

Tompkins County 2020 Energy Strategy

*Interim Actions Toward Achieving the Community 2050 Greenhouse Gas
Emissions Reduction Goal*

Prepared by the
Tompkins County Planning Department
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Tompkins County 2020 Energy Strategy

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Technical Language Used in this Report

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.

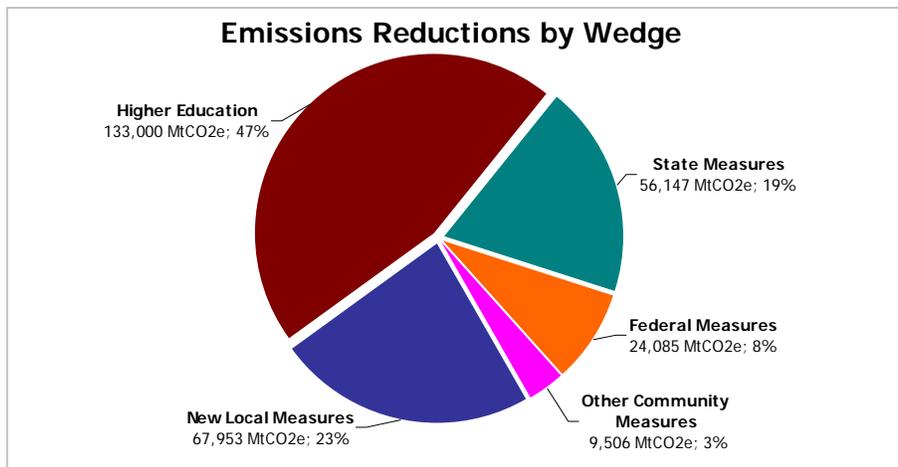
MtCO₂e, or Metric tons of carbon dioxide equivalent – is a measure of the combined ability of all emitted greenhouse gases to trap heat over a given lifetime in the atmosphere, relative to the effects of the same mass of carbon dioxide released over the same time period.

ICLEI – International Council for Local Environmental Initiatives, is a membership association of local governments committed to climate protection and sustainability.

Conclusion

By proactively implementing programs and solutions to reduce energy use, it is possible for the Tompkins County community to reduce its greenhouse gas emissions 20% from 2008 levels by 2020. In order to do so, actions must be undertaken by all sectors of the community to reduce greenhouse gas emissions by 277,512 metric tons of carbon dioxide equivalent (MtCO_{2e}*) in order to achieve the target emissions in 2020 of 938,334 MtCO_{2e}; emissions that are 20% below 2008 levels. The strategies described in this document total 290,691 MtCO_{2e}, or 5% over the required emissions reduction.

With Cornell University contributing 119,625 MtCO_{2e} to that goal for the ten year period studied, however, it is clear that although the 2020 emissions reduction goal is achievable, the community needs to begin laying the groundwork to implement significant energy saving programs and policies, so that it can meet its goals in the future without relying so heavily on the contributions of higher education.



Introduction

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 predicted to result in extreme weather patterns and disrupted ecosystems. All of these forces work together to increase energy, food, and commodity prices worldwide.

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 all levels of government, adapt to changing economic conditions, and reduce our dependence on fossil fuel energy.

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 make great strides toward reducing greenhouse gas emissions.

* Carbon dioxide equivalent units (CO_{2e}) 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.

Evolving Commitment to Greenhouse Gas Reduction

Municipal and Institutional Emissions Reduction Commitments

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 photovoltaic system on the roof of the County library. Following that decision, Tompkins County joined ICLEI's Cities for Climate Protection campaign in 2001, recognizing local governments' role in advancing climate protection and sustainable development. As part of its participation in the ICLEI program, the County set an emissions reduction goal for itself and has tracked its progress, as well as community emissions, from 1998-2008.

Since its initial energy work, the County has adopted many new goals, policies, and programs to reduce energy use in government operations, several of which are highlighted in this document. In 2008, Tompkins County (and the City of Ithaca) joined Clean Communities of Central New York, a public/private coalition formed to support the U.S. Department of Energy's Clean Cities Program. In 2009, Tompkins County (along with the City and Town of Ithaca) became one of the first municipalities to join the NYS Department of Environmental Conservation's Climate Smart Communities program, which emphasizes local actions that will save taxpayer dollars and support other community goals while protecting the climate.

Several municipalities within Tompkins County have set formal emissions reductions goals or incorporated energy considerations into adopted plans. These include the City of Ithaca, which joined ICLEI in 2007, and subsequently set a goal of reducing greenhouse gas emissions from government operations to 20% below 2001 levels by 2016, and the Towns of Ulysses and Caroline, which included energy and greenhouse gas emissions as elements of their Comprehensive Plans. The Town of Ithaca is currently updating its Comprehensive Plan and is researching the issues of energy and greenhouse gas emissions to include as a component.

Other commitments of note include: 1) In 2005, the City of Ithaca joined the Sierra Club's Cool Cities campaign by signing the U.S. Mayors' Climate Protection Agreement and agreeing to implement smart energy solutions to save money and build a cleaner, safer future. 2) Since the program's initiation in 2006, Ithaca College, Cornell University, and Tompkins Cortland Community College have all signed the American College and University Presidents Climate Commitment to eliminate campus greenhouse gas emissions in a reasonable period of time as determined by each institution.

Greenhouse Gas Emissions Inventories

Since 1998, the Tompkins County Planning Department has prepared three greenhouse gas emissions inventories for both County government operations as well as for the broader Tompkins County community. ICLEI's Clean Air and Climate Protection (CACCP) software is used to estimate emissions. The greenhouse gases associated with fossil fuel combustion that are considered in the emissions inventory process are carbon dioxide (CO₂), nitrous oxide (N₂O), and methane (CH₄). When quantifying emissions, these gases are converted to an equivalent amount of CO₂, referred to as carbon dioxide equivalent, or CO₂e.

1998 Emissions Inventory – The first greenhouse gas emissions inventory for both Tompkins County government operations and the community was completed in 2001, using 1998 data. The initial government emissions inventory included energy consumption data for County buildings, vehicle fleet, waste, and outdoor lighting. The community inventory included energy consumption data for the residential, commercial, industrial, transportation, waste, and agricultural sectors. The Tompkins County government emitted 6,290 MtCO₂e in 1998. At the same time, the community emitted 1,109,892 MtCO₂e, primarily from buildings (54%) and transportation (34%).

As a result of the findings from the first government inventory, in 2002 the County Legislature established a 10-year emissions reduction goal for County government operations to reduce emissions to 20% below 1998 levels by 2008. Then in June 2003, Tompkins County developed a Local Climate Action Plan to meet this reduction target. The plan identified measures underway and proposed actions that, together with the existing programs, would reach the greenhouse gas emissions reduction target. A number of the policies and measures proposed in the Local Climate Action Plan have been accomplished and are achieving both energy and greenhouse gas emissions savings for County government. These are highlighted in the "Emissions Reduction Actions Underway" section of this document (page 5).

2006 Emissions Inventory – In 2007, Tompkins County performed a second emissions inventory, tracking the emissions for 2006. The methodology for the analysis and data collection for the 2006 inventory was the same as that used for the 1998 inventory, though some additional data were gathered for both the 2006 and 1998 inventories to improve accuracy. Two significant changes were made in the 2006 inventory. The first change modified the community transportation sector methodology (vehicle miles traveled) by using an updated transportation model (TransCAD). The second change, embedded in the CACP emissions accounting software, updated the Federal Environmental Protection Agency emissions coefficients for greenhouse gases reported. These updates required the findings from 1998 to be modified to reflect new data and to allow for comparison between inventories.

For the County government operations, emissions decreased 4% to 6,049 MtCO₂e in 2006 as building improvements to the County's facility portfolio were implemented. Meanwhile, community emissions rose 4% to 1,156,415 MtCO₂e.

2008 Greenhouse Gas Emissions Inventory – In 2009, Tompkins County performed a third inventory by tracking the emissions for 2008. Overall, from 2006 to 2008 County government emissions increased 5% to 6,336 MtCO₂e in 2008, and community emissions increased 1% to 1,172,918 MtCO₂e. Included in the 2008 inventory, however, were the 139,846 MtCO₂e of emissions associated with local power generation at the Cornell Combined Heat and Power Plant and the Groton Electric Company, which were not included in the 1998 and 2006 inventories. Excluding this addition so as to compare sectors for which we had data in 2006 and 2008, Tompkins County community emissions declined 10.7% between 2006 and 2008.

The details of this inventory are highlighted later in this document (page 6), and serve as the baseline for this 2020 Energy Strategy. For complete details on the three inventories conducted between 1998 and 2008, please see the reports: Tompkins County Community Greenhouse Gas Emissions Report, 1998-2008; and Tompkins County Government Greenhouse Gas Emissions, 1998-2008: A Report on the Local Action Plan, available online in July 2010 at <http://www.tompkins-co.org/planning>.

County Comprehensive Plan and Energy and Greenhouse Gas Emissions Element

The Tompkins County Comprehensive Plan was adopted by the County Legislature in December 2004. It includes elements addressing Regional Cooperation, Housing, Transportation, Jobs, Water Resources, Natural Features, Strong Communities, Centers of Development, and Efficient Use of Public Funds. Much of the Plan focuses on policies to promote nodal development patterns; develop alternative transportation options; invest in local jobs and business opportunities; and protect rural resources and natural features. These policies all contribute positively toward energy sustainability.

In 2008, the County Legislature adopted a new element of the Comprehensive Plan exploring the broad range of issues related to energy and greenhouse gas emissions, and identifying specific policies and actions to address them. Included in this element is the first community-wide greenhouse gas emissions goal to reduce emissions by a minimum of 80% from 2008 levels by 2050. This 2020 Energy Strategy looks to achieve the interim milestone of a 20% reduction in emissions by 2020.

The guiding principle of the element is that the Tompkins County community should reduce energy demand, improve energy efficiency, transition to renewable sources of energy, and reduce greenhouse gas emissions. Eight policies form the backbone of the County's strategy to address energy and greenhouse gas emissions, and seventeen action items are identified as key steps to achieve the principle. One of these actions is to develop an interim strategy (this document) to determine how the community can achieve the stated greenhouse gas emissions reduction goal. The other actions, which will be pursued in conjunction with the new measures identified in this strategy, are to:

- 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 and peak oil.

- 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.

Emissions Reduction Actions Underway

Over the course of the past decade, substantial progress has been made among local governmental entities, businesses, organizations, and individuals in developing innovative programs to reduce greenhouse gas emissions. Examples include:

- Town of Dryden installed a geothermal heating system in its new Town Hall;
- GreenStar Cooperative Market installed 18 solar panels on the store's roof;
- Tompkins County and the City of Ithaca both entered into long-term energy performance contracts with Johnson Controls, Inc. to implement comprehensive energy efficiency measures in government buildings;
- Ithaca Tompkins Regional Airport initiated a process to create a Sustainable Master Plan, making it the first airport in the country to undertake such an effort using FAA funds;
- Cayuga Medical Center became the first medical center in New York State to achieve LEED Silver certification for a new addition to the hospital;
- EcoVillage at Ithaca developed the largest concentration of energy efficient homes in Tompkins County, a total of 60 passive solar homes, furthering its goal of co-housing that supports community-based sustainable living;
- Tompkins Energy Conservation Corps conducted home energy audits on community leaders' houses and developed educational materials to help residents take advantage of financing opportunities for energy efficiency;

- Town of Caroline completed a new energy-efficient Town office building that is powered by a geothermal heating-cooling system and solar photovoltaic electric system;
- Weill Hall opened as Cornell's first LEED Gold certified facility, a cutting-edge research building that is 35% more energy efficient than a standard energy code compliant building;
- Ithaca College opened two new buildings: the Dorothy D. and Roy H. Park Center for Business and Sustainable Enterprise, which achieved LEED Platinum certification, and the Peggy R. Williams Center, which is expected to achieve LEED Platinum certification.;
- Tompkins County Legislature made permanent a provision for solar installations to be exempt from local sales tax;
- Tompkins County Industrial Development Agency voted for sales tax abatement on energy efficiency projects for small business and landlords;
- Alternatives Federal Credit Union began offering special discounts on loans for green home renovations, solar panel installations, and hybrid vehicle purchases;
- Ithaca Carshare launched operations, offering members self-service 24-hour access to vehicles for hourly rental.

Development of the Tompkins County 2020 Energy Strategy

The recently adopted Energy and Greenhouse Gas Emissions element of the Comprehensive Plan, based on extensive public outreach and participation, serves as the basis for this interim strategic plan that moves the Tompkins County community toward achieving the 2050 emissions reduction goal. In preparing this plan, the County Planning Department relied upon the input of multiple advisory boards: the Tompkins County Planning Advisory Board, Tompkins County Climate Protection Initiative, and Tompkins County Environmental Management Council.

