Organization of Chapter

Introduction and Goal and Objectives

The diverse landscapes within the Oxford Region - ranging from farm fields to urban neighborhoods - provide a wide variety of opportunities for optimizing energy consumption and generating sustainable or alterative energy. This chapter provides an inventory and evaluation of energy conservation opportunities within the Region, in accordance with the following Goal:

> *Minimize energy consumption in the Region and incorporate the use of renewable and reliable energy sources to reduce energy costs and environmental impacts.*

Plan Objectives

The Energy Conservation Plan focuses on how best to achieve the Energy Conservation Goal and the following Objectives:

16-A Promote the reuse of existing resources including redevelopment and community revitalization, the restoration of brownfields and greyfields, and allowance for new technologies to be utilized in recycling and waste management.

16-B Encourage the development, distribution, and use of alternative fuels and energy sources, with a preference for those energy sources that are renewable, sustainable, and locally-generated.

16-C Encourage upgrades to government facilities, utilities and public infrastructure that will promote energy efficiency and the distribution and use of alternate fuels and energy sources, as they become available.

16-D Promote energy efficiency and the reduction of energy demand and consumption in the use of vehicles, and the design and construction of motorized and non-motorized transportation infrastructure.

16-E Support the development and use of energy efficient technologies, as they become available, in farming, manufacturing, industrial processes and activities and other economic development activities.

16-F Promote the design and construction of subdivision and land development utilizing energy efficient "Green" technologies, as they become available.

16-G Promote efforts to educate residents, government officials and the business community about energy conservation technology and techniques, through public outreach and demonstration projects.

Energy Conservation – A New Focus

This Chapter presents an evaluation of energy consumption in the Oxford Region. Because the field of energy conservation planning at the municipal and regional level has only become common place in recent years, this Chapter focuses primarily on new and potential initiatives for conserving energy.

The renewed interest in energy conservation is largely the result of rising energy costs and concerns with global warming and climate change and the possibility of the nation's security being compromised by dependence on imported fossil fuels. Furthermore, energy conservation and efficiency is one of the major tools in the reduction of greenhouse gases.

Act 247

PA. Act 247, the *Pennsylvania Municipalities Planning Code* (MPC) permits municipalities to address energy conservation as part of a comprehensive plan. Section 301.1 entitled "Energy Conservation Plan Element," sets forth that, "…the comprehensive plan may include an energy

conservation plan element which systematically analyzes the impact of each other component and element of the comprehensive plan on the present and future use of energy…"

Energy consumption relates to all forms of energy use and generation by individuals, the business community, and the public sector. When assessing energy use by any user, the following five topics should be considered:

- **Reducing Demand and Consumption** - How much energy is used.
- **Improving Energy Efficiency** - How energy can be used more efficiently.
- **Revitalization, Reuse, and Recycling** - How energy use can be reduced by reusing materials, buildings, or previously developed land.
- **Alternative and Sustainable Energy** - How energy can be generated from renewable sources. Alternative energy, such as wind and solar, ultimately conserves energy because unlike fossil fuels it does not need to be extracted, transported, or stored, all of which require the consumption of energy.
- **Reducing Unintentional Barriers to Energy Conservation** - Existing land use regulations that are meant to improve living conditions, but unintentionally result in higher energy cost for residents, such as homeowner association rules that forbid laundry to be hung to dry outdoors.

Although municipal planning can influence the private sector, municipal governments only have direct control over energy use in the public sector. The public sector primarily uses energy for 1) community services, 2) public infrastructure, and 3) utilities. As a result, short-term municipal initiatives for energy conservation typically focus on these three elements.

Recycling, Reuse, and Redevelopment

Recycling is a major tool for reducing energy consumption. Pennsylvania Act 101, also known as the Municipal Waste Planning, Recycling, and Waste Reduction Act of 1988, mandates curbside recycling programs in communities with a population of more than 5,000 people and a density of at least 300 people per square mile. In these communities, Act 101 mandates the recycling of glass, paper, aluminum, steel, plastics, and the composting of leaves and branches. Furthermore, Act 101 requires the creation of recycling drop-off centers at landfills and trash incinerator facilities. Act 101 also established the Recycling Fund, which provides grants to local governments to help implement recycling programs in their communities. Under Act 101, recycling also includes the composting of yard waste.

Upper Oxford Recycling Drop-off

While only two of the six municipalities in the Region are required to implement Act 101 (East Nottingham and Oxford), five have voluntary recycling programs which are popular and extensively used by the public. Municipalities with private hauler contracts also participate in recycling. The experience of the municipalities is that the public actively participates in these recycling programs. The Southern Chester County Refuse Authority (SECCRA) serves as a regional recycling center, and can be easily accessed by the Region's residents. SECRRA's main role is at the municipal level, where it collects recyclables from local drop-off centers

An increase in solid waste recycling was identified as the third most effective tool in addressing energy conservation in the Region

Energy Conservation Survey

Figure 16-A shows the existing and projected populations and densities for the Region's municipalities which clearly identify East Nottingham, Lower Oxford, and Oxford Borough as surpassing the 5,000 person threshold and density in 2020 and 2030.

Figure 16-A: Population and Population Densities for Oxford Region (2010-2030)

Municipality	2010 Census		2020 Projections		2030 Projections	
	Actual	Density	Population	Density	Population	Density
East Nottingham	8,650	430	9,580	476	11,178	556
Elk	1,681	168	1,758	176	1,891	189
Lower Oxford	5,200	283	5,858	320	6,989	381
Upper Oxford	2,484	180	2,606	189	2,817	204
West Nottingham	2,722	193	2,971	211	3,399	241
Oxford Borough	5,077	2590	5,384	2747	5,912	3016

Source: DVRPC, 2012 (Based on 2010 Census Data)

Evaluation of Opportunities and Obstacles

The more densely populated parts of the Region are well suited to implement new techniques for collecting and processing recycled material. Such techniques could include single stream recycling which involves mixing all types of recyclables at the curbside so they can be collected and transported in one trip to a recycling center where they are sorted. This technique can reduce costs by reducing the number of trips needed to haul recyclables, but it requires more coordination and sorting. The close proximity of SECCRA could help with the implementation of such new techniques.

