Montgomery County, Maryland

Climate Protection Plan

Prepared by the
Montgomery County Sustainability Working Group

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Montgomery County Sustainability Working Group

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Executive Summary

Montgomery County, Maryland has been a national leader in addressing climate change. From the early adoption of climate protection objectives to the implementation of ground-breaking programs designed to expand the use of clean energy, increase the energy efficiency of buildings, or develop new transportation initiatives, the County has sought effective and innovative solutions to reducing the County's climate footprint. This 2009 Climate Protection Plan represents the next major step in the County's efforts. The Plan contains 58 specific recommendations across a broad spectrum of activities to ensure that Montgomery County remains at the forefront of local governments addressing climate change.

On Earth Day, April 22, 2008, the County adopted Bill 32-07, which codified the County's greenhouse (GHG) reduction goals. The bill also established the Sustainability Working Group (SWG) and charged it with developing the Climate Protection Plan to:

> "…reduce County wide greenhouse gas emissions to 80% below the amount…in the base year [FY05]…including a plan to stop increasing County wide greenhouse gas emissions by 2010 and achieve a 10% reduction every 5 years through 2050."

The SWG consists of 26 representatives, 15 from the County government, County agencies or regional organizations, and 11 from the public. To help with the development of the Plan, the SWG established committees to look more closely at issues in seven distinct areas:

- Renewable Energy
- Residential Building Energy Efficiency
- Commercial/Multi-Family/Public Building Energy Efficiency
- Transportation
- Forestry & Agriculture
- Long-Term Planning (including Land Use Planning)
- Education & Outreach

The committees, chaired by one or more members of the SWG, ranged in size from 10 to 25 individuals. The recommendations proposed in this Plan were formulated, debated, and initially drafted at the committee level before being brought to the SWG for review and incorporation into the final Plan.

The Development of the Climate Protection Plan

The process through which the SWG and its committees worked to develop the County's initial Climate Protection Plan revealed the significant challenges and great opportunities that surround the issue of climate change. The Plan's collective recommendations received overwhelming support from members of the SWG and the committees. Given the volume of recommendations, the Group realized that it would be unreasonable to expect full agreement on each and every issue. In fact, there were areas of spirited debate and, in some instances, disagreement. It is useful to acknowledge the areas of disagreement so that they can be taken

into account as County policymakers move forward to implement the recommendations in this Plan.

Scope of the Climate Protection Plan – The majority of those involved in the development of the Plan felt strongly that the County has an obligation to "do its part" to address climate change, and anything less than a full commitment to the 80% reduction goal was unacceptable. Others expressed the opinion that the goal, while laudable, was not something to which the County should unilaterally commit – significant federal and state assistance and actions are necessary – and that the County's programs should not create undue requirements and obligations on County residents and businesses. Even these participants, however, understood the task assigned to the SWG and were committed to the development of a comprehensive and ambitious Plan.

Fiscal Constraints and Opportunities – The submission of this Plan coincides with a severe economic recession. At the time of the publication of this Plan, the County government is facing an estimated $450 million gap as it develops the budget for FY10. Businesses are equally stressed, and development activity in the County has dropped precipitously. Given this situation, a few participants in the process felt that the County should proceed cautiously and carefully consider the timing of policies and programs that exert (or appear to exert) additional fiscal pressure on the government or the private sector. In contrast, however, a majority felt that the Plan promotes both environmental *and* financial sustainability. While the initial cost of some of the recommendations may seem untimely during this period of fiscal austerity in government and within the community, many of them specifically address financing obstacles faced by both government and the private sector and lay the groundwork for short and long-term savings, in some cases significant. Thus, most of the costs associated with many of these proposals should be considered prudent investments that will actually save money. Moreover, many of the recommendations will help to stimulate development of the County's green business sector, thus providing jobs and strengthening the tax base.

Prioritization of Recommendations – There was a strong desire among all participants to develop a process for prioritizing actions so that the most "effective" ones were pursued first. Ideally, a rigorous evaluation methodology could be employed to consider such critical factors as GHG reduction potential, implementation cost, etc., but it was recognized that there were insufficient data immediately available to pursue such an approach, even if such a methodology existed. Nonetheless, given the magnitude of the problems associated with climate change, the SWG felt it needed to set forth some concrete recommendations immediately. It did not want to defer recommendations until a thorough analysis could be completed, nor did it feel that outlining general policy considerations was adequate. The Group recognized that dramatic and immediate steps must be taken to achieve the County's GHG emission reduction goals, and that bold and actionable recommendations were necessary. It was also clear to the Group that no "silver bullet" existed that would solve the problem. Rather, addressing climate change will require a broad complement of coordinated and leveraged actions by individuals, institutions, and government. Ultimately, it was agreed that the greatest risk would be to wait for precise data and a thorough analysis before taking action.

The SWG therefore agreed that it should recommend actions for immediate consideration if they met all three of what came to be known as "implementability" criteria:

- The action is a proven practice or complements, expands, or strengthens a program or policy already in place
- The action is technically and logistically feasible in the short term
- The general steps required for implementation can be defined

As the recommendations progress toward implementation, rigorous cost-benefit analyses will be done that will guide the County in making future decisions.

On-Going and Evolving Effort

The 2009 Climate Protection Plan is the beginning of an on-going effort to address climate change. The County will contract with a consultant to assist in the development of a rigorous evaluation methodology and monitoring framework to track actual GHG reductions against established goals. This will form the basis of a monitoring plan enabling the SWG to report on its progress annually. It will also clarify gaps, shortfalls, and opportunities so that actions can be revised and added. The 58 recommendations included in this Plan have already prompted consideration of additional recommendations that could be incorporated in future plans.

Finally, although the Plan's focus is on reducing GHG emissions, the SWG intends to establish a long term and broad based Sustainability Action Plan that goes well beyond climate protection and includes areas such as water and air quality, pollution prevention, waste reduction, etc. In short, the County has committed to an aggressive, comprehensive and on-going effort to build a more sustainable future.

Environmental Equity

The success of the Climate Protection Plan is dependent upon broad inclusion and mobilization of the County's population. All residents must have access to carbon reduction programs, and share in the resulting health and economic benefits. As decision makers implement the Plan's recommendations, it is critical that they strive to maximize social benefits and avoid adverse, unintended consequences. The County must ensure that low income households and at risk populations are not disproportionately burdened. Similarly, programs must be accessible to small businesses that may not have the resources of larger organizations. The County must strive to balance the common good derived from public expenditures to achieve particular policy objectives against the ability of some to absorb the costs associated with achieving these objectives.

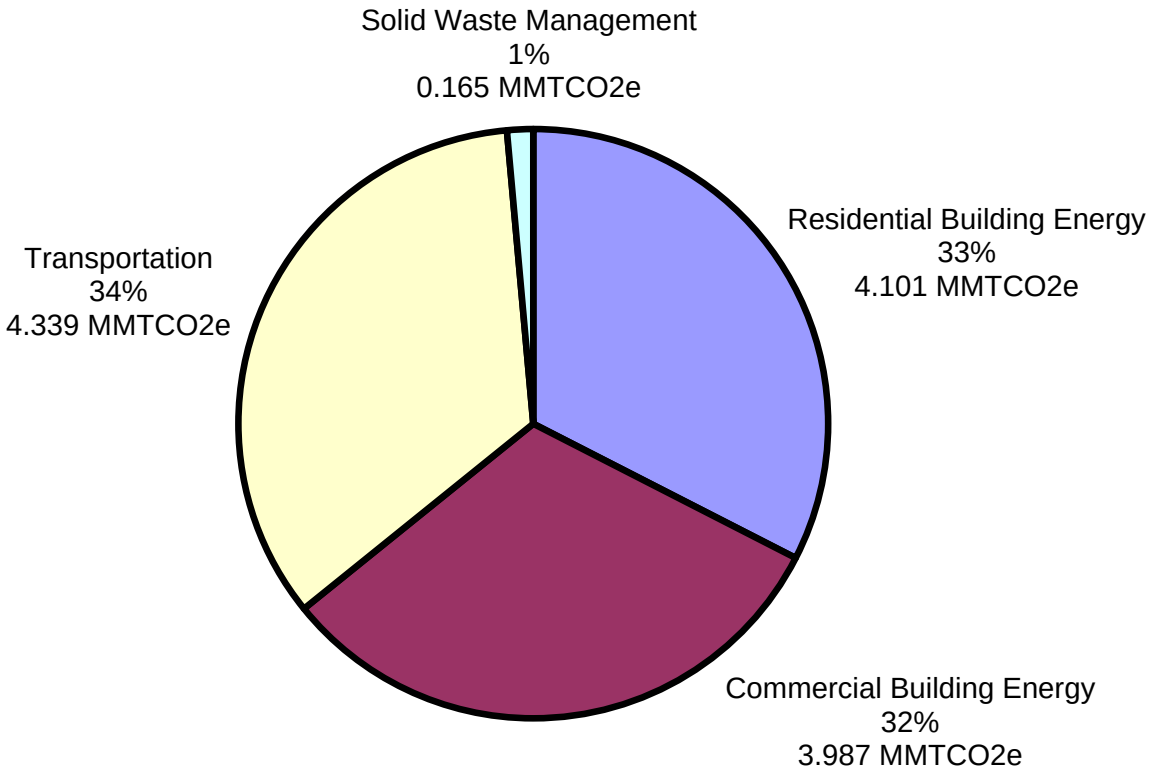
In addition, educational and outreach efforts will achieve their desired results only if linguistic, cultural, racial, and religious differences are truly considered. In order for our residents and businesses to speak with one voice about the County's mission to reduce GHG emissions, it is essential that the County government find ways to broaden and deepen its dialogue with all groups so that the Plan resonates with all sectors of society. As the County deliberates on the recommendations, broader stakeholder engagement is essential to ensure that on-going

implementation reflects the community's diverse needs and interests. If pursued in this way, the Climate Protection Plan has the potential to serve as a powerful unifying force.

Greenhouse Gas Emissions in Montgomery County

To support the development of the Climate Protection Plan, the Department of Environmental Protection (DEP) conducted a GHG emissions inventory that established an emissions baseline for the County. As shown in Figure ES-1, the inventory indicated that total measured GHG emissions in the County in FY05 were 12.592 million metric tons of carbon dioxide equivalents (MMTCO2e), with three sectors accounting for 99 percent of the total – energy use in residential buildings, energy use in commercial/multifamily/public buildings, and transportation, with each contributing roughly a third of the emissions.

Figure ES-1 – Total Montgomery County GHG Emissions in FY05



Montgomery County's goal is to reduce GHG emissions 80% by 2050 from the FY05 base year. Therefore, the County's emission target in 2050, based on GHG emissions of 12.592 MMTCO2e in FY05, is 2.518 MMTCO2e. This is a reduction of more than 10 MMTco2e. However, data for building energy usage, which is the only major component of the County's GHG emissions for which reliable historical data exists, suggests the County's future "business

as usual" GHG emissions would track population growth. When this growth is factored in, the County's projected 2050 "business as usual" emissions would total 16.638 MMTCO2e. In order to meet the 2.518 MMTCO2e target by 2050, therefore, emissions will have to be reduced by 14.119 MMTCO2e, which is greater than the County's total base year FY05 emissions.

These reductions will not be achieved solely through programs adopted by Montgomery County. Policies and programs at the federal level – for example, strengthened Corporate Average Fuel Economy (CAFE) standards or more stringent requirements on electric generating facilities – will play a major role in achieving emissions reductions. At the State level, the Maryland Commission on Climate Change projects that full implementation of the forty-two measures included in the Commission's *Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy* would achieve reductions that will be consistent with the established goal of reducing statewide emissions by at least 25%.

The Recommendations

A summary of the 58 recommendations of the SWG are shown in Table ES-2. The Plan contains detailed background information and implementation steps for each of the recommendations. In addition to the adopted recommendations, the Plan also provides information about several related issues that will be explored in more detail in future plans, including solid waste management, water supply and wastewater management, "green" economic development, and adaptation.

Funding Options for Climate Change Programs

The implementation of the majority of the recommendations in this Climate Protection Plan will require funding. In some cases, funds can be redirected from existing programs, or existing programs can be modified to incorporate climate change objectives. In other cases, after initial funding is provided, cost savings can be used to fund additional activities and even pay back the original funding source. Finally, there are some programs that may require a steady source of funding. The Plan explores three different methods of funding climate protection programs, including fuel/energy and carbon taxes, sustainable energy funds, and cap and trade programs. The information provided is not intended to be an exhaustive review of the financial, regulatory and legal issues associated with these complex mechanisms, although it does raise the issues and questions the County would need to address before pursuing these options.

Table ES-2 – Summary of Recommendations in the Climate Protection Plan

Renewable Energy

RE-1	Maintain the commitment of the County government and County agencies to purchase a percentage of annual electricity consumption from clean energy sources. Establish energy policy criteria recognizing the benefits and prioritizing the purchase of various clean energy options.
RE-2	Adopt building design guidelines applicable to all County government and agency buildings requiring the use of geoexchange, or the most effective system available, as the primary heating and cooling energy source.
RE-3	Support the installation of solar photovoltaic systems through the use of power purchase agreements in public facilities.
RE-4	Provide revolving and low-interest loans for on-site renewable energy installations.
RE-5	The County should facilitate customer aggregation of renewable energy, including voluntary purchases of electricity from renewable sources or renewable energy certificates, and renewable energy installations.
RE-6	Establish a public-private, non-profit entity to promote, facilitate, develop and invest in clean energy sources for the benefit of Montgomery County agencies, businesses and residents.
RE-7	Investigate the feasibility of adding sustainable energy biogas/combined heat & power (CHP) facilities to WSSC Seneca and Piscataway wastewater treatment sites.

Residential Building Energy Efficiency

EER-1	Develop promotional giveaways and buy-downs of low-cost energy efficient products.
EER-2	Develop energy efficiency programs, in coordination with State and utility-based programs, to assist low income households address their energy needs.
EER-3	Enhance consumer awareness of energy consumption by advocating for utility programs that provide home-energy consumption displays and develop other County programs to increase availability and affordability of in-home energy displays.
EER-4	Develop a low cost loan program to facilitate residential energy efficiency improvements.
EER-5	Create an effective residential energy education and outreach program with the goal that 50% of Montgomery County homeowners will take steps to reduce the annual consumption of energy in their homes by at least 25% by 2020.
EER-6	Promote the deployment of smart grid technologies by utilities serving Montgomery County.

Table ES-2 – Summary of Recommendations in the Climate Protection Plan (cont'd)

Commercial, Multi-family, and Public Building Energy Efficiency

EEC-1	Require ENERGY STAR appliances and equipment, and EPEAT registered IT equipment, in public facilities.
EEC-2	Improve the energy performance of public facilities through enhanced data acquisition and energy efficiency measures.
EEC-3	Establish specific energy performance requirements and timelines for the benchmarking, commissioning and improvement of new and existing commercial and multi-family buildings in order to reduce energy consumption by 25% by 2020. This will be achieved by a combination of education and outreach efforts, incentives, market forces and, if necessary, mandates.
EEC-4	Develop a process for adopting new energy efficiency standards for commercial and multi-family buildings.
EEC-5	Advocate for cost-effective utility-based energy efficiency and demand reduction programs, and form partnerships with local utilities to extend programs to businesses and residents.
EEC-6	Advocate for peak pricing and tiered electricity rate structures that encourage energy conservation by providing pricing signals for energy consumption during peak periods or by large users.
EEC-7	Develop and implement programs to support energy efficiency improvements by residents, managers and owners of multifamily properties, particularly affordable and low-income properties.
EEC-8	Use energy efficient lighting technologies when installing new streetlights or replacing existing streetlights.

Transportation

T-1	Conduct parking supply and pricing study to ensure parking policies and zoning requirements are consistent with transportation demand management goals.
T-2	Establish a car sharing program in Parking Lot District facilities
T-3	Support the Ridership Growth Initiative by 2020 by implementing bus rapid transit on Veirs Mill Road and Georgia Avenue, and study and implement where appropriate light rail transit and bus rapid transit systems in other corridors.
T-4	Conduct transportation planning studies during 2009 in order to better target transportation-related GHG reduction programs.

Table ES-2 – Summary of Recommendations in the Climate Protection Plan (cont'd)

Transportation (Cont'd)

T-5	Identify pedestrian improvements to maximize walking and bicycling to recreation centers, libraries, shopping centers and schools.
T-6	Plan, design and construct bicycle paths, lanes and shared signed roadways, as well as facilities supporting bicycling, to encourage increased use of bicycling for commuting and other transportation needs.
T-7	Explore ways to reduce vehicle travel to schools by expanding walking, bicycling and use of buses.
T-8	Develop a policy that requires the consideration of roundabouts whenever traffic signalization is being pursued.
T-9	Develop comprehensive idling policies supporting Maryland's vehicle anti-idling law with an emphasis on both education/outreach as well as effective enforcement of the law.
T-10	Increase the County government employee commuter benefit to be consistent with US government agencies.
T-11	Create an effective transportation education and outreach campaign to modify resident and business transportation behavior to reduce GHG emissions.
T-12	Coordinate with other regional, state and federal governments and organizations on activities that will result in reduced emissions from the transportation sector as a result of a more efficient transportation system and the use of more efficient modes of transportation.

Forestry & Agriculture

F&A-1	Develop an accurate inventory of forest cover and tree canopy in Montgomery County, and set forest cover and tree canopy goals.
F&A-2	Develop a comprehensive approach that protects and enhances forest and tree resources.
F&A-3	Lobby the State of Maryland and the Department of Natural Resources (DNR) to revise and update the State Roadside Tree Law (RTL) and its implementing regulations, as well as enforce the existing law. Explore opportunities to increase the role of the County departments and agencies in protecting trees in the right-of-way (ROW).
F&A-4	Extend the County's current property tax credit for energy conservation and renewable energy measures to include tree planting.

Table ES-2 – Summary of Recommendations in the Climate Protection Plan (cont'd)

Forestry & Agriculture (Cont'd)

F&A-5	Create landscape incentives in urban areas to increase number, quality, and survivability of trees planted in the public right-of-way and on private property.
F&A-6	Increase shade tree planting and maintenance in public and private parking lots.
F&A-7	Develop simplified processes to enable landowners to establish conservation easements or protection areas.
F&A-8	Encourage and foster school programs integral to curricula that promote increased student involvement and engagement in forest and tree planting, conservation and maintenance programs within their communities and on available public property. Engage surrounding communities in planting and conserving trees on private property.
F&A-9	Develop an educational campaign to convey the vital role trees play in the long-term sustainability and health of the County.
F&A-10	Manage non-native invasive pests that threaten forests and trees.
F&A-11	Expand local production of fruits and vegetables.

Land Use & Planning

LUP-1	The County's Growth Policy should direct growth to areas with significant existing or planned transit resources, and promote development that fulfills smart growth criteria such as those required as part of the LEED) for Neighborhood Development or more stringent County standards.
LUP-2	Amend the Zoning Code.
LUP-3	Master Plans should plan for redevelopment to create compact, livable places with a variety of housing types and mixed uses that invite people to walk or bike safely to work, to shop, and to participate in community life without a long commute by car. The Agricultural Reserve should continue to be protected for food production, recreation, and carbon sequestration.
LUP-4	A Green Infrastructure Plan should be adopted to protect an interconnected network of forests, fields and wetlands and provide priorities for protection, restoration and mitigation of loss of natural resources. This plan will be considered in master plans, development proposals (both public and private) and park acquisition for natural resource protection.

Table ES-2 – Summary of Recommendations in the Climate Protection Plan (cont'd)

Land Use & Planning (Cont'd)

LUP-5	A Water Resources Functional Master Plan (WRFMP) should be adopted to provide priorities for water resources goals in other functional and area/sector master plans; development proposals; park acquisition that focuses on forest cover, wetland, and tree canopy protection; restoration and enhancement; as well as Environmental Site Design (ESD) implementation. Policies and strategies that provide water-related benefits through enhancements in these areas will also provide ancillary, carbon reduction benefits.

Education & Outreach

ED-1	Develop a branded communication platform that will enable the County to speak with one voice about its mission to reduce GHG emissions.
ED-2	Develop and provide presentation toolkits to support a social marketing campaign that raises awareness about Climate Protection Plan programs and encourages active participation throughout the County.
ED-3	Develop, provide access to and promote an on-line tool to promote the Climate Protection Plan and other related programs in order to raise awareness of the need to reduce greenhouse gases, provide specific actions, and encourage community based sustainability.
ED-4	Build and maintain an information network service that provides online Climate Protection Plan updates on County programs and regular specific suggestions such as "Green Tips" to inform and encourage residents to take action to reduce greenhouse gases.
ED-5	Establish and coordinate a coalition with representation from a broad range of community organizations to support outreach, raise awareness of the climate protection plan and to provide opportunities and support for education programs.
ED-6	Promote community-based education programs using the model of small, self-facilitated group discussions to motivate and empower members of the community on issues concerning sustainability.
ED-7	Establish, coordinate and maintain a County interdepartmental education and outreach plan.
ED-8	The County Government and agencies should adopt broad-based sustainable practices and policies, and use these programs as a basis for outreach to the private sector.
ED-9	Replicate community-based organizations like Bethesda Green under a central umbrella organization.

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LIST OF ACRONYMS

AGP .....Annual Growth Policy
AMI.....Advanced Metering Infrastructure
APFO .....Adequate Public Facilities Ordinance
BRT.....Bus Rapid Transit
CAFE .....Corporate Average Fuel Economy
CCEF .....Connecticut Clean Energy Fund
CER .....Clean Energy Rewards
CFL .....Compact Fluorescent Light Bulb or Lamp
CHP .....Combined Heat and Power
CO .....Carbon Monoxide
CO2 .....Carbon Dioxide
CSA.....Community Supported Agriculture
CxA .....Commissioning Agent
DED .....Department of Economic Development
DEP .....Department of Environmental Protection
DFMS.....Division of Fleet Management Services
DGS .....Department of General Services
DNR .....Department of Natural Resources
DOE .....U.S. Department of Energy
DOT .....Department of Transportation
DPS.....Department of Permitting Services
DSWS .....Division of Solid Waste Services
EPA.....U.S. Environmental Protection Agency
EPC.....Energy Performance Contract
ESCO.....Energy Service Company
ESD.....Environmental Site Design
EUSP .....Electric Universal Service Program
FCL .....Forest Conservation Law
GEDI .....Green Economic Development Initiative
GHG .....Greenhouse Gas
HVAC.....Heating, Ventilating, and Air Conditioning
ICC .....Inter-County Connector
ICLEI.....International Council for Local Environmental Initiatives
IPCC .....Intergovernmental Panel on Climate Change
KW .....Kilowatt
LED.....Light Emitting Diode
LEED.....Leadership in Energy and Environmental Design
LRT .....Light Rail Transit
MC .....Montgomery College
MCEC .....Maryland Clean Energy Center
MCPS.....Montgomery County Public Schools

LIST OF ACRONYMS (Cont'd)

MDHP .....Maryland Home Performance
MEA .....Maryland Energy Administration
MEAP.....Maryland Energy Assistance Program
MGD.....Million Gallons per Day
MMTCO2e .....Million Metric Tons of Carbon Dioxide Equivalents
M-NCPPC .....Maryland-National Capital Park & Planning Commission
MRF .....Materials Recycling Facility
MTA .....Maryland Transit Administration
MWCOG .....Metropolitan Washington Council of Governments
NAAQS .....National Ambient Air Quality Standards
NNI.....Non-Native Invasive
NOx .....Nitrogen Oxides
NWEI.....Northwest Earth Institute
OHEP.....Office of Home Energy Programs
OLO .....Office of Legislative Oversight
PAHs .....Polycyclic Aromatic Hydrocarbons
PLD.....Parking Lot District
PM .....Particulate Matter
PPA.....Power Purchase Agreement
PSC.....Public Service Commission
PV .....Photovoltaic
REC .....Renewable Energy Certificate or Credit
RGGI.....Regional Greenhouse Gas Initiative
RTL .....Roadside Tree Law
SEF.....Sustainable Energy Fund
SEIF.....Strategic Energy Investment Fund
SEU.....Sustainable Energy Utility
SIP .....State Implementation Plan
SO2.....Sulfur Dioxide
SOP .....Standard Operating Procedure
SWG .....Sustainability Working Group
TDR.....Transfer of Development Rights
TMX .....Transit Mixed Use
TS .....Transfer Station
USPP .....Utility Service Protection Program
VMT .....Vehicle Miles Traveled
WAP.....Weatherization Assistance Program
WMATA.....Washington Metropolitan Area Transit Authority
WRFMP .....Water Resources Functional Master Plan
WSSC .....Washington Suburban Sanitary Commission
WWTP.....Wastewater Treatment Plant

1.0 Introduction

Montgomery County, Maryland has been a national leader in addressing climate change. From the early adoption of climate protection objectives to the implementation of ground-breaking programs designed to expand the use of clean energy, increase the energy efficiency of buildings, or develop new transportation initiatives, the County has sought effective and innovative solutions to reducing the County's climate footprint. This 2009 Climate Protection Plan represents the next major step in the County's efforts. The Plan, developed by leaders from the County government and the community, contains 58 specific recommendations across a broad spectrum of activities to ensure that Montgomery County remains at the forefront of local governments addressing climate change.

1.1 Background on Montgomery County's Response to Climate Change

Montgomery County's first explicit step toward recognizing its obligations to address climate change occurred in 2000, when the County joined the International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection campaign. In 2007, Montgomery County was one of the founding counties involved with the Sierra Club in the creation of the Cool Counties Climate Stabilization Declaration, an initiative encouraging action by counties across the nation to address the challenges climate change poses to local communities. Participating counties pledge to reduce greenhouse gas (GHG) emissions by 80% by 2050, and to work together to urge action at the federal government.

The County's commitment to the 80% reduction goal was reaffirmed in County Code as part of a package of seven climate related bills approved by the County Council on Earth Day, April 22, 2008. These bills (1) directed the County to research a variety of potential climate protection initiatives, (2) implemented several specific programs, and (3) created the Sustainability Working Group (SWG). The initial charge to the SWG was to outline:

> "…a plan to reduce County wide greenhouse gas emissions to 80% below the amount…in the base year [FY05]…including a plan to stop increasing County wide greenhouse gas emissions by 2010 and achieve a 10% reduction every 5 years through 2050."

The legislation requires the submission of an annual update of the Climate Protection Plan, including identifying the actions taken in the County in the preceding year to implement the Plan, and whether the County is meeting the goals identified in the Plan.

1.1.1 The Sustainability Working Group

Leading up to the adoption of climate-related legislation in April 2008, County Executive Isiah Leggett and the County Council recognized that the challenges posed by climate change require involvement from not only all facets of government, but each and every resident, business, and institution in the County. As a result, the policies and programs that would be part of the County's long term strategy should be formulated by a broad spectrum of individuals representing government, residents, and the business community.

The SWG, first proposed by the County Executive in response to County Bill 32-07 introduced by Councilmember Roger Berliner, consists of 26 representatives, 15 from the County government, County agencies or regional organizations, and 11 from the public. The diversity of government representatives – including officials involved in environmental protection, planning and development review, transportation, facilities, fleet management, and economic development – encourages departments and agencies to take a long-term view and transcend traditional mission statements. The public members represent a broad range of disciplines and organizations, including the business community, land development or building interests, energy distribution or supply firms, science and academia, communications and media, and civic organizations. As a result, while this Plan is the first iteration of an on-going process, it is far more comprehensive than it would have been if just one department or civic group crafted the plan in isolation.

Perhaps most importantly, the process the SWG engaged in during the development of the Climate Protection Plan highlighted the community-building aspect that comes from addressing a common concern. Indeed, the development of this Plan has helped lay the foundation for broadened community participation and engagement, an essential factor in achieving the County's GHG reduction targets.

1.1.2 Process for Development of the Climate Protection Plan

To support the anticipated development of policies and programs to address climate change, the Department of Environmental Protection (DEP) finalized a GHG emissions inventory for the County in 2008. This inventory, discussed in more detail in Section 2.0, served as the starting point for the development of the County's Climate Protection Plan. The inventory indicated that three sectors account for 99 percent of the total measured emissions in the County – energy use in residential buildings, energy use in commercial/multifamily/public buildings, and transportation, with each contributing roughly a third of the emissions. In addition, DEP reviewed the climate plans of a number of jurisdictions throughout the country, and developed a "catalog" of potential actions the County could consider as part of its initial Climate Protection Plan.

The SWG convened for the first time in September 2008. Based on the information provided by DEP, the SWG determined that it would be appropriate to establish committees to look more closely at issues in seven distinct areas:

- Renewable Energy
- Residential Building Energy Efficiency
- Commercial/Multi-Family/Public Building Energy Efficiency
- Transportation
- Forestry & Agriculture
- Long-Term Planning (including Land Use Planning)
- Education & Outreach

Each committee, chaired by one or more members of the SWG, was made up of individuals with expertise and interest in the committee's work. The committees, which ranged in size from 10

to 25 individuals, met every 2-3 weeks. The recommendations proposed in this Plan were formulated, debated, and initially drafted at the committee level before being brought to the SWG for review and incorporation into the final Plan.

The process through which the SWG and its committees worked to develop the County's initial Climate Protection Plan revealed the significant challenges and great opportunities that surround the issue of climate change. The Plan's collective recommendations received overwhelming support from members of the SWG and the committees. Given the volume of recommendations, the Group realized that it would be unreasonable to expect full agreement on each and every issue. In fact, there were areas of spirited debate and, in some instances, disagreement. In many cases, the resolution to these disagreements will be addressed over time as (1) the County's climate protection programs mature, (2) actions are implemented at the state and federal level, and/or (3) technological advances occur and become accepted as common practice. It is useful, however, to acknowledge the areas of disagreement so that they can be taken into account as County policymakers move forward to implement the recommendations in this Plan.

Scope of the Climate Protection Plan

Achieving 80% reductions in GHG emissions is a daunting challenge. Significant changes will be necessary in the way we generate and use energy. Yet these changes will not occur overnight. Nor will changes in the policies and programs of Montgomery County alone have a significant impact without others taking similar actions. Nonetheless, the majority involved in the development of the Plan felt strongly that the County has an obligation to "do its part" to address climate change, and anything less than a full commitment to the 80% reduction goal was unacceptable. Others expressed the opinion that the goal, while laudable, was not something to which the County should unilaterally commit – significant federal and state assistance and actions are necessary – and that the County's programs should not create undue requirements and obligations on County residents and businesses. Even these participants, however, understood the task assigned to the SWG and were committed to the development of a comprehensive and ambitious Plan.

Fiscal Constraints and Opportunities

The pace of the County's efforts to address climate change was also the subject of significant discussion. As noted, there was strong support from the Group for the recommendations contained in the Plan. However, the submission of this Plan coincides with a severe economic recession affecting jurisdictions across the nation. Montgomery County is no exception. At the time of the publication of this Plan, the County government is facing an estimated $450 million gap as it develops the budget for FY10, which represents approximately 12 percent of the overall operating budget. Businesses are equally stressed, and development activity in the County has dropped precipitously. Given this situation, a few participants in the process felt that the County should proceed cautiously and carefully consider the timing of policies and programs that exert (or appear to exert) additional fiscal pressure on the government or the private sector. In

particular, some were concerned that certain recommendations mandate specific actions without a full understanding of the ramifications of those actions, particularly their impact on economic activity in the County.

In contrast, however, a majority felt that the Plan promotes both environmental *and* financial sustainability. While the initial cost of some of the recommendations may seem untimely during this period of fiscal austerity in government and within the community, many of them specifically address financing obstacles faced by both government and the private sector and lay the groundwork for short and long-term savings, in some cases significant. Thus, the costs associated with many of these proposals should be considered prudent investments that will actually save money. Moreover, many of the recommendations will help to stimulate development of the County's green business sector, thus providing jobs and strengthening the tax base.

Ultimately, the SWG concluded that their task was to develop a plan to start the County along the path of reducing GHG emissions by 80% by 2050, not to focus their energy adjudicating between competing public policies. While the Group endeavored to balance conflicting priorities, it concluded that resolution of such conflicts should be the domain of elected officials.

Prioritization of Recommendations

This Plan includes 58 specific recommendations the County could implement. Many more were examined and debated based on the hundreds of different actions that are being considered or implemented around the country. There was a strong desire among all participants to develop a process for prioritizing these actions so that the most "effective" ones were pursued first. The issue was how to define effectiveness. Ideally, a rigorous evaluation methodology could be employed to consider such critical factors as GHG reduction potential, implementation cost, return on investment, etc., but it was recognized that there were insufficient data immediately available to pursue such an approach, even if such a methodology existed. At the opposite end of the spectrum, a "gut feel" approach was clearly unacceptable as well.

Nonetheless, given the magnitude of the problems associated with climate change, the SWG felt it needed to set forth some concrete recommendations immediately. It did not want to defer recommendations until a thorough analysis could be completed, nor did it feel that outlining general policy considerations was adequate. The SWG recognized that dramatic and immediate steps must be taken to achieve the County's GHG emission reduction goals, and that bold and actionable recommendations were necessary. It was also clear to the Group that no "silver bullet" exists that would solve the problem. Rather, addressing climate change will require a broad complement of coordinated and leveraged actions by individuals, institutions, and government.

The SWG therefore agreed that it should recommend actions for immediate consideration if they met all three of what came to be known as "implementability" criteria:

- The action is a proven practice or complements, expands, or strengthens a program or policy already in place
- The action is technically and logistically feasible in the short term
- The general steps required for implementation can be defined

As the recommendations progress toward implementation, rigorous cost-benefit analyses will be done that will guide the County in making future decisions.