Baseline Year 2008 Greenhouse Gas Emissions Inventory and Projections

2008 Greenhouse Gas Emissions Inventory

In Summer 2009, the Tompkins County Planning Department completed greenhouse gas emissions inventories of the Tompkins County community, as well as County government operations, using 2008 data.

2008 Emissions Inventory

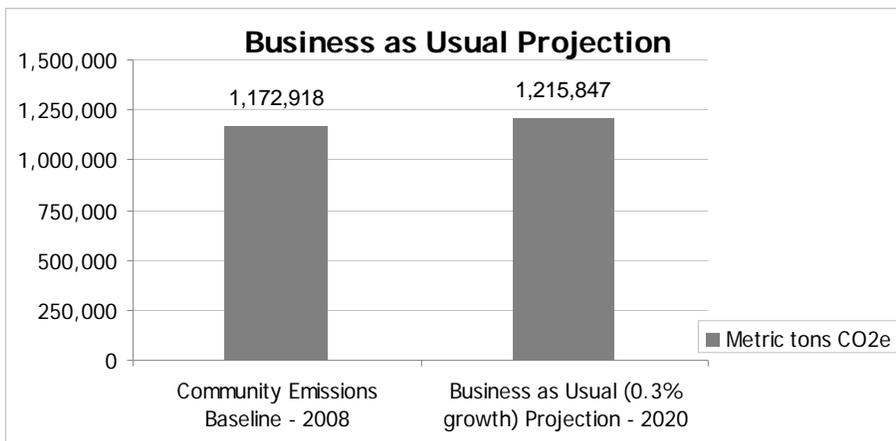
	County Government		Community	
	Overall Total = 6,336 MtCO ₂ e		Overall Total = 1,172,918 MtCO ₂ e	
<i>Sector</i>	Total Emissions	Percent of Total	Total Emissions	Percent of Total
Buildings*	4,393	69.3	539,815	46.0
Transportation/Fleet	1,913	30.2	407,469	34.7
Signals/Lights	31	0.5	n/a	n/a
Waste	n/a	n/a	41,792	3.6
Agriculture	n/a	n/a	43,996	3.8
Local Power Generation**	n/a	n/a	139,846	11.9
<i>Major Source</i>				
Electricity	2,578	40.7	256,202	21.8
Natural Gas	1,839	29.0	226,428	19.3
Fuel Oil	6	0.1	22,838	1.9
Propane	n/a	n/a	34,347	2.9
Gasoline	1,048	16.5	337,866	28.8
Diesel	864	13.6	69,603	5.9
Methane (Ag +Waste)	n/a	n/a	85,788	7.3
Local Power Generation**	n/a	n/a	139,846	11.9

*For the community inventory, buildings include the residential, commercial, and industrial sectors.

** Cornell Combined Heat and Power Plant, and Groton Municipal Light and Power Plant

Emissions Projections: Business as Usual

The "Business as Usual" projection indicates the likely emissions profile if the community does not invest in significant energy efficiency upgrades to infrastructure and energy conservation over the next decade. The projection used for this 2020 Energy Strategy was based upon one produced by the Department of Energy's Energy Information Administration for its Energy Outlook 2009 Report. The Outlook 2009 Report forecast an average annual growth in energy-related (fossil fuels) carbon dioxide emissions for the entire U.S. to be 0.3% per year from 2006 through 2030. After reviewing several other methodologies and sources for projections, the 0.3% appeared to offer a conservative estimate for a business as usual projection. Applying this projection to 2008 County community emissions figures, if the Tompkins County community continues on its current path, its greenhouse gas emissions are estimated to grow from 1,172,918 MtCO₂e in 2008 to 1,215,847 MtCO₂e by 2020, representing a 3.7% increase over 2008 levels. For more information on the alternate projections evaluated, please see the technical appendix.

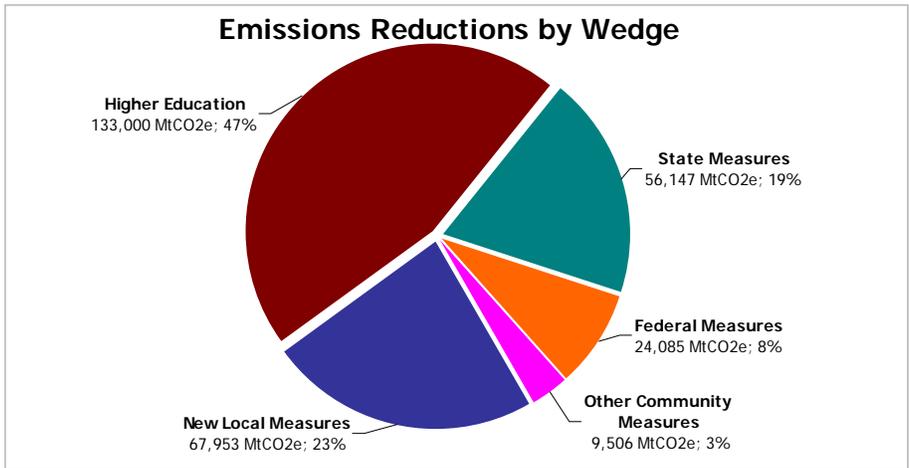


Achieving the Goals

The 2020 Energy Strategy was developed using the wedge concept utilized by Cornell University in its Climate Action Plan, and originally advanced by Princeton researchers Robert Socolow and Stephen Pacala in the article "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies" in the journal *Science*, in 2004. The original concept called for identifying off-the-shelf technologies that could be implemented widely to reduce emissions over 50 years.

The wedges and associated measures listed below will guide the Tompkins County community as it works to achieve its 2020 emissions reduction goal. Although not identified below as a new local measure, local efforts to promote settlement and job creation in development focus areas will greatly impact energy use and greenhouse gas emissions in the community. Energy planning efforts, such as this, must occur in tandem with planning to create dense, livable communities, a robust transportation system, and healthy ecosystems and rural areas. This strategy was developed in close coordination with many such efforts in the Tompkins County community.

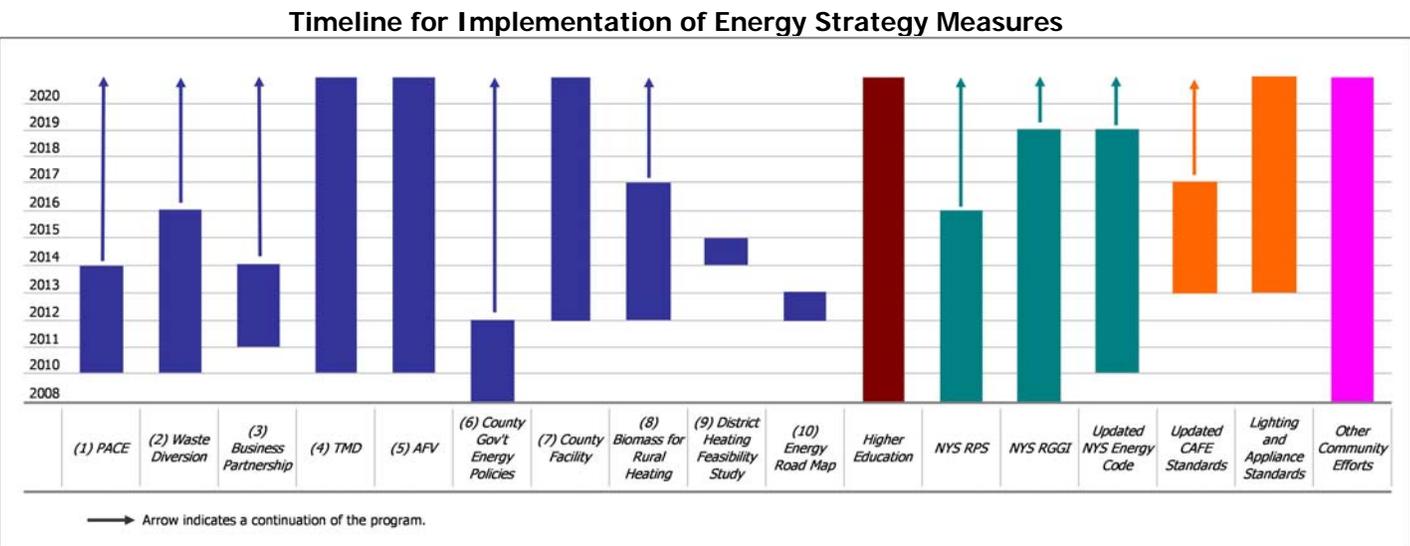
As the chart below indicates, if fully implemented, the ten new local measures identified have the potential to reduce emissions by 67,953 MtCO₂e by 2020, accounting for approximately 23% of the reductions needed to meet the 2020 goal. The bulk of the emissions reductions (46%) come from the higher education sector, primarily through the 2010 replacement of Cornell's coal-fired power plant with a state-of-the-art combined heat and power plant that shifts from coal as a source of energy to natural gas. Initiatives from the federal and state governments, as well as the broader community, also contribute to the anticipated reductions.



In calculating the greenhouse gas emissions reduction potential, several tools and methods were used to quantify emissions reductions. These are best estimates by the Tompkins County Planning Department using existing tools and resources available. The tools and resources used are as follows:

- 1) The Climate and Air Pollution Planning Assistant (CAPPA) tool from ICLEI and the EPA provides information and emissions quantification for over 100 distinct emissions reduction strategies. It was launched in early 2010 to assist local government leaders in developing customized plans for reducing climate and local air pollution based on the collective advice of local governments throughout the ICLEI network.
- 2) ICLEI's Clean Air and Climate Protection (CACCP) tool was used to calculate greenhouse gas emissions associated with reduction in energy usage, assuming the amount of energy and type of fuel used (with appropriate units) was known and could be input into the software.
- 3) The City of Chicago's Climate Action Plan includes detailed analyses prepared by a private consultant to quantify emissions reductions that are expected as the City undertakes specific actions. When the CAPPA tool did not include strategies that matched a proposed measure, Tompkins County staff consulted Chicago's Climate Action Plan to see if it included a comparable measure that could be scaled to Tompkins County's program size.

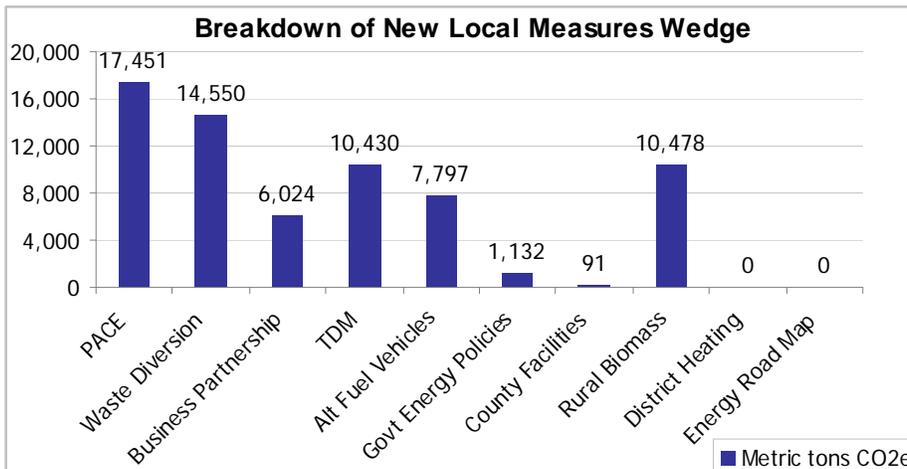
Where possible, all three tools and methods were used to calculate results to determine whether the quantified measure was comparable using alternate means of calculation. Calculations and explanation of methodologies are presented in the Technical Appendix to this document.



New Local Measures WEDGE

Total Savings in 2020: 67,953 MtCO_{2e}

Many of the new local measures presented will require significant decisions about budget priorities and trade-offs between community costs and benefits. The cost-effectiveness of each measure will have to be evaluated at the time of implementation due to the unpredictability of crucial factors beyond the control of local entities, such as energy pricing. However, the list of strategies proposed here is achievable and will move the Tompkins County community toward its carbon reduction goals. The focus of this plan is to make early progress in the community to reduce emissions over the next 10 years. The programs described below are designed to have Countywide impacts and will, for the most part, be led by established County agencies. While these programs do not attempt to quantify much of the work being done by other entities in the community, it is hoped that the measures described will provide good models for others to follow.