All parts of the Region are well suited for the reuse and redevelopment of greyfields, which are empty or economically unviable stores, malls, or office centers. Likewise, it is well suited for the redevelopment of previously developed areas such as brownfields, which are abandoned or underused industrial or commercial properties where redevelopment is complicated by actual or perceived environmental contamination. The entire Region is well suited for programs that promote the reuse of materials. One such program that is increasingly popular in Chester County is "free-cycling." With this technique, individuals post notices on free-cycling internet

sites, offering to give away large or useful items that they no longer need, instead of disposing of these materials.

☑ RECOMMENDATIONS FOR MUNICIPALITIES TO SUPPORT AND ENCOURAGE RECYCLING, REUSE, AND REDEVELOPMENT

Action 16-1 Encourage all municipalities to meet the recycling requirements of PA Act 101, The Municipal Waste Planning Recycling and Waste Reduction Act.

Action 16-2 Promote emerging recycling initiatives that improve energy efficiency and reduce public expenditures, such as the use of single stream recycling and, increasing the types of material recycled.

Action 16-3 Encourage the establishment of drop off centers and/or recycling transfer stations on land already used for utilities or public infrastructure and, when possible, close to developed residential areas, reducing the transportation costs for the movement of solid waste and recyclable materials.

Action 16-4 Support salvage opportunities and programs that offer consumers opportunities to re-use materials which would otherwise be disposed of, such as permitting curbside pickup for reuse, or "free-cycling".

Action 16-5 Encourage the restoration of existing buildings and the adaptive reuse of historic structures.

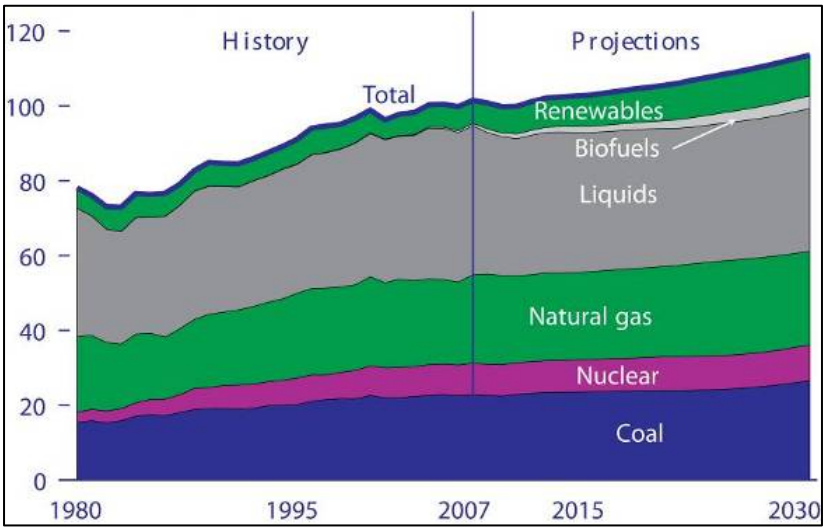
Action 16-6 Promote the redevelopment of brownfields, greyfields, and infill development of vacant properties in already developed neighborhoods.

Action 16-7 Promote the development of schools, government offices and other publicly funded buildings in existing developed areas.

Sustainable Fuels and Renewable Energy Resources

There is no readily available information on the amount of energy used by the Oxford Region's energy consumers, including residents, business operators, and any other energy user. However, data on the amount of energy consumed at the national level is presented in Figure 16-B on page 16-6. This chart shows that on the national level, energy consumption is anticipated to rise in the coming decades with no major shift in the type of fuels consumed. It is therefore reasonable to assume that energy sources used within the Region are not likely to change significantly in the coming decades. However, new energy technologies are currently being investigated throughout the world, and an unforeseen new invention, or a change in the global economy could alter even the most well thought-out projections.

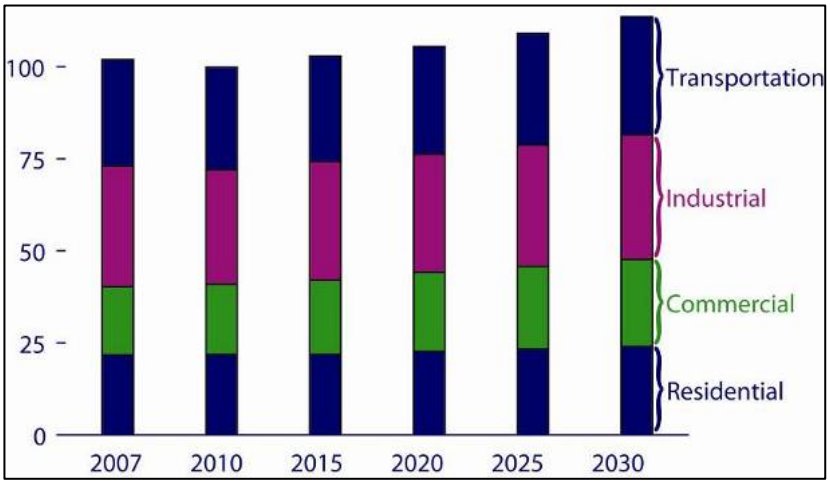
Figure 16-B: Primary Energy Use by Fuel, 1980-2030



Source: U. S. Energy Information Administration, *Annual Energy Outlook 2009*

Energy demand is the amount of energy required to make cars, factories, stores, and homes function. The people, businesses, and other entities that use energy are jointly called the "end use sector." Figure 16-C shows energy use by end use sectors at the national level. This figure shows that no one sector is dominant, although transportation and industrial use account for a large portion of energy consumption. The Oxford Region likely reflects this national data and has an energy use mix that shows a similar breakdown, with no one sector being overwhelmingly dominant.

