YMCA Southcoast

"Making Sustainability Happen"

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ABOUT THE YMCA SOUTHCOAST

"We Build Strong Kids, Strong Families, Strong Communities"

YMCA Southcoast Dartmouth's mission statement is the "improvement of the spiritual, mental, social, educational and physical conditions of all persons."

The YMCA came about in 1844 in London to serve as a safe place for men to stay when they were working away from home. As the years past, the YMCA developed into a national corporation that serves all walks of life and offers a broad range of fitness, social and educational programs. The organization is a not-for-profit association that includes members, volunteers, contributors and staff who all share a common goal to "provide quality programs to enhance human and community growth and development."[1] In conjunction with the YMCA's statement of building strong kids, families and communities, it becomes evident, in today's world that the need for sustainability is imminent.

INTRODUCTION

In our visit with the Dartmouth group, we discussed different ideas for our team to evaluate and possibly make recommendations on. We talked about how the YMCA Dartmouth group could become more sustainable, the possibilities of cost reduction through change and reduction of the carbon footprint. We discussed evaluating the facilities energy use, electrical use, water use and filtration systems, recycling, green office and cleaning supplies and practices, community farming in regards to composting, solar power/photovoltaic system, and community awareness and education. Together as a team, we have submitted an overview of your facilities needs, results of our findings and specific recommendations for your organization to review and consider.

[1] www.Gardencity.net

IMPLEMENTING A GREEN CLEANING PROGRAM

What is Green Cleaning and why should we implement (or benefits to implement)? "Green Cleaning" is defined as *cleaning to protect health without harming the environment*.[2] It truly is about effective cleaning to create healthier buildings and at the same time reduce environmental impacts. Many chemicals in cleaning products may be hazardous to the environment and to the health of maintenance workers, employees, and guests. "Green cleaning" reduces environmental and health risks by selecting alternative, environmentally-sensitive products, by applying these products properly, and by implementing maintenance practices that minimize exposure to cleaning products. At this point the YMCA Southcoast is not currently using a green cleaning program or product, however, strong interests has been shown by the Executive Director to move in this direction.

Implementing a Green Cleaning program goes beyond chemical and equipment choices. It includes policies, procedures, training, and shared responsibility efforts that minimize the impact of cleaning materials on the health of building occupants and protect the environment as a whole. Simple changes in procedures and the use of certain tools will improve the indoor air quality of the buildings that we spend so much time in. However, one must maintain, all good cleaning maintenance programs begin and end with sound cleaning principles.

In doing so, creating criteria or policies will assist in the success of the program through the coordination and adopting some or all or the four basic elements of a green cleaning program: (1) requiring the use of green cleaning products, (2) establishing guidelines for purchasing products that reference existing third-party standards (e.g. Green Seal and Green Choice programs), (3) identifying green cleaning practices, and (4) providing staff training. These descriptions are provided to help the YMCA Southcoast understand some current green cleaning policy and to assist in guiding as they develop their own approaches to implementing healthier, more environmentally sound practices.

[2] http://en.wikipedia.org/wiki/Green_cleaning

There are a lot of cleaning products to choose from and understanding how these products can affect your health and the quality of your work is important. As important, cost of the product should be understood and in line with your current chemical cleaners while seeking the continue level of quality to be obtain. Also look at entering into a program which the vendor that will assist with switching out at no cost the cleaning dispensers and other product dispensers.

The manger should develop an evaluation criteria checklist that eliminates the guess work; in addition, provide safety questions that is needed to be asked. However, we would highly recommend seeking advice from a professional dealer or "green" consultant to survey and compare your current cleaning to a "green cleaning" program. An analysis from a vendor can be obtained usually at a no cost, no obligation that would guide to meet the needs of your organization and to recommend various products specifically for your facility. However, considerations to be aware of if the product is:

- non-toxic to humans
- free of any ingredients that are carcinogens or known to cause reproductive toxicity
- non-corrosive to the skin or eyes or free of ingredients that can be skin sensitizer
- free of substance that contribute to the production of photochemical smog or poor indoor air quality
- free of alkylhenol ethozylates or dubutyl phthalate
- free of ozone depleting compound
- heavy metals; arsenic, lead, cobalt, chromium, mercury, nickel, selenium

Overall, with newer technologies and certain tools, such as the microfiber, and latest developed processes will make it possible to clean effectively, efficiently, and with less impact on health and the environment, in addition, for the employees and patrons who utilize the facility they will benefit from the reduce human health risks, improved air quality, and the reduction to exposure of harmful chemicals.

Recommendation:

It is our recommendation that the YMCA Southcoast engage in a professional such as, Erick Heroux with Casey EMI, contact cell phone 401-952-0884 for a no cost, no commitment audit and review. He is very knowledgeable and qualified to assist with the first step the YMCA Southcoast should do is to develop the four basic elements of a green cleaning program: (1) requiring the use of green cleaning products, (2) establishing

guidelines for purchasing products that reference existing third-party standards (e.g. Green Seal and Green Choice programs), (3) identifying green cleaning practices, and (4) providing staff training. Once a plan is establish, Casey EMI would assist with the implementation of providing the dilution control equipment, hands free soap containers, and paper towel system for possible no cost or very little start monies.

COMPOSTING

Why Compost? Composting can convert a lot of the "trash" that goes into our landfills today. It is estimated that 35% of our garbage consists of kitchen and yard wastes. Composting cuts costs in disposal, it saves energy and it reduces air and water pollution. [3] It is a natural way to recycle and it offers you a fertilizer that is second to none. Composting is environmentally friendly, offers free fertilizer for the community farm, minimizes the amount of refuse that ends up in our landfills and last, but not least, it's easy! [4] Aside from resource conservation, and the building of a healthy soil, composting reduces pollution. Organics breakdown anaerobically which in turn produces a methane gas. Methane gas is 20 times more powerful than carbon dioxide as contributors to our climate changes.[5]

Composting converts organic materials such as grass and scraps of food into compost that can be reused in plantings. Instead of sending these types of organics into the landfills and wasting space, it makes sense to utilize their benefits as it can positively affect a garden or farm. The compost will provide fertilizer for the plantings in the community farm. In addition to this, it benefits the soil as it will help it to maintain a healthy pH which allows for better growth and healthier plants. It will also help a plant when the environment is less than desirable such as through a drought or frosty conditions. Composting will help with the texture of the soil and help a "sandy" soil manage the water more efficiently. It is a great source of plant nutrients.

Composting requires three basic ingredients – browns – dead leaves, branches and twigs; greens – grass clippings, vegetable waste, fruit scraps and coffee grounds; and water. When these three ingredients are used

[3] http://www.resourceconservation.mb.ca/cap/why.html

[4] http://www.fredericton.ca/en/environment/benefitsofcomposting.asp

[5] http://www.resourceconservation.mb.ca/cap/why.html

together in equal amounts, compost development can prosper. The brown ingredients provide the carbon and the green ingredients provide the nitrogen. The water provides the catalyst to breakdown the organic matter.

For more information on the Massachusetts Composting Regulations, you can contact:

Agency for Composting Regulations
Sumner Martinson
Department of Environmental Protection
1 Winter Street
Boston, MA 02108
Ph: 617.292.5969
Fx: 617.556.1049

To find some "101's" on composting, please check out www.composting101.com. This website offers some great information on everything you need to know about putting a program together like this.

Recommendations:

It is recommended that the YMCA try composting to see if it works for their needs. It is suggested to have a team put together to begin the compost project. This team should become completely educated on the compost process. We are suggesting that you obtain the wood (and it can be scrap wood) and build a composting bin within close proximity of the crops following the attached directions. Keep in mind though that there may be things to add to the compost from the facilities so choose your location carefully. Once the team is comfortable, they need to start educating other farming members on how to use the compost bin(s) and how to manage them. At the end of this document, you can also find a chart on what to compost and what not to compost (Attachment A), how to build your own compost bin instructions and plans (Attachment B) and on some common composting problem questions (Attachment C).

