EXHIBIT "I"

Electric Systems Task Force
Phase 1 Report
15 October, 2007

Findings and recommendations of the Phase 1 Report of the Electric Systems Task Force

The Electric Systems Task Force (ESTF) was commissioned by the Village Council of Yellow Springs to provide information regarding the condition of its electric system, and to assist the Village Council to understand and address issues of electric power usage in the Village. The driving force for the creation of the ESTF was concern over issues of delivering power quality and capacity to meet current and future village needs and the potential need for a new substation. The tasking of the ESTF was split into two phases: Phase 1 provides information regarding the condition of the electric system and an exploration of options regarding the needs of the system. Phase 2 is to provide information and recommendations about electric power conservation in the Village. This report is on Phase 1.

The ESTF gathered information from public documents, information supplied by the Village Manager, and by face-to-face meetings with representatives from AMP-Ohio, which schedules and coordinates the delivery of electric power to the Village, and discussions with large power users.

Village Distribution System

The ESTF has determined that the condition of the Village-owned distribution system is generally good and well maintained. Some customers at the end of a distribution circuit experience low line voltage during periods of high energy demands on the Village distribution system and, according to Michelle Palmer of AMP-Ohio, this problem can be fixed by installing a 3rd set of voltage regulators on the two existing Village 3 phase distribution circuits at a cost of approximately $120,000. Installation of a 3rd distribution circuit is recommended in the near future to further improve the quantity and quality of power at a cost of approximately $210,000. The additional 3rd circuit will increase the total village distribution system capacity to approximately 14 MW from its current limitation of approximately 9.4MW (on the two existing circuits) and should eliminate the need for the Village to "shed load" as is required now whenever the two existing circuits are overloaded and exceed their individual limitations of approximately 4.7 MW each. A model of the existing Village electric system is being developed by AMP-Ohio as requested by the Village Manager at the recommendation of the ESTF. The model will enable analysis of power distribution within the Village and improvements of power quality and capacity. It will also, with inputs from the ESTF, simulate growth scenarios and their effect on the electric system.

Demand & Capacity

Historic data show that the existing Village electric system has a margin of approximately 25% in capacity (comparing 2006 usage to 1999 usage). As for distribution from DP&L to the Village, Amp Ohio estimated that DP&L would likely operate their system at a demand of up to approximately 40% over 2006 peak usage before upgrading. Also, peak demand has consistently trended downward since 1999, and a survey of large industrial users indicates further reductions in demand. Finally, modest conservation efforts can reduce peak usage in the Village by at least 10%, again adding margin to capacity. More detailed analysis of conservation measures is the task of Phase 2.

It is concluded that there is a significant margin for peak demand.

Substation
The purpose of the electric substation would be to accept increased power transmission capacity from DP&L and distribute it within the Village. When this was first raised as an option by the Blaeser Engineering Study in 1990, it was proposed as a cost-saving measure that would have paid for itself in a 7 year period. The cost of this project has increased seven fold. The modest savings in transmission and distribution costs paid to DP&L of $90,000 per year would not offset the $280,850 cost per year to finance its construction. This analysis negates financial considerations as a factor for construction of a substation. From the demand analysis discussed above, it is clear that there is ample time to react to year-on-year changes in demand, including long lead-time installations such as a substation if or when one is ultimately needed.

In conclusion, the ESTF has determined that the electric substation is not needed now, and that the decision to delay building it can be safely made, even taking into account the long lead time to bring it online. This finding is supported by AMP-Ohio.

Recommendations
The ESTF does believe that the Village distribution system needs to be upgraded. Here are three recommended options to achieve this:

Option 1) Based on results from the "Electrical System Modeling" by AMP Ohio, it may be possible to better balance the existing Village distribution system.

Option 2) If Option 1 is not sufficient to meet current needs, 1 or 2 voltage regulators may be added to the existing 3-phase distribution circuits at an estimated cost of $60,000 each.

Option 3) If additional quality and capacity are needed, a 3rd 3-phase distribution circuit can be added at an estimated cost of $210,000. The 3rd distribution circuit will increase the total capacity to distribute power within the Village to approximately 14 MW.

If demand exceeds 13.7 MW, it will exceed the existing capacity of the power transmission lines to the Village distribution system, and will necessitate an increase in power delivered by DP&L or the installation of a substation. Note that Options 1 and 2 will need to be executed first in order to distribute 13.7 MW or greater anyhow.

The options provided above comprise a series of improvements for consideration by the Village Council that can make the distribution of power within the Village more reliable and meet power demand for the Village.

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Technical Report to the council
Final Version – October 8

Introduction:

The purpose of this report is to respond to the Village Council charter for the Energy Task Force Phase 1. The Phase 1 tasks set by council are as follows:

> The Task Force will provide information regarding the condition of our electric system and explore options regarding the needs of the system. It will identify the questions which need to be answered, identify the sources of expertise needed to assist them in their work and report their findings to Council and the community. An important component of the process is to invite public involvement in the discussion. The Task Force will issue a report with the following findings:
> - A description of the current electrical system, its condition, reliability, safety and demand capability based on historic and present day data.
> - A description of electrical capacity needs of residential, commercial and industrial users based upon historic, current and anticipated future needs.
> - A description of available options to meet these needs.

Electrical Power Systems are complex and the terminology and numbers can be daunting. Simply stated, Dayton Power & Light transmits electricity from the "grid" to Yellow Springs and the Village distributes the electricity to Village customers. To distribute electricity, the Village owns and maintains a 3 phase distribution system that delivers 3 phase power to industrial and commercial customers and single phase power to small businesses and residential customers.

It is necessary to understand this in some detail in order to understand the recommendations of the task force. In a later section describing the details of the system, a table is provided rather than placing it in an appendix. The reader may refer to this table as he or she reads the text. Throughout this document the abbreviation SRS is used to designated DP & L's Snypp Road Substation and VMS is used to describe what can be called the village switching station or distribution station or metering system.

Getting Power

There are three terms that are necessary to understand electricity delivery systems – generation, transmission and distribution. Power first must be generated. Generation is mostly done by electrical power plants burning coal, oil and natural gas. In Ohio almost 90% of its electrical power is generated by coal fired plants. Other ways of generation include nuclear power plants and hydroelectric dams along with wind turbines. A small percentage of power (less than 2%) is generated by burning biomass, mostly wood. Less than 1% of the nation's power is generated from photovoltaic (solar) and wind generation.

Transmission is the process of moving the generated power from the point of generation to various parts of the country or region. Transmission is differentiated from distribution, which is the process of taking transmitted power, normally at high voltages, "stepping it down", and sending it to the end consumer, normally in a residence (single phase) or a commercial/industrial building (3-phase).

Power is generated throughout the country. The pylons of the national grid pass a few miles away from Yellow Springs. Dayton Power and Light (DP&L) has the equipment to take high voltage power from the national grid and convert it to the lower voltages used by distributors. All power consumed in Yellow Springs comes through power lines from the Snypp Road Substation (SRS), owned by DP&L. All the power purchased by the village is transmitted to Yellow Springs via the DP&L transmission lines.

Transmission lines from the SRS arrive in Yellow Springs at the Village's metering electrical substation (VMS) on Fairfield Pike Road. The power received from SRS is diverted into the two 3-phase circuits that carry power throughout the village. Each of the two 3-phase circuits runs (supported by power poles) to the various users within the village who use 3-phase power or single phase power.

Electricity Ownership – Participants

Electricity is delivered to Yellows Spring's residents via efforts of many different entities. Each entity has different responsibilities for the different components of power delivery. The Village owns and operates its own electric utility in the same manner that it owns and operates its water and sewer system. This is not the most common approach to providing electrical services in the U.S. The average person receives electricity through a commercial power company such as Dayton Power and Light (DPL). In such cases, DPL would own the lines, poles, etc. However, in the case of Yellow Springs, the poles, lines and transformers belong to the village. The village sets electric rates and collects payments. The Village employs utility staff and associated equipment, trucks, etc. While two bucket trucks are used mostly by the electric utility, other larger equipment and all employees work with more than one utility.

The electric utility that the village owns includes the metering station (VMS located on Fairfield Pike road). The metering station includes a wide range of power equipment resting on a foundation surrounded by a wire fence. The station includes transformers, current limiting devices, voltage regulators and monitoring equipment.