Figure 16-C: Primary Energy Use by End-use Sector, 2007-2030

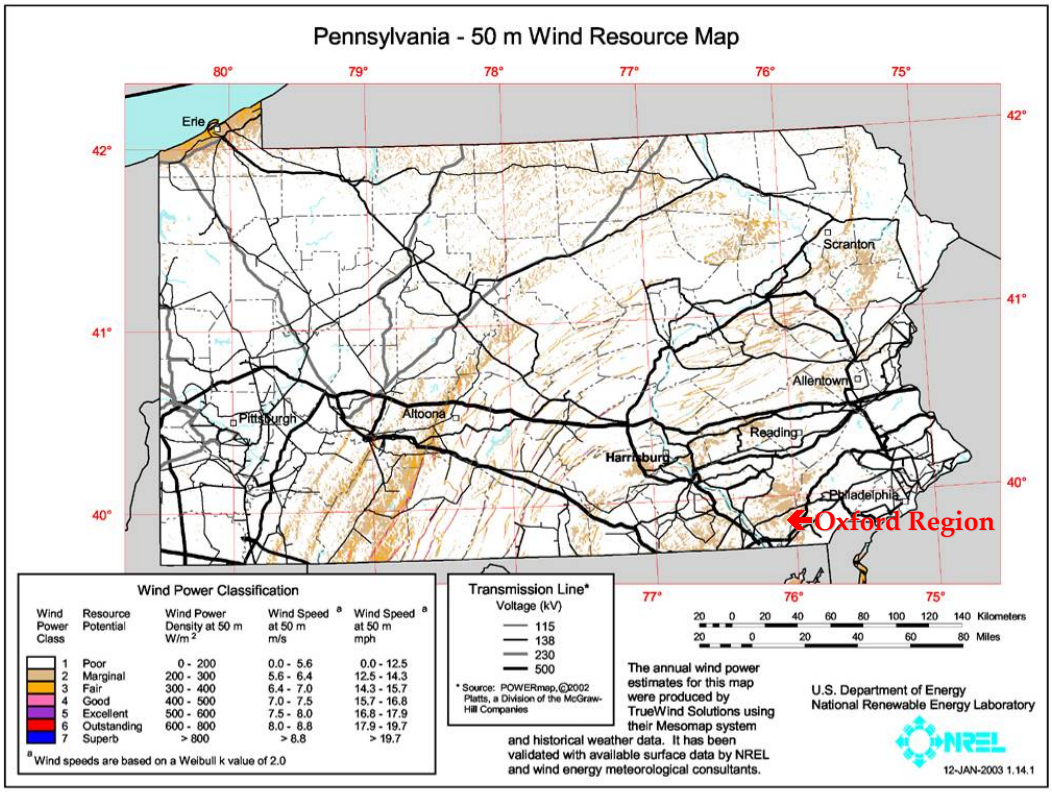


Source: U. S. Energy Information Administration, *Annual Energy Outlook 2009*

Wind Power

Chester County is not especially well suited for wind production, as shown on the wind map in Figure 16-D. Areas designated Class 3, 4, and 5 are suitable for most wind turbine applications, while Class 2 areas are marginal. Class 1 areas are generally not suitable. The Oxford Region in included in Class 1 and 2 Areas. The Wind power estimates apply to areas that are free of obstructions to the wind, and to areas that are well exposed to the wind such as open plains and hilltops.

Figure 16-D: Pennsylvania Wind Resources Map



Source: United States Department of Energy, National Renewable Energy Laboratory, 2003.

Solar Power

Chester County is somewhat well-suited for solar power generation in the form of photovoltaic panels as would be used on rooftops. As Figure 16-E shows, Southeastern Pennsylvania lies in the mid-range in regard to exposure to sunlight.

On-site energy generation (wind mills, solar) was identifed as the most effective regulatory tool to implement energy conservation in the Region

Energy Conservation Survey

Evaluation of Opportunities and Obstacles

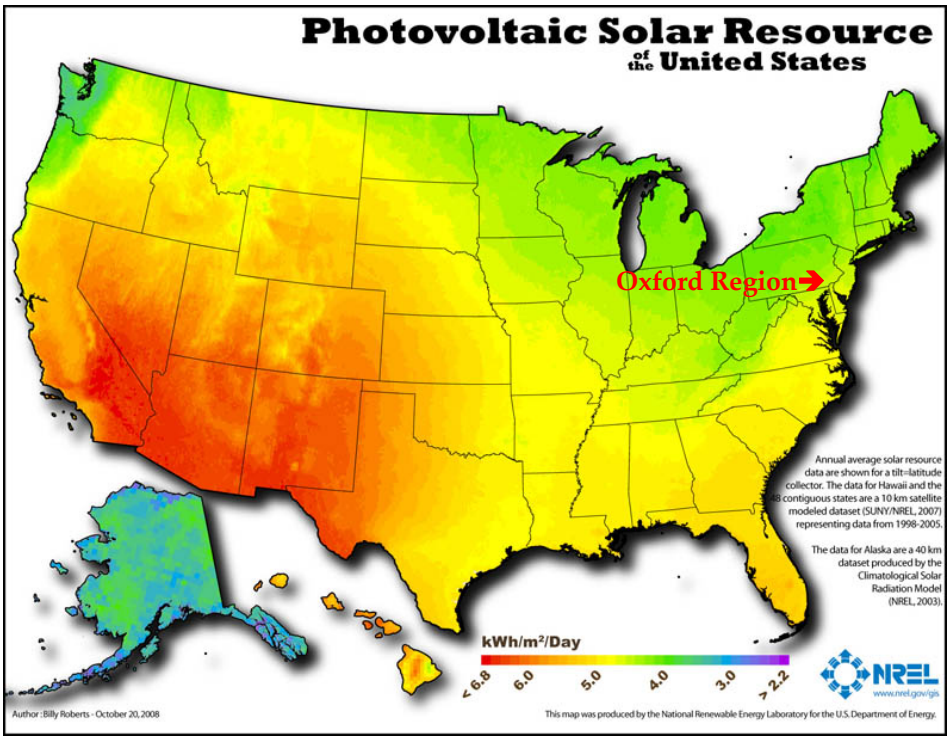
The Region as a whole is not especially well suited for large scale wind generation. However, the abundance of large open farmland could be well suited for wind turbines that generate enough energy to enhance the farm operations and add to their profitability. Given the ongoing advances in technology, such wind production may become

