climate change

WHILE GLOBAL ENERGY AND CLIMATE 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. AND ULTIMATELY IT IS ONLY RECOGNITION AND ACTION AT LOCAL LEVELS EVERYWHERE THAT CAN ACCOMPLISH THE NEEDED CHANGES. ACTING NOW WILL PREPARE THE COMMUNITY TO BETTER ADAPT TO A RAPIDLY CHANGING CLIMATE AND TO RESPOND NIMBLY TO CHANGING ENERGY AND CLIMATE POLICY AND PROGRAM DECISIONS. COMMUNITIES THAT HAVE PREPARED FOR AN ENERGY FUTURE THAT IS CLIMATE NEUTRAL WILL BE ATTRACTIVE PLACES TO LIVE AND INVEST IN. THIS SECTION DISCUSSES TWO INTER-RELATED ASPECTS OF CLIMATE CHANGE. THE FIRST IS TO REDUCE THE MAGNITUDE OF CLIMATE CHANGE BY REDUCING THE COMMUNITY'S CONTRIBUTIONS TO GREENHOUSE GAS EMISSIONS. THE SECOND IS TO LIMIT THE COMMUNITY'S VULNERABILITY TO THE CURRENT AND FUTURE IMPACTS OF CLIMATE CHANGE.

energy and greenhouse gas emissions

The past decade has seen a dramatic change in the types of available energy sources. The expansion of new exploration techniques used to tap previously hard-to-reach fossil fuel resources, including shale gas, tar sands, and deep ocean deposits, as well as the decreasing costs of some of the traditional renewable resources, including solar and wind, have changed the way these sources are viewed. Other sources of energy are also getting a fresh look, including geothermal, hydro, tide, and wave energy. Re-localization initiatives around local food and products and reusing materials are also being embraced across the country not only as a way to enhance the resilience of a community in the face of climate change, but as a way to reduce the energy costs and associated greenhouse gas[1] emissions of transporting and manufacturing goods.

In addition to the changing global energy picture, several well-respected studies have identified how New York State could run on 100 percent renewable energy by 2050. This interest in transitioning to renewables is driven by many factors, including fear of the environmental and social costs of high-intensity fossil fuel extraction; deep concern about the future impacts of climate change; desire for energy independence from foreign powers; and New York's experience with recent disasters, such as Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee.

In response to these concerns, the community is interested in moving toward climate neutrality, or achieving net zero greenhouse gas emissions by dramatically reducing the amount of fossil fuel energy used and offsetting the remaining emissions with sequestration of greenhouse gases by natural vegetation and soils. Purchasing Renewable Energy Credits[2] to make up the difference may be employed as an interim measure while the community works towards long-term solutions.

Changing energy-use patterns is not simple, but addressing this energy challenge can provide numerous local benefits. 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. The economy can be further enhanced by investing in local energy sources that support local jobs and keep dollars circulating in the community.

PRINCIPLE

Tompkins County should be a place where the energy system meets community needs without contributing additional greenhouse gases to the atmosphere.

POLICIES

It is the policy of Tompkins County to:

- Reduce greenhouse gas emissions to reach a minimum 80 percent reduction from 2008 levels by 2050 and reduce reliance on fossil fuels across all sectors.
- Improve the energy efficiency of all components of the community energy system.
- Increase the use of local and regional renewable energy sources and technologies.
- Increase carbon capture and storage in the county's forests, wetlands, and soils.
- Reduce the amount of material disposed of in landfills.

SNAPSHOT
OF THE COUNTY TODAY

Electricity

In 2008, the community consumed approximately 780 million kWh of electricity. The bulk of that usage, 44 percent, was by the commercial sector, which includes educational and institutional users. Annual residential electricity usage averaged 7,800 kWh per household, compared to 7,300 kWh for New York State as a whole and 11,500 kWh for the United States.

Many people assume that Tompkins County's electricity is provided primarily by the Cayuga Power Plant, a 306 megawatt (MW) coal-fired power plant located in Lansing, but the county's electricity is actually generated from a diverse group of sources, most of which are located outside of the local area. According to New York State Electric and Gas (NYSEG), a mix of fuel sources is used to generate electricity for our region, with 47 percent from natural gas, 28 percent from nuclear, 13 percent from hydroelectric, five percent from wind, four percent from coal, and three percent from other sources. In addition to NYSEG, there are two other local energy providers, Cornell University and the Village of Groton Electric Department.