New Local Measure #1

Property Assessed Clean Energy Program

Estimated Savings in 2020:
17,451 MtCO_{2e}

Overview – Most energy consumed in the Tompkins County community is used for heating and lighting buildings. Therefore, to make significant strides in reducing energy use, incentives and programs to retrofit the existing building stock must be established. The purpose of the Property Assessed Clean Energy (PACE) Program is to assist property owners interested in making energy efficiency improvements or installing renewable energy systems in their buildings by providing low-interest financing to augment federal and state incentive programs. This new funding mechanism would fundamentally change how energy improvements are financed in the County. It is envisioned that a PACE program could, through a combination of grants, bonds, and other funding sources, ultimately reduce energy consumption in 23,000 buildings/units over 25 years – including fully half of the County's housing stock. PACE loan repayments are made over a fixed number of years through an assessment on the property tax bill, with the amount of the assessment not to exceed the savings in energy costs attributable to improvements.

Beyond helping the community reach its greenhouse gas emissions reduction targets, the PACE program has three benefits: 1) reduce the energy used for heating and lighting in buildings Countywide, 2) motivate property owners to make energy improvements to their buildings, and 3) create and retain jobs in the energy audit and energy-contracting sector. The program would also focus on assisting target populations, such as landlords or rural residents currently using higher-emitting fuel sources. Also, the program will seek to enhance energy audits to ultimately achieve reductions in energy use in the range of 50-60%.

In order to launch such a program and sustain it over the long-term, financing will be needed to establish an Energy Office, develop a marketing strategy, create an interactive consumer energy financing website, develop program guidelines and materials, issue loans under the program, and formalize a bonding program to continue the program for an anticipated 25 years.

Scale and Timeline – The PACE program is envisioned to launch in 2010 with 230 energy efficiency loans and 23 renewable systems installed by the end of 2011. By 2013, the program would be running at full capacity with 1,000 energy efficiency loans and 40 renewable systems being installed per year. It is anticipated that by 2020, 8,030 housing units would be made more energy efficient, and 323 renewable systems would be installed.

Financial Feasibility – This program will require financing of approximately \$1 million to \$2 million to launch the program until it reaches the point where active loan repayments cover the administrative costs associated with the program. These funds may be available through federal grants to pilot/expand these types of programs, or other sources.

Technical Needs – Administration of a PACE program will require hiring 1.5 full-time staff, as well as contracting with technical consultants to design an interactive website and develop a marketing strategy. Municipal bond attorneys will be required to structure the program, as well as participation by County Planning, Finance, Assessment, and Attorney's offices.

New Local Measure #2 Waste Diversion Program

Estimated Savings in 2020:
14,550 MtCO_{2e}

Overview – Over the past two decades, the Tompkins County Solid Waste Division has been implementing a multi-faceted approach to waste management to divert waste from landfills that includes public-private partnerships, financial incentives, and community engagement. Currently, the County diverts an impressive 60% of its waste stream. Having adopted a goal of 75% waste diversion by 2015, however, the County will be implementing a comprehensive waste diversion plan that includes the following initiatives: 1) expanding the types of materials that can be recycled and launching single-stream recycling, 2) expanding food waste composting for the business and residential sectors, 3) expanding the ReBusiness Partnership Program's work assisting local businesses, public schools, and institutions to reduce waste, adopt green purchasing practices, and increase recycling, 4) expanding the reuse program in partnership with Finger Lakes Reuse, and 5) coordinating the green purchasing programs for County government, municipalities, and other non-profit agencies.

Increasing diversion rates of waste to landfills would directly reduce emissions of methane, and indirectly reduce those emissions produced from the transport fuels used in garbage trucks that move waste. While not captured in these calculations, increased recycling and reuse of materials would lower the emissions associated with the entire life cycle of a product, including resource extraction and material manufacturing.

Scale and Timeline – The strategies to achieve a 75% waste diversion policy would be incrementally introduced starting in 2010, with full implementation by 2015. A new ten year Solid Waste Management Plan will be submitted to the NYS Department of Environmental Conservation, the regulatory agency responsible for approval of such plans, by March 2011.

Financial Feasibility – Funds will be needed to carry out the programs required to reach the 75% diversion goal. It is anticipated that it will cost approximately \$500,000 to launch and implement the programs necessary to achieve this goal.

Technical Needs – Several of the programs envisioned, particularly single stream recycling, will be implemented through a new contract for operating the recycling and solid waste center that is expected to be in place in 2010. Some other programs may require consultants or contractors on a case by case basis.

New Local Measure #3 Energy Business Partnership Program

Estimated Savings in 2020:
6,024 MtCO_{2e}

Overview – Taking a cue from the highly successful ReBusiness Partnership Program operated by the Tompkins County Solid Waste Management Division, this measure calls for the creation of a similar program focused on assisting local businesses, public schools, and institutions to reduce energy consumption and associated greenhouse gas emissions. The program would enable a trained team of energy assessors to work with one or two individual businesses, public schools or institutions each week to evaluate energy usage, energy efficiency, and fleet management. The program would include a comprehensive energy assessment including an on-site walk-through to gain an understanding of the current practices at the business, identification of opportunities for improvement, analysis of energy usage and waste practices, benchmark information comparing business operations with similar businesses, and recommendations for reducing energy usage. The assessment could be expected to reveal building energy efficiency improvements, as well as behavioral and operating practices that could be modified, including transportation-related operations. The program will also provide long-term follow-up with participating businesses, in order to identify and quantify reductions in energy usage, and related reductions in greenhouse gas emissions.

Another key aspect of the program would be the close collaboration and sharing of information with the ReBusiness Partnership Program, whereby energy and waste assessments are shared between the programs, as well as participant contact information. It is envisioned that one program may more easily make headway with different businesses for one reason or another, and that there would be opportunities to build on the work of one program by providing an entrée for the other.

The program would build tremendous capacity within the private sector to understand energy and greenhouse gas emissions issues, to develop effective strategies for businesses to reduce energy and greenhouse gasses, and to understand the community emissions reduction goals. As businesses touch the lives of all residents of the County and are highly visible, reaching out to this community and building its base of knowledge about these issues is expected to have a wide impact on County residents. Employees of the businesses are also expected to benefit as they become more aware of their roles in saving energy at their places of work and how those same steps can translate to saving money and energy in their own homes. The expanded private sector capacity may be expected to translate into innovation in energy efficiency or energy reduction practices in the business sector and more investment in local energy efficiency or renewable technologies.

Scale and Timeline – Within 2 years of launching this program, 200 businesses could be brought into the program. Every year, 100 more businesses would be added, for a total of 1,000 businesses, schools, and institutions involved by 2020.

Financial Feasibility – It is estimated that this measure would cost \$357,500 to implement, primarily for staffing. Therefore, funding will need to be obtained to carry out the program.

Technical Needs – Although it is estimated that two staff people will need to be hired to implement this program, technical knowledge of how to conduct such a program already exists within Cornell Cooperative Extension of Tompkins County.

New Local Measure #4 Transportation Demand Management

Estimated Savings in 2020:
10,430 MtCO_{2e}

Overview – Reducing the number of miles driven by private vehicles in the community is a critical component of any strategy to reach greenhouse gas emissions reduction targets. In its recent update to the community's Long

Range Transportation Plan, the Ithaca-Tompkins County Transportation Council outlines policies and programs to achieve significant reductions in vehicle miles traveled. Analysis in the Plan shows that in order to meet the greenhouse gas emissions goals adopted by the County, the following must be achieved by 2030: 1) more efficient land use development patterns to facilitate the use of transit, walking, bicycling, car pools, vanpools, car sharing, and ride sharing; 2) a 40% reduction in drive-alone commute trips; 3) at least a moderate community conversion to alternative vehicles and fuel use by 2030; and 4) a 25-50% reduction in the overall number of drive-only trips for all trip purposes.

This measure calls for developing a robust Transportation Demand Management (TDM) program, which is a general term for a program of strategies aimed at the “users” of transportation services that result in more efficient use of transportation resources. The overall goal of a TDM program is to reduce vehicle miles traveled by encouraging people to switch from single-occupancy vehicles to alternate modes of transportation. Given the widely differing transportation needs of the various segments of the local population, the key to reducing vehicle miles traveled is to offer a variety of transportation options that are both affordable and easily accessible. A TDM program is most effective when it provides a one-stop experience for people looking for the best ways to get where they want to go. An effective TDM program will serve individuals as well as businesses and other organization-based customers.

The TDM proposed includes several key initiatives (in no priority order):

- Identify and promote one north-south and one east-west “bike boulevard” in the City of Ithaca to address safety concerns and promote more widespread bicycle use.
- Establish a 34 mile multi-use trail commuter network within the urbanized area, as defined in the Ithaca-Tompkins County Transportation Council’s planned multi-use trail network.
- Expand and support the existing Way2Go program and its website, to educate consumers and to facilitate various transportation options, such as rideshare, vanpool, carshare, and bikeshare.
- Analyze the transportation network for connectivity and ease of transfer between modes, including reservation and payment methods to access services.
- Promote programs and policies that focus on establishing multi-modal transportation incentives between 2010 and 2015 and corresponding disincentives to single-occupancy vehicle use, such as parking cash-out programs, between 2015 and 2020.
- Increase transit service, as appropriate, by extending existing lines, expanding new options on existing routes like express bus or bus rapid transit, longer hours of service, on-demand service, increased frequency of service, and new stations or stops.
- Develop and implement a targeted promotional campaign to encourage customer participation in the different TDM program initiatives.

Quantifying the Policies

The 2006-2008 American Community Survey 3-Year Estimates Transportation to Work figures for Tompkins County report that 55% of commuters drive alone, 17% walk, 12% carpool, 7% use transit, 6% work from home, 2% bike, and 1% use other means such as motorcycle and taxi. Local transportation experts believe that launching a comprehensive TDM program in the community has the potential to result in a significant modal shift by 2020 to: 39% of commuters drive alone, 20% walk, 16% carpool, 10% transit, 10% work from home, 4% bike, and 1% use other means such as motorcycle and taxi. Applying these percentages to the commuting population would result in the following modal shifts by 2020:

- Increase of 2,250 trips by bus per day
- Increase of 7,200 trips by bike per week
- Increase of 12,000 walking trips per week
- 8,000 additional employees offered carpool or vanpool incentives
- 8,000 additional employees offered telecommuting incentives
- 5,000 members using car share (market study’s probable limit of membership to Ithaca Carshare)

Scale and Timeline – The initiatives identified will be rolled out over the course of the next ten years, with emphasis on getting transportation alternatives in place in the first five years and expanding those options, as well

as looking at implementing disincentives to single-occupancy vehicle use in the urbanized area in the later years of this planning term.

Financial Feasibility – This program will require financing of approximately \$1 - \$2 million to launch and implement the programs. These funds may be available through federal grants to pilot/expand these types of programs, or other sources. Additionally, investment in bike lanes, walking paths, buses, support facilities, as well as program administration, will be required to significantly increase the number of people taking transit, walking, and biking. In particular, Tompkins Consolidated Area Transit has identified a need to expand its maintenance and operations facility in order to accommodate additional transit service in the community. Participation in carpool, vanpool, rideshare, and car share programs is largely a decision made by consumers, often based on personal budgets and lifestyle choices.

Technical Needs – Implementation of these transportation programs will not require technical knowledge beyond that already available in local governments and transportation agencies. Administration of a TDM program will require hiring 1.5 full-time staff, as well as contracting with technical consultants to design an interactive website and develop a marketing strategy.

New Local Measure #5 Alternative Fuel Vehicles

Estimated Savings in 2020:
7,797MtCO₂e

Overview – The conversion of vehicles to technologies and fuels with enhanced fuel economy will have significant impact on reducing greenhouse gas emissions. In addition to modal shifts, reduction in vehicle miles traveled, and land use changes, the Ithaca-Tompkins County Transportation Council's Long Range Transportation Plan identifies the need to convert at least a moderate percent of vehicles to alternative fuel vehicles (AFVs) by 2030 in order to meet the greenhouse gas emissions goals adopted by the County.

While the manufacture of AFVs and purchasing preferences of individual consumers are largely out of the County's sphere of influence, there are actions that can be taken locally to help support the transition in vehicle fuel mix. These include: mapping the locations of public electric car plug-in facilities and fueling stations for compressed natural gas, propane, and biofuel; educating consumers on the vehicles and technologies available; and working with municipal officials, utilities staff, and vehicle representatives to anticipate and address issues associated with early adoption of alternative fuel vehicle technologies.

Between the rising cost of fossil fuels, the availability of new types of vehicles and vehicle fueling stations, anticipated policies and incentives from the Federal and State government, and the efforts described in this measure, it is expected that by 2020 approximately 75% of all the newly purchased vehicles in the County will be AFVs. It is further estimated that roughly 40% of those vehicles will be hybrids, 30% will be electric, 20% will be B20 biodiesel, and 10% will be compressed natural gas.