Urgency of Action

The recommendations offered in this Plan reflect the SWG's belief that actions not be deferred until such an analysis has been completed. All the recommendations can be pursued immediately since they face relatively minor barriers and either build on successful County programs or are patterned after proven practices elsewhere. Some are relatively simple to implement and require little or no up front costs. Others require funding or legislative action, but they are all clearly within the County's immediate reach. In short, the greatest risk is in waiting for precise data and thorough analysis before taking action.

Specific Local Issues

Although climate change is a global problem requiring global solutions, the implementation of policies and programs at the local level is bound to shine a spotlight on specific local issues, particularly those that are the subject of passionate disagreement.

One such issue in Montgomery County is the Inter-County Connector (ICC). After years of study and debate, construction on the ICC is underway. Yet there remains disagreement about the costs and benefits of this project, including its impact on climate change and potential to limit the funding available for public transit projects. Some SWG and committee members felt that it would be irresponsible to develop a Climate Protection Plan for the County and not address the ICC's GHG impact. Ultimately, however, the SWG agreed that although the impact of the ICC would have to be considered in determining progress toward future goals, resolution of the ICC debate was beyond the capacity of the Group. However, the SWG recognized the need to more rigorously examine the GHG impacts of major transportation and land development projects. Recommendation T-4 calls for the identification of the technical analyses required to forecast GHG emissions from future transportation and land use planning efforts so that the effects of individual plans and projects (such as major roads and rail and bus systems) can be forecasted and incorporated into the County's decision-making process.

1.1.3 On-Going and Evolving Effort

The Climate Protection Plan is just the beginning of an on-going effort to address climate change. The County will contract with a consultant to assist in the development of a rigorous

evaluation methodology and monitoring framework to track actual GHG reductions against established goals. This will form the basis of a monitoring plan enabling the SWG to report on its progress annually. It will also clarify gaps, shortfalls, and opportunities so that actions can be revised and added.

The 58 recommendations included in this Plan have already prompted consideration of additional recommendations that could not be incorporated in this year's Plan prior to the submission deadline. These ideas will be reviewed as part of next year's updated Plan. In addition, there are other prospective, and potentially significant, actions that did not meet the "implementability" criteria that must be analyzed in greater detail.

Finally, although the Plan's focus is on reducing GHG emissions, the SWG intends to establish a long term and broad based Sustainability Action Plan that goes well beyond climate protection and includes areas such as water and air quality, pollution prevention, waste reduction, etc. In short, the County has committed to an aggressive, comprehensive and on-going effort to build a more sustainable future.

1.1.4 Environmental Equity

The success of the Climate Protection Plan is dependent upon broad inclusion and mobilization of the County's population. All residents must have access to carbon reduction programs, and share in the resulting health and economic benefits. As decision makers implement the Plan's recommendations, it is critical that they strive to maximize social benefits and avoid adverse, unintended consequences. The County must ensure that low income households and at risk populations are not disproportionately burdened. For example, it is not acceptable that the costs of, but not the savings from, energy efficiency improvements at a multifamily property are passed on to residents, potentially resulting in their displacement from their apartments. Similarly, programs must be accessible to small businesses that may not have the resources of larger organizations. The County must strive to balance the common good derived from public expenditures to achieve particular policy objectives against the ability of some to absorb the costs associated with achieving these objectives.

In addition, educational and outreach efforts will achieve their desired results only if linguistic, cultural, racial, and religious differences are truly considered. In order for our residents and businesses to speak with one voice about the County's mission to reduce GHG emissions, it is essential that the County government find ways to broaden and deepen its dialogue with all groups so that the Plan resonates with all sectors of society. As the County deliberates on the recommendations, broader stakeholder engagement is essential to ensure that on-going implementation reflects the community's diverse needs and interests. If pursued in this way, the Climate Protection Plan has the potential to serve as a powerful unifying force.

1.2 The Need for Climate Protection

There is widespread scientific consensus that human activities have increased the concentration of GHGs in the atmosphere, and that this increase has affected the Earth's climate system. As the U.S. Environmental Protection Agency states:

> "Scientists know with virtual certainty that human activities are changing the composition of Earth's atmosphere. Increasing levels of greenhouse gases like carbon dioxide (CO2) in the atmosphere since pre-industrial times are well-documented and understood." (www.epa.gov/climatechange/science/stateofknowledge.html)

In its 2007 report, the Intergovernmental Panel on Climate Change (IPCC) stated that:

> "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (www.ipcc.ch/ipccreports/index.htm)

1.2.1 The Global Impact of Climate Change

The potential effects of climate change are well documented. On a global scale, observable changes include the loss of polar ice, shrinking of glaciers, thawing of permafrost, later fall freezing and earlier spring break-up of ice on rivers and lakes, lengthening of growing seasons, and shifts in plant and animal ranges. A particularly significant concern for many coastal areas is the potential for a rise in sea level, the magnitude of which is difficult to predict, reflecting the complex science associated with climate change. According to the EPA, some processes affecting sea level have long (centuries and longer) time-scales, so that current sea level change is also related to past climate change, and some relevant processes are not determined solely by climate. (www.epa.gov/climatechange/effects/coastal/index.html)

Another potentially significant impact of climate change is the variation in weather patterns and the increase in severe weather events, including droughts, heat waves and hurricanes. Table 1 lists the potential effects of these changes as summarized by the 2007 report of the IPCC. (www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf)

1.2.2 The Impact of Climate Change on Maryland and Montgomery County

In July 2008, the Scientific and Technical Working Group of the Maryland Commission on Climate Change issued a *Comprehensive Assessment of Climate Change Impacts in Maryland*. (www.mde.state.md.us/Air/climatechange/index.asp) This report, based on extensive literature reviews and model projections, summarized the likely consequences of climate change on Maryland:

> Temperature Variations
>
> Climatic regimes will continue to vary across the state. Western Maryland has cooler winters and summers and less precipitation during the winter than the rest of the state. Changes that occur will overlay these regional differences, perhaps with some greater warming during the summer to the west than on the Eastern Shore. Temperature is projected to increase substantially, especially under higher emissions. The increase in average summer temperatures in terms of degrees of warming is greater than that in

Table 1 – Potential Effects of Changes in Weather Patterns Due to Climate Change

Projected Change	Projected Impacts by Sector			
	Agriculture & Forestry	**Water Resources**	**Human Health**	**Industry/Society**
Warmer/fewer cold days/nights; warmer/more hot days/nights over most land areas	Increased yields in colder environments; decreased yields in warmer environments	Effects on water resources relying on snow melt	Reduced human mortality from decreased cold exposure	Reduced demand for heating; increased demand for cooling; declining air quality in cities; reduced effects of snow, ice, etc.
Warm spells/heat waves: frequency increases over most land areas	Reduced yields in warmer regions due to heat stress at key development stages; fire danger increase	Increased water demand; water quality problems, e.g., algal blooms	Increased risk of heat-related mortality	Reduction in quality of life for people in warm areas without air conditioning; impacts on elderly and very young; reduced thermoelectric power production efficiency
Heavy precipitation events: frequency increases over most areas	Damage to crops; soil erosion, inability to cultivate land, water logging of soils	Adverse effects on quality of surface and groundwater; contamination of water supply	Deaths, injuries, infectious diseases, allergies and dermatitis from floods and landslides	Disruption of settlements, commerce, transport and societies due to flooding; pressures on urban and rural infrastructures
Area affected by drought: increases	Land degradation, lower yields/crop damage and failure; livestock deaths; land degradation	More widespread water stress	Increased risk of food and water shortage and wild fires; increased risk of water- and food-borne diseases	Water shortages for settlements, industry and societies; reduced hydropower generation potentials; potentials for population migration
Number of intense tropical cyclones: increases	Damage to crops; wind throw of trees	Power outages cause disruption of public water supply	Increased risk of deaths, injuries, water- and food-borne diseases	Disruption by flood and high winds; withdrawal of risk coverage in vulnerable areas by private insurers
Incidence of extreme high sea level: increases	Salinization of irrigation and well water	Decreased freshwater availability due to saltwater intrusion	Increase in deaths by drowning in floods; increase in stress-related disease	Costs of coastal protection *versus costs of land-use* relocation; also see tropical cyclones above

winter. Annual average temperatures are projected to increase by about 3°F by mid-century and is likely unavoidable. The amount of warming later in the century is dependent on the degree of mitigation of greenhouse gas emissions, with summer temperatures projected to increase by as much 9°F and heat waves extending throughout most summers if greenhouse gas emissions continue to grow unchecked.

Precipitation

Precipitation is projected to increase during the winter, but become more episodic, with more falling in extreme events. Projections of precipitation are much less certain than for temperature, but the mean projections indicated modest increases of about 10% or so

are likely in the winter and spring. Because of more intermittent rainfall and increased evaporation with warmer temperatures, droughts lasting several weeks are more likely to occur during the summer.

Water Resources & Aquatic Environments

Increased precipitation in the winter and spring would mean that the water supplies in the greater Baltimore area will probably not be diminished, but the adequacy of summer water supplies in the greater Washington region, which rely on Potomac River flows, is less certain. Any increases in precipitation are unlikely to replace groundwater substantially enough to compensate excessive withdrawals of some aquifers. At the same time, summer droughts may increase groundwater demand for agricultural irrigation.

More intense rainfall resulting from the combined effects of global climate change and localized factors (for example, the influence of the urban canopy on rainfall) is likely to increase peak flooding in urban environments. Continued increase in impervious surfaces attendant with development would exacerbate this problem. Aquatic ecosystems will likely be degraded by more flashy runoff and increased temperatures. Intensified rainfall events and warmer surfaces (roads, roofs, etc.) would result in rapid increases in stream temperatures, limiting habitat suitability for native fishes and other organisms. Higher peak flows and degraded streams would also transmit more nutrients and sediments to the Chesapeake Bay and its tidal tributaries, contributing to water quality impairment in the estuaries.

Farms & Forests

Crop production may increase initially, but then decline later in the century if emissions are not reduced. The longer growing season and higher carbon dioxide levels in the atmosphere are likely to increase crop production modestly during the first half of the century. Later in the century, crop production is likely to be reduced due to heat stress and summer drought under the higher emissions scenario. Milk and poultry production would also be reduced by heat stress. These changes will require adaptation by Maryland's agricultural industry, including changes in crop or animal varieties, increased irrigation, and air conditioning for some livestock.

The maple-beech-birch forest of Western Maryland is likely to fade away and pine trees to become more dominant in Maryland's forests. Forest productivity in terms of timber produced is likely to decline late in the century under the higher emissions scenario as a result of heat stress, drought, and climate-related disturbances such as fires and storms. The biodiversity of plants and animals associated with Maryland's forests is likely to decline. Habitat alterations resulting from climate change may force out 34 or more bird species, including the emblematic Baltimore oriole, although southern species may replace them.

Coastal Vulnerability

Sea level in Maryland rose by 1 foot in the 20th century, partially because the land is sinking as a result of slow adjustments of the Earth after the last Ice Age. Maryland coastal regions have been subsiding at about a rate of 6 inches per century and should continue at this rate during this century. Additionally, the average level of the sea in this region rose by about the same amount (6 inches) during the past century, resulting in the observed 1 foot of rise of the mean tidal level relative to the land. As a result, Maryland has experienced considerable shoreline erosion and deterioration of coastal wetlands which are a critical component of its bays and estuaries.

Sea-level rise is very likely to accelerate, inundating hundreds of square miles of wetlands and land. Projections that include accelerating the melting of ice would increase the relative sea-level along Maryland's shorelines by more than 1 foot by mid-century and 3 feet by late century if greenhouse gas emissions continue to grow. If sea level rises by 3 feet, most tidal wetlands would be lost—about 200 square miles of land would be inundated. New tidal wetlands developed on newly flooded land would not offset the loss of existing wetlands and significant negative effects on living resources dependent on these wetlands would result. Moreover, if sea level were to rise by 3 or more feet, this would mean that rapid and probably uncontrollable melting of land-based ice was underway and that sea level would rise at an even greater rate during subsequent centuries.

Rains and winds from hurricanes are likely to increase, but changes in their frequency cannot be predicted at the present time. The destructive potential of Atlantic tropical storms and hurricanes has increased since 1970 in association with warming sea surface temperatures. This trend is likely to continue as ocean waters warm. Whether Maryland will be confronted with more frequent or powerful storms depends on storm tracks that cannot yet be predicted. However, there is a greater likelihood that storms striking Maryland would be more powerful than those experienced during the 20th century and would be accompanied by higher storm surges – made worse because of higher mean sea level – and greater rainfall amounts.

Human Health

Health risks due to heat stress are very likely to increase if emissions are not reduced. Under the higher emissions scenario, heat waves are projected to greatly increase risks of illness and death before the end of the century, with an average of 24 days per summer exceeding 100°F. The poor, the elderly, and urban populations are most susceptible. Some, but not all, of these increased risks can be reduced by air conditioning and other adaptation measures.

Respiratory illnesses are likely to increase, unless air pollution is greatly reduced. More ground-level ozone, responsible for multiple respiratory illnesses, is formed under prolonged, high temperatures. Releases of air pollutants (nitrogen oxides and volatile organic compounds) that cause ozone to be formed have been declining, but would

have to be reduced much more in a warmer climate to avoid a reversal in progress toward achieving air quality standards.

Increased risks of pathogenic diseases may be less likely. The mortality due to vector-borne and non-vector borne diseases in the United States is low because of public health precautions and treatment, which would likely adapt to changes in disease risks. Climate change might affect the exposure of Marylanders to pathogens such as the West Nile virus, but precautions and treatment could manage this greater risk.

1.3 Co-Benefits of Climate Protection

As noted, the overwhelming majority of the scientific community agrees that human activity is altering the composition of the Earth's atmosphere, creating changes to the world's climate. Nonetheless, there are those that are not convinced that these changes are anything other than the natural variations in temperature patterns, sea levels and other characteristics of the Earth's environment. Even for those that are uncertain about climate change, however, there is a multitude of environmental, public health, and economic reasons for pursuing the recommendations contained in this Plan, which provide benefits beyond climate change mitigation.

1.3.1 Additional Environmental Benefits

Air Quality

The Clean Air Act, as amended in 1990, establishes National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants. At different times, the Washington metropolitan region, of which Montgomery County is a part, has been designated "nonattainment" for three of these pollutants – carbon monoxide (CO), particulate matter (PM), and ground level ozone. Nonattainment areas are areas where air pollution levels persistently exceed NAAQS. Plans must be developed for such areas to demonstrate how the area will come into compliance with the NAAQS for that pollutant. Such plans, known as State Implementation Plans (SIPs), include control measures that the jurisdictions in the area are taking, or will take, to reduce the emission of pollutants contributing to the violation of the NAAQS.

Through the Metropolitan Washington Council of Governments (MWCOG), Montgomery County and other jurisdictions in the Washington area have developed plans demonstrating that the area is in compliance, or will be in compliance, for those pollutants for which the area has been designated nonattainment. Many of the measures recommended in this Plan to control GHG emissions can be included as control measures in the region's SIPs and help the region to meet NAAQS.

Water Quality

Air emissions have a major impact on water quality, as pollutants released into the air eventually make their way down to the Earth's surface. Scientists estimate, for example, that one-quarter to one-third of the nitrogen that enters the Chesapeake Bay comes from air deposition –

nitrogen released into the air that falls onto the land and runs off into the water, or falls directly onto the water. (www.chesapeakebay.net/airpollution.aspx) Nitrogen is one of the primary pollutants contributing to the poor quality of the Chesapeake Bay and other water bodies; therefore, control of air emissions of nitrogen oxides (NOx) is critical to meeting water quality goals. Because NOx is primarily released into the air as a by-product of combustion – the burning of fossil fuels like oil, gas or coal – energy efficiency measures implemented to combat climate change will contribute to meeting water quality goals.

Other pollutants that are released by combustion processes include mercury and organic contaminants such as Polycyclic Aromatic Hydrocarbons (PAHs). A major source of mercury in the air is combustion of coal to generate electricity. PAHs come from a variety of sources, including vehicle exhaust. Once again, climate change measures resulting in reduced energy consumption or vehicle miles traveled will help reduce the emission of these pollutants.

Forests & Trees

This plan contains a number of recommended actions intended to protect and enhance trees and forests in the County. Trees reduce summertime temperatures through the process of evapotranspiration and from the shade they provide. This in turn reduces the formation of ground level ozone, energy needs for cooling, the evaporation of pollutants from car engines and other surfaces, and the need for maintenance of asphalt and concrete. Trees increase air quality by absorbing pollutants and filtering fine particulate matter, and they sequester and store carbon in the wood they grow. Most importantly, trees produce oxygen.

Forests and trees intercept and store rainwater, reducing stormwater management needs as well as maintenance need on existing infrastructure. Tree roots and leaf litter are essential components of healthy soils, allowing water infiltration and groundwater recharging. Trees clean and cool water through filtration and evapotranspiration.

Finally, forests and trees provide social benefits as well. Trees add to property values and increase business revenues. Tree lined streets are safer with fewer reports of crime, domestic violence, and acts of aggressive driving. Children who live on tree lined streets have lower rates of asthma, and school children with attention deficit disorders show fewer symptoms. (www.kibi.org/pdfs/Urban_Tree_Facts.pdf)

1.3.2 Social and Public Health Benefits

Beyond the environmental benefits described in Section 1.3.1, the actions proposed in this Plan provide broad social benefits. For example, the land use recommendations encourage compact and mixed use development. This facilitates increased walking and bicycling that improve health and fitness, ease traffic congestion, and foster community cohesion. Increased forests and trees reduce summertime heat and enhance wildlife habitat and ecosystems, thus increasing opportunities for local outdoor recreation and the appreciation of the County's natural resources. Finally, many opportunities to reduce GHG emissions save residents money, a particularly pressing need given the current economic recession.

The proposed measures translate into public health benefits as well. Reducing energy use helps control ozone levels and the emission of particulate matter. These pollutants can trigger a variety of health problems including chest pain, coughing, and throat irritation. They can worsen the adverse impacts associated with bronchitis, emphysema, and asthma, and cardiopulmonary problems. (www.epa.gov/particles/health.html) Certain populations are particularly at risk from these pollutants, including the elderly, children, and individuals with asthma or pre-existing heart or lung disease. A report prepared by the Natural Resources Defense Council estimated that 64,000 premature deaths from cardiopulmonary causes may be attributable to particulate air pollution each year. (www.nrdc.org/air/pollution/bt/btinx.asp) More recent studies by the California Air Resources Board suggest that the number of premature deaths may be higher than previously thought, particularly from fine particulate matter. (www.arb.ca.gov/research/health/pm-mort/pm-mort_final.pdf)

Similarly, minimizing pollutants entering water bodies through reductions in air deposition and controlling run-off through the planting of trees helps protect drinking water supplies.

1.3.3 Economic Benefits

As noted previously, the vast majority of recommendations in this Plan are focused on reducing energy consumption through improvements to buildings and transportation systems, or generating energy from renewable resources. These actions provide a host of economic benefits beyond the savings associated with purchasing less electricity, natural gas, gasoline and other fuels.

Reducing the nation's reliance on imported fossil fuels contributes to energy independence. A more immediate concern in this region, however, is the reliability of the electric grid, which is strained due to increased demand and aging infrastructure. Reducing the demand for electricity and upgrading components of the distribution system, which are key components of this Plan, will contribute to ensuring a reliable, high-quality supply of electricity to the County's homes and businesses.

Improving the region's transportation network, and developing communities where jobs, housing, shopping, and entertainment options are in proximity to one another, will maintain the County as a desirable place to live and contribute to the economic vitality of the area. This is particularly important at this point in time as the nation copes with a severe economic downturn.

Finally, a number of recommendations in the Plan call for the implementation of energy efficiency measures and support the installation of renewable energy systems. These activities create a wide range of "green collar" jobs, from the installation of insulation and energy efficient windows to the design of complex heating and cooling systems. Jobs of this type, which have received significant attention as a cornerstone of plans to revive the national economy, are a key component of the County's Green Economic Development Initiative (GEDI), which is described in greater detail in Section 10.3.

1.4 Guiding Principles of the Climate Protection Plan

The SWG adopted a set of G*uiding Principles* that were used to direct its work and help ensure a consistent focus as the recommendations in the Climate Protection Plan were developed. These principles were drafted taking into consideration the following definition:

> *Principles guide the requirements and obligations of right conduct and play a key role in setting the context for the ethical choices that organizations make.*

The *Guiding Principles* were established consistent with these criteria:

- The guidelines should focus on developing and implementing programs to achieve the County's main goal of reducing GHG emissions.
- The guidelines should address the four main elements of sustainability that also support GHG reductions: Ecology/Environment, Economy/Employment, Equity/Equality, and Education.
- The guidelines should establish principles that are clear, concise and easy to understand.

Guiding Principles of the Sustainability Working Group

1. ***Prioritize Greenhouse Gas Reductions*** – The County government and its residents should take bold actions to reduce greenhouse gases and achieve an 80 percent reduction by 2050. The County should focus on measures and actions that effectively and efficiently reduce greenhouse gas emissions.

2. ***Provide Sustainable and Innovative Programs*** – The County should commit to creating long term solutions and model programs by taking into consideration our current needs and the needs of future generations. Special consideration should be given to actions that have proven successful in other jurisdictions or that are already in place in Montgomery County and can be expanded.

3. ***Define Success*** – The County programs should establish measurable targets, provide clear lines of accountability, undergo regular review of results, and implement appropriate adjustments to ensure sufficient progress is being made.

4. ***Educate and Promote Action*** – The County should educate, motivate and empower all members of the community to increase awareness of climate change issues and to take actions that reduce the County's greenhouse gas emissions.

5. ***Lead by Example*** – The County government, businesses, non-profit institutions, residents and opinion leaders should lead the path toward climate protection by actively practicing and promoting these actions through their own behavior.

6. ***Ensure Fairness*** – The County should consider the cost and benefits of adopting certain programs, while addressing the equitable delivery of programs and services to our diverse community.

7. ***Create New Markets and Economic Activity*** – The County should promote opportunities to support current businesses and create new businesses and jobs that foster clean technology, green practices and community vitality.

2.0 Montgomery County's Greenhouse Gas Emissions

DEP conducted an inventory of GHG emissions in Montgomery County in order to establish an emissions baseline. This inventory, based on estimated emissions in FY05 (July 1, 2004 – June 30, 2005), was conducted using the Climate Action Planning software package developed jointly by ICLEI and the State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (now known as the Association of Clean Air Agencies). This software is widely used by local jurisdictions, which helps facilitate some consistency in GHG emissions estimates.

Montgomery County's GHG inventory takes into account emissions from building energy consumption, on-road transportation and solid waste. The availability of the data for these sectors varies. For example, very good data is available for building energy use from the County's energy tax, which applies to electricity, natural and LP gas, and heating oils. Transportation emissions are based on estimates of vehicle miles traveled (VMT) as well as assumptions about the breakdown of vehicles in the County. As a result, the figure for transportation emissions is a reasonable approximation but not as exact as emissions associated with building energy. Nonetheless, the emission estimates in the County's inventory provide a reasonable and replicable image of the GHG emissions of the community that can be used to evaluate policies and programs.

The County's emissions inventory does not include emissions from agricultural activities, off-road vehicles, aviation, industrial processes (except process energy), and emissions of fluorinated substances, primarily as a result of a lack of comprehensive data. Though not quantified, the impact of emissions from these sources is believed to be small in comparison to the sources that were evaluated. The inventory also does not include the lifecycle emissions of consumer goods and products due to the scarcity and complexity of data. In the future, these sources can be included in the County's inventory if methodologies and data become available. It would be important to have data back to the base year of FY05 in order to maintain consistency in the County's GHG emissions data.

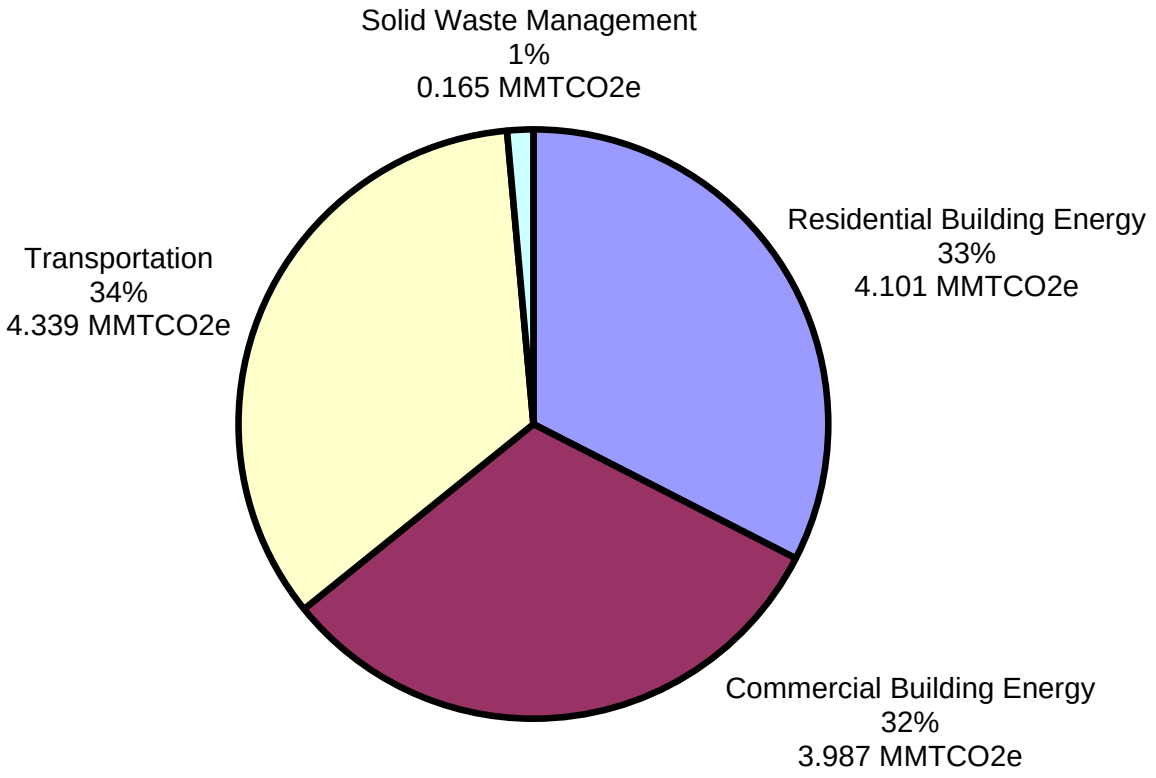
It is important to note that GHG inventories can only be compared in the broadest sense, as each community's inventory is shaped by the data available for analysis. As more communities conduct GHG inventories, and the tracking of GHG emissions becomes more important (for example, as a result of the imposition of a carbon tax), the data available to each jurisdiction may become more standardized.

2.1 Results of the GHG Emissions Inventory

Estimated GHG emissions in Montgomery County totaled 12.592 million metric tons of CO2 equivalents (MMTCO2e) in the base year of FY05. Transportation, residential building energy use and commercial energy building use (which includes public buildings) each accounted for approximately one-third of the total emissions. Note that the energy usage in multi-family

properties is difficult to segment between the residential and commercial sectors. This is due to the tariff schedules that apply to different types of multi-family properties. As a result, multi-family energy use is split between the residential and commercial sectors. A breakdown of total estimated GHG emissions in Montgomery County by sector is shown in Figure 1.

Figure 1 – Total Montgomery County GHG Emissions in FY05



As noted, GHG emissions from building energy are based on data from the County's energy tax. Historical energy tax data shows that the total building energy use in the County has increased approximately 18% since 1995. However, this increase is approximately the same as the increase in the County's population, suggesting that on a per capita basis, energy use in buildings has remained nearly constant (See Figure 2). Total building energy use does fluctuate on a yearly basis, due primarily to weather and the cost of various fuels. This fluctuation is more pronounced in the residential sector than the commercial sector. Figure 3 shows building energy consumption by fuel type for the commercial sector. Residential building energy consumption by fuel type is shown in Figure 4. As illustrated by these figures, more natural gas is used in residential buildings than commercial buildings, and the use of natural gas fluctuates more widely than other fuels. These fluctuations likely correspond to weather patterns, as natural gas is used predominately in home heating and to provide hot water.

Figure 2 – Total Building Energy Consumption and Population
FY95 – FY07

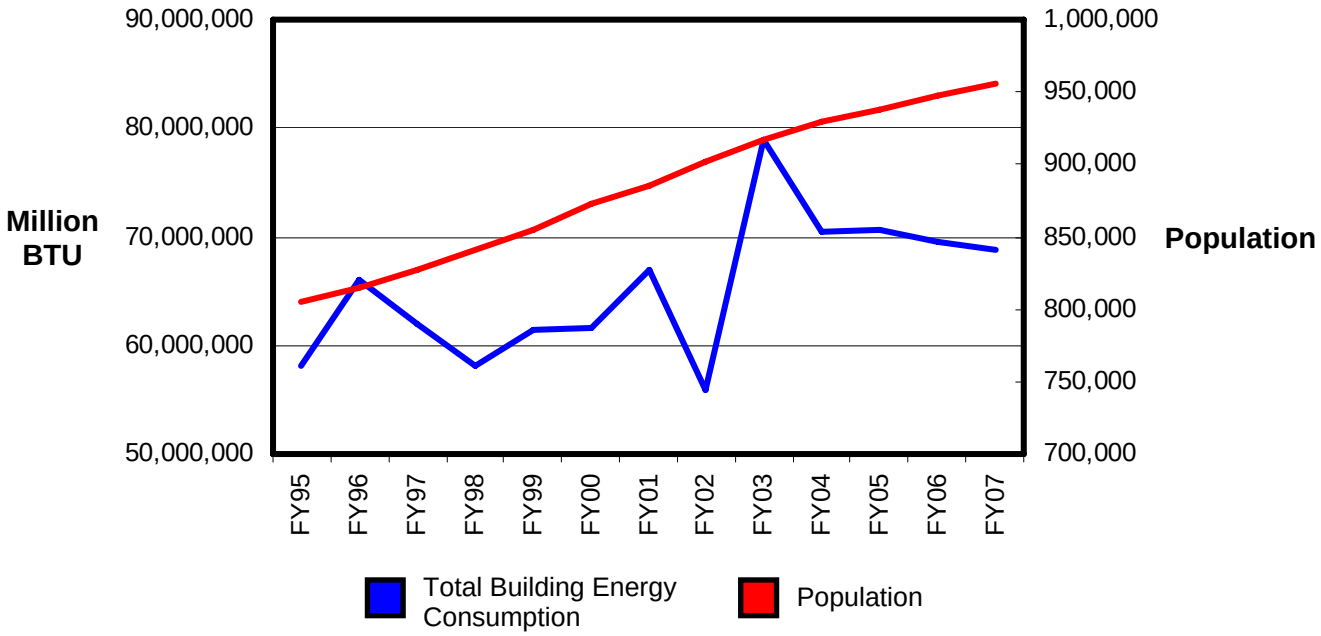


Figure 3 – Commercial Building Energy Consumption by Fuel Type
FY95 – FY07

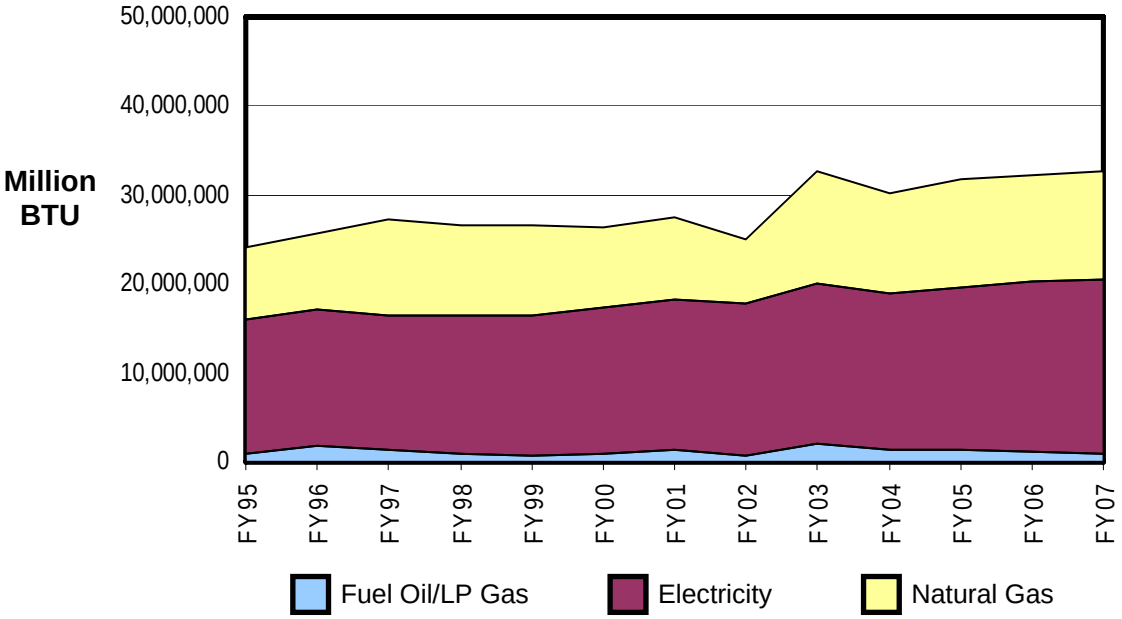
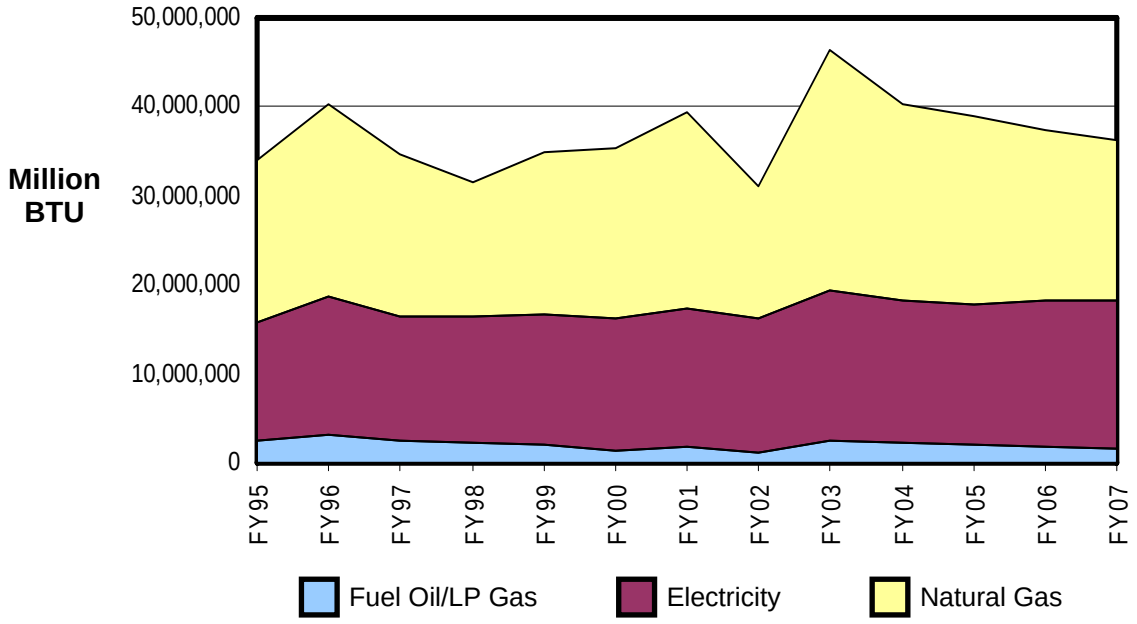


Figure 4 – Residential Building Energy Consumption by Fuel Type FY95 – FY07



GHG emissions from the County government and County agencies account for less than 4% of the total GHG emission in the County, amounting to an estimated 0.453 MMCO2e in FY05. Figure 5 shows a breakdown of emissions from the County government, Montgomery County Public Schools (MCPS), Montgomery College (MC), and the Montgomery County-based operations of the Washington Suburban Sanitary Commission (WSSC) and the Maryland-National Capital Park and Planning Commission (M-NCPPC).