The power delivered to the various industries/businesses/homes of Village electric customers is not generated by the village. That power is generated at many different locations connected to the electric grid – some from coal plants, some from hydroelectric sites and some from waste products. AMP-Ohio schedules and coordinates the delivery of power delivered to the Village. Other means of generation also contribute. To be more precise, all power generated goes into a common pool and although the village might buy hydropower from one source, what actually is delivered could be from any generating plant as noted above.

Dayton Power and Light (DP&L) is the entity that delivers electricity to the village metering station (VMS). The village buys the actual power from the multiple sources previously mentioned and pays DP&L to transit it to the VMS.

The Village is a member of AMP-Ohio. AMP-Ohio is a non-profit cooperative, municipally-owned corporation (AMP-Ohio schedules and coordinates the delivery of power delivered to the Village. Yellow Springs purchases most of its power generation (not transmission) through AMP-Ohio. AMP-Ohio also provides a variety of other services to private electrical distributors, including legislative advocacy, electric generation facilities, conservation tools, technical consulting, etc.

Reliability and Capacity

The formation of the task force was based initially on concerns about the age and reliability of the system in general as well as the reliability of the system at its highest loads. Surprisingly, there were no specific details found that could measure either abnormal events or the level of the severity of any events that did occur. One benefit of this analysis was in learning that AMP-Ohio does have access to some data on the YS system which they received by a telemetry system. AMP-Ohio said it would be possible to add some analysis capability using the data that is generated to get a better sense of the reliability in the future.

The conclusion that the system is reliable comes mostly from AMP-Ohio as well as the experience of two task force members, Dave Heckler, former Village Manager, and Richard Zopf, former consultant to the village. The task force did no analysis of its own with system data nor was any attempt made by task force members to review or measure the system. Michele Palmer of AMP-Ohio toured the distribution system and in her professional judgment it was deemed well maintained and reliable. AMP-Ohio has over 102 systems – her familiarity with many of these systems adds credence to her conclusion. She acknowledged that there was system degradation in terms of voltage levels on a few occasions throughout the year, typically at times of hot weather (high demand associated with air conditioning load). She also noted that tree trimming is needed in some areas.

Issues—Capacity versus Quality

The following table summarizes information that is used in the remained of this section (MW means megawatts, kV means kilovolts, V means volts, A means amps, kWh means kilowatt hours):

Present Capacity Information	
Rated capacity of DP&L's 3-phase Snypp Road Substation (SRS)	10 MW
Maximum peak capacity (short periods) provided by SRS	11 MW
Peak Transmission from SRS to Village Metering Station (VMS) 2006	9.1 MW
Peak Usage in 2006	9.1 MW
Transformer voltage change at SRS	69 kV to 12.47kV
Present power transmission voltage from SRS to VMS	12.47kV
Maximum Contracted quantity of power DPL must deliver to VMS	18.8 MW
Single Phase voltage range within Village	114V to 126V
Number of 3-phase Village distribution circuits	2
Number of voltage regulators on each Village 3 phase distribution circuit	1
Number of voltage regulators on DP&L's transmission circuit to VMS	1
Existing limit (MW) on each Village distribution circuit (Total 9.4 MW)	4.7 MW
Amperage of VMS Recloser that sets 4.7 amps per distribution circuit	219A
Year of historical peak usage	1999
Amount of 1999 historical peak usage	11.15 MW
Percent decline from high usage point (1999 to Sep 2006)	22%
Percent decline from high peak point (1999 to Sep 2006)	19%
Possible increased usage capacity	25% (11.15/9.1)
Potential Capacity Information	
Potential power transmission voltage from SRS to VMS with new substation	69kV
Number of voltage regulators that can be added to each existing circuit	1
Number of 3 phase distribution circuits that can be added to existing VMS	1
Cost estimate from AMP-Ohio to add 3rd (final) voltage regulator to 2 circuits	$120,000
Cost estimate from AMP-Ohio to add 3rd circuit -	$210,000
Amount of additional power provided by adding 3rd 3 phase distribution circuit	4.7MW
(System capacity will increase from current 9.4 MW to 14.1 MW)	
Space available at the existing switching station to add circuits	sufficient
Estimated cost of a new substation	$3.5 million
Estimated time to design and build a new substation	3 years
Statistics – large users	
Antioch University (includes Antioch College and McGregor) usage	4,842,543 kWh
Antioch College future usage requirements	Unknown
Morris Bean usage (DP&L customer)	6,000,000 kWh
Antioch Company goal to reduce future usage	15-25%
YSI goal to reduce future usage	10-25%
Number of residential customers 2005	1850
Total residential electrical usage	14,692,114 kWh
Average residential energy usage	8,000 kWh

The issue of electric power to Village residents and businesses is actually two problems: Capacity and Quality. Quality of power here refers primarily to the distribution of power by the Village to customers specific voltage range. Capacity is the ability to deliver enough power during peak usage periods to meet demand. In our case it refers specifically to the capacity of DP&L to transmit power to the VMS from the SRS. For the Village these two issues are basically independent—that is increasing capacity does not improve quality to Village customers, and improving quality does not increase capacity delivered by DP&L. However, if DP&L were to provide greater capacity to VMS, the current village system does not have the capacity to deliver in excess of 9.4 MW.

Capacity: Peak power delivery from DP&L to the Village of Yellow Springs

The Capacity Situation Today

Power is transmitted to the Village by DP&L, who owns and operates the equipment up to the Village switching station. DP&L transmits power to the village from the Snypp Road Substation (SRS) which includes a transformer that reduces the voltage of the electricity from 69 kV to 12.47kV, the voltage that is transmitted to Yellow Springs. The rated capacity of the SRS transformer is 10 MW although at times DP&L has used the transformer at the slightly higher rate of 11.1 MW). The limit of transmission capacity of the power lines from Snypp Road to the Yellow Springs switching station is 13.6 MW. DP&L current equipment can deliver 10 MW of peak power. This is sufficient to meet the 2006 Village power demands of 9.1 MW. This leaves a margin of growth of <u>peak power</u> of about 10%.

Delivering more power to the Village:

The DP&L power transmission system as of today can deliver a maximum peak power of 10-11 MW. If the peak power demand of the Village exceeds the DP&L transmission capacity, then either new DP&L equipment must be installed or Village-owned equipment must be installed. The current DP&L Substation at Snypp Road (SMS) is limited to 11 MW peak power while the lines can carry 13.6 MW.

The current contract between the Village and DP&L stipulates that DP&L must be ready to deliver up to 18.8 MW of power to the village. DP&L might be required by this contract to upgrade their equipment to meet an increased peak power demand from the Village. One option is to increase the substation transmission capacity. Another option is to deliver power at 69kV to VMS and build a new substation there. This option may not be practical for DP&L but might be practical for the village. The substation and new transmission lines would cost the Village $3.5 million.

A second scenario to increase peak power capacity above about 13 MW is to install another 12.47 kV transmission line to the Village. This would still require an upgrade of the DP&L transformer at SRS. It is unclear what this would cost the Village but appears to be covered within the existing contract with DP&L. Questions for DP&L on this issue to be discussed in Phase II include:

- -Would the Village be required to pay for any of the upgrades?
- -How long would the upgrade take?
- -What would the peak power capacity of the upgraded system?

Quality of Power and Brownouts

Quality of power here refers to the delivery of power within a range of voltages. For residential users this is 114V to 126V. Excursions above, or more typically below this range can harm some electrical equipment. The existing Village-owned distribution system sometimes delivers power below the 114V limitation.

A brown out is defined as the delivery of power at less than 114V. A brownout is a decrease in power quality, not an interruption in service. Full interruptions – often called blackouts - are caused by falling tree limbs, squirrels, lightning storms, etc. Brownouts come when the demand at some time of day is greater than the capacity of the distribution system.

While brown-outs (or system overloads not resulting in system shut-down) caused by a limitation on the capacity to deliver (regulate and distribute) power to the village have been reported by users, documentation has not been produced as the village does not have the ability to record these events. So the number or severity of the brownouts is not known. Also, it is not clear what the cause of the browns out were, i.e., the Village system or DP&L; however, currently available evidence point to limitations in the Village distribution system.