Scale and Timeline – This measure will be implemented in coordination with the introduction to the local market of AFVs, although some work on mapping biodiesel and compressed natural gas facilities could be implemented immediately.

Financial Feasibility – Although this measure may require hiring a part-time staff person and therefore require necessary funding, it is likely that it can be largely implemented by devoting existing local staff and resources to the effort.

Technical Needs – While development of vehicles that can run on alternative fuels and achieve higher gas economy will require technical knowledge, implementation of the local program described will not require technical knowledge beyond that already available in local governments, transportation agencies, and Cornell Cooperative Extension of Tompkins County.

New Local Measure #6 County Government Energy Policies

Estimated Savings in 2020:
1,132 MtCO₂e

Overview – This measure focuses on standardizing and implementing accounting and tracking methods for three broad energy-reduction policies adopted by the County Legislature between 2007 and 2009: the Green Fleet policy, Waste Reduction and Resource Management policy, and Facilities Management and Workplace Environment policy. Additionally, as stated in the Energy and Greenhouse Gas Emissions element of the County Comprehensive Plan, County staff will work closely with the County Legislature to adopt a new 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.

Green Fleet Policy – In 2009, the Tompkins County Legislature passed a green fleet policy that requires each County department to reduce its fleet emissions by 2% annually, to achieve an 80% reduction in emissions by 2050. To do so, each department with more than 5 vehicles must submit a plan to County administration to green their fleet. County administration has developed a comprehensive countywide vehicle database to facilitate this effort. In May 2010, the County will add three Prius hybrids to the fleet through Legislative funding and U.S. Department of Energy Clean Cities funding to begin improving vehicle efficiency in the fleet.

Another initiative under this policy that has had a successful start is the recent transition of County Highway Division vehicles to B20 biodiesel. The County Highway Department has been researching biodiesel options for the past several years (B5 and B20), in collaboration with the local Alternative Fuels Consortium (comprised of all 17 municipalities, Cornell, Ithaca College, TCAT, the county's school districts and fire departments). In 2009, the County Highway department transitioned 62% of its diesel vehicles (which constitute more than three-quarters of the County Highway fleet) to B20 biodiesel. In 2010, the department intends to switch all diesel-fueled vehicles to B20, provided that Federal biodiesel tax incentives are reinstated to make this fuel cost-effective.

Waste Reduction and Resource Management Policy – This policy was adopted in December 2007 and includes provisions for County departments to seek to maximize environmentally preferable purchasing by procuring products and services that have a reduced negative effect on human health and the environment when compared to competing products and services that fulfill the same purpose. It also establishes a waste reduction program to assess and manage the waste of all County departments, including waste assessments to identify practices and procedures to be implemented for waste reduction, reuse, recycling, composting, and environmentally preferable purchasing based on the unique circumstances of each department. Adoption of the policy has resulted in the County joining with TST-BOCES, the City of Ithaca, Cornell University, Ithaca College, TC3, the Chamber of Commerce, Cayuga Medical Center, and the Tompkins County Council of Governments to form the Finger Lakes Environmentally Preferred Procurement Consortium. The consortium seeks ways to use its collective purchasing power to purchase environmentally preferred products at the best possible price.

Facilities Management and Workplace Environment Policy – Topics addressed in the policy include energy reduction, thermostat settings, and use of appliances in county buildings. The policy states the intent of reducing energy use in County facilities to lower costs and assist in meeting countywide goals for reducing greenhouse gas emissions. It mandates that thermostats will be set to maintain temperatures in the range of 72-76 degrees Fahrenheit in summer/air conditioning season and 68-72 degrees Fahrenheit in winter/heating season; and prohibits use of personal appliances in personal workspaces.

Quantifying the Policies

While the governmental policies will result in a wide range of energy savings, some specific metrics are identified here for quantification of possible results and to give an idea of the degree of change that would, at a minimum, need to be accomplished to reach the stated emissions levels associated with implementing the governmental policies over the next ten years.

Vehicle Fleet – Transition 100% of the County Highway Division heavy equipment and vehicles from diesel to B50 biodiesel by 2020. Additionally, replace 80% (128 vehicles) of the County’s non-diesel vehicle fleet with hybrid or alternatively fueled vehicles by 2020.

Equipment – When computers and monitors need to be replaced, purchase Energy Star rated models. Based on County purchasing information from 2008, 58 new computers and 51 monitors were purchased for County employees. Assuming that rate continues, a total of 580 new computers and 510 monitors would be replaced by 2020. Additionally, if 10% of the printers and copiers owned by the County are replaced each year, then 40 printers and copiers would be replaced with energy efficient models by 2020.

Buildings – Through the County’s performance contract with Johnson Controls, many energy improvements have been made and continue to be addressed. Several of the key facility-specific energy efficiency upgrades are described in detail in new local measure #7, “County Facility Energy Improvements.”

Scale and Timeline – These policies apply to the 220 vehicles in the County fleet, the 21 County-owned buildings (approximately 410,000 sf, not including airport and solid waste facilities), and the 758 employees of County government. Implementation of one of the policies began in 2008 and the others began in 2009. It is anticipated that a LEED policy will be brought to the County Legislature in 2010.

Financial Feasibility – Implementation of these policies may involve increased initial costs, though the payback period for the investment may be relatively short. Over the long term, a half-time staff person may be needed to optimally manage the County’s vehicle fleet.

Technical Needs – It is well within the professional capacity of County staff to analyze the costs and benefits of these programs and implement solutions.

New Local Measure #7 County Facility Energy Improvements

Estimated Savings in 2020:
91 MtCO_{2e}

Overview – Federal and State funding opportunities available in 2009 and 2010 to reduce energy use in municipal facilities helped the County to identify and quantify several key projects to pursue in the immediate future to reduce greenhouse gas emissions. All of the specific projects listed below have been the basis of grant applications submitted during the past two years.

Lighting Retrofit at Recycling and Solid Waste Center – The Recycling and Solid Waste Center is a one-story building with a mezzanine constructed in 1995 that is used to house the sorting and shipping operations of the solid waste transfer and recycling center. The facility has older fluorescent lighting in the office areas and the process area is lit by high-bay high-pressure sodium lighting. A lighting retrofit is proposed which will include an upgrade of the existing fluorescent lighting in the office areas with super T-8s or T-5 fluorescent as appropriate. In the process areas, T-5 fluorescents will replace the high-bay high-pressure sodium lighting. Occupancy sensors will be installed in the office areas, as appropriate.

Temperature Controls at Public Works Building – The Public Works Garage is a one-story building constructed in 1966 that is used to house Highway maintenance vehicles and equipment as well as repair shops. The facility has a garage area that is heated by ceiling-mounted fan coil units. In order to address heating waste, programmable thermostats will be installed to set back the temperature of the garage during unoccupied periods and garage door position sensors will be installed and interfaced with contactors to be installed on the fan coil unit’s electrical panels. This arrangement will shut off power to fan coil units if doors are in the open position to prevent unnecessary loss of heat.

Public Safety Building Solar Thermal Installation – The Public Safety Building is a one-story building constructed in 1986 that is used to house inmates, as well as administrative and support functions of the jail and law enforcement. The facility is occupied 24/7 and has a kitchen and a large number of showers. Therefore, the

domestic hot water load is high and energy costs would be significantly reduced by solar thermal water heating. A 32-panel glazed solar thermal system is proposed for installation on the roof at the Public Safety Building. The system will be interfaced in the existing domestic hot water, as well as the heat pump building loop to provide supplemental heating to the heat pump loop.

Human Services Building Solar Thermal Installation – The Human Services Building is a four-story building constructed in 1997 that is used to house various functions for the Social Services, Probation, and Youth Services departments. A 16-panel glazed solar thermal system is proposed for installation on the roof of the Human Services Building. The system will be interfaced with the building's domestic hot water system to provide supplemental domestic hot water heating.

Human Services Building Solar Electric Installation – In addition to the above project at the Human Services Building, a 34 kW solar photovoltaic project is proposed to produce 38,664 kWh annually to provide electricity for the building.

Scale and Timeline – Projects will be implemented as funding becomes available.

Financial Feasibility – It is estimated that the first four measures together would cost \$395,750 to implement, and project 5 would cost \$252,450. Unless the County Legislature decides to fund these improvements, outside funding will be needed to make the facility upgrades.

Technical Needs – The County, through its partnership with Johnson Controls, has the technical knowledge necessary to design and install these improvements.

New Local Measure #8 Biomass for Rural Heating

Estimated Savings in 2020:
10,478 MtCO_{2e}

Overview – Since the majority of energy consumed in Tompkins County is used for heating and lighting buildings, it is important to address how existing homes are heated and look for better solutions. Although this initiative offers modest projected reductions in greenhouse gas emissions, a pilot program to use biomass for home heating has the potential to significantly impact rural home heating. The program would focus on utilizing local biomass as a viable, carbon-neutral, low-cost heating source in rural households in Tompkins County. The program would demonstrate and evaluate the use of pellet boilers/furnaces and wood gasification systems for centralized heating in 20 rural households. After the pilot is complete, this measure has the potential to achieve ongoing reductions in greenhouse gas emissions, assuming it expands throughout the rural areas of the County and more broadly to the region.

The project's premise is a win-win for the environment and rural landowners: tap into underutilized land resources to generate income while creating a local, reliable, renewable, carbon-neutral energy source. There is potential to replicate this model to the approximately 11,000 households in Tompkins County that, according to the 2008 community emissions inventory, currently heat with highly emitting fossil fuels such as fuel oil, electricity, and propane.

Three products of local biomass would be promoted for use in highly efficient furnaces and boilers: wood pellets, raw wood gasification, and grass pellets. Each of the demonstration projects would include measurement of the reduction in greenhouse gas emissions associated with the three methods of biomass burning. At each demonstration site, annual heating usage and costs dating back three years prior to the installation of the biomass technology would be tracked, along with fuel type, fuel usage (units/degree day), and calculated associated emissions. Biomass heating system performance would then be tracked for a year after installation to benchmark changes in fuel usage, costs, and greenhouse gas emissions, accounting for differences in heating-degree days. Upon completion of the pilot program, monitoring of the demonstration units would continue for an additional two years and the benefits of the program would be promoted within the community.

Scale and Timeline – It is envisioned that the program would be launched in 2011. Initially, the program would focus on outreach to rural homeowners and businesses to identify those willing to sponsor demonstration projects and then selection of demonstration projects that reflect a variety of conditions. By 2012, the goal would be to have purchased and installed biomass-heating systems in 20 rural homes or businesses, and then tracking would begin to monitor energy savings and greenhouse gas emission reductions for the next 5 years. It is anticipated that this program, in conjunction with the likely development of a local biomass pelletizer facility, ongoing efforts to educate and organize the public on biomass growing and burning, and increasing fossil fuel prices, will spur 20% of the households currently using fuel oil, electricity, and propane to adopt biomass for home heating.

Financial Feasibility – Funding would be required to pay staff (averaging 0.8 FTE for each of the 3 years of the program) to administer this project, as well as to provide a cost share for the 20 biomass heating systems to be deployed in the community. The estimated total cost of this measure is \$325,000 over three calendar years, including purchasing and installing 20 biomass heating systems at a cost of \$120,000.

Technical Needs – Technical knowledge of how to administer such a program exists within Cornell Cooperative Extension of Tompkins County.

**New Local Measure #9
District Heating Feasibility Study**

**Estimated Savings in 2020:
0 MtCO₂e**

Overview – Since district heating has a high initial cost, yet great potential to significantly change how buildings are heated in the community, it is important to first study how the technology could be specifically used in the County. Therefore, although this measure would not result in reductions in greenhouse gas emissions by itself, it is an important first step in achieving high energy efficiencies through heating and cooling distribution to buildings in the community.

This project would evaluate the technological and economic feasibility of installing the infrastructure necessary to distribute heating, cooling energy and hot water that is generated in a centralized location to a concentrated residential and/or commercial area.

Two potential study areas for this project are 1) the downtown Ithaca Commons, which is already slated to have its basic infrastructure replaced within the next 3-4 years, and 2) a manufactured housing park that has recently been the focus of work done by Tompkins Community Action for energy efficiency improvements.

Project work for each target area would include quantifying the demand for space heating and cooling, and water heating, designing the system, and pricing the materials and construction costs.

Scale and Timeline – It is estimated that the study could be completed in one year, including issuing a Request for Proposals for services.

Financial Feasibility – Funds would be needed to hire an energy expert to complete this project. The cost to conduct such a study is unknown at this time.

Technical Needs – This cannot be done in-house by County staff. A consultant would need to be hired.