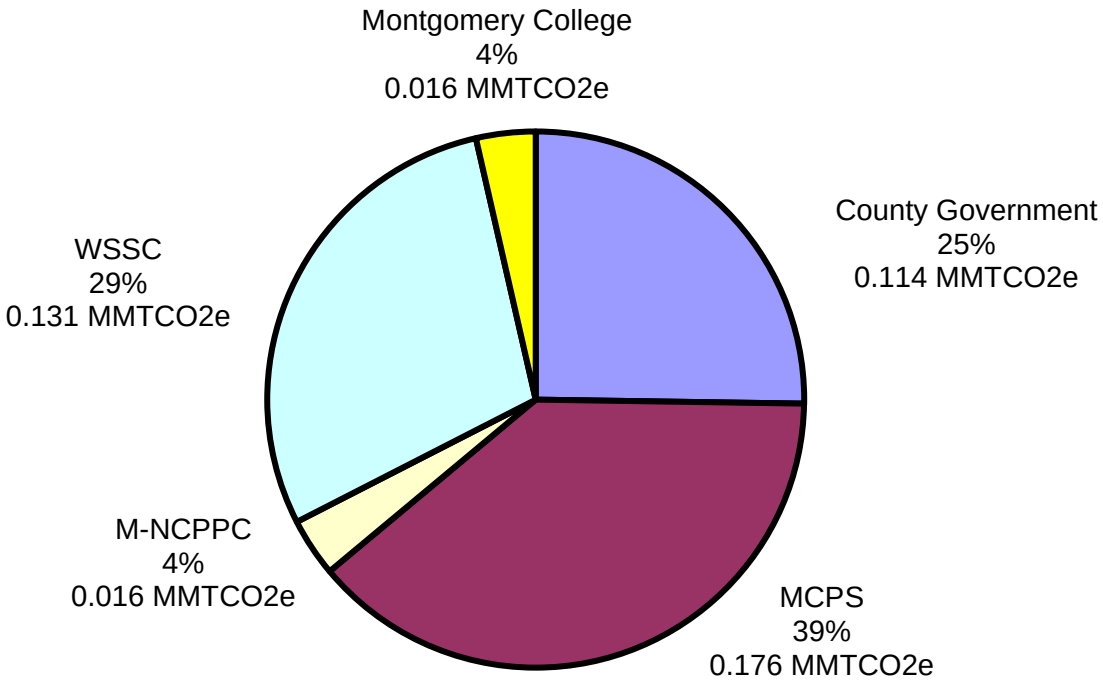
Data from these organizations was not uniformly available, and some building energy and transportation related emissions were not captured. Each of these entities is working to develop the necessary data collection procedures to allow for a more precise estimate of GHG emissions in the future.

2.2 Future GHG Emissions and Emission Reduction Goals

Montgomery County's goal is to reduce GHG emissions 80% by 2050 from the FY05 base year. Therefore, the County's emission target in 2050, based on GHG emissions of 12.592 MMTCO2e in FY05, is 2.518 MMTCO2e. This is a reduction of more than 10 MMTco2e.

As noted previously, however, building energy usage, which is the only major component of the County's GHG emissions for which reliable historical data exists, has been increasing at

Figure 5 – Breakdown of Montgomery County Government and Agency GHG Emissions in FY05



approximately the same rate as the County's population. It is reasonable to assume, therefore, that the County's future "business as usual" GHG emissions would track population growth.

In cooperation with MWCOG, the Research & Technology Center of the Montgomery County Planning Department at M-NCPPC produces long-range forecasts of population, employment and housing for Montgomery County and areas within the County. Forecasts are based on analysis of data from a variety of sources, including local development, population and economic trends; models of the Washington, D.C. area population and economic base; and published state and federal statistical resources. (mcparkandplanning.org/research/data_library/forecasts/7_1/research_forecasts.shtm) These projections, made at five year intervals through 2030, show a decreasing rate of population growth, down to 3% between 2025 and 2030. Using these population projections, and a conservative 2.0% rate of growth for each five year period beyond 2030, the projected "business as usual" GHG emissions for the County until 2050 can be estimated.

The County's GHG emissions reductions goals as stated in County Bill 32-07 are to reduce emissions to 80% below the base year of FY05, stop increasing emissions by 2010, and achieve a 10% reduction every 5 years through 2050. The goal to stop increasing emissions by 2010 is interpreted to mean that emissions in 2010 should be equivalent to FY05 emissions.

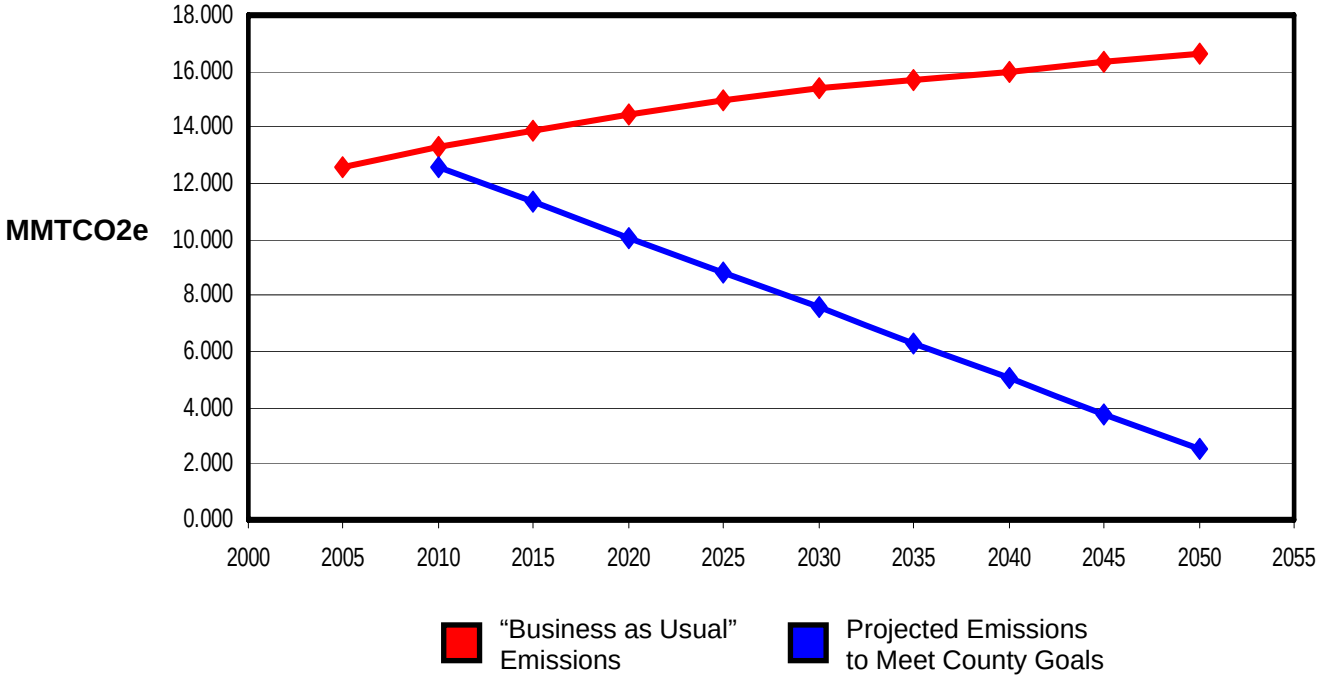
Table 2 shows the County's projected GHG emissions under a "business as usual" scenario, the County's emissions levels under the stated reduction goals, and the resulting emissions reductions that will be required to meet the County's goals. This data suggest that, from the "business as usual" scenario, the County's emissions will have to be reduced by 14.119 MMTCO2e, which is greater than the County's total base year FY05 emissions. This reduction is shown graphically in Figure 6.

Table 2 – Projected GHG Emissions Reductions Necessary to Meet County Goals

Year	Projected Population	% Population Change	Projected "Business as Usual" GHG Emissions (MMTCO2e)	Emission Reduction Goal (FY05 Base)	GHG Emissions Goal (MMTCO2e)	Emission Reductions from "Business as Usual" (MMTCO2e)
2005	938,000		12.592			
2010	990,000	5.5%	13.290	0%	12.592	0.698
2015	1,035,000	4.5%	13.894	-10%	11.333	2.561
2020	1,075,000	3.9%	14.431	-20%	10.074	4.358
2025	1,112,000	3.4%	14.928	-30%	8.814	6.113
2030	1,145,000	3.0%	15.371	-40%	7.555	7.816
2035	1,167,900	2.0%	15.678	-50%	6.296	9.382
2040	1,191,258	2.0%	15.992	-60%	5.037	10.955
2045	1,215,083	2.0%	16.312	-70%	3.778	12.534
2050	1,239,385	2.0%	16.638	-80%	2.518	14.119

These reductions will not be achieved solely through programs adopted by Montgomery County. Policies and programs at the federal level – for example, strengthened Corporate Average Fuel Economy (CAFE) standards or more stringent requirements on electricity generating facilities – will play a major role in achieving emissions reductions. At the State level, the Maryland Commission on Climate Change projects that full implementation of the forty-two measures included in the Commission's *Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy* would achieve reductions that will be consistent with the established goal of reducing statewide emissions by at least 25%. (www.mde.state.md.us/assets/document/Air/ClimateChange/Executive_Summary.pdf, Page 7)

Figure 6 – Projected GHG Emissions Reductions Necessary to Meet County Goals



3.0 Renewable Energy

This section outlines recommendations related to renewable energy, including the adoption of renewable technologies and the development of funding and administrative mechanisms to support renewable energy. Various definitions of renewable energy (sometimes referred to as clean energy or green energy) exist, but most are generally similar to the one included on the US Environmental Protection Agency's Clean Energy website (www.epa.gov/cleanenergy/index.html):

> Renewable energy generally refers to electricity supplied from renewable energy sources, such as wind and solar power, geothermal, hydropower, and various forms of biomass. These energy sources are considered renewable sources because they are continuously replenished on the Earth.

Renewable energy has been a component of the County's energy supply for some time. The County government and County agencies are long-term purchasers of clean energy. The Clean Energy Rewards Program provides a financial incentive to resident and businesses purchasing clean energy. MCPS has implemented large scale solar installations at several facilities employing an innovative power purchase agreement, a model that is being considered for broader application in the County government. MCPS has also installed geoexchange heating and cooling systems at a number of schools. Landfill gas-to-energy facilities are being installed on the County's two capped landfills that will provide approximately 3.4 MW of clean energy capacity. Finally, as of 2008, the County provides residential property tax incentives to spur on-site adoption of renewable energy technologies. More information about the County's programs related to renewable energy is included in Appendix A.

A new renewable program already being evaluated by the County involves the potential collection and conversion of waste vegetable oil from local restaurants to biodiesel for use by County agency fleets. In December 2007, the County Council established an interagency working group to study this issue. A December 2008 memo from the working group to the County Council reporting on the progress of the group is included in Appendix B.

Recommendation RE-1: *Maintain the commitment of the County government and County agencies to purchase a percentage of annual electricity consumption from clean energy sources. Establish energy policy criteria recognizing the benefits and prioritizing the purchase of various clean energy options.*

Starting in 2003, the Montgomery County Council adopted energy policies that include a requirement for the County government to purchase a specific percentage of their electricity from renewable energy sources. Collectively, the Montgomery County government and various County agencies (including the MCPS, M-NCPPC, and WSSC) have historically been leaders in voluntary renewable energy purchases, currently ranking 7th among U.S. Environmental Protection Agency (EPA) Green Power Partnership local government members. In FY09, the group will procure 15% of its electricity from renewable sources, and this amount is scheduled to increase to 20% in FY11. In FY08, this purchase exceeded 65,000 megawatt hours of

renewable energy, resulting in a reduction of an estimated 38,000 metric tons of GHG emissions.

The County executed its purchases through the procurement of renewable energy certificates (RECs). REC's are credits created by renewable energy generators to document the environmental benefits of the project. These credits are sold by producers either in tandem or separately from actual electricity generation. RECs are purchased by utilities, energy suppliers and others to meet regulatory requirements, and voluntarily by organizations, such as Montgomery County, to meet environmental policy commitments.

There are four primary mechanisms in which local governments can engage in voluntary clean energy purchases.

- *On-Site Renewable Energy Installations*: On-site installations, such as photovoltaic solar systems, provide energy generation from renewable sources "behind the meter," typically offsetting a portion of a building's grid-supplied electricity. Local firms may benefit from the installation and maintenance contracts for these facilities.
- *Community Sited Renewable Energy Systems*: These are typically large projects sited on municipal property. The power generated and RECs created may either be marketed or deposited in the regional transmission operator's accounts tied to local facility needs. Once again, local installers may benefit from the installation and maintenance of these facilities.
- *Power Purchase Agreements (PPAs) with Regional Renewable Energy Generators:* These contracts require a municipality, through a broker or other entity, to engage in bi-lateral, typically long-term contracts for renewable energy. An example of this arrangement is WSSC's contract with a Somerset County, Pennsylvania wind farm. The construction of a new clean energy asset may hinge on the willingness of a credit worthy entity to engage in a PPA, including the purchase of the RECs.
- *REC purchases:* Voluntary REC purchases, in concert with strong regulatory markets, help maintain a high return on investment and market value for renewable energy generation, stimulating further development of renewable energy projects. Unlike the mechanisms above, RECs are not directly responsible for the creation of new generation capacity, but the revenue generated from the sale of RECs may make the economics of a project favorable.

The environmental and economic benefits of these approaches vary. Generally, projects built in the County will provide more localized benefits, both environmentally and economically, than regional or national projects. As a result, Montgomery County should adopt procurement guidelines that prioritize renewable energy purchases in the following order:

1. On-site generation, or municipally operated or community sited systems
2. Long-term power purchase agreements with regional generators
3. REC purchases

The current purchase volume as defined by the County Energy Policy of 20% by 2011 should be maintained and budgeted accordingly. Specific parameters, including acceptable cost

differentials, should be established in the County's Energy Policy to define the parameters under which the County should phase out the purchase of RECs in favor the more preferable options of on-site systems, municipally operated systems, or long-term power purchase agreements.

Implementation Steps

- Maintain funding for REC purchases at 15%, increasing to 20% by 2011.
- Ensure renewable energy purchased by the County meets the requirements of the U.S. EPA's Green Power Partnership.
- Ensure that the County's Energy Policy clearly specifies that on-site renewable energy can be used to fulfill the renewable energy purchase commitment, where the REC is retired or reserved by the County.
- Establish specific parameters in the County's Energy Policy that clearly identify when on-site systems, municipally operated systems, or long-term power purchase agreements should be pursued in lieu of RECs.
- Consider procurement guidelines establishing the use of clean energy as an element consider when evaluating contracts. Include options encouraging vendors pursuing County contracts to be EPA Green Power Partners and meet the minimum renewable energy purchase requirements established by the County's Energy Policy.

Recommendation RE-2: *Adopt building design guidelines applicable to all County government and agency buildings requiring the use of geoexchange, or the most effective system available, as the primary heating and cooling energy source*.

Geoexchange systems reuse thermal energy for summer cooling and winter heating operations by storing or releasing heat in a ground-coupled well field. Geoexchange avoids the use of fossil fuels to augment winter heating loads, and the use of water to cool summer cooling loads, typically in conjunction with incremental heat pump delivery systems. This reuse of energy allows geoexchange systems to be 20 to 30 percent more efficient in energy consumption per building square foot compared to conventional systems. MCPS has used a geoexchange system in several buildings, including the Leadership in Energy and Environmental Design (LEED) Gold certified Great Seneca Creek Elementary School. The system can be used widely in areas without special geotechnical conditions. A test bore and thermal analysis of local soil conditions is needed to determine design assumptions concerning thermal conductivity.

For over thirty years, a large fraction of public and commercial buildings have been designed with incremental heat-pump HVAC systems. The hydronic heat pump system has inherent advantages in efficiency, first cost, low maintenance costs, and individualized comfort control. Many current hydronic heat pump systems are compatible with geoexchange technology to further expand efficiency. Geoexchange replaces the fossil fuel boilers and evaporative cooling towers normally used with hydronic heat-pump HVAC systems, to significantly reduce energy consumption and water use for the building.

Implementation Steps

- Revise building design guidelines applicable to all County government and County agency buildings to require analysis of geoexchange as a source of heating and cooling energy in initial design phases of new buildings and HVAC replacement projects.
- Review existing buildings with compatible hydronic heat pump distribution systems for feasibility of adding a geoexchange well field. Fund acceptable candidates through energy capital improvement projects.
- Fund the initial capital improvement cost premiums of geoexchange associated with soil analysis, well field design, and construction and recognize offsetting operating budget savings.
- Develop a detailed exemption procedure that clearly outlines the criteria for choosing a mechanical system alternative to a geoexchange system.
- Where possible, alternative mechanical system designs should remain "geoexchange ready" by including:
    - Distribution-loop temperature design compatible with ground coupled-loop temperatures suitable for heat pumps
    - Stub out for ground loop pump
    - Space in equipment room for ground loop pumps, header, and controls
- Continue to evaluate new heating and cooling technologies and systems for implementation in County government and County agency buildings

Recommendation RE-3: *Support the installation of solar photovoltaic systems through the use of power purchase agreements in public facilities.*

Development of solar photovoltaic (PV) systems through power purchase agreements (PPAs) is the most effective means to substantially increase the number of production-sized solar PV systems located in Montgomery County on public buildings. A solar PV PPA allows a government building to host a PV system on the roof of the building without having to finance the installation. A PPA developer installs, owns, and maintains the solar array and sells power directly to the building owner. Unlike the government building owner, the developer is able to offset 30 percent of the capital cost through Federal and state tax credits and incentives. The developer also sells solar power production certificates to utilities to meet renewable portfolio standard requirements. Under the right conditions, this approach can result in renewable energy production below the cost of grid electricity. As a result, the building owner benefits from cheaper electricity, with no upfront cost.

The County, State, and region benefit from increase local production of power that reduces congestion in long-distance electric transmission lines. The likelihood of brownouts and blackouts is reduced. The need for additional conventional power plants, along with their associated emissions, also is reduced. In addition, the building owner avoids transmission charges associated with grid provided electricity.

MCPS has established solar PPA contracts at four existing schools. The construction of PV systems with 614 kW of peak capacity is almost complete. MCPS has procurement

authorization for a total of 7 MW of installed PV projects, constituting 20 percent of its summer peak load electric requirements. The initial projects are located on buildings with relatively new roofs. However, subsequent phases are being planned to incorporate PV installations into re-roof projects and new construction

Because the Washington, DC region has a significant problem with electric transmission congestion, a concerted effort to increase the installation of solar PV systems will have multiple benefits. Currently, the PPA method appears to be the best means of increasing the number of these systems at public buildings because of the nature of existing tax incentives. The County government and other County agencies should pursue PPAs similar to MCPS's contract, and address barriers to broad application (e.g., roof supporting infrastructure, building size, etc.).

Implementation Steps

- Develop and proceed with a standard PPA procurement vehicle for solar PV systems that can be used by all County government agencies.
- Revise building design standards applicable to all County government and County agency buildings to provide the infrastructure to better accommodate solar PV PPAs in public facilities. Roof replacement projects should incorporate the infrastructure to accommodate PV systems to the extent practicable.
- Where possible, smaller facilities should be designed and built to be "solar ready" by including:
    - Empty electric conduit runs from the main electric room to the roof
    - Suitable space and pad designated for placement of a future solar DC to AC inverter in the electric room
    - Optimize placement of roof equipment, exhaust fans, condensing units and penthouses for compatibility with PV arrays
    - Encourage use of solar-reflective energy-star roofing membranes (non-ballasted)
- Review recently constructed buildings for solar PV system feasibility, and proceed with PPA retrofits where appropriate.
- Where relevant regulations lie within County authority, ensure that the planting of new trees near public buildings does not result in shading significant portions of roofs otherwise suitable for the installation of solar-electric PPA projects.
- As the initial inventory of buildings with roofs suitable to receive solar PV systems is exhausted, the remaining buildings with large enough roofs will not be candidates for solar PV systems until their roofs are replaced. This limitation can be mitigated by increasing funding for replacement of roofs.
- For a PPA installation to be economical for a County agency, the building must be large enough to host an 80 KW or larger system. Consider ways to lower the 80 KW threshold. One possible method would be to provide an incentive payment equal to the premium cost (difference between the PPA billing rate and the cost of conventional power) for smaller systems that otherwise would not be economical.

Recommendation RE-4*: Provide revolving and low-interest loans for on-site renewable energy installations.*

Renewable energy systems, including solar photovoltaic arrays, solar water heating systems, geothermal heating and cooling systems, and small scale wind turbines, in concert with energy efficiency opportunities, are essential to helping to wean the nation off fossil fuels. Some renewable energy installations are cost-effective over the long-term (particularly with state and local incentives); however, many homeowners and businesses lack the upfront capital to adopt these technologies. For homeowners, home equity lines of credit have become less available as housing prices have declined. For both homeowners and businesses, manufacturer or installer lines of credit may be limited to only the most credit worthy individuals, and may bear an interest rate that makes an installation financially difficult.

This barrier can be largely overcome for many residents and businesses by creating a loan program with favorable interest rates and an amortization period long enough to ensure that utility savings from locally generated electricity are greater or equal to annual loan payments. The methodology proposed in Recommendation EER-4 for financing home energy efficiency improvements could also be used to finance renewable energy systems for residences and businesses. In summary, this approach would provide consumers with a low-cost long-term loan through a County supported program. (Additional details on this financing approach can be found in EER-4.)

To successfully implement this program, the County will need to establish criteria for defining a renewable energy installation eligible to participate in the loan program as well as for certifying products and installers.

Implementation Steps:

- Advocate for federal funding for a revolving renewable energy loan program.
- Direct the Departments of Environmental Protection and Permitting Services to establish qualifying criteria for renewable energy systems, and a process for certifying clean energy products and installers.
- Direct the Departments of Finance and Environmental Protection to create a plan to implement a revolving loan program for residential and commercial renewable energy systems immediately in order to achieve implementation at the earliest possible date.
- Identify and develop sources of below market rate financing.
- Identify a process to collect loan repayment through the Montgomery County Department of Finance.
- Identify recommended energy-efficiency prerequisites (e.g., for homes, an audit through the Maryland Home Performance program).
- Develop an outreach and marketing campaign, in partnership with utilities and community organizations, to build consumer awareness of the benefits of renewable energy systems and the availability of the loan program.

Recommendation RE-5: *The County should facilitate customer aggregation of renewable energy, including voluntary purchases of electricity from renewable sources or renewable energy certificates, and renewable energy installations.*

Individual businesses and residents in Montgomery County can procure renewable energy, often supported by state and county incentives to help defray purchase costs. These are individual customer decisions, with high transaction costs and minimal ability to negotiate favorable terms. However, the total demand for renewable energy in the County could be large enough to attract interest from renewable energy marketers and equipment suppliers if such demand were aggregated and presented as a sales opportunity worthy of significant discounts. Significant discounts through aggregated purchases would encourage additional demand for renewable energy and reduce the need for County incentives such as the Clean Energy Rewards Program.

In terms of renewable electric power (also known as "green power") or renewable energy certificates, the County or a non-profit organization established or supported by the County could design an opt-in solicitation based upon surveyed interest from business and residential customers, and allow renewable marketers to bid on an aggregated load. In the case of grid supplied renewable electricity, the marketer would bill the customer directly for the supplied electricity or the cost would be passed through the customers distribution utility bill as with any other competitive energy supplier.

Likewise, County businesses and residents who wish to install renewable energy equipment on their premises – such as solar photovoltaic panels, solar hot water heating, or geoexchange systems have to contact individual suppliers, compare bids, and make choices among competing offers. This entails a significant effort on the part of both potential customers and suppliers. The County or a non-profit organization could design a request for proposals based upon surveyed interest from individual customers and award a large contract for renewable installations on individual customer premises. This could create the economies of scale and scope for an equipment supplier to install individual systems at a lower cost, and to spur the development of local renewable energy businesses. Aggregating supply would also partially ameliorate the need for County incentives.

Implementation Steps

Renewable Electricity Purchases

- Conduct a survey to gauge interest in green power offerings on a bundled basis.
- Depending on the number of potential participants, develop an opt-in aggregation process to collectively procure renewable energy supply from a competitive energy supplier.
- Design a request for proposals for an aggregated renewable load.
- If appropriate award a contract to a renewable energy marketer.

Renewable Energy Equipment

- Conduct a survey to gauge demand for on-site renewable energy systems at various prices.
- Determine whether it is most appropriate for the County to lead a procurement, establish a new non-profit, or partner with an existing non-profit to facilitate aggregation services.
- Design a request for proposals for equipment suppliers to bid on the aggregated purchase commitments
- Obtain commitments to purchase renewable energy systems from customers under specified terms and conditions
- Award contracts to winning bidders.

Recommendation RE-6: *Establish a public-private, non-profit entity to promote, facilitate, develop and invest in clean energy sources for the benefit of Montgomery County agencies, businesses and residents.*

Montgomery County agencies (the Montgomery County government, MCPS, M-NCPPC, WSSC and others) have engaged in cross-agency collaboration to aggregate their energy use and competitively procure energy supply in a deregulated energy environment. This cooperation among agencies has been leveraged for the purchase of renewable energy for these agencies, including innovative purchases of clean energy supply energy by the County government. The SWG has recommended a variety of actions related to renewable energy, including:

- The aggregated purchase of renewable energy and renewable energy systems with voluntary participation from businesses and residents
- The provision of incentives for on-site renewable energy systems
- Additional use of aggregated purchases of renewable energy among Montgomery County agencies
- Promotion of the use of on-site renewable energy systems in public facilities, including the use of solar PV systems, geoexchange heating and cooling, and energy generated from anaerobic digestion at wastewater treatment plants

In the short term, the issue is how to leverage existing knowledge and expertise in renewable energy purchases by Montgomery County agencies into expanded purchases and use by businesses and residents. To achieve this objective involves more than marketing, public education and outreach and a laissez-faire expectation that business and residents will aggregate out of self interest. While there may be strong interest in the use of renewable energy, the task of “bundling or aggregating” the demand for such energy may be daunting, and in fact overwhelming, to the individual business or resident to achieve the economies of scale necessary for such purchases of renewable energy to be cost effective or efficient.

The challenge of cost effective bundled or aggregated demand for renewable energy is the same for the purchase of deregulated energy sources, i.e. to ensure a relatively predictable stream of regular consumption of sufficient volume. A public-private partnership could help to identify and address the risks, benefits, and costs involved in the collective purchase of

renewable energy. It would also be desirable to evaluate opportunities and legal barriers to facilitate the aggregated demand for renewable energy by residents and businesses with Montgomery County agency purchases in a manner that benefits all involved. One possible method for achieving this objective is the establishment of a new non-profit entity or designation of an existing non-profit to act as a facilitator and consultant for the purchase of all renewable energy for Montgomery County agencies (as specified by their respective governing boards) and aggregate this demand with voluntary business and residential users to meet effective and efficient energy demand aggregation standards.

In the longer term, once the demand and use of renewable energy is demonstrated through public and private partnership and aggregation, planning may occur subsequently or simultaneously for on-site installation of renewable energy systems, using real time information regarding demand and life cycle costs for renewable energy systems. Onsite installation of renewable energy systems can also be facilitated by the knowledge and expertise of Montgomery County public agencies currently and actively involved in this enterprise.

This non-profit entity may also be the conduit through which investments are made in the development of new renewable systems, which in the long-term could be funded in part by the newly formed Maryland Clean Energy Center. The technical review of potential projects and possible sponsorship or partnership with this non-profit could enhance the successful application of new technologies or renewable energy systems.

There are a number of non-profit entities throughout the United States involved in energy efficiency programs, the development of and investment in renewable energy sources, provision of incentives for reducing energy demand or conversion to renewable energy sources, and public education about energy efficiency and renewable energy. Examples include Efficiency Vermont and the Delaware Sustainable Utility.

Another approach is found in Connecticut through the Connecticut Clean Energy Fund (CCEF). The CCEF is a quasi-state agency that “promotes, develops, and invests in clean energy sources for the benefit of Connecticut rate payers.” (www.ctcleanenergy,com) The CCEF’s charge is to:

> “…foster the growth, development, and commercialization of renewable energy sources and related enterprises, and stimulate demand for renewable energy and the deployment of renewable energy sources that serve end-use customers in the state and for the further purpose of supporting operational demonstration projects for advanced technologies that reduce energy use from traditional sources.
>
> Further, such expenditures may include grants, direct or equity investments, contracts and other actions that support research, development, manufacture, commercialization, deployment, and installation of renewable energy technologies, and actions that expand the expertise of individuals, businesses and lending institutions with regard to renewable energy technologies.” (Connecticut Clean Energy Fund, FY 2009 – FY 2010 Comprehensive Plan, Page 5)

The CCEF supports a broad range of programs supporting residents, businesses and municipal governments. Montgomery County should consider elements of the CCEF, or other successful public-private non-profits, as a potential model for developing its public-private non-profit entity. The transfer of knowledge to facilitate the use and development of renewable energy is a common practice among all the studied entities. In Montgomery County, this knowledge transfer could include technical services related to grants and incentives available to businesses and residents for installation of renewable energy systems. For example, the County has a property tax credit for renewable energy systems. The Maryland Energy Administration offers grants for renewable energy projects through the Maryland Solar Energy Grant Program and the Maryland Geothermal Energy Grant Program. The Federal Government offers the Clean Energy Production Tax Credit as well as technical assistance and other incentives. Montgomery County's public-private non-profit entity could provide assistance to residents and businesses seeking to take advantage of these programs to improve the life cycle costs for on-site renewable energy installations.

Implementation Steps

- Examine models of public-private partnerships and the establishment of a non-profit entity to implement clean energy strategies, including aggregation of demand for renewable energy purchases, on-site renewable energy generation, demonstration of new technologies, and the provision of technical assistance and knowledge transfer for the benefit of County residents and businesses. Include a review of non-profits active in Montgomery County, the region or state and recommend whether a new non-profit is needed to facilitate the proposed mission.
- Study and determine the risks and benefits of establishing a non-profit entity to implement renewable energy use and on site generation in Montgomery County. Recommend whether to establish a non-profit and identify funding strategies as appropriate.
- Determine if there are charter or state law impediments to establishing a non-profit renewable energy entity and advocate for changes to law if necessary.
- Determine if the state code of public utilities permits widespread aggregation of clean energy, identify any barriers and constraints. Advocate for changes to state law before the Maryland Public Service Commission as appropriate.
- Determine if County agency staff can be assigned to the non-profit entity for specific activities. The purpose of these assignments, much like a matrix organization, is to provide the expertise and project management skills of existing and cross disciplinary staff among County agencies to purchase renewable energy or to install renewable energy equipment and to extend such expertise, as well as aggregation of demand, to the private sector.
- If the issues described above can be favorably addressed, determine the appropriate governance, organizational structure, authority, and scope of a non-profit entity.