Voltage regulators can be installed to increase the lower voltage. Industry practice limits the number of voltage regulators to 3 per circuit. The Village has two 3 phase distribution circuits, (each of which has 1 voltage regulators). There is also a voltage regulator at SRS. Thus, one solution to the voltage drop problem is to install a third voltage regulator on each of the two 3 phase distribution circuits at a cost of $120,000. (Estimate from AMP-Ohio's Michelle Palmer).

An alternate solution is to install a third 3 phase distribution circuit in the Village, with a more direct feed to those customers receiving poor quality power. AMP-Ohio's Michelle Palmer gave a rough estimate of $210K as the cost to install a third distribution circuit. This would increase the approximately 9.4 MW limit to about 14 MW. Note that improving the Village distribution system does not increase the power delivered to the Village by DP&L.

The quality of power, i.e., the providing of electric power within specifications appears to be within the control of the Village. The addition of a third voltage and/or a third power distribution line will enhance quality. The upgrade to a substation (which receives 69 kV power) does not solve the problem of power quality. Similarly, upgrading the power quality with a regulator or another distribution line does not increase the peak power transmission capacity of DP&L to the Village. The placement of the voltage regulator and/or the third distribution line should be modeled as soon as possible.

Summary

There is no immediate need for a new substation. Both capacity and quality can be improved at a much lower cost. Adding a third Voltage regulations to both of the 3 – phase distribution circuits will improve quality. Adding a third distribution circuit will increase both quality and capacity. It will also allow Yellow Springs to balance total load (MW) across three 3-phase distribution circuits (current load occasionally exceeds capacity of two existing 3-phase circuits)

Note that these possible improvements are congruent with the Blaser capital improvement report dated November, 1990. These possible improvements are a continuation of improvements previously outline in that report. Some of the improvements in the Blaser report have already been implemented.

Future Work

Phase II of the task force will address growth of Village residential population, growth in Village business, increase or decrease in per capita electric power as well as peak power demand and a strategy for energy conservation and efficiency. Power transmission and distribution equipment takes time (years) to install—if demand exceeds capacity upgrades may be slower than desired. Growing demand may exceed supply for housing and business (commercial and large industrial). Potential businesses interested in establishing a Village location might be deterred by the capacity limits of the electric system. Concern that not enough is being done to conserve (reduce consumption) and fight global warming must be addressed.

2008

ELECTRICAL SYSTEMS TASK FORCE

ESTF PHASE II FINAL REPORT

Final report for Phase II of the Electrical Systems Task Force to the Village Council of Yellow Springs, Yellow Springs, Ohio.

Electrical Systems Task Force

ESTF Phase II Final Report
Dec. 2008

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Recommendations

In concert with Village Council's current goal to "Develop a comprehensive policy that addresses global warming and seeks to reduce the carbon footprint of our community", the ESTF recommends that Council

commit to and begin funding a long term (2025) phased-in project to minimize our reliance on coal, provide as much of our electricity from renewable sources as possible, reduce our average per meter consumption by 50% and create 100 new conservation, efficiency and/or renewable energy related jobs in the village.

Methods to implement this include:

- Fund a study to size and cost an energy plan towards the above goals. (anticipated cost not to exceed $75K.) This is in addition to the $125K and possibly could be funded with KWH tax funds or economic development funds.
- Increase electric utility rates to generate an additional $125K per year for a minimum of 5 years.
- Use these funds for conservation, education and renewable generation (in order of priority) working closely organizations like AMP-Ohio and Ameresco
- Allocate $50k per year (from the $125k or KWH tax) for 3 years to initiate conservation measures in Village-owned facilities (Bryan center, library, water and sewage treatment plants, etc.)
- Implement a plan to incentivize the creation of 100 new jobs through a "conservation, efficiency and intermediate technology" energy themed economic development program

Execution:

- Establish a new task force to assist the Council and Staff in developing and implementing the strategy. Involve new task force in all phases of the effort.
- Develop a request for information (RFI) from potential contractors who would be pre-qualified to execute the energy plan under contract.
- Develop a request for proposals (RFP) to execute the energy plan.
- Implement the plan over the funded 5 years.

Funding:

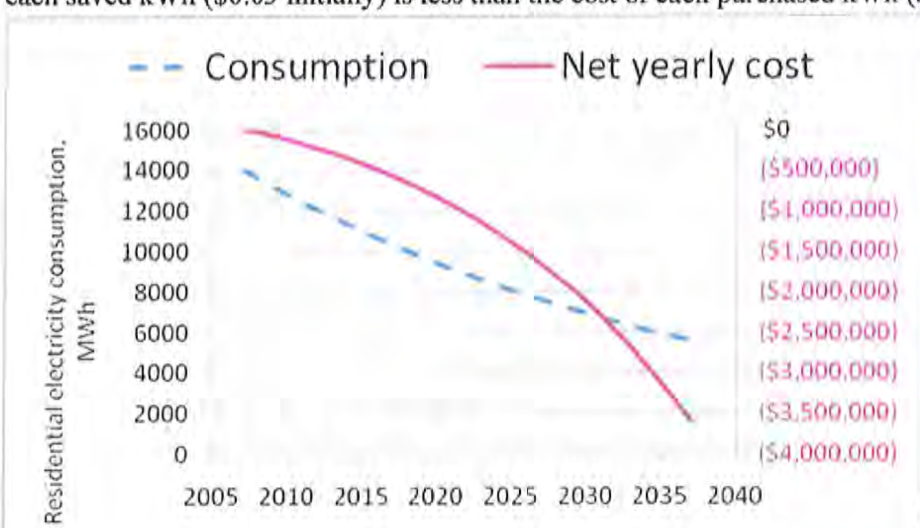
- $75K from the general fund for a consultant to produce a detailed work and estimated cost plan.
- $125K per year for 5 years in funds generated from Electric Utility rates to pay for conservation and alternative energy generation.

APPENDIX A
Analysis by Robert Brecha

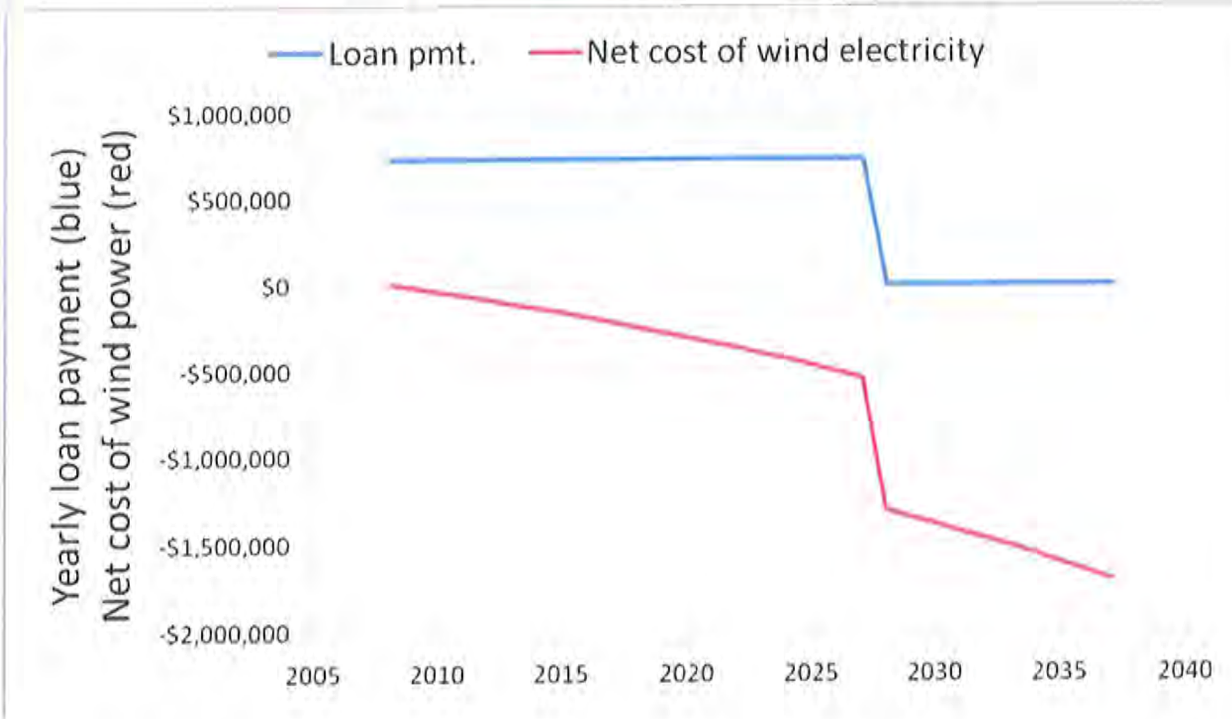
ESTF – Energy efficiency and alternative energy cost and benefit examples

