

Alternative Energy

The purpose of the Alternative Energy working group is to investigate and recommend potential alternative energy options, policies, and incentives which may be addressed by the city of Elgin and other public agencies, businesses, as well as the community-at-large. This may involve the production of energy generated from solar, wind, geothermal, hydropower, biomass, etc. or how it energy is harnessed and consumed.

Energy consumption is part of our lifeblood, whether it is energy used for transportation, buildings or communication. As shown by the U.S. Green Building Council, buildings in the United States account for 39% of energy use, 72% of electricity consumption, and 38% of all carbon dioxide emissions.

While the Alternative Energy working group has investigated many opportunities for energy conservation, many others still exist – and many others have not yet been developed. The challenge brought forth by Alternative Energy is to look at and evaluate opportunities for the reduction of energy consumption and greenhouse gas emissions.

Alternative Energy Goal I

Encourage energy conservation by city of Elgin residents and businesses.

The purpose of this goal is to organize programs to educate, facilitate, as well as provide incentives to citizens and businesses of the city of Elgin for investing in cost effective, ROI-based improvements to existing residential and commercial buildings that conserve energy.

These programs will increase the community's awareness, access and ways for:

- Reducing the cost and amount of energy required to comfortably heat, cool, light, and power residential and commercial buildings.
- Reducing the use of finite fossil fuels, as well as sources of renewable energy, to promote a more sustainable per capita rate of energy consumption.
- Increasing the demand for “green” businesses to locate in Elgin and the Fox River Valley to serve the area's residents and businesses.

Objective 1

Organize a program to educate, citizens and businesses about the benefits of energy audits to identify cost effective ROI-based improvements that conserve energy.

Tasks/Metrics

1. Research energy audit industry standards and practices for performing commercial and residential building energy audit assessments.
2. Identify the types of improvements providing the highest energy conservation ROI.
3. Identify existing (and proposed) energy conservation incentives, rebates, and discounts offered by governmental agencies, utilities, and local energy auditors and contractors.
4. Meet with local energy conservation organizations to learn what they are doing to encourage governmental agencies, utilities, and other groups to promote energy conservation through educational programs and incentives.
5. Develop a presentation that summarizes the energy audit process and provide actionable information about the types of building improvements that provide the highest ROI, existing (and proposed) energy conservation incentives, rebates, and discounts, and local organizations that encourage energy conservation.
6. Provide the presentation at several Elgin area venues (sustainability meetings, Elgin Alive, Gail Borden Library, local conservation organizations, etc.).

Objective 2

Pursue establishing a volume-based discount program to provide a standardized before/after energy audit, and make the types of improvements that produce the highest energy conservation ROI.

Tasks/Metrics

1. Identify local Energy Auditors and contractors who perform energy conservation oriented building improvements.
2. Develop a checklist of questions (e.g., licensed, insured, certified, BBB rating, etc.) used to vet Energy Auditor and contractors.
3. Meet with candidates to review the checklist and gather information about their services and business practices. Interview a sample of their customers to document their satisfaction with the services provided. Based on this information, energy auditors and contractors can be selected to participate in a program to offer discounted Energy Audits and energy conservation oriented building improvements.
4. Negotiate volume pricing with the recommended Energy Auditors and contractors and obtain an agreement from them to provide discounted services to residential and commercial property owners of the city of Elgin.
5. Energy auditors agree to discount their assessments and contractors agree to discount energy conservation oriented building improvements on a sliding scale, (i.e. 10% to 25%) if a specified number of residential or business property owners purchase energy assessment and make typical energy conservation building improvements within a specified period.
6. Develop a presentation that summarizes the volume-based discount program to provide a standardized before/after energy audit, and typical improvements that produce the highest energy conservation ROI. Include a brief summary of the Energy Audit process, the types of building improvements that provide the highest ROI, and existing (and proposed) energy conservation incentives, rebates, and discounts.
7. Report the results of the Energy Conservation volume pricing program to the Elgin City Council over a period of 5 years. Publish the following statistics quarterly:
 - Number of Energy Audits performed by each Energy Auditor
 - Number of energy conservation oriented building improvements by type performed by each contractor
 - Difference between before and after energy audit results
 - ROI of energy conservation oriented building improvements
 - Qualitative feedback from residential and business program participants

Foreseeable Challenges

The greatest challenge associated with accomplishing these objectives will be to motivate and channel the efforts of citizen volunteers, many of whom have full time jobs and who commit much of their free time to their families.