more feasible in coming years. The abundance of farms in the Region could support on-site energy production from methane digesters. Ordinances may have to be updated to regulate the size of such digesters, and set forth locations where they should be restricted or encouraged.

Methane digesters are anaerobic treatment lagoons covered with a gas-tight high-strength plastic (HDPE) fabric that produces methane-rich biogas through the anaerobic (without oxygen) digestion of manure or other agricultural waste.

On-site energy generation can be installed in all land uses from residential to industrial, but it must be sensitive to surrounding land uses. For example, it may be appropriate to install solar panels on an isolated silo, but not on a telephone pole in an historic residential district or village. The increase in solar panel use may require updates to municipal regulations and building codes. Affordability could also be an issue since low-to-moderate income households are less likely to have the finances needed to install solar panels. In some instances, installing solar panels on condominiums and rental units can be an issue since the tenant pays for the electricity, which provides no financial incentive for the landlord or the condo association to install energy saving solar panels. To overcome this, landlords can make agreements with power companies in which solar panels become an additional source of income from the buildings.

Figure 16-E: Photovoltaic Solar Resource of the United States



Source: National Renewable Energy Laboratory, U.S. Department of Energy, 2008.

☑ RECOMMENDATION FOR SUSTAINABLE FUELS AND RENEWABLE ENERGY SOURCES

Action 16-8 Promote appropriate on-site energy generation such as solar, wind, methane digesters, and other alternative technologies in areas and land uses deemed appropriate by the municipality.

✓This action addresses Objective 16-B

Government, Utility, Public Facilities, and Infrastructure

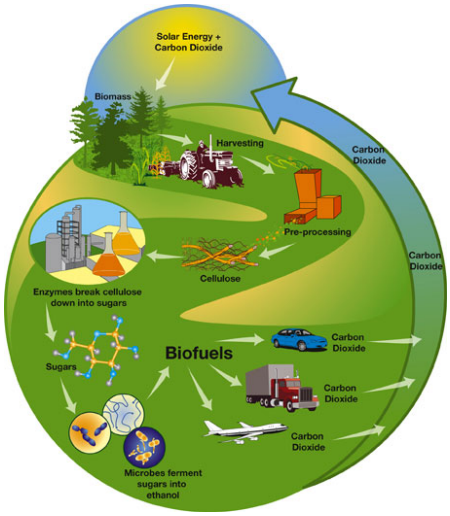
There are three key ways in which municipal governments can pursue the conservation of energy by utilities, public facilities and public infrastructure. These techniques are:

- ***Direct Municipal Initiatives*** - Municipalities directly implement energy conservation techniques on municipally owned properties.
- ***Municipal Ordinances and Regulations*** - Municipalities promote energy conservation in the private sector by updating ordinances and regulations which require energy conservation techniques.
- ***Influencing Infrastructure Upgrades*** - Municipalities promote energy conservation by utilities, school districts, and state agencies that issue permits by adopting comprehensive plan policies which call for energy conservation to be initiated when constructing or upgrading facilities and infrastructure.

Direct Municipal Initiatives

Municipal governments can take actions on their own such as agreeing to purchase energy from companies that generate a specific percentage of their energy from renewable sources, typically wind or solar. Governments may also be able to take advantage of emerging alternative fuels technologies. Tree and grass clippings have the potential to be used in "cellulosic" ethanol production, although the technology is not advanced enough at this time for mass production. Municipalities that accumulate large amounts of these clippings, may be able to use them as a revenue source in the future. It is prudent for local government to monitor such opportunities, and develop policies which will not discourage them should they occur.

Act 213 of 2004, the Alternative Energy Portfolio Standards Act provides opportunities for municipalities, residents, and business owners to earn alternative energy credits. The credits can be sold to utilities. These utilities, such as electric distribution companies and electric generation suppliers, need to obtain alternative energy credits to comply with the Act. These credits have the potential to create an additional revenue stream. The Pennsylvania Public Utility Commission administers this program.



Source: DOE Joint Genome Institute

It is the building code, and not municipal ordinances, which determine much of what can be permitted in terms of energy conservation and construction. However, municipalities can suggest changes to the building code. Municipalities can also monitor developing technologies to determine which of them can be applied to municipal facilities. For many years solar panels have been too expensive for some municipalities to install, but as the price has dropped more local governments are installing them. This monitoring deals with both technical and financial considerations.

Municipal Ordinances and Regulations

Numerous advances in energy conservation technologies are expected in the coming decade, and many of these will impact the construction of buildings and infrastructure. No one can predict what impact these emerging technologies will have, but municipalities should be vigilant to ensure that existing ordinances and regulations do not include provisions which will unreasonably impede the use of these technologies.

When asked if municipal ordinances should be updated to permit forms of alternative energy, 75% of survey respondents said yes.

Energy Conservation Survey

Municipalities can also require that homeowner associations (HOA) have land management agreements that promote energy conservation and discourage wasteful practices. Thus the HOA would be encouraged, though not required, to consider management practices such as allowing grass to be mowed seasonally and permitting laundry to be hung outside. Historically, such practices were restricted because they are viewed as unaesthetic. However, given the current need to conserve energy, such considerations are not a top priority.