1. Consider the costs and benefits of implementing energy efficiency measures in the Village. In the following, I assume (following AMP-Ohio and others, and being conservative) that energy efficiency measures cost \$0.03/kWh saved. Total residential consumption in the Village is about 14,000 MWh across approximately 1700 households. If we further assume that electricity costs will rise at 5%/year, and that our goal is to realize energy-use reductions of 3%/year going forward, we find the following, for the first five years of a program. In the first year, 0.03×14,000 MWh = 420 MWh reduction. Since the investment needed to realize this savings is \$0.03/kWh, the total cost will be 420,000kWh × \$0.03/kWh = \$12,600. At our current electricity rate of about \$0.10/kWh, the total dollar savings for villagers by reducing consumption by an aggregate 420 MWh is 420,000 kWh × \$0.10/kWh = \$42,000. We can continue these calculations into the future, assuming that electricity costs increase, per kWh, and efficiency investments continue as well. After five years, just for the sake of argument, we can assume that the cost per kWh for energy efficiency will increase to \$0.05/kWh, as we move to more and more difficult measures. Further increases to \$0.08/kWh and \$0.15/kWh occur after 10 years and 20 years, respectively. (These numbers are pure guesses, and might be high or low; the point is to roughly acknowledge the fact that as measures are implemented, somewhat larger investments will be necessary to take further steps.) Following this path until 2025, we find that total consumption will have decreased to about 8100 MWh, and villagers will be saving nearly \$1.5million per year compared to what electricity expenses would otherwise be. For an average family, the total savings will be on the order of \$7000 over that time period.

   The key point in this exercise is that the dollar amount saved each year is significantly greater than the investment made to implement efficiency measures. This point is actually obvious, because the cost of each saved kWh (\$0.03 initially) is less than the cost of each purchased kWh (\$0.10 initially).



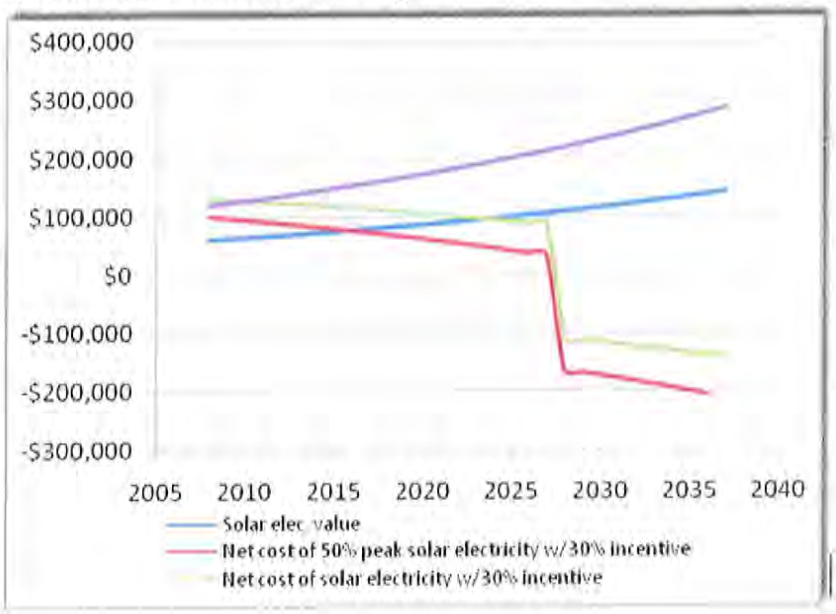
2. The second example is a bit more speculative, until we talk to energy providers, but will still serve to illustrate the potential advantage to investing in renewable energy generation capacity. If we were to pay for the installation of wind turbines with a total capacity of 4 MW (for example, four turbines with 1 MW power output rating), and the cost per kW of installed capacity were $2500, the total capital cost would be $10,000,000. Given a capacity factor of about 0.2 (capacity factor is essentially the fraction of time the turbine is actually producing at its nameplate capacity), we can calculate how many kWh of energy the turbines would produce. If we assume that we could get financing for 20 years at a rate of 4% for this project, there will be a monthly or yearly debt payment necessary. However, the electricity generated by the turbines is sold to homes in YS at the going rate of $0.10/kWh, inflating at about 3%/year, as assumed in the previous example. This system would produce about 7000 MWh/year. (Remember that the example for efficiency considered only households; even so, this example might be a bit ambitious in that there is almost too much wind power.) Village residents would pay $0.103/kWh × 7,008,000kWh = $720,000 in the first year for power from the turbine. The debt payment would be, given the above conditions, $727,000 in that first year, and for every year after. As time goes on, electricity gets more expensive, so the income from wind-generated electricity increases over time, whereas the debt payments remain constant. The result is that after the first year, there is net income from the wind project, as shown below.



Photovoltaic energy (electricity directly from the sun) is, relatively speaking, an expensive source of electricity if quoted costs are taken merely at face value. Looking into photovoltaics a bit more carefully, some of the excess cost is reduced significantly, although it is still more expensive than even wind power. The main advantages of solar energy are that the "fuel" is free and the generation is local. Financially, solar energy is eligible for various tax credits. The cost to install and generate solar photovoltaic systems is often quoted as being on the order of $0.30/kWh. However, there are at least four points to consider, all tending to reduce the relative cost disadvantage of solar photovoltaics. First, there are subsidies available; for example, a 30% cost reduction in the form of a tax rebate will reduce the overall cost of generation by that same 30%, to ~$0.21/kWh. Second, the cost of the solar input energy will not increase over time, meaning that as fossil-fuel generated electricity becomes more expensive, solar electricity will close the gap in price. Third, since solar electricity is generated locally, there is very little loss in transmission to the end-user. Overall, "line losses" account for about 7% of the electricity generated nationwide; this figure can climb to as high as 20% in summer peak-load periods. Thus, extra energy must be generated at peak-load times, not only to satisfy demand, but also because a greater percentage is being lost in transmission. The effect of this is to make locally-generated solar electricity less costly, relatively speaking. Fourth, electricity prices fluctuate over the year and during the day, as more expensive generating sources are brought on line to satisfy cyclic demand increases. Generation costs can vary by a factor of four or more, with the highest-cost electricity coming at just the time on hot summer afternoons when solar photovoltaic generation is at its maximum. Therefore, much of the electricity that is being replaced by photovoltaics is high-cost electricity, and not low- or average-cost electricity to which the price is often compared.

Given this preamble, here are a couple of options for solar photovoltaics.

3. Solar photovoltaic (version 1)
   Buy a system, or large set of systems to be mounted on individual buildings, houses, parking lots, etc. Imagine a total capacity of 500kW, at an installed cost of $7.50/kW peak capacity. If, as in the wind example, financing is available for 20 years at 4%, and furthermore, if there is a 30% tax credit available, then there will be debt service of approximately $200,000/year. The generated electricity, assuming half to be at peak rates does cost more per year than the debt payment, at least for the period of the loan. However, over the last ten years or so of the expected lifetime of the panels, there is a net income to the Village electric system. It should be noted as well that the total amount generated annually by this rather large photovoltaic system is only slightly less than 600 MWh; on the other hand the extra cost involved is also only a relatively small amount of the income to the utility, and therefore represents only a very small rate increase which itself decreases over time. The figure below shows this information graphically (positive numbers are net dollar outflows, while negative numbers are net income).



4. Solar photovoltaic (version 2)

   A second possibility for pv generation is to engage in a power-purchase agreement. An Ohio company, Dovetail Solar, offers a plan in which they provide installation and service, and essentially a lease agreement for roofspace, with the option to fully purchase the system at the end of an eight-year initial period. They claim an expected system lifetime (56.4 kW is the standard size they offer) of 40 years. Such an agreement would have to be investigated in more detail, and it may be that other entities, perhaps even AMP-Ohio, would offer similar or more favorable agreements.

