Group 1

January 7, 2011

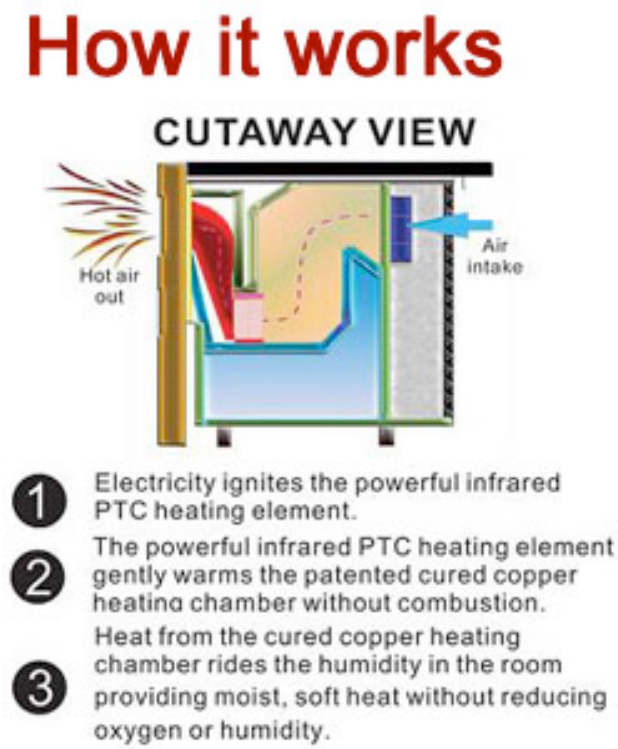
College Math

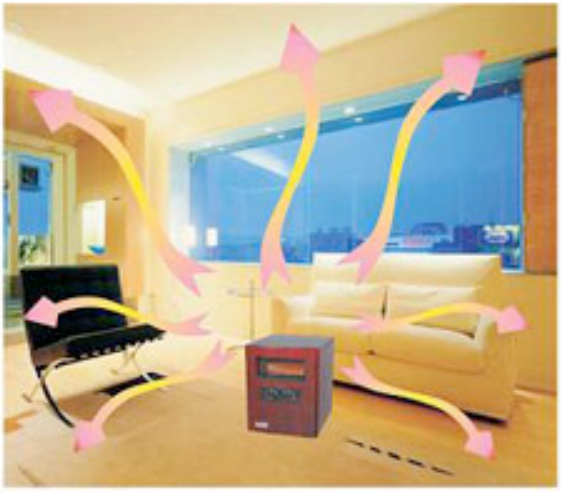
Budget Solutions

Northwestern Lehigh School District has a total budget of $36,017,163 to spend in the year of 2012. Do you think our school is spending the budget wisely? Are there areas where less money could be spent and more could be saved? The answer is YES! The ideas our group has come up are meant to help out our school save money and go green. By implementing these simple ideas, money could be saved to use on other necessities needed in our school system. Our ideas include space heaters throughout the building, take-home computers, and LED light instillation. In theses next few pages, we will go into depth on each idea, explaining the costs, savings, and benefits included with each.

Currently our school system uses heating fuel to heat the schools in the district. It is set at an average temperature of 70°. Although our current heating system has been successful in heating the schools and keeping the students and staff at a nice comfortable temperature, there is another option, space heaters, which could do the same job while saving more money for the school. Space heaters allow the students and staff to be comfortable throughout their day while saving the school money on heating fuel, even if they are just being used in the high school. Instead of keeping the heating system on such a high temperature, space heaters would allow the maintenance staff to lower the temperature of the High Schools heating system. To offset the lower temperature we will place ceramic space heaters in all of the main offices, library, classrooms, and faculty rooms of the high school only. Because fall and early winter are not yet bitterly cold, in the months of October, November, and March all heaters will be set on low blast. When the temperatures start to drop in the months of December, January, and February all heaters will be on high blast. This will help to save even more money by not having unnecessary heat being blasted into the rooms of the high school.

The heating system runs in the high school for an estimated 12 hours a day. With the implements of space heaters, when the teachers enter the building around 7:30 they will turn them on and leave them on till 3:30, when they leave. The following diagram shows how a space heater works.





The iHeater Infrared portable Heater provides clean and even heat from wall-to-wall and ceiling-to-floor.

Just a couple of simple equations show how much the school would be saving with this simple adjustment:

Individual Space Heaters cost $48 on Amazon each

On high speed: 1.5 kw per hour

On low speed: .9 kw per hour

72 classrooms in the high school, and one library.

1 heaters per class room, 2 heaters in the library.