Recommendation RE-7: *Investigate the feasibility of adding sustainable energy biogas/combined heat & power (CHP) facilities to WSSC Seneca and Piscataway wastewater treatment sites.*

Today, more than 16,000 municipal wastewater treatment plants (WWTPs) operate in the United States, ranging in capacity from several hundred million gallons per day (MGD) to less than 1 MGD. Roughly 1,000 of these facilities operate with a total influent flow rate greater than 5 MGD, but only 544 of these facilities employ anaerobic digestion to process the wastewater. Moreover, only 106 WWTP utilize the biogas produced by their anaerobic digesters to generate electricity and/or thermal energy. EPA has undertaken targeted efforts to increase CHP use in wastewater treatment.

Anaerobic digestion is a naturally occurring biological process in which large numbers of anaerobic bacteria convert organic matter into methane and carbon dioxide (a mixture called biogas) in the absence of air. It is a widely used biological process for treating wastewater solids. This process stabilizes the organic matter in wastewater solids, reduces pathogens and odors, and reduces the total solids/sludge quantity by converting part of the volatile solids fraction to biogas.

Anaerobic digestion systems have the ability to produce “free” fuel (i.e., biogas), and often pay for themselves through the combination of reduced costs for biosolids disposal (owing to a reduction in biosolids volume through the digestion process), the potential marketing of a Class A biosolids product, and the recovery of usable biogas.

CHP is a reliable, cost-effective option for WWTPs that have, or are considering adding anaerobic digesters. The biogas flow from the digester can be used as fuel to generate electricity and power in a CHP system using a turbine, microturbines, fuel cell, or reciprocating engine. The thermal energy produced by the CHP system is then typically used to meet digester heat loads and for space heating. A well-designed CHP system offers many benefits for WWTPs because it:

- Produces power at a cost below retail electricity
- Displaces purchased fuels for thermal needs
- Qualifies as a renewable fuel for green power programs
- Enhances power reliability for the plant
- Offers an opportunity to reduce greenhouse gas and other air emissions

Combined heat and power systems offer considerable environmental benefits when compared with purchased electricity and onsite-generated heat. By capturing and utilizing heat that would otherwise be wasted from the production of electricity, CHP systems require less fuel than equivalent separate heat and power systems to produce the same amount of energy. Because less fuel is combusted, greenhouse gas emissions, such as carbon dioxide (CO2), as well as criteria air pollutants like nitrogen oxides (NOx) and sulfur dioxide (SO2) are reduced.

EPA recommends that WWTPs with influent flow rates greater than 5 MGD could potentially produce enough biogas from anaerobic digestion of biosolids to make CHP technically and economically feasible.

Based on EPA's "engineering rule of thumb", for each 4.5 MGD processed by a WWTP with anaerobic digestion, the generated biogas could produce approximately 100 kilowatts (kW) of electricity. Using this parameter and the nominal 30 MGD production rate for two selected WSSC WWTPs – Seneca (located in Germantown) and Piscataway (located in Accokeek) – the power output of a CHP system would be 650 kW at each plant.

The use of biogas from anaerobic digestion at WWTPs is often eligible for renewable fuel credits and clean energy funding. Biogas-fueled electricity generation qualifies as a renewable energy source in each state with a renewable portfolio standard (i.e., 22 states and the District of Columbia as of October 2008) including Maryland.

Approximately 50,000 tons/year of biosolids are trucked out of the Seneca and Piscataway WWTPs and land applied in Virginia and Maryland. Since Maryland has stricter land application regulations and higher fees than surrounding states, the trend has been for biosolids haulers to take an increasing volume of the material outside Maryland, resulting in increasing fuel use and GHG emissions. Adding anaerobic digestion to the Seneca and Piscataway plants would not only lower the amount of retail electricity needed to be purchased at each plant by approximately 33%, but would reduce the quantity of biosolids generated and hauled each year by about 40% (using industry standard factors) or 20,000 tons.

A preliminary capital cost estimate to design and construct anaerobic digesters, provide side stream cleanup, and biogas processing (CHP) facilities at the Seneca and Piscataway WWTPs is between $10 million and $15 million per plant, with savings from electricity generated, reduction in biosolids, carbon credits and RECs totaling between $1.0 million and $1.5 million per year. The County should support WSSC's request for $230,000 in FY10 funding to retain the services of an engineering firm with a sound background in state of the art digestion processes, who can also evaluate the various CHP technologies (fuel cells, microturbines, internal combustion) as well as conversion of biogas to other byproducts such as methanol.

Implementation Steps

- Solicit and evaluate consultant services proposals – 1st half of 2009
- Obtain WSSC General Manager's approval to award consulting contract – July 2009
- Complete feasibility study (including selection of key processes and technologies, capital cost estimates, and financial analysis) – 2nd half of 2009
- If recommendation is to go forward, include costs and schedules in FY11 CIP budget
- If study indicates technology is appropriate for these applications, support investigation of implementation at similar facilities (e.g. Blue Plains Wastewater Treatment Plant)

4.0 Residential Building Energy Efficiency

This section provides recommendations designed to improve the energy efficiency of single family homes in the County. Recommended programs focus on increasing the information available to homeowners about their energy usage, the deployment of a variety of energy efficiency measures via County and utility sponsored initiatives, and the development of a low-interest, long-term loan program to fund energy-related improvements.

Single family homes provide significant opportunities for improved energy efficiency. Beyond behavioral changes related to the use of lighting, appliances and heating, ventilating and air conditioning (HVAC), there are a number of measures homeowners can take to reduce energy usage and save money. Among these are sealing cracks and openings in doors, windows, and walls; increasing insulation in attics and crawlspaces; and replacing inefficient appliances and HVAC systems. The recommendations provide information about a number of different County, state and utility programs that support the adoption of these actions.

In 2008, the County adopted a property tax credit to help reduce the cost of installing energy conservation measures. In addition, the County now requires individuals selling a home to disclose energy costs and consumption data to prospective buyers to give them a better understanding of a home's energy performance. As of 2010, all new single-family homes built in the County will have to comply with ENERGY STAR standards, unless an equivalent but more effective approach is approved by the County. More information about these programs is contained in Appendix A.

Recommendation EER-1: *Develop promotional giveaways and buy-downs of low-cost energy efficient products.*

Relatively simple, low-cost energy efficiency devices such as compact fluorescent light bulbs (CFLs) and programmable thermostats often yield significant energy savings, providing a rapid payback on investment. However, it is often difficult to overcome public skepticism that these products can reduce energy consumption and costs. Providing giveaways, rebates or buy-downs to reduce the initial cost of these items is a method for overcoming doubts, achieving immediate savings, and introducing residents to the benefits of energy efficiency. Utilities, the County, and community organizations are well suited to coordinate and fund programs that provide products at less than market prices.

PEPCO and BGE have operated a successful CFL buy-down program for the past year in Montgomery County funded by a small surcharge on residential utility bills. For PEPCO customers this equated to less than 50 cents annually for a typical consumer. To streamline the program, the two utilities partnered with retailers such as Home Depot, Costco and Ace Hardware to develop a consumer friendly program where bulbs were automatically marked down, eliminating the need for administratively intensive coupons and rebate forms. Hundreds of thousands of bulbs have been sold in Montgomery County, exceeding the initial expectations for the program.

These utilities, as well as Allegheny Power, currently have proposals awaiting approval by the Maryland Public Service Commission (PSC) that would expand the array of rebates to Montgomery County consumers. Specific initiatives proposed by PEPCO include rebates for ENERGY STAR qualified appliances and consumer products (including CFLs, window air conditioners, refrigerators and programmable thermostats) and replacement electric water heaters meeting a specified performance standard.

Between 2006 and 2008, the County distributed over 4,000 CFLs and hundreds of energy-efficiency kits through DEP and the Department of Health and Human Service's Office of Home Energy Programs (OHEP). CFL giveaways were coupled with workshops that provided education on a broad range of energy efficiency measures for homes, apartments and businesses. Energy efficiency kits were distributed to the most "at need" homeowners in Montgomery County who sought utility assistance.

There is a clear opportunity to expand programs to include a wider variety of energy efficiency products. This effort would be effective as a partnership between utilities serving the County, the County government and community organizations. The County should develop, and where possible jointly fund with utilities and community organizations, initiatives that provide the strategic giveaway or buy-down of low-cost energy-efficiency products, particularly where warranted to motivate specific audiences. Such programs can also address other environmental or public health objectives, such as the replacement of older "mechanical" thermostats containing mercury with programmable thermostats.

Implementation Steps

- Continue to support, where appropriate, utility rebate and buy-down programs serving Montgomery County.
- Partner with utilities, businesses, and community organizations serving the County to promote approved rebate and buy-down programs. Develop consistent marketing messages and content for educational and outreach campaigns by co-developing initiatives with partners. Marketing efforts should include workshops, web content and print materials where appropriate.
- Provide funding for CFL and other low-cost energy-efficiency product giveaways by DEP, OHEP, the Housing Opportunities Commission and other departments and agencies that interact with the community.
- Disseminate information on proper handling and recycling of CFLs.

Recommendation EER-2: *Develop energy efficiency programs, in coordination with State and utility-based programs, to assist low income households address their energy needs.*

Low income households are the hardest hit by high home energy prices. Much of the assistance going to these households in the past has been in the form of energy assistance programs designed to offset the cost of electricity, heating oil, etc. These programs provide critical support to families struggling to meet their basic energy needs. However, they may not address one of the root causes of the problem – inefficient homes. The County can help

dramatically reduce long-term energy costs in these homes by providing programs that support the implementation of energy efficiency improvements.

Currently, the Office of Home Energy Programs (OHEP) in the Department of Health and Human Services provides support to homeowners needing assistance meeting energy expenses. OHEP connects homeowners with programs offered by the state, including:

- The Maryland Energy Assistance Program (MEAP), which helps eligible families with the cost of winter heating
- The Electric Universal Service Program (EUSP), which helps low-income electric customers pay their electric bills
- The Utility Service Protection Program (USPP), which provides MEAP eligible households access to an even monthly payment program and turn-off protection
- The Weatherization Assistance Program (WAP), which helps to make homes participating in the MEAP and EUSP more energy efficient at no cost to eligible households when funds are available

Another energy-related program offered by the State is the Maryland Home Performance program, which trains and certifies contractors to perform energy audits and install whole-house energy improvements. Sponsored by the Maryland Energy Administration, this program provides a high-quality energy audit based on EPA's ENERGY STAR guidelines, and identifies appropriate energy efficiency improvements that provide reliable and long-term cost savings. However, the cost of the audit and subsequent improvements are often beyond the capabilities of financially strapped homeowners.

Funding for weatherization and home improvement programs is expected to be available from a variety of sources. In statements made during the 2008 Presidential election, President-elect Obama pledged to weatherize at least one million low-income homes each year for the next decade (www.barackobama.com/pdf/factsheet_energy_speech_080308.pdf). MEA will use funds obtained from the auction of CO2 emissions allowances under the Regional Greenhouse Gas Initiative (RGGI) to fund weatherization and energy assistance programs, and utility programs being proposed as a result of the EmPower Maryland Energy Efficiency Act of 2008 have a major low-income component.

The County should increase its efforts to educate qualified homeowners about energy assistance programs available to them, with particular emphasis on implementing improvements to the long-term energy performance of their homes. The ENERGY STAR process, or an equivalent methodology, should be the basis for any County weatherization or home improvement program. In addition, the County should advocate for an increase in state and federal funds for energy audit and improvement programs, particularly for low-income households. This includes advocating for appropriate utility programs.

Implementation Steps

- As soon as practical, establish the Maryland Home Performance process as the basis for identifying home improvements to be funded by the County's low-income weatherization programs.
- Continue to support state and utility efforts to deliver weatherization funding to low-income homeowners, including where feasible the Maryland Home Performance process.
- Advocate for federal investment via zero interest loans, grants or other mechanisms to boost weatherization funding.
- In collaboration with utilities serving Montgomery County, fund County agencies including the OHEP and DEP to educate and develop outreach materials linking low-income homeowners with options for weatherization and other energy-efficiency improvements. Ensure that County agencies have sufficient staff to take advantage of state programs.
- Develop mechanisms for evaluating the performance of low-income programs, including calculating the number of homeowners who have received assistance and what additional funding is needed on an ongoing basis.

Recommendation EER-3: *Enhance consumer awareness of energy consumption by advocating for utility programs that provide home-energy consumption displays and develop other County programs to increase availability and affordability of in-home energy displays.*

In-home energy displays show residents how much electricity or natural gas they are using moment-to-moment and also display a running total of the cost of the energy delivered. Similar to the well documented "Prius effect," whereby the in-car energy display encourages drivers of the Toyota Prius to conserve fuel, in-home energy displays provide immediate feedback on energy costs and savings and encourage conservation. This is essential to motivating consumers and validating the effectiveness of energy efficiency measures (e.g., turning off lights, installing compact fluorescent lamps, or changing thermostat settings).

In 2004, Hydro One, the largest utility in Ontario, Canada, initiated a pilot project involving the installation of in-home energy displays by 500 customers. Participants in the pilot, which was carefully monitored, saved up to 15 per cent on their electricity bill. Based on the results of the pilot, Hydro One concluded that in-home displays could be a valuable tool for demand-side management and energy conservation, especially if they could be installed on a large enough scale. Since the spring of 2006, more than 28,500 monitors have been successfully deployed, constituting approximately 20% of the population in northern Ontario. A study conducted by Hydro One found that 92% of customers who had a display would recommend it to family and friends; 87% taught family members how to use it in an effort to conserve energy; and 91% found the product easy to install. (www.ase.org/content/article/detail/3925)

In-home energy displays can be implemented by utilities in concert with direct load response and "dynamic" pricing initiatives and advanced metering infrastructure. Such programs allow greater consumer control over energy costs by providing time dependent pricing and automatic

curtailment of some loads (e.g., water heaters or air conditioners). The displays can also complement other programs seeking to reduce consumer energy consumption such as weatherization and CFL give-away programs, allowing residents to see the immediate cost savings resulting from energy efficiency improvements.

The County should establish a goal that 10% of County homeowners receive an in-home energy meter by the end of 2010, rising to 50% by 2020 unless superseded by utility supplied programs.

Implementation Steps

- Incorporate information on in-home energy displays into County energy and sustainability educational programs.
- Continue to advocate for utility programs that provide in-home energy displays as part of direct load control and advanced metering programs. Collaborate with utilities in marketing benefits and attributes of the programs.
- Collaborate with electricity and natural gas utilities to develop a pilot to buy-down the initial cost of commercially available in-home energy displays for customers.
- Provide financial incentives, in the absence of utility based programs, to reduce the cost of an in-home energy display by adding the home energy display as a qualifying energy-efficiency device under the County's Energy Conservation Property tax credit.

EER-4 Recommendation: *Develop a low cost loan program to facilitate residential energy efficiency improvements.*

The technologies needed to make long-term reductions in home energy consumption exist today. While each home's needs are different, a combination of insulation; heating, ventilating, and air conditioning; and lighting properly applied can result in substantial reductions in energy consumption, increase the value of a home, and save money. Implementing energy efficiency improvements can also create green job opportunities and markets for products and services.

Residents are increasingly aware of the need to improve the energy performance of their homes. Two key barriers to undertaking improvements are identifying the actions that will result in real and sustained energy savings, and paying for those actions.

The first barrier – identifying cost-effective energy efficiency improvements – can be addressed by a high-quality energy audit delivered by a trained professional. To help alleviate this issue, the Maryland Energy Administration has sponsored Maryland Home Performance (MDHP), a program that trains and certifies contractors to perform energy audits and in many cases install whole house energy improvements. Certified auditors recommend energy efficiency improvements based on their effectiveness. Where owners adopt recommendations, a follow-up visit verifies the effectiveness of the improvement after it is installed. PEPCO's recently approved programs for energy efficiency and demand side management programs include incentives for MDHP energy audits.

The second barrier, paying for the improvements, must be addressed in order for large numbers of County homeowners to undertake improvements to their homes. Based on audits conducted in 2008, the average MDHP audit identifies opportunities that can reduce household energy consumption, energy costs and emissions by 20%, at an implementation cost of approximately $5,000, resulting in a payback period of approximately seven years. However, the initial cost is more than the average homeowner can afford, even after applying utility rebates and property tax credits offered by the County. While installer financing is available to homes with high credit ratings, the terms may not be favorable. In addition, the loan is tied to the individual and must be repaid even if the individual moves or sells the house, while the benefits of the energy savings are reaped by the home's next owner.

A solution to this key barrier is for the County to develop a loan program to facilitate financing of effective energy efficiency improvements. The County would facilitate collection of loan repayments via the property tax collection process, a program design that has been implemented or is under development in Berkeley, California, Annapolis, Maryland, and Palm Desert, California.

The framework for this program consists of the following steps:

- An audit by a MDHP certified auditor, or equivalent audit, would be required in order to be eligible for financing. This ensures that cost-effective improvements are identified.
- A MDHP certified auditor, who is also a licensed contractor in Maryland, would then perform the work as a contractor or verify the installation by a homeowner or other contractor.
- Consumers can opt for a low-cost long-term loan through a County supported program, confident that monthly energy savings will be greater than the cost of financing, ensuring positive cash flow for the current and future owners of the home.
- Repayment of the loan balance would be collected annually through the County's property tax bill, giving lenders a greater reassurance of repayment and lessened administrative costs.
- If the homeowner sold the home before the financing was paid in full, the loan balance along with the benefits of the energy-efficiency improvements would transfer to the new owner.

The essential uncertainty that needs to be evaluated is how the financing will be funded and administered. There are three potential options:

Option 1 – Advocate for a federally-sponsored loan program. Under this option the County would advocate for federal funding from economic stimulus or other legislation to establish loan programs with the agreement that the County would administer repayment through the property tax collection process. However, funding is not guaranteed.

Option 2 - Issue a taxable bond to fund loans administered by the County. This allows the County to secure favorable interest rates for a revolving loan. The County would collect funds to repay the bond through the property tax collection process. However,

this implementation mechanism is subject to the County's debt ceiling and risk may be incurred from consumer defaults on loan balances.

Option 3 – Partner with a non-profit or pool of certified lenders to offer financing. Under this option, the County would secure collection of loan repayment via the property tax collection process but financing would be provided by private sector lenders. Under this option the interest rate is uncertain, but would likely be reduced below market due to the County's administering of repayment.

It is recommended that the County immediately begin developing a framework for a residential energy-efficiency loan program based on the most favorable model that can be developed in order to achieve implementation at the earliest possible date.

Implementation Steps

- Advocate for federal funding of a residential revolving loan program.
- Direct the Departments of Finance and Environmental Protection to immediately create a plan for a revolving loan program for residential energy-efficiency improvements in order to achieve implementation at the earliest possible date.
- Identify and develop sources of below market rate financing.
- Establish quality criteria for energy audits, equivalent to those delivered by Maryland Home Performance trained auditors.
- Identify a process to collect loan repayment through the Montgomery County Department of Finance.
- Develop an outreach and marketing campaign, in partnership with utilities and community organizations, to build consumer awareness of the benefits of energy-efficiency and availability of the loan program.
- Evaluate options for expanding the program to renewable energy technologies and the commercial and multi-family sectors.

Recommendation EER-5: *Create an effective residential energy education and outreach program with the goal that 50% of Montgomery County homeowners will take steps to reduce the annual consumption of energy in their homes by at least 25% by 2020.*

Public education is critically important to achieving the County's goal of reducing GHG emissions by 20% by 2020. In the residential energy sector, much of this reduction will be as a result of voluntary actions by homeowners. Fortunately, there are ample opportunities to achieve substantial reductions in energy use in existing single family homes.

Significant amounts of energy can be saved in the average home through sealing and insulating the building envelope, upgrading HVAC equipment, and replacing old appliances with ENERGY STAR models. For example, the U.S. EPA estimates that homeowners can reduce heating and cooling costs by 20% by air sealing their homes and adding insulation in attics, floors over crawl spaces, and accessible basement rim joists (www.energystar.gov). ENERGY STAR appliances can cut energy costs by as much as 50%.

Finally, behavioral changes by a home's occupants can reduce energy use. Significant energy savings can be achieved by installing a programmable thermostat and setting it a few degrees cooler in the winter and a few degrees warmer in the summer, turning off lights when leaving a room, and replacing incandescent bulbs (which will be phased out for most applications in the US after 2012) with CFLs.

Many of these measures can be implemented through a homeowner's utility as a result of the EmPower Maryland Energy Efficiency Act of 2008. The Act requires electric utilities to devise a plan to reduce per capita electricity consumption by 5% by the end of 2011 and by 10% by 2015. In December 2008, the Maryland Public Service Commission approved plans by PEPCO, Alleghany Power, and BG&E that include a variety of energy efficiency measures for residential and commercial consumers in Maryland. These programs will be funded by a small surcharge on electricity rates. (There is, however, no equivalent Maryland requirement to reduce per capita natural gas consumption.)

In order to be successful, a Residential Energy-Efficiency Outreach and Education campaign should:

- Be large enough to provide accurate and compelling information to tens of thousands of home owners every year. (In 2006, there were 360,000 housing units in Montgomery County of which 69 percent – or 250,000 units – were individually owned.)
- Provide information in the most common foreign languages used in Montgomery County. (In 2000, languages other than English were spoken in 32 percent of homes in Montgomery County.)
- Provide accurate and up-to-date information on Federal, State and County energy efficiency and renewable energy incentive programs. It should also provide information on all electric utility incentive programs that are part of the EmPower Maryland mandate to reduce per capita energy consumption.
- Be designed to overcome skepticism that proposed actions will actually reduce energy consumption and will be cost-effective. Social marketing research shows that testimonials (written or video-taped) from a trusted source and/or face-to-face interaction with peers who have taken steps to reduce energy use are very effective in countering skepticism.
- Develop mechanisms, such as the ENERGY STAR Home Energy "Yard Stick" to allow residents to establish a benchmark for their homes against others in the region. Educate residents on the value of this benchmark and how it can be used to guide energy-efficiency action.
- Provide information on contractors with a proven record of effective home energy audits and energy efficiency retrofits (e.g., air leak sealing, insulation, proper sizing and installation of high efficiency HVAC equipment). Maryland Home Performance with ENERGY STAR's training and certification of home energy auditors and contractors is an important step in this direction.
- Incorporate feedback mechanisms that measure energy efficiency actions taken and energy saved by home owners reached by education and outreach campaign.

- Seek to maximize its impact, while restraining costs to the County, by having the County actively seek partnerships with community organizations and energy utilities.

Implementation Steps

- Provide information on and access to Climate Protection Plan Programs through a Web-based clearinghouse – Fund the development, launch and maintenance of a Montgomery County website that serves as the centerpiece of the county's education and outreach efforts for all Climate Protection Plan programs, including residential energy efficiency and private vehicle fuel efficiency (see recommendation for a Transportation Education and Outreach Program). DEP is developing a prototype "Green Guide" that can be used as a foundation for this effort.
- Provide educational programs about Climate Protection Plan programs throughout the community to raise awareness and encourage active participation – The County should enter into informal partnerships with community organizations (homeowners associations, community associations, faith-based organizations, non-profits with large and diverse memberships in Montgomery County) to conduct educational programs and hold "house meetings" around the county. The County should develop a residential energy efficiency tool kit for presenters and discussion leaders. The toolkit would include informative handouts that summarize the actions residents can take to reduce green house gases along with the supporting County programs. Presenters and discussion leaders would be recruited and trained by the County and they would be volunteers or ideally paid a small stipend, e.g. for transportation. The County would collect evaluation data to assess the reach and impact of the program and to conduct follow-up to provide attendees with additional relevant information such as additional County programs and updated information on new technologies and applications.
- Develop and implement Climate Protection Plan Programs in conjunction with energy utility companies – The Empower Maryland Act creates an unprecedented opportunity to coordinate closely with energy utility companies operating in Montgomery County to ensure that residential energy efficiency programs complement, rather than duplicate, each other. For example, a portion of the proposed new fees paid by electric utility customers that are to be used for public education and outreach about energy efficiency could be used to support the county's Green Guide web application.

Recommendation EER-6: *Promote the deployment of smart grid technologies by utilities serving Montgomery County.*

It is widely recognized that the nation's utility infrastructure is overtaxed and nearing obsolescence. The Department of Energy and the incoming Obama administration have highlighted the need for modernizing the electric grid to reduce energy loss and consumption, enhance reliability, and protect national security.

The infrastructure in Montgomery County is no exception. The majority of residential and small commercial meters in the community are dated analog designs not significantly different than meters installed before the Second World War. Some other utility infrastructure is similarly

dated. The consequences of this are substantial, including a track record of intermittent failures and power quality problems in some neighborhoods in the County. While isolated upgrades and improved maintenance have helped mitigate some of these problems, the only way to address the root cause is a comprehensive upgrade of the electric distribution system, starting with the meter.

A “smart grid” is an advanced transmission and delivery system that uses digital technology to save energy and reduce costs. Smart grid technology would:

- Support energy efficiency, conservation and demand response programs
- Improve electric distribution system operations, minimize power disruptions, and reduce operation and maintenance expenses
- Enable customer “energy awareness” by increasing access to account information via online and in-home energy displays
- Support small-scale renewable generators
- Supports plug-in electric vehicle rates and “vehicle-to-grid” technology
- Improve utility customer service and enable faster restoration of power after disruptions

Unfortunately, comprehensive improvements to the grid are costly and take years to implement. The utilities serving Montgomery County have been unable to implement system wide improvements or large scale pilots due to barriers at the PSC that have prevented reasonable cost recovery from consumers to offset part of the cost of the upgrades.

PEPCO is working with Montgomery County Councilmember Roger Berliner’s office and others in Montgomery County to develop a proposal to the PSC that would enable smart grid deployment on a pilot basis to approximately 2,000 Montgomery County homes.

Implementation Steps

- Support the pilot scale deployment of smart grid technology by PEPCO in Montgomery County, and monitor impacts of technology on system reliability and energy consumption.
- If results of pilot are successful, support the full-scale deployment of smart grid infrastructure in Montgomery County.

5.0 Commercial, Multi-Family, and Public Building Energy Efficiency

This section provides recommendations focused on improving the energy efficiency of commercial buildings (which includes multi-family and public buildings). Over the last few years, energy consumption from this sector has been rising at a more rapid rate than the residential sector, and GHG emissions from commercial buildings will exceed the residential sector in the years ahead without significant improvements in energy efficiency.

Commercial buildings vary widely in form and function. The energy efficiency measures utilized in a fast food restaurant will be vastly different from those applied in a Class A office building. As a result, the programs developed for this sector must be flexible, and designed to encourage property owners and managers to find site specific solutions. One of the key recommendations related to the commercial sector involves a study to determine the best approach and schedule for achieving a 25% increase in the energy efficiency of commercial buildings. Such a study will highlight the different paths that should be taken to achieve this performance goal.

Current County policies and programs related to the commercial sector include a green building standard that applies to all commercial buildings over 10,000 square feet, and property tax credits that provide substantial incentives for the highest performing buildings. More information about the County's programs related to commercial buildings is included in Appendix A. For public buildings, the County has recently concluded the first phase of a detailed energy analysis identifying and characterizing the energy performance of County facilities, as well as establishing a process for addressing energy deficiencies. A summary report of this effort can be found in Appendix C.

Recommendation EEC-1: *Require ENERGY STAR appliances and equipment, and EPEAT registered IT equipment, in public facilities.*

Appliances and office equipment make up a significant portion of the electrical load in public buildings. Such items include refrigerators, dishwashers and other kitchen appliances; computers, monitors, and other office equipment; consumer electronics including televisions; commercial food service equipment; and small commercial heating and cooling equipment. Mandating the use of products meeting widely recognized standards such as ENERGY STAR and EPEAT (the Electronic Product Environmental Assessment Tool) will provide significant energy savings and other environmental benefits.

ENERGY STAR is a joint program of the EPA and the U.S. Department of Energy (DOE). Products that have earned the ENERGY STAR label meet strict energy-efficiency guidelines set by the EPA and DOE. For example, ENERGY STAR qualified appliances incorporate advanced technologies that use 10–50% less energy and water than standard models. Although ENERGY STAR products may be more expensive than standard models, the money saved on utility bills can more than make up any cost difference.

EPEAT is a system to help purchasers in the public and private sectors evaluate, compare and select desktop computers, notebooks and monitors based on their environmental attributes.

Compared to traditional computer equipment, all EPEAT-registered computers have reduced levels of cadmium, lead, and mercury to better protect human health and the environment. They are more energy efficient, which reduces emissions of climate changing greenhouse gases. They are also easier to upgrade and recycle. In fact, manufacturers must offer safe recycling options for EPEAT registered products. In 2007, an Executive Order mandated that all federal agencies buy EPEAT registered electronic products for at least 95 percent of their needs.

Montgomery County should adopt procurement guidelines applicable to all County government departments (and County agencies where applicable) requiring the purchase of ENERGY STAR and EPEAT qualified products and equipment.

The SWG also recommends that the County establish guidelines for the proper decommissioning and disposal of obsolete or inefficient equipment.

Implementation Steps

- Revise purchasing policies to ensure that, where applicable, ENERGY STAR and EPEAT equipment is specified when replacing or buying new appliances and equipment.
- Provide Departments and agencies reasonable operating and capital improvement budget increases to offset the slight cost premiums of ENERGY STAR and EPEAT equipment.
- For contractors with operations in Montgomery County facilities (e.g., food service), require that ENERGY STAR and EPEAT equipment be used, where applicable, for all new contracts, and when replacing or buying new appliances and equipment under existing contracts.
- Develop a detailed exemption process that clearly outlines the criteria for choosing an alternative product that does not meet ENERGY STAR or EPEAT criteria.

Recommendation EEC-2: *Improve the energy performance of public facilities through enhanced data acquisition and energy efficiency measures.*

County Government and other public facilities account for a relatively small share of total GHG emissions. Nonetheless, they serve as ideal candidates for deployment of cost-effective and innovative energy efficiency and other environmentally beneficial technologies. Key reasons for this include:

- Enhanced energy performance programs for local government facilities have historically been under funded, resulting in opportunities for significant improvements.
- It is in the public interest, as taxpayer supported facilities, to implement improvements to public facilities that provide positive cash flow as soon as practical.
- Public facilities offer an opportunity to showcase enhanced energy management and energy conservation measures that can be adopted by private sector buildings.
- Contracts for public facilities can spur local and regional development of energy service professions.

- Entities like Montgomery County can take advantage of relatively low-cost financing via municipal bonds to implement improvements.

The need for enhanced energy management is well recognized by public facility managers. What is not always available are the financial, policy and technical tools to translate the desire for improved public facilities into real long-term strategies. County Bill 30-07 mandated the establishment of an energy consumption baseline or benchmark of County facilities, and the development of an energy savings plan for these facilities. The Department of General Services (DGS) has created the first baseline of County facilities and categorized the facilities, based on their energy performance, in order to approach improvements in the most effective manner.

Building upon the steps taken to date by DGS, the County should undertake an effort to implement all energy efficiency improvements that provide positive cash flow to the County. Several options are available to facilitate cost-effective improvements.

Advanced Energy Information Systems: The first step to effectively manage energy is measuring consumption over time. There are a variety of tools available to analyze energy consumption data, including building energy management systems that measure energy usage via a sophisticated array of computers, controllers and sensors. A thorough understanding of a building's energy consumption is important not only to determine the appropriate energy efficiency improvements to implement, but also to encourage operational practices by building occupants that reduce energy use. This is critical because "plug in" loads can be 40% or higher in a typical office building and must be controlled by the users of the equipment (i.e. the occupants of the building).

Energy Performance Contracting (EPC): This mechanism uses an energy services company (ESCO) to leverage energy savings to pay for energy efficiency improvements in municipal buildings. The up front costs of the energy improvements are borne by the ESCO and paid back out of the energy savings. The cost savings produced by the project need to be sufficient to cover all project costs (including financing and ongoing maintenance and monitoring services) over the contract term. Contract terms are usually 10 to 15 (or more) years. Performance contract packages can be flexible, and the County may be better able to control costs by taking charge of the financing portion (at a lower rate than that provided by the ESCO) and allowing the ESCO to be more heavily involved with the installation of equipment.

Internal Funding and Self Financing: Some small scale upgrades on otherwise improved buildings or on smaller facilities may not be appropriate to bundle in a performance contract. Internal mechanisms, such as an energy efficiency CIP should be available to facilitate these improvements.

Implementation Steps

- Complete energy cost baseline and energy savings plans for all County facilities.

- Implement a program of energy audits of County facilities based on the results of the baseline, or use assessments bundled as part of a performance contract where appropriate.
- Increase the capacity, where feasible, to sub-meter facilities in order to enhance accountability for energy performance.
- Develop criteria in FY09 to determine when a performance contract is appropriate for a facility. Package facilities suitable for evaluation for performance contracts by Energy Service Companies. Issue at least one package of major facilities in FY10.
- Provide funding in FY10 for additional energy management and maintenance staff to support DGS's energy programs.
- Develop a committee, including representatives from DGS, DEP and OMB to streamline review of proposed energy-efficiency projects.
- Use the utility Non-Departmental Account to pay for energy efficiency projects that provide a positive cash flow.
- Develop a funding mechanism to deposit positive cash flow from energy-efficiency improvements into the CIP project for these activities, over time creating a self-sustaining CIP project.
- Develop a process to educate public facility operations, maintenance personnel, and occupants on energy management and efficiency.