New Local Measure #10 Energy Road Map

Estimated Savings in 2020:
0 MtCO₂e

Overview – While no immediate reductions in greenhouse gas emissions would be achieved by completing this project, a more detailed understanding of the energy demand and supply in the community is key to determining the most effective and efficient means of meeting the community's long-term energy goals.

An Energy Road Map would create an integrated approach to assessing the energy demand and supply for the residential and commercial sectors in the entire County today and in the future under the development framework and the objectives established in the County Comprehensive Plan.

Specific objectives of the study are to:

- 1) Provide an overview of the energy demand situation and the present energy supply structure in the County;
- 2) Investigate and quantify the energy production potential of renewable energy supply resources in Tompkins County;
- 3) Identify the primary stakeholders in the present and future energy demand and supply;
- 4) Develop and analyze scenarios for the future energy demand and supply structures which fulfill the goals for an efficient energy future;
- 5) Develop evaluation criteria by which to select a preferred energy demand and supply structure to guide energy-related decisions in the future and identify a preferred scenario;
- 6) Identify those specific changes that will need to occur in the supply and demand for energy to meet the preferred scenario;
- 7) Specify actions we need to take (or avoid) in the next ten years to make those changes possible; and
- 8) Identify ramifications of those changes that need to be recognized and addressed.

Scale and Timeline – It is estimated that the Countywide study could be completed in one year, including issuing a Request for Proposals for services.

Financial Feasibility – Funds would be needed to hire a consultant to complete this project. It is estimated that it could be completed for \$250,000.

Technical Needs – Portions of this cannot be done in-house by County staff. A consultant would need to be hired.

Higher Education WEDGE
Total Savings in 2020: 133,000 MtCO₂e

The contribution of higher education to reducing greenhouse gas emissions in the community is significant. Cornell University, Ithaca College, and Tompkins Cortland Community College have all signed the American College and University Presidents Climate Commitment to eliminate their campus' greenhouse gas emissions by 2050. As calculated in their respective greenhouse gas emissions inventories, in 2008 Cornell University emitted 319,000 MtCO₂e, or 26% of the community's total 2008 greenhouse gas emissions, in 2007 Ithaca College emitted 32,600 MtCO₂e, or 3% of the community's 2008 emissions and in 2008 Tompkins Cortland Community College emitted 5,752 MtCO₂e.

In 2009, both Cornell and Ithaca College completed Climate Action Plans describing how each institution would eliminate emissions by 2050. Each plan identifies Scope 1 emissions that are generated from sources owned or controlled by the institution; Scope 2 emissions that are indirect emissions generated in the production of electricity consumed by the institution; and Scope 3 emissions that are indirect emissions that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution, such as commuting and air travel for university activities.

By 2020, the two institutions together are planning to reduce greenhouse gas emissions by 131,850 MtCO_{2e} (37.5% reduction from each institution: 119,625 MtCO_{2e} from Cornell and 12,225 from Ithaca College). This high level of reduction is primarily attributable to the 2010 opening of Cornell's new Combined Heat and Power Plant, which has allowed Cornell to switch from highly emitting coal to lower-emitting natural gas to provide energy for the majority of Cornell's electricity and heating needs.

The Climate Action Plans of both Cornell and Ithaca College specify particular ongoing and planned emissions reductions initiatives. These plans can be viewed online:

Cornell: <http://www.sustainablecampus.cornell.edu/climate/>

Ithaca College: <http://acupcc.aashe.org/cap-report.php?id=243>

Although Tompkins Cortland Community College has not yet prepared a detailed Climate Action Plan, it is anticipated that it will do so in 2010, and it is assumed that TC3 will achieve at least a 20% (1,150 MtCO_{2e}) reduction in emissions by 2020.

New York State Government WEDGE ***Total Savings in 2020: 56,147 MtCO_{2e}***

New York State is considered a national leader in implementing standards and programs to reduce its greenhouse gas emissions. Bold steps such as setting renewable portfolio standards in 2004 and joining the Regional Greenhouse Gas Initiative in 2008, will help the state and the Tompkins County community reach its emissions goals. Although New York currently offers many different programs to help consumers reduce energy use, three key programs are quantified for this energy strategy below.

New York State Measure #1 **Renewable Portfolio Standard (RPS)**

Estimated Savings in 2020:
53,497 MtCO_{2e}

The New York Public Service Commission adopted a renewable portfolio standard (RPS) in September 2004 and expanded the goals in December 2009. It is a policy that seeks to increase the proportion of renewable energy generation that provides electricity to the grid that is sent on to retail customers. The New York Public Service Commission reports that in 2003, the New York electricity grid was powered by 19% renewables, 29% nuclear, and 52% coal, natural gas, and oil. New York's RPS target is 30% renewable energy in the portfolio by 2015. Of this 30%, it is estimated that approximately 19% of the target will be derived from renewable energy facilities that have been in existence since 2004 and 1% from voluntary purchase of green power by consumers. The New York State Energy Research and Development Authority (NYSERDA) intends to procure the remainder from new, eligible renewable resources.

The Renewable Portfolio Standard program identifies two tiers of eligible resources: a Main Tier and a Customer-Sited Tier. Resources eligible for the Main Tier include methane digesters and other forms of biomass, liquid biofuels, fuel cells, hydroelectric power, photovoltaics (PV), ocean power, tidal power, and wind power. Resources eligible for the Customer-Sited Tier include fuel cells, photovoltaics, wind turbines, and methane digesters. Customer-Sited Tier systems are generally limited to the size of the load at the customer's meter and support active open-enrollment incentive programs for development of eligible resources.

As of December 31, 2009, thirty-three Large Scale Electricity Generators in the State were participating in the Renewable Portfolio Standard program. These include 13 wind farms, 17 hydroelectric plant upgrades, 2 power plants displacing coal with biomass, and 1 power plant that will use 100% clean renewable biomass.

In order to evaluate the impact of the RPS program on Tompkins County emissions, it was assumed that the emissions associated with the electricity used in the community in 2020 would be reduced by 11% (going from 19% renewables in the existing portfolio to 30% by 2015). Since this 11% reduction will be coming from the carbon emitting sources of the electricity grid, which currently makes up 52% of the grid, the overall reduction will be 21% of the carbon emitting sources. However, given the goals of the Regional Greenhouse Gas Initiative, below, a flat 20% was used to quantify both measures.

New York State Measure #2 Regional Greenhouse Gas Initiative

**Estimated Savings in 2020:
Included in RPS figure**

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by ten Northeast and Mid-Atlantic States to limit greenhouse gas emissions by capping CO₂ emissions from the electric power sector and requiring a 10% reduction in those emissions by 2018. It is the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions.

RGGI is composed of individual CO₂ Budget Trading Programs in each of the ten participating states. These ten programs are implemented through state regulations, based on a RGGI model rule, and are linked through CO₂ allowance reciprocity. Regulated power plants can use a CO₂ allowance issued by any of the ten participating states to demonstrate compliance with the state program governing their facility. Taken together, the ten individual state programs function as a single regional compliance market for carbon emissions. Proceeds from the emissions auctions are subsequently invested by states in consumer programs to increase energy efficiency, renewable energy, and other clean energy technologies.

To reduce emissions of greenhouse gases, the RGGI participating states are using a market-based cap-and-trade approach that includes:

- Establishing a multi-state CO₂ emissions budget cap that will decrease gradually until it is 10% lower than initial levels.
- Requiring electric power generators to hold allowances equal to their CO₂ emissions over a three-year control period.
- Providing a market-based emissions auction and trading system where electric power generators can buy, sell and trade CO₂ emissions allowances.
- Using the proceeds of allowance auctions to support low-carbon-intensity solutions, including energy efficiency and clean renewable energy, such as solar and wind power.
- Employing offsets (greenhouse gas emissions reduction or sequestration projects outside the electricity sector) to help companies meet their compliance obligations.

RGGI's phased approach means that reductions in the CO₂ cap will initially be modest, providing predictable market signals and regulatory certainty. Electricity generators will be able to plan for and invest in lower-carbon alternatives and avoid dramatic electricity price impacts.

Since both the RGGI program and the Renewable Portfolio Standards program address greening the electric power sector, and the goals of the two programs are complementary, a flat 20% reduction was calculated for savings to be achieved in Tompkins County from both programs together.

New York State Measure #3

Updated NYS Energy Code

Estimated Savings in 2020:
2,650 MtCO₂e

In February 2009, Congress enacted the American Recovery and Reinvestment Act (ARRA), an economic stimulus package intended to create jobs and promote investment during the recession. One requirement of ARRA is that states use these funds to implement residential and commercial building energy codes that meet or exceed the 2009 International Energy Conservation Code and the ANSI/ASHRAE/IESNA Standard 90.1-2007, respectively. Another requirement was that states demonstrate 90% compliance with the new codes within 8 years.

ARRA included funds for states to offer various implementation and support services to help the entire building community, including local jurisdictions charged with implementation of the state energy code, architects, engineers, and homebuilders, to achieve compliance with the new energy code.

Currently, New York State is using the 2007 International Energy Conservation Code. An update to the residential Energy Code, in conformance with ARRA requirements, has been introduced in the State. It is anticipated that the 2009 International Energy Conservation Code will be in place by the end of 2010. Energy code experts estimate that the 2009 Energy Code will produce approximately 15% in energy efficiency gains compared to the current code.

In calculating the impact of the new code on new residential housing units built in the Tompkins County community by 2020, it was assumed that, in order to comply with new energy codes, all new units would be 15% more efficient than if they were built to the current standards.

Federal Government WEDGE

Total Savings in 2020: 24,085 MtCO₂e

While many programs, policies, initiatives, and funding opportunities are being discussed and implemented at the federal level, two are quantified for this County-wide energy strategy: the updated Corporate Average Fuel Economy (CAFE) standards and the increased efficiency of incandescent light bulbs and appliances due to the issuance of new federal standards.

Federal Government Measure #1

Updated Corporate Average Fuel Economy Standards

Estimated Savings in 2020:
3,541 MtCO₂e

The National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA) issued a joint proposal to establish a new National Program to regulate model year 2012 through 2016 passenger cars and light trucks in order to improve fuel economy and reduce greenhouse gas emissions. NHTSA has implemented Corporate Average Fuel Economy (CAFE) standards for model year 2012-2016 passenger cars and light trucks, and EPA has implemented national greenhouse gas emissions standards under the Clean Air Act. While NHTSA has been setting fuel economy standards since the 1970s, this action represents the first-ever joint proposal by NHTSA with another agency.

The CAFE standards apply to passenger cars and light trucks manufactured in model years 2012 through 2016. CAFE standards require these vehicles to meet an estimated combined average mile per gallon (mpg) level of 34.1 by model year 2016. The EPA's standards also enable manufacturers to earn compliance credits by improving the air conditioners of their vehicles. The National Program, combined EPA standards and NHTSA CAFE standards, requires vehicles to meet an estimated combined average emissions level of 250 grams of CO₂ per mile in model

year 2016, equivalent to 35.5 mpg (assuming that the automotive industry were to meet this CO₂ level through fuel economy improvements alone.)

In an effort not to double-count increased CAFE fuel economy with the conversion to alternative fuel vehicles (AFVs), it was estimated that 70% of new vehicles purchased from 2011 (vehicle year 2012 available) to 2014 would be of non-AFVs, shifting to 25% by 2020.

Federal Government Measure #2 Lighting and Appliance Standards

Estimated Savings in 2020:
20,544 MtCO₂e

The Energy Independence and Security Act of 2007 (the *Energy Bill*) was an Act of Congress concerning the energy policy of the United States. Under the law, lighting and appliance standards for residential and commercial use will be updated for higher energy efficiency.

Lighting – Incandescent bulbs that produce 310–2600 lumens of light are required to use 30% less energy than today's incandescent bulbs by 2012 and 2014. The phase-out will start with 100-watt bulbs in January 2012 and end with 40-watt bulbs in January 2014. By 2020, a Tier 2 would become effective which requires all bulbs to be at least 70% more efficient (effectively equal to today's compact fluorescent light bulbs). Bulbs outside the 40 to 100-watt range (roughly, light bulbs currently less than 40 watts or more than 150 watts) are exempt from the ban. Also exempt are several classes of specialty lights, including appliance lamps, "rough service" bulbs, 3-way, colored lamps, and plant lights.

The standards set by the bill are technology neutral therefore; by 2012 a next generation of incandescent bulbs could satisfy the 30% increased efficiency. There are also other lighting technologies, such as halogen and LEDs that will be able to meet the new requirements and are expected to both increase in performance and drop in cost over the next few years.