SINGLE STREAM RECYCLING

Trash is commonly viewed as a cost of doing business. A trash bin or dumpster gets filled and emptied without much thought given to the materials being thrown away. "In 2003 Americans threw out almost 500 billion pounds of paper, glass, plastic, wood, food, metal, clothing, dead electronics and other refuse."[6] Each

[6] Rogers, Heather. *Gone Tomorrow: The Hidden Life of Garbage*. New York: The New Press, 2005.

American discards an average of more than 1,600 pounds of garbage per year, or approximately 4.5 pounds per person each day.[7] Compared to other nations, the United States has a poor waste production record.

Waste prevention and recycling are materials management strategies that organizations can use to minimize waste, control disposal costs, and potentially save on material purchases. Waste prevention begins by looking at the type and volume of waste, and developing methods for reducing or eliminating these materials. A waste management program goal has helped many municipalities, businesses, schools, and regions around the world reach waste diversion rates of 50-60% within a few years. Along the way, the YMCA Southcoast would realize cost savings in their operating expense of like numbers.

There are various styles of resource management or recycling. For simplicity of implementing, operating, and limited space requirements, single stream technology would be recommended for your facility and organization. Keep in mind, this program is intended to provide basic information on waste management strategies. However, the actual design of each program must be tailored to best meet the facility's needs and this can be accomplished through additional research and a waste management audit that can be performed by a professional. Such with working with Marissa Perez-Dormitzer, the District Recycling Coordinator Greater New Bedford Regional Refuse Management District; contact information is phone: (508) 979-1493 and email: mperry@ci.new-bedford.ma.us.

Through a single stream program, the goal would be to reduce waste going to the landfill or incinerators, participate in avoiding future green house gas emissions, conserves natural resources, and realize cost reduction within the operation budget. Single stream technology is recycling made simple. It allows everyone to use one bin for their recyclable materials rather than multiple bins and areas; no sorting - all acceptable items go into the same bin together. This system makes the whole process more efficient and less of a hassle for those reluctant to participate. This direction will actual encourage more people to recycle.

Critical, visible and clear signage on all recycling containers and in the recycling areas encourages recycling and reduces contamination. Container signs specifying the type of materials collected work best.

[7] Ibid

This helps prevent employees and visitors from using the recycling containers as trashcans. Labels and signs that specify the ***Do's*** and ***Don'ts*** or ***Acceptable*** and ***Not Acceptable*** may also be beneficial.

Finally, with single stream, the value of recycling goes a long way for everyone. Recycling enriches employees, customers, and community relations by fostering a positive public image and helping to create a healthy environment. However, it is real import to perform on-going and annual evaluations. As this process is ongoing keep it flexible; adopting a plan to conduct waste assessments at regular intervals can help the facility continually improve its efforts. Most importantly, keep in mind when creating a program, involvement of employees in program planning and implementation creates the buy in and ownership. Keep the program simple and convenient—the fewer changes people have to make in their daily routines, the greater the program's success and also ask for suggestions regarding program efficiency and ease of participation. At last, provide on-going publicity. Post or announce the amount of materials reduced and/or recycled each month, as well as the resulting environmental benefits. Keep messages short, positive, and interesting.

Recommendation:

It is the recommendation that the YMCA Southcoast begin recycling right away. First, contact the current solid waste provider, Frades, which they are currently partnered with the largest single stream operator in New England. A contract re-negotiation will need to take place to include replacing one of the two 4-yard containers with an 8-yard single stream dumpster. Further, the contract should include the supply, at no cost, two to three 96-gallon toters that will be places strategically around the facility. In addition, a great contact for implementation and assistance with getting the operation underway is Marissa Perez-Dormitzer, the District Recycling Coordinator Greater New Bedford Regional Refuse Management District; contact information is phone: (508) 979-1493 and email: mperry@ci.new-bedford.ma.us. Her program is set up to differ solid waste from going to the landfill and promotes the start ups of recycling by providing individual desk side containers and "slim jim" style containers at no cost. With education and promotion, this program will be underway without added cost to the YMCA Southcoast's budget.

WATER

Water is our most important resource. It is most important to maintain its integrity without compromising during the sustainability provisions. Everything on the planet requires water for survival and our water supply is limited. There is less than 1% of the Earth's water is available to human use. A 10 minute shower can use between 25 and 50 gallons of water – typical high flow showerheads use between 6 to 10 gallons per minute (gpm). Moen offers a showerhead that can decrease the water consumption by 30%. These showerheads range from $36 to $460.

By installing hands free faucets at the sink, you will save gallons of wasted water by only using the water when you need it. The hands free units are quite costly and are probably not an option for the YMCA at this point. You can purchase new faucets that will optimize the water consumption for $71.90 to $582.35. the new faucets use 1.5 gpm which equals out to about 32% less than the existing faucets. If these aren't options at this time, by installing flow optimized aerators on the existing faucets, you will be able to increase their effective performance. An aerator works by forcing air into the flow to help keep the water pressure normal. Installing an aerator can reduce the 2.2 gpm normal flow to 1.5 gpm, approximately 32% decrease in water usage. You can purchase aerators for around $5.00.

You will be able to cut your energy use by 20% by installing an on-demand water heater. These are tankless water heaters that work by "flash" heating the water when you need it.[8] Typically, the tankless water heaters can provide between 2 and 5 gallons per minute. You can get either gas fired heaters or electric heaters. An example of a tankless water heater is Eemax EX144T2S Series Two electric tankless water heater parallel with two thermostats. This particular model runs around $553 with easy installation. There are many different kinds of tankless heaters, this is only an example. [9]

[8] Moen.com

[9] http://www.plumbersurplus.com/Prod/Eemax-EX144T2S-Series-Two-Electric-Tankless-Water-Heater-Parallel-with-Two-Thermostats

HVAC

As stated in the previous section, there are currently three oil burners for providing heat and hot water which is costly. Future planning to determine viable options utilizing incentives available from utility companies to switch to newer/higher efficiency models with on demand water heating, or even a combined heat/electricity unit might be possible.

However for now though huge savings can be realized in heating and cooling expenses by utilizing programmable thermostats with proper zone control. New programmable thermostats utilize learning software to provide more efficient operation by managing furnace demand. During the initial walkthrough it was noted that in a wide open area with no activity there was a programmable thermostat set to 70, where it could have easily been set to lower. Also there should be proper enclosures for thermostats to control who may set the temperature.

ELECTRICITY

To help manage costs associated with heating and cooling a closer look should be taken at the windows. Being an older building there are many different types of windows, some being old single pane style, and almost all are fixed panels. The single pane styles have high levels of heat loss and should be replaced, or a for lesser upfront cost, a plastic film could be placed over the frame to create an additional insulating air pocket. It would also be beneficial to replace some fixed windows with ones that can be opened on nice days at bypassing the need to run the HVAC system. During the walkthrough there were several areas for potential electrical savings, many of them with minimal costs. Many of us are often unaware of how much energy the electrical items around us consume; by utilizing a Kill-a-Watt device available for $20 it would be possible to determine these costs.

The vending machines are one type of device which may be adapted to reduce electrical consumption associated with refrigeration and lighting. Coordinate with vending representative to implement a system to shut the refrigeration unit off during hours that the facility is not in use. This might simply be an outlet timer

which might save up to a dollar per day or more. Typical vending machines lights draw as much as 150 watts of power; this continuous load consumes 1,314 kWh per year for an annual cost of $236 (at 18¢ per kWh).