Recommendation EEC-3: *Establish specific energy performance requirements and timelines for the benchmarking, commissioning and improvement of new and existing commercial and multi-family buildings in order to reduce energy consumption by 25% by 2020. This will be achieved by a combination of education and outreach efforts, incentives, market forces and, if necessary, mandates.*

For new buildings, Montgomery County has adopted green building standards which include some requirements related to energy performance, including building commissioning. Many building experts believe that some level of commissioning – which involves verifying that the building's energy related systems are installed, calibrated, and perform as intended – is essential to ensuring building performance.

In order to achieve the sector wide reductions identified, however, additional energy performance requirements will need to be established. As a first step, it was suggested that the County should require enhanced commissioning for all buildings to which the County's green building standard applies. Enhanced commissioning is the process of detailed measurement and verification of many aspects of a new construction project that directly or indirectly impact the ability of that building to perform as it was intended. System components include but are not limited to: the building envelope, HVAC systems, plumbing and electrical systems, building automation, and the occupancy and use of the facility. The increased prevalence of new construction technologies and practices make commissioning of new construction even more important.

Successful completion of enhanced commissioning is worth one point in the Energy & Atmosphere section of the U.S. Green Building Council's LEED Green Building Rating System.

As defined by LEED, enhanced commissioning requires the engagement of an independent Commissioning Authority (CxA) to "lead, review, and oversee the completion of all commissioning process activities." In order to receive credit, the CxA must have documented commissioning authority experience in at least two building projects and be independent of the work of design and construction, although the CxA can be a qualified employee or consultant of the project owner.

This issue resulted in significant discussion by the SWG. Proponents of enhanced commissioning felt that it was critical that every possible step be taken to ensure that buildings are "state of the art" and perform as efficiently as possible. Their view was that it was much more effective to achieve this when a building is new than to go back and implement measures after the building is built. Those reluctant to adopt a requirement for enhanced commissioning agreed that it was best to make the building as efficient as possible up-front, but felt that a mandate requiring enhanced commissioning would imply following the LEED process, which was unnecessarily burdensome. They suggested that building projects often undergo an "enhanced commissioning" process without having to follow the strict mandates of the LEED requirements. In fact, the guidelines for fundamental commissioning, which is a prerequisite for LEED certification, state that:

> "Owners are encouraged to consider including water-using systems, building envelope systems, and other systems in the scope of the commissioning plan as appropriate. The building envelope is an important component of a facility which impacts energy consumption, occupant comfort and indoor air quality. While it is not required to be commissioned by LEED, an owner can receive significant financial savings and reduced risk of poor indoor air quality by including building envelope commissioning." (www.usgbc.org/ShowFile.aspx?DocumentID=1095)

The Department of General Services reports that the County currently employs a very comprehensive commissioning process on all projects that includes many of the elements included in the definition of enhanced commissioning.

The County should strive to ensure that new public and private sector buildings in the County are as energy efficient as possible and incorporate "state of the art" technologies. An appropriate enhanced commissioning process is one step toward achieving this objective.

Improving the efficiency of new buildings, while critically important, does not reduce the County's GHG emissions but simply reduces the rate of increase. Moreover, new buildings will constitute only a small portion of the commercial and multi-family square footage in the County in the years ahead. A significant reduction in GHG emissions from commercial and multi-family buildings can only be achieved by addressing energy consumption in existing buildings.

There are a number of ways to assess and improve the energy efficiency of existing buildings. As energy costs and societal awareness of the environmental consequences of excessive energy use increase, some building owners will undertake this activity themselves. The County can assist in these efforts by providing technical education and outreach to property owners regarding assessment tools and efficiency measures, as well as information on financial

benefits such as tax credits that may be available to them from local, state or federal sources for efficiency measures. In order to further accelerate this process, the County should provide additional incentives for, or establish mandates requiring, energy assessments and improvements in existing commercial and multi-family buildings.

The first step in this process is benchmarking to assess the relative energy performance of a building. Benchmarking provides a building owner or operator essential information on the relative efficiency of a building compared to similar buildings, or relative to the past performance of the building being benchmarked. Through this process, the low performing buildings of a particular type are identified and further analysis can be conducted to determine what improvements are needed to improve the energy performance of the building.

Use of facilities over time, as well as changes in building function and occupancy, almost always results in building component modification and manipulation that have a negative cumulative effect on the performance of the building. Retro-commissioning is one approach to identifying and remedying these cumulative effects. Retro-commissioning of an existing building involves assessing the commissioning parameters discussed above for conformance with original design intent and equipment specifications. The retro-commissioning process also provides the opportunity to revise “design” conditions in light of use and occupancy requirements and improvements in available technology that were not in place when the building was first designed and constructed. Research conducted by three leading building research laboratories concluded that retro-commissioning is one of the most cost-effective means of improving energy efficiency in commercial buildings. Their studies, which analyzed more than 224 buildings totaling over 30 million square feet of floor space, showed a median commissioning cost of $0.27 per square foot, energy savings of 15 percent, and a simple payback period of 0.7 years. (www.energystar.gov/ia/business/EPA_BUM_CH5_RetroComm.pdf).

The SWG proposes the following schedule be adopted to address increasing the energy efficiency of existing buildings:

By	Milestone
2010	All existing buildings be benchmarked to assess relative energy performance
2015	All existing buildings undergo: ▪ Retro-commissioning, or ▪ Qualify for an exemption
2020	Commercial/Multi-Family sector meets 25% energy reduction target.

Although there is general consensus among the SWG and stakeholders involved in the discussions of this subject that the energy efficiency targets for commercial and multi-family buildings are appropriate, it is clear that the methods for achieving the targets are complex and more information is needed to effectively implement these policy objectives. Information is needed about the inventory of existing buildings in the County, the relative energy performance

of these buildings, appropriate energy performance or prescriptive targets for these buildings, educational needs of building owners and operators, suitable incentives and/or mandates for making energy efficiency improvements, and approaches to funding/financing of improvements.

To gather this information, the County should fund a detailed study for new and existing commercial and multi-family buildings that recommends:

- Requirements for benchmarking the energy performance of existing buildings (e.g. through ENERGY STAR's Portfolio Manager)
- Requirements for initial and retro-commissioning, including the specific criteria for exemption from such requirements
- Incentives and/or mandates which may be appropriate to achieve the energy improvements identified through the benchmarking, energy auditing and retro-commissioning process necessary to achieve the 25% energy reduction goal for existing buildings.

Among the issues that need to be examined are the following:

- Identifying the universe of buildings to which the benchmarking and retro-commissioning requirements apply. Factors such as building type, ownership, usage, size, and age should be considered.
- Special circumstances, such as the small business sector and affordable income multi-family.
- Substantial economic or technical barriers that would form the basis for an exception.
- How the use of renewable sources of energy and carbon offset approaches to meeting the energy efficiency requirements would be addressed.
- The enforcement process for meeting the requirements and penalties for non-compliance.
- Education and outreach efforts needed to increase awareness of and conformance with requirements among building managers, operators, owners and developers.

The study must include specific provisions that can be incorporated into the County's 2010 Climate Protection Plan in order to achieve the schedule identified above.

<u>Implementation Steps</u>

- To achieve the goal of having new buildings as energy efficient as possible and incorporate "state of the art" technologies, modify the County's current green building requirements to mandate the phasing in of enhanced commissioning of new public buildings starting in 2009. One year after the effective date of the requirement for public buildings to undergo enhanced commissioning, require that new commercial and multi-family buildings undergo enhanced commissioning. As part of the 2010 Climate Protection Plan, submit detailed guidelines for approval by the County Council that define the scope, applicability, and process for the enhanced commissioning of new commercial and multi-family buildings. These guidelines should be developed with input from DEP, DPS, the development community and individuals with experience in building

commissioning. The County should explore opportunities for incentives, consulting assistance, and training for consultants, contractors, and builders during the first several years after the effective date of this requirement.

- Develop a scope of work for and fund the study necessary to determine if the proposed schedule is appropriate (or if an alternative, perhaps phased schedule, should be adopted), and develop the detailed implementation steps for analysis and improvement of existing buildings.
- Incorporate recommendations for education and outreach, technical assistance and support, incentives, enforcement and penalties into the 2010 Climate Action Plan.
- Adopt the identified schedule for benchmarking and retro-commissioning existing commercial and multi-family buildings.

Recommendation EEC-4: *Develop a process for adopting new energy efficiency standards for commercial and multi-family buildings.*

Montgomery County has adopted green building standards for new construction, which include requirements related to energy efficiency. However, nationally recognized building standards are under constant revision for scope of application, intensity of design, and inclusion of new technologies and construction methods or exclusion of ineffective or obsolete components and processes.

To ensure that new public and private sector buildings constructed in the County represent the pinnacle of energy-efficiency and green building design, the County should develop a process to ensure that the most rigorous energy and green building codes are adopted in a timely manner as the base for all new construction; codes requirements are effectively disseminated to builders, developers, and building managers; and that enforcement is effective, thorough and uniform.

Codes and standards considered by the County may include, but not be limited to, the following:

- *ASHRAE/IESNA/USGBC 189.1 – Standard for the Design of High-Performance Green Buildings except Low-Rise Residential Buildings*. Energy efficiency and on-site renewable energy is expected to be a large part of this standard, which is currently under development, with a goal of achieving a minimum of 30% reduction in energy intensity or cost over that in ANSI/ASHRAE/IESNA 90.1-2007 - Energy Standard for Buildings except Low-Rise Residential Buildings, which is the current basis for building codes worldwide.

- *ASHRAE Advanced Energy Design Guides.* These sector specific publications provide recommendations for achieving energy savings over the minimum code requirements of ANSI/ASHRAE/IESNA Standard 90.1-1999. These guides have been developed in collaboration with the American Institute of Architects, the Illuminating Engineering Society of North America, the U.S. Green Building Council, the U.S. Department of Energy, and the New Building Institute. The initial series of guides have an energy savings target of 30%, which is the first step in the process toward achieving a net zero

energy building – defined as a building that, on an annual basis, draws from outside resources equal or less energy than it provides using on-site renewable energy sources. Each guide addresses a specific building type.

Implementation Steps

- Establish a Building Energy Performance Standards committee that will be comprised of individuals representing a cross-section of construction professionals, code experts and officials, energy efficiency professionals and climate change constituents charged with making formal nominations of new code requirements.
- Develop a process for the standard nomination, review, and adoption of new energy efficiency codes. Clearly outline specific criteria under which the Department of Permitting Services can delay implementation of, or waive compliance with, a new standard.
- Establish an implementation methodology by which County approved energy efficiency standards will be incorporated into permitting and construction programs.
- Establish a process for training code officials about new energy efficiency standards, including enforcement.
- Develop an educational program to increase builder and developer awareness of County code requirements. Outreach should include but not be limited to workshops, pre-design meetings, and web or print resources.
- Establish appropriate penalties for non-conformance with building energy codes.

Recommendation EEC-5: *Advocate for cost-effective utility-based energy efficiency and demand reduction programs, and form partnerships with local utilities to extend programs to businesses and residents.*

On December 31, 2008, the PSC approved energy efficiency programs developed by the electric utilities serving Montgomery County (PEPCO, BGE and Allegheny Power) as directed by the EmPower Maryland Energy Efficiency Act of 2008. Once implemented, these utility-based programs will provide Montgomery County residents with a broad range of initiatives that will help reduce energy use and GHG emissions from electric energy consumption.

PEPCO, which provides service to the majority of the County's electricity customers, created a "Blueprint for the Future" that described their planned energy efficiency, conservation, and demand response programs. Programs offer by BGE and Allegany Power would be very similar to PEPCO's programs. PEPCO's planned initiatives include:

- Customer Energy Awareness Campaign – Educate consumers about energy savings opportunities
- Building Commissioning Program – Fund engineering studies and training that improve the way customers commission, operate and maintain their specific facilities
- Non-Residential HVAC Efficiency Program – Provide incentives to encourage customers to select high efficiency options when purchasing HVAC systems through incentives for high efficiency unitary AC and heat pump equipment

- Non-Residential Prescriptive Rebate Program – Provide incentives to encourage the installation of efficient lighting, efficient motors, and other select measures
- Custom Incentive Program – Provide incentives to encourage the installation of highly efficient end-uses that include large chillers, energy management systems, and other end-uses that are unique to a specific facility
- Home Performance Program with ENERGY STAR – Fund a residential energy audit program, the installation of specific cost-effective energy savings measures, and the training and certification of contractors
- Residential Low Income Program – Fund the weatherization of low and moderate income homes in Montgomery and provide incentives to encourage the installation of high efficiency HVAC systems and appliances
- Residential High Efficiency Air Conditioning Program – Provide incentives to encourage the installation of high efficiency air conditioning units and fund the provision of contractor training to perform this work
- Residential Lighting and Appliance Program – Provide incentives to encourage the widespread adoption of efficient lighting and select ENERGY STAR appliances
- Residential Direct Load Control Program – Install direct load control equipment to reduce peak electricity demand through utility HVAC control
- Dynamic Pricing/Advanced Metering Infrastructure (AMI) Residential Feedback Programs – Establish AMI enabled dynamic pricing to encourage customers to reduce energy use during high priced periods and provide detailed energy efficiency information to consumers. Encourage the installation of AMI enabled energy display monitors in residential homes.

It is important to note that EmPower Maryland only applies to electricity distribution utilities and not to natural gas utilities. While electricity is generally more carbon intensive than natural gas, it would be beneficial to develop programs that provide incentives for improvements that reduce natural gas consumption.

Implementation Steps

- Work with utilities to continue to support proposed energy-efficiency and demand side management programs where economically beneficial to Montgomery County.
- Work with utilities to propose and support additional energy efficiency and energy management programs for consideration by the PSC.
- Advocate for consistency, where feasible, in messaging and program delivery for demand side management programs being offered by the three utilities serving the County.
- Collaborate on marketing and promoting utility programs to the public, and where possible extend utility funding by using existing County outreach and education programs.
- Collaborate with utilities to monitor and evaluate the effectiveness of utility-based programs.
- Advocate for incentive programs, operated by utilities or another entity, to provide incentives for energy efficiency improvements that reduce natural gas consumption.

Recommendation EEC-6: *Advocate for peak pricing and tiered electricity rate structures that encourage energy conservation by providing pricing signals for energy consumption during peak periods or by large users.*

It is widely recognized that energy pricing is one of the most effective mechanisms for encouraging energy efficiency by consumers. However, the cost of electricity does not always reflect the actual costs associated with its generation, transmission, and distribution. Similarly flat rates, or rate structures that provide discounts for large users, do not encourage users to decrease their energy consumption.

Peak Pricing

The costs of generating, transmitting and distributing electricity during times of peak consumption (typically in the mid to late afternoon on a summer day in this region) are significantly higher than off-peak hours. During these peak times, additional generating units must be brought online and the cost of transmitting power becomes greater due to congestion, resulting in higher wholesale prices that are not always fully passed onto the consumer. Some larger consumers in the County do pay different rates during peak times, but these rates do not fully reflect the increased costs of energy delivered during these periods. Moreover, peak pricing tariffs are not available to all rate classes.

Successful programs have been implemented by utilities across the nation that provide "dynamic" pricing for all types of consumers from large businesses to individual residents. Consumers covered by these programs can reduce their electricity bills by reducing their electricity consumption during high priced periods. These rate options, combined with the availability of direct load control technology (e.g., smart thermostats, or advanced refrigeration and lighting systems) are a powerful tool for reducing the overall peak electricity demand. Such reductions would have positive benefits, including increasing electric system reliability, reducing the need for new generation capacity, placing downward pressure on energy prices, and reducing GHG emissions. Peak pricing also helps stimulate photovoltaic and other solar technologies which, combined with net-metering, offset energy costs during high-demand periods.

Peak pricing tariffs can be voluntary, providing pricing advantages to those consumers that can reduce their electricity consumption during high priced periods. While the benefits of imposing mandatory peak pricing tariffs needs further study, the County should advocate for the development of voluntary peak pricing tariffs, and the necessary metering infrastructure to support such pricing, through all rate classes.

Tiered Energy Rates

Conventional electricity rate structures that provide consumers with uniform pricing or progressively lower prices as energy consumption increases may discourage the adoption of energy efficient technologies and practices. Assigning tiered energy rates – ratcheting up rates as consumption and/or demand increases – provides a significant incentive for energy-efficiency and demand side management improvements.

Rate tiers are powerful economic tools to spur changes in energy consumption; however they need to be applied judiciously to ensure that charges are equitably distributed. For example,

the energy consumption of a restaurant and a retail store may vary widely, but they may be in the same "rate class," essentially paying the same energy rates. If a tiered structure is put in place based purely on increasing the price as energy consumption increases, the restaurant may have significantly higher energy costs due to the more energy intensive nature of the business. Any tiered structure must be moderated by sector to ensure equitable treatment while encouraging energy efficiency improvements accessible to the sector.

The County should advocate for appropriate tiered energy rate structures that encourage energy conservation measures in concert with programs that promote and provide incentives for energy conservation.

Implementation Steps

- Advocate for Maryland Public Service Commission approval of appropriate peak pricing and tiered energy rate structures.
- Advocate for infrastructure and technology necessary to enable peak pricing and tiered energy rate structures.
- Partner with utilities to increase consumer awareness campaigns about peak pricing and tiered energy rates.

Recommendation EEC-7: *Develop and implement programs to support energy efficiency improvements by residents, managers and owners of multifamily properties, particularly affordable and low-income properties.*

Implementing energy efficiency measures in multifamily housing, particularly affordable and low-income properties, can be a significant challenge. Multifamily properties vary widely in age, design, and condition, resulting in the need for an equally wide variety of programs and measures.

In many properties, the occupants pay a fixed charge for utilities. In these cases, the tenant has no incentive to conserve energy or implement energy efficiency measures, and the property owner is not likely to implement such measures and pass the savings on to tenants. In those cases where tenants pay for utilities based on usage, there is an incentive to change behavior. However, unless the property is a condominium, tenants cannot make improvements to building components, appliances or other features that would result in major energy savings.

Furthermore, while the value of a single family home increases when energy efficiency improvements are made, no such benefit accrues to the occupant of a multifamily property. In fact, when energy efficiency improvements are made to a multifamily property, they are often made as part of an overall renovation program, which may lead to the gentrification of the property and the displacement of economically disadvantaged residents. Finally, education and outreach programs about energy efficiency often fail to reach multifamily audiences. Again, this is particularly true for residents in affordable and low-income housing, especially where language barriers exist.

Residential energy conservation, assistance and improvement programs at the County and State level have historically focused on, and been utilized by, residents in single family housing. For example, the Maryland Home Performance program sponsored by the Maryland Energy Administration, which is a very effective initiative for improving a home's energy performance, typically only applies to properties with four or fewer units.

In December 2008, utilities serving Montgomery County received conceptual approval from the Maryland Public Service Commission for a broad package of energy conservation and efficiency programs, funded by a small surcharge applied to electricity bills. Included in these programs are initiatives focusing on multifamily housing, including affordable and low-income properties. The details of these programs have not been fully developed, however, providing the County with an opportunity to help shape them.

Basic energy conservation measures utilized in single family homes may be used in multifamily properties. However, improvements to major components like a property's HVAC system or building envelope are more complex and costly. Recommendations RE-4 and EER-4 call for the establishment of low-interest loan programs to finance energy efficiency and renewable systems. These programs should be extended to include multifamily properties.

Implementation Steps

- Assess current County and State residential energy conservation, assistance and improvement programs for their applicability to multi-family housing, particularly affordable and low-income housing. Make or encourage the appropriate modifications to single family oriented programs to expand their applicability to multifamily properties.
- Collaborate with utilities as they finalize their multifamily housing programs, and take advantage of opportunities to link County, State and utility programs. County entities that should be involved in these discussions include DEP, the Department of Housing and Community Affairs, the Office of Home Energy Programs, and the Housing Opportunities Commission.
- Identify the varied constituencies occupying multi-family housing, and develop appropriate education and outreach materials on energy conservation, assistance, and improvement programs.
- Develop associated materials for multifamily property managers and owners, working with organizations such as the Building Owners and Managers Association, the Maryland Multi-Housing Association, and the Mid-Atlantic Affordable Housing Management Association.
- Where appropriate, provide low-interest loans and other incentives to multi-family property owners, ideally in concert with utility programs, to encourage energy efficiency improvements. Ensure that the programs outlined in recommendations RE-2 and EER-4 establishing low-interest loans for energy efficiency and renewable energy activities are applicable to multi-family properties, and that provisions are in place so that properties benefiting from these programs remain accessible to low-income residents.

Recommendation EEC-8: *Use energy efficient lighting technologies when installing new streetlights or replacing existing streetlights.*

An effective system of street and walkway lighting is essential to enhancing pedestrian safety, increasing motorist visibility, and providing a sense of security to residents. As with many other areas of the country, much of the County's street lighting system is dated, resulting in inefficient operation and poor performance (e.g., light trespass and over lighting). Upgrading street lighting provides an ideal opportunity to reduce GHG emissions and operating costs for the County government and utilities.

Montgomery County currently has approximately 66,000 streetlights consuming an estimated 45 million kilowatt-hours annually, and emitting nearly 26,000 metric tons of CO2 annually. (Energy Efficient Streetlights, Greater Washington Board of Trade, March 2008) More than half of these lights are owned and operated by utilities serving Montgomery County. The remainder are owned and operated by the County. A significant share of this lighting is highly inefficient mercury vapor lamps, which are being phased out due to concerns about the mercury content of the fixtures. The remainder consist primarily of metal halide and high pressure sodium lamps, many of which are highly-efficient and enclosed in "dark sky friendly" cut-off fixtures.

In 2008 the Maryland Public Service Commission approved PEPCO's proposal to retrofit all existing mercury vapor streetlights with more energy-efficient high pressure sodium fixtures over five years. The program will be paid for by a surcharge on utility bills.

When replacing existing County lighting, DOT currently uses conventional technologies such as high pressure sodium lamps and appropriate cutoff fixtures for most applications. Although these fixtures are considerably more efficient than their predecessors, they are 20-40% less energy efficient than cutting-edge light-emitting diode (LED) and induction technologies that may become more practical, effective and less costly in the near future. However, due to the importance of having reliable high-performance street lighting that provides cost savings over its operating life, the County must be cautious about deploying new technologies until they are thoroughly tested in real world conditions. The County is currently evaluating advanced technologies for future application.

Montgomery County will participate in an effort led by MWCOG to explore opportunities for utilizing advanced street lighting technology on a region-wide basis. This effort will involve collecting data on the type and condition of street lighting in the region, developing a regional streetlight action plan, engaging participating jurisdictions in pilot projects, and coordinating deployment of appropriate next generation lighting technologies on a widespread basis.

<u>Implementation Steps</u>

- Advocate for utility deployment of high-efficiency street lighting technologies, where appropriate, that provide cost savings to the County over existing technology.
- Continue to deploy high-efficiency, dark-sky compliant technologies for all new and replacement street lights.
- Formally participate in the MWCOG regional street lighting program including:

- Participating in information exchange and regional planning with other jurisdictions in the DC metro area.
- Participating in pilot demonstrations of advanced street lighting technologies such as LED and induction lamps.
- Where appropriate, participating in joint widespread implementation of advanced street lighting technologies.

6.0 Transportation

This section contains a broad range of recommendations related to transportation services and infrastructure. These initiatives focus on encouraging environmentally sound transportation choices, increasing opportunities for walking and bicycling, and enhancing the County's transit services. In addition, one of the recommendations encourages the County to promote state, regional and federal policies and programs related to vehicles, fuels, and transportation infrastructure. This is necessary because the majority of the regulatory and funding activity related to transportation (e.g. vehicle efficiency standards, fuel regulation, transit funding, etc.) occurs at these levels.

Education plays an important role in transportation. The choices individuals make about the mode of transportation they use, the type of vehicles they drive, and the types of trips they take fundamentally affect GHG emissions from the Transportation sector. A simple step such as combining trips can significantly reduce fuel use and the associated emissions.

The County has a robust transit system, utilizes alternatively fueled vehicles, provides extensive commuter services (including fare-matching programs), implements congestion mitigation measures, and recently initiated a car share pilot program. More information is contained in Appendix A.

Recommendation T-1: *Conduct parking supply and pricing study to ensure parking policies and zoning requirements are consistent with transportation demand management goals.*

The County Council Office of Legislative Oversight (OLO) recently released a review of transportation demand management in the County, including an analysis of County parking policies. Current County transportation demand management programs in urban centers are designed to encourage alternatives to single-occupant vehicle travel. The report found that, as currently implemented, county parking policies, including county zoning requirements and transportation demand management strategies often work at cross purposes to each other, simultaneously promoting alternative commuting modes and providing single occupant drivers with easy access to plentiful, low-cost, conveniently-located parking.

Under current zoning requirements, developments in urban centers must provide nearly the same amount of parking (for similar uses) as developments in less dense parts of the County. These requirements, adopted when the County was more suburban in nature, do not fully account for transit services and traffic congestion in urban centers today.

The Montgomery County Department of Transportation manages a major public parking program operated through four Parking Lot Districts (PLDs). The County's parking management practices also encourage commuters to drive alone by providing an abundance of long term urban parking at a low price.

The OLO report recommends the County improve the consistency and coherence of transportation demand management policies and practices by establishing parking policies

consistent with the County's transportation demand management goals. Current policies on urban center parking requirements, supply, and pricing may need to be redefined and updated. Council staff will draft possible policy changes. Representatives of the Maryland-National Capital Park and Planning Commission, the Department of Transportation, and other County agencies have conducted a preliminary review of the OLO report.

DOT proposes a joint study with M-NCPPC to explore alternative urban parking requirements and transportation management solutions that will help reduce both congestion and greenhouse gases, and promote ridesharing and transit use.

Implementation Steps

- Receive County Council review and comments on OLO report.
- Work with Park and Planning Commission to develop a scope of work that is consistent with Council recommendations and comments on OLO report.
- Develop a Task Order for a parking consultant to evaluate possible parking policies changes and the impacts of such changes.
- Conduct study process, working with M-NCPPC and supported by consultant.
- Present study findings and recommendations for Executive and Legislative review and approval.
- Incorporate approved recommendations in future parking policies.

Recommendation T-2: *Establish a car sharing program in Parking Lot District facilities*

Car Sharing companies provide convenient short term rentals of motor vehicles parked near mass transit providers in urban areas. Car sharing provides the benefit of an easily accessible vehicle for urban residents who generally use mass transit and only occasionally need a vehicle. Car sharing can allow urban residents to travel freely without the costs and responsibilities of car ownership, ultimately reducing personal vehicles miles traveled, traffic congestion and parking demand within the PLDs.

Several car share providers with slightly differing business models provide car-sharing services to the general public. Zip Car is the largest car share provider nationally. In Montgomery County, Zip Car provides car-sharing service at WMATA stations and select privately owned properties, but is currently not widely available to County residents. Strategically locating a fleet of shared vehicles within PLD facilities would make car sharing a more convenient option for County residents.

DOT envisions developing a car-sharing program and establishing a legal relationship with one or more private firms. DOT proposes to use a public selection process to identify a vendor(s) who would operate this service within PLD facilities. The private firm(s) would implement, market, and manage the car-sharing program. DOT would provide PLD-controlled on-street and/or off-street parking spaces to support the program. Both the County and private firm(s) would participate in the net profits of the program. Consistent with Chapter 60 of the County

Code, the selected vendor(s) would be required to pay the PLD an appropriate fee for use of PLD facilities.

Implementation steps

- Develop a scope of work for the car-sharing program.
- Use competitive bid process to select vendor(s).
- Identify parking locations for program.
- Implement program and monitor results.

Recommendation T-3: *Support the Ridership Growth Initiative by 2020 by implementing bus rapid transit on Veirs Mill Road and Georgia Avenue, and study and implement where appropriate light rail transit and bus rapid transit systems in other corridors.*

Bus systems in Montgomery County travel along the same routes as automobiles and trucks. During morning and evening rush hours, major County and State routes are frequently overtaxed with commuter travel, causing congestion and delay.

Veirs Mill Road and Georgia Avenue are major traffic corridors in Montgomery County. They are currently crowded with automobile traffic during peak hours and traffic volume is expected to increase. In fact, Veirs Mill Road is the single heaviest bus line within Montgomery County, with frequently scheduled service that is often late, "bunched," etc., on account of heavy traffic volumes. Because buses currently travel these corridors in the most congested times, buses have difficulty maintaining schedule reliability and providing competitive travel times. Bus rapid transit (BRT) and light rail transit (LRT) can reduce vehicle miles of travel by providing high quality and reliable transit service. BRT and LRT improvements could provide an integrated system of facilities, services and amenities that collectively improve the speed, reliability and acceptance of mass transit.

Councilmember Marc Elrich reviewed a proposed BRT network along a number of major corridors in the County with the SWG. The County should undertake the appropriate comprehensive analysis necessary to determine where BRT, or other mass transit options, are appropriate options.

Implementation Steps

- Complete the Facility Planning study of BRT strategies to improve bus travel time on Veirs Mill Road and Georgia Avenue, and fund the design and construction of the appropriate system.
- Undertake a comprehensive study of BRT, LRT, and other mass transit options in other appropriate corridors.

Recommendation T-4: *Conduct transportation planning studies during 2009 in order to better target transportation-related GHG reduction programs.*

Approximately one-third of the GHG emissions in Montgomery County are from the transportation sector. This figure is based on VMT data compiled by MWCOG, coupled with emission factors for the various vehicle classes included in the MWCOG data. Typically, VMT is estimated in one of two ways:

- An estimate of the amount of travel occurring on roadways in the County based on vehicle types, regardless of the origin, destination, or purpose of the trip, or
- A survey of County household travel characteristics, which can generate an estimate of VMT generated by County residents, regardless of how much of that travel occurs in the County.

VMT is nationally recognized as a generally measurable variable that, all else being equal, correlates well with GHG emissions. VMT, however, does not take into account equally meaningful factors that effect per-mile GHG emissions such as:

- Fleet variability – there is a significant difference in the fuel efficiency, and the corresponding GHG emissions, between vehicles within an individual vehicle class
- Fleet efficiency – improving fuel efficiency and tailpipe emissions can also reduce GHG emissions independent of VMT
- Trip lengths – due to “cold starts”, short vehicle trips create greater per-mile emissions than longer ones
- Travel speeds – GHG emissions are generally lower in free-flow conditions than in stop-and-go conditions

More specific metrics are needed in order to develop, and measure the effect of, comprehensive programs designed to reduce GHG emissions from the transportation sector. During 2009, the County should initiate a study to define the appropriate data, and identify the methodologies for acquiring this data, that would help with the development of more targeted transportation-related GHG emission reduction programs and measures.

The study should include the following elements:

- The current estimate of GHG emissions from transportation is a relatively gross estimate. The study should help ensure the GHG inventory is the sum of its component parts by considering the level of fleet disaggregation practical and desirable for GHG tracking, including consideration of:
    - The breakdown of the County’s passenger car and light truck fleet
    - Public transit providers (WMATA, MTA, Ride-On)
    - MCPS school bus fleet
    - Fleets maintained by individual public agencies operating in the County (including municipalities)

- The study should analyze the ability, timeframe, and analytical tools necessary to forecast transportation-related GHG emissions, and the impact of measures that the County may implement. This part of the study should be closely coordinated with MWCOG efforts, as much of this activity must occur on a regional basis. The study should ascertain, per Section 18-14 (d) (3) of the County Code, the best available economic models, emissions estimating techniques, and other scientific methods for making short and long-range decisions related to transportation GHG emission control measures.

- The study should identify the technical analyses required to forecast GHG emissions from future transportation and land use planning efforts so that the effects of individual plans and projects (such as major roads and rail and bus systems) can be forecasted and incorporated into the County's decision-making process.

- The study should identify methodologies for measuring potential for changes attributable to:
    - More efficient land use that improves jobs and housing balances within communities connected by transit corridors
    - Transportation network improvements that reduces person-miles of delay per person-mile of travel and improves person-movement in transit corridors
    - Improved vehicular and fuel/tailpipe technology efficiency
    - Transportation system operational policies that disincentivize peak period single-occupant auto use, including telecommuting, transit and HOV priority treatments, and parking management

Recommendation T-5: *Identify pedestrian improvements to maximize walking and bicycling to recreation centers, libraries, shopping centers and schools.*

Currently, there are a limited number of sidewalks and bikeways in neighborhoods within walking and or riding distance from recreation centers, libraries, shopping centers and schools which do not have access to bus service. Capital improvement projects identified by DOT that enable or encourage walking or bicycle riding to schools, recreation centers, libraries, and shopping centers should be given high funding priority. In addition, the public review process for sidewalks should be revised to allow easier and faster implementation of improvement projects.

DOT currently constructs between 5 and 7 miles of new sidewalk each year. However, this is entirely in response to complaints from residents and communities. In order to provide a proactive approach and a complete sidewalk network, DOT would need to conduct a survey to inventory and characterize existing sidewalks and most importantly, identify sidewalk deficiencies and missing segments. At this point, there is no comprehensive inventory database in place to enable the County to define and quantify the costs associated with addressing this need. Conducting such an inventory is considered critical to accomplishing this strategic objective in a cost-effective and efficient manner. This survey would be similar to what was performed for the County's Bus Stop Improvement Program in 2003 or the Road Conditions

Inventory in 2008. The survey would enable the county to create a GIS layer of existing, new, and improved sidewalk infrastructure, to prioritize improvements were most needed, and to cost-effectively manage these improvements.

The objective would be to provide complete sets of sidewalks and bike paths that connect every major activity center in the County to all surrounding residential communities (as well as locations with vulnerable pedestrian populations such as schools and senior facilities) located within a 1.5 mile walking radius of the activity center. This will provide a viable walk or bike option within the County's transportation system. High activity centers will be defined in the Pedestrian Safety Action Plan currently under development.