Guiding Utility Infrastructure Upgrades

Although municipalities do not control most public infrastructure, many utilities and permitting agencies are required to document consistency with local comprehensive plans or at least request comments from municipal governments. Municipal governments can therefore adopt policies that may address public infrastructure issues, such as:

- The increase in electronic devices and the potential development of plug-in hybrid or all-electric cars would likely require an increase in the amount of electricity transmitted and stored by utilities. This increased need for plug-in infrastructure could significantly effect streetscapes and reduce real estate values in areas that do not have access to vehicle plugs.
- In 2007 the Consortium for Energy Efficiency, a nonprofit, organization composed of electric, gas and water utilities, research organizations, and state and regional energy offices, reported that public drinking water and wastewater facilities account for approximately 3% of total electricity use nationwide. These facilities represent up to 35% of municipal government energy use. Wastewater treatment plants use a significant amount of energy for machinery, such as wastewater treatment plant sludge blowers, which operate 24 hours. New technological advances, such as computerized blowers, can provide greatly increased energy savings. Energy can also be saved by using treatment technologies which rely on created wetlands or vegetated ponds to treat wastewater.

- The Pennsylvania Department of Environmental Protection issues permits for the construction of infrastructure relating to sewage facilities and other infrastructure. Some of these permits require consistency with municipal comprehensive plans. Section 71.21(5)(d) of PA Act 537, the Pennsylvania Sewage Facilities Act, requires that official sewage facilities plan (also known as a "537 plan") identify alternative for establishing or upgrading facilities based on municipal comprehensive plans. Similarly the state Public Utility Commission requests comments from local governments regarding the expansion of certain utility infrastructure. See Chapter 8: Community Facilities and Services Inventory and Plan.
- School buildings use a large amount of energy through lighting, heating, transportation, and large-scale food preparation. School districts can reduce energy by using more energy efficient busses, and managing how the bus routes are designed. School districts can also promote having children walk to school or walk longer but safe and reasonable distances to bus stops, thus reducing the number of stops a bus must make. See Chapter 9: Transportation.

Evaluation of Opportunities and Obstacles

It was suggested that Municipal facilities should be "cutting edge demonstration sites for energy conservation and environmental stewardship."

Energy Conservation Survey

Energy Conservation through Municipal Initiatives
Each municipality within the Oxford Region has a range of viable options to initiate energy conservation efforts on its own, such as updating ordinances, building codes, and other regulations to either promote or permit green infrastructure and emerging technologies. Such efforts should also update those regulations already in place that may inadvertently limit the use of new energy conservation techniques. A municipality can also serve in an educational role for its residents by using its facilities, vehicle fleet, or other infrastructure as demonstration projects showcasing new technologies.

Green Infrastructure and Low Impact Development
The Oxford Region is well suited to benefit from energy conservation through the use of green infrastructure and low impact development. These techniques can be implemented on municipally owned property or promoted through updating municipal ordinances and regulations. They can also be the focus of demonstration projects used to educate the public.

Green Infrastructure refers to the use of scientifically-designed vegetation plantings and landscaping that can be used instead of brick and mortar public infrastructure, such as storm water sewers or sewage treatment plants. Green infrastructure is an effective tool for reducing energy consumption because it is usually vegetation-based, and so does not require electricity to function. Examples of green infrastructure are presented in Figure 16-F.

According to the U.S. EPA, green infrastructure encompasses an "interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife".

Low Impact Development (LID) is similar to Green Infrastructure, but it is used to describe land planning and engineering designs that manage stormwater runoff. LID emphasizes conservation and the use of on-site natural features to protect water quality and control run off. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrology of watersheds through infiltrating, evaporating, and detaining runoff close to its source. LID plays a role in energy conservation because it improves water quality without the operation of treatment plants.

Figure 16-F: Green Infrastructure and Energy Conservation

Description of Green Infrastructure	Energy Conservation Impact of Green Infrastructure
Development and Construction Techniques	
Greyfield & Brownfield Redevelopment is the reuse of brownfields (abandoned or underused industrial or commercial properties where redevelopment is complicated by actual or perceived environmental contamination) or greyfields (empty or economically unviable malls or office centers).	***Greyfield & Brownfield Redevelopment*** promotes energy conservation by locating development in already built areas, reducing the need to extend utilities. It also promotes reducing transportation fuel consumption.
Infill Development and Redevelopment is the re-use of vacant land and property within a built-up area for further construction or development, especially as part of neighborhood revitalization.	***Infill Development and Redevelopment*** promotes energy conservation by locating development in already built areas or structures, thus reducing the need to extend utilities. It also promotes clustering, reducing transportation fuel consumption.
Green Roofs are conventional roofs covered with a layer of vegetation. They absorb rainwater, providing insulation, creating a habitat for wildlife, and helping to lower urban air temperatures.	***Green Roofs*** provide insulation thus retaining energy, and they reduce runoff thus reducing the need for the construction of brick and mortar storm water management facilities and structures.
Transportation and Parking Facilities	
Permeable Pavements include pervious concrete, asphalt, or pavers that allow precipitation to percolate through otherwise impervious paved areas permitting stormwater to infiltrate through to the soil below.	***Permeable Pavements*** reduce runoff thus reducing the need for the construction of storm water management facilities and structures.
Green Parking refers to techniques that reduce the total impervious cover on a property, such as using alternative pavers in overflow parking areas, using bioretention areas to treat stormwater, and encouraging shared parking.	***Green Parking*** reduces runoff thus reducing the need for the construction of brick and mortar storm water management facilities and structures.
Green Streets & Highways refers to a street or highway that uses vegetated facilities to manage stormwater runoff at its source.	***Green Streets & Highways*** reduce runoff thus reducing the need for the construction of storm water management facilities and structures.
Land and Natural Resource Management	
Vegetated Swales are shallow channels with vegetation covering the side slopes and bottom. They promote infiltration, reduce the velocity of stormwater runoff, and trap particulate pollutants such as suspended solids and trace metals.	***Vegetated Swales*** reduce runoff and purify water reducing the need for the construction of storm water management and water purification facilities and structures.