Green Glossary

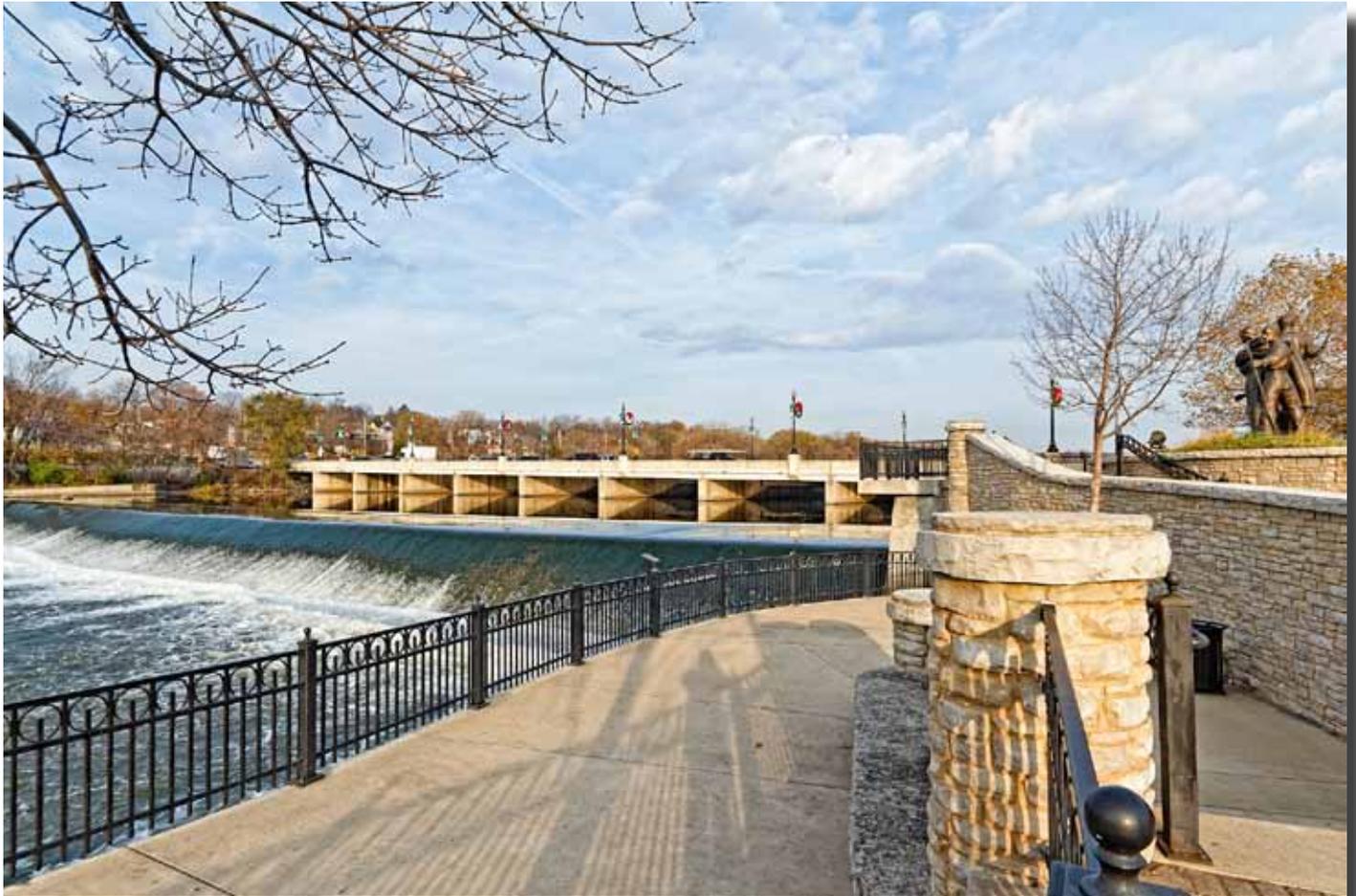
Alternative energy is defined as energy that is produced without the undesirable consequences of the burning of fossil fuels or without having high carbon dioxide emissions.

Renewable energy is defined as natural recurring potential energy sources to be harvested without the detrimental effects of carbon emissions.

Alternative Energy Goal II

Develop clean and renewable energy alternatives unique to Elgin

The most sustainable lifestyles maximize the use of local and renewable natural resources. In regards to alternative energy, this idea focuses upon the use of available geothermal, solar, wind, and water power. This can be done on a community-wide basis for large projects, or a single building at a time.