Implementation Steps

- Obtain resources and funding to conduct sidewalk inventory; procure contractor to conduct survey, using geo-coding for application to GIS-referenced database; and incorporate into interactive GIS-referenced database.
- Prioritize new sidewalk construction based on connectivity to high activity centers, vulnerable populations, and those locations determined to be most deficient and with the highest number of pedestrians and cyclists.
- Eliminate requirement to hold public hearings for any locations where agreement is reached between DOT and all adjoining property owners of proposed new sidewalks.
- Construct missing links based upon prioritized sidewalks and available funding. These improvements can also be implemented as Planning Board conditions of development approval for off-site, non-auto transportation facilities as part of the County's Adequate Public Facilities Ordinance.

Recommendation T-6: *Plan, design and construct bicycle paths, lanes and shared signed roadways, as well as facilities supporting bicycling, to encourage increased use of bicycling for commuting and other transportation needs.*

Additional efforts are needed to further promote bicycling as a viable means of transportation. Many roads are not compatible for bicycle use in their current configuration. Discontinuity of marked bicycle routes creates problems for cyclists, and serves as an obstacle for regular usage. Many bicyclists feel unsafe riding in the general stream of traffic, and would prefer lanes that are wide enough for bicycles and vehicles to share, or have dedicated bicycle lanes.

To address existing roads, the County should explore additional opportunities for re-striping roads as they are being resurfaced to include bicycle compatible lanes, or dedicated bicycle lanes where feasible. The Department of Transportation estimates approximately $100,000 per year would be needed for the development of new roadway marking plans.

As new roads are built or reconstructed due to development or capital improvement projects, bicycle compatibility will be addressed through the recently revised Roadway Design Standards.

The County should further encourage the use of bicycles for commuting and other transportation purposes by expanding the facilities required to make bicycling easier, safer, and more convenient for the user. In coordination with local bicycle groups, the County should develop a comprehensive program to provide appropriate signage, bike racks, lockers and other bicycling related facilities at appropriate locations.

Implementation Steps

- Plan, design and construct bike paths, bicycle compatible lanes, and dedicated bicycle lanes as specified in the 2005 Countywide Bikeways Functional Master Plan. In coordination with local bicycle groups and the general public, prioritize new facilities to connect to the County's major employment and activity centers, and transit facilities.
- Obtain resources to engineer updated pavement marking plans for use in remarking roadways as part of resurfacing projects.
- Train in-house and consultant engineers on the use of the County's new roadway design standards (in terms of lane widths and related bike lane needs) for repaving projects, and for reviewing and approving pavement marking plans associated with developer road construction projects.
- Implement new markings in accordance with plans during resurfacing projects.
- Provide "Bicycle Stations" at major transportation hubs and urban centers that will accommodate a significant volume of bicycle parking, and bicycle rentals with supporting facilities.
- Expand bicycle parking program with the provision of racks and lockers at major activity centers such as regional malls, libraries, recreation centers and entertainment venues.

Recommendation T-7: *Explore ways to reduce vehicle travel to schools by expanding walking, bicycling and use of buses.*

The County operates a Safe Routes to School program which is supplemented by grant funds from the Maryland Highway Safety Office. The program's goal is to encourage more students to walk to school by providing pedestrian education to parents and students as well as traffic engineering improvements and enforcement in proximity to schools to provide safer routes. The County should explore ways to reduce vehicle travel to schools by expanding walking, bicycling and use of buses.

Elementary and Middle Schools – Currently, many elementary and middle school students are dropped off at school despite being served by school buses or located within walking distance. Recent observations of area schools reveal that very few students – less than 10% – walk to school regularly. This is true even in communities designed to promote walking such as the Kentlands.

Changing behaviors of children and parents should include creative solutions that are safe and fun. One way of achieving this among elementary and middle school students is to create pilot "walking school bus" programs. A walking school bus – a group of children walking to school with one or more adults – can help influence a healthy change in behavior for school students.

A walking school bus can be as informal as several neighborhood families taking turns walking their children to school on designated days of the week. Or it can be as structured as a specific route(s) with several meeting points, a timetable and a regularly rotated schedule of trained volunteers, usually parents of the participating children. The flexibility of the walking school bus makes it appealing to communities of all sizes with varying needs. Parents often cite safety issues as one of the primary reasons they are reluctant to allow their children to walk to school. Providing adult supervision may help reduce those worries for families who live within walking or bicycling distance to school.

The pilot programs should target several elementary schools and their surrounding neighborhoods. Educational efforts should be aimed at existing walkers and those students and parents that are interested in walking to school. Creating pilot walking school bus programs will not only benefit children by giving them a healthier lifestyle, but traffic congestion around schools can decrease because of a decline in the amount of vehicles dropping off and picking students up.

High Schools – For high schools, where many students drive, a mix of strategies should be analyzed including incentives (increased number of secure bike racks, recognition, perks, etc.) as well as restrictive policies such issuance of driving passes with strict requirements. In order to better understand high school automobile use, MCPS should first identify the reasons students drive to school. Some students, for example, need cars for work-study programs or off-site college courses. Stakeholders involved in this process should include students, parents, school administrators, principals, teachers, Parent Teacher Student Associations, the Safe Routes to School coordinator, etc.

All Schools -- Some schools are not conducive for walking to school but students at these schools are provided with school bus transportation. A social marketing campaign should be developed to change the perception that the only way to travel to school is by private vehicle. Such a program would need to secure strong support from parents and students alike and clearly explain the benefits of using existing school bus service.

Implementation Steps

- For elementary and middle schools, establish informal and formal walking school buses that help to increase the number of school age children walking school; evaluate the success of these pilot walking school buses by surveying participants.
- For high schools, identify barriers and opportunities for reducing automobile use by students; convene stakeholders to determine effective strategies and policies.
- For all schools, conduct education and outreach and organize training on safe walking and bicycling practices; determine if increased enforcement is needed to ensure safety.

Recommendation T-8: *Develop a policy that requires the consideration of roundabouts whenever traffic signalization is being pursued.*

In the last decade, roundabouts have emerged as an acceptable and viable intersection control method. Traffic signals or all-way stop signs stop traffic by requiring alternating assignment of right-of-way. A roundabout is a circular intersection that flows around a center island. Since vehicles entering the roundabout are required to yield to traffic in the circle, more vehicles can move through the intersection with less delay.

Incorporating roundabouts reduces traffic delays and idling, resulting in lower fuel use and fewer emissions because there are fewer stops and hard accelerations. Roundabouts also help congestion management. They are efficient in both peak and off-peak times and they typically have less delay than signals. Unlike a traffic signal, safety is not compromised during power outages. They often complement other community values, offering aesthetic advantages, serving as "gateways", and offering quieter operation than the acceleration and deceleration associated with signalized intersections.

Roundabouts can provide other benefits as well. Roundabouts eliminate the most severe type of angle crashes. When there are collisions at roundabouts they are usually at lower speeds and are significantly less severe than typical intersections, signalized or not. The 32 conflict points at an intersection of two two-lane roads are reduced to 8 in a roundabout. Studies have shown (e.g., National Cooperative Highway Research Program Report 572) that roundabouts reduce all crashes by over 35% and, especially significant, reduce injuries by over 75% compared with other types of intersection control.

Roundabouts do have some design and planning considerations. Roundabouts require more pavement area at the intersection to accommodate their geometry, making them more land intensive. They may, however, require less pavement width on the upstream approaches and downstream exits if multiple turn lanes associated with a signalized intersection can be avoided. Initial construction costs are typically higher for a roundabout than for a traffic signal or other forms of intersection control, such as a standard all-way stop.

Roundabouts are typically considered during the planning process for new roadways and major reconstruction/widening projects, but are not routinely considered when existing intersections are being studied for upgraded traffic controls. A County policy can be established to consider roundabouts whenever a traffic signal is being proposed or pursued.

There are obviously places where roundabouts are not necessarily the right solution. For example, in high traffic volume areas with limited right-of-way, in areas with high pedestrian use and multi-lane approaches, or at intersections on grades, roundabouts may not be the best choice. There are also still concerns about whether multi-lane approaches to roundabouts will be required by the U.S. Access Board to have some form of signal control for pedestrian crossings. Accordingly, a sensible policy will recognize such situations and avoid the need for detailed analysis.

Implementation steps

- Research similar policies that have been exacted by other state and local jurisdictions.
- Prepare a policy for use in Montgomery County.

Recommendation T-9: *Develop comprehensive idling policies supporting Maryland's vehicle anti-idling law with an emphasis on both education/outreach as well as effective enforcement of the law.*

Vehicle idling, particularly from diesel bus and truck engines, has a significant environmental, economic and public health impact. According to the Federal Highway Administration, truck idling alone consumes almost 1 billion gallons of diesel fuel, and results in the emission of 11 million tons of carbon dioxide, 180,000 tons of nitrogen oxides, and 5,000 tons of particulate matter (www.fhwa.dot.gov/environment/cmaqpgs/idlereduct/index.htm). In addition, excessive engine idling increases maintenance requirements and shortens engine life, creates noise pollution, and impacts minority and disadvantaged communities in disproportionate numbers due to the location of facilities where diesel vehicles are housed.

One area where states have taken action is promulgating anti-idling laws. Maryland has an anti-idling law that prohibits vehicle idling for more than five minutes (with some exceptions), and the State law applies within Montgomery County. The anti-idling law plays an important role in reducing engine idling, but without adequate education and enforcement this law will fail to reduce idling and realize its many benefits.

The County should develop comprehensive idling policies and Standard Operating Procedures (SOPs) for all of its major fleets. The Division of Fleet Management Services (DFMS) has developed a vehicle idling SOP specific to DFMS maintenance staff and contractors specifying permissible times and conditions when vehicle idling is allowed. DFMS has also collaborated with the Division of Transit Services and the Montgomery County Police Department to develop idling policies unique to their operating environments. For the police, a fuel usage report has been designed to help managers monitor vehicle fuel usage by vehicle number as well as vehicle class in an attempt to modify driver behavior.

DFMS has also initiated a vehicle idling awareness campaign by placing signage at each of the fuel sites around the County designating them as "no idling zones" prohibiting engine idling while re-fueling. Vehicle idling information has been placed on DFMS' website along with updated air quality information as part of its re-education process. These educational efforts are cost effective, generate fuel savings, provide continual reminders to County vehicle operators and the general public, and demonstrate the County's commitment to lead by example.

As fleets develop SOPs they should consider techniques for monitoring/enforcement as well as idle reduction technology. Major county fleets should monitor fuel usage by individual vehicle number and by class to establish baseline information for fleet vehicles. Once a baseline has been established fleet vehicles should be monitored on a monthly basis and driver feedback

should be provided where possible. In some cases fuel usage may be an appropriate performance measure that is annually reviewed.

Implementation Steps

- Disseminate information about idling reduction efforts and technologies to County-controlled fleets.
- Develop department/agency “Workforce Awareness” and outreach plans focusing on negative air quality impacts associated with vehicle idling.
- Evaluate and identify high priority idling zones for diesel vehicles (for example, transit and school bus depots and load/off-load zones).
- Identify strategies for monitoring vehicle idling und technology improvements.
- Establish fuel reduction targets that can be realized through decreased idling (this would differ among distinct vehicle fleets).
- Explore enforcement opportunities targeting gross violators including brief "blitzes" or sweeps of high priority areas.

Recommendation T-10: *Increase the County government employee commuter benefit to be consistent with US government agencies.*

Federal government employees have been eligible for up to $115 per month since an Executive Order in April 2000, which was adopted into law as part of a federal transportation bill in 2005. (The maximum amount will increase to $120 in January.)

Montgomery County Government employees receive $35 per month as a tax-free benefit to offset transit and vanpool commuter costs. In addition, County Government employees can utilize the Ride On bus system for free using their employee IDs.

Most County Government employees converting from driving would need to use either the Metrorail or Metrobus system for commuting. Many also live in locations requiring the use of MARC Rail or long Metrorail rides due to the high cost of housing near their work sites. For employees using MARC, a monthly ticket runs anywhere from $100 - $225 per month. For employees using Metrorail to Rockville, costs can be anywhere from $66 per month (from Shady Grove to Rockville) to $180 per month (from stations throughout the region to Rockville).

The County should evaluate whether raising the County’s employee transit benefit to the maximum level authorized by law would have a significant impact on the employee commute profile.

Implementation Steps

- Conduct survey of County employees to estimate how many would convert from single occupancy vehicle commuter travel to public transit or vanpool if the County subsidy were increased.

- Initiate Commuter Information Days encouraging employees to participate in subsidy program; include "Pool Party" component where employees meet others with whom they could vanpool.
- Increase budget for commuter subsidy accordingly, and develop protocols to review the effectiveness of the subsidy and to ensure it is used appropriately (i.e. used to subsidize eligible commuting expenses).

Recommendation T-11: *Create an effective transportation education and outreach campaign to modify resident and business transportation behavior to reduce GHG emissions.*

The transportation sector, predominantly cars and light duty trucks, is responsible for approximately one-third of the GHG emissions in the County. Consequently, daily choices individuals and businesses make regarding transportation will play a significant role in meeting Montgomery County's emissions reduction goals. Education is one of the most important long-term initiatives that the community can use to promote awareness and engage the community to reduce vehicle miles traveled, increase vehicle fuel efficiency, and reduce the carbon content of fuel.

A sustainable transportation education and outreach campaign may include the following elements:

- Know Your Impact – Take an auto audit to determine miles driven, carbon released, and ways to reduce emissions. Create a campaign, similar to Arlington's Car Free Diet, that provides a personalized transportation carbon footprint and estimates on how much money can be saved, calories can be burned, and GHG emissions can be reduced when different commuting actions are taken.
- Alternatives to Driving – Identify opportunities for public transportation, carpooling, telecommuting, minimizing unnecessary automobile trips, walking or biking and provide estimates on the benefits achieved if these actions are taken.
- Selecting an Automobile – Provide education for vehicle purchases and retirement decisions that includes fuel economy information, tax and rebate incentives, fuel savings, maintenance options, and carbon reductions.
- Drive Smart – Create a driver education campaign and website that features tips on proper car maintenance and driving habits to reduce vehicle wear and tear, reduce fuel consumption, and reduce emissions. Maintenance items may include correct tire pressure, regular tune-ups, and removing unnecessary weight and car racks. Driving tips include anti-idling, driving 55 mph, accelerating and decelerating gently, combining trips, and reducing rush hour trips.
- Schools Education Campaign – Include a school curriculum on transportation's role in regional air quality and climate change and provide information to parents and students on how to reduce their emissions on their commute to school and after-school activities.
- Special Initiatives – Provide information on special transportation initiatives (parking prices, financial incentives, zip car, car share, bike maps, carpooling, telecommuting, car sharing programs, or other appropriate programs).

- Montgomery County's Green Fleet – Publicize the measures and benefits associated with greening Montgomery County's fleet.
- Community input and feedback – Encourage community input and feedback on transportation strategies, highlight success stories and best practices, take a Car Free Challenge, and share information on a blog.

Implementation Steps

- Define transportation performance benchmarks and target goals that the average resident can clearly understand and the benefits (economic, environmental, and health) associated with different actions. For example, develop a per capita VMT reduction goal or a fleet MPG goal, and translate GHG reductions that could be achieved by these measures into an equivalent number of cars off the road.
- Develop curriculum, website, brochures, and marketing materials. The cost of developing this information can be minimized by utilizing existing government programs.
- Incorporate transportation education into Commuter Connections and other transportation related outreach campaigns, as well as the general program recommend by the SWG.

Recommendation T-12: *Coordinate with other regional, state and federal governments and organizations on activities that will result in reduced emissions from the transportation sector as a result of a more efficient transportation system and the use of more efficient modes of transportation.*

Montgomery County's transportation network is part of a larger inter-county and inter-state system, encompassing not only roads and transit services, but a wide range of vehicles and fuel supply services. As a result, many aspects of this system can not be regulated or influenced at the County level. Close coordination with the state and federal government, as well as with regional organizations like the Metropolitan Washington Council of Governments, is necessary to better understand, influence, and regulate various transportation activities that contribute significantly to GHG emissions.

In order to help achieve GHG reductions in the transportation sector, the County should

- Seek to obtain data and information that will help policymakers at the county, state and federal level formulate policies to influence or regulate transportation choices and behaviors.
- Investigate the use of incentives, fees and taxes to encourage use of fuel efficient vehicles or transit services.
- Support or invest in transit services, specific transportation projects, and "clean" transportation alternatives that reduce GHG emissions.

Implementation Steps

The County should increase the information and data available related to the transportation sector by:

- Obtaining data from the State of Maryland on gasoline consumption or sales in the County.
- Supporting the creation of systems at the State or regional level that track VMT, congestion, transportation-related GHG emissions or other relevant information that may be useful in creating policy or influencing the community's behavior.

The County should encourage the use of fuel efficient vehicles and transit services by:

- Providing incentives for driving alternative or fuel efficient vehicles.
- Exploring a per gallon tax on vehicle fuels to be collected from the consumer at the pump by the State or by the County.
- Exploring a tax reflecting vehicle emissions classifications (low for efficient vehicles and high for inefficient vehicles), to be collected when a vehicle is registered or at the time of biannual emissions inspection. Such a tax could also factor in the actual mileage of the vehicle.

The County should support or invest in transit services, specific transportation projects, and "clean" transportation alternatives that reduce GHG emissions by:

- Expanding transit investment and give higher priority to transit projects in the region based on GHG reduction objectives.
- Directing any new taxes or fees to local transit or transportation projects that support GHG reduction objectives.
- Seeking local and federal support through grants and other funding sources to expand the use of alternative fuels and clean energy technologies in transportation.
- Support, where appropriate, state, regional, or federal low-carbon fuel standards.

7.0 Forestry & Agriculture

Included in this section are recommendations related to the conservation and enhancement of forests and trees in the County. Protecting and increasing these resources provides benefits far beyond the sequestration of carbon, including air pollution reductions, energy savings as a result of heat island mitigation, and water quality improvements and a wide array of social benefits. Currently, the greatest threats to forests and trees include changes in land use and invasive species.

In concert with the State, the County has a number of policies and programs in place that seek to conserve, protect and increase forest cover and tree canopy. These include the County's Forest Conservation Law, the Legacy Open Space program, the street tree planting and maintenance program, the Forest Stewardship program, the WeedWarrior program, deer management programs and gypsy moth suppression activities. More information on County and state programs related to forests and trees are included in Appendix A.

The SWG recognizes the value of the County's Agricultural Reserve and the opportunity it offers in reducing GHGs, as well as the other environmental and social benefits it provides. Subsequent plans will examine ways to increase conservation efforts, agricultural economic development, and initiatives to ensure conservation of the County's agricultural industry, as well as measures that could be adopted by the agricultural community to reduce GHG emissions.

Recommendation F&A-1: *Develop an accurate inventory of forest cover and tree canopy in Montgomery County, and set forest cover and tree canopy goals.*

Forest cover is generally defined as the area where forests occupy, or cover, the land. Forest includes areas with multiple layers typical of forest communities such as the forest floor, shrubs, small and large trees. Tree canopy generally means the area of land covered by the crowns of individual trees rather than forests, whether the trees are large or small trees and regardless of what they grow over such as lawns, homes, or roads.

Forests and individual trees provide valuable environmental benefits including the potential to sequester large volumes of GHGs. The more area covered by forests and trees, the greater the ability to store and sequester atmospheric carbon, filter pollution, reduce the formation of ozone, and reduce energy consumption due to direct shading of buildings. Other ecosystem benefits include reducing stormwater runoff and increasing air and water quality.

American Forests, a leading non-profit organization involved in the protection and enhancement of forests, has established the following tree canopy goals for metropolitan areas east of the Mississippi River (www.americanforests.org/resources/urbanforests/treedeficit.php):

Average tree cover counting all zones	40%
Suburban residential zones	50%
Urban residential zones	25%
Central business districts	15%

American Forests recommends that each community complete a tree canopy inventory and set goals to help meet environmental and quality of life goals. Goals established for Montgomery County should take into account not only climate change objectives, but also stormwater management needs (e.g. in highly impacted subwatersheds like Sligo Creek) and other community objectives (e.g. the emphasis on agriculture in the Agriculture Reserve).

Implementation Steps

- Develop and maintain an accurate, GIS-based inventory of forest cover and tree canopy cover. These inventories are underway in the Planning Department at M-NCPPC (forest cover) and the Department of Environmental Protection (canopy cover).
- Develop methodology to measure the carbon sequestration potential of the County's forest and trees based on the data from the forest cover and tree canopy inventories.
- Set forest cover and tree canopy goals specific to Montgomery County. Goals should be generally set for central business districts, urban residential, suburban residential, rural residential, and agricultural reserve areas. Within the context of master plans updates and other land use study areas, more specific goals can be set for specific planning areas.
- Identify areas for conservation and planting priorities. These priorities should be incorporated into existing publicly funded or mandated forest and tree planting and conservation programs such as the forest conservation program within the Planning Department, the street tree program with in the Department of Transportation, and landscape plans required as part of site plan development reviewed by the Planning Department and the Department of Permitting Services.
- Develop targeted tree planting and enhancement programs, through the use of various informational programs and incentives, in areas falling short of forest cover and tree canopy cover goals.

Recommendation F&A-2: *Develop a comprehensive approach that protects and enhances forest and tree resources*.

Montgomery County's Forest Conservation Law (FCL) was established in 1992 and has been amended several times. Implemented primarily by M-NCPPC, the law generally applies to properties going through the subdivision process or to properties greater than 40,000 square feet. Development activities that result in the disturbance of more than 40,000 square feet trigger review and mitigation requirements. In these cases, a natural resources inventory/forest stand delineation must be prepared to identify the natural resources on the property, especially forests and trees. A forest conservation plan may be required based on the results of the NRI/FSD and the disturbance. This plan outlines measures to be taken during and after the development process to protect forests and trees, as well as plans for meeting mitigation requirements. Mitigation for loss of forest and trees resources is usually met through reforestation or payment of fees. Although the FCL has resulted in a significant number of mitigation projects, the overall quantity and quality of other forest land in the County has declined due to development, non-native invasive species including plants and insects, and the overabundance of white-tailed deer.

Proposed amendments to the FCL were introduced in 2007. These amendments cover a broad range of issues, from clarifying language to increasing the mitigation requirements when forest is lost.

Non-subdivision activities affecting forests and individual trees are not currently regulated. As the development patterns in the County shift toward increasing amounts of redevelopment and "in-fill" development, loss of smaller areas of forest and individual trees on these unregulated areas is increasing as well. While this type of development occurs one lot at a time, the cumulative loss of forest and trees is no less important, particularly in many older communities without stormwater management or where trees are a significant part of the character of the community.

Implementation Steps

The County should develop a comprehensive approach to regulating forests and trees that:

- Broadens the current regulatory framework to cover smaller areas of forest and individual trees.
- Creates incentives to protect more forests and trees, and provide for mitigation when these resources are lost.
- Strikes the appropriate balance between the rights of property owners to develop their property and the environmental benefit that trees provide to the larger community.
- Develops an application and review process that provides certainty and speed to developers and landowners, and does not create significant financial pressure on the County.
- Increases the success of mitigation efforts, resulting in healthier and more forests and trees which provide benefits to climate change, air and water quality, and stormwater management while increasing property values and enhancing the community.

Recommendation F&A-3: *Lobby the State of Maryland and the Department of Natural Resources (DNR) to revise and update the State Roadside Tree Law (RTL) and its implementing regulations, as well as enforce the existing law. Explore opportunities to increase the role of the County departments and agencies in protecting trees in the right-of-way (ROW).*

Trees along roadways shade wide expanses of impervious surfaces and help reduce summertime temperatures. Lower summertime temperatures reduce the formation of ground-level ozone, running time needed for air conditioners to cool cars, energy needs for cooling buildings, and maintenance needs of asphalt and concrete. Tree-lined streets also provide stormwater management benefits, reduce acts of aggressive driving, make neighborhoods safer, and increase property values.

The Maryland RTL was enacted in 1914 to protect trees along all ROWs in Maryland. This law requires that all work on trees in ROWs be completed by a licensed tree expert, and that construction activity that may affect trees in ROWs be overseen by a licensed tree expert. The RTL does not give the State authority to delegate its responsibilities to local jurisdictions.

Therefore, enforcement authority rests solely with the State and the County cannot create legislation for its own program without an amendment to the existing law.

Street trees along all roadways, regardless of the jurisdiction, are frequently damaged or killed by careless building and construction practices, poor pruning practices, trenching, dumping of chemicals, and piles of stone or equipment parked on the critical root zones of trees. All too often these practices are implemented without the supervision of a licensed tree expert.

The RTL requires a permit, issued by DNR, to remove, maintain, or plant any tree in the ROW. DNR reviews requests based on other approved permitted activity; conditions of the tree; and health, safety, and welfare of adjacent landowners. Permits for removals include requirements for tree replacement.

DNR inspects and enforces the provisions of the RTL in response to complaints about roadside tree activities. However, irreversible damage to a tree often occurs before a complaint can be lodged, or inspection and enforcement can occur. For this reason, it is critical to the health of roadside trees to have licensed tree experts involved in all work on trees in ROWs. The benefits of roadside trees warrant additional attention to improving the protection of these resources.

Although DNR has enforcement authority for the RTL, the County's Departments of Permitting Services (DPS) and Transportation (DOT) could potentially assist the State by protecting trees in ROW during regulated building construction activities. Similarly, M-NCPPC could help to improve the protection of critical root zones of trees during the subdivision review process.

Implementation Steps

- Ensure entities working in ROWs understand the requirements for utilizing licensed tree experts for all work affecting trees, and for the need to obtain a permit for planting, removal, and maintenance of trees in ROWs.
- Lobby DNR, the Governor's office, and other appropriate agencies for better protection of roadside trees, including better enforcement of the Maryland Roadside Tree Law.
- Explore the implications of enabling the County to share regulatory and enforcement authority of the RTL.
- Explore opportunities for DPS, DOT and M-NCPPC to play a larger role in protecting trees in ROWs during regulated construction and development activities.
- Explore mechanisms to quickly stop unusually egregious actions from damaging trees.

Recommendation F&A-4: *Extend the County's current property tax credit for energy conservation and renewable energy measures to include tree planting.*

In July 2008, the County began offering a property tax credit for the implementation or installation of energy conservation or renewable energy measures. These credits are administered by the Department of Finance. Taxpayers taking advantage of the credit can obtain information and an application from the Department's website.

The County should expand this tax credit to include the planting of trees, subject to defined limitations. In addition, to helping address climate change, trees provide benefits for stormwater management, improve air quality, mitigate urban heat islands, provide habitat, and generally enhance the community. Moreover, increasing the planting of trees can provide green-collar jobs and stimulate business at nurseries and landscape companies.

Implementation Steps

- Define tree planting activities that will be eligible for the tax credit, including characteristics of the trees (e.g. species, size, etc.)
- Define the amount of the individual tax credit, and the cumulative annual amount of credits available for all tree planting activities.
- Define the documentation needed to apply for an application, and develop application materials for inclusion on the Department of Finance website.
- Publicize the availability of the tax credit, including working with local nurseries.

Recommendation F&A-5: *Create landscape incentives in urban areas to increase number, quality, and survivability of trees planted in the public right-of-way and on private property.*

Cities can be 10 to 15 degrees hotter than suburban areas due to heat trapped by paved surfaces, buildings, and cars. This effect is known as the urban heat-island effect. Trees can mitigate the oppressive summertime heat created by urban heat islands. By cooling the environment, the costs associated with cooling buildings and cars can be significantly reduced where shade trees are abundant and well-placed. Also, trees provide other environmental and aesthetic benefits such as reducing stormwater runoff, providing wildlife habitat, absorbing air pollutants, and providing visual relief from harsh built environments.

Urban landscapes can be hostile places for trees to grow. Limited root space, trunk injuries, competition with overhead and underground utilities, soil compaction, and drought combine to shorten the life of individual trees and decrease the function and value of these trees. However, the constant process of redevelopment in urban areas provides opportunities to enhance them with trees, making these areas more comfortable and more energy efficient. Changes in design standards, zoning codes, open space requirements, and building materials can provide more places for trees to grow. Additionally, promoting a sense of stewardship among people who live and work in urban areas will ensure that simple measures, such as watering, prevent the unnecessary demise of the urban forest.

Implementation Steps

- Consolidate and strengthen existing zoning codes to integrate green and open space design elements within development plans such as:
    - Shade trees to the southwest of buildings to maximize energy savings
    - Percent shading requirements from trees within parking lots

    - Shade trees around courtyards and along sidewalk and medians to reduce potential heat absorption
    - Native landscape materials to reduce maintenance and water requirements
- Update street tree standards to improve long-term living conditions for street trees, including the provision of space and soil volumes that ensure tree roots have adequate space to thrive. This may include layering of features such as requiring vaults below sidewalks to increase soil volume and space for roots.
- Create incentives that encourage retrofitting of existing parking lots and large vacant right-of-way areas to maximize opportunities for shade tree planting.
- Establish "adopt-an-urban-forest" stewardship programs to encourage residents to monitor and water trees within the public right-of-way.
- Protect existing trees during site construction and utility maintenance by utilizing modern and creative techniques for tree root protection.
- Create and track an inventory of urban street trees in conjunction with canopy goals for neighborhoods, master plan areas and watersheds.

Recommendation F&A-6: *Increase shade tree planting and maintenance in public and private parking lots.*

Shading impervious surfaces is widely recognized as beneficial in reducing the negative impacts of heat-islands and improving air quality. Increasing trees in parking lots increases shade over wide expanses of impervious surfaces and helps reduce summertime temperatures. Benefits of lower summertime temperatures include reducing the formation of ground-level ozone, reducing evaporation of pollutants from engines in parked cars, reducing running time needed for air conditioners to cool cars, reducing energy needs for cooling surrounding buildings, and reducing maintenance needs of the asphalt.

<u>Implementation Steps</u>

- Develop educational material directed towards business owners. Material should include information about the benefits of planting shade trees in parking lots, how to hire landscapers, how to buy trees, and how to recognize when a tree in poor health.
- Develop incentive programs for planting shade trees in parking lots.
- Work with facility and property managers to increase awareness of the benefits of shade trees in parking lots.
- Provide trees and planting services for county-owned public facilities through the street tree maintenance program's contracts.

Recommendation F&A-7: *Develop simplified processes to enable landowners to establish conservation easements or protection areas.*

A conservation easement is a voluntary agreement that allows landowners to limit the type or amount of development on their property while retaining private ownership of the land. A conservation easement is a recorded deed restriction, and the right to enforce the restriction is

generally given to a government agency or a tax-exempt conservation organization. Conservation easements are frequently used in the County to protect forests to meet the requirements of the Forest Conservation Law.

All conservation easements have legal, financial, and tax implications, and they can be complex. Currently, opportunities to use them to protect smaller "backyard" resources are limited. The County should explore options for creating a simplified version of a conservation easement or protection area that landowners could voluntarily use to protect areas of forest, trees, or other natural resources. Once they are identified, such areas could be protected from all activities that require permits through existing County processes, such as building permits. Methods for effective enforcement of non-regulated activity would need to be considered.

Under the County's current Forest Conservation Law, developers often meet mitigation requirements by "purchasing" an easement on an established forested area, a process known as "forest banking." These forest banks are often located far from the site of the development, so that the benefits of the protected area do not compensate for the loss of the resource in the vicinity of the development. A similar mechanism could be developed for smaller "backyard" resources, which could potentially encourage the creation of protected areas of forests and trees closer to the location of the development. These resources could be assigned a value on a sliding scale based on the quality of the resource protected. These resources could then be "sold" to individuals or developers needing credits to meet requirements for mitigation. The owner of the resource would be paid for the permanent protection of the trees by an individual or a developer who needs credit for disturbance nearby. The existing permitting process would regulate most activity impacting these protected areas. Again, effective enforcement for non-regulated activity, or activity that does not go through the permitting process would need to be considered.

Implementation Steps

- Identify mechanisms for recording simplified conservation easements or resource protection areas.
- Develop specific guidelines for landowners, realtors, developers, and surveyors for protecting resources.
- Develop banking mechanisms for "backyard" resources, including enforcement mechanisms.
- Develop methods for effective enforcement of non-regulated activity (i.e., activity that does not go through the permitting process).

Recommendation F&A-8: *Encourage and foster school programs integral to curricula that promote increased student involvement and engagement in forest and tree planting, conservation and maintenance programs within their communities and on available public property. Engage surrounding communities in planting and conserving trees on private property.*

MCPS students participate in environmental education learning opportunities through the science and social studies curricula, including the MCPS Outdoor and Environmental Education Program, which serves 22,000 K – 12 students annually. Additionally, successful tree planting and garden programs have been established at numerous schools with the support of outside groups including the Montgomery County Sierra Club, TREEMENDOUS Maryland program, Master Gardeners, Audubon GreenKids, and the Montgomery County Forestry Board. Environmental programs that provide opportunities for students to experience the benefits of our natural resources should be available for all students at each grade level.

Middle and high school student are required to complete 75 cumulative hours of public service before graduation. The grade 6 science curriculum facilitates the acquisition of 10 of these hours through environmental learning and the creation and implementation of local environmental action projects, including the establishment of butterfly gardens and expanding riparian buffers. Park and Planning has approved student service learning activities such as planting trees and removing undesirable plants.

Involving students in environmental projects will help prepare a generation largely isolated from the outdoors for stewardship of the environment, and decrease the public health costs associated with conditions exacerbated by sitting indoors, such as childhood obesity (www.nih.gov/news/WordonHealth/jun2002/childhoodobesity.htm).