Also noted in the walkthrough was an old chest style freezer, this should be replaced with a new Energy Star model. On average, new Energy Star appliances are about 45% more efficient than the models they replace. According to the Wisconsin Energy Bureau a new model uses slightly more than one third of the energy of the older models. So you could be spending $120 to $180 per year to operate your old freezer. So your savings would be in the range of $54 to $81 per year.

Few people ever look up at the exit lights above doors however depending on the type of bulbs utilized they can cost as much as $51 a year. Replacing older styles with LED options can lead to significant savings with payback time being less than a year. Lighting A typical LED exit sign consumes 95 percent less energy than a comparable incandescent exit sign and 80 percent less than a comparable fluorescent. Maintenance costs are also a factor. Incandescent exit sign lamps last 2,500 compared to the LED's 10,000 hours. This can mean multiple bulb changes per year for each exit sign. In comparison, LEDs are estimated to have a lifetime of 25 years or more. This translates into lower replacement and maintenance costs for the LED exit sign. And, it's not just a matter of cost. An exit sign with a burned-out bulb is a safety issue.

Another major consumer is the current pump for circulating pool water through a filtration system, which utilizes a 7.5 HP or 5.6 kwh motor. Over the course of a five month swimming season this can cost as much as $3630 a year. By replacing the pump with a variable frequency drive system operating costs can be reduced by 40-60% which would pay for itself in 2.5 years or less.

PHOTOVOLTAIC ENERGY, A SUMMER COOLING AND WINTER HEATING SUPPLEMENT

One of the greatest barriers to the widespread adoption of Photovoltaic (PV) systems is their high initial cost. Photovoltaic panels require an unobstructed exposure to sunlight to obtain their maximum efficiency. The experience with existing photovoltaic products over the past 20 years has shown that they have excellent reliability with very little maintenance required with warranties from 10-25 years.

Like anything else, market drives the cost of PV modules, and to some extent depends on the quality of the product and the quantity purchased. Expected cost of electricity produced from a PV system is equal to about 25 to 50 cents per kilowatt-hour (kWh) when considering initial cost spread over the lifetime of the system, plus maintenance costs. This compares with an average rate of now over 9.53 cents per kWh for utility supplied power.[10] Although the up-front costs of solar projects are usually high, there are utility and government subsidies, matching funds, and cost incentives available to offset some of the initial investment. Updated information on grants and funding incentives can be found at DSIREUSA (Database of State Incentives for Renewables and Efficiencies) web page at http://www.dsireusa.org/.

Overall, this energy source is free, clean and highly reliable. PV systems are long-lasting and require little maintenance. The benefits of Photovoltaic's far outweigh the initial cost the systems. Such as, PV generates electricity from free light and produces no air pollution or hazardous waste. It doesn't require liquid or gaseous fuel to be transported or combusted and an added bonus; it would also reduce the carbon footprint of the YMCA Southcoast.

With the prospect of a major building renovation and the condition of the roof, a proposal to install solar panels next to the building would be ideal due to the magnitude of land on the property and placement facing of due south for maximum annual energy production. The size of the PV system that will meet your expectations depends on your individual needs, site location and climate. A detail plan is recommended by certified engineer or architect to customize the system specifically.

Though there are different styles of photovoltaic systems, we recommend a system called "grid-connected" systems. These work to supplement existing electric service from the utility company. When the amount of energy generated by a grid-connected PV system exceeds your electric loads, excess energy is exported to the utility company which turns the customer's electric meter backward. On the other hand, you can draw needed power from the utility when energy from the PV system is insufficient to power the building's

[10] http://www.toolbase.org/Technology-Inventory/Electrical-Electronics/pv-systems

loads. Under this arrangement, the monthly electric utility bill reflects only the net amount of energy received from the electric utility.

This system would allow during the summer month to offset the cost of the current cooling system and two future additional compressors the same size with the 3-phase 208 volt electricity needed to produce cooling for the building. The electricity consumed would be approximately 70 kilowatts per day or 2,100kw per month for all four. This will insure a savings up to 20% or $400-$500 of the cost of utilities in the summer and will assist with the return of investment and hedges future electricity price increase for the next 20 years.

During the winter months, since the recreation facility has a large open space with numerous windows, a supplemental heating system is recommend to be added and supplied with the PV electricity. Though this is just a supplement source, it would accompany the primary source which is operates using a costly fossil fuel – oil. We would like to reduce the use of the three Utica IBR boilers by 50% in consumption by lowering the constant burn rate to 90 degree versus the recommended 180 degrees. This will be done through the controls and resetting the set points. The makeup temperature will be supplied through strategically installed electric utility heaters.

While we can lower the use of oil consumed, the following savings are upon January 2008 oil cost which was the highest from each Januarys from 2007-2009. The following saving is calculated at the cost of oil at $2.83 per gallon for running three IBR boilers only for producing a constant lower burn rate at 50 degrees. A cost savings reduction calculation assumes a decrease use of (reduction of # gallons) x (cost/gallon) x (# days per heating season) = gallon savings and cost savings. For example, 10 gallons savings x $2.82 x 31 days = $874.20. Further calculations of purchasing and installing two Dayton brand ceiling mount utility heaters at $466.00 each plus a 5120 BTU wall mount for the front office would have these heaters paid off in approximately one cooling season (Attachment D).

Is it feasible? “The capacity of a PV system is stated in terms of the number of watts, kilowatts or megawatts it produces in standard sunlight conditions. A good estimate for the northeast U.S. would be for each kilowatt of PV capacity (alternating current) installed, the system will produce approximately 1,000 to

1,300 kWh (kilowatt hours) per year, depending on the angle at which the solar panels are mounted. Thus, a 100 kW system will generate about 100,000- 130,000 kWh per year."[11]

For a quick reference point for this study, we have taken a quick look into various types of possibilities of installing a PV system for the YMCA Southcoast, stand alone and grid-tie. Since there is a dramatic increase of standalone systems caused by the added purchase of back up batteries, we have pursued a grid-tie system which is connected to the local utility provider's power lines.

We used a quick worksheet, from "Estimating the Cost of Photovoltaic Systems,"[12] needed to perform the recommendation of this option. It appears with a total cost of the system, we would need to fund approximately $202,328.00 to install (Attachment E). With utilizing a government, non-profit base grant or "green" funding to pay at least 50%, sometimes more, the savings for the added cooling and heating throughout the year would allow $11,413 per year for a ROI of over twenty years. This appears this conservative option would be viable and profitable following ten years (or less) of budgeted savings and would be the best interest of the YMCA Southcoast. Additionally, keep in mind, the rating of the system was produce at the coldest month of the year and further electricity and energy savings could be produced during the shoulder months (times no cooling or heating is needed) along with any excess or unused electricity being sold back to the local utility provider. This would produce a quicker increase ROI and can further be used to offset the energy for everyday's cost of doing business uses such examples, of running computers, lights, and participants programming.

Recommendation:

With the understanding that there is potential of a multi-million dollar renovation starting to be planned, we recommend the implementation of an 8kW Grid-tie PV system. It is suggested to start immediately with the planning and design of the system and working with the current utility provider, NSTAR for permitting and possible discount financing. Along the way, the organization should be shovel ready while monitoring

[11] http://www.solaresystems.com/answers.php

[12] http://www.infinitepower.org/pdf/FactSheet-24.pdf

DSIREUSA's web page for utilizing a government, non-profit base grants or "green" funding to pay at least 50%, sometimes more, with matching funds, grants, and cost incentives available to offset the initial investment. Again, acknowledging that there is a high possibility of renovation to the facility, condition of the roof, and the ability to direct it south maximizing annual energy production, an earth mount PV system would be ideal. This project will serve as a short term and long term sustainability and cost reduction venture to the YMCA Southcoast. Short term, it will provide subsidiary heat as outline in scenario 1 to the large opening of the recreation area allowing participants to be comfortable while utilizing the facility, as well as, the main office to keep staff comfortable as well. Further, saving of cost of electricity will be created doing the summer during for the cooling, as well as the shoulder months when electricity would be sold back against the utility bill. Long term, as which will be discussed and suggested in the "Future Initiative" section, a redesign of the HVAC system will at that point give the PV systems production directly to offset the electric bill which will see a greater ROI for the next 20 years.