74 heaters in total

x$48

$3,552

ON HIGH

Hs uses 7.7 cents an hour for electric

X 1.5 kw per hour

11.55 cents an hour/heater

X 74

$8.55/hr for all the heaters

X 8 hrs in one school day

$68.40/ day

December, January, February= 59 days of school

$4,035.60 in total

ON LOW

Hs uses 7.7 cents an hour for electric

X .9 kw per hour

6.93 cent per hour

X 74

$5.13/hr for all the heaters

X 8 hrs in one school day

$41.04/ day

October, November, March= 61 days of school

$2,503.44 in total

TOTAL HEATING COST: $6,539.04 for each year

+ HEATERS

$10,091.04 cost of heaters and heating bill for first year

As the formula shows, the high school currently spends $115,110.65 on heating fuel. With these adjustments made we will end up saving $8,425.34 a year. Even though the first year we are saving less due to the actual purchase of the space heaters, we were still able to pay them off the first year with the savings made on heating fuel.

Laptops consume a lot of energy when charging. One measure that could be used for our school to avoid paying this cost is giving laptops to the students. The money that is saved from this economic decision could be then used to purchase newer laptops when the old laptops when they start to fail.

Laptops use way too much energy to charge all the time. Each laptop takes 60 watts per hour. This means that up to 1.4 kilowatts of energy is used per day to charge each laptop.

60 watts per hour
X 24 hours a day

1440 watts per day (1.4 kilowatts)

The high school currently fifteen-laptop carts, otherwise known as C.O.W.S. each holding thirty computers. Each laptop requires 1.4 kilowatts per day to charge meaning that 42 kilowatts per day will be used for each C.O.W..

30 laptops per C.O.W.
X 1.4 kilowatts per day (each laptop)

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42 kilowatts a day per C.O.W.

With each C.O.W. requiring 42 kilowatts of energy each to charge, 630 kilowatts per day to charge all the laptops and $13,461.53 each year.

15 C.O.W.S

X 42 kilowatts a day per C.O.W.

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630 kilowatts per day to charge all laptops

PPL charges 7.7 cents per kilowatt. With 630 kilowatts being used per day, we spend around $48.95 a day just on the energy to charge the laptops.

7.7 cents per kilowatt

X 630 kilowatts per day

$48.95 a day on energy to charge laptops

$48.95 per day on energy for laptops

X 275 days

$13,461.53 per year on energy for laptops

What we want to do is take away the C.O.W.S. and distribute the laptops to students in 11^{th} and 12^{th} grade, non-elective courses. Each student would have the laptops for the semester that they have the 11^{th} or 12^{th} grade course and then they would return it, similar to textbooks. Because the students would have the laptops, they would be able to charge them at home, which will eliminate the issue of having to spend money on charging these laptops. It could also eventually save on school supplies because students could take notes and have tests on laptops given to them. It could hypothetically save the school $13,461 a year which could be used for other supplies.

There are florescent light bulbs throughout the whole high school building. If we could replace all of the florescent light bulbs with LED light bulbs over a couple years we could save energy. The LED light bulbs are more expensive and will have to be installed by an electrician, but they last a lot longer. These bulbs are also more environmentally friendly than florescent bulbs. If we replace the bulbs overtime, we will be saving money on lighting energy and florescent bulb replacement.

In the table below, it shows how Incandescent lights vary from CFL and LED. LED use the least amount of power for the same brightness. LED lights are definitely the way to go. They will save Northwestern Lehigh High School a lot of money in the long run.

Incandescent Watts	CFL Watts	LED Watts	Lumens (Brightness)
40	8 - 12	4 - 5	450
60	13 - 18	6 - 8	890
75 - 100	18 - 22	9 - 13	1210
100	23 -30	16 - 20	1750
150	30 - 55	25 - 28	2780

National Geographic has a website that has a tool that replaces all fluorescent lights in a home with LED lights. On the website, it shows a living room with fluorescent lights. Instead of replacing lights in homes, we will be replacing lights in the High School.

HOUSE
VS
SCHOOL

There are a lot more light bulbs in a high school then a house so we have to estimate the number of bulbs needed and how many we replace at a time. Because of the more expensive cost of LED lightbulbs, our plan is to replace bulbs over time and this will save money on the purchase of incandescent light bulbs. Even though the cost of each lightbulb and fixtures is more expensive than out current florescent light bulbs, the cost we would be saving in energy would very quickly offset the cost. Over time we will save energy allowing us to save money on electricity expenses. The chart below shows the pros and cons of LED lightbulbs vs. the pros and cons of our current florescent tube lightbulbs. As you can see, LED tubes last twice as long as fluorescent tubes. Also, you do not have to worry about them creating a heat build-up and they do not contain the toxic ingredients mercury and phosphor, which could pose a possible threat to the students and staff in the building. It also mentions that fluorescent tubes in an environment which causes them to be switched on and off frequently need to be replaced twice as often. Being in classrooms, this is the situation we are dealing with and fluorescents are clearly not the best option for us.