Cornell generates approximately 86 percent of its main campus' annual electricity needs from its 38 MW Central Energy Plants and its 1 MW hydroelectric plant on Fall Creek. In order to provide heat and electricity with the highest efficiency to its campus, in 2009 Cornell began commercial operation of its 30 MW Combined Heat and Power Plant utilizing combustion turbine technology with heat recovery steam generators, adding to the electricity production "cogenerated" from its steam turbine generators built in 1986. Cooling to the campus is provided by Cornell's Lake Source Cooling project, which has been utilizing the deep cold waters of Cayuga Lake to cool facilities at Cornell and Ithaca High School since 2000 with 86 percent less electricity than the refrigeration-based chillers it replaced. Lake Source Cooling is complemented by peaking capacity from the 4.4 million gallon Thermal Storage Tank and three high-efficiency centrifugal chillers. In September 2014, Cornell began receiving remote net metered electricity from a two MW solar photovoltaic electric installation that generates about one percent of annual needs.

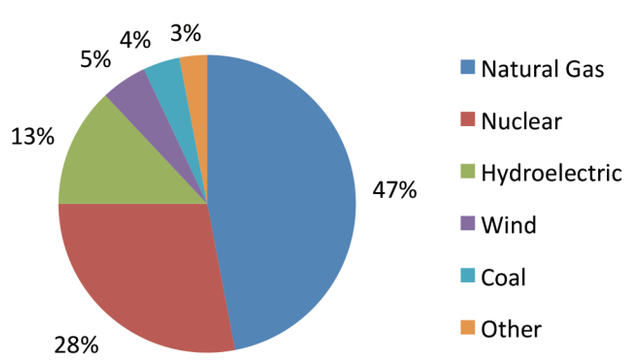
The Village of Groton has a long-term financial agreement to purchase up to 4.5 MW of low-cost power from the New York Power Authority's hydro-electric plant at Niagara Falls, with any excess demand purchased through the New York Municipal Power Agency.

Thermal Energy

In 2008, the community consumed over five million MMBtus[3] of thermal fuel, including nearly 43 million therms of natural gas, two million gallons of heating oil, and six million gallons of propane gas. The top users of thermal energy were the residential sector at 47 percent and the commercial sector at 43 percent, with the industrial sector accounting for ten percent of thermal energy use.

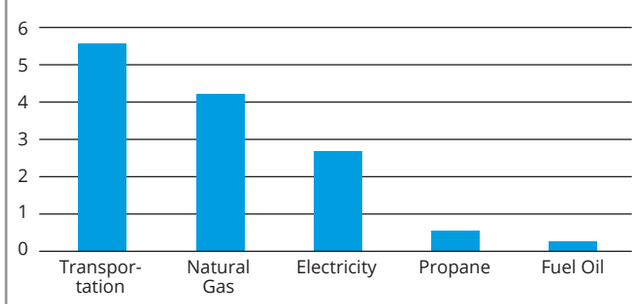
Fuel oil and propane are provided to users in Tompkins County through a series of independent distributors, and natural gas is delivered through a pipeline network. Natural

NYSEG Electricity Grid Fuel Sources (2012)



Source: New York State Electric and Gas

Community Energy Use, MMBtus (2008)



Source: Tompkins County Planning Department

gas transmission assets in Tompkins County are operated by Dominion Transmission, and the distribution system is operated by NYSEG. The two types of transmission pipelines in Tompkins County are natural gas and liquids. The natural gas pipelines transport gas to NYSEG for distribution and to main line users such as the Cornell Central Energy Plants. The liquid pipelines transport petroleum products to distributors.

Transportation*

In 2008, the community consumed nearly six million MMBtus of energy to fuel its transportation needs to drive nearly 687 million miles over the course of the year. Gasoline accounted for roughly 85 percent of fuel used at roughly 37 million gallons, and diesel accounted for 15 percent at seven million gallons.

Community Greenhouse Gas Emissions

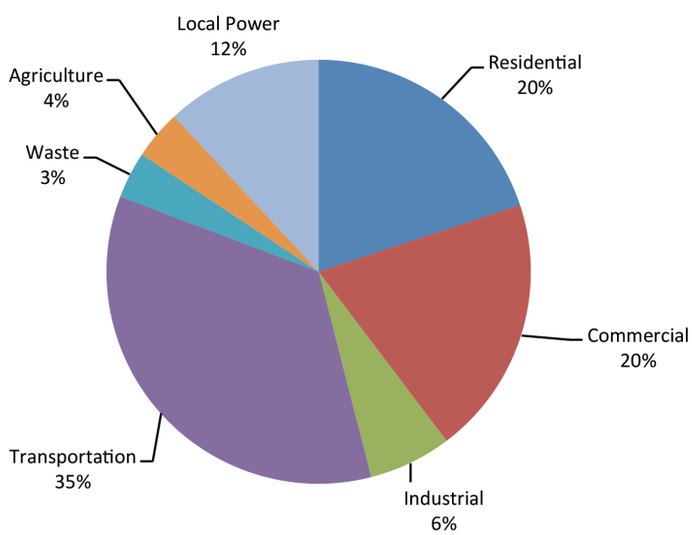
According to the most comprehensive recent greenhouse gas emissions inventory, in 2008, the Tompkins County community used over 13 million MMBtus of energy, and emitted nearly 1.2 million metric tons of carbon dioxide equivalent[4] (MTCO2e). A greenhouse gas emissions inventory was also completed using 2010 data as part of the *Cleaner Greener Southern Tier Regional Sustainability Plan*, and emissions for Tompkins County were estimated at 1.1 million MTCO2e. Since that regional methodology was somewhat different than county emissions counting, the Comprehensive Plan will focus on the finding of the Tompkins County inventory that used 2008 data.