5. Solar thermal

   Using solar energy to heat water for domestic use is a viable option, and costs significantly less than photovoltaics. Solar thermal systems are also eligible for tax credits. Sample runs from a solar software package are shown below; without going into all details, a summary is as follows:

   a. Often, hot water heaters are set at temperatures that are too high, such as 140°F. If this is the case for an individual household, simply turning down the hot water heater to 120°F is enough to save ~\$50/year in energy costs. (See the comparison between the first two figures below, "Cost Aux Enrgy Without Solar"
   b. In the second figure, for the lower set-point temperature, the cost savings per year for using solar hot water, calculated for our location and average solar input, comes out to about \$180/year for an average household.
   c. In the third figure, and again for the lower set-point temperature of 120°F, but now with an electric hot-water heater, the savings work out to about \$420/year by having a solar hot water system.

SolarSim

File Weather Data Active Solar Solar Wall PV Wind Help

Location: DAYTON
System: Hot Water
Collector Area = 8 (m2) Slope = 45 (deg) Azimuth from South = 0 (deg) Grnd Refl = 0.2
Num glaz = 1 Fita = 0.73 FrUL = 13.03 (kJ/hr m2 C)
Mass H20 Storage = 400 (kg)
Eff Hot Water Heater = 0.7 Cost Aux Energy = 12 (\$/GJ)

Month	Avg It kJ/dy	Avg Qts kJ/dy	Avg Qfshw kJ/dy	Avg Ts C	Avg Qloadhw kJ/dy	Avg Qauxhw kJ/dy	Total SLR Qfs/Qloadtot
1	82,369	29,230	28,602	39.7	45,875	17,273	0.62
2	99,159	34,989	33,457	46.4	46,775	13,318	0.72
3	115,000	40,941	35,769	51.6	45,603	9,833	0.78
4	143,952	47,823	40,736	65.3	43,633	2,896	0.93
5	143,952	47,373	38,496	66.9	41,202	2,705	0.93
6	145,199	49,117	38,244	72.5	39,055	811	0.98
7	144,244	47,582	36,305	73.6	36,588	283	0.99
8	155,685	49,799	35,797	76.4	35,973	176	1.00
9	141,193	45,143	35,426	71.1	36,750	1,324	0.96
10	138,675	44,643	34,810	68.6	37,759	2,949	0.92
11	78,708	27,579	27,208	44.7	40,863	13,655	0.67
12	63,422	21,413	22,729	35.3	43,346	20,617	0.52
Annual Avg	121,073	40,493	33,953	59.4	41,083	7,130	0.83

Avg Solar System Eff = Qfs/It = 0.28

Annual Savings
Cost Aux Engy Without Solar = \$257/year
Cost Aux Engy With Solar = \$45/year
Savings from Solar = \$212/year

Calculations assuming a gas hot-water heater with set-point of 140°F.

SolarSim

File Weather Data Active Solar Solar Wall PV Wind Help

Location: DAYTON
System: Hot Water
Collector Area = 8 (m2) Slope = 45 (deg) Azimuth from South = 0 (deg) Grnd Refl = 0.2
Num glaz = 1 Frta = 0.73 FrUL = 13.03 (kJ/hr m2 C)
Mass H20 Storage = 400 (kg)
Eff Hot Water Heater = 0.7 Cost Aux Energy = 12 ($/GJ)

Month	Avg It kJ/dy	Avg Qts kJ/dy	Avg Qfshw kJ/dy	Avg Ts C	Avg Qloadhw kJ/dy	Avg Qauxhw kJ/dy	Total SLR Qfs/Qloadtot
1	82,369	29,230	27,192	39.7	37,588	10,396	0.72
2	99,159	34,989	30,812	46.4	38,488	7,676	0.80
3	115,000	40,941	32,643	51.6	37,316	4,673	0.87
4	143,952	47,823	34,628	65.3	35,346	718	0.98
5	143,952	47,373	32,282	66.9	32,915	633	0.98
6	145,199	49,117	30,713	72.5	30,768	55	1.00
7	144,244	47,582	28,301	73.6	28,301	0	1.00
8	155,685	49,799	27,686	76.4	27,686	0	1.00
9	141,193	45,143	28,302	71.1	28,463	161	0.99
10	138,675	44,643	28,449	68.6	29,472	1,024	0.97
11	78,708	27,579	25,284	44.7	32,576	7,292	0.78
12	63,422	21,413	22,228	35.3	35,059	12,831	0.63
Annual Avg	121,073	40,493	29,021	59.4	32,797	3,775	0.88

Avg Solar System Eff = Qfs/It = 0.24

Annual Savings
Cost Aux Engy Without Solar = $205/year
Cost Aux Engy With Solar = $24/year
Savings from Solar = $182/year

Calculations assuming a gas hot-water heater with set-point of 120°F.

SolarSim

File Weather Data Active Solar Solar Wall PV Wind Help

Location: DAYTON
System: Hot Water
Collector Area = 8 (m2) Slope = 45 (deg) Azimuth from South = 0 (deg) Grnd Refl = 0.2
Num glaz = 1 Frta = 0.73 FrUL = 13.03 (kJ/hr m2 C)
Mass H20 Storage = 400 (kg)
Eff Hot Water Heater = 0.7 Cost Aux Energy = 28 ($/GJ)

Month	Avg It kJ/dy	Avg Qts kJ/dy	Avg Qfshw kJ/dy	Avg Ts C	Avg Qloadhw kJ/dy	Avg Qauxhw kJ/dy	Total SLR Qfs/Qloadtot
1	82,369	29,230	27,192	39.7	37,588	10,396	0.72
2	99,159	34,989	30,812	46.4	38,488	7,676	0.80
3	115,000	40,941	32,643	51.6	37,316	4,673	0.87
4	143,952	47,823	34,628	65.3	35,346	718	0.98
5	143,952	47,373	32,282	66.9	32,915	633	0.98
6	145,199	49,117	30,713	72.5	30,768	55	1.00
7	144,244	47,582	28,301	73.6	28,301	0	1.00
8	155,685	49,799	27,686	76.4	27,686	0	1.00
9	141,193	45,143	28,302	71.1	28,463	161	0.99
10	138,675	44,643	28,449	68.6	29,472	1,024	0.97
11	78,708	27,579	25,284	44.7	32,576	7,292	0.78
12	63,422	21,413	22,228	35.3	35,059	12,831	0.63
Annual Avg	121,073	40,493	29,021	59.4	32,797	3,775	0.88

Avg Solar System Eff = Qfs/It = 0.24

Annual Savings
Cost Aux Engy Without Solar = $479/year
Cost Aux Engy With Solar = $55/year
Savings from Solar = $424/year

Calculations assuming an electric hot-water heater with set-point of 120°F.

6. Job opportunities from energy efficiency and renewable energy generation.
   There are many possibilities for meeting the additional Energy System Task Force goal of creating new job opportunities. Among these are:
   - Energy efficiency – building (residential and commercial) energy inspections; energy efficiency retrofits to high and documentable standards; ultra-high efficiency (e.g. German passive house) construction.
   - Wind – engineering design companies; turbine maintenance; manufacturing of components
   - Solar pv – system design and planning; installation and maintenance
   - Solar thermal – system design and planning; installation and maintenance; manufacturing of solar thermal panels

APPENDIX B
Analysis by Reginald Stratton

ESTF Energy Efficiency and Conservation Program Summary for Village Council

Program Goal and Objective

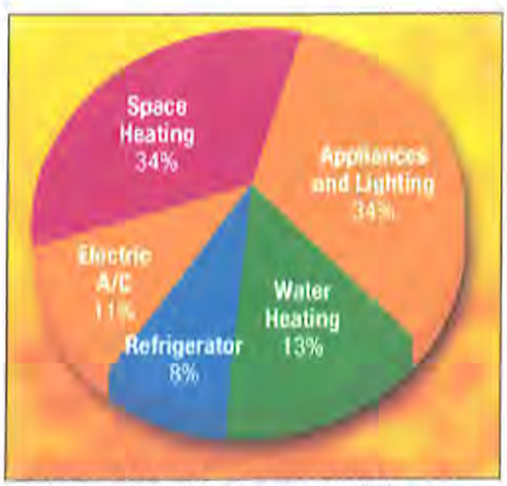
a. Goal:
Reduce carbon footprint to help deter impact Village has on global warming.
b. Objective:
Reduce our average per meter consumption by 50% over the next 15 years through a comprehensive energy efficiency and conservation program.