COMMUNITY EDUCATION AND AWARENESS

There are several different ways the YMCA Southcoast can accomplish their education and awareness of a sustainability plan. They can begin with the people who are involved with the community farm. Through education of how to compost and the importance of composting, the "farmers" can learn to give back to Mother Nature. In doing so, this will reduce the amount of refuse that would normally end up in the garbage bins. Another option could be to have computer kiosks scattered throughout the facilities that continuously scroll with interesting facts regarding our environmental impact on the world. http://www.intouchkiosk.com/home.html This website offers programs based on the corporation's needs and tailors them to what is expected. There could be educational courses developed with children in mind to help them understand what global warming is and what they can do, as our future leaders, to make positive changes. Through educating the staff, volunteers and members on the importance of simple recycling, you will be able to help make the YMCA more sustainable. By sharing information on what the YMCA is doing to help the

environment, it allows people to feel good about what they are doing and about what the YMCA stands for which is building strong kids, strong families and strong communities.

Recommendations:

It is suggested that the YMCA create a database full of "fun facts" about the environment, the YMCA and what can be done to make positive changes that will benefit the environment and also the YMCA. Some ideas might include information on recycling. For example, what types of materials can be put into the recycling bins that are scattered throughout the facilities and what types of materials are not acceptable. Information on the composting program – for example, how it is benefiting the crops, how it has decreased the amount of refuse to go to the landfill, how easy it is to compost. You might also think about putting some facts in regarding photovoltaic energy systems. Many people don't even know what a photovoltaic energy system is. Listing the benefits it offers to decrease the YMCA's annual energy costs and how it uses natural "free light" to operate. Once you have your fact database in place, either hire a company to put together a computer program to utilize throughout the facilities or create one yourself with your database. Scatter laptop computers in various high travel areas for people to see and utilize.

FOSTERING SUSTAINABLE BEHAVIOR

Current behavior	Expected behavior	Barriers	Benefits	Strategies
All garbage being placed in the dumpsters to be taken to the landfill	Begin recycling program	• Education • Behavioral changes with staff and participants • finding someone to take the recyclables	• Decreased amount of refuse being taken to landfills • Decreased refuse costs	• Education • Provide proper bins to recycle in • Identify a resource to collect recyclables
No composting	Composting program put into place	• Education • Change in behavior	• Environmentally friendly • Natural fertilizer • Healthier soil • Decrease in air and water pollution • It's easy	• Education • Behavioral changes
Cleaning Chemical Use	Use environmentally acceptable cleaning products	• Education • Loss of cost of current chemicals in use • Identifying what type of chemicals are safe • Procedural changes	• Improve indoor air quality • Safer for human health	• Staff training • Require the use of "green" cleaning products • Establish purchasing guidelines • Identify green cleaning practices
Unsupported HVAC system	Supplemental heating and cooling through photovoltaic systems	• Start up cost	• Low maintenance • Free, clean and reliable energy source • No air pollution or hazardous waste production	• Identify possible offsets – funding • Obtain detailed plan recommended by architect or engineer

The easiest way to get a program like this up and running is to get all the participants on board with the plan. With the Executive Director's support, the next step would be to educate the staff and volunteers on the importance of "becoming green". By communicating the positive and negative aspects of the suggested modifications or additions, they will be able to see that the end result is clearly a benefit to the organization, the community and the environment in a win-win-win situation. It is suggested to have a brainstorming meeting with everyone, possibly even doing one with the children, to find out what people think about going green – what kind of ideas might they have and what do they actually know about it. Then, by taking the feedback from the forums and implementing change, everyone feels as if they are playing a part in the success of the program.

Providing full disclosure will instill a sense of importance and can be utilized as a team building tool. By making sure all people affecting the changes are fully aware of what is happening proves to not only be important but essential in the success of the program.

Once the organization is all in tune with the game plan, it will be important to pass on the information gathered to their members and contributors. As we all know, change is difficult to acclimate to and by ensuring the education of everyone, they will all be more receptive of behavioral changes such as recycling.

FUTURE INITIATIVES

The suggested above initiatives were "low hanging fruit' and provided knowing that there is a possible plan to begin a future $2 million dollar upgrade to the facility and for the short term these would be able to be implemented at a low cost and possibility to use or tie into the future project. However, when planning for the renovation of a larger scale cost saving can be had when planned appropriately and performed at the same time. Thus, it would give you a bigger bang for the buck and sustainability programs can be planned into action at this time. The following initiatives are recommended to insure the continuation of being the best possible environment stewards in sustainability while capturing future savings. The following are just a few ideas we recommend that you pursue during the planning stages of design.

First of all, upgrading or installing any missing insulation is required and upmost the highest priority. Make sure that R-19 insulation is the minimum for the attics, especially in the silos where there is none. Further, upgrades to the windows with proper R-value will insure that all dollars spent to operate any heating or cooling system will realize a dramatic savings.

The next recommendation would be to have a boiler analyst to evaluate efficiencies of performance; however, taking into consideration the cost for heating oil versus natural gas is very costly. It is recommended during the renovation project that a switch over to a natural gas furnace. Although it would take up front cost to connect to the gas pipeline from the building to the street, we believe in the long run, your saving can be produce from the increase efficiencies of the boiler and the reduction of the cost from natural gas. An average cost can be budgeted for roughly "up to 100 feet of service line for the first natural gas appliance will be installed at no cost to you! If needed, an additional 25 feet of gas service line will be provided for each additional natural gas appliance connected. Additional footage is installed at a cost of $5.00 per foot, if needed."[13]

This would also protect you from the next oil bubble increase which will exceed future cost of the $100/barrel like last year. For example, furnaces before 1992 have only 60% efficiency while presently the high efficient furnaces are 90%. That alone increases your saving by a third of the cost. In addition to, natural gas cost cheaper to burn, for instance, "in comparing the heat value of oil and gas…the cost of natural gas last winter was equivalent to heating oil at $1.72 a gallon. That's roughly half the average price for oil today."[14] Lastly, natural gas companies often offer rebates to switch to gas -- occasionally including a new gas furnace or boiler! The following are present rebates and saving offer by NSTAR from their web site **http://www.nstaronline.com/business/energy_efficiency/gas_programs/heating.asp**

As of December 12, 2009:

> Need new heating equipment? Purchase high efficiency-rated heating equipment (300,000 BTU max) for your business and increase your benefits of saving energy with a rebate check for the following:
>
> -$1,000 for forced hot water builders greater than or equal to 90% AFUE (Annual Fuel Utilization Efficiency).
> -$500 for forced hot water boilers greater than or equal to 85% AFUE.
> -$200 for steam boilers greater than or equal to 82% AFUE.
> -$400 for warm air furnaces with an AFUE rating of at least 92% and equipped with an electronic commutated motor (ECM) or equivalent advanced furnace fan system.
> -$100 for furnaces greater than or equal to 92% AFUE.

The following power point link is provided a for added NSTAR additional information on upgrades, NSTAR Power point http://www.aeenewenglannnnd.org/NSTAR.pdf.