Emissions from residential, commercial, and industrial buildings together accounted for the largest proportion of community emissions and transportation accounted for more than a third of all community emissions. Gasoline used for transportation was the largest single energy source consumed, and electricity was the second most used energy source, followed by natural gas.

It should be noted, however, these emissions are calculated using the Environmental Protection Agency's (EPA) global warming potential figure for methane that was in place when the inventory was performed and follow the 100-year Global Warming Potential (GWP) time horizon that was adopted in the Kyoto Protocol and is now used widely as the default metric. Since 2008, many scientists have focused research on methane emissions and it appears that it would be more accurate to use a much greater GWP for methane to reflect its extreme potency in the shorter duration when reductions will most help in limiting warming that may result in a cascade of uncontrollable negative impacts. Such an analysis of methane will likely be incorporated into future energy plans, and would primarily affect the waste and agriculture sectors, as they are currently the highest emitters of methane.

Community Greenhouse Gas Emissions and Energy Use (2008)

Sector	GHG Emissions (MTCO2e)	Energy Equivalent (MMBtu)
Residential	233,469	3,396,123
Commercial	232,081	3,377,933
Industrial	74,265	994,576
Transportation*	407,469	5,606,892
Waste	41,792	0
Agriculture	43,996	0
Local Power	139,846	0
Total	**1,172,918**	**13,375,524**



**Air flight emissions are tracked, but not counted in these emissions since the data is incomplete, as it does not include private air flight. Commercial flights were estimated to have released 916 tons eCO2.*

Source: Tompkins County Planning Department

** For more information see the Transportation Chapter, "Transportation's Role in Greenhouse Gas Emissions" section.*

County Government Initiatives

Tompkins County's efforts to play an active role in reducing greenhouse gas emissions and reducing energy costs began in earnest in 2000 with the decision to install a 147 kW solar photovoltaic (PV) system on the roof of the County Library. Since then, the County has set emissions reduction goals and has periodically tracked both County government and community greenhouse gas emissions. Since its initial energy work, the County has adopted many new goals, policies, and programs to reduce energy use in its government facilities and operations, including:

- Entering into energy performance contracts with Johnson Controls and making significant upgrades to the energy efficiency of government facilities.
- Installing solar panels on nearly all County facilities through long-term lease agreements, and thereby helping Tompkins County and its municipalities lead the state in installed solar capacity in government facilities.
- Adopting green fleet, green building, and other green government policies.
- Partnering to create the Municipal Electric and Gas Alliance and piloting a program to provide long-term, price-certain electric energy to its members from renewable sources.
- Becoming a NYS Climate Smart Community.
- Transitioning to bio-diesel for the County Highway fleet.
- Purchasing Renewable Energy Credits to offset 100 percent of electrical energy use.

As part of its adoption of the Energy and Greenhouse Gas Emissions chapter of the Comprehensive Plan in 2008, the County Legislature committed to reduce emissions from 2008 levels by at least two percent a year to achieve a 20 percent reduction by 2020 and at least an 80 percent reduction by 2050. In support of those goals, the Legislature endorsed the *Tompkins County 2020 Energy Strategy*. The Strategy identifies action steps that should be taken to reduce greenhouse gas emissions to achieve the 2020 goal, paving the way for achieving the 2050 goal.

> The County Legislature committed to reduce emissions from 2008 levels by 20 percent by 2020 and at least 80 percent by 2050.

In 2008, Tompkins County government facilities and operations emitted approximately 6,000 MTCO2e and used 87,000 MMBtus of energy. Buildings and facilities were the biggest emitters at 52 percent, followed by vehicle fleet at 30 percent. In 2008, the Tompkins County government spent $1.7 million for its total energy costs. Buildings accounted for $1.3 million or 78 percent of all County government energy costs. Vehicles fuel expenses were $364,000, or 21.6 percent, and streetlights/traffic signal electricity cost $7,000, or 0.4 percent of County government energy costs.

