control the boilers, the benefits would be extremely positive for the school. Because the EMS can monitor the heating and cooling fixtures in a building, when there is a problem with a fixture it can be seen through a computer, and corrected more effectively. There will also be less unnecessary heat exerted and so the students will be educated in a better learning environment.

Energy Conservation Measure 1: Building Envelope

Existing Conditions:

There are 14 wooden single doors and 2 double doors, all exterior. These doors have gaps underneath them and they are letting the heat out in the winter and the cold out in the spring and summer. Some of the doors are damaged along with the windows and roof. Right now Talmadge has to open the windows in winter because it's too hot inside and the cold air will come in to cool it down.

Proposed Conditions:

Weather stripping should be added. The building will keep heat in with the weather stripping. The weather stripping also needs to be put on the windows because again the heat is getting out and the cold air is coming in.

Proposed Scope of Work:

- Install Weather Stripping on the doors to fill the gaps.

Cost-Savings Analysis:

Weather Stripping Installation	$5,090
Estimated Energy Savings:	$1,100
Pay Back in Years.	4.6 years.

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CONCLUSION:

The weather stripping will help the heat to be kept inside the school without any cold coming for the outdoors. In the gym the door has to be left open because the students are uncomfortable because the temperature is 75 degrees when it should be set at 66 degrees. During the winter when the door is left open, snow comes in and damages the floors. If we were students at Arthur T. Talmadge Elementary we would be uncomfortable with the environment and may be unable to participate in class.

Energy Conservation Measure 2: Vending Miser

Existing Conditions:

One soda machine does not have a vending miser.

Scope of Work:

Install a vending miser on one soda machine; this will control the machine with a motion sensor.

Cost-Savings Analysis:

Install Vending Miser	$300
Estimated Savings	$100
Rebate	$50
Total Cost	$250
Payback	2.5 years

Conclusion:

If the Talmadge gets a vending miser it will save electricity and money, and it will pay for itself within three years. This is possible because vending misers have motion sensors to tell if there is anyone around. These sensors tell the machine when it has to cool sodas and when it can shut off.

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Energy Conservation Measure 3: Energy Management System

Existing Conditions:

The boilers are out dated and overheating, which causes it to get too hot in the school. There is no web based system for control over the boilers and air handling units, which means they are manually controlled and will stay on at all times unless shut off. There is no way for anyone outside of the school to know if they are on or off.

Proposed Scope of Work:

1. Install networking to city wide EMS.
2. Install controls for boilers 1-2
3. Install controls for pumps 1-6
4. Install Multi-Zone AHU (3 zones.)
5. Install Multi-Zone Dampers (typical for 3)
6. Install Multi-Zone AHU (18 zones.)
7. Install Multi-Zone Dampers (typical for 18)

Cost-Savings Analysis:

Install web based EMS	$48,385
Mechanical Contractor	$5,000
Asbestos Abetment testing	$4,500
Estimated Bay State Gas Incentive	$10,000
Estimated Western Mass Rebate	$2,000
Total Cost	$43,885

Estimated Energy Savings

Natural Gas	$6,500
Electricity	$1,000
Total Energy Saving	$7,500
Payback in Years	5.85 years

Conclusion:

Control of the boilers and the AHUs is necessary because without it, the school would suffer from overheating all throughout the year. The AHU could help in the summer time because of the major heat waves; the AHU could make it cooler in the rooms and more suitable for student learning. If we had these controls, the students would be happy and the city would save electricity. Although the payback time of 5.85 years is slightly higher than the target 5 years, it is still near enough that the city will start to see savings soon.

INITIATIVES

ENERGY CONSERVATION

INITIATIVE 1: *HEATING*

The heating initiative we want to take is to make the heating more energy efficient in larger buildings like city hall and our schools. Heat is constantly released and wasted because of the inefficient heating we have now. If heat energy is being wasted so is the money of whoever is paying for it. Also, when the boilers are running all day, carbon dioxide is being emitted into the atmosphere. These inefficient boilers are unnecessary contributers to global climate change.