In June 2009, President Obama set additional lighting standards which affect fluorescent tube lamps (most commonly found in offices and stores) and conventional incandescent reflector lamps (such as track lighting). These forms of lighting will also become more efficient starting in 2012. The additional standards also phase out conventional incandescent reflector lamps, effectively extending the phase out of inefficient incandescent products initiated by Congress in 2007 to the common cone-shaped bulbs used in recessed light fixtures and track lighting.

Residential Water Heaters – In compliance with the Energy Independence and Security Act of 2007 (the *Energy Bill*) the U.S. Department of Energy announced more stringent appliance standards for residential water heaters. The standards will significantly reduce energy consumption by these products, including decreasing energy use in large electric storage water heaters by 47 percent and by more than 30 percent in large gas water heaters. The standards for water heaters will go into effect in 2015, while the standards for pool heaters and direct heating equipment – including gas-fired wall, floor and hearth heaters – will apply to products manufactured in 2013 and beyond.

Additional appliance standards are expected to be released in the near future: Improved energy efficiency standards for refrigeration appliances will be announced in December 2010; space heating appliances will be announced in May 2011; and air conditioning appliances will be announced in June 2011.

Other Community Efforts WEDGE

Total Savings in 2020: 9,506 MtCO_{2e}

Other entities in the community that will also be committing resources to address climate change over the next 10 years are local governments, public schools, and industry. As shown in the “Emissions Reduction Actions Underway” section, all of these sectors have been actively participating in reducing energy demand and improving energy efficiency.

Local Municipalities – Towns, villages, and the City of Ithaca have all been showing leadership in reducing municipal government emissions by installing renewable energy systems and looking closely at government operations to reduce energy use. The only local government that has formally quantified its emissions and established goals and strategies to achieve stated reductions is the City of Ithaca. It has completed several emissions inventories and has made significant progress (averaging 1% per year) in meeting its goal of reducing 2001 emissions by 20% by 2016. Assuming that these reductions continue through 2020, the City will be reducing its 2008 emissions of 5,050 MtCO_{2e} by 12%, yielding a reduction of 606 MtCO_{2e}.

In two grant applications prepared in early 2010 by a partnership of six towns in Tompkins County, the group proposed to hire shared staff to, among other things, identify and directly implement basic energy reduction measures, move energy projects towards implementation, coordinate facilities-based energy programs, assist residents with energy efficiency program applications, and establish a benchmarking database for residential utility usage. The projects were estimated to cost \$117,000 over the course of one year, with a minimum energy savings of 882 MMBtus, or 65 MtCO_{2e}. Additionally, as part of the proposal, 8 municipal facilities were analyzed for energy improvements including upgrades to lighting, heating and ventilation systems, and building envelopes and were found to have an average projected energy savings for recommended energy improvements of 858 MMBtus, or 63 MtCO_{2e}. Given the level of interest and activity by local municipalities to reduce energy consumption, it seems reasonable to expect the 15 governments (not including the City of Ithaca or Tompkins County) to achieve reductions of 250 MtCO_{2e}.

Public Schools – Public schools in the area have also been tapping available funding resources to improve the energy efficiency in their facilities, as well as looking for ways to reduce energy use and waste generation. Again, it seems conservative to assume that greenhouse gas emissions from all of the public schools in the County combined could be expected to achieve at least a reduction equivalent to that expected from County government, or 1,223 MtCO_{2e}.

Industry – In 2008, the industrial sector emitted 74,265 MtCO_{2e}. Given current and anticipated incentives at the state and federal level, coupled with local Industrial Development Agency incentives for improving efficiencies for industry, along with the anticipated spikes in energy costs, it is expected that this sector will be able to achieve an emissions reduction of 10% from 2008 to 2020, yielding a reduction of 7,427 MtCO_{2e}.

The total for all these initiatives is 9,506 MtCO_{2e}.

Finally, not quantified in this report is the expected contribution of local land and soil resources to sequester carbon. By implementing best management practices to enhance carbon sequestration in agriculture and forestry practices, and protecting wetlands and open space to expand sequestration areas, it is expected that carbon will be stored in the natural resources to a greater degree in 2020 than it was in 2008.

Achieving the Goals: Additional Items

Tompkins County Government Emissions Reduction Goal

As part of its adoption of the Energy and Greenhouse Gas Emissions element of the Comprehensive Plan, the County Legislature committed to reduce emissions by at least 2% a year. Accordingly, this 2020 Energy Strategy also includes detailed information on how the County government will achieve its goals. In addition to the measures outlined in this document, in its work to reduce greenhouse gas emissions from government operations the County should identify and pursue opportunities to purchase cleaner energy from renewable sources.

According to the 2008 emissions inventory, County government operations emitted 6,336 MtCO_{2e}. A 20% reduction from 2008 levels would require reducing emissions by 1,267 MtCO_{2e}, assuming that the scope and scale of County government operations will not change substantially during that time period. As identified in the new local measures section of this document, implementing governmental policies and making facilities upgrades will reduce County government emissions 1,223 MtCO_{2e}, which is roughly equivalent to the target of 1,267 MtCO_{2e}.

Grid-Distributed Power Generation

There are two significant potential and current emitters of greenhouse gases in the Tompkins County community that are not included in these calculations, but should be identified and tracked. These are the AES Cayuga power plant and the activities associated with the possible future extraction of natural gas from the Marcellus Shale. These power generators are not included in the emissions inventory since the energy that they generate is/will be distributed to the grid, where it will then be tracked in emissions inventories as grid-purchased energy used by consumers.

The AES Cayuga plant was built in 1955 and contains two units which both run on coal. The units have installed capacities of 155 and 167 MW, respectively. Although the plant has made substantial investment in technologies to reduce emissions, as a coal-fired power plant it emitted approximately 1,995,000 MtCO_{2e} in 2008, or nearly double the total community emissions.

Hydrofracking the Marcellus Shale to extract natural gas was the subject of a draft supplemental generic environmental impact statement (dSGEIS) in 2009. While the State has not yet determined whether or how permits would be issued for extractive activities, the dSGEIS is clear that the associated greenhouse gases released from drilling operations would be substantial. Using the figures identified in the dSGEIS, the Tompkins County Planning Department has estimated that greenhouse gas emissions in Tompkins County could total 2.1 billion MtCO_{2e} over a 30-year period as a result of gas exploration.

Monitoring and Reporting

Progress towards the 2020 goal will be monitored by conducting community-wide greenhouse gas emissions inventories and reports to the community at three points:

- To be released in 2013, using 2012 data
- To be released in 2017, using 2016 data
- To be released in 2021 using 2020 data

Each emissions inventory and report to the community will include detailed information about the amount of greenhouse gases being emitted in the community; how those levels compare with the emissions goals set in this report; evaluation of effectiveness of reduction activities by the “wedge sectors” identified in this report over the previous three years; and recommendations for new implementation measures to help the community reach its greenhouse gas emissions goals. It is expected that in 2021 a new report will be prepared that looks forward over the next 10 years to a reduction in emissions of another 20% by 2030, or a 40% emissions reduction from 2008 levels by 2030.

TECHNICAL APPENDIX

Emissions Projections: Business as Usual

Four emissions projections were evaluated and compared to determine a reasonable estimate of business as usual emissions in the target year 2020.

The source that was ultimately used in this energy strategy is the U.S. Department of Energy's Energy Outlook 2009 Report, which forecast an average annual growth in energy-related carbon dioxide emissions for the entire U.S. to be 0.3% per year from 2006 through 2030, which translates locally to a 3.7% increase from 2008-2020.

Business as usual projections also appeared in a white paper submitted to the New York State Climate Action Council on March 1, 2010 by Gerry Stokes and Patrick Looney at the Brookhaven National Laboratory. The authors lay out the future "business as usual" emissions scenario for New York State and project that emissions will increase 0.17% per year from 2007 to 2025, which translates to a 2.08% increase in emissions from 2008-2020.

The Stokes and Looney paper also cites a NYSERDA projection that by 2025 the annual greenhouse gas emissions in New York will be 266 million MtCO_{2e} (as opposed to the 258.3 tons forecasted by Stokes and Looney). This increase of 0.34% per year from 2007-2025 translates to a 4.16% increase in emissions from 2008 to 2020.

Finally, the Tompkins County Planning Department utilized ICLEI's CACP software projections tool to develop a 2020 projection for community energy consumption and emissions. All sectors required forecast data, by sector and fuel type, entered to calculate projected energy consumption growth in 2020, which then determined associated emissions. The Planning Department utilized projections from the Department of Energy's Energy Information Administration's Annual Energy Outlook 2010, Supplemental Table for the Middle Atlantic Region (the region that includes New York State) to forecast average annual growth in local energy consumption from 2008-2020 for the residential, commercial, industrial, and transportation sectors. The waste sector estimated a growth rate of 0.2% based on the 2010-2020 projected average annual household growth rate of 0.2% from work done by the County Planning Department for the County Comprehensive Plan. All of these inputs together project that emissions in Tompkins County will increase 0.54% per year from 2008 to 2020, which translates to a 6.62% increase in emissions from 2008-2020. Working with the CACP software's "Forecast Builder" module was a somewhat frustrating experience for County Planning staff, as it seems that it is in more of a "beta" stage than the main software. While staff feels that the figure of 6.62% is as accurate as is possible at this time, iterations in the process ranged from negative 16% to positive 6.62%, lending an air of uncertainty to the numbers.

Emissions Reduction Calculations for Measures

In calculating the greenhouse gas emissions reduction potential, three main tools and methods were used to quantify emissions reductions:

- 1) The Climate and Air Pollution Planning Assistant (CAPPA) tool from ICLEI and the EPA provides information and emissions quantification for over 100 distinct emissions reduction strategies. It was launched in early 2010 to assist local government leaders in developing customized plans for reducing climate and local air pollution based on the collective advice of local governments throughout the ICLEI network.
- 2) ICLEI's Clean Air and Climate Protection (CACCP) tool was used to calculate greenhouse gas emissions associated with reduction in energy usage, assuming the amount of energy and type of fuel used (with appropriate units) was known and could be input into the software.
- 3) The City of Chicago's Climate Action Plan includes detailed analyses prepared by a private consultant to quantify emissions reductions that are expected as the City undertakes specific actions.

Where possible, all three tools and methods were used to calculate results to determine whether the quantified measure was comparable using alternate means of calculation.

New Local Measure #1 – Property Assessed Clean Energy Program

Greenhouse Gas Emissions Reduction Potential in 2020

EFFICIENCY COMPONENT – 8,030 housing units with energy efficiency retrofits

Used the calculation method on p. 89 of the Chicago Climate Action Plan – First we calculated the average emissions per housing unit from the Tompkins County community 2008 emissions inventory. Residential emissions = 233,469 MtCO₂e. 39,616 housing units per the Tompkins County 2008 Indicators of Success report. $233,469/39,616 = 5.9$ MtCO₂e.

Then assumed that the energy retrofit program begins in 2010 with 130 units and builds to a total of 8,030 units by 2020. Applying the nationally-reported average documented emissions reductions of 35% per housing unit after energy improvements have been made, yields $(5.9 \times 8030 \text{ units}) \times 35\% = \mathbf{16,582 \text{ MtCO}_2\text{e reduction}}$.

RENEWABLES COMPONENT - 323 renewable systems installed

Used the calculation method on p. 156 of the Chicago Climate Action Plan – assumed that 323 units will install renewable generation equivalent to 75% electricity replacement (based on experience of local installers). Also assumed that 323 housing units will install solar domestic hot water, reducing natural gas consumption by 25% per participating housing unit.

- Since Tompkins County residential emissions for electricity in 2008 was 96,447 MtCO₂e, and there are 39,616 housing units, then each housing unit will save $(96,447 / 39,616) \times 0.75 = 1.83$ MtCO₂e for electricity.
- Since residential emissions for heat is 137,022 MtCO₂e and there are 39,616 housing units, then each housing unit will save $(137,022 / 39,616) \times 0.25 = 0.86$ MtCO₂e for heat (note that this figure includes emissions from natural gas, heating oil, and propane).

For a total GHG reduction potential of $1.83 + 0.86 = 2.69$ MtCO₂e/housing unit. $(323 \text{ units} \times 2.69) = \mathbf{869 \text{ MtCO}_2\text{e reduction}}$.

Total for PACE program: $16,582 + 869 = \mathbf{17,451 \text{ MtCO}_2\text{e reduction}}$

New Local Measure #2 – Waste Diversion Program

Greenhouse Gas Emissions Reduction Potential in 2020

The greenhouse gas reduction potential represents the elimination of 75% of all waste emissions associated with methane production in landfills forecasted for Tompkins County for 2020. The reduction potential does not include the GHG saved from reduced vehicle trips that could result from eliminating municipal garbage truck trips to and from landfills, nor does it include any additional transportation needs due to an increase in recycling levels.