	LED TUBES	FLUORESCENT TUBES
Lifespan	Tubes last twice as long as the average fluorescent tube	Last 10 to 20 times longer than incandescent bulbs, but not as long as LED bulbs.
Cost	Very expensive. Tubes can range from $50 to $100.	Inexpensive. Tubes cost $2 to $10.
Heat output	These bulbs do not cause heat build-up.	Temperature can be up to 2 degrees warmer under fluorescent tubes.
Efficiency	More efficient than both fluorescent and incandescent tubes.	Four to six times more efficient than incandescent bulbs, but less efficient than LED tubes. They also require a ballast to power.
Comfort	More ergonomic than fluorescent tubes.	Not ergonomic: light is drab and all bulbs flicker (though not always visible to the human eye).
Material	Does not contain hazardous metals like mercury.	Does contain mercury and phosphor.
Other	Light is not as strong as fluorescent or incandescent bulbs.	Bulb life is reduced in situations where light is switched on and off frequently.

Another one of our ideas to accumulate money for our school is advertising on the marquee. We have recently added an electronic marquee right in the front of our school by 309. Many cars drive by there on a daily basis so many people will see the advertising while driving by. We would like to have multiple advertisements as well to get more money. Part of the money acquired we could use to pay off the whole electricity cost for the marquee and then the extra money would go to whatever the school desires to put it towards. Due to the advertising on the marquee, we would like some of them be from local businesses to help the community. In relation to that the businesses will start doing better and getting their products out to the people they will need to employ more people and expend their business.

We don't have to go crazy on advertising everywhere like in the schools and what not but we could if we choose. It could be good to do that though because again it would bring up a better profit and other businesses could take notice and want to jump in even possibly bigger businesses. Benefits to this process are the start up cost for advertising is very little so we don't need to worry about paying things off because everything is relatively cheep. Putting the advertisements on the marquee also won't change the operating cost for the marquee. For example if we would have five advertisements on the marquee and biweekly we would get 70 dollars an advertisement. When you would do the math for that to figure out how much money that would be for a year. For this scenario we would accumulate around 9,100 dollars. I consider that pretty good the operation for the marquee yearly is a little less then 2,000 dollars. We stand by this and agree it would be a relatively simple process, give us some extra spending dollars where we might need it with also bringing awareness to the businesses that are around us.