Objective 1

Pursue the construction of a hydropower dam at the Kimball Street Dam

The power of the Fox River is a historic asset of the community that may be under-utilized. The use of a low-head, hydro-electric generation unit (generator) on the Kimball Street Dam, should be re-evaluated using the current funding options. If it is found to be a viable project, it should be constructed.

As a part of the updated evaluation, include all current resources, such as current costs for energy, lower cost for interest, sales of Renewable Energy Certificates, and Clean Energy Grants. If the generator is economically viable, this plan recommends the City pursue construction.

There are several benefits to the hydro-electric dam project including:

Demonstration of Elgin's continuing commitment to sustainable living.

The project will demonstrate the Elgin's long-term goal of living sustainably.

Return on Investment

The power generated will be a predictable commodity. The project will only be approved if it is economically justified. Therefore, if it is constructed, it should be a reliable source of income for the Elgin.

Renewable energy

It is understood that hydropower is one of the most economically viable forms of renewable energy. The investment is primarily in the dam structure itself. The flow of the water provides a substantial, predictable, and reliable amount of baseload energy. In this case, the dam is almost a permanent installation due to the need to backup water for the drinking water facility. This makes using the energy even a more viable option than other projects where dam removal is possible.

Reduced line losses by generating power at a city center.

Energy losses are a fact in any operation. The fact that this generation facility is in the midst of electricity users makes this an installation with above average efficiencies.

Improved dam safety.

The energy of the water running over the dam is the primary cause for the churning action at the base of a dam, which has been a hazard. In this case, the vast majority of the water will be routed through the generation system. This means that the energy at the base of the dam is greatly reduced. This should greatly reduce the chance for a tragedy at the Kimball Street dam. Sufficient water will be routed over the dam to retain the aesthetic, and historic, appearance of the dam.

Reduced cost for dam maintenance.

The energy of the water running over the dam is the primary cause for damage to the dam's structure. In this case, the vast majority of the water will be routed through the generation system. Therefore the energy that may damage the dam is reduced.

Reduced dependence on fossil fuels.

Hydropower generation units provide the majority of the country's renewable energy resources. They have been installed for decades, even when oil and natural gas prices have been much lower than they are today. This is an indication of the extremely beneficial economics of generating electricity from dams.

Reduced carbon footprint.

Renewable energy reduces the need for fossil fuels, improving economic stability and security.

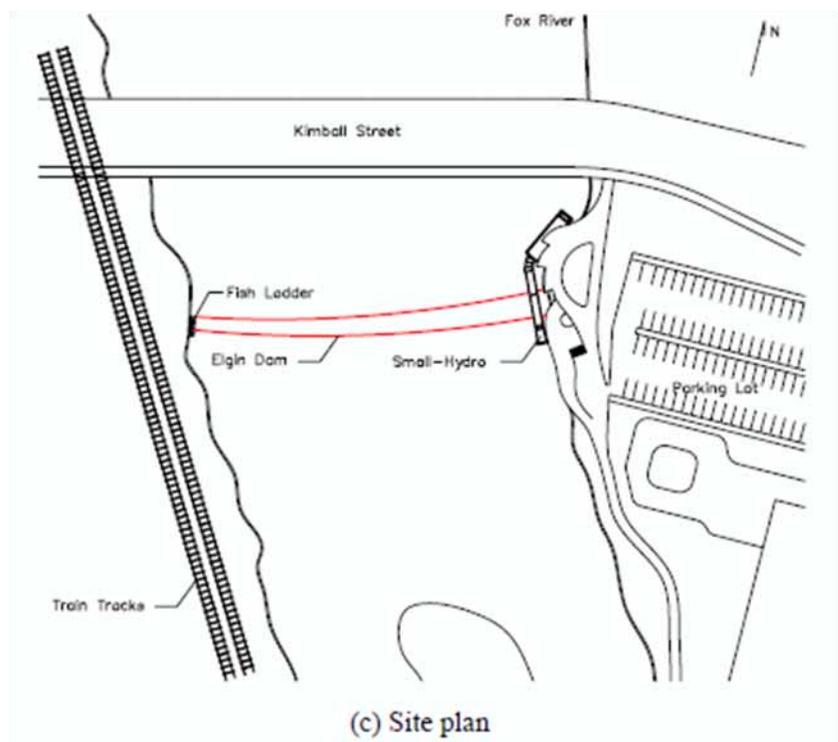
Demonstration of viability to other communities with low-head dams.