ISSUES AND OPPORTUNITIES

No one solution or approach will bring about a major reduction in community energy usage and greenhouse gas emissions. Rather, this complex issue requires a suite of strategies be implemented, including both reducing energy demand and making more efficient use of energy, to see progress.

Consider Energy and the Economy Together*

Addressing our community's energy needs while reducing greenhouse gas emissions poses an immense challenge that demands immediate action if there is a hope of avoiding the direst consequences of climate change. The goal of reducing community emissions 80 percent by 2050 was not selected at random, but was determined by the United Nation's Intergovernmental Panel on Climate Change (IPCC) as the minimum that must be attained. Achieving that goal is an imperative that has been thrust upon the community by global forces and one that is becoming clear cannot be put off until 2050 or even 2030. The November 2014 IPCC's Fifth Assessment Synthesis Report states that "Delaying additional mitigation to 2030

> The overall goals for strengthening the local economy and reaching the energy and greenhouse gas emissions targets are compatible and can be mutually reinforcing.

** For more information see The Economy Chapter, "Supporting Infrastructure for Economic Development - Energy Infrastructure" section.*

Green jobs can help power Tompkins County's economy

will substantially increase the challenges associated with limiting warming." The need to take steps to limit fossil fuel use grows in urgency with every new climate change-related impact that is experienced and "tipping point" that is identified.

Even though this topic is critical and should be a key driver in decision-making in the community, it is also important to recognize the other aspects of living in Tompkins County that make life prosperous and sustainable. Without good jobs from successful businesses, few residents could continue to live here. Without housing and transportation systems to sustain those employees, they would need to find work elsewhere. There need to be ways of addressing long-term and immediate energy needs and emissions that also contribute to the vital local economy.

One way to begin this collaboration is to bring a broad variety of voices to the discussion of community goals and strategies, as well as identify tangible steps to meet both energy and economic development goals. While the overall goals for strengthening the local economy and reaching the energy and greenhouse gas emissions targets are compatible and can be mutually reinforcing, it is also important to recognize that there may be specific instances where they come into conflict. In such cases it may be helpful to create public-private partnerships to evaluate the issue more closely and incentivize actions that reduce greenhouse gas emissions. Although the goal would be to find a mutual gains solution to the perceived conflict, it is likely that some instances will arise where no clear mutually beneficial solution can be identified and, in such cases, the attempt to meet multiple goals will need to be weighed in making a decision.

It will be important in such instances to consider the energy and economy pictures as a whole. If, for example, it is determined that fossil fuels are necessary to power a certain development because of the positive impacts on the economy, there should be a clear understanding of where energy use will be curtailed in other segments to compensate for the additional usage. Tackling the climate crisis will require unity in action and the community must develop ways to discuss these difficult issues in productive and positive ways. Rethinking how decisions are made around economic development and energy use will be critical to maintaining a high quality of life in 2015, as well as in 2050.

Explore Infrastructure in Energy Focus Areas*

Several areas are critical to the economic success of the county including downtown Ithaca; the business parks and industrial sites proximate to Ithaca Tompkins Regional Airport; Cornell's Campus on East Hill; and South Hill, including Ithaca College, the South Hill Business Campus, and the Emerson (Chainworks) site. These are areas that currently host substantial development, are expected to support new development, and are ripe for potential adoption of innovative energy solutions. Possible solutions include increased deployment of renewables, reduced energy demand through energy efficiency, analysis of applicability of Combined Heat and Power facilities, and establishing micro-grids to provide added resilience to the electrical supply in the event of grid failure due to storms or other unforeseen events.

They are also areas that could benefit from direct engagement with NYSEG and others, including funders at NYSERDA, to evaluate current and future constraints of the energy infrastructure and devise long-term plans that will meet current and future business, residential, and community energy needs while reducing greenhouse gas emissions. This approach is in accordance with the New York State Public Service Commission's *Reforming the Energy Vision (REV)* process and framework which envisions a distributed energy grid with micro-grids as integral components of our energy system.

Reduce Energy Demand**

CHANGING BEHAVIOR. After years of having access to low-cost and abundant energy, U.S. society has become accustomed to using energy freely and without thought. Indeed, a poll commissioned by several State agencies and conducted in July and August 2014 found only 53 percent

* *For more information see The Economy Chapter, "Supporting Infrastructure for Economic Development - Energy Infrastructure" section.*
** *For more information see the Housing Chapter, "Energy Efficient Housing" section.*

Local contractor improving energy efficiency of a house

of New Yorkers characterized themselves as knowledgeable about the amount of electricity used by various household appliances, and 48 percent said they understood the components of their electric bill. On the bright side, 69 percent believed it was important to reduce carbon emissions. Simple, immediate steps can be taken to reduce energy use that will also reduce greenhouse gas emissions and save money. This message has been at the core of the Get Your GreenBack Tompkins campaign to inspire all 42,000 households to take at least one step to save energy and money in the areas of heating and lighting, transportation, food, and waste. The campaign highlights steps individuals and businesses can take, ranging from carpooling to growing their own food to setting thermostats lower in the winter and higher in the summer.