Shade Trees & Urban Forestry refers to the careful care and management of tree populations in developed settings for the purpose of improving the urban environment.	***Shade Trees & Urban Forestry*** can reduce heating and cooling cost to nearby buildings. Tree leaves shade structures in the summer, and buffer winds in the winter.
Riparian Buffers are vegetated areas next to streams and lakes that protect them from nonpoint source pollution while providing bank stabilization and habitat for wildlife and aquatic species.	***Riparian Buffers*** reduce runoff and purify water thus reducing the need for the construction of brick and mortar storm water management and water purification facilities and structures.

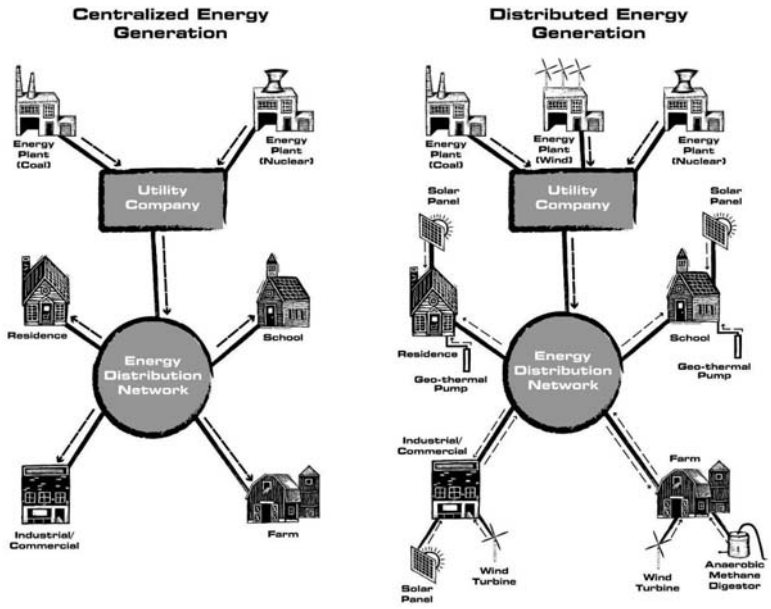
Source: CCPC, 2009.

Transitioning from Centralized to Distributed Energy Generation

In the coming years the United States - and therefore the Oxford Region - is expected to experience at least a partial transition from centralized to distributed energy generation. Distributed Energy Generation refers to an energy network in which there are multiple large and small-scale energy generators, which could include wind turbines, solar panels, and conventional fossil fuels or nuclear power plants. This type of network is also referred to as "Decentralized Energy Generation" because it is a change from the "Centralized Energy Generation" network that is currently the norm.

Centralized Energy Distribution is characterized by large electric generating plants that are usually located at a distance from where the energy is consumed. The electricity is then transported through the transmission and distribution infrastructure to the energy consumer. Figure 16-G illustrates how a Central Energy Generation system could be gradually modified into a ***Distributed Energy System***. Distributed Energy Generation is anticipated to become more common in coming decades.

Figure 16-G: Centralized Versus Distributed Energy Generation



Source: CCPC, 2009.

☑ RECOMMENDATIONS FOR GOVERNMENT, UTILITY, AND PUBLIC FACILITIES AND INFRASTUCTURE

Action 16-9 Support the purchase of energy efficient supplies, equipment, and physical plant elements for government and utility buildings and facilities, and where possible use these upgrades as demonstration projects.

Action 16-10 Encourage municipalities to purchase a portion of their energy needs from renewable energy sources, if or when such an option is available.

Action 16-11 Monitor opportunities to use raw materials for the production of biofuels, such as cellulosic ethanol, from tree and lawn clippings from the maintenance of parks, public open spaces, and roadside vegetation.

Action 16-12 Encourage coordinated planning between municipalities and utility providers in order to locate utility infrastructure so as to optimize energy efficiency.

Action 16-13 Promote the use of vegetative-based or alternative wastewater treatment and disposal technologies, such as the retrofitting of existing wastewater treatment facilities in order to improve energy efficiency.

Action 16-14 Encourage the Oxford Area School District to reduce energy demands through efficient bus routes, safe walking routes to school, upgrades to the fuel efficiency of bus fleets, and the reduction of energy use in buildings, athletic fields, and property management.

✓These actions address Objective 16-C

Efficient Vehicles, Transportation Facilities, and Management

Transportation related energy conservation primarily impacts the following three topics:

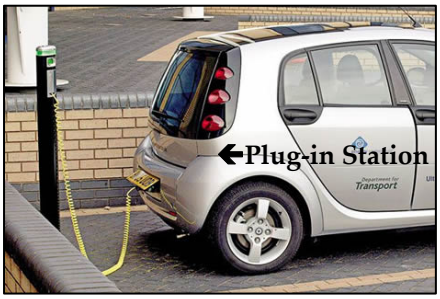
- ***Efficient Vehicles*** - Energy consumption by individual vehicles including cars, truck, busses, trains, or other vehicles.
- ***Efficient Transportation Management*** - A wide range of issues such as parking options, commuting, and reducing the need for motor vehicles through mass transit or ride-sharing.
- ***Efficient Transportation Facilities*** - Constructed transportation infrastructure such as roads, park-and-ride lots, bus stops, or train stations.

Highly efficient and alternative fuel vehicles are just beginning to enter the market and are anticipated to become more commonplace. Alternative fueled vehicles can only be practical if there are places nearby where the drivers can purchase alternative fuels. In the case of electric powered vehicles, plug in stations need to be made available. Predicting which of these technologies will come into regular practice in the next decade is difficult, so it would be prudent for local governments to establish general policies that will not discourage alternative fuels stations.