The project should serve as a demonstration to other communities.

RECs for sale, or use as part of Green Power Community certification.

Renewable energy certificates (REC's) are a new part of the evaluation. These are a salable asset that is expected to grow in value as more mandates for renewable energy are required within Illinois and nationwide.

The evaluation for this project can be started immediately and completed within a year. The permitting process for a generator on the dam can take up to three years. The construction could start immediately after permitting and completed within another year. Completion before 2016 is a realistic schedule.



Potential Dam Layout

Objective 1 Pursue the construction of a hydropower dam at the Kimball Street Dam (cont.)

Tasks/Metrics

1. Evaluate the feasibility of the project
2. Conduct a selection process to choose a dam consultant
3. Decision to proceed with final design and construction.
4. Obtain permits from required jurisdictions
5. Engage local population and interest groups
6. Secure funding
7. After bidding, and prior to award, the economics of the bid price, versus the design price should be compared. If the decision were made to scrap the project due to economics, the threshold price where it becomes viable should be calculated. Availability of grants may be a deciding factor.
8. Construction
9. Operation
10. Confirm operation results in expected efficient generation of low-cost power (i.e. commissioning)

Foreseeable Challenges

Economics

Economics and ROI need to be evaluated. According to a presentation by Orenco Systems at the December 1, 2010 meeting of the Elgin City Council, the payback on the dam could be as low as four years. Construction costs are currently estimated at \$1.5M.

Appearance

There can be aesthetic concerns about generator facilities because high-power dams where water is not seen overtopping the massive dam structure. In fact, there will be little change to what people see today. With low-head generating units about 10% of the water is allowed to overtop the dam, maintaining the historic view of the Kimball Street Dam. Outreach showing current dams in the area and digital images of before and after views of the Kimball Street Dam site should be prepared.

The second visual concern is the expectation of a large generator beside the dam. In fact, the generation unit will mostly be below ground and quite unobtrusive. Once again, a public education program will likely be necessary.

Safety

Safety is a concern at the Kimball Street Dam. A significant advantage of the generator is that safety is substantially improved by adding it. Without a generator, 100% of the water passes over the dam. This water generates extensive turbulence and churning action at the base of the dam, which is the primary hazard. With a generator, 90% of the water is directed through the generator, reducing the churning at the base of the dam.

Environmental Issues

Dams are a concern of some environmental advocacy groups as they do segment the river, preventing fish passage upstream. In addition, in the pool upstream of the dam can often suffer from excessive sediment deposition and low levels of dissolved oxygen. In this case, the dam is necessary for Elgin's water treatment plants to operate. Therefore, the issue is not if the dam is good or not, it is: "If the Kimball Street dam will be present for the next several decades, is it a good idea for Elgin to generate power from that dam?"

In addition, the construction of the dam can be used to improve the problems associated with the existing dam. Modifications to the dam can include installations of the most modern fish ladders. The fish ladders will be easier to traverse since the rate of flow over the top of the dam is reduced by 90%. In addition, dissolved oxygen can be supplemented by a fountain or bubbler system powered by the dam. Engaging environmental activist groups early-on in the evaluation process is a necessary step.

There is also a concern that fish will be harmed by the generator. In fact, large fish are excluded from the generator by a screen at the intake and maintaining a slow enough rate of flow into the screen that large fish can easily swim away from the screen. Modern designs of generators result in a low amount of turbulence for water passing through the generator. This results in smaller fish mostly passing through the generator without harm. So there is some harm, however the number of injured fish by the generator must be compared with what occurs with the current dam where all fish that are pulled over the dam are subjected to the churning at the base of the dam.

Alternative Energy Goal III

Pursue alternatives and renewable energy systems to reduce Elgin's urban peak energy demand.

Benefits of alternative and renewable energy systems

- Alternative and renewable energy systems can reduce Elgin's peak power requirements and avoid costly infrastructure of new electrical peaker energy supply plants.
- Alternative and renewable energy allows for future sustainable growth of the region. They also prepare the downtown urban environment for global warming rising temperature effects. It is projected that Illinois' future climate temperatures will equal those of the State of Texas by 2050 if emissions remain high.
- Projection of global warming's impact on the Mid-West: Heat waves that are more frequent, more severe, and longer-lasting are projected. The frequency of hot days and the length of the heat-wave season will both be more than twice as great under a higher emissions scenario versus a lower one. Alternative and renewable energy systems help reduce emissions.