IMPROVING ENERGY EFFICIENCY. There are many opportunities to use less energy through improved technology and better understanding of how systems operate. Both new and existing homes, businesses, vehicles, and appliances could be improved to greatly reduce total community energy use and associated emissions. Transportation, the sector in Tompkins County that uses the most energy and emits the most greenhouse gases, can achieve efficiency by transitioning to more fuel-efficient vehicles and improving alternative transportation options. The Federal government has taken leadership in setting higher energy efficiency standards for new vehicles and appliances, which will trickle down into the local level as people replace older models.

As for local buildings, more than half of the homes in the county are over 50 years old. A large percentage of these homes have little or no insulation, single-pane windows, and rely on aging heating systems. Sometimes these same homes have limitations imposed due to their location in historic districts. 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. Homeowners and businesses can reduce energy use by air sealing and insulating, and upgrading furnaces in their homes and businesses.

One aspect of existing housing that makes it particularly difficult to improve energy efficiency is the so-called "split incentive" associated with rental housing, where the renter pays utility bills and the landlord would need to pay to upgrade the building. With over 40 percent of housing units rented in Tompkins County, this is a big issue which can result in the rental housing stock wasting energy and negatively impacting vulnerable populations as energy costs rise. It will be important to ensure that home energy retrofits are financially available to renters, landlords, and homeowners, as well as to people at all income levels.

While new housing will be more energy efficient than most existing housing due to continued improvements in New York's Energy Conservation Construction Code, significant strides can be made to reduce energy demand in new housing even further through good design and location. Local projects have found that it is possible to significantly reduce energy use by designing new housing to be much more energy efficient, tight and well-insulated; locating it in Development Focus Areas to allow people to more easily walk, bike and bus to work and activities; and being "design-ready" to take advantage of renewable resources, such as orienting homes with south-facing roofs for solar energy generation. Given the difficulty in retrofitting existing houses to improve energy efficiency, it would be prudent to ensure new construction will not require retrofitting in the future.

> Local projects have found that it is possible to significantly reduce energy use by designing new housing to be much more energy efficient.

Use of energy-efficient technologies that produce heat and electricity can also be expanded in Tompkins County to help achieve energy sustainability. A few examples of technologies that focus on efficient processes include: combined heat and power systems that utilize waste heat generated from electricity production to warm buildings; advanced air- and ground-source heat pumps that move heat

Solar Tompkins 2014 Program

rather than convert it from fossil fuels; distributed heat networks that circulate heat through pipe systems; and distributed electricity micro-grids that provide power to multiple users using solar or wind resources.

Developing a diverse energy portfolio that includes renewable energy sources will allow the community to meet its energy needs in a responsible and sustainable manner.

SOLAR. Energy from the sun is one of the most quickly evolving and exciting technologies available in the transition to a sustainable future. The cost of solar PV has been rapidly decreasing and efficiencies are improving. At first glance, Tompkins County may not seem like an ideal place for solar energy, but it actually has two-thirds of the solar resource of Arizona, and a better solar resource than that found in Germany, a global leader in solar energy production.

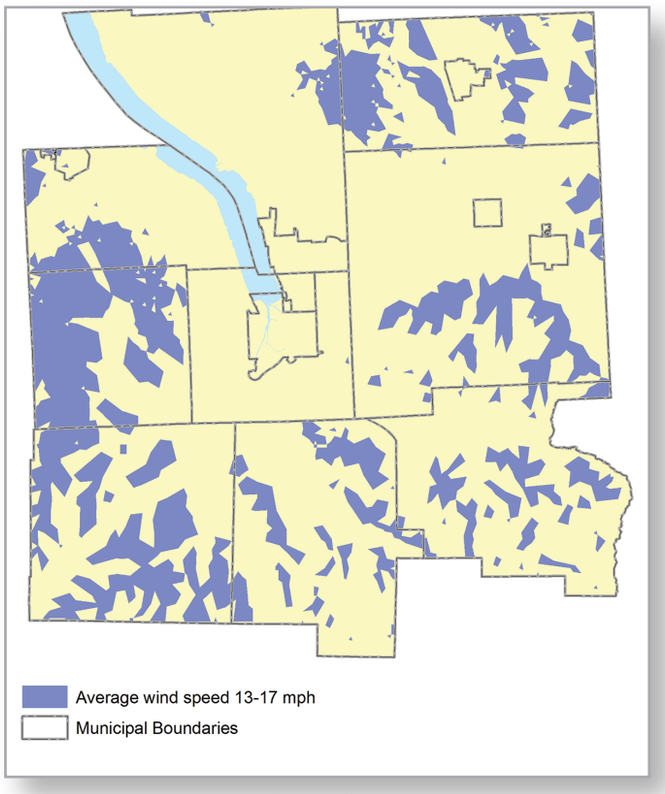
As of August 1, 2014, the New York State Energy Research and Development Authority (NYSERDA) reported Tompkins County had 510 grid-connected solar arrays, up from 93 in 2008. Those numbers are expected to greatly expand within the next year, due to the successful Solar Tompkins program that resulted in over 400 households contracting to install 3 MW of new solar. In addition, there are two large-scale solar farms in development in the community.