The predicted effects of global warming for the environment and for human life are numerous and varied. The main effect is an increasing global average temperature. From this flows a variety of resulting effects such as rising sea levels, altered patterns of agriculture, increased extreme weather events, and an increased range of tropical diseases.

Energy efficiency and conservation is the quickest and most cost effective way that the village can reduce its contribution to global warming and its subsequent devastating effects.

In this report, we will provide an overview of programs our community could implement to reduce our energy use and lesson our contribution to global warming and help preserve the environment for generations to come.

Before embarking on a comprehensive EE & C program, it is important to understand how energy is consumed in residential and commercial buildings. As indicated from the U.S. Department of Energy chart below and the table demonstrating the end use of energy in residential and commercial buildings, the majority of energy is expended on heating and cooling buildings, lighting, water heating and refrigeration. Initiating programs that address these sectors of energy use can have the greatest impact.



Source: U.S. Department of Energy

Table 3: U.S. Buildings Primary Energy and Expenditure End-Use Splits, 2004

Energy consumed is shown in quads and % of totals

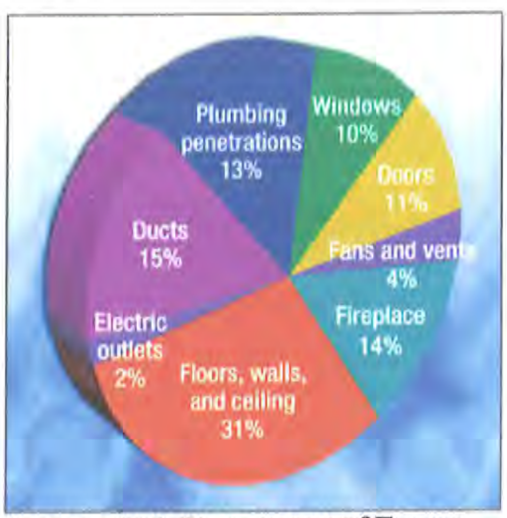
End Use	Residential		Commercial		All Buildings	
Space Heating	6.6	32%	2.3	13%	8.9	23%
Lighting	2.5	12%	4.3	25%	6.8	18%
Space Cooling	2.3	11%	1.9	11%	4.2	11%
Water Heating	2.7	13%	1.1	6%	3.7	10%
Refrigeration	1.7	8%	1.1	6%	2.8	7%
Electronics	1.1	5%	1.0	6%	2.0	5%
Cooking	1.0	5%	0.4	2%	1.3	3%
Wet Clean	1.0	5%			1.0	3%
Ventilation			1.0	6%	1.0	3%
Computers	0.2	1%	0.4	3%	0.7	2%
Other	0.9	4%	1.8	10%	2.6	7%
Adjusted to SEDS*	1.1	5%	2.2	13%	3.3	9%
Total	**21.1**	**100%**	**17.4**	**100%**	**38.5**	**100%**

* State Energy Data System

It is also important to know how energy is wasted through poor weatherization or insulation of buildings, inefficient use of hot water or the use of inefficient appliances and lighting systems.

Air Infiltration and Thermal Transfer: The chart below breaks down how air infiltrates our homes and buildings producing heat loss in the winter and cooling loss in the summer. Air leaking through cracks and crevices in doors and window framing or holes in plumbing penetrations can cause considerable cooling and heating loss. Thermal loss occurs as well through poorly insulated walls, attics and floors. Solar gain through windows in the summer time creates an extra burden on air conditioning.

Creating weatherization programs to address these losses is an important element of any EE & C Program.



Source: U.S. Department of Energy

Water Heating:

Water heating is the third largest energy expense in your home. It typically accounts for about 13% of your utility bill (U.S. DOE). The chart below details how the typical home owner uses heated water. Programs that promote the use of low flow faucets and shower heads, water heater insulation jackets and more efficient electric water heaters can help lessen this impact.

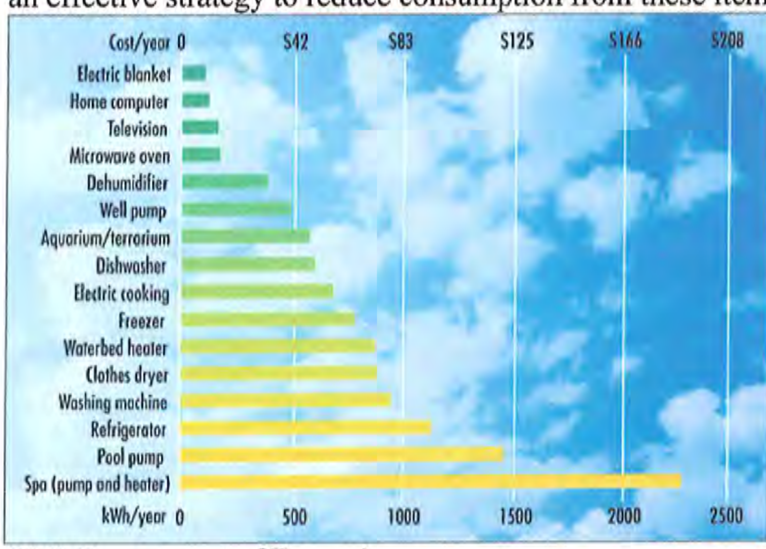
Average Hot Water Use

Activity	Gallons per Use
Clothes washing	32
Showering	20
Bathing	20
Automatic dishwashing	12
Preparing food	5
Hand dishwashing	4

Source: U.S. Department of Energy

Inefficient Appliances

Appliances account for about 20% of your household's energy consumption with refrigerators, clothes washers, and clothes dryers at the top of the consumption list (U.S. DOE). Encouraging the purchase of "Energy Star" rated appliances through incentive programs and new construction building codes can be an effective strategy to reduce consumption from these items.



(U.S. Department of Energy)

Inefficient Lighting

Upgrading lighting systems from incandescent to fluorescent is one of the fastest ways to cut energy usage. An average household dedicates 12% of its energy budget to lighting while commercial buildings dedicate up to 25%. Using new lighting technologies can reduce lighting energy use by 50% to 75% (U.S. DOE). Here is an example of energy savings realized by switching out twenty 60 watt incandescent bulbs with twenty 14 watt (60 watt equivalent) compact fluorescent bulbs in your home:

print this page

Simple Energy Estimator

Calculate the energy savings you'll gain by relamping your lighting system.
Also find out how long it will take to recoup your full investment for the new system.

Enter the following information and click "calculate."
Your results will display below.

* Required	
* Number of fixtures:	20
* Average number of hours on per year:	2184
* Your electric cost per kilowatt hour: $	0.10
* Watts per fixture used in current system:	60
* Watts per fixture used in proposed system:	14
Cost to upgrade each fixture*: $	1.60
	CALCULATE

Results

Cost of Electricity

Current system:	$262.08	per year
Proposed system:	$61.15	per year

Energy Savings (with proposed system)

Each fixture:	$10.05	per year
Total:	$200.93	per year

Using only your energy savings, you will get your full investment back in: 2 months (0.16 yr.)

Source: General Electric Lighting Estimator

Note: In addition to the cost savings of $200.93 year you use 1373 less kWh per year.