Objective 1

Continue Elgin's Center City Commercial Retrofit grant program, focusing on thermal efficiency.

Tasks/Metrics

1. Through participation in Elgin's Center City Commercial Retrofit program, reduce the thermal energy required for the interior conditioned working environment of Elgin's urban business districts by 30% with the following:
 - High efficiency lighting systems and daylighting
 - High efficiency air conditioning systems
 - Building automation computerized systems
 - Use of cost effective utility rates and conservation programs (real-time-pricing)
 - Make the roofs, windows, walls of buildings more thermally efficient
 - Energy effective operational procedures
 - Proactive preventive maintenance and behavior
2. Study additional funding opportunities for the program such as a Property Assessed Clean Energy (PACE) assessment, revolving loan or with TIF district monies
3. Pursue the addition of a Vacancy Rebate Program to the program similar to Richmond, California and Sudbury, Ontario to target vacant properties to improve the energy efficiency of their vacant buildings thus increasing their marketability.

What is a peaker power plant? ○

"Peaker" power plants run only when there is a high demand, known as peak demand, for electricity. In Illinois, this occurs during the summer when air conditioning load is high, and other power plants cannot meet the demand for power.

Objective 2

Investigate the opportunity to contract with a solar leasing company for providing photovoltaic solar panels and installation to viable roof surfaces, parking garages, parking lots and buildings in the downtown business district.

Solar power considerations include:

Timing and Location

Consider that solar power is producing power when our energy demands and costs are highest. Solar power will benefit the end user by producing power where it is needed with no transmission losses and with minimal infrastructure costs.

Also, solar panel costs are trending downward as standardization and mass manufacturing become more prevalent, similar to the same downward trend of the silicon chip industry of a decade ago.

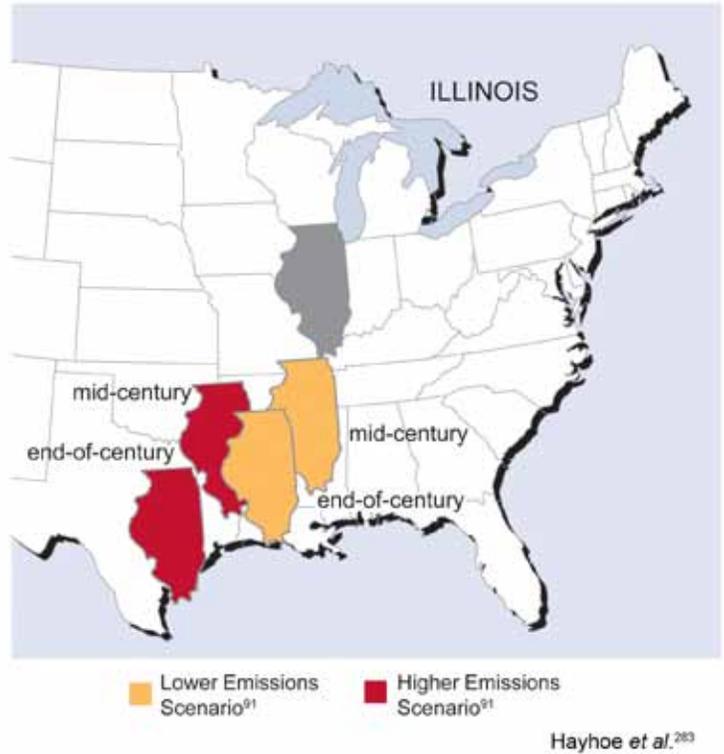
Leasing vs. Owning

Investigate the idea of leasing solar panels. The general idea is the solar company and utility team up to give consumers panels with no up front costs. Companies pay for the panels and installation. An example of this would be where the owner then pays the utility a leasing fee, roughly \$100 in most cases, for a 15 year term. Any government incentives also are passed through to the utility.

So, why do this? First consumers do not have any up front costs. Secondly, utility bills should be reduced by more than the monthly lease payment. This way, the utility benefits from a reduced demand on the grid and consumers benefit from reduced energy bills.

Real Cost of Coal Generation

Because coal-based electricity generation accounts for about a third of U.S. CO2 emissions (some 2 billion metric tons) and with future price signaling of carbon emissions either with a carbon tax or a cap and trade legislation (incentive based) or EPA policy (command and control), the cost of coal will increase. If implemented properly, the price signaling will allow our aging coal-fired plants to be replaced with renewable sources.



