

## Energy and Greenhouse Gas Emissions

The Tompkins County Comprehensive Plan was adopted by the Legislature in December 2004. This new Energy and Greenhouse Gas Emissions Comprehensive Plan element is being added to the section of the Plan entitled Interlocking Pieces: The Environment. It complements existing elements that address Water Resources and Natural Features and relates directly to many of the policies adopted in support of other plan elements. Some examples of such policies include promoting nodal development patterns; developing alternative transportation options; investing in local jobs and business opportunities; and protecting rural resources and natural features. These policies all contribute positively toward energy sustainability. This new element explores the broad range of issues related to energy and greenhouse gas emissions and presents specific policies and actions to address them.

### Principle

The Tompkins County community should reduce energy demand, improve energy efficiency, transition to renewable sources of energy, and reduce greenhouse gas emissions.

### The Global Context

The projected decline in world oil supply and increasing global energy demand are constraining energy availability while generating record energy prices that are impacting global, national, and local communities. Since the 1950s, access to cheap oil spurred explosive growth in the consumption of fossil fuels. This growth has been strongly linked to spiking greenhouse gas emissions and, in turn, global climate change that is producing extreme weather patterns and disrupting ecosystems. All of these forces work together to increase energy, food, and commodity prices worldwide.

While oil prices are notoriously difficult to predict, energy experts project the cost of gasoline will increase on the order of \$1 per gallon per year and forecast that in twenty to forty years oil and gas will be priced out of range of most people. While this is sobering to consider, and the exact details of these predictions can be endlessly debated, most experts agree that the years of cheap oil are coming to an end, and now is the time to prepare for this coming transition.

### The Local Energy Challenge

While these global energy problems cannot be solved exclusively at the local level, and leadership is needed from global, federal, and state organizations, locally we can identify, plan for, and take steps to address these issues. Acting now will prepare our community to respond nimbly to changing policy and program decisions at the global, federal, and state levels.

In Tompkins County, rising energy, food, and commodity prices are creating financial hardships for many community members. Unfortunately, those who are least able to afford these rising costs tend to be those without the financial resources to take the steps that would most help, such as installing energy efficiency upgrades in their homes and purchasing more fuel-efficient vehicles. While certain sectors of the population will bear a disproportionate share of the burden, all are feeling the pinch already. The cost of energy is becoming a more important factor in deciding whether to drive or take the bus to work; what food to put on the table; how to heat a building; where to live or locate a business; and what types of services a local government can offer its citizens. Community members are already making these decisions by opening their homes to renters to share costs, traveling less often, turning down the thermostat, telecommuting when possible, growing their own food, rediscovering locally based businesses and events, lobbying higher levels of government, and installing renewable energy systems. We can also anticipate that the changing energy picture will result in greater pressure on our natural resources – agricultural land, water resources, and local forests – to help meet the energy demands of the County.

In response to this energy and greenhouse gas emissions challenge, a number of community initiatives, including those of local governments, institutions of higher education, local coalitions, the business community, and local nonprofits, are already underway. By combining efforts to reduce energy demand, improve efficiency, and transition to alternative energy sources, the Tompkins County community will also make great strides toward reducing greenhouse gas emissions.

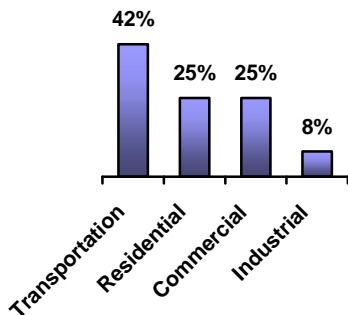
**Community Energy Picture**

Based on a community-wide emissions inventory conducted by the County government for 2006, buildings consumed more than 50 percent of the community’s energy and vehicles utilized another 42 percent. The percentage of energy used was found to have a direct correlation with the amount of greenhouse gas emissions from the given sectors. According to New York State Electric and Gas (NYSEG) 2006 figures, the fuel sources used to generate our region’s electricity came from natural gas (36%), hydroelectric, (23%), nuclear (23%), coal (12%), oil (4%) and other renewables (2%).

Between 1998 and 2006, community-wide greenhouse gas emissions increased by 5 percent as energy use increased by 23 percent. The main contributors to the increase in energy use were the industrial, residential, and commercial sectors, though vehicular transportation energy use also rose. The increase in greenhouse gas emissions might have been higher but was mitigated by improvements made in regional electricity transmission technology and the large numbers of homes and businesses that made the conversion from heating oil and propane to cleaner-burning natural gas during this time period.

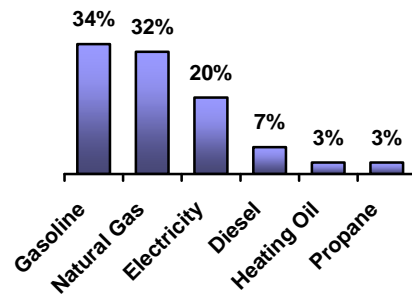
A fairly recent development in the local energy picture is the tapping of the Marcellus Shale formation for natural gas. The formation extends deep underground beneath Ohio, West Virginia, Pennsylvania, and New York and includes Tompkins County in its mapped range. While this is an opportunity to boost national fuel production, with several companies actively drilling and leasing land in Tompkins County, questions have been raised about possible environmental and community impacts associated with the technique of hydraulic fracturing, which is used to increase production rates. These and other concerns are being studied locally, as well as by the NYS Department of Environmental Conservation and other agencies and organizations throughout the Marcellus region.

COMMUNITY ENERGY USE BY SECTOR (2006)



Source: Tompkins County Emissions Inventory, August 2007.

SOURCE OF COMMUNITY ENERGY (2006)



Source: Tompkins County Emissions Inventory, August 2007.

**A Community Approach**

There is no one single solution or single approach that will work to affect a major reduction in community energy usage and greenhouse gas emissions. Rather, a four-pronged approach is required:

- Reduce energy demand
- Improve energy efficiency
- Transition to renewable energy sources
- Enhance resources that naturally remove carbon from the atmosphere

## **Reduce Energy Demand**

Reducing energy demand is the quickest and cheapest method to address the energy problem. However, it will be difficult as it means weaning ourselves from a very addictive habit – using energy freely and without thought. Simple, immediate steps can be taken to reduce energy use that will also reduce greenhouse gas emissions. Examples of actions that can be taken to reduce energy demand are: individuals can install programmable thermostats in their homes and choose to take the bus or carpool a few times a week; businesses can install building controls to focus heating and lighting in the high-use areas; and governments can evaluate routes and study the feasibility of building interconnected bike and pedestrian paths to make it easier for citizens to get around without vehicles.

## **Improve Energy Efficiency**

Every segment of the community can take steps to increase energy efficiency. Energy suppliers can install technologies that reduce energy losses during transmission; individuals can hire professionals to conduct an energy audit of their homes and replace appliances that wear out with Energy Star-rated models; businesses can employ new processes and technologies to reduce energy waste; and government can improve local transit service, replace aging vehicle fleets with more efficient vehicles, and explore efficiency technologies such as combined heat and power or district heating.

Improving energy efficiency for transportation and buildings would greatly reduce total community energy use and associated emissions. Transportation, the sector that singularly uses the most energy and emits the most greenhouse gases, can achieve efficiency through a transition to more fuel-efficient vehicles and improved transit systems. Research is also underway to identify and produce sustainable fuel sources to replace fossil fuels that power vehicles.

As for local buildings, almost 40 percent of the homes in the County were built prior to 1940. A large percentage of these homes have little or no insulation, single-pane windows, and rely on aging heating systems. The energy loss that occurs in these homes is enormous and will, in many cases, become a financial burden on homeowners as energy prices rise. The chart below illustrates the financial impact of weatherization on a typical home in Tompkins County.

**ANNUAL COST TO HEAT AN 1,800 SF HOUSE IN TOMPKINS COUNTY, 2007**

<b>STATUS OF WEATHERIZATION</b>			
<b>Energy Heat Source</b>	<b>POOR (17 BTU/SF/HDD)</b>	<b>AVERAGE<sup>2</sup> (8 BTU/SF/HDD)</b>	<b>OPTIMAL<sup>3</sup> (1.5 BTU/SF/HDD)</b>
Electricity	\$5,554 <sup>1</sup>	\$2,614	\$490
Propane	\$4,881	\$2,297	\$431
Oil	\$4,039	\$1,901	\$356
Natural Gas	\$3,029	\$1,426	\$267
Grass/Wood Pellets	\$2,356	\$1,109	\$208
Wood	\$2,356	\$1,109	\$208

<sup>1</sup> 2007 US average costs based on approximate efficiency for typical heating appliance used for each energy source.

<sup>2</sup> Based on annual 5,500 heating degree days (HDD) in Tompkins County. HDD is a unit of measure that relates daily temperature to expected demand for fuel. 79.2 million British thermal units (BTUs) are required to provide heating for a typical 1,800 square foot (sf) home in Tompkins County with average weatherization (8 BTUs/sf/HDD)

<sup>3</sup> Based on several reports, including a Rocky Mountain Institute study showing 80% efficiencies obtainable in home renovations.

Sources: U.S. Department of Energy and Cooperative Extension of Tompkins County

Improving energy efficiency in buildings also has great potential for stimulating the local economy; it offers opportunities for new industry and green job creation. These jobs might include performing energy audits,

retrofitting buildings to tighten the building envelope, and designing and constructing new, energy efficient buildings.

### **Transition to Renewable Energy Sources**

A long-term solution will be to transition to renewable sources of energy for heat and transportation. Developing a diverse energy portfolio that includes renewable energy sources will allow the Tompkins County community to meet our future energy needs in a responsible and sustainable manner. In addition to incentives at the Federal level, New York State offers an attractive package of rebates and tax incentives, as well as net metering legislation, to help consumers more readily afford renewable energy systems. Locally, the Tompkins County Legislature has permanently exempted residential solar energy systems equipment and installation service from local sales and use taxes. In terms of renewable opportunities, Tompkins County can draw on local renewable energy sources that include solar, wind, biomass, water, methane and geothermal.

In a region known for its cloudy weather, Tompkins County is not immediately thought of for solar energy potential. However, even on cloudy days, solar radiation is available and is a viable energy source to provide both electricity and heat. According to the New York State Energy Research and Development Authority, as of July 2008, there were 93 grid-connected solar arrays in the County.

Another important energy source in Tompkins County is wind. Given the varied topography in the County, much land is located in high areas with annual average wind speeds of at least 11 miles per hour, the threshold required for household grid-connected applications, and some areas have wind speeds up to 17 mph. Wind energy that is sited in areas with strong wind resources near transmission lines can produce extremely affordable electricity.

Biomass, in the form of forests, brush, and crops, can be cut or pelletized and used for home heating. Biomass that is burned in efficient, clean-burning stoves could help residents make the transition away from nonrenewable energy. Currently, in the County there are 140,000 acres of privately and publicly owned forestland, 22,000 acres of marginal brushland, and 19,000 acres of inactive agricultural land. It may be feasible that half of this acreage could be used for biomass production. As it takes 5-6 acres of sustainably managed brushland or forestland to heat one typical home for one year, potentially 16,500 homes could be heated each year using existing forestland, marginal brushland, and inactive agricultural land.

The many streams in Tompkins County have historically provided power to the community, as is evidenced in the many old mill dams scattered throughout the region. Currently, water resources are being used to supply energy in Tompkins County, but chiefly by individuals and Cornell University. Cornell recently upgraded its hydroelectric facility below Beebe Lake, which is expected to increase that facility's annual production by 20 percent, and Cornell's Lake Source Cooling project uses the deep cold waters of Cayuga Lake to cool Cornell and Ithaca High School. There is potential for more hydropower to be harnessed at the individual level, as well as at the community level using the fast-moving waters in our streams.

Methane, a byproduct of decaying organic waste, can be harnessed in the County's agricultural areas and landfills to produce electricity. Harvesting methane also reduces the amount of this harmful greenhouse gas that is emitted into the atmosphere.

Geothermal energy takes advantage of the stable temperatures near the surface of the earth for use in heating and cooling buildings. Heat energy can be extracted from the earth in the winter, and added to the building. In the summer the process can be reversed, with unwanted heat extracted from the building and added to the earth.

### **Technologies that Can Help Fill the Gaps**

Energy-efficient and renewable technologies that produce heat and electricity can be employed in Tompkins County to help achieve energy sustainability. A few examples of technologies that focus on efficient

processes include: combined heat and power that utilizes waste heat generated from electricity production to warm buildings; distributed heat which circulates heat through a pipe network in densely developed areas; distributed electricity generated using solar or wind power; and anaerobic digestion that uses microorganisms to break down biodegradable material. Distributed heat, in particular, is often cited as having great potential in the City of Ithaca, Villages, and even smaller units of dense housing such as mobile home parks. Also, two innovative, renewable energy technologies currently being researched at Cornell University are deep rock geothermal and biochar using pyrolysis. Tompkins County is well positioned to benefit from any of these technologies through pilot projects and perhaps spin-off technology businesses.

### **Reduce Emissions**

By reducing energy demand, improving energy efficiency, and transitioning to renewable energy sources, the Tompkins County community can reduce the amount of greenhouse gases it emits. Additionally, emissions can be reduced by enhancing resources that naturally remove carbon from the atmosphere. The natural process of carbon sequestration absorbs and stores atmospheric carbon in carbon sinks - local land, forests, wetlands, and waters. Protecting and sustainably managing these natural resources is vital to reducing greenhouse gas emissions.

Based on analysis done by the United Nations Intergovernmental Panel on Climate Change, many scientific, environmental and industrial organizations have determined that we must reduce greenhouse gas emissions by at least 80 percent by 2050 to avoid the worst impacts of global climate change. The Tompkins County community can do its part by setting the goal of reducing greenhouse gas emissions by two percent of 2008 base year emissions per year for the next 40 years to achieve that reduction. By implementing a combination of approaches over time, citizens, businesses, and institutions across the County could feasibly achieve this goal by using technology that largely exists today.

#### **THE MULTIPLIER EFFECT**

Imagine the impact the "Smith" family could have, over time, if they took advantage of choices currently available regarding their transportation, home electric, and heating.

##### **Transportation**

Suppose the Smith family typically drives 10,000 miles per year and three times a week they start to bike or take public transit to work instead of driving, that could result in their driving 5,700 miles per year, or a 43 percent reduction in vehicle miles traveled.

If the Smiths also trade in their current vehicles for more fuel-efficient cars, they could go from 25 mpg to 45 mpg, a 44 percent reduction in gasoline used per mile. Just these two choices alone would reduce the family's vehicle emissions by 68 percent.

##### **Home Electric and Heating**

If the Smiths reduce their demand for home energy by installing a programmable thermostat, switching to compact fluorescent light bulbs, adding insulation and making other low-cost, simple changes to reduce energy demand, and they also have an energy audit and make the recommended improvements to make their home more efficient, they could reduce their energy consumption and greenhouse gas emissions by 40 percent.

If the Smith family then installs a renewable energy system (or if the electric grid delivers energy from renewable sources), they might achieve a 60 percent reduction in greenhouse gas emissions from their energy source, so that overall, the family would achieve a 76 percent reduction by taking these multiple steps.

## **Local Benefits of Energy Transition**

Changing energy-use patterns is hard, but this energy challenge can provide local benefits. Through energy transition, Tompkins County can position itself as a regional leader in building a strong, local economy with the development of green jobs, local production facilities for new technologies, and sustainable agriculture and forestry.

Energy transition is also a strong impetus for building in a more nodal development pattern as people seek to reduce transportation costs. It can also help to preserve the natural areas and resources that hold energy potential for the region. More people living near employment, commerce, education, entertainment, parks, and recreation areas could very well result in improvements in our quality of life, as people are able to walk and bike more, interact with neighbors and participate in nearby community activities more readily, and benefit from efficiencies in the delivery of public services.

It is anticipated that any adverse fiscal impacts that might result from energy transition will likely be offset by the economic benefits associated with retaining dollars in the local economy that would normally flow out to pay for higher energy costs.

## **Policies**

It is the policy of Tompkins County to:

- Reduce community greenhouse gas emissions by at least 2 percent of 2008 base year emissions per year to reach, at a minimum, an 80% reduction from 2008 levels by 2050.
- Foster coordination of energy and greenhouse gas emissions planning and project implementation activities in the community.
- Support energy reduction through countywide composting, recycling, reuse, and other waste stream management programs.
- Create financial mechanisms and incentives that foster investment in the systems and programs necessary to help the community achieve reductions in energy demand, improvements in energy efficiency, and transition to renewable energy sources.
- Encourage all new development and renovations to be energy efficient and to take advantage of renewable energy sources wherever possible.
- Encourage development of local renewable energy sources and technologies.
- Construct, renovate, and maintain Tompkins County government facilities and buildings to optimize energy efficiency, utilize renewable energy where possible, and enhance environmental sustainability.
- Consider energy usage and greenhouse gas emissions when making decisions about local laws and regulations, future development, transportation projects, and infrastructure.

## **Action Items**

*Action items are short-term activities that Tompkins County government or community partners can undertake to implement the long-term policies.*

- Work with local municipalities, school districts, businesses, institutions of higher education, and non-profits to develop a 5-year strategy to reduce community greenhouse gas emissions by at least 10% of 2008 emissions levels, including a detailed plan for County government to achieve that same target.

- Incorporate into the *Tompkins County Comprehensive Plan Indicators of Success Report* metrics of change in energy use and greenhouse gas emissions, energy efficiency improvements, and renewable energy systems installations in the community.
- Prepare an adaptation plan to help prepare the community for impacts of global climate change.
- Conduct an educational campaign on energy issues and energy choices that address topics such as home heating options, energy efficiency measures, transportation options, food production, and renewable energy systems.
- Identify and promote utilization of Best Management Practices in agricultural, forestland, and water management to enhance carbon sequestration.
- Develop a strategy to divert 75% of the community waste stream from landfills by 2015.
- Develop a plan to address the specific energy needs of low-income people, including recommendations for improvements to existing energy-related programs and identification of potential pilot projects to address energy needs.
- Investigate the feasibility of developing a low-interest revolving loan fund to improve the payback period for energy efficiency investments made by homeowners, landlords, and businesses.
- Promote green business development and create green job training opportunities for workers, high-school students, and college students.
- Adopt and expand local tax incentives, such as sales and property tax abatements, to encourage homeowners and businesses to invest in energy efficiency and renewable energy systems.
- Develop or identify a model building energy code that can be phased in, as well as incentives to assist with code compliance.
- Adopt a County administrative policy that requires major new County government buildings or renovations of County buildings to be certified Leadership in Energy and Environmental Design (LEED) Silver or higher.
- Determine the feasibility of developing a regional consortium of sustainable biomass growers and processors to supply biomass consumers in the region.
- Develop criteria and identify the sites most appropriate for locating community-scale wind power in Tompkins County.
- Establish a green fleet policy for County government, including participating in car share and bike share programs for County government employees, and determining needs for amenities to facilitate alternative transportation use.
- In the 2009 update of the Long Range Transportation Plan include provisions to reduce vehicle miles traveled and enhance transportation efficiency through physical and programmatic improvements, such as park and rides, express regional commuter service, vanpool, and interconnected bike/pedestrian ways.
- Identify and, if necessary, create a board or committee to advise the Tompkins County Legislature on proposed federal and state legislation and policy initiatives regarding energy and greenhouse gas emissions.