Program Initiatives (all would need cost/benefit analysis)

The following are descriptions of possible energy efficiency and conservation programs that could be adopted by the village to address many of the issues stated above. A comprehensive approach is needed to obtain deep cuts in our consumption and delay large capital outlays for increased generation. Savings from energy efficiency and conservation efforts will also offset ever increasing costs of energy for residential, commercial and industrial customers:

Education Program

- An educational program should be the cornerstone of any conservation program. Utilizing the local newspaper and radio station (WYSO) to launch the various initiatives, incentives, give aways or rebates are effective ways to "get the word out" to the general public. Developing a newsletter or sending out informational inserts with utility bills could also be effective communication tools. Posting links to energy efficient ideas, products or programs on the village web site would also be good conduit for exchanging information. The website could also have links to Green Energy Ohio or the US Green Build Council where information on renewable energy and green building design can be found.
- Develop an energy education program in our school curriculums (similar to the "water project") through partnerships with local organizations such as Community Solutions or the Environmental Coalition. There are also state funded programs that will provide teacher assistance and educational materials. Amp Ohio also provides teacher assistance for schools in its member communities.
- Host Village sponsored events, such as an "energy expo" or conference with local business involvement and vendors brought in to display energy efficient products and services.
- Provide information on Local, State and Federal incentive programs for energy efficiency, conservation and renewable energy and post on village website or village newsletter.
- Host talks on energy efficiency and conservation and invite speakers in with expert knowledge or experience in the field of conservation.
- Network with other businesses to share conservation efforts and provide tours of facilities.
- Encourage membership in the local chapters of the USGBC and Green Energy Ohio and publish information about events hosted by these organizations.

Audit Program

An audit program for residential and commercial/industrial customer is essential in helping the user to identify areas of high energy use, wasted energy or inefficient use of energy resources.

- Organize a group of volunteers group to do building scans with a thermal imaging camera to identify areas of poor insulation or air infiltration.
- Provide forms, tools and resources for homeowners to perform self audits.

- The Village could loan out an appliance meter, such as the "Watts Up" or "Kills-A-Watt" to residents to assist with self audits. The local library currently loans out one of these devices.

- Contract with a local vendor to perform audits at a discounted or subsidized rate. The contractor could offer a basic walk through audit or an audit involving thermal imaging and blower door tests.
- Commercial / Industrial customers can request a comprehensive audit through the village manager performed by an AMP-Ohio representative.

Compact Fluorescent Bulb Program

- A CFL program could be initiated by forming partnerships with local businesses support by village promotional/educational materials and rebates or other incentives. Downing's Do-It-Best Hardware and Living Green store have expressed interest in supplying CFL's for such a program. Other organizations that could champion this type of program could be the Environmental Coalition or Community Solutions. CFL's could also be given out as part of a conservation kit.

Programmable Thermostats

- "Set-up" assistance from a local vendor, village staff, or local volunteers for programmable thermostats could be offered as part of a program to promote the purchase and installation of these devices in residential homes. AC Service is a possible local vendor who could stock this item and perform the installation and set up as a package deal. Programmable Thermostats range in price from $29.00 to $79.00 and are very user friendly.

Appliance Program – Energy Star

- An appliance exchange program to encourage residents to turn in their old refrigerators or other inefficient appliances with low income assistance provided by the village to promote the purchase of Energy Star rated appliances. Offering a "trade up" allowance to residents who are planning to buy a new appliance to encourage the purchase of a more efficient appliance could be an additional approach.

Other Incentive Programs

- Provide free materials in the form of a "Conservation Kit" that may include caulking, low flow showerheads, water heater blankets, power strips, window film and a CFL's. Again, use a local vendor to stock these kits at a substantial discount and launch with promotional and educational materials.
- Provide credits on bill for energy efficiency/conservation implementation by commercial and residential customers or institute a usage penalty to those above a certain usage threshold.
- Low/No Interest Loans or incentives for Energy Efficiency Projects such as Energy Star appliance purchases or HVAC upgrades.

Insulation/Weatherization Program

There are a couple of existing weatherization programs available to Yellow Springs residents:

- **Greene County Program**

  Green County offers a low income assistance weatherization program. The village sent out flyers about this program; however, very few customers are taking advantage of it. Offering an application assistance program may help participation.

- **Vectren CAP Program**

A low income weatherization program is available to Yellow Springs residents who are Vectren customers. It is run by the Community Action Partnership (CAP). CAP will perform a home energy efficiency assessment and then install cost effective measures up to a certain value. The program is now budgeted at $2 million a year and is scheduled to expand in size. It is probable that very few villages are aware of this program. Ellis Jacobs stated that CAP may be willing to coordinate weatherization activities in YS with any broader energy efficiency program that YS would set up. He frequently represents CAP in utility cases and would be glad to make introductions whenever appropriate.

Load Management – Interruptible Circuits

- AMP-Ohio offers a load management program to its member community. This program involves the installation of radio controlled switches on the utility customer's air conditioning units or electric water heaters to turn off the condensers, resulting in a load reduction. The fans continue to run during cycling. Typical programs cycle the units off for up to 15 minutes on the hour during times of high peak load events during the summer months. This can be an effective program to help the village alleviate the number or frequency of "brown outs" currently experienced in the summer due to exceeding peak load capacity on electric transmission lines. The Village can contract with AMP-Ohio for this service and customers could enroll in such a program voluntarily or the village could provide a rate incentive to encourage participation.

Building Code "above code' requirements:

- The village could consider an above code requirement for new construction involving heating, cooling, appliance and insulation standards. Incorporating "Energy Star" and USGBC "LEED" programs could have significant impacts.

Approaches to Comprehensive EEC Programs

There are several approaches to defining and implementing a comprehensive EE & Conservation Program. The first is a completely community based program which uses resources within the community to develop and implement programs. The second approach is to utilize the services of **AMP-Ohio** who recently contracted with **Vermont Energy Investment Corporation** to develop an EE &C Program for its member community. A third approach is to hire consulting firm (such as VEIC) to design a program for the village. And finally, a fourth approach is to hire a design, build, and install performance contractor who will work mostly with the utility to identify efficiency opportunities within the village infrastructure and recommend upgrades with a guaranteed payback.

Community Based

- The village organizes a "grass roots" effort that utilizes volunteers, local business leaders and educators to help introduce energy saving products and habits to the community. Form a volunteer audit team, for example, to perform simple energy audits for residential customers. Utilize a local community action organization to promote and or distribute energy saving products or educational materials. Use local businesses to host and promote energy conservation events or product demonstrations. Assist the schools in implementing an energy education module in their curriculum.

Energy Performance Contracting

- The ESTF met with **Ameresco**, a private energy performance contracting firm. In general, the company focuses on efficiency improvements to municipality-owned properties, including municipal buildings, schools, water treatment facilities, traffic control and lighting systems, but are capable of delivering a comprehensive energy program involving energy education, renewable generation and grant assistance. Other competitors include **Optimera, The Synergy Company, Trane and Siemens**.

Private Consulting

- **The Vermont Energy Investment Corporation (VEIC)** is a non-profit consulting firm that can provide analytic, planning, management and technical support for a comprehensive EE & C program. The VEIC is currently working with AMP-Ohio to design a program that AMP-Ohio plans to roll out to member communities in June of 2008.
- **Environmental Defense Fund**

  Pat Murphy met with James Fine, an economist with Environmental Defense Fund in San Francisco. James said EDF might volunteer some resources to aid Task force in analysis.

Below are some other resources for the Village that requires further exploration:

- **Conservation Services Corporation**
- **WECC (Wisconsin Energy Conservation Corp)**
- **Ohio Home Performance Program**
- **International Conservation Services**

Utility Based

- **Amp Ohio** has contracted with **VEIC** to develop an EE program it will later roll out to member communities by early summer. An EE portfolio is being developed comprised of possible member programs. The next phase involves forming a "pilot" group comprised of AMP-Ohio member communities. A program "menu" will be established for each participant in this group and potential penetration rates and program costs and benefits will be evaluated. Our village was suggested as a possible participant in this study by the Amp-Ohio board of directors and members of the ESTF were invited to a teleconference with the Village manager, AMP-Ohio, and the VEIC to explore this opportunity.

Case Studies

Osage, Iowa

The center piece of the Osage, Iowa conservation program is education. Osage strategically launched each initiative with ads and articles in the local media. They also produced a bi-monthly newsletter mailed out to all utility customers that detailed energy efficient techniques and local energy achievements and used them to promote new initiatives or giveaways. The village also hosted talks and formed partnerships with the local schools to promote energy education and provided teacher assistance.

Auditing was also an important element in their conservation program. Village staff performed thermal scans of building roofs, walls and interiors and sent pictures of scans to residents to show how heat loss and thermal transfer was occurring in their buildings. The village also performed blower door tests for residents and free energy audits for local industrial and commercial accounts.