Illustrates Illinois' changing climate if current CO2 emissions trends continue

Tasks/Metrics

1. Conduct a solar assessment survey of usable roof areas and parking areas for solar panel electrical production through visual surveys and aerial maps.
2. Conduct a solar installation survey study inventorying the roof type, age and conditions of the usable roofs to determine which roofs are due for replacement.
3. Coordinate with the Downtown Neighborhood Association (DNA) to assist in outreach to reach building and business owners as well as help in developing a Vacancy Rebate Program to target vacant commercial buildings.
4. Coordinate with the solar provider and electrical utility provider for outreach and participation of the target area building and business owners.
5. Begin to install solar roof arrays.
6. Develop testimonials with electrical cost saving of solar panel installation with continued outreach.
7. Examine feasibility of direct current micro grid to lower system installation cost by eliminating inverter costs at each installation. If feasible, begin direct current micro grid for solar and wind systems to eliminate inverter initial cost and continuing maintenance or replacement costs.
8. Track on-going performance and cost of solar panels.

Source: U.S. Global Change Research <http://globalchange.gov/publications/reports/scientific-assessments/us-impacts/regional-climate-change-impacts/midwest/>

Objective 3

Look to adopt a “Heat Island” mitigation policy for solar shading strategies. Focusing on streets, parking pavement, the use of cool roofing products for reroofing existing roof surfaces as well as streetscape-paving material with high reflectivity value.

Tasks/Metrics

1. Identify trees which reduce the heat island effect, putting them in the proper location to maximize their ability to shade buildings and hardscapes, as well as block winds throughout the year.
2. Draft a resolution to mitigate Elgin’s urban heat island effect.
3. Through an ordinance strive to reduce parking stall requirements of parking lot areas for new and redevelopment projects. Consider future trends with work- from-home initiatives, shared way to work, shared parking and e-commerce.
4. Implement solar shading with plantings coordinated with ground mounted solar arrays at parking lot locations, public spaces and public rights of way.
5. Strive to adopt an ordinance that establishes standards limiting the amount of solar energy absorbed with an accepted list of cool roofing materials, and paving materials for high reflectivity.



Green Roof Display courtesy of DLA Architects, Ltd.

Alternative Energy Goal IV

Encourage and increase the use of renewable energy by the city of Elgin and its residents and businesses.

Benefits of renewable energy include:

Possible lower energy costs

Conventional energy sources are vulnerable to political instabilities, trade disputes, embargoes, and wars. In 1973, the U.S. imported 34% of its oil. Today, the U.S. imports more than 53%. Natural gas prices are also likely to rise in the future (citizensutilityboard.org). Including renewable energy technologies can help insulate consumers from price spikes due to unpredictable natural gas costs.

Reduces carbon footprint

Fossil fuels pollute the atmosphere with carbon, leading to acid rain and other environmental and health impacts. Alternative energy options produce little or no carbon emissions. In fact, the "Biomass Sustainability and Carbon Policy Study" commissioned by Massachusetts Department of Energy Resources (MA DOER) and authored by the Manomet Center demonstrates that even biomass (plant matter) generates substantially less carbon emissions than fossil fuels. [http://www.mass.gov/Eoeea/docs/doer/renewables/biomass/Manomet_Biomass_Report_Full_HiRez.pdf]

Supports new renewable energy generation, creates new clean energy American jobs, and helps to create a clean energy American economy.

Renewables can contribute to economic development by providing opportunities to build export industries. In developing countries that do not have electricity grids, pipelines, or other energy infrastructure, renewable energy technologies can be the most cost-effective options for electrifying rural villages. The American Wind Energy Association has estimated that global markets for wind turbines alone will amount to as much as \$400 billion between 1998 and 2020.

Objective 1

Track the effectiveness of alternative fuel vehicles within the municipal fleet; encourage the use of alternative fuel vehicles.

Alternative fueled vehicles operate on fuels other than gasoline or ordinary diesel, such as compressed natural gas (CNG), liquid natural gas (LNG), propane, biodiesel/petroleum blend, electricity, hybrid gasoline and electricity, and hydrogen. The benefits of alternative fuel vehicles include improvement in environmental and human health resulting from reduced dependence on fossil fuels, greenhouse gas emissions and air pollution. Automobiles are, by their nature, highly visible, making it possible for the community itself to provide role models to residents and businesses. As gas prices continue to rise, this also presents an opportunity for the community to save money.