STEPS:

- *Put in energy efficient boilers in these buildings in order to save heat*
- *Put in newer pumps in large buildings so no heat is released through cracks*
- *Put the more energy efficient heating on a web based start/stop control system so that when heat is at a good temperature it can be turned off and can be turned back on just as quickly*

BENEFITS:

- *We will be saving a good amount of heat energy by doing this*
- *We will be saving a good amount of money by doing this*
- *We will be emitting a smaller amount of carbon into the atmosphere because the boilers won't need to run as long.*

INITIATIVE 2: *CFL LIGHT BULBS*

This initiative entails that we change the inefficient light bulbs we have now to CFLs (compact fluorescent light bulbs). We should be changing these anywhere we can like in homes, offices, schools, etc. A good amount of energy is released because of the light bulbs most people use now. This is because bulbs that are not fluorescent lose energy during transfer. This means we waste money on these light bulbs by paying for energy that is wasted. Switching to CFLs is a great change that can benefit everyone.

STEPS:

- *Change the light bulbs we have in the homes, schools, etc. to CFL bulbs. This could even be done just by replacing dead bulbs with CFLs, although we will see results more quickly by changing them immediately.*

BENEFITS:

- *CFL costs only 2-15 dollars so we can save money on bulb replacement*
- *Saves 30 dollars over its lifetime and pays for itself in one month*
- *CFLs use 1/3 the electricity and last 10 times as long*
- *Will keep half-ton of carbon dioxide out of the atmosphere*
- *Reduces emissions of sulfur oxide and high level nuclear waste*
- *Can be applied nearly anywhere*
- *Decreases overall carbon footprint*

INITIATIVE 3: *ENERGY AUDITS*

We need to find out, in larger buildings like school and offices, where energy is being wasted and also where it can be saved. We look at the buildings different machines and functions and look at how we can improve them. If we don't perform energy audits we won't know how we can save energy and we will miss out on easy ways that we can help Springfield.

STEPS:

- *Carry out energy audits in Springfield's schools, offices, etc. over the next few years.*
- *Act on these audits by implementing ECMs to improve conditions.*

BENEFITS:

- *Performing energy audits will help make buildings as energy efficient and cost effective as possible and help conserve as much energy as possible*
- *See where heat or cold is escaping, show where repairs need to be made*
- *Over time this will save thousands of dollars in energy savings*
- *Less greenhouse gasses and pollutants are emitted*
- *Tax breaks could be given to those companies and buildings that are energy efficient, which will gain public support*
- *The potential to reduce annual energy and power consumptions by 50%*

WASTE MANAGEMENT

INITIATIVE 1: *SCHOOL RECYCLING*

Recycling in schools across the city is a big initiative that can be taken to improve our city and our planet. In The Springfield Renaissance School we do paper recycling regularly, but not many other schools in Springfield recycle. Despite the fact that we are diligent paper recyclers, we don't have aluminum, metal, and plastic recycling in this school. We have asked around and have visited other schools. They don't have it either. Students see paper in the halls, soda cans and plastic food bags in the trash. It's not environmentally friendly.

STEPS:

- *First, a group of students and/or faculty would go around the school once or twice a week and pick up each class's recycling bin.*
- *The recycle bins would then be dumped into a recycle can(s) similar to the green trash cans used around Springfield.*
- *From there the recycle cans would be transported to the nearest recycling facility*

BENEFITS:

- *For every time we recycle 1 ton of paper we save 17 trees, enough electricity to run the average home for 6 months, 7,000 gallons of water and decrease the pollution by 60 percent.*
- *It also connects to the idea of lowering the carbon footprint because we are not wasting reusable/recyclable materials.*
- *It would save schools money because they would not have to waste money on buying paper and other school materials.*

INITIATIVE 2: *SWITCHING STYROFOAM PLATES WITH PLASTIC TRAYS*

The city of Springfield is currently doing a good job on the amount of initiatives being used to help the city, but could be doing more to help Springfield go permanently green. One initiative we propose is that Springfield schools should change the styrofoam plates used at lunch to plastic trays instead. At the moment most elementary schools in Springfield serve their food to both teachers and students on styrofoam plates. Styrofoam can not be recycled and when burned releases a lot of toxins. Each student and faculty member receives a new plate every day which means the plates are being frequently purchased therefore wasting money.