New construction standards were implemented specifying a minimum r-value for insulation of new buildings. Non-compliance to this new standard meant no gas or electric service until standards were met.

Osage incentive programs included free weatherization materials and low flow shower heads and faucet aerators along with CFL rebates to help residents conserve energy and encourage participation.

Osage also looked inward, initiating upgrades of their utility system to minimize line losses and detect faulty currents. Street lights were upgraded as well to more energy efficient lighting. A load management program was implemented to address peak loading during summer months through the installation of interruptible circuits on residential air conditioners and electric water heaters.

Ohio Energy Smart Communities

In 2001, Governor Taft initiated the "Energy Smart Community Challenge". This program recognized communities who made commitments to comprehensive energy efficiency programs and renewable energy strategies. A few of these communities are members of the Amp-Ohio network. These include Bowling Green, The City of Westerville and The City of Oberlin.

Bowling Green's energy program is focused on developing a diverse, clean power portfolio. Approximately 20% of electricity used by local consumers is generated from sustainable resources. This portfolio includes solar, wind, landfill gas and hydro with plans to expand wind and hydro capacity. Two elementary schools have 1kw grid connected solar panels and a solar education program. The project was made possible by the Foundation for Environmental Education and a grant from the Ohio Department of Development Office of Energy Efficiency and with revenue from the City's "Green Power" program. Additionally, the Ohio Energy Project (OEP) is providing in-kind contributions in the form of teacher training as a part of the Energy Smart School Program. A load management program is also deployed in Bowling Green and they are developing consumer programs on energy conservation and efficiency.

The City of Westerville has an on-line tool called "Energy Depot" where customers can perform a comprehensive on-line energy audit. An "Energy Calculator" is featured to help users determine the approximate energy consumption and costs for home appliances. The web-site has helpful "tips" to educate customers on conservation and energy efficiency. The Westerville School District has an energy education program that is funded in part by the Westerville

Electric Division and instructional materials and assistance is provided by the Ohio Energy Project. Like Bowling Green, Westerville also has solar panels installed at local elementary schools and solar education program.

The City of Oberlin partners with Oberlin College Students and local business to distribute Energy and Water Conservation kits to local residents. The local hardware stores provide the kits at a 50% discount ($27.00) and the students install the packages for free. The conservation kits include a water heater blanket, CFL, low flow shower heads, two faucet aerators, toilet tank dams, leak detector tablets and an energy conservation booklet. Oberlin College has one of Ohio's largest solar installations (60kw) providing 53% of the Lewis Center building energy demands. The college has installed a comprehensive energy and water monitoring system in all its dormitories that will provide real-time feedback that allows students to better conserve resources. A competition between dormitories is held to see which dormitory can reduce its consumption the most.

APPENDIX C
Resolution Authorizing the ESTF

VILLAGE OF YELLOW SPRINGS
RESOLUTION #2007-16

A RESOLUTION AUTHORIZING THE CREATION OF AN ELECTRICAL SYSTEM TASK FORCE FOR THE VILLAGE OF YELLOW SPRINGS.

Whereas, Council has concerns with the current condition and capabilities of the Village-owned electrical system; and

Whereas, along with anticipated residential and commercial growth, the need to consider options to address current and future concerns must begin now; and

Whereas, Council would also like to address concerns regarding the global environment and the need to reduce CO_2 emissions and consumptions; and

Whereas, Council would create an Electrical System Task Force to address these concerns.

NOW, THEREFORE, THE COUNCIL FOR THE VILLAGE OF YELLOW SPRINGS, OHIO HEREBY RESOLVES THAT:

Section 1. The Electric System Task Force is an ad hoc committee of the Yellow Springs Village Council. Its first order of business shall be to choose a Chair Person whose responsibilities include presiding over the meetings, and reporting the findings of the Task Force. If the Chair is not able to fulfill their responsibilities, the Task Force shall choose an alternate to stand in for the Chair.

Section 2. The Electrical System Task Force shall begin its work within 30 days of Council approval of its makeup and charge. A report of findings to Village Council and the community will be made in two parts. A report on Phase 1 will be made 90 days from the start of the Task Force work, and a report on Phase 2 will be made in an additional 90 days.

Section 3. The membership of this Task Force is as follows:

Benji Maruyama, Materials Engineer
Steve Conn, Environmental Commission, Professor of History, OSU
Roy Eastman, Owner Electroshield, former Village Council member
Richard Zopf, Miami Township Planner
Carol Gasho, Community Resources
Pat Murphy, Community Solution
David Heckler, Former Village Manager
Paul Abendroth, Retired Systems Engineer with Electrical degree
Reggie Stratton, Antioch Company
Bob Brecha, PhD. Physics, UD. Resource person for energy conservation; not a task force member.

Section 4. For a more comprehensive outline of the duties of this Task Force, the reporting content and the resources available, please see the attached memo.

Karen Wintrow, Vice President of Council

Passed: June 4, 2007

Attest: ______________________________
Deborah Benning, Clerk of Council

ROLL CALL

Karen Wintrow __Y___ Bruce Rickenbach Absent Judith Hempfling __Y___

Kathryn Chase __NO__ Kathryn Van der Heiden __Y___

APPENDIX D
Electrical Usage Data for the Village of Yellow Springs
Compiled by VYS Staff

Village Electric Usage, Top Five Consumers

KWH USAGE, BY TOP FIVE CONSUEMRS AS PURCHASED

		2001	2002	2003	2004	2005	2006
VYS	VYS Sewer Treatment	754,600	1,026,920	1,316,360	1,229,380	1,152,840	1,043,100
VYS	YELLOW SPRINGS EVSD	478,510	433,270	740,053	974,536	1,002,900	919,159
VYS	VYS Bryan Center	412,560	468,960	432,480	455,160	420,000	407,760
VYS	VYS Water Treatment	201,890	244,525	217,425	199,475	193,280	218,998
	VERNAY	8,696,760	7,118,160	3,977,160	2,797,920		
	ANTIOCH COLLEGE	4,591,113	4,934,730	4,605,845	5,880,643	4,842,543	4,528,794
	YELLOW SPRINGS INSTRUMENT	2,749,920	2,851,560	2,537,880	2,639,640	2,527,840	2,378,240
	ANTIOCH PUBLISHING	2,659,800	2,786,400	2,459,400	2,722,800	3,037,200	2,799,000
	FRIENDS CARE CENTER	1,026,720		1,168,203	1,226,943	1,152,944	1,090,004
	TOTAL TOP FIVE/Govt	21,571,873	19,864,525	17,454,806	18,126,497	14,329,547	13,385,055
	YEAR/YEAR CHANGE		-1,707,348	-2,409,719	671,691	-3,796,950	-944,492
			-8%	-12%	4%	-21%	-7%
	CHANGE 2001 TO 2006 FOR TOP FIVE CUSTOMERS						-38%
	CHANGE 2003 TO 2006 FOR TOP FIVE CUSTOMERS						-23%

Total VYS A kWH per ye	Average VY kW	Savings fron kW	Expected reduction in consumption
1,847,560	210.90868	35	17%

Village Electric Usage by Class in KWH

	2001	2002	2003	2004	2005	2006
Residential	13155760	14165796	13468781	13802378	14692114	13566555
General Service	7937302	8528645	8455663	7454140	7382797	6786348
Large Power	20051740	18810080	15000500	15756880	14355920	13472100
Total	40,275,869	40,797,076	36,924,944	37,013,398	36,430,831	33,825,003
Change from Previous		1.3%	-9.5%	0.2%	-1.6%	-7.2%
Peak (Top Hour Interval)	9919	9951	8513	8201	9036	9057
Change from Previous		0.32%	-14.45%	-3.66%	10.18%	0.23%
Cumulative Cooling Degree Day Units	900	1272	687	771	1075	860
Year/Year Pct change		41%	-85%	11%	39%	-25%
Correlation total to CDD		0.491516979				
Correlation Resident to CDD		0.631411539				
Correlation General to CDD		0.208337168				
Correlation Large to CDD		0.381151903				
Correlation Peak to CDD 03-06		0.712423611				

Degree Days is a weather term used to help understand energy use over a period. A "degree day" is a unit of measure for recording how hot or how cold it has been over a 24-hour period. The number of degree days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65 degrees F. (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by 2.)