Tasks/Metrics

1. Analyze cost per mile of alternative fuel vehicles and compare them to a baseline for the existing non-alternative fuel vehicle fleet.
2. Determine the cost of vehicle based on lifecycle (purchase price, maintenance, fuel, etc.)
3. Report results to guide fleet related decisions

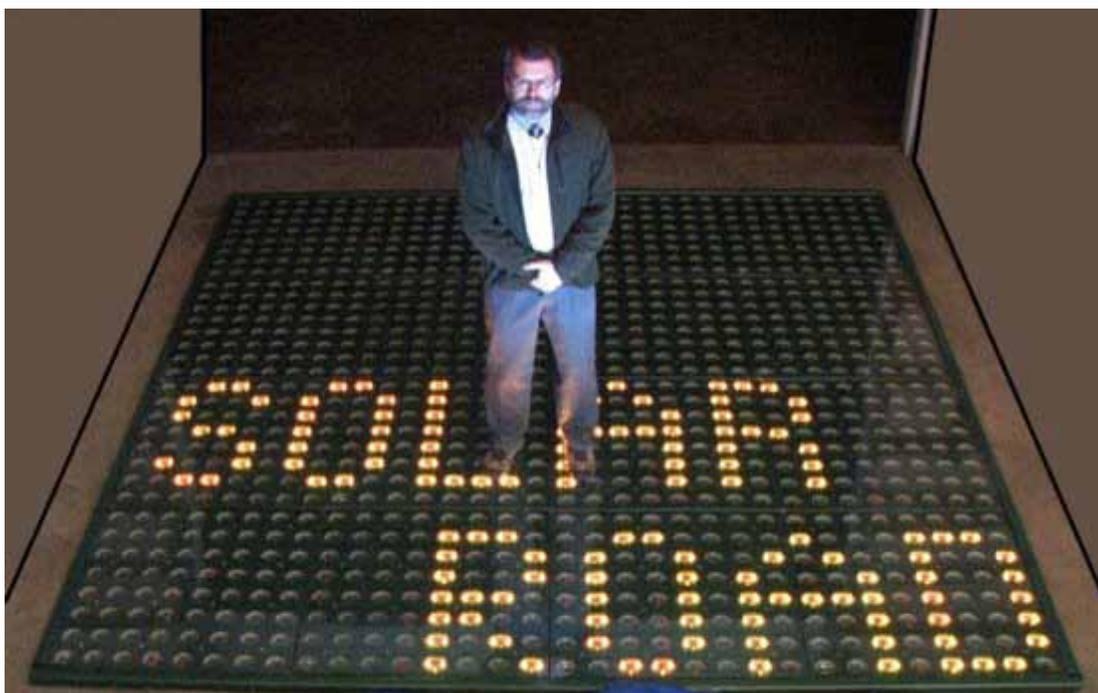
Objective 2

Continue research on alternative and renewable energies

The Alternative Energy working group studied a variety of energy options over the development of this plan. The research conducted led to many promising concepts that are simply too “bleeding edge” for implementation in 2010 or 2011; however, the alternative energy landscape is constantly evolving and these technologies should be periodically reviewed. Examples of the systems we investigated are:

Tasks/Metrics

1. Hydrogen Fuel Cell electricity generators for municipal, business and residential buildings. The technology is valid and being used in hundreds of applications across the country, including Whole Foods Markets, Coca-Cola, Pepperidge Farm Bakery, an Anaheim California Police Station and many universities [<http://www1.eere.energy.gov/hydrogenandfuelcells/adoption.html>]. When we contacted manufacturers for additional information, we were informed that unless state and local incentives exist, the initial installation cost in Illinois does not provide a suitable ROI for this market to be taken seriously. The local electricity rate would have to exceed \$0.12 per kWh to be economically feasible without the availability of new incentives.
2. Solar and Wind power should be further investigated, because changes in this industry are happening quickly. For instance, current legislation might allow Elgin to form a co-op with other municipalities to construct a wind or solar farm in rural areas of the state that are more suited to these technologies. The power generated could be fed into the grid and the co-op would be paid for the power generated by the utilities. At the very least current ordinances should be evaluated to determine what types of alternative energy residents and businesses could install at their site and what limitations might be needed (aesthetic, maximum power production per square foot of property, etc.)
3. Solar Roadways are in the R&D stages, but current funding prospects are positive (including GE’s Ecomagination project). This technology could be especially beneficial to Elgin in a variety of ways. Solar panels would be installed instead of asphalt or concrete surfaces for roads, parking lots, patios and sidewalks. The road would then generate electricity which could be transmitted into the power grid; this means that deteriorating overhead power lines could be replaced. Another benefit would be the solar roadways ability to transmit small amounts of heat, enough to melt any snow or ice on the surface, meaning that the snow removal fleet wouldn’t need to work as hard. Another safety benefit would be the integrated lights the system offers. The lights can be static, simply for marking lanes, or the lights could be programmed for short term messaging (as in marking the route for the Fox Trot or directing traffic to festival parking, etc). Pressure pads in the system could also make it an alert system for obstacles ahead, such as children or animals in the roadway. For additional examples of solar roadways visit: <http://www.solarroadways.com/main.html>