Transportation management techniques can be used regardless of the efficiency of the vehicles in a community. Parking management strategies include flexible parking requirements such as when one parking lot is shared by two adjacent buildings that are used at different times of the day or week. For example, a church and school could share a lot, or an apartment and corporate office could share a lot. Travel demand management strategies include home office use, flex time, ridesharing, on-site daycare, and compressed work week schedules. (See Chapter 9: Transportation)

Similarly, transportation infrastructure can be upgraded using techniques that promote energy efficiency regardless of individual vehicle efficiency. Transit Oriented Development (TOD) is one such technique in which the land around a mass transit stop, such as a train station, is developed with a focus on pedestrian facilities and higher-density residential uses in order to promote use of the train and reduce the need for the use of automobiles. Mixed use development is another approach in which residential, commercial, and employment centers are built close enough together that they can be reached on foot, much like towns were in the past.

Evaluation of Opportunities and Obstacles



Accommodating Plug-in Vehicles

Parts of the Oxford Region may not be well-suited to accommodate plug-in electric vehicles. Currently, plug-in vehicles can easily be re-charged if the car-owner has an indoor garage, a carport, or a driveway which has ready and safe access to an appropriate outdoor plug. However, recharging a car that is parked on the street, in a townhouse parking lot, or at a mall or train station would require the construction of new outdoor plugs and plug stations.

Land Use Development that Promotes Energy Efficient Transportation

The Oxford Region is well suited to pursue land use development that promotes energy efficient transportation, because it has one central population center located in and around Oxford Borough. The existing street grid extending out from the Borough is well-suited for transportation-related energy conservation efforts. This developed area can also support expanded mixed-use development, in which residential, commercial, and employment centers are built close enough together that they can be reached on foot, much like towns were in the past.

Oxford Borough's train station may also have future potential for Transit Oriented Development, if it were to become a commuter line. The land around the train station could serve as a center for pedestrian facilities and higher-density residential uses, thereby reducing the need for the use of automobiles.

☑ RECOMMENDATIONS FOR EFFICIENT VEHICLES, TRANSPORTATION FACILITIES, AND TRANSPORTATION MANAGEMENT

Action 16-15 Accommodate the use of alternative fuel powered vehicles, the establishment of stations that distribute alternative fuels, and the retrofitting of existing buildings and parking facilities to provide for new fueling technologies, such as vehicle plug stations.

Action 16-16 Promote alternatives to single occupancy vehicles such as commuter rail, mass transit, ridesharing, carpooling and park-and-rides.

Action 16-17 Promote the efficient use of parking facilities in municipal planning and zoning ordinances and regulations through parking management strategies.

Action 16-18 Promote travel demand management strategies, which are techniques that reduce travel associated with commuting to work.

Action 16-19 Support non-motorized transportation options, including pedestrian, bicycle, and buggy facilities, and the expansion of crosswalks, sidewalk grids, bike lanes, trail networks, and horse and buggy lanes.

Action 16-20 Promote mixed-use development that reduces travel distances between residential, commercial, and employment centers.

✓These actions address Objective 16-C

Industrial and Commercial Efficiency, Including Agriculture

The Oxford Region has a diverse economic base including buildings and facilities used for retail, wholesale, manufacturing, and agricultural operations. All of these operations have vast opportunities for energy conservation in terms of land use, building design, manufacturing processes, commuting, and the scheduling of work hours.

Agricultural operations have added opportunities to achieve energy savings by expanding sales to customers on the Boston to Washington DC corridor who want locally grown foods. The County Agricultural Development Council is also promoting this effort through their *Buy Fresh, Buy Local* brochure and guide to local fresh food markets.

Energy Efficiency Development and Construction Standards

There are a number of new techniques that can be used to construct and reconstruct existing buildings to make them more energy efficient. Part of this increased efficiency can be realized through building construction techniques, and part can come through the efficiency of the appliances and systems used for heating, ventilation, and air conditioning (HVAC). The standards which are commonly used to rate the efficiency of buildings, appliances and HVAC systems are:

- **Energy Star,** created in 1992, is an international standard for energy efficient consumer products such as computer products, kitchen appliances, buildings, and other products. Devices carrying the Energy Star logo typically reduce energy by between 20 and 30 percent.
- **Leadership in Energy and Environmental Design** (LEED) Green Building Rating System was developed in 1998 by the U.S. Green Building Council to provide a suite of standards for environmentally sustainable construction. It has since become a standard throughout the U.S.

☼ Evaluation of Opportunities and Obstacles

The Oxford Region is well suited to pursue LEED certification for commercial and industrial buildings. To date, only a few "green buildings" have been constructed in southern Chester County, most notably Dansko footwear's West Grove corporate headquarters which achieved LEED "Gold" certification. Such buildings are anticipated to become more common as more engineering and architectural firms gain experience with the designs and systems.

Farms in the Oxford Region have opportunities to provide locally grown food to urban customers in the mid-Atlantic Region, most notably those in Philadelphia and Wilmington. In these cities, businesses which serve food, like hotels or restaurants, can get a higher LEED rating if they buy their food locally. Thus agricultural operations in the Oxford Region can become more competitive by serving this need.

☑ RECOMMENDATIONS FOR INDUSTRIAL AND COMMERIAL EFFICIENCY INCLUDING AGRICULTURE

Action 16-21 Promote energy efficiency standards, such as LEED and Energy Star certification, and the installation of alternative energy generation systems in commercial and industrial operations including agriculture.

Action 16-22 Support the expansion and promotion of manufacturing and agricultural operations which provide local products (which are those within approximately a 100-mile radius) to nearby major markets, and support regional efforts to promote the sale of these products.