STEPS:

- *Schools would buy plastic trays*
- *The food would be served on these plastic trays instead of styrofoam plates*
- *The trays would be reusable thus eliminating the need for Sytrofoam*

BENEFITS:

- *By switching to plastic trays it eliminates the amount of money being spent*
- *The trays can be washed and reused every day, eliminating the amount of trash being dumped out of the schools*
- *It also reduces the amount of trash being dumped into local landfills each year.*

WATER MANAGEMENT

INITIATIVE 1: *WASTE LESS WATER*

Throughout Springfield people waste a good amount of water. People waste it at their homes, at their schools, at their job, etc. Wasting water also means that we're wasting money. Also, wasting water takes away from the lakes and rivers we get them from which takes away both habitats and resources. To reduce the amount of water wasted we should take these steps:

STEPS:

- *Education: In order for people to understand why they should save water, they need to be educated on how it is harmful to waste and how it will help them to save. This could be done through public service announcements, posters, or letters to students' families.*
- *Taking showers instead of baths or taking shorter showers saves water*
- *Turning off the faucet when brushing your teeth*
- *Run laundry under cold water*
- *Filling up sink with water to wash dishes instead of letting water run*
- *Buy pool covers so that water doesn't evaporate causing you to keep having to refill the pool*
- *Putting in sensors on the sink so that they turn off when nobody is there*

BENEFITS:

- *People will save money on water bills*
- *People won't waste so much water, making Springfield more environment friendly*

TRANSPORTATION

INITIATIVE 1: *BIKING*

Biking is a safe, enjoyable, and healthy way to get children to school and people where they need to go. It's a better way to exercise, have fun, and another way to go somewhere. It energizes you for the day ahead and helps you work off the stress at the end of the day. It also keeps cars off the road, which reduces pollution and congestion, enhancing quality of life.

STEPS:

- *Create bike paths especially for school children*
- *Publicize and encourage this plan (commercials, incentives, flyers etc.)*
- *Educate people on how to be safe while riding bikes*
- *Try to start bike lessons for younger children who want to learn, and be part of this project*

BENEFITS:

- *Biking produces NO greenhouse gases:*
    - *Bikes don't use gas, which produces pollution when burned.*
    - *Bikes will save the city money for lowering the amount of gas that has to be bought each year*
- *Biking reduces our city's carbon footprint.*

INITIATIVE 2: *HYDROGEN POWERED BUSES*

Although hydrogen powered buses are expensive, they have some great benefits. By having hydrogen powered buses we emit less greenhouse gases into the air, through this we greatly lower Springfield's carbon footprint.

STEPS:

- *Purchasing one or two buses to test how well hydrogen powered buses would work in our city*
- *A comparison will be done by having both types of buses run the same route. Through this we will be able to tell how cost effective and environmentally friendly hydrogen powered buses are*
- *If they prove effective, more could be purchased*

BENEFITS:

- *Hydrogen power has no carbon which means no carbon is being released into the atmosphere*
- *Hydrogen is a renewable source meaning we will never run out*
- *Just as effective as gasoline or diesel*
- *Hydrogen is safer than gasoline*
- *Hydrogen can be produced on-site and does not need elaborate transportation systems*
- *Hydrogen can be produced in any country.*

INITIATIVE 3: *PUBLIC TRANSPORTATION*

By taking public transportation instead of cars we greatly lower greenhouse gas emissions, in which case we become more environmentally friendly.

STEPS:

- *Encouraging people to take the bus instead of driving everyday by educating them on the benefits of taking the bus*
- *Having buses take more routes therefore having a fewer amount of buses which means a decrease in greenhouse gas emissions*

BENEFITS:

- *Public transportation shrinks the amount of gasoline being used and purchased each year*
- *For every $10 million invested in public transportation, more than $15 million is saved in transportation costs to both highway and public transportation users*
- *Each year, public transportation use avoids the emission of more than 126 million pounds of hydrocarbons, a primary cause of smog, and 156 million pounds of nitrogen oxides, which can cause respiratory disease*

The Environment and Our Community

Initiative 1: *Helping Springfield*

Working together as a community will greatly help Springfield. Doing small things in Springfield's neighborhoods and communities will unite Springfield and raise awareness about keeping Springfield as green as possible.