Implementation Steps

- Develop and provide standardized garden templates, planting and maintenance tool kits, and workshops for schools. Resources include the Master Gardeners, Montgomery County Forestry Board, Audubon Naturalist (GreenKids Program), and the Sierra Club.
- Expand awareness and utilization of existing planting programs with suggestions for "greening the grounds" projects, which incorporate MCPS guidelines for plantings on school grounds. The programs must take into account physical constraints on school property related to future school expansions, on-site stormwater management structures, existing or potential use of geoexchange or photovoltaic systems, or other physical requirements.
- Establish a definition of community service for MCPS students that includes planting and maintenance of gardens and trees in parks and on available public lands.
- Encourage MPCS high school students to take a course in environmental science to meet one of the high school graduation requirements in science. Environmental science courses should require a minimum of five hours of community service with additional hours available to students doing special semester-long projects that advance the goals of the Climate Protection Plan.
- Include a semester's course in environmental science as part of the core curriculum at Montgomery College (MC) with the expectation that all MC students be involved in outdoor community service. Provide training to MC students to enable them to act as guides for younger students in middle or high school who are volunteers in environmental community service projects, Garden Clubs, Future Farmers Association, or other similar programs.

- Work with existing and new programs to establish measurable objectives that contribute to the Climate Protection Plan tree planting and maintenance objectives. Collect data from programs, monitor progress and provide recommendations to enhance program impact.

Recommendation F&A-9: *Develop an educational campaign to convey the vital role trees play in the long-term sustainability and health of the County.*

Outreach and education programs should be developed to reach a broad spectrum of the community to raise awareness of the benefits trees provide, and to encourage people to plant and maintain trees.

Implementation Steps

- Develop presentation materials and training to key people in environmental related organizations and businesses related to the benefits of trees.
- Provide training through established courses and workshops at local colleges, M-NCPPC, DEP, and through organizations such as the Sierra Club, Potomac Conservancy, and the National Audubon Society. Organizations to target for presentations should include the Scouts, PTAs, public school staff and students, community organizations, garden clubs, and business groups.
- Tailor presentations to appropriate audiences and include the benefits of trees, best planting practices, preferred planting locations (e.g., shading air conditioning units, preventing runoff), preferred tree species selection, sources for project funding, county and state programs, additional resources, and relevant regulations and guidelines.
- Develop a program to recognize individuals that present a minimum number of programs per year to the public through their organizations.
- Provide information to builders and subcontractors, as well as community leaders in communities with high rates of redevelopment, on best practices for tree protection and maintenance during construction and redevelopment activities. Information should include designing tree save plans and on-site planting plans to increase benefits of trees including reducing runoff, erosion control, and minimizing heat islands.

Recommendation F&A-10: *Manage non-native invasive pests that threaten forests and trees.*

Non-native invasive (NNIs) plants and insects are overwhelming threats to forests and trees in Montgomery County. NNIs threaten two-thirds of endangered species worldwide. Most experts consider them to be the second most important threat to biodiversity after outright habitat destruction. Combined with over-browsing by white-tailed deer and disturbance from development, erosion, and storms, NNIs are causing significant changes in the composition, structure, and ecosystem function in natural areas and backyards in Montgomery County.

In 1999, the Montgomery County Department of Parks implemented the Weed Warrior program. Weed Warriors are trained resident volunteers who assist park staff on a regular basis in

monitoring and removing NNIs from Montgomery County parkland. Certified Weed Warriors complete a two-part online course and participate in a two-hour field training session with a forest ecologist. The training stresses proper identification of invasive plants, correct removal and control techniques, and working safely in the woods. Weed Warriors are then authorized to work on County parkland on their own schedules and at their own pace. Occasionally Weed Warriors will work with larger groups, such as those organized by a community organization, with permission from the parks department.

A good example of the successful control of a particularly destructive NNI is the Gypsy moth control program conducted jointly by the Maryland Department of Natural Resources and the County. Through an annual suppression program involving detailed surveying of Gypsy moth populations and targeted aerial spraying, the impact of this destructive pest on the County's deciduous trees has been greatly reduced.

Given the wide array of benefits from forests and trees for mitigating for climate change and providing other environmental benefits, managing existing populations of NNIs, reducing their spread, and limiting introduction of new pests is essential to the health of forests and trees. The County should build on the success of the Weed Warrior program by significantly expanding its scope while also pursuing ways to limit the sale and spread of NNIs.

Implementation Steps

- Ensure a consistent definition of NNIs for use by all County departments and agencies.
- Expand the Weed Warrior program on all property managed by the Department of Parks.
- Implement the Weed Warrior program on all property managed by the County.
- Implement the Weed Warrior program on all other publicly managed property including local jurisdictions, homeowner associations, and civic associations.
- Develop a program for private property that follows the same guiding principles as the Weed Warrior program.
- Explore regional collaboration to limit sales and spread of NNIs, including incentives for homeowners to remove NNIs from yards and gardens, and for developers to remove NNIs from forests and trees on development sites.
- Continue to fund the gypsy moth suppression program.

Recommendation F&A-11: *Expand local production of fruits and vegetables.*

On average, fruits and vegetables travel 1,200 to 2,500 miles from the farm to our table, requiring enormous amounts of energy for transportation, freezing and refrigeration. Surveys suggest that there is a high demand for local products and that almost 50% of Marylanders are willing to pay a premium for locally grown produce (Maryland Policy Choices: 2007, Schaefer Center for Public Policy). Expanding local production of fruits and vegetables would therefore reduce GHG emissions and help to meet the demand for local produce.

However, factors including regulatory barriers, economic issues, deer control, and cost of land limit the ability of County farmers to meet the demand for local produce. According to the Department of Economic Development, about 30 of the County's 577 farms generate fruits and vegetables, utilizing about 3,000 acres, or four percent of the 75,000 acres of farmland in the County. As a result, there is not sufficient farm capacity to support the County's 13 existing farmers markets and 12 on-farm markets, and farmers from outside the County are actively recruited to meet the public demand for local food production.

Land in the County is expensive, making it very challenging for new individuals seeking to start an agricultural operation. Cash flow associated with agricultural operations may not be sufficient to sustain a farm operation if the property is encumbered by a mortgage. In addition, the County's land use requirements as outlined in the Zoning Regulations (Chapter 59 of the County Code) are not entirely conducive to new or innovative agricultural business operations. Finally, although value added products are in great demand, the County's food license regulations for such products are confusing and the fees are cost prohibitive for many participants of farmers markets and owners of on-farm markets.

The County should seek to both increase opportunities for prospective new fruit and vegetable farmers and address the barriers that limit local food production among existing farmers.

Specifically, the County should develop an on line directory for willing landowners of available land not in agricultural production to connect with individuals interested in renting land for crop production. The program could be structured like Community Supported Agriculture (CSA), with mutually supportive arrangements in which landowners and farmers share risks (e.g. poor harvests due to pests and unfavorable weather) and benefits of food production. Under a new program, the landowner would pledge in advance to help cover the estimated costs of the operation. In return, the landowner would receive rental income, fresh fruits and/or vegetables throughout the growing season, satisfaction gained from reducing GHG emissions and participating directly in food production, and generally more favorable prices. The farmer obtains advanced working capital and financial security. Since agricultural production and farm uses are allowed in most zoning areas of the County, even relatively urban areas in down County could participate. The program could be designed simply, although program criteria should consider extended lease agreements (perhaps for a minimum of five years) to provide farmers with greater security.

Additionally, the County should amend the regulations governing food licenses to streamline the procedures and fees for value added products sold at farmers markets and on-farm markets. The County should also analyze the actual costs associated with providing necessary equipment, deer fencing, etc. for the on line lease program and explore opportunities to create financial assistance programs for new types of agricultural businesses and operations.

<u>Implementation Steps</u>

- Amend the County's regulations governing food licenses as they apply to farm produce.
- Rework the Agricultural Services webpage or a partner organization webpage to include the on line exchange directory.

- Develop incentives to encourage lease agreements for a minimum of five years by landowner receiving benefits of fresh locally grown products CSA and rental income.
- Conduct a study or survey to better understand barriers and assistance opportunities for local producers of vegetables and fruits.

8.0 Land Use & Planning

This section includes recommendations related to land use and planning activities in the County. These issues are critically important to any jurisdiction's long-term efforts to mitigate GHG emissions. Because the County has a unique planning framework and regulatory environment, a summary of the background and major components of County's planning process is provided prior to the recommendations.

Background

In 1927, the Maryland legislature created the Maryland-National Capital Park & Planning Commission (M-NCPPC) to acquire land and implement plans for a system of parks and conservation areas; determine the location of highways; exercise control of the subdivision of land; and implement zoning regulations. Maryland State Law (Article 28, known as the Regional District Act) provides the basic planning and zoning authority for M-NCPPC. On this authority, the M-NCPPC and the County Councils of Montgomery and Prince George's County, acting as a District Council for each County, exercise their various planning and zoning powers for the Regional District (excluding certain municipalities).

The Montgomery County Departments of Parks and Planning perform the detailed staff work in long-range master planning, transportation and environmental planning, park planning and development, zoning, demographics and other research, historic preservation, the annual Growth Policy, and community outreach. In addition, regulatory responsibilities include preliminary plans of subdivision, site plans, project plans, and record plats, plus mandatory referrals, special exceptions, technical briefings and other work for the Montgomery County Planning Board.

Land Use Planning Framework

The General Plan is a comprehensive guide to the County's development. The Planning Board developed the General Plan for land use, transportation and circulation, in conjunction with residents throughout the County. The General Plan was subsequently reviewed and approved by the County Council. Because of its long-term nature, the General Plan includes broad policy guidelines for natural resources, conservation, open space, water and sewerage systems, employment and housing. It envisions a development concept of "wedges and corridors" for the County.

The "corridors" portion of this concept represents concentrations of development along major transportation spines or "corridors" that radiate out from the District of Columbia. In Montgomery County, these transportation corridors include Interstate 270 and Interstate 95, part of which lies in the eastern portion of the County along US 29.

Green "wedges" are the spaces between the corridors reserved for predominantly low-density and rural development, except for certain "satellite" towns such as Damascus, Olney and Poolesville. In the green wedges, the Planning Board and County Council have successfully

preserved a vast and viable agricultural preserve, primarily through effective planning, zoning and the Transfer of Development Rights (TDR) program.

Based on the General Plan, and following the process for input from staff and the public, the Planning Board creates local area-specific master plans and sector plans to set the land use vision for local areas. The Planning Board also creates systems-oriented functional master plans that are incorporated into the General Plan.

The Planning Board and its staff have always planned for compact and connected communities in the “corridors” of the “wedges and corridors” plan, however in the last few years the focus has turned even more strongly toward the corridors, creating a set of linked urban neighborhoods along transit lines. The global climate crisis, traffic congestion, rising commuting costs, threats to the agriculture reserve, and the desire among our residents to have a more convenient lifestyle have all been factors in forming this direction.

The Growth Policy

The Montgomery County Planning Board helps ensure the sufficiency of basic amenities for both current and future residents. The Growth Policy presents guidelines to identify where new development can take place (or if mitigation is needed), matching growth to the availability of public services and infrastructure like transportation and schools.

The growth policy implements a 1973 law, the Adequate Public Facilities Ordinance (APFO), which directs development to areas where public services and infrastructure are in place. Although commonly referred to as a separate ordinance, the APFO is actually part of Montgomery County’s subdivision regulations: Section 50-35 (k) of the County Code. The goal of the AFPO is to synchronize development with the availability of public facilities needed to support that development. The introductory sentence states, "A preliminary plan of subdivision must not be approved unless the Planning Board determines that public facilities will be adequate to support and service the area of the proposed subdivision."

For the following 13 years, it was the responsibility of the Planning Board to define adequate public facilities, and it developed a series of reports and guidelines to do that. Then, during the building boom of the mid-1980s, the Council became concerned that too much development was being approved.

After several proposals for moratoria or caps on building permits were rejected, the Council, as a compromise, enacted legislation under which the Council each year adopted an Annual Growth Policy (AGP) for the County. Since 1986, the Growth Policy has been used by the Council to direct the Planning Board's administration of the APFO.

The 2007-2009 Growth Policy:

- Established that development should be managed in ways that contribute to the sustainability of our facilities, communities and resources
- Strengthened transportation guidelines to better consider surrounding roads and transit

- Linked the evaluation of school capacity to Montgomery County Public School program capacity
- Expanded the definition of public facilities to include the environment (water pollution, air pollution, etc), energy, and affordable housing
- Established a better way to measure the impact of growth and propose a fair impact tax for developers
- Considered ways to raise the standards for well-designed communities

Current Strategies

The threat of global climate change has sharpened the need for compact, well-designed, mixed-use urban communities strategically located along transit corridors that showcase opportunities for walking and bicycling. There is a desire for communities that are diverse, energy efficient, focused on environmental conservation, and feature connections between well landscaped streets, transit stations, jobs, services, promenades, parks, and trails. The goal is to create communities where more people have the opportunity to walk to work in the morning and stop along the way for a cup of coffee or to read the newspaper; more workers venture outside during lunch to enjoy a well-designed public space; and in the evening, more people are near enough to retail to run errands or stop by school or an after-care program to pick up their children on foot.

This new direction in planning is “growing smarter.” It requires rethinking how growth is managed, not just basing it on traffic or school capacity, but on features that create quality of place in the community, such as:

- an attractive, active human environment that promotes social interaction along our sidewalks and provides a hierarchy of urban spaces
- centers with lower carbon footprints and buildings that generate power for their energy needs
- density around transit
- quality projects that contribute to a positive perception of our communities
- a range of housing opportunities for all income groups
- development linked to the County’s system of parks and natural areas
- a network of neighborhoods linked through trails and corridors

Communities with interactive downtowns or areas of relative quiet and repose attract a range of residents who create sustainable growth, and generate the need for a diverse range of services.

Rethinking Zoning

Planners are developing a diagnosis of deficiencies in the current zoning ordinance, the first step in a comprehensive revision that addresses overlapping regulations, unnecessary complexity, and outdated zones. In the end, the revision will feature fewer, more meaningful zones, more tables and diagrams to graphically illustrate concepts, and better organized content. The new zoning code will highlight urban design guidelines and sustainability.

In late summer 2008, planners launched a public input process by inviting code users to participate in a roundtable discussion and soliciting input in an online survey. The diagnosis informs the revision, which is planned for delivery in 2011. A significant part of that diagnosis will be looking at ways that the current code makes creation of the kind of communities described above harder and examine how other communities have facilitated energy efficiency, renewable power generation and GHG reductions.

Creating specifications for a zone that regulates mixed uses continues. The Council is completing work on a new Transit Mixed Use (TMX) zone proposed by the Planning Board to regulate development in transit station areas outside central business districts. The TMX zone supports growing smarter, partly by allowing more density in areas designated as receiving zones for buildable development rights agreements. It also supports the preservation of the Agricultural Reserve through the building lot termination program that will provide farmers a higher price for transferring the last development rights off farmland.

Master Planning

Community planners are incorporating growing smarter and sustainable principles into each plan. Upcoming plans seek to focus mixed-use development in areas that are well-served by public transit. Plans in the I-270/MD 355 corridor seek to address the balance between jobs and housing while enhancing access to transit in the Red Line Metro/Corridor Cities Transitway corridor. Each master plan estimates the carbon footprint of the planning area when all property is developed and transportation improvements have occurred. In addition, the department is developing better models to compare various development patterns and transportation improvements in order to advise decision-makers and refine planning in the future.

Efforts are underway to bridge the gap between current methods of addressing environmental protection, and the need for additional, new, and more comprehensive approaches that will address sustainability of both growth and the environment. For example, planning staff is looking at other techniques for achieving multiple objectives in implementing master plans by allowing increased density in appropriate areas in exchange for increased environmental benefits. This will help the County to accommodate additional expected growth where it makes sense, and at the same time make progress in enhancing the functions and values of the environment.

Healthy and Sustainable Communities Indicators

Indicators of healthy and sustainable communities were developed by the Planning Board based on the General Plan and on existing policies and programs to measure the effects of growth policies, master plans, public expenditures and policies that influence quality of life and sustainability. The first report was published in September, 2008. This initial set of indicators was developed with the assistance of subject matter experts and public workshops to bring the best minds and stakeholders to bear on this issue. Work continues to refine this set and find better indicators with input from all sectors. Planning staff coordinates with County Executive staff, and packages the information for Planning Board, County Council, and public review. The data analysis for the second report tracking progress will be prepared in 2010.

Recommendation LUP-1: *The County's Growth Policy should direct growth to areas with significant existing or planned transit resources, and promote development that fulfills smart growth criteria, such as those required as part of the LEED for Neighborhood Development, or more stringent County standards.*

The Montgomery County Planning Board helps ensure basic amenities for both current and future residents. The Growth Policy establishes guidelines to identify when new development can take place (or if mitigation is needed), matching the pace of growth to the availability of public services and infrastructure like transportation and schools. Past Growth policies have simply assessed whether services were adequate for growth to occur (given the land use and zoning prescribed by the relevant master plan) or whether certain inadequacies needed to be addressed before development plans were approved.

The Planning staff is currently preparing a draft of the 2009-2011 Growth Policy that will be sent as a recommendation to the County Council. The Planning staff is studying ways to provide incentives for development that can make efficient use of existing infrastructure. While Montgomery County has many regulations and guidelines that assure protection of resources, and the connectivity of roads, pedestrian and bike routes, evaluation of systems such as LEED for Neighborhood Development and others bring many of these factors together in one rating system. Staff is examining all development regulations and standards currently in use to determine how best to support new development that meets a high standard for sustainability. The emerging Growth Policy is based on four principles: connectivity, design, environment and diversity. The Planning staff is looking at criteria based on these principles that will help to assess development in a comprehensive fashion, in addition to the current assessments for traffic and school capacity.

Implementation Steps

- Planning Department staff prepares background material and analysis to establish thresholds for adequate existing or planned infrastructure. Staff will also analyze existing regulations and guidelines against LEED ND or other similar rating systems to determine a way to evaluate proposed development and appropriate incentives.
- The Planning Board will consider staff proposals and review comments from residents and stakeholders to develop recommendations for the County Council.
- The County Council will discuss the recommendations in committee and at the full Council, resulting in a resolution establishing a new Growth Policy.
- The Planning Board will use the policy in evaluating all proposed preliminary plans.

Recommendation LUP-2: *Amend the Zoning Code.*

The Zoning Code should be amended to:

- Promote compact development, direct growth to strategic areas with mixed uses for walkable communities

- Allow development incentives (consistent with master plans) if certain environmental benefits are provided
- Reduce parking requirements in transit accessible zones
- Allow renewable energy generation in all zones
- Promote use of building orientation, shading and materials to maximize use of natural conditions and minimize energy use
- Require minimum pervious natural or landscaped area to promote carbon sequestration and shading

The current zoning code is exceedingly complex and inconsistent regarding how sustainable development should be promoted. The code was based on historic considerations about separating uses and avoiding public nuisances. This separation of uses has led to residential areas with little daytime activity, commercial areas with little night life and roads packed with people going from one place to another. Requirements for separate buildings and parking for each activity led to excessive imperviousness and increased traffic congestion as people were forced to drive and park at each destination. Urban heat island, increased vehicle miles traveled and building energy use all lead to excessive carbon emissions. The new zoning code will include ways to promote compact growth with mixed uses, shared parking and reduced parking requirements. In addition, it will include minimum standards for pervious (natural, green or landscaped space) considerations for energy efficiency and renewable power generation. It will also examine how to reduce the amount of land consumed by individual lots to reduce the carbon emitted for construction and maintenance of public infrastructure.

Implementation Steps

- Complete a diagnosis of problems with existing code and study examples of other approaches to zoning
- Planning Board drafts code sections, receives public comment and makes recommendations to County Council by 2011
- County Council considers, revises as necessary, and adopts code changes

Recommendation LUP-3: *Master Plans should plan for redevelopment to create compact, livable places with a variety of housing types and mixed uses that invite people to walk or bike safely to work, to shop, and to participate in community life without a long commute by car. The Agricultural Reserve should continue to be protected for food production, recreation, and carbon sequestration.*

While the General Plan supports planning for environmental protection, energy efficiency, transit, bike and pedestrian access as well as “smart growth” principles, the actual work of reconciling these goals among themselves as well as with those associated with economic development is the work of the individual area master plans or sector plans. All master and sector plans will examine ways to reduce carbon emissions and estimate the carbon footprint of the proposed plan.

The Planning Board's focus in master planning is to redirect growth into areas that have been previously developed, considering ways to accommodate more people and businesses in mixed use, walkable communities. These communities allow people to conduct their daily business in the community, children to walk or bike to school, and anyone to bike, walk or take transit to work. Multi-family and multi-story buildings can be heated and cooled more efficiently. Green roofs, stormwater collection systems and open space can cool areas significantly, making buildings more energy efficient and walking more pleasant.

Accommodating growth closer to transit and in areas of existing infrastructure also reduces pressure on the agriculture reserve. More concentrated demand facilitates farmers markets, demand for locally-grown food and appreciation of the larger rural vistas in the countryside.

Implementation Steps

- The Planning Board's work program should include master and sector plans where compact communities can be enhanced or redeveloped to accomplish reduced carbon emissions and smart growth.
- The County Council should support and adopt plans that accommodate a significant amount of the County's growth in compact, walkable communities.

Recommendation LUP-4: *A Green Infrastructure Plan should be adopted to protect an interconnected network of forests, fields and wetlands and provide priorities for protection, restoration and mitigation of loss of natural resources. This plan will be considered in master plans, development proposals (both public and private) and park acquisition for natural resource protection.*

This plan, to be released in spring 2009 in draft, will identify the most important environmental features throughout Montgomery County and recommend ways to develop a comprehensive interconnected system of natural areas. It will establish a conceptual network map of green infrastructure that includes natural areas of countywide significance and potential connections between those areas. The plan will also recommend policies and implementation strategies to help realize as much of the network as possible, and to protect and enhance the carbon sequestration, water quality and habitat benefits afforded by the network. It will provide a countywide understanding of the relative importance of natural resources within the network, and identify opportunities for conservation, mitigation, and restoration, and will be considered in development review, master planning, park acquisition, and budgeting.

This network of green will sequester carbon and cool the County while providing habitat, water quality benefits and key connections for walking and biking.

Implementation Steps

- The Planning Board will review the draft plan and consider public comment and forward recommendations to the County Council

- The County Council will hear further public testimony, consider the plan in committee and at full Council and should adopt a plan with implementation recommendations that will be considered in master plans, park acquisition and development plans to protect key features of the interconnected, green network.
- Amend or adopt appropriate regulations and programs to protect and, where possible, expand the network.

Recommendation LUP-5: *A Water Resources Functional Master Plan (WRFMP) should be adopted to provide priorities for water resources goals in other functional and area/sector master plans; development proposals; park acquisition that focuses on forest cover, wetland, and tree canopy protection; restoration and enhancement; as well as Environmental Site Design (ESD) implementation. Policies and strategies that provide water-related benefits through enhancements in these areas will also provide ancillary, carbon reduction benefits.*

The Water Resources Element of Maryland HB 1141 requires the County to amend its General Plan to address water resource related planning issues. While focusing on water issues, the plan should help set priorities for protection of resources in the Green Infrastructure Master Plan and other master plans to assure that the natural cleansing functions can be maintained.

Because of this connection, a key component will involve the strategic protection, restoration, and enhancement of forest cover, wetlands, and urban tree cover, as well as the implementation of ESD. Specifically, the Plan will address how expected growth will affect and be affected by limiting factors such as water supply, wastewater, stormwater, non-point source pollution, and water quality of receiving streams. This plan will help the County identify strategies to address these limitations, and avoid building moratoriums, public health hazards, and adverse environmental impacts. The WRFMP will develop strategies, goals, and objectives to improve the protection and enhancement of important natural resources such as wetlands that provide critical water quality benefits where they are needed most. It will also help identify watersheds with the highest priorities for protection or restoration and complement and refine existing information to facilitate a more comprehensive approach to meeting state and federal water resources standards. These strategies will not only serve to improve and protect water quality, but will also result in air and climate-related benefits.

<u>Implementation Steps</u>

- Planning staff is coordinating the preparation of this plan with significant input from the Montgomery County Department of Environmental Protection and the Washington Suburban Sanitary Commission. A draft plan will be available for public comment in the fall of 2009.
- The Planning Board will take public comments, review and approve the plan early in 2010, sending it to the County Council for further public comment, committee and full Council consideration.
- Implementation of the plan should follow, requiring action by all partners based on the final recommendations of the plan as adopted by the County Council.

9.0 Education & Outreach

The County government conducts education and outreach related to a wide variety of activities that provide GHG reductions, including recycling, the use of mass transit, home energy efficiency, clean energy use, and more. The County also partners with numerous civic, environmental and business groups promoting environmental stewardship through various campaigns, events and programs.

However, the SWG recognized that a more strategic and comprehensive education and outreach campaign is necessary for the County to reach its GHG reduction goals. The following set of recommendations is designed to achieve broad based behavioral change and includes a branded communication platform, specific tools to assist residents, development of a coalition of green champions/trainers as well as informational and organizational networks to disseminate information and spark action.

These recommendations repeatedly touch on two key themes. The first is that behavioral change by County residents is essential to meeting the County's GHG reduction goals. Although not easily tracked, and thus not part of the GHG inventory, the GHGs embodied in household consumption of goods, services and food are very significant. One 2005 study, conducted by the University of California, Berkeley estimated that these "indirect" emissions -- stemming from the production, manufacturing and transportation of products and services -- account for 56 percent of total household GHG emissions. (repositories.cdlib.org/ucias/breslauer/8/)

The second key theme is that the County government has an obligation to lead by example. Policies, programs and, most importantly, practices adopted by the County government and County agencies should demonstrate to the broader community that they are not being asked to do anything that the County is not willing to take on itself.

Recommendation ED-1: *Develop a branded communication platform that will enable the County to speak with one voice about its mission to reduce GHG emissions.*

Educational and outreach programs that utilize community-based social marketing to promote behavior change are often more effective when they are implemented at the community level and involve direct contact with people. Social marketing researchers Doug McKenzie-Mohr and William Smith provide the example of the study of home energy auditors for one of the largest utility companies. They found auditors who were trained to use behavior change tools such as addressing barriers, encouraging commitment, providing reminders and prompts, building community support, and communicating effective messages, and incentives persuaded three to four times as many households to weatherize their dwellings when compared with the national average. (Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing, New Society Publishers, 1999) Community-based social marketing has successfully raised recycling rates in many jurisdictions.

Social marketing efforts are just beginning to see the benefits of utilizing traditional marketing techniques, such as branding, to build awareness and acceptance of the central ideas of a campaign. While the focus remains on end goals, this advanced effort creates a platform from which all subsequent communications can draw structure and insight for maximum effectiveness. By developing an overall identity that county stakeholders can rally around, future branded communications, like an old friend making a request, will evoke this original sentiment and find a more receptive audience.

Market Research and Branding – The County must first develop, plan, and conduct market research to identify baselines and the barriers/drivers that could hinder/expedite progress towards the County's GHG reduction goals. The objective of the research is to better understand what ideas and concepts stakeholders are receptive to and inform the development of communications that will resonate and motivate consistently over time. Qualitative and quantitative methods will be utilized to generate insight, confirm assumptions, segment audiences, and develop effective communications. By studying audiences' current attitudes and behaviors, insights are developed that identify "hot button" issues that can serve as the foundation for compelling messages and visuals. Such issues cut through the clutter of competing messages and resistance to change when they are uniquely and quickly branded as the voice of Montgomery County. This unified message resonates strongly with community members making them more receptive to the specific goals of the individual communication.

Website Use and Development – A website serves a variety of stakeholder engagement functions. It will first and foremost reinforce the central ideas of the campaign utilizing messages, visuals, and foundational content to define the effort and invite participation. As an information clearinghouse, it can educate visitors about environmental issues, County initiatives, and related actions to be taken utilizing helpful resources. The information should be educational and action-oriented to quickly move people from learning about issues, to considering actions that simultaneously make a difference and benefit them. The website will include elements of social media to allow active participants to comment on portions of the site and provide additional ideas. This will make the site look more "lived in" and snowball participation. Posting news and events updates people on the County's progress spurring further involvement. The County could set up accounts to customize future information in e-newsletters, etc. Entertainment-oriented elements could dovetail nicely with more factual/action-oriented elements to increase site engagement.

Additional Channels – The County must identify and develop appropriate media and partner channels to reach stakeholders/segments on an ongoing basis to support specific goals, including raising campaign awareness and acceptance and supporting specific behavior change initiatives. The website serves as the hub of all communications, providing for all information needs and drawing in stakeholders to encourage a deeper engagement. Other media drive people to the website, develop their understanding of the campaign, and move people toward action. By developing partner networks, the County could utilize its communication vehicles to propagate the message and draw more people into the effort. Branded communications customized to the needs of an individual publication could ensure usage, while maintaining the underlying message of the campaign. Partners could also utilize the communications/branding in their stores, promotional materials, etc. as an affiliation benefit. In-kind media (e.g. Metro)

and earned media should also be explored to develop further reach. Intriguing messages and actions (e.g. lead by example) could help generate word of mouth interest that then gets the attention of media. Online sources should also be explored as should in-person outreach (e.g. presentations, events). Materials that could either be disseminated or downloaded from the web site could help support specific initiatives or the general ideas of the campaign.

Additionally, the County will look to coordinate with utility-based campaigns. The purpose of the utility sponsored campaigns is to educate all customers about opportunities to reduce their electricity bills through energy efficiency, conservation and demand response activities.

Evaluation – The overall objective of evaluation is to develop significant insight into the stakeholders/segments the County is trying to reach and engage through the social marketing campaign. This insight serves to develop communications that will resonate and spur action. Throughout the research process, message/communications development, campaign, etc. feedback loops need to be developed to test assumptions and effectiveness of efforts to allow for adjustments as necessary.

Resource Allocation – Any budget that can be allocated to the initial communications effort will help build a solid platform for maximum effectiveness. Given fiscal constraints, a phased approach to implementation should be utilized with a deeper treatment/development taking place as further support becomes available. Pro bono services (e.g. communication agencies, in-kind media) should also being explored and low-cost/free options are the first possibilities to be considered for their effectiveness to conserve resources wherever possible.

Implementation Steps

- Develop a Marketing and Branding outline. Use it to develop plans and strategies for education and outreach for the Climate Protection Plan's programs based on community-based social marketing.
- Establish a central clearinghouse, such as a website, to support education and outreach that would provide information on Climate Protection programs including: information on County programs educational and skill building opportunities, local/state/national resources, incentives, and tools to support GHG reduction targets.
- Develop, conduct, analyze and apply results of market research to developing the education and outreach plans.
- Identify and establish education and outreach strategies for programs and launch education efforts and media efforts to raise awareness of the Plan and the programs.
- Develop and execute evaluation plans to ensure objectives are being met and to adjust program plans.
- Conduct periodic community surveys to compare baseline data and to identify incentives and barriers for delivering programs effectively.
- Ensure that the financial support and in-kind support is sufficient to achieve the development and execution of the education and outreach plans.

Recommendation ED-2: *Develop and provide presentation toolkits to support a social marketing campaign that raises awareness about Climate Protection Plan programs and encourages active participation throughout the County.*

Since the goods and services households consume on a daily basis represent about half of their carbon footprint, programs that focus on changing behavior patterns to reduce carbon are one of the major ways to reduce overall GHG emissions. Educational presentations that encourage community members to make changes immediately – without waiting for major policy initiatives, new technologies or alternative energy sources to scale up – are imperative and can be cost effective. The County can build demand and support for bold policy changes as well as green products and services needed to create a sustainable community by engaging residents through community education events. A key strategy for reaching GHG reduction goals will be to mobilize the public by delivering programs that raise awareness, provide support through practical recommendations, and provide access to County programs.

Implementation Steps

- Develop standardized presentation tool kits on a variety of Climate Protection Plan programs such as energy efficiency actions residents can adopt, commercial energy efficiency, tree planting, transportation options, etc.
- Content should address strategies that reduce barriers, focus on benefits, provide clear and consistent messages, provide clear prompts and reminders, reinforce and reward positive actions, provide opportunities for public commitment, and build community support (establish behavioral norms consistent with reducing GHG emissions).
- Partner with community organizations (homeowners associations, community associations, faith-based and ethnic/multi-cultural organizations, parent-teacher associations, non-profits with large and diverse memberships in Montgomery County) to develop presentation kits, recruit volunteer presenters and deliver presentations to the constituencies served by these organizations. Presentations should reinforce and support County agencies and departments that deliver the Climate Protection Plan programs.
- Recruit and train volunteers to present educational programs for large and small groups.
- Identify the County programs that have common greenhouse reduction goals and establish coordinated messages to promote the program plans and a process for County departments to continually integrate education and outreach across all sections of the Climate Protection Plan.
- Establish a central information clearinghouse, such as a website, to support the presentations and the presenters.
- Conduct periodic community surveys to compare baseline data and identify incentives and barriers for effective program delivery.

Recommendation ED-3: *Develop, provide access to and promote an on-line tool to promote the Climate Protection Plan and other related programs in order to raise awareness of the need to reduce greenhouse gases, provide specific actions, and encourage community based sustainability.*

Residents polled in a recent Montgomery County survey identified climate change as the biggest environmental problem of our time. Additionally, 80% "mostly agreed" or "strongly agreed" that personal behavioral changes will help to reduce the impacts of climate change and other environmental problems.