<http://www.solarroadways.com/prototype.shtml>

Additional Resources/Best Practices

American Wind Energy Association, Wind Energy and Climate Change: A Proposal for a Strategic Initiative, October 1997

<http://www.awea.org/policy/ccwp.html>

Ashland, Oregon

<http://www.ashland.or.us/Page.asp?NavID=1366>

Austin, Texas energy conservation ordinance

<http://www.austinenergy.com/About%20Us/Environmental%20Initiatives/ordinance/index.htm>

Richmond, California Town hall Vacancy Rebate Program

http://www.richmondhill.ca/subpage.asp?pageid=townhall_vacancy_rebate_program

Carbon/Coal Video

<http://www.sunrunhome.com/why-solar/solar-video/the-story-of-coal>

Combating the urban heat island effect across the USA

<http://yosemite.epa.gov/gw/heatisland.nsf/HIRIInitiativeTypesbyStateLocal?openview&count=500>

Cool Roofs

http://www.energystar.gov/ia/partners/manuf_res/OurSaviors_new.pdf

Energy Matters

<http://www.buildingscience.com/documents/insights/bsi-012-why-energy-matters?topic=doctypes/insights>

Energy-Saving Tips from ENERGY STAR

http://www.energystar.gov/index.cfm?c=business.bus_index

Florida Atlantic University Solar installation project

<http://www.fau.edu/broward/sustain/EnergyProjectFLL.php>

Government Fleet Website

<http://www.government-fleet.com/Channel/Green-Fleet/News/List.aspx>

National Renewable Energy Laboratory, a DOE national laboratory, Dollars from Sense: the Economic Benefits of Renewable Energy <http://www.nrel.gov/docs/legosti/fy97/20505.pdf>

One Block Off the Grid established a grass roots organization for combining the buying power of large groups of motivated citizens to purchase energy audit and contractor services for increasing home energy efficiency before installing such alternative energy technologies as solar, wind and geothermal systems. Typical discounts for home energy audits are 15%.

<http://www.youtube.com/watch?v=bAWS5eLuAKQ>

<http://howsolarworks.1bog.org/12-ways-to-increase-home-energy-efficiency-before-installing-solar-panels/>

<http://www.youtube.com/watch?v=rD8aBvaJXY8&feature=related>

Prioritizing Green—It's the Energy Stupid

<http://www.buildingscience.com/documents/insights/bsi-007-prioritizing-green-it-s-the-energy-stupid?topic=doctypes/insights>

Rocky Mountain Institute solar PV analysis

<http://www.rmi.org/rmi/SolarPVBOS>

Solar Shading

<http://www.ci.gilbert.az.us/planning/urbanheatiland.cfm>

Sudbury, Ontario vacancy rebate program

http://www.city.greatersudbury.on.ca/cms/index.cfm?app=div_tax&lang=en&currID=6195

The Federal Energy Management Program provides materials for establishing an Energy Awareness Campaign

http://www1.eere.energy.gov/femp/services/create_campaign.html

Ukiah, Oregon

http://www.cityofukiah.com/pageserver/?page=energy_conserv

US Dept of Energy's Petroleum Reduction Tool for Fleet Management

<https://www.afdc.energy.gov/afdc/prep/index.php>

Union of Concerned Scientists

http://www.ucsusa.org/clean_energy/technology_and_impacts/impacts/public-benefits-of-renewable.html#44

Western Organization of Resource Councils

<http://www.worc.org/userfiles/file/benefitsofrenewableenergy.pdf>

Wheaton, Illinois

<https://www.wheaton.il.us/EnergyPrograms/>