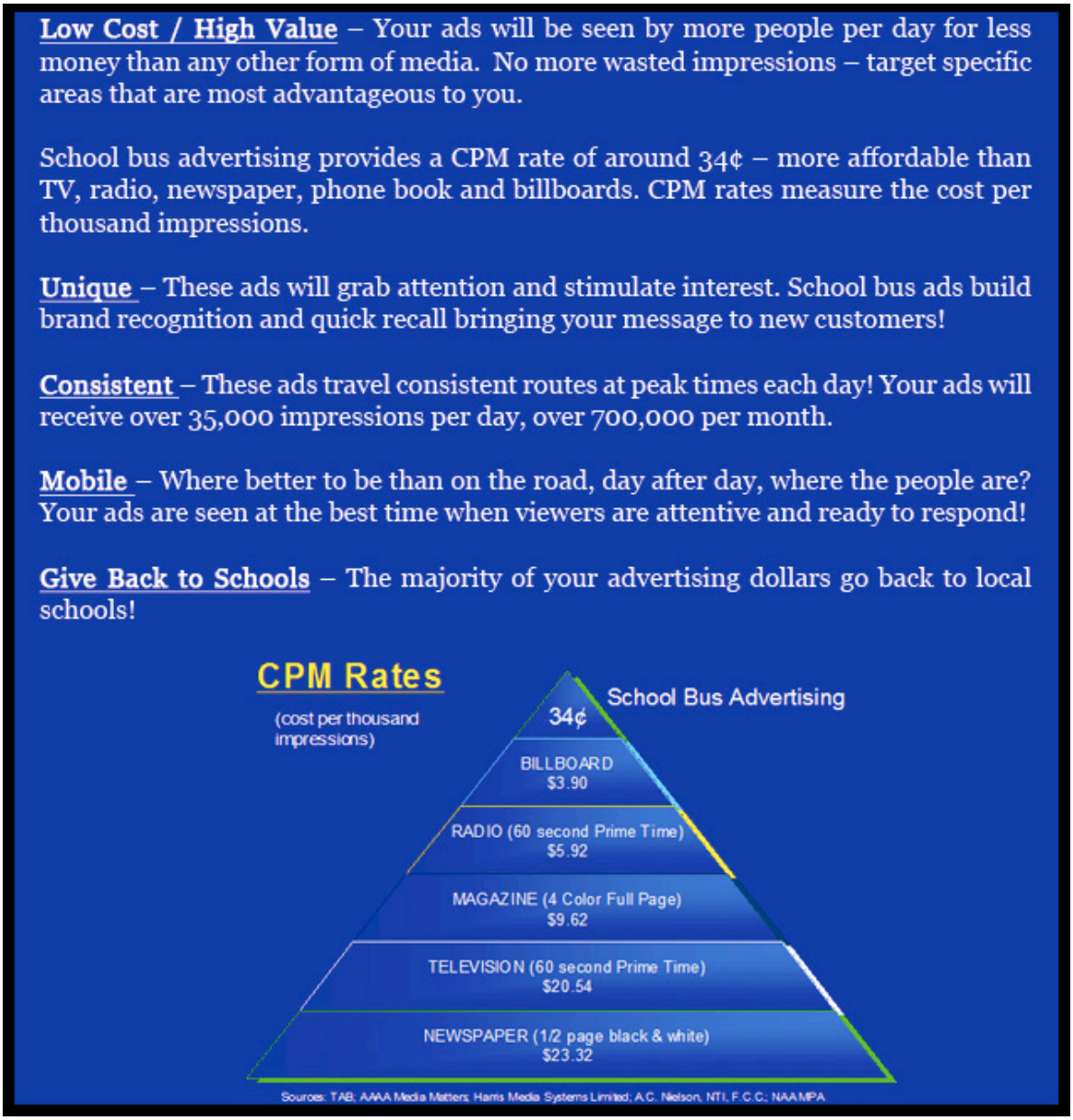
We could consider advertising on our schools website as well to bring a profit and many people including parents go on the site to check for updates like what is going on like snow days etc. The simplicity of doing it on the website would be as easy as it would get to start it up. Since this would be on the worldwide web it would appeal to a much wider range of people. People driving by might only be driving by the marquee that specific day but with the website

people we see it much more frequently. The upkeep cost for the website is very low key too. A telling fact due to the website advertising is the average individual person is on the Internet for 7 hours a week. Proving that many people would be able to glimpse the advertising we would have on our site. We could fit all the advertising on the home screen somewhere in the margins and we could even have a separate page on our site that has just our advertisements and even a little information about each advertisement.

Parkland has recently considered advertising on their buses to gain some profit. Now they are a bigger school obviously but they said they could accumulate around 150,000 dollars on just advertising on each one of their buses. We could also take that into consideration with our advertising options with all of our buses that we have, we could acquire quite a bit of money as well. It could then go towards the gas for the buses or tools needed for maintenance on the buses, pretty much anything related to the buses. When or if we decide to advertise on the buses the only thing that probably we would need to have is some time so that they can put all the advertisements on the buses. Going along with amount of people seeing the advertisements on the buses would be good also. When the buses go to pick the kids up so around when many people are heading off to work and will pass the buses at some point in the trip to work. The same would go for when the buses are dropping the kids off at home once the school day is complete. The overall scheme would be to raise a good amount of money that our school district could use to pay off some of the low cost materials that we use and have some extra for our sports and employs.

We want this to help the cause for our school and have that extra money so we can spend it on extra things for the students and the staff. It could be possible if we happen to be behind in a payment or short on money at the time so we can't pay the amount needed for that cost. This extra money that accumulates from the advertising could go towards to that and then we could get out of a tough situation with that money. The benefits for this most definitely outweigh the disadvantages for the advertising on the marquee or website. I know there we most likely be

some parents that believe it is wrong and don't want their child being corrupted by the advertisements. That is an argument I don't really understand because then they must not let their child out of the house. There are advertisements all over you can most likely drive to your local grocery store and will see multiple advertisements along the way. Your kid is going to experience thousands of ads in a year so it is nothing new. The advertisements don't have to be from an unhealthy food organization, they can be from local organization selling random things like tools etc. This is something that would definitely benefit the school in many ways.



As a group, we are trying to save money for our school and go green at the same time. The Earth and our school are in danger and both need help. The school shouldn't have to spend so much money on our necessities; there are many more alternative options out there that could be considered by the Northwestern Lehigh school board. All the school board needs to do is a little research and they will be able to save over $20,000 a year.