However, as the survey results suggest, behavioral change is difficult. Twenty-two percent said they are "procrastinators" and that "changing behavior is hard." Even if individuals wanted to change their behavior to be more environmentally sensitive, 33% said they "didn't know where to start." Because of the complexity of the topic and the variety of environmental information available, there is a need to develop a resource to help county residents find ways to reduce their environmental impacts, set goals for meeting a particular outcome, and put into practice a plan for living a low-impact lifestyle.

The goal of this "Green Guide" would be to encourage Montgomery County residents to *take action* to decrease their impact on the environment and adopt a lifestyle of calculated choices that will move the community toward its GHG reduction goals.

Implementation Steps

- Develop an online system for users to identify the actions they will take and track results across a range of environmental issues including air quality, water quality, climate change mitigation, pollution prevention, resource and waste reduction, and others. The tool should be developed in a format that best suits the needs of county residents.
- Develop the resource drawing on similar residential resources and tools such as the Green Team Project, Turn the Tide Campaign, Stanford University's Sustainable Choices, and other programs. Incorporate information and data from nationally recognized programs like ENERGY STAR to ensure its validity.
- Involve stakeholders in the design and piloting of the Green Guide to determine: proper format, process for implementation of actions, ratio of factual data to resource tools, length, dissemination strategies, etc. since it must be accessible to a broad and diverse audience.
- Establish specific measurable objectives to assess usage of the Green Guide and its impact.
- Establish and maintain a tracking tool to measure how many actions are being implemented by County residents.
- Evaluate the use of small incentives to encourage users to report their actions and progress (e.g., faucet aerator, weather stripping, etc) as well as recognition by the County in the form of a plaque or yard post, identifying a household as a "Green Home."

Recommendation ED-4: *Build and maintain an information network service that provides online Climate Protection Plan updates on County programs and regular specific suggestions such as "Green Tips" to inform and encourage residents to take action to reduce greenhouse gases.*

Marketing research on Montgomery County residents shows that residents are eager to see the County do more in the area of environmental programs and climate change and are hungry for information that will enable them to do their part. Residents want to focus on their homes (especially if financial incentives are available) and on the businesses in our community. In order to continue to be informed and take action, residents and businesses need to have relevant, positive, information related to county Climate Protection Plan programs.

Dissemination of "Green Tips" would be one method for providing information. Green Tips should be short, simple pieces that would provide information on County programs in relation to the Climate Protection Plan. The objective would be to increase knowledge and awareness of actions the County is promoting to address climate protection.

Below is a sample Green Tip, based on information about the County's expansion of the residential curbside recycling program to include more plastics:

The Tip: Recycle more plastics and keep waste out of the trash!

The Facts: Montgomery County recently expanded its residential curbside recycling program, so start filling your blue bins with more of what you used to throw in the trash. Why? Because recycling helps by reducing our need to mine for new resources and manufacture new products. It therefore reduces pollution, saves energy and helps mitigate global climate change.

Here's a quick review of the types of plastics you can now put in your blue recycling bin:

Plastic Type	Resin #	Examples
Bottles	1, 2, 3, 4, 5, 7	Narrow-neck plastic bottles that contained food, drink and household products
Containers, tubs and lids, pails and buckets	2, 3, 4, 5	butter/margarine tubs; cottage cheese, sour cream, and whipped topping containers; peanut butter and mayonnaise jars; deli tubs; yogurt cups; prescription bottles; detergent, pet food and kitty litter containers
nursery and flower pots	2, 5	all colors of pots accepted
Beverage cups		fast food fountain drink cups

These Items are not acceptable:

- Any plastic bottle or container that held hazardous automotive or garden products (examples: motor oil, antifreeze and pesticides)
- Plastic wrap, bags, or film
- Non-bottle items made from resins #1 (polyethylene terephthalate) or #6 (polystyrene and Styrofoam™ products) (examples: plastic knives, forks, and spoons; 4-pack and 6-pack plant containers, plastic egg cartons, "clamshell" containers, packaging from small electronics and toys, jewel cases from CDs)

For more information: Montgomery County Division of Solid Waste Services www.montgomerycountymd.gov/apps/dep/solidwaste/collectionservices/material_detail.asp

Implementation Steps

- Produce and disseminate Montgomery County "Green Tips" daily, weekly or monthly.
- Develop a unified format and look to "Green Tips" and use for all promotions.
- Promote to local newspapers and seek publication of the "Green Tips" in local publications, e.g., Gazette, Montgomery County Extra, etc.
- Solicit and collect testimonials of businesses and residents who have benefited from the "Green Tips." Use testimonials in promotions.

Recommendation ED-5: *Establish and coordinate a coalition with representation from a broad range of community organizations to support outreach, raise awareness of the climate protection plan and to provide opportunities and support for education programs.*

A common strategy for enhancing the impact of education and outreach programs is to build and maintain a coalition of organizations and community members to promote and execute programs. Coalitions typically provide a foundation for uniting groups of people from either target populations or a broad base to work on a common set of issues. Forming coalitions with other groups with similar values, interests, and goals allows members to combine their resources, maximize impact and enhance results. A County based coalition of organizations devoted to working together to advance the goals of the Climate Protection Plan would be an important foundation for building a sustainable community. A "green" coalition could also help focus awareness and raise visibility of the Plan's programs and thereby increase peoples' access to and utilization of county programs, such as renewable energy credits, renewable energy property tax credit, weatherization, and other programs.

Implementation Steps

- Establish the purpose and goal of the coalition and identify potential organizations and members to invite striving for broad and diverse representation.
- Provide organizations with background information on the Climate Protection Plan and the need for a coalition; recruit and invite representatives to join the coalition.

- Hold initial meeting (thereafter regular meetings) to brief coalition members on the purpose of the Climate Protection Plan, its goals, programs, and the resources supporting the Plan; solicit suggestions on how specifically their organizations can help promote the education and outreach goals of the Plan; establish strategies for coalition members to help achieve the Plan's goals; and determine specific measurable objectives.
- Provide on-going support for coalition members to educate their constituencies and organization members through regular online communication and updates, training programs and presentations, etc.
- Coordinate data collection on County Climate Protection Plan programs and facilitate information exchanges and sharing through the coalition. Conduct evaluations and needs assessments to improve and adjust programs based upon coalition members feedback and suggestions.
- Establish a central clearinghouse, such as a website, for internal and external communication to provide and manage information on Climate Protection Plan and program planning.

Recommendation ED-6: *Promote community-based education programs using the model of small, self-facilitated group discussions to motivate and empower members of the community on issues concerning sustainability.*

Small, self-facilitated group discussions provide a unique framework for individuals to explore personal values, attitudes, and habits conducive to a more sustainable lifestyle. Two organizations offer discussion guides which are already in use in the county, and these guides cover all of the sustainability topics addressed by the SWG (energy efficiency, sustainable transportation, climate change, and more).

The Empowerment Institute's "Low Carbon Diet" offers a step-by-step program, designed to reduce a person's carbon footprint (www.empowermentinstitute.net/lcd/index.html). The Institute also has a children's book called "Journey for the Planet" which could be used in schools.

The Northwest Earth Institute (NWEI) offers a series of seven study guides that facilitate small group dialogue which can be offered in the workplace setting, homes, faith centers, or anywhere groups are inspired to meet (www.nwei.org/discussion_courses). The topics offered include *Menu for the Future, Global Warming: Changing CO2urse, Choices for Sustainable Living,* and *Voluntary Simplicity.*

Each program listed above is a participant-led series of discussions held over five to nine sessions. Groups meet periodically for 1-2 hours. Over the past 15 years, over 100,000 people have participated in NWEI programs. The "Low Carbon Diet" program is newer but is grounded in over two decades of environmental behavior change research.

A local all-volunteer organization is already set up to facilitate the organization of these discussion groups. Simplicity Matters Earth Institute has been operating in Montgomery County

since 2002 and has started more than 200 discussion groups in Washington, D.C. and Maryland (www.simplicitymatters.org).

Implementation Steps

- Advertise and promote the groups through communication vehicles developed to support the County's Climate Action Plan and other sustainability initiatives.

Recommendation ED-7: *Establish, coordinate and maintain a County interdepartmental education and outreach plan.*

Jurisdictions nationwide are employing a variety of best practices to reduce greenhouse gases. A common element that other jurisdictions employ is to plan, develop and deliver coordinated programs across departments and agencies to establish a set of cohesive strategies to increase effectiveness and impact, and to combine and conserve resources. The current challenging economic climate offers an opportunity for focusing County efforts on implementing programs that reinforce both the existing and new programs within the Climate Protection Plan. Many departments and agencies have established programs that are already reducing GHGs and are developing plans to meet goals similar to the ones recommended in the Plan.

Outreach and education is an area that lends itself to interdepartmental planning and implementation since there are multiple benefits to establishing a common message and campaign to promote programs and educate the public. Establishing a coordinated plan for outreach can help focus promotional efforts on strategies that raise awareness and the visibility of common programs to increase access to and utilization of multiple county programs (e.g., renewable energy credits, renewable energy property tax credit, weatherization, etc.) Establishing coordinated plans can also enhance education strategies and thereby increase effectiveness, participation rates and improve overall program outcomes.

Implementation Steps

- Develop interdepartmental education and outreach plans and activities, identify programs that can be promoted and delivered cooperatively to reach common goals related to the Climate Protection Plan. Establish specific measurable objectives and evaluation plans. (Examples can be found at: liheap.ncat.org/Directors/outreach/mdoutrfin.htm and www.nero.noaa.gov/nero/outreach/outreachplan-final.pdf)
- Integrate and coordinate education and outreach across departments and agencies to establish common and consistent messages, coordinated methods of message delivery, opportunities for cooperative program implementation, broad and deep outreach to a diverse audience, and coordinated data collection, sharing, evaluation plans and future program improvements.
- Integrate the development of various strategies recommended in the Plan such as the Green Guide, educational presentations and in-home meetings, etc.

Recommendation ED-8: *The County Government and agencies should adopt broad-based sustainable practices and policies, and use these programs as a basis for outreach to the private sector.*

County residents spend a large percentage of their day in the workplace or at school. This presents an ideal opportunity to educate people about sustainable behaviors that benefit both them and the organization where they work or learn. Significant energy and cost savings can be accrued from the adoption of simple practices, such as turning out lights, the elimination of unnecessary IT equipment and peripherals, or a reduction in unnecessary travel. However, the benefits of sustainable practices go far beyond energy savings. Numerous studies have shown that "green" buildings and the incorporation of sustainable practices in workplaces and schools foster better attendance, health, productivity, and test scores.

While many of these benefits accrue from improvements to the design, construction and layout of facilities, creating a sustainable work or learning culture that emphasizes specific actions and behaviors is critical to maintaining a sustainable environment. Essential to enabling sustained, long-term change in public facilities are educational efforts that build awareness among occupants, create opportunities for personal action, enable information sharing, and deliver recognition that reinforces beneficial actions. Furthermore, awareness and adoption of sustainable practices within County government and agency, MCPS, and Montgomery College facilities can provide a powerful example, and such facilities can be used as a "learning lab" to for the community. Sustainable programs at schools can also help prepare students for "green collar" jobs in the future.

It is understood that each type of public (or private) sector facility is different, and that to some degree messaging will require customization to a specific organization's culture. However, each facility or organization, no matter how different, has opportunities for improvement.

<u>Implementation Steps</u>

- Establish a "sustainable workplace" policy and training program for the County government and agencies that can be used as a model for other organizations throughout the County.
- Develop a multi-media communication package promoting sustainable practices using the Internet/Intranet, video clips, printed materials (where necessary), and the posting of information in facilities illustrating sustainable attributes and practices.
- Create an annual recognition program, funded with a portion of estimated energy and other cost savings accrued from sustainable practices, to recognize and reward departments, employees and students who show remarkable efforts to improve organizational environmental performance.
- Prominently publish performance statistics for County government and agency operations, including such things energy consumption, solid waste generation, and use of recycled and environmentally preferable products and services. Where possible, for accountability break information down to specific facilities or Departments.
- Evaluate partnering with a non-profit or non-governmental agency to share resources and increase messaging reach.

Recommendation ED-9: *Replicate community-based organizations like Bethesda Green under a central umbrella organization.*

A 2007 survey of Montgomery County adults revealed that 66 percent of residents are not familiar with the County Government's role in environmental protection and the benefits of its various environmental programs and incentives. Fewer than one in 10 reported being very well informed. Moreover, nearly 70 percent indicated a willingness to volunteer some of their personal time to improve the environment locally.

There are a number of successful models of community-based organizations around the country, particularly on the West Coast, including Sustainable Seattle, Sustainable Marin, Sustainable San Mateo, Sustainable San Rafael, Sustainable Sonoma County and more. In short, they connect residents and businesses with each other and government programs and resources; showcase sustainable practices; sponsor environmental education workshops and activities; and build an environmental ethic.

Launched in January 2008, Bethesda Green is designed to play a similar role and serve as a model that can be replicated throughout the County. In its first year, the organization has procured recycling bins in pedestrian-friendly areas; organized home energy workshops; sponsored an e-cycling day that collected an estimated 90,000 pounds of electronics; hosted a *Be Green Showcase* attracting close to 400 attendees; and more. The organization also received donated space to house a sustainability education center and green business incubator. Nearly 100 volunteers, including students, are actively engaged in working groups and the organization has generated financial and in-kind support from dozens of local businesses and residents.

The appeal of Bethesda Green is that it provides the organizational framework to engage and mobilize residents and businesses at the grassroots level, as well as a way to strategically direct financial and in-kind donations from the private sector and media. Importantly, it serves as a critical information bridge linking community members with County government programs.

The County should create a unifying network of Bethesda Green-like entities in other communities under a broad-based organization that connects these organizations with each other and County Government. Given the large size of the County, a network of community-based organizations will enable all its communities to move in tandem and measure and monitor collective progress. The network would also serve as the conduit for a social marketing campaign. The County government can leverage its resources by helping to fund locally-based organizations that have the ability to raise private sector funds, which would serve to benefit all residents and businesses.

<u>Implementation Steps</u>

- In FY10, the County should provide financial support to strengthen and hone the Bethesda Green model, particularly its development of a corporate, foundation and individual contributions program.
- In FY11, assess the pros and cons of replicating the Bethesda Green model.
- In FY11, determine the appropriate institutional umbrella and/or fiscal sponsor to spawn and organize a network of Bethesda Green-like community-based organizations.

10.0 Other Important Sectors

10.1 Solid Waste Management

People living and working in Montgomery County generate over 1.3 million tons of municipal solid waste per year. The Department of Environmental Protection's Division of Solid Waste Services (DSWS) is responsible for assuring the proper management of that waste. In order to carry out its mission, DSWS employs an integrated system of modern operations, facilities and management techniques.

The County provides comprehensive recycling collections for all of the County's non-municipal single-family homes, and provides refuse collection services to about forty-two percent of the County's non-municipal homes. The County operates a variety of processing facilities for recycling and disposal of wastes it receives, and the vast majority of the waste that is generated in the County is handled at the Solid Waste Transfer Station (TS) or the Materials Recycling Facility (MRF), both located in Derwood, MD. In addition, the County manages a transportation system that includes: (i) movement by rail of compacted processible waste from the TS to a waste-to-energy facility located in Dickerson, MD; (ii) transport by rail of all residue remaining after energy recovery to a contract out-of-county landfill, (iii) transport by rail and truck of leaves and grass from the TS (and also seasonally by truck from a DOT depot in Brookville, MD) to a composting facility located in Dickerson; and (iv) transport by truck of all non-processible waste received at the TS to the out of County landfill. The County manages two closed landfills, and is installing landfill gas-to-energy systems at each. The County's operating system also includes additional contract recycling facilities (e.g. for paper recycling) and back-up contracts (e.g. for composting).

The County's programs and facilities are supplemented by private sector collection, processing, recycling and disposal activities that handle that portion of the waste generated in the County that does not come to County facilities. By a variety of means, including licensing, permitting and regulation, the County also manages the waste that it does not physically handle, and the County influences the behavior of all waste generators in the County by means of outreach, education and enforcement of comprehensive recycling regulations.

All of these activities – waste generation, collection, processing, transportation, whether by the County or the private sector – generate GHG emissions. In addition, there are GHG emissions that reach far beyond the direct emissions resulting from these activities. In a systems approach to climate change management, it must be recognized that net GHG emissions can be influenced by many choices related to how solid waste is generated and managed. A full accounting and a full recognition of the choices is a necessary but daunting challenge.

The County's initial GHG inventory estimated that waste management activities contribute approximately 0.165 MMTCO2e in the base year of FY05, representing just over 1% of the County's measured GHG emissions. In reality, the actual emissions from this sector may be significantly less, or even negative, due to the County's robust recycling and waste management efforts and the difficulty in evaluating the upstream GHG reductions from the recovery of resources form these activities. In other words, the recycling of materials – for example, aluminum and other metals that have significant embodied energy resulting from mining,

manufacturing and transportation – greatly reduces GHG emissions, and tracking such reductions is very difficult.

DSWS anticipates undertaking the following activities in the future to gain a better understanding of the GHG emissions associated with managing the solid waste generated by the County's residents and businesses:

- Estimate direct GHG emissions resulting from all solid waste management activities in the County.

- Work with the private sector (e.g. subscription collectors) to quantify emissions associated with private sector waste management activities. Special efforts may be needed to gather data related to private sector waste collection.

- Identify opportunities for net GHG reductions achievable by changes in component activities of the solid waste management system including increased recycling, and changes to the collection and transportation systems.

10.2 Water Supply & Wastewater Management

The Washington Suburban Sanitary Commission (WSSC) is the 8th largest water and wastewater utility in the U.S., serving nearly 1.8 million residents in Montgomery and Prince George's Counties. WSSC operates and maintain seven water and wastewater plants, more than 5,500 miles of fresh water pipeline, and nearly 5,400 miles of sewer pipeline.

WSSC's climate-related actions to date have been in 4 major program areas: energy efficiency, peak load shaving, use of renewable energy, and production of renewable energy. Since 2005, significant progress has been made in these areas:

Energy Conservation/Energy Efficiency

In 2005, through the utilization of energy performance contracting, WSSC completed $10.3 million in capital upgrades to improve the energy efficiency of a variety of processes at the Western Branch, Parkway, Piscataway, and Damascus WWTPs, and the headquarters office building in Laurel. The annual guaranteed energy/energy related savings resulting from these upgrades will cover the entire cost of capital required for the improvements over a 15-year period. In the first three years following completion of the project, WSSC has saved an average of 8,930,000 kWh per year.

The 2nd phase of the energy performance project included an extensive engineering feasibility study and audit of all major WSSC water pumping stations, Potomac, and Patuxent water treatment plants, selected wastewater pumping stations, major field offices, and the Western Branch and Seneca WWTPs.

Finally, during FY08, WSSC conducted extensive testing and analysis of the Potomac water supply pumping facilities, which constitute the Commission's largest concentrated energy consumption. This analysis identified a variety of upgrades and replacements for this infrastructure. Work will be undertaken as part of a future energy services contract, and is expected to be completed by the end of 2010.

Peak Shaving/Load Shaping

In 2005, WSSC implemented an automated water pumping and storage control system that takes into account demand for water and electricity pricing. Over the last three years, implementation of this system has saved WSSC an estimated 12,000,000 kWh due to efficiency gains (selecting pump combinations with greatest efficiency) and an average of 6,000 kW per year peak load capacity due to load shedding during peak electricity demand periods. These efforts have helped lessen the need for fossil-fuel peak shaving generators during high demand hours.

Renewable Energy Usage (Wind)

In December 2006, WSSC culminated an 18 month study and competitive bid process by signing a 10-year wind power agreement that is predicted to lower energy expenditures while providing long-term price stability. The uniqueness of this agreement is that it is a direct physical wholesale purchase of 85% of the output of the wind farm (including RECs), regardless of output. That allowed WSSC to lock in a greater percentage (33%) of its annual consumption than what it would be able to afford to do under a straightforward REC purchase. In April 2008, WSSC began buying approximately 70,000 MWh of wind power per year from the Forward Wind farm located in Stoystown, PA. This use of wind power by WSSC will reduce CO2 emissions by approximately 38,000 metric tons per year.

Renewable Energy Usage (Solar)

WSSC is proceeding with plans to construct solar PV panels on the Potomac Water Treatment Plant clearwell roofs. In December 2008, WSSC began discussions with ESCOs to build, own, operate, and sell solar power to WSSC at a fixed price over a long term period. The estimated solar panel capacity at Potomac is 1 MW, and the estimated GHG reduction is 2,000 metric tons per year.

Renewable Energy Production (Biomass):

The EPA is urging wastewater utilities to utilize anaerobic digestion to displace purchased fuels, produce renewable fuel for green power programs, enhance power reliability for the wastewater treatment plant to prevent sanitary sewer overflows, reduce biosolids production, improve the health of the Chesapeake Bay, and reduce GHGs and other air pollutants. WSSC's proposed

study to explore the feasibility of achieving this at the Seneca and Piscataway WWTPs is Recommendation RE-7 in Section 5.0.

WSSC is in the process of putting together a detailed 2005-2008 GHG inventory, including (other than energy usage) employee commuting, solid waste, HVAC refrigerant replacement, recycling, water and wastewater treatment fugitive emissions, etc. This process will follow the Climate Registry General Reporting Protocol and 2006 IPCC guidelines for wastewater treatment operations. The Inventory will include the development of an annual management plan, which will enable WSSC to update its GHG inventory annually by establishing standard data sources and formats, data management systems, and key contacts.

Following the completion of the GHG Inventory and Management Plan, WSSC will develop a formal Climate Protection Plan that identifies WSSC's strategy for capping GHG emissions by 2010 and reducing GHG emissions by 10% every five years from 2010 through 2050 resulting in an 80% reduction by 2050 compared to the base year (2005).

10.3 Green Economic Development

Nearly two decades ago, Montgomery County made a strategic decision to become a leader in biotechnology. Today, Montgomery County is Maryland's life sciences capital, and is home to over 200 bioscience and bioscience-related companies that employ over 12,000 people. Now that green economic development and clean energy are high on the County and national agendas, Montgomery County is preparing to become a national leader in this sector as well.

The County's highly-educated workforce, proximity to the federal government and agencies, relationships with leading academic institutions, partnerships with leading businesses, and progressive sustainability policies provide unparalleled opportunities to accelerate the transition to a green economy. This array of assets make Montgomery County the ideal community for green consulting and design services, research and development, local product and service providers, manufacturing in collaboration with regional partners, and other target sectors.

<u>Montgomery County Green Economic Development Initiative</u>

The Green Economic Development Initiative (GEDI) will advance businesses, technologies, and jobs within Montgomery County that develop, deploy or adopt green products and services. GEDI is led by the Department of Economic Development (DED) in partnership with DEP.

Key GEDI objectives include:

- Attracting new businesses that provide green services;
- Driving innovation, research and development into next generation technologies;
- Retaining existing green product, service, research and development sector businesses and fostering the creation of new green companies;
- Forming a cohesive green business network to enable information exchange and partnerships;

- Translating progressive County policies into green business opportunities;
- Leveraging and directing private investment and federal funding to County businesses;
- Facilitating workforce training and retraining to meet the needs of next generation green jobs;
- Promoting the County's green business cluster regionally, nationally and internationally.

The full scope of the GEDI initiative will be created by a task force appointed by the County Executive. The task force will work with a consulting team contracted by the County to develop a green economy ten point plan. Supporting the task force will be a larger advisory council that will facilitate broad community participation, enlist the support of business leaders, involve existing clean energy businesses and engage policy makers and other stakeholders.

GEDI will operate in concert with the SWG. Many of the policies identified by the SWG will create opportunities for businesses developing and delivering green products and services. These policies will be essential to creating local markets for County businesses and new green jobs. As GEDI evolves, the GEDI task force will need to consider the SWG's recommendations as a component of the County's green economic development strategy. Conversely, as research by the GEDI task force advances, outputs will be communicated to the SWG and its committees on an ongoing basis.

GEDI Task Force

The GEDI task force is a hands-on group representing a diverse range of business, academic, and other organizations interested in developing and implementing a green economic strategy. The task force will be responsible for the development and implementation of the County's Green Economic Strategy. The effort will build on the County's existing strengths to generate environmental, economic, and social value for County businesses and the global community. The committee will be a "working" effort and members will be selected accordingly. The task force will meet approximately monthly. The committee is supported in the development of this strategy by a consultant.

A first step of the task force will be to identify and facilitate access to existing and future federal, state, and foundation resources that can be used to expand opportunities for the County. Key efforts will include maintaining relationships with policy makers, federal agencies and the philanthropic community to benefit the County's initiative.

GEDI Advisory Council

In addition to the task force, an advisory council will be formed. Participants will consist of representatives of leading traditional and clean energy businesses, researchers, non-profit organizations, financiers and investors, labor interests, representatives of policy makers, and other organizations essential to successful green economic development activities. The key functions of the advisory council will be to facilitate connections and relationships, endorse strategies as appropriate, comment on task force efforts, and participate in periodic events.

11.0 Funding Options for Climate Change Programs

The implementation of the majority of the recommendations in this Climate Protection Plan will require funding. In some cases, funds can be redirected from existing programs, or existing programs can be modified to incorporate climate change objectives. In other cases, after initial funding is provided, cost savings can be used to fund additional activities and even pay back the original funding source. Finally, there are some programs that may require a steady source of funding.

This chapter explores several different methods for funding climate protection programs, including fuel/energy and carbon taxes, sustainable energy funds, and cap and trade programs. These funding mechanisms can be very complex. The information provided in this Plan is not intended to be an exhaustive review of the financial, regulatory and legal issues associated with implementing them, although it does raise the issues and questions the County would need to address before pursuing these options.

An issue closely related to the funding of climate change programs is the accounting methodology used to track dollars spent associated with such programs. Many of the recommendations contained in this Plan have initial costs but provide long term savings. It would be beneficial for the County government and County agencies to adopt a method of budgeting that considers items with clearly identified long-term savings in a different category than other expenditures. Through this methodology, the net economic costs of particular actions could be tracked, and positive cash balances could be utilized to fund additional programs.

11.1 Fuel/Energy and Carbon Taxes

Montgomery County has an existing energy tax, established in the 1970s. The tax is an excise tax levied against distributors of electricity and suppliers of building fuels (primarily natural gas and fuel oil) based on the amount of electricity or fuel distributed to consumers in the County. The tax is passed on to consumers through their utility bills, based on the amount of electricity or fuel they consume, along with a small administrative fee allowed by the Maryland Public Service Commission.

When conceived, the rates for electricity and each building fuel were roughly based on the equivalent heat content of the electricity/fuel at the point of consumption. Historically, all revenue generated through the County's energy tax has gone to the County's General Fund. As a result, there has been no direct connection between the imposition of the tax and any particular program or activity.

A "carbon surcharge" was added to the rates of the most carbon intensive fuels in FY09 in order to pave the way for a potential conversion of all the rates to reflect the carbon intensity of the electricity/fuel. In addition, $1.5 million of the revenues raised as a result of this surcharge was included in the FY09 budget to fund various climate protection programs.

Energy taxes, like carbon taxes, are based on the "polluter pays" principle – the amount one pays is based on the amount of energy used. In theory, this encourages the taxpayer to use less energy. In practice, however, the effect taxes of this sort have on behavior is dependant on several factors:

- The size of the tax – If the tax is not of sufficient size to make an appreciable difference to taxpayers, it will not serve to influence behavior. The point at which behavior change is induced, however, is difficult to determine and will vary from consumer to consumer.
- The connection between the tax and energy use – Even if the tax were of sufficient size to cause consumers to notice, it will affect consumers only if they are aware of the connection between their behavior (i.e., their energy use) and the tax. In many cases, consumers are not aware of the things they can do to reduce their energy consumption.
- The ability to alter energy use – In some cases, consumers may understand, but not be able to reasonably affect, some aspects of their fuel choice or energy consumption. For example, some homeowners on more heavily taxed electric heating systems may not have access to natural gas. Similarly, apartment dwellers are limited primarily to behavioral changes and have little control over primary components of the building (e.g., building envelope, HVAC) that may substantially affect energy use.

Montgomery County's energy tax rates can be reformulated to better, though never perfectly, reflect the GHG "footprint" of energy consumption. Such a recalculation is straightforward for fuels such as natural gas and fuel oil, as the carbon content of these fuels can be assumed to be relatively constant. Reflecting the carbon content of electricity is more complex, however, as the source of electricity for each utility or energy supplier serving the County is different. As a result, the carbon "content" of electricity delivered to the consumer depends on the fuel mix of the generation source. Utilities or suppliers more dependent on coal generated electricity, for example, will generate a greater amount of carbon per unit of electricity generated than those with a higher mix of natural gas, nuclear or renewable fuels. Thus, having different tax rates for different utilities serving the County may not be equitable to the community as it is difficult for a homeowner or business to relocate to obtain less "heavily taxed" electricity.

Similarly, many energy suppliers serving the County offer clean energy products that have no carbon footprint, or are lower carbon compared to "conventional" electricity generated from fossil fuels. Fuel taxes for these competitive suppliers are levied via the utility that distributes the actual electricity in the same way as fossil fuel derived electricity, based only on the total units of electricity consumed and not the source of the electricity. There is no process within the current energy tax framework that allows the reduction or elimination of the tax as a result of the use of low or no-carbon sources of electricity. The Clean Energy Rewards (CER) program, originally conceived as a "rebate" of the energy tax, provides an incentive for voluntary purchases of clean energy. However, the amount of the incentive paid through the CER program is a fixed rate per unit of clean electricity purchased and is not directly tied to the actual energy tax a consumer pays. It is also unclear under a carbon driven tax scheme how nuclear energy, with its relatively low carbon footprint but other environmental impacts, would be treated.

There exist other possible options for altering the County's energy tax. One option would be to levy the energy tax proportionally to the benefit received by the taxpayer. For example, if the revenues collected through the tax are utilized predominately to fund programs benefiting the single-family residential sector, then this sector would pay a proportionally higher portion of the tax. Currently, the energy tax rates do vary between residential and commercial customers based on utility tariffs, but there is no mechanism under the existing framework to further subdivide the residential sectors into single family and multifamily residential, or to tie the rates to the program expenditures of the County. Under this approach, these mechanisms would have to be developed and the rates would have to be adjusted regularly based on projections of current or future programs.

Another alternative is to adjust the energy tax structure to "ratchet" up the rate incrementally based on the amount of energy/fuel consumed. Under this approach, for example, the first 1,000 kWh of electricity used in a month could be charged one rate, while each additional 1,000 kWh would be charged an incrementally higher rate. The intent of this structure is to tax more conservative users less and provide a disincentive for wasteful or excessive energy consumption. Issues that would need to be considered under this approach include the appropriate tiers for each fuel type (including different tiers for different home and business types) and the ability of consumers whose energy consumption is based on structural rather than behavioral issues (e.g. older, inefficient homes or homes with inefficient systems) to adjust their energy usage without assistance, particularly low-income and multi-family residents.

It is important to note that all users of energy pay the current energy tax, including the County government and associated agencies like MCPS and WSSC. As a result, any changes to the energy tax would not only affect residential and commercial customers, but these entities as well.

Finally, the energy tax and carbon surcharge need to be considered in tandem with other efforts that may increase energy costs to consumers. In December 2008, for example, the Maryland Public Service Commission approved utility programs to deliver energy efficiency measures to consumers. These programs will be funded by a surcharge on utility bills paid by all consumers. The degree of this surcharge and distribution of these programs among various consumers is not certain, but any actions by the County should consider the total tax burden related to climate and energy programs.

11.2 Sustainable Energy Fund

A sustainable energy fund (SEF) is a financial mechanism that provides incentives to foster energy efficiency improvements and the installation of renewable energy systems, as well as investments in associated industries. Across the nation, such funds are identified by a variety of names, including sustainable energy utility, public benefit fund, or clean energy fund. SEFs are administered by a variety of entities, including state and quasi-state agencies, local governments, non-profit organizations, and utilities.

An SEF may be based on a steady stream of capital from a particular source (or sources), or it may be a revolving fund that, once initially capitalized, sustains itself with little or no infusion of additional capital. An example of the latter model is a fund that loans money for an activity and then uses the proceeds from the repayment of the loan to provide future funding for other loans.

There are a variety of potential sources of funding for a sustainable energy fund:

- Utility Settlements – Monetary awards or negotiated surcharges from utility restructuring initiatives, major lawsuits, or negotiated agreements to offset the impacts of new utility infrastructure. These awards may be one-time or extend over a period of time, or a combination of the two. One-time settlements usually involve a trust fund that pays for programs from investment revenue. Funding from these sources is predictable, with the exception of funds based on investment income, where the funding stream is dependent on investment performance. Programs of this type include the Pennsylvania Sustainable Energy Fund, the Connecticut Clean Energy Fund, and the Oregon Energy Trust.

- Electricity Surcharges – Incremental surcharges on electricity customers. Surcharges resulting from legislative mandates (such as EmPower Maryland) or programs proposed proactively by utilities. Utilities operating in Maryland received approval from the PSC in December 2008 to enact a surcharge to fund a portfolio of demand side management programs. Utilities will administer the fund with the assistance of implementing contractors. Funding from this source is very predictable as it is tied to electricity consumption.

- Carbon/Energy Taxes – Taxes on fuels, based on rate of use, and tied to the carbon content or energy value of the fuel. In FY09, Montgomery County used a portion of the Energy Tax to fund programs related to addressing climate change. Another example of this source of program funding is the Arlington Initiative to Reduce Emissions in Arlington County, VA. In this case, revenue from the taxation of building energy is used to support incentive, outreach and education programs administered by the Arlington County government. Again, this source of funding is very predictable as it is tied to energy consumption.

- Emission Allowance Auctions – Proceeds from the