WIND. The threshold speed for wind power suitability varies across studies, with some studies using values as low

Transition to Renewable Energy Sources

A long-term solution that needs to expand dramatically in the near-term to avoid the worst impacts of climate change will be to transition to renewable sources of energy for heat, electricity, and transportation. Developing a diverse energy portfolio that includes renewable energy sources will allow the Tompkins County community to meet its 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 services from local sales and use taxes. Tompkins County can draw on local renewable energy sources that include solar, wind, biomass, water, geothermal, and methane from animal waste. While each of these sources have significant potential in the county, each faces its own obstacles to full deployment, ranging from shading limiting siting of roof-mounted solar to local regulations limiting wind turbines to air quality concerns limiting biomass stoves.

Potential Wind Areas



Source: AWS Truewind LLC and Cornell University, 2003

as 11 miles per hour (mph) for small wind systems and others recommending 14.5 mph average wind speeds for utility-scale wind farms. In general, the wind speeds in the county are rather low compared to requirements for utility-scale wind farms, with a maximum average wind speed of approximately 16.8 mph, according to estimates prepared by AWS Truewind, However, many areas offer potential for small or medium-scale wind.

Medium-scale wind (100-500 kW) may be particularly suitable in locations such as farms or other institutions that have higher wind speeds, large on-site demand, available land, and the ability to take advantage of incentive programs to make the financing attractive. Another potential in the future may be to provide energy for off-site users through remote net metering.

One bright spot for wind energy is the development of Black Oak Wind Farm in the Town of Enfield. Located at the site of the largest high wind resource area in the county, this 11.9 MW facility is expected to begin construction in late 2014 and will be New York State's first community-owned wind farm.

BIOMASS. 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 non-renewable energy, and especially help rural homeowners who rely on expensive fuel oil and propane for their heat. As of 2012, there were 180,000 acres of forest and brushland and 10,000 acres of inactive agricultural land that could potentially be used for biomass production. In 2013, a team involving Cornell Cooperative Extension in eight Southern Tier counties, Ehrhart Propane and Oil of Trumansburg, MESA Reduction Engineering and Process of Aurora, New England Wood Pellet, and several businesses in the region were successful in obtaining State funds to jumpstart the bulk wood pellet delivery business in the region.

GEOTHERMAL. Geothermal energy is heat from the Earth's core and ranges from molten rock magma to the nearly constant temperatures found in the upper 10 feet of the Earth's surface. Ground-source heat pump technology uses the stable temperatures beneath the surface, in conjunction with some electricity to operate it, to very efficiently heat and cool buildings. Heat energy can be extracted from the earth in the winter and added to the building, and extracted from the building and added to the earth in the summer. Reaching well beyond the application of shallow, ground-source heat pumps, Cornell University is evaluating "deep rock" geothermal to provide heating and, potentially, electricity to its campus. If this technology were to be successfully adopted, it could serve as a model for surrounding areas and the world.

HYDROPOWER. The many streams in the area have historically provided power to the community, as is evidenced in the many old mill dams scattered throughout the county. Currently, water resources are being used to supply energy in Tompkins County by individuals and Cornell University. Cornell recently upgraded its hydroelectric facility below Beebe Lake, which increased the plant's annual output by 20 percent. There is potential for more hydropower to be harnessed at the individual level, as well as at the community level, using micro-hydro technology to tap the fast-moving waters in local streams. Micro-hydro power produces up to 100 kW of electricity from naturally flowing streams and can provide a more continuous supply of electricity than many other small-scale renewable technologies.

BIOGAS. Methane, a byproduct of decaying organic waste, can produce electricity from the county's agricultural waste and wastewater treatment plants. Harvesting methane also reduces the amount of this harmful greenhouse gas emitted into the atmosphere. The Ithaca Area Wastewater Treatment Facility captures methane from digesters to meet one-quarter of the plant's electricity needs while also heating some of its buildings.