[13] http://www.rockymountnc.gov/utilities/gasfaqs.html

[14] http://pressherald.mainetoday.com/story_pf.php?id=182584&ac=PHnws

At the same time, an on demand tankless hot water system will provide all the needed hot water for the locker rooms and domestic water supply for the pool participants, restrooms, and summer campers. Since there is dramatic cost savings and "green" benefits provide a genuine advantage for these reasons[15]:

- tankless water heaters reduce energy consumption by up to 40% by heating water only on demand and avoiding standby loss.
- tankless water allows flexibility with installation so it can be located closer to fixtures and appliances, saving on water consumption because the "wait" time for hot water is reduced.
- tankless water heater produces very low NOx (less than 40 PPM) and CO2 emissions, contributing to cleaner air and a healthier home and making it an environmentally sound gas appliance.
- With up to a 20-year service life, tankless water heaters last 2-3 times longer and are significantly smaller in size than traditional tank water heaters, thus reducing the amount of material that ends up in landfills.

With just couple of these upgrades, the YMCA Southcoast can become a model of the town of Dartmouth in proving and becoming an environmentally leader and steward through proactive carbon reduction.

PERFORMANCE MATRIX

A performance matrix is a tool that will allow each recommended strategies implemented to be evaluated and tracked for the benefits over a period of time. Such benefits will identify the improvements to your carbon footprint as your organization has taken the steps to become sustainable, along with proving and documenting cost savings. This instrument will assist to support that being environmentally friendly really does payoff. This will allow showing the support for future sustainability projects that will continue to increase the value to the organization, their customers, shareholders, and employees.

For example, we have begun a baseline graph of the cost to operate electricity and heating for the facility. We suggest continuing to document your electricity and oil's monthly expenses to monitor the baseline as charted in Attachment G which will allow serving as a comparison to previous expenditures and costing savings produced when such program has been implemented. In addition, this will assist in providing larger projects insurance which may take a higher amount of capital, but the decision makers would feel comfortable about receiving a favorable ROI.

Secondly, we recommend the Greenhouse Gas Equivalencies Calculator from the United States Environmental Agency's web page http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results to

[15] http://www.rinnai.us/tankless-water-heaters/learn-about-tankless/green-tankless-water-heaters/

serve as your "Green Monitoring Tool" which will allow you to keep a monthly or annual data that reveals how much GHG emissions that your facility is produce or reducing. Attachments H - K have both your electricity and oil conversions to GHG for the years 2007 & 2008.

When implementing a recycling program, we found that the Ecorewards Recycling[16] has an outstanding tool that calculates the amount of recycled materials and coverts your landfill avoidances, green house gas emission savings, energy and water savings. Simply by inputting the amount of recyclable from your monthly receipt can produce amount of impact you are saving within your carbon footprint. See Attachment L.

Lastly, begin a marketing program to capture a large audience and interactive web page should be put in place that is easily found from the home page titled ***"YMCS Southcoast reducing our carbon footprint."*** Along with a questionnaire - ***What does sustainability mean to you…*** The web pages should be set up to allow show daily carbon, oil and electric savings, amount of recycle product which was saved from entering the landfill, composted and community farm production, and perhaps amount of PV energy produced and not consumed from the production of burning of fossil fuels. In addition, "show off" your "green accomplishments and detail and inform customers of future programs. Finally, this matrix will offer human feedback which provides productive support, criticism, and even new ideas.

[16] http://ecorewards.contentactive.com/infostore/ECalculator.asp

ATTACHMENT A - Ingredients that can make good compost include:

Materials to Compost	
Browns = High Carbon	**Greens = High Nitrogen**
Ashes, wood	Alfalfa
Bark	Algae
Cardboard, shredded	Clover
Corn stalks	Coffee grounds
Fruit waste	Food waste
Leaves	Garden waste
Newspaper, shredded	Grass clippings
Peanut shells	Hay
Peat moss	Hedge clippings
Pine needles	Hops, used
Sawdust	Manures
Stems and twigs, shredded	Seaweed
Straw	Vegetable scraps
Vegetable stalks	Weeds*
*Avoid weeds that have gone to seed, as seeds may survive all but the hottest compost piles.	

Materials to Avoid

• **Coal Ash** - Most ashes are safe to mix into your compost pile, but coal ashes are not. They contain sulfur and iron in amounts high enough to damage plants.

• **Colored Paper** - Some paper with colored inks (including newsprint) contain heavy metals or other toxic materials and should not be added to the compost pile (see Heavy Metal Garden).

• **Diseased Plants** - It takes an efficient composting system and ideal conditions (extreme heat) to destroy many plant diseases. If the disease organisms are not destroyed they can be spread later when the compost is applied. Avoid questionable plant materials.

• **Inorganic Materials** - This stuff won't break down and includes aluminum foil, glass, plastics and metals. Pressure-treated lumber should also be avoided because it's treated with chemicals that could be toxic in compost (see Safety Concerns Cut Down Treated Lumber).

• **Meat, Bones, Fish, Fats, Dairy** - These products can "overheat" your compost pile (not to mention make it stinky and attract animals). They are best avoided.

• **Pet Droppings** - Dog or cat droppings contain several disease organisms and can make compost toxic to handle. (Can you believe the state of Alaska actually spent $25,000 on a study to determine the effects of composting dog poop?)

• **Synthetic Chemicals** - Certain lawn and garden chemicals (herbicides - pesticides) can withstand the composting process and remain intact in the finished compost. Poisons have no place in the natural micro-community of your compost pile.

ATTACHMENT B – Building A Compost Bin

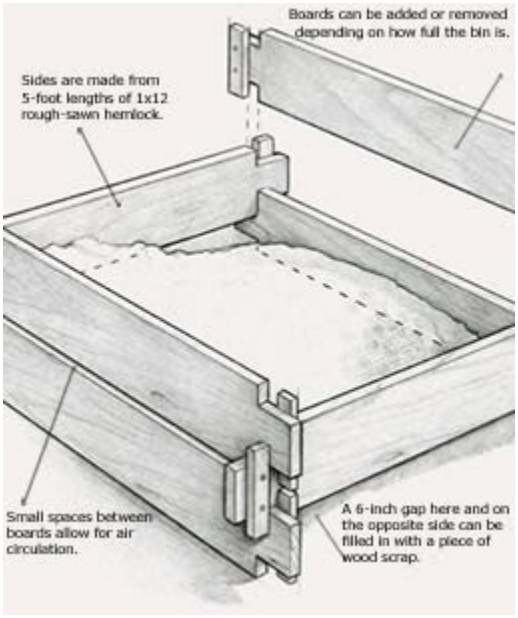
Easy to assemble and disassemble, this bin can adapt to the size of your compost pile

by Lee Reich

A compost pile is not a garbage pile, and one way to clearly differentiate between the two is with an enclosure -- a compost bin. The ideal bin retains heat and moisture, is easy to fill and empty, and fends off raccoons, stray dogs, and other animals.

A compost pile is not a garbage pile.

Boards can be added or removed depending on how full the bin is.

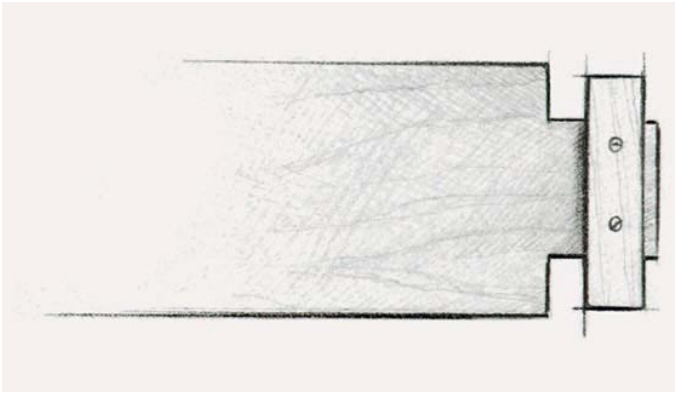


My own homemade compost bin is easy to assemble and disassemble and works with whatever size compost pile I have at a given time. It is made of rough-sawn 1x12 hemlock boards, each 5 feet long. I cut the corners from both ends of the boards to create tabs. To keep the boards in place when they are stacked in a bin, I make the tabs into notches by screwing a foot-long 1-inch by 3-inch piece of wood across the end of each board. I make the notch slightly wider than the width of the boards to allow for some movement.