In 2008, Tompkins County generated 156,137 metric tons of solid waste (172,112 short tons). Of this, 91,953 metric tons were recycled and 64,152 were disposed for a diversion rate of 59% $(91,953 / 156,137 = 59\%)$. The County's goal is to increase the diversion rate to 75% by 2015. Assuming flat line projections of solid waste generated, by 2015 the County should be recycling 117,103 metric tons of waste $(0.75 \times 156,137 \text{ metric tons})$. This represents a diversion of $117,103 - 91,953 = 25,150$ metric tons of solid waste from landfills.

Using the CACP software, it is possible to convert tonnage of solid waste diverted from landfills to CO₂e if you know the amount of waste diverted and the composition of the waste stream. According to the EPA, in 2008 municipal solid waste (before recycling) in the U.S. was composed of 31.0% paper, 4.9% glass, 8.4% metals, 12.0% plastics, 6.6% wood, 7.9% rubber, leathers and textiles, 13.2% yard trimmings, 12.7% food scraps, and 3.3% other. Due to the already aggressive recycling efforts underway in the County, most of the paper, glass, and

metals, and half the plastics were already recycled in 2008. That leaves the composition of the waste stream remaining to be diverted from landfills composed of plastics, wood, rubber, leathers and textiles, yard trimmings, food scraps, and other. Assigning ratios to each of these segments yields the following percentages. Total left in waste stream after recycling: $13.2+12.7+6+7.9+6.6+3.3 = 49.7\%$

- Yard trimmings $13.2\% / 49.7\% = 26.6\%$
- Food scraps $12.7\% / 49.7\% = 25.6\%$
- Plastics $6\% / 49.7\% = 12.1\%$
- Rubber, etc $7.9\% / 49.7\% = 15.9\%$
- Wood $6.6\% / 49.7\% = 13.3\%$
- Other $3.3\% / 49.7\% = 6.5\%$

In CAPA, entered the figures of 25,150 metric tons being diverted and a waste stream mix of 27% yard trimmings, 26% food scraps, 13% wood products, and 34% other, results in an emissions reduction of **14,550 MtCO_{2e}** by 2020.

Note for Comparison: The City of Chicago's Climate Action Plan estimated that emissions associated with solid waste were 0.4 MtCO_{2e} per ton of solid waste sent to landfills (assume that's in U.S. short tons of solid waste, as that is the common unit of measurement for solid waste in the U.S.). 25,150 metric tons of waste diverted x 1.1023 short tons/metric tons = 27,723 short tons solid waste x 0.4 MtCO_{2e} per short tons solid waste = 11,089 MtCO_{2e} reduction.

New Local Measure #3 – Energy Business Partnership Program

Greenhouse Gas Emissions Reduction Potential in 2020

Using the CAPP tool for "Green Business Programs" and assuming that 1,000 businesses have participated in the program by 2020, CAPP yields a reduction of **6,024 MtCO_{2e}**. Inputs to the tool were: 1,000 businesses participating, and the CAPP tool's default inputs of 11,500 kWh annual energy savings per business, and 367 therms annual energy savings per business.

Note for Comparison: Using the CAPP tool for "Energy Efficiency Education Targeted at Business" and assuming that 1,000 businesses have participated in the program by 2020, CAPP also yields a reduction of 6,024 MtCO_{2e}.

Note for Comparison: The grant proposal for EPA Showcase Communities funding in the summer of 2009, estimated the Potential Greenhouse Gas Emissions Reductions by anticipating a 40% reduction in greenhouse gas emissions per business. This reduction was attributed to energy reduction, energy efficiency strategy implementation, and waste stream reduction. Applying the County's average emissions per housing unit from the 2008 emissions inventory of 5.9 MtCO_{2e} (calculation shown under the PACE measure) and applying to that the City of Chicago's methodology that assumes businesses are 50% more emissive on average than residential units, then a per business emissions is $5.9 \times 1.50 = 8.85$ MtCO_{2e}. 1,000 program participants x 8.85 x 40% reduction = 3,540 MtCO_{2e} reduced by 2020.

New Local Measure #4 – Transportation Demand Management

Greenhouse Gas Emissions Reduction Potential in 2020

The 2006-2008 American Community Survey 3-Year Estimates Transportation to Work figures report that 55% of commuters drive alone, 17% walk, 12% carpool, 7% use transit, 6% work from home, 2% bike, and 1% use other means such as motorcycle and taxi. By applying a robust TDM program in the community, it is possible to shift modes of transportation as shown below (Est. % Share 2020):

2006-2008 ACS 3-year Estimates Transportation to Work								
Mode	Trips 2008 ACS One-Way/Day	Est Total Trips One-Way/Year	% Share 2008	Est % Share 2020	Est Total Trips One-Way 2020	Change 2008-2020	Change/Yr 2008-2020	Change/Week 2008-2020
Total	50,294	18,357,310			18,357,310	0	0	0
Drive Alone	27,838	10,160,870	55%	39%	7,159,351	-3,001,519	-250,127	-4,810
Carpool	5,798	2,116,270	12%	16%	2,937,170	820,900	68,408	1,316
Transit	3,642	1,329,330	7%	10%	1,835,731	506,401	42,200	812
Bicycle	990	361,350	2%	4%	734,292	372,942	31,079	598
Walk	8,352	3,048,480	17%	20%	3,671,462	622,982	51,915	998
Other	442	161,330	1%	1%	183,573	22,243	1,854	36
Work at home	3,232	1,179,680	6%	10%	1,835,731	656,051	54,671	1,051

Using these figures, the CAPPa tool was used to estimate emissions reductions.

1) CAPPa's "Increase Bus Ridership" shows benefit of **510 MtCO₂e** by 2020 if increase number of additional daily bus passengers by 2,249 (820,900 / 365 = 2,249 trips per day), assuming an average one-way commute length of 4 miles and that the average passenger vehicle fuel economy of the vehicle not driven is 19.7 mpg.

2) CAPPa's "Bicycling Paths and Facilities" shows benefit of **891 MtCO₂e** by 2020 if increase number of weekly trips switching from car to bike by 7,172 (372,942 / 52 weeks = 7,172 trips per week), assuming an average length of trip avoided of 5 miles, and that the average passenger vehicle fuel economy of the vehicle not driven is 19.7 mpg.

3) CAPPa's "Walking Friendly Environments" shows benefit of **595 MtCO₂e** by 2020 if increase number of weekly trips switching from car to walking by 11,980 (622,982 / 52 weeks = 11,980 trips per week), assuming an average length of trip avoided of 2 miles, and that the average passenger vehicle fuel economy of the vehicle not driven is 19.7 mpg.

4) CAPPa's "Promote Carpooling and Vanpooling" shows benefit of **1,174 MtCO₂e** by 2020 if increase number of employees in the community offered carpool or vanpool incentives by 8,000 (approximately 20% of total employment in the County), assuming an average one-way commute length of 8 miles, 8% reduction in commute vehicle trips, and that the average passenger vehicle fuel economy of the vehicle not driven is 19.7 mpg.

5) CAPPa's "Promote Telecommuting" shows benefit of **1,468 MtCO₂e** by 2020 if increase the number of employees offered telecommuting incentives by 8,000 (approximately 20% of total employment in the County), assuming 10% of employees telecommuting each workday, an average one-way commute length of 8 miles, and that the average passenger vehicle fuel economy of the vehicle not driven is 19.7 mpg.

6) Increase the number of members using car share by 500 per year for a total of 5000 members by 2020. This is in line with a market study showing the probable limit of membership to be 5,000. Although there are approximately 1,000 members in 2010, this study's base year is 2008, by which time Ithaca Carshare had not yet been launched. CAPPa's "Initiate a Carshare" shows benefit of **5,792 MtCO₂e** if 5000 new members joined by 2020, assuming that members drove an average of 8081 miles per year before joining carshare, experienced a 30% reduction in vehicle miles as a result of joining carshare, and the average passenger vehicle fuel economy of the vehicle not driven is 19.7 mpg.

Total for all 6 programs: 510 + 891 + 595 + 1,174 + 1,468 + 5,792 = **10,430 MtCO₂e**.

New Local Measure #5 – Alternative Fuel Vehicles

Greenhouse Gas Emissions Reduction Potential in 2020

The New York State Department of Motor Vehicles provided information in the table below on the number of new registrations (including new and used vehicles) in Tompkins County.

The number of all County vehicle registrations considered active by year

	Passenger Vehicles and Light Trucks	Number of New Registrations
2005	49,512	
2006	50,077	565
2007	50,985	908
2008	51,199	214
2009	51,624	425
Average number of new registrations		528 vehicles

Source: New York State Department of Motor Vehicles, Statistical Summaries, Vehicle Registrations in Force (2005-2009). Data accessed March 2010.

While the average number of new registrations from 2005 to 2009 was 528, it was assumed that 60% of those are new vehicles, so that the potential exists for 317 newly purchased vehicles to be registered each year, for a total of 3,804 (317 x 12 years = 3,804 new purchases) by the year 2020. Assume that from 2008 – 2014, while the alternative fuel vehicles (AFVs) are being introduced and purchased by early adopters, that 30% of all newly purchased vehicles are alternatively fueled, for a total of (317 x 6 years) x 0.30 = 571 AFVs. Then from 2014 – 2020, assume that 75% of all newly purchased vehicles are AFVs, for a total of (317 x 6 years) x 0.75 = 1,427 AFVs. Therefore, 571 + 1,427 = 1,998 new AFVs would be purchased by 2020.

If we then assume that 40% of these purchase will be hybrids (1,998 x 0.40 = 799); and 30% will be electric (1,998 x 0.30 = 599); and 20% will be biodiesel B20 (1,998 x 0.20 = 400); and 10% will be compressed natural gas (200), the CAPP tool may be used to quantify these assumptions.

1) CAPP's "Hybrid Vehicles" shows benefit of **3,193 MtCO₂e** by 2020 if 799 vehicles are replaced with hybrid vehicles, assuming an average 12,000 annual miles per vehicle, the average passenger vehicle fuel economy of the vehicle being replaced is 19.7 mpg, and the hybrids average 46 mpg.

2) CAPP's "Electric Vehicles" shows benefit of **2,441 MtCO₂e** by 2020 if 599 vehicles are replaced with electric vehicles, assuming an average 12,000 annual miles per vehicle and the average passenger vehicle fuel economy of the vehicle being replaced is 19.7 mpg.

3) CAPP's "Fleet Conversion to Biodiesel B20" shows benefit of **1,854 MtCO₂e** by 2020 if 400 vehicles are replaced with B20 vehicles, assuming an average 12,000 annual miles per vehicle and the average passenger vehicle fuel economy of the vehicle being replaced is 19.7 mpg.

4) CAPP's "Compressed Natural Gas Vehicles" shows benefit of **309 MtCO₂e** by 2020 if 200 vehicles are replaced with CNG vehicles, assuming an average 12,000 annual miles per vehicle and the average passenger vehicle fuel economy of the vehicle being replaced is 19.7 mpg.

Total for these 4 programs: 3,193 + 2,441 + 1,854 + 309 = **7,797 MtCO₂e** reduction.

New Local Measure #6 – County Government Energy Policies

Greenhouse Gas Emissions Reduction Potential in 2020

While the governmental policies will result in a wide range of energy savings, some specific actions may be quantified.

1) Convert the entire highway heavy-duty vehicle fleet of 60 vehicles from diesel to B50 biodiesel so that in 2020, a total of 73,791 gallons per year (figure from 2008 County Highway fuel usage) of diesel will be replaced with biodiesel. CAPPAs does not have a tool for B50 conversion, so used CAPPAs "Fleet Conversion to Biodiesel B20" and made the following assumptions: 60 vehicles will be converted to B20, the vehicles converted have an average fuel economy of 8 mpg and are driven 10,000 miles per year (resulting in 75,000 gallons of fuel). These inputs yield benefit of **571 MtCO_{2e}** assuming that the vehicles converted have an average fuel economy of 10.5 mpg and were driven 10,000 miles per year. The goal of B50 will exceed B20, so emissions reductions calculated here are conservative.

2) Replace 80% of the County's non-diesel vehicle fleet with hybrid or alternatively fueled vehicles by 2020, resulting in 128 hybrid or other alternative fuel vehicles. CAPPAs "Hybrid Vehicles" shows benefit of **513 MtCO_{2e}**, assuming an average 12,000 annual miles per vehicle, the average passenger vehicle fuel economy of the vehicle being replaced is 19.7 mpg, and the combination of hybrids and other alternative fuels, such as electric vehicles, average 65 mpg.