Emissions and Sequestration

Reducing fossil fuel energy use in the community will reduce greenhouse gas emissions. Additionally, emissions can be reduced by protecting and enhancing resources that naturally remove carbon from the atmosphere. The natural process of carbon sequestration absorbs and stores atmospheric carbon in local land, forests, and wetlands. Protecting and sustainably managing these natural resources is vital to reducing levels of greenhouse gases in the atmosphere, and Tompkins County is fortunate to have abundant natural resources to help reduce community emissions.

> Protecting and sustainably managing these natural resources is vital to reducing levels of greenhouse gases in the atmosphere.

Reduce Waste

The manufacture, distribution, and use of the goods and food consumers rely on in their daily lives—as well as management of the resulting waste—all require energy. This energy mostly comes from fossil fuels, which contribute greenhouse gas emissions to the atmosphere. Making smart choices about purchasing, using, and disposing of materials can make a big difference in the amount of waste produced and the resulting greenhouse gas emissions. The Tompkins County Solid Waste Division is a leader in the field in making it easy for consumers to reduce the amount of waste sent to the landfill. In 2013, a total of 16,821 tons of waste was sent to the Seneca Meadows Landfill in Waterloo, NY, marking an 11 percent reduction from the previous year. Also in 2013, the County received 15,323 tons of recyclable materials, and Cayuga Compost collected 1,807 tons of food scraps, showing that the community is currently recycling more than it is landfilling. The County has a goal of diverting at least 75 percent of waste from landfills by 2016 which is likely to be met given the robust reuse scene in Ithaca with over 40 thrift and consignment shops and the large number of homeowners and businesses that compost food scraps at home and work.

TAKING ACTION

STRATEGIES. Specific actions that support the principle and policies in this chapter are outlined in two key countywide documents: the *Tompkins County 2020 Energy Strategy (2010)* and the *Cleaner Greener Southern Tier Regional Sustainability Plan (2013)*.

The Tompkins County Legislature endorsed the *Tompkins County 2020 Energy Strategy* in 2010. The Legislature has adopted a goal of reducing greenhouse gas emissions in the community by at least 80 percent from 2008 levels by 2050. The first step along that path is to achieve a 20 percent reduction by 2020. The Strategy concluded this first step could be achieved by proactively implementing programs and solutions to reduce energy use. To achieve this target, the Energy Strategy identified measures already being taken by key stakeholders, as well as measures to be taken at the local level:

> The *Cleaner Greener Plan* identified 22 top actions to achieve emissions goals.

- New local measures, such as Property Assessed Clean Energy (PACE) Program, Waste Diversion Program, Transportation Demand Management, Biomass for Rural Heating, and preparing an Energy Road Map, would result in a total savings of 23 percent of the 2020 emissions reduction goal.
- Measures taken by higher education institutions would result in a total of 47 percent of the 2020 emissions reduction goal. Cornell University, Ithaca College, and Tompkins Cortland Community College have all prepared climate action plans and taken steps to reduce their greenhouse gas emissions.
- Measures taken by New York State, primarily implementing the Renewable Energy Portfolio Standard, adopted in 2004 and expanded in 2009, would result in a total savings of 19 percent of the 2020 emissions reduction goal.
- Measures taken by the Federal government would result in a total savings of eight percent of the 2020 emissions reduction goal. The primary measure would be to establish higher lighting and appliance energy efficiency standards for residential and commercial use, as called for in the Energy Independence and Security Act of 2007.
- Measures taken by other community entities, including local municipalities and public schools, would result in a total savings of three percent of the 2020 emissions reduction goal.

The *Cleaner Greener Plan* looked at the issues of energy, greenhouse gas emissions, and sustainability at the regional level and identified 22 top actions to implement to achieve emissions goals. These included promoting energy efficiency and renewable energy in residential and commercial buildings and facilitating deployment of solar PV and solar thermal systems.

PARTNERS. While there are many actions that can be led by departments within Tompkins County government, many also require a collaborative approach. Key leaders and partners include local municipal planning and public works departments, Cornell Cooperative Extension of Tompkins County, Tompkins Community Action, the Tompkins County Climate Protection Initiative, the Park Foundation, and institutions of higher education. Education and engagement of the broader public is undertaken by many organizations including Get Your Green-Back Tompkins, Sustainable Tompkins, the Sustainability Center, Creating Healthy Places, and Bike-Walk Tompkins. Local businesses are also critical to providing the services necessary to make the energy transition including energy

performance contractors, local renewable energy designers and installers, Finger Lakes Reuse, and many other organizations devoted to reducing energy use and greenhouse gas emissions.

COUNTY ROLE. County Government plays many roles in energy and greenhouse gas emissions actions, including improving the energy efficiency of its own facilities and operations, administering programs that help others reduce energy use, and partnering on efforts to show leadership on the topic in the community. The County is currently considering joining the Energize NY Finance Property Assessed Clean Energy program to assist commercial and non-profit organizations to finance energy upgrades and renewable energy projects.