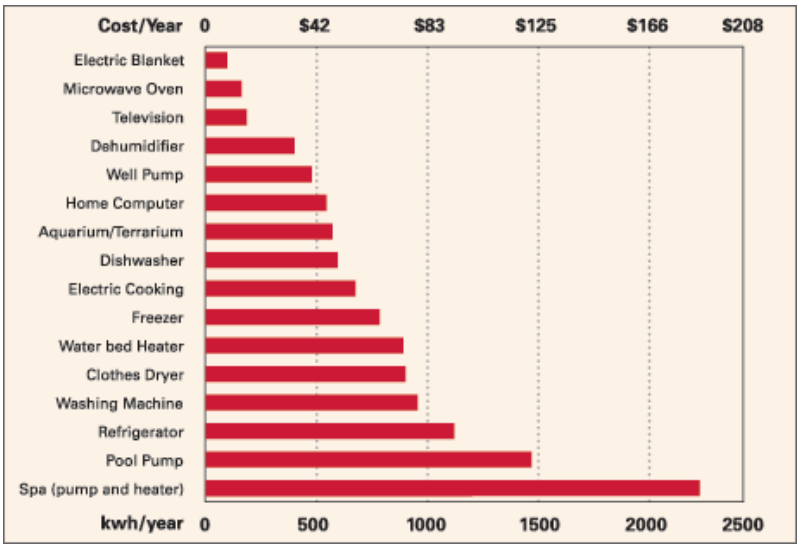
✓These actions address Objective 16-E

Residential Land Use and Property Management

The Oxford Region has a wide diversity of residential units, ranging from low density farm houses, to high density apartments in Oxford Borough. All of these properties can be built or upgraded according to the Energy Efficiency Development and Construction Standards, such as LEED and Energy Star, that are discussed in the previous section.

In residential settings, energy is used for appliances and HVAC systems within the unit, and for maintaining the property outside the unit, which can include mowing, external lights, and pool pumps. Figure 16-6 shows how much energy a typical appliance uses per year and its corresponding cost based on national averages. For example, a refrigerator uses almost five times the electricity of the average television uses.

Figure 16-H: Electricity Use by Appliances - 2009



U.S. Department of Energy, *Energy Savers Tips on Saving Energy & Money at Home* Web Page, 2009.

Evaluation of Opportunities and Obstacles

There are ample opportunities to improve the energy efficiency of residential units using both new and well established techniques. These techniques may include:

- Installing programmable thermostats
- Weatherproofing doors and windows
- Unplugging instant-on appliances
- Air drying laundry and dishes
- Replacing old appliances and HVAC systems with more efficient models
- Constructing or restoring buildings to use more natural light
- Reducing hot water use by installing point of use water heaters, low-flow faucets, and showerheads

- Insulating basements and attics, and hot water heaters and pipes
- Reducing lawn mowing through seasonal mowing or planting trees and ground cover
- Planting trees for cooling summer shade and winter wind breaks

Most of these techniques can easily be done by a homeowner or a contractor. However, there are sometimes regulatory or economic barriers which discourage them. For example, it is common for condo or homeowner associations to prohibit the hanging of laundry or seasonal mowing of low-use lawn areas. These restrictions are put in place to promote a visual conformity, but they inadvertently serve to increase energy consumption rather than promote conservation.

Economic factors can also discourage energy conservation. Residents who live in an apartment or a condominium typically pay the heating bills, but they do not own or maintain the walls, attic spaces, or basement areas of their units. Because the residents do not own the exterior walls of their units, they are unable to put in insulation that would lower their heating bills. Only the landlord or the condo association has the right to put in insulation, but they have no incentive to pay for that improvement because they do not pay for the heat, and so will not realize the cost savings that offset their investment.

☑ RECOMMENDATIONS FOR RESIDENTIAL LAND USE AND PROPERTY MANAGEMENT

Action 16-23 Promote energy efficiency standards, such as LEED and Energy Star certification for the development or redevelopment of buildings, properties, and neighborhoods.

Action 16-24 Promote residential density and walkable communities through innovative development designs such as cluster development, village centers, urban centers, traditional neighborhood design, and mixed use.

Action 16-25 Remove restrictions from regulations within local ordinances that discourage energy conservation and require homeowner associations to complete management land plans that promote energy conservation.

Action 16-26 Support programs that allow residents and businesses to improve energy efficiency in their homes and buildings through weatherization, efficient climate control, and the conservation of hot water.

✓These actions address Objective 16-F

Education, Information Distribution and Demonstration Projects

Figure 16-C at the beginning of this chapter showed that transportation and residential uses account for roughly half of the energy expended in the United States. The way that a person gets to work and lives at home is a matter of individual choice and habit and changing such habits requires public education. From a practical standpoint, any meaningful effort to address energy conservation needs to include a significant education component.

☼ Evaluation of Opportunities and Obstacles

Municipalities can pursue educating their residents about energy conservation in a variety of ways. Local governments can sponsor demonstration projects, and require that newly constructed buildings open to the general public include energy conservation features that can be viewed by people visiting the building. Municipalities can also use their web pages, newsletters, or other mailings to distribute information on recycling and energy conservation. Local governments can participate in educational partnerships with school districts or business groups. Such efforts could include programs for children in schools, or programs for adults in the workplace, such as encouraging employees to drink tap water instead of bottled water.

☑ RECOMMENDATIONS FOR EDUCATION, INFORMATION DISTRIBUTION, AND DEMONSTRATION PROJECTS

Action 16-27 Support education efforts that encourage energy and resource saving practices at home, at school, at the work place, and through municipal web sites, newsletters and other media.

Action 16-28 Support construction and development projects that implement energy conservation, including demonstration projects and programs, and pursue public and private grants to fund such initiatives.

✓These actions address Objective 16-G

Associated Websites:

Chester County Freecycle: http://groups.freecycle.org/freecycle_chester_county/description