The finished boards stack tier upon tier, like Lincoln Logs. To assemble the bin, I place two boards on the ground parallel to each other. Then I slide two more boards into the notches to form a square. Each time I use a board, I put the opposite side inward; consequently, the boards have remained serviceable even after 10 years. A short piece of scrap wood held by a stake fills in the 6-inch gap at the bottom of the two sides where the boards are held above the ground.

Creating the Notches

Cut the corners out of each board to create tabs at both ends. The screw a foot-long piece of 1x3 board across the end of each tab to create a notched end. The notches will keep the boards in place when stacked.



Photos: Virginia Small; drawing: Bob LaPointe
From *Fine Gardening* 81, pp. 47

ATTACHMENT C - Composting Problems

Q: Help! I've created a stinky monster. Where have I gone wrong?

A: If your compost pile is smelly chances are it has an overabundance of anaerobic microbes. They're doing a great job feasting on your garbage, but at the same time are creating a big stink. Usually, stirring and turning your compost pile regularly will put a stop to it.

Aerating the compost pile puts a check on the anaerobic microbes while encouraging the less smelly compost microorganisms to grow and prosper. Give it a try! You and your compost pile will be happier.

Q: I've noticed that my compost is damp and warm only in the center of the pile. What's going on?

A: When it comes to composting, size does matter! Your pile is too small. Go out and collect some more composting materials and make sure to mix the new stuff with the old.

The ideal compost pile size should be in the range of 3' x 3' x 3' to 5' x 5' x 5'. Smaller piles can't generate the heat necessary for plant material to decompose. Larger piles are harder to manage and may not decompose uniformly.

Q: Recently, while aerating my compost I noticed that the center of the pile was dry. How could that be?

A: Looks like you're being skimpy with the water. Next time you aerate the pile make sure to water while turning the pile. Better yet, consider moving the pile next to your garden so when it gets watered... your compost does, too!

Q: I just noticed maggots in my compost pile. What's the deal?

A: Some fly species lay eggs on decomposing plant material. Try adding a layer of hay to the pile and cover with screening. I've also heard that a 2 inch layer of sandy soil spread over the surface will work. Read more about effective fly control here.

Q: What can I do in the dead of winter to keep my compost pile active?

A: The bacteria that work to break down organic garbage into compost do not do well in freezing temperatures. One thing you can do to offset the cold is to keep your compost pile in a black bin in direct sunlight or you can insulate it using organic materials like hay bales.

If you live in a place that has significant cold -- like Montana where I live -- you may have to let your compost go on hiatus in the winter months. You can still recycle your kitchen scraps by using an indoor composter or worm bin. Learn more about composting indoors here.

Q: Arrgh! I don't understand what's going on. My pile is damp and has a pleasant smell... but it's not heating up. What do you think the problem is?

A: Happy composting is all about balancing the brown stuff (carbon) with the green stuff (nitrogen). To keep your pile "cooking" you want to maintain a C:N ratio somewhere around 25 to 30 parts carbon to 1 part

nitrogen. From your description, I'd say you're running low on nitrogen. Try adding some fresh grass clippings, manure or blood meal. You can also "recharge" a cool pile with a compost activator. I bet you notice a big difference.

Q: What's that ammonia smell?

A: Too much nitrogen. Add some high carbon materials, like straw, sawdust, or peanut shells to the pile and mix them in well.

Q: Yikes! What can I do about shrinkage? My compost pile keeps getting smaller.

A: As organic material goes through the composting process it takes up less space. You'll be surprised at how long it can take to fill a bin. When you do reach maximum capacity, dig down to the bottom of the pile and you'll probably find finished compost, which can be removed. If not, then you'll need to wait. If a full bin without compost is a continual problem you may need to invest in a second bin.

Still having problems? Visit the City Farmer's Compost Hotline.

ATTACHMENT D – Utility Heaters

Electric Utility Garage Heater - Dayton 3UG74 - 17100 BTU / 5000 W / 208 V

Description:
Our wonderful heating product comes with an inbuilt thermostat. It can raises the temperature by 60 degrees Fahrenheit. Working in the power range of 2.5Kw to 5Kw, its efficiency and heating capacity is very high. The single phase heater model also has a ceiling-mount bracket included. The heater also has a rugged plate fin installed inside along with an automatic fan delay control system. UL listed and available in neutral gray finish, this heater unit is a viable option for heating in basements, workshops, garages, warehouses, etc.
http://www.heater-store.com/scart/public/scart/dynamic.php?uid=2&action=printableview&pid=1360

Electric Heaters - Electric Wall Heaters - Commercial Fan Forced Wall Heater - Dayton 3UG57 - 16,382 BTU

Description:
The DAYTON 3UG57 is a wall mount, fan forced, commercial electric heater that works at 240/208 Volts. This surface mount heater is finished exquisitely with a white enamel finish. Steel finned metal sheath heating elements with low sheath temperatures make the model highly reliable and durable. The built-in delay switches start the fan only after the elements are heated. This model is ideal for light-duty residential and commercial use. Its surface mounting configuration makes it superb for 2 x 4 inches wall stud installation.

http://www.heater-store.com/electric_heaters_commercial_fan_forced_wall_heater_dayton_3ug57_1476_prd1.htm

ATTACHMENT E – WORKSHEET – ESTIMATING THE COST OF PHOTOVOLTAIC SYSTEMS

Sizing for Supplement Heating

WORKSHEET – ESTIMATING THE COST OF PHOTOVOLTAIC SYSTEMS[17]

Step 1. Determine the load, available sunlight, array size, battery bank size:

a. Determine the energy load required in watt-hours (Wh) per day. Multiply the number of watts the load will consume by the hours per day the load will operate. Multiply your result by 1.5.

Total Wh per day required**: 85,690 Wh**

b. Determine the hours per day of available sunlight at the site.

Total available sunlight: **4.4 hrs/day**

c. Determine the PV array size needed. Divide the energy needed (1.a.) by the number of available sun hours per day (1.b.). Total array size required: **19,475 Watts**

d. Determine the size of the battery bank (if one is desired). Multiply the load (1.a.) by 5 (result is watt-hours, Wh). Then divide by the battery voltage (for example, 12 volts) to get the amp-hour (Ah) rating of the battery bank.

Total Battery Bank Required: **__N/A____ Ah**

Step 2. Calculate the cost of the PV system needed for this application:

a. Multiply the size of the array (1.c.) by ~~$5~~ $4.32 per watt. (Actually current price)

Cost estimate for PV array: **$ 84,132**

b. If a battery bank is used, multiply the size of the battery bank (1.d.) by $1 per amp hour.

Cost estimate for battery bank: **$ __N/A_____**

c. If an inverter is used, multiply the size of the array (1.c.) by $1 per rated watt.

Cost estimate for Inverter: **$ 19,475**

Subtotal: **$ 168,607**

d. Multiply the subtotal above by 0.2 (20%) to cover balance of system costs (wire, fuses, switches, etc.).