3) When computers and monitors need to be replaced, purchase Energy Star rated models. Based on County purchasing information, in 2008, 58 new computers and 51 monitors were purchased for County employees. Assuming that rate continues, a total of 580 new computers and 510 monitors would be replaced by 2020. CAPPAs "Energy Efficient Computers" shows benefit of 20.2 MtCO_{2e} by 2020 for Energy Star computers and CAPPAs "Energy Efficient Computer Monitors" shows benefit 11.9 MtCO_{2e} by 2020 for Energy Star monitors. For computers, this assumes that the average annual energy savings of one Energy Star computer is 67.8 kWh, based on all computers being turned off every night and on weekends and holidays (currently a County requirement) and half of all computers going into standby or hibernate mode when inactive. For monitors, this assumes that the average annual energy savings of one Energy Star monitor is 100.7 kWh, based on all monitors being turned off every night and on weekends and holidays and half of all monitors going into shutdown mode when inactive. In order to fine-tune these kWh energy savings figures, the EPA's Low Carbon IT Calculator was used (www.energystar.gov/ia/products/power_mgt/LowCarbonITSavingsCalc.xls). Total reduction is **32 MtCO_{2e}**.

4) Assume 20 employees share one printer and one copier, or that there are approximately 38 printers and copiers used by the County, and that 10% of those printers and copiers are replaced each year, or 4 printers. Over the course of 10 years, 40 printers and copiers would be replaced with energy efficient models. CAPPAs "Energy Efficient Printers" shows benefit of 5.1 MtCO_{2e} by 2020 for Energy Star printers, and CAPPAs "Energy Efficient Copiers" shows benefit of 10.4 MtCO_{2e} by 2020 for Energy Star copiers. Total reduction is **16 MtCO_{2e}**.

Total for these 4 programs: 571+513+32+16 = **1,132 MtCO_{2e}** reduction.

New Local Measure #7 – County Facility Energy Improvements

Greenhouse Gas Emissions Reduction Potential in 2020

Projects 1, 2, 3 and 4 were quantified by Johnson Controls for the NYSERDA RFP 1613 grant proposal, submitted in August 2009. Project 5 was quantified by Johnson Controls for the NYSERDA RFP 10 grant proposal, submitted in March 2010. Figures were converted into MMBtus and the CO_{2e} calculated using the CACP software.

1. Lighting Retrofit at Recycling and Solid Waste Center:
 - Electricity savings – 44,015 kWh (150 MMBtus)
 - Heat Savings – 28.5 MMBtus/year

- Source energy savings – 43 MMBtus

Total = 222 MMBtus for emissions reduction in 2020 of **16 MtCO₂e**

2. Temperature controls at Public Works Building

- Electricity savings – 7,458 kWh (25 MMBtus)
- Natural gas savings – 2,860 Therms (286 MMBtus)
- Source energy savings – 36 MMBtus

Total = 347 MMBtus for emissions reduction in 2020 of **26 MtCO₂e**

3. Public Safety Building solar thermal installation

- Electricity savings – 1,000 kWh (3 MMBtus)
- Natural gas savings – 3,091 Therms (309 MMBtus)
- Source energy savings – 30 MMBtus

Total = 342 MMBtus for emissions reduction in 2020 of **25 MtCO₂e**

4. Human Services Building solar thermal installation

- Electricity savings – 800 kWh (3 MMBtus)
- Natural gas savings – 1,351 Therms (135 MMBtus)
- Source energy savings – 13 MMBtus

Total = 151 MMBtus for emissions reduction in 2020 of **11 MtCO₂e**

5. Human Services Building solar electric installation

- Electricity savings – 38,664 kWh (132 MMBtus)

Total = 132 MMBtus for emissions reduction in 2020 of **13 MtCO₂e**

Total for all 5 projects: 16+26+25+11+13 = **91 MtCO₂e**.

New Measure #8 – Biomass for Rural Heating

Greenhouse Gas Emissions Reduction Potential in 2020

The anticipated reduction of greenhouse gas emissions from conversion to biomass is expected to be 80% per demonstration household. This assumes that local biomass will largely be replacing high emitting fuels, such as coal and fuel oil, which results in the 80% figure.

Applying the 5.9 MtCO₂e emissions per housing unit from the 2008 emissions inventory (calculation shown under the PACE measure) and applying an 80% reduction to that number for the 20 new pellet boilers/furnaces and wood gasification systems, the result is a 94 MtCO₂e reduction. Applying this formula to the anticipated 20% of households expected to adopt biomass as a home heating source, yields a 10,384 MtCO₂e reduction (11,000 households that in 2008 emissions inventory used highly-emitting fuel x 0.20 = 2,200 household adopters. 2,200HH x 0.80 x 5.9 MtCO₂e = 10,384 MtCO₂e.)

Total reduction from this measure = 10,384 + 94 = **10,478 MtCO₂e**.

New York State Measure #1 – Renewable Portfolio Standards

Greenhouse Gas Emissions Reduction Potential in 2020

2008 Total Community Emissions = 1,172,918 MtCO₂e.

2008 Community Emissions from Electricity = 256,202 MtCO₂e.

Therefore, Community Emissions from Electricity is 22% of the Total Community Emissions

2020 Business As Usual Projected Total Community Emissions = 1,215,847 MtCO₂e.

Applying the 22% to the projections yields:

2020 Business As Usual Projected Community Emissions from Electricity = $1,215,847 \times 0.22 = 267,486 \text{ MtCO}_2\text{e}$

In order to evaluate the impact of the RPS program on Tompkins County emissions, it was assumed that the emissions associated with the electricity used in the community in 2020 would be reduced by 11% (going from 19% renewables in the existing portfolio to 30% by 2015). Since this 11% reduction will be coming from the carbon emitting sources of the electricity grid, which currently makes up 52% of the grid, the overall reduction will be 21% of the carbon emitting sources. However, given the goals of the Regional Greenhouse Gas Initiative, below, a flat 20% was used to quantify both measures.

Therefore, $267,486 \text{ MtCO}_2\text{e} \times 0.20 = \mathbf{53,497 \text{ MtCO}_2\text{e} \text{ reduction}}$.

New York State Measure #2 – Regional Greenhouse Gas Initiative

Greenhouse Gas Emissions Reduction Potential in 2020

The RGGI program anticipates reducing greenhouse gas emissions from the electric power sector 10% by 2018, and the Renewable Portfolio Standards program anticipates reducing electricity emissions by 10% by 2015. Since both the RGGI program and the Renewable Portfolio Standards program address greening the electric power sector, and the goals of the two programs are both to achieve a 10% reduction in emissions by at least 2020, a flat 10% reduction was calculated for both programs together.

New York State Measure #3 – Updated NYS Energy Code

Greenhouse Gas Emissions Reduction Potential in 2020

Energy code experts estimate that the 2009 Energy Code will produce approximately 15% in energy efficiency gains compared to the current code. However, since many of the housing units in Tompkins County are older and less efficient than the current code, a 10% energy efficiency gain was estimated to quantify this measure.

According to the County Planning Department Housing Development Database, based on County Assessment data, the average number of new units built per year is 300 units. Over 10 years, assume that 3,000 new housing units are built.

The 2008 Emissions Inventory using the CACP software yielded 5.9 MtCO₂e per housing unit (average total emissions per housing unit, calculation shown under the PACE measure).

Total emissions from these new units therefore would be $3000 \times 5.9 = 17,700 \text{ MtCO}_2\text{e}$

10% of those emissions yields **1,770 MtCO₂e reduction**.

Federal Measure #1 – Updated CAFE Standards

Greenhouse Gas Emissions Reduction Potential in 2020

The New York State Department of Motor Vehicles provided information in the table below on the number of new registrations (including new and used vehicles) in Tompkins County.

The number of all County vehicle registrations considered active by year

	Passenger Vehicles and Light Trucks	Number of New Registrations
2005	49,512	
2006	50,077	565
2007	50,985	908
2008	51,199	214
2009	51,624	425
Average number of new registrations		528 vehicles

Source: New York State Department of Motor Vehicles, Statistical Summaries, Vehicle Registrations in Force (2005-2009). Data accessed March 2010.

While the average number of new registrations from 2005 to 2009 was 528, it was assumed that 60% of those are new vehicles, so that the potential exists for 317 newly purchased vehicles to be registered each year, for a total of 3,804 (317 x 12 years = 3,804 new purchases) by the year 2020. Assume that from 2008 – 2014, while the alternative fuel vehicles (AFVs) are being introduced and purchased by early adopters, that 30% of all newly purchased vehicles are alternatively fueled, for a total of (317 x 6 years) x 0.30 = 571 AFVs. Then from 2014 – 2020, assume that 75% of all newly purchased vehicles are AFVs, for a total of (317 x 6 years) x 0.75 = 1,427 AFVs. Therefore, 571 + 1,427 = 1,998 new AFVs would be purchased by 2020. That leaves 3,804 – 1,998 = 1,806 non-AFV new purchases from 2008 – 2020, or 1,806 / 12 = 150 new non-AFV purchases per year.

The Climate and Air Pollution Planning Assistant (CAPPA) software tool's action of "Use Smaller Fleet Vehicles" results in a sum total of **7,075 MtCO2e reduction** (see table below) for conversion of the community vehicle fleet of 150 vehicles per year to more fuel efficient models based on the combined proposed federal CAFE standards and EPA national greenhouse gas emissions standards, as indicated in the chart below. Other inputs to the tool are: 12,278 vehicle miles traveled (based on estimates provided by the Ithaca-Tompkins County Transportation Council in February 2010) and average passenger vehicle fuel economy of the vehicle being replaced is 19.7 mpg.

Output from CAPPA Software Tool

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Miles per gallon (based on EPA & CAFE Standards)	27.3	30.1	31.1	32.2	33.8	35.5	35.5	35.5	35.5	35.5
MtCO2e reduced	245	304	323	342	367	392	392	392	392	392
Total GHG Emissions Reduction = 3,541 MtCO2e										

Federal Measure #2 – Lighting and Appliance Standards

Greenhouse Gas Emissions Reduction Potential in 2020

2008 Total Community Emissions = 1,172,918 MtCO2e.

2008 Community Emissions from Electricity = 256,202 MtCO2e.

Therefore, Community Emissions from Electricity is 22% of the Total Community Emissions

2020 Business As Usual Projected Total Community Emissions = 1,215,847 MtCO2e.

Applying the 22% to the projections yields:

2020 Business As Usual Projected Community Emissions from Electricity = 1,215,847 x 0.22 = 267,486 MtCO2e

(1) Twenty percent of electricity usage comes from lighting*: $267,486 \text{ MtCO}_2\text{e} \times 0.20 = 53,497 \text{ MtCO}_2\text{e}$ (for lighting).

Therefore with a 30% energy savings by 2014: $53,487 \text{ MtCO}_2\text{e} \times 0.30 = 16,049 \text{ MtCO}_2\text{e}$.

Tompkins County residents have already adopted CFLs at a high rate. Additionally, some bulbs will not be replaced as they are exempt from the new standards and other bulbs will not yet have "died" and need to be replaced. Therefore, an adoption rate of 40% is anticipated: $16,049 \text{ MtCO}_2\text{e} \times 0.40 = \mathbf{6,420 \text{ MtCO}_2\text{e}}$ (for lighting).

(2) Twenty percent of electricity usage comes from water heating*: $267,486 \text{ MtCO}_2\text{e} \times 0.20 = 53,497 \text{ MtCO}_2\text{e}$ (for water heating).

Therefore with a 38% energy savings by 2015: $53,497 \text{ MtCO}_2\text{e} \times 0.38 = 20,329 \text{ MtCO}_2\text{e}$.

Since water heaters have a fairly long lifespan, it is anticipated that by 2020 there will be a 30% adoption rate: $20,329 \text{ MtCO}_2\text{e} \times 0.30 = \mathbf{6,099 \text{ MtCO}_2\text{e}}$ (for water heating).

(3) Sixty percent of electricity usage comes from space heating, refrigeration, air conditioning, and small appliances*: $267,486 \text{ MtCO}_2\text{e} \times 0.60 = 160,492 \text{ MtCO}_2\text{e}$ (for space heating, refrigeration, air conditioning and small appliances).

Therefore with an estimated conservative 10% energy savings by 2020: $160,492 \text{ MtCO}_2\text{e} \times 0.10 = 16,049 \text{ MtCO}_2\text{e}$.

An adoption rate of 50% is proposed: $16,049 \text{ MtCO}_2\text{e} \times 0.50 = \mathbf{8,025 \text{ MtCO}_2\text{e}}$ (for space hearing, refrigeration, air conditioning, and small appliances).

* National percentages from the U.S. Department of Energy's Energy Information Agency.

Total for these 3 initiatives: $6,420 + 6,099 + 8,025 = \mathbf{20,544 \text{ MtCO}_2\text{e}}$