Steps:

- *Clean up Springfield daily – this could be done not only by city workers, but by community groups*
- *Planting more trees*
- *Planting gardens together to help the environment*
- *Carpooling with one another so there are fewer cars on the street being driven and fewer greenhouse gases being emitted*

Benefits:

- *Creates a stronger community bond among Springfield's citizens*
- *Creates a greener Springfield*
- *Raises awareness levels about keeping Springfield green*

CONCLUSION

Global climate change is a serious issue facing the world today. The time for planning the prevention of this issue is far behind us. Now is the time to take action. We will need to be the generation that instills change in the world's lifestyle. A change in Springfield can cause a trickle up effect, where other towns emulate our work, leading to a change in the nation, and eventually the world, helping to save our planet. Although some cities have made progress in green initiatives, many have not. San Francisco and other cities are aggressively pursuing alternative energy measures. Despite their efforts, there may still be things that can't be helped. Already, many effects of global climate change are irreversible, such as rising sea levels. However, we are able to stop some other effects, such as rising temperatures, and lessen the impact of those that are unstoppable, such as the chain effects initiated by these rising temperatures. While the future will belong to the youth of today, in order to help slow global climate change, we need the support of the generation that is in power today. In order to save the planet for ourselves, our children, and our grandchildren, we need *your* help. Springfield has the opportunity to be a pioneer in green innovations; to reduce our carbon footprint and begin the long process of reversing Global Climate Change.

If Springfield takes the road suggested in this greenprint, then we will see enormous benefits to our city as a result. The ECMs we propose will allow us to begin looking at making changes to our lifestyle as a city; we can become a smarter, cleaner, nicer place to live. These benefits will be both economic and environmental. We will have the potential to receive national attention as a "green city", helping to boost our image and attract green-thinking residents. With more people wanting to live here, property values city wide may rise, putting more money in resident's hands to spend in Springfield. This may lead to an improvement of the overall economy in Springfield which will lead to further improvements in the city such as new jobs and higher salaries.

With new jobs and more money, people may resort less to crime and other problematic activities, which will cause quality of life to improve throughout the city.

While economic growth and lower crime rates are excellent possibilities, something that is even more important to the world as a whole is the potential for environmental health in Springfield. Our carbon footprint as a city will be reduced, meaning fewer emissions of greenhouse gasses into the air. This reduction of emissions will help to slow global warming, a serious issue facing our planet today. We will see a reduction in the wasting of electricity, which will lead to lower bills, and more importantly less wasted energy. If we are using less energy, then less energy must be produced to meet our need. This may help to cut – if only slightly – the huge amounts of coal being burned today in order to produce enough electricity to meet the world's needs. The environment of our city will improve from our smarter, greener lifestyle changes. These initiatives will help to make our city a cleaner, "greener," place to live.

Schools are a major area in which our need to go green is apparent. While our class toured the elementary schools of Springfield we found many wasteful systems being used within the buildings. One Renaissance student said "When we stepped inside the building you could tell that it was overheated. This was obviously a waste of energy, and it could not be comfortable for the kids." We need to set a good example for the young children of this city and create a better learning environment for them. With the installations of the ECMs in Brunton Elementary school, the quality of learning will be enhanced because the students and teachers will have a more comfortable learning environment.

Global Climate Change is a very real and potentially deadly event that is occurring on our planet. We have a chance to change this. While many cities choose to ignore it, we can face it head on. We can institute new green initiatives, such as the energy conservation measures proposed in this greenprint, to change our city for the better. These initiatives will allow for our city to receive a new image and for our planet to receive a

second chance. As the famous poet Robert Frost once said, “Two roads diverged in a yellow wood, and I, I took the once less traveled. And that has made all the difference”. The city of Springfield has the chance to take the road less traveled, and we urge you to choose as Mr. Frost did.

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