Cost Estimate for Balance of System: **$ 33,721.40**

Total Estimated PV System Cost: **$ 202,328.40 x 50% funded = $101,164.20**

Heaters

(2) Utility @ 70% capacity x 5000w = 3500 x (2) = 7000 x running time/hour .75 = 5250 x 12 hours/day = 63,000

(1) Wall mount 70% capacity x 3600 = 2520 x running time/hr .75 = 1890 x 12 hours/day = 22680

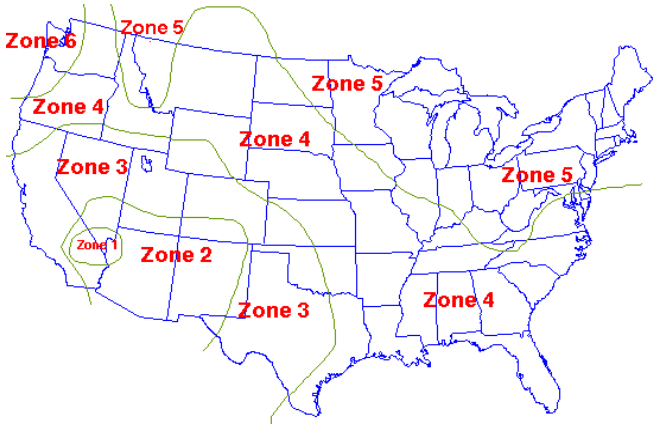
= 85,690 Total Required Load in watt-hours

[17] http://www.infinitepower.org/pdf/FactSheet-24.pdf

ATTACHMENT F

System Rating	1kW	2kW	3kW	4kW	5kW	6kW	7kW	8kW	10kW
6.5 Sun Hrs	150	300	450	600	750	900	1,050	1,200	1,500
6 Sun Hrs	140	280	420	560	700	840	980	1,120	1,400
5.5 Sun Hrs	130	260	390	520	650	780	910	1,040	1,300
5 Sun Hrs	120	240	360	480	600	720	840	960	1,200
4.5 Sun Hrs	105	210	315	420	525	630	735	840	1,050
4 Sun Hrs	95	190	285	380	475	570	665	760	950
3.5 Sun Hrs	80	160	240	320	400	480	560	640	800

SUN HOURS/DAY ZONE MAP



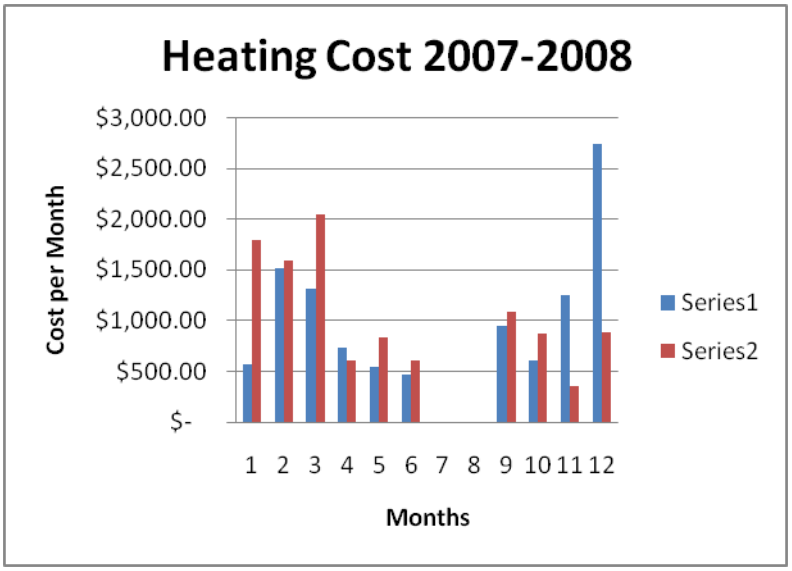
How Many Sun Hours a Day Do You Get?

Zone 1 6 hours
Zone 2 5.5 hours
Zone 3 5 hours
Zone 4 4.5 hours
Zone 5 4.2 hours
Zone 6 3.5 hours

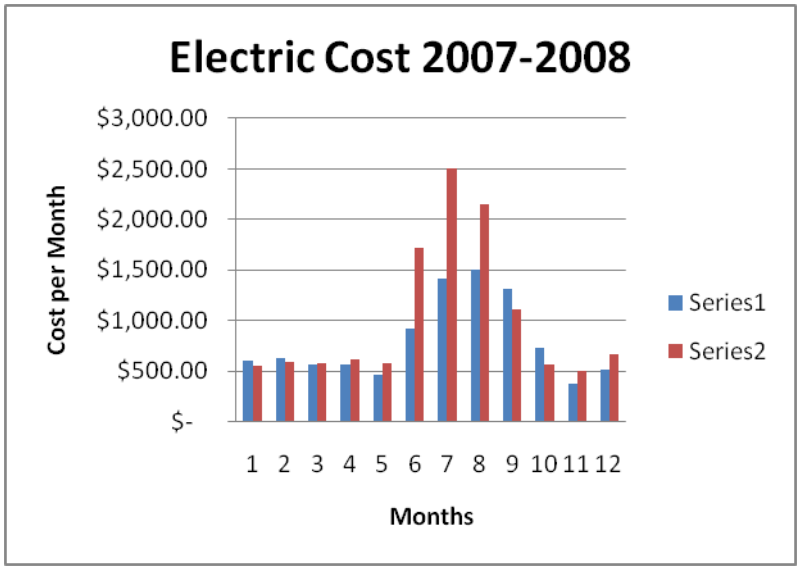
http://www.wholesalesolar.com/StartHere/GRIDINTERTIED/GRIDINTCalculator.html
http://rebeeco.com/images/stories/pv/solar%20data%20from%20nasa.pdf

ATTACHMENT G – 2007 and 2008 Base Monthly Utility Costs

	Heating Cost	
	2007	2008
January	$ 572.90	$ 1,790.87
February	$ 1,512.33	$ 1,587.53
March	$ 1,318.24	$ 2,047.54
April	$ 739.44	$ 615.03
May	$ 539.92	$ 835.74
June	$ 468.52	$ 605.48
July	$ -	$ -
August	$ -	$ -
September	$ 947.52	$ 1,091.72
October	$ 610.74	$ 877.84
November	$ 1,252.15	$ 352.80
December	$ 2,734.13	$ 884.84



	Electric Cost	
	2007	2008
January	$ 598.12	$ 556.02
February	$ 629.49	$ 585.61
March	$ 564.27	$ 576.92
April	$ 568.65	$ 614.65
May	$ 463.79	$ 576.00
June	$ 919.86	$ 1,718.83
July	$ 1,410.27	$ 2,510.00
August	$ 1,509.48	$ 2,148.25
September	$ 1,317.21	$ 1,116.31
October	$ 736.77	$ 569.11
November	$ 380.10	$ 498.73
December	$ 516.87	$ 665.86



ATTACHMENT H - 2008 Electric GHG Conversion [18]

2008 Electric GHG conversion

64800 | kilowatt-hours of electricity | Calculate Equivalent

Bottom of Form

**This calculator uses an eGRID non-baseload national average emissions rate when calculating "kilowatt-hours of electricity" to "carbon dioxide equivalent."

The sum of the greenhouse gas emissions you entered above is 46.5 Metric Tons of Carbon Dioxide Equivalent.

Equivalency Results

The information you entered above is equivalent to one of the following statements:

Annual greenhouse gas emissions from 8.9 passenger vehicles ? (click to read more about this calculation)

CO2 emissions from 5,235 gallons of gasoline consumed ?

CO2 emissions from 108 barrels of oil consumed ?

CO2 emissions from 0.62 tanker trucks' worth of gasoline ?

CO2 emissions from the electricity use of 6 homes for one year ?

CO2 emissions from the energy use of 4.2 homes for one year ?

Carbon sequestered by 1,193 tree seedlings grown for 10 years ?

Carbon sequestered annually by 9.9 acres of pine or fir forests ?

Carbon sequestered annually by 0.44 acres of forest preserved from deforestation ?

CO2 emissions from 862 propane cylinders used for home barbeques ?

CO2 emissions from burning 0.24 railcars' worth of coal ?

Greenhouse gas emissions avoided by recycling 15.7 tons of waste instead of sending it to the landfill ?

Annual CO2 emissions of 0 coal fired power plants ?

http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

[18] http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

ATTACHMENT I - 2007 Electric GHG Conversion [19]

2007 Electric GHG conversion

Top of Form

56320 | kilowatt-hours of electricity | Calculate Equivalent

**This calculator uses an eGRID non-baseload national average emissions rate when calculating "kilowatt-hours of electricity" to "carbon dioxide equivalent."
*If your estimated emissions of methane, nitrous oxide, or other non-CO2 gases are already expressed in CO2 equivalent or carbon equivalent, please enter your figures in the row for CO2 or carbon equivalent.

The sum of the greenhouse gas emissions you entered above is 40.4 | Metric Tons of Carbon Dioxide Equivalent.

Equivalency Results:

The information you entered above is equivalent to one of the following statements:

Annual greenhouse gas emissions from 7.7 passenger vehicles ? (click to read more about this calculation)

CO2 emissions from 4,550 gallons of gasoline consumed ?

CO2 emissions from 94.1 barrels of oil consumed ?

CO2 emissions from 0.54 tanker trucks' worth of gasoline ?

CO2 emissions from the electricity use of 5.3 homes for one year ?

CO2 emissions from the energy use of 3.6 homes for one year ?

Carbon sequestered by 1,037 tree seedlings grown for 10 years ?

Carbon sequestered annually by 8.6 acres of pine or fir forests ?

Carbon sequestered annually by 0.38 acres of forest preserved from deforestation ?

CO2 emissions from 749 propane cylinders used for home barbeques ?

CO2 emissions from burning 0.21 railcars' worth of coal ?

Greenhouse gas emissions avoided by recycling 13.6 tons of waste instead of sending it to the landfill ?

Annual CO2 emissions of 0 coal fired power plants ?

[19] http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

ATTACHMENT J - 2008 Electric GHG Conversion[20]

2008 Electric GHG conversion

3672 | gallons of gasoline | Calculate Equivalent

Bottom of Form

**This calculator uses an eGRID non-baseload national average emissions rate when calculating "kilowatt-hours of electricity" to "carbon dioxide equivalent."

The sum of the greenhouse gas emissions you entered above is 32.6 Metric Tons of Carbon Dioxide Equivalent.

Equivalency Results:

The information you entered above is equivalent to one of the following statements:

Annual greenhouse gas emissions from 6.2 passenger vehicles ? (click to read more about this calculation)

CO2 emissions from 3,672 gallons of gasoline consumed ?

CO2 emissions from 75.9 barrels of oil consumed ?

CO2 emissions from 0.44 tanker trucks' worth of gasoline ?

CO2 emissions from the electricity use of 4.2 homes for one year ?

CO2 emissions from the energy use of 2.9 homes for one year ?

Carbon sequestered by 837 tree seedlings grown for 10 years ?

Carbon sequestered annually by 7 acres of pine or fir forests ?

Carbon sequestered annually by 0.31 acres of forest preserved from deforestation ?

CO2 emissions from 605 propane cylinders used for home barbeques ?

CO2 emissions from burning 0.17 railcars' worth of coal ?

Greenhouse gas emissions avoided by recycling 11 tons of waste instead of sending it to the landfill ?

Annual CO2 emissions of 0 coal fired power plants ?

[20] http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

ATTACHMENT K - 2007 Electric GHG Conversion[21]

2007 Electric GHG conversion

Top of Form

4602.5 | gallons of gasoline | Calculate Equivalent

**This calculator uses an eGRID non-baseload national average emissions rate when calculating "kilowatt-hours of electricity" to "carbon dioxide equivalent."

The sum of the greenhouse gas emissions you entered above is 40.9 | Metric Tons of Carbon Dioxide Equivalent.

Equivalency Results:

Click on the question mark ? link to read the explanation of that particular calculation. Read about all calculations.

The information you entered above is equivalent to one of the following statements:

Annual greenhouse gas emissions from 7.8 passenger vehicles ? (click to read more about this calculation)

CO2 emissions from 4,603 gallons of gasoline consumed ?

CO2 emissions from 95.2 barrels of oil consumed ?

CO2 emissions from 0.55 tanker trucks' worth of gasoline ?

CO2 emissions from the electricity use of 5.3 homes for one year ?

CO2 emissions from the energy use of 3.6 homes for one year ?

Carbon sequestered by 1,049 tree seedlings grown for 10 years ?

Carbon sequestered annually by 8.7 acres of pine or fir forests ?

Carbon sequestered annually by 0.39 acres of forest preserved from deforestation ?

CO2 emissions from 758 propane cylinders used for home barbeques ?

CO2 emissions from burning 0.21 railcars' worth of coal ?

Greenhouse gas emissions avoided by recycling 13.8 tons of waste instead of sending it to the landfill ?

Annual CO2 emissions of 0 coal fired power plants ?

Bottom of Form

[21] http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

Enter Total Quantity of Recycling (Tons) 5

Calculate Results

Default composition Change

Material	Composition
Paper/Cardboard	92%
Glass Bottles	1%
Aluminum Cans	3%
Steel Cans	1%
HDPE Containers	0%
PET Bottles	3%

Material	Composition
Paper/Cardboard	%
Glass Bottles	%
Aluminum Cans	%
Steel Cans	%
HDPE Containers	%
PET Bottles	%

Landfill | Greenhouse | Energy | Water

Landfill | Greenhouse | Energy | Water

Material	Quantity Recycled	Landfill Per ton
Paper/Cardboard	4.600000000000	354.86
Glass Bottles	0.05	2.25
Aluminum Cans	0.15	18
Steel Cans	0.05	3.18
HDPE Containers	0	0
PET Bottles	0.15	29.97
Total		408.25

Material	Greenhouse Benefits(Tons CO2 eq per ton recycled)	Total Greenhouse Benefits (Tons CO2 eq)	Cars Permanently Removed from Roads	Groups of 10 Cars Permanently Removed from Roads
Paper/Cardboard		1.84	0.31	0.03

Glass Bottles		0.02	0	0
Aluminum Cans		2.28	0.38	0.04
Steel Cans		0.04	0.01	0
HDPE Containers		0	0	0
PET Bottles		0.23	0.04	0
Total		4.4	0.74	0.07

Material	EnergSavings(Kw-Hrs per ton recy)	Total Energy Savings (KWH)	Annual Electricity Requirements (Blocks of 10 Households @ 10,656 KWH/yr each)	Annual Electricity Requirements(Blocks of 100 Households)
Paper/Cardboard	4536.00	20865.6	0.2	0.02
Glass Bottles	932.40	46.62	0	0
Aluminum Cans	43092.00	6463.8	0.06	0.01
Steel Cans	8290.80	414.54	0	0
HDPE Containers	11793.60	0	0	0
PET Bottles	12499.20	1874.88	0.02	0
Total		29665.44	0.28	0.03

Material	Water Savings(1000's of gallons per ton recycled)	Total Water Savings (1,000s of gal)	Olympic Swimming Pools	Average. Sized Backyards Swimming Pools	Annual Water Usage(Persons)
Paper/Cardboard	6.950	31.97	0.05	1.28	1.3
Glass Bottles	0.911	0.05	0	0	0
Aluminum Cans	41.844	6.28	0.01	0.25	0.25
Steel Cans	3.715	0.19	0	0.01	0.01
HDPE Containers	-19.268	0	0	0	0
PET Bottles	-19.436	-2.92	0	-0.12	-0.12
Total		35.56	0.05	1.42	1.44