County Actions to be Initiated within Two Years

- By the end of 2015, finalize the Tompkins County Energy Roadmap to determine the most effective and efficient means of meeting the community's long-term energy and greenhouse gas emissions goals and begin implementation.
- Conduct a greenhouse gas emissions inventory for both the community and County government using 2014 data.
- Work with municipalities to develop tools to encourage widespread deployment of renewable energy systems.

[1] Greenhouse Gas is the term used for gases that trap heat in the atmosphere. The principal greenhouse gases that enter the atmosphere as a result of human activity are carbon dioxide, methane, and nitrous oxide.

[2] Renewable Energy Credits are tradable, non-tangible energy commodities that represent proof that 1 MWh of electricity was generated from an eligible renewable energy resource. These certificates can be sold, traded, or bartered, and the owner of the REC can claim to have purchased renewable energy.

[3] MMBtu stands for one million British thermal units, a measure of energy.

[4] Carbon dioxide equivalent units (CO2e) is a measure of the combined ability of all emitted greenhouse gases to trap heat over a given lifetime in the atmosphere, relative to the effects of the same mass of carbon dioxide released over the same time period.

High Volume Hydraulic Fracturing and Horizontal Drilling for Natural Gas

In December 2014, the Commissioners of the New York State Departments of Health and of Environmental Conservation recommended that New York State ban High Volume Hydraulic Fracturing (HVHF) and horizontal drilling for natural gas in shale formations, most notably the Marcellus Shale, and the Governor deferred to their recommendation. This summary of the proposal for HVHF was written prior to that announcement. It should be noted, however, that New York State does not prohibit the acceptance of HVHF wastewater for treatment, allows the use of brine that is a byproduct of the HVHF process on roads and construction sites, and imports HVHF gas that may still contain radioactive materials from other states.

The Marcellus Shale resource is fundamentally different from prior natural gas development in the state in that it is of relatively uniform distribution within a broad geographic area which would have been likely to lead to more intensive well development with the attendant network of access roads, pipelines, and other facilities. HVHF also requires a tremendous amount of water with chemical additives, resulting in additional anticipated infrastructure impacts and energy use to both deliver water to the site and address wastewater treatment issues. Tompkins County has asserted that these characteristics were likely to result in cumulative impacts of a scale and intensity unlike any prior natural gas development in the state.

In a case involving the Tompkins County Town of Dryden, New York State's highest court, the Court of Appeals, upheld the right of local municipalities to ban HVHF under their home rule zoning authority. Several other municipalities have passed similar bans.

In the County's most recent comments to the DEC in January of 2013, the broad-reaching cumulative impacts to New York State of HVHF and the lack of measures to adequately assess or address cumulative impacts in both the proposed regulations and the revised draft Supplemental Generic Environmental Impact Statement (rdSGEIS) were noted. The Tompkins County Planning Department has quantified some of the potential impacts within Tompkins County:

- If built out to the horizontal drilling spacing standards outlined in the rdSGEIS, Tompkins County could have anticipated one eight-well, five-acre industrial site per square mile (640 acres), or a total of 512 well sites, assuming no development within city or village boundaries.
- Over 2,500 acres of land could have been directly developed as well pads and nearly 60 miles of access roads to the well pads could be built. Under these conditions, over 1,000 acres of forestland would be developed and the forested landscape would be further fragmented.
- According to the rdSGEIS, each well could utilize five million gallons of water for HVHF activities. Under the build-out conditions this would have resulted in total water usage of over 20 billion gallons. The three major water supply plants in Tompkins County together use 2.6 billion gallons of water per year.
- According to the rdSGEIS, the development of a single well would generate 1,200 truck trips. The development of nearly 4,100 wells would have generated the equivalent of a 27 percent increase in heavy truck traffic on State roads in Tompkins County, if it occurred over 30 years, and an 82 percent increase in heavy truck traffic on State roads if it occurred over ten years.
- Using the figures presented in the rdSGEIS, the Tompkins County Planning Department estimated the lifetime greenhouse gas (GHG) emissions from one eight-well pad would have been roughly equivalent to one year of GHG emissions from the entire Tompkins County community.

There would also have been more localized impacts on water quality, noise and light pollution, agriculture, community character, and a host of other issues. Should HVHF ever be reconsidered and approved in the future, it is likely an amendment to the Comprehensive Plan would be required to address these issues.

In parts of the Finger Lakes region support for the continued growth in tourism has led many tourism related businesses to question the establishment of industries that are deemed to be incompatible with the qualities that draw visitors to the area. In addition to HVHF, plans for natural gas and underground liquid petroleum gas storage in abandoned salt mines have come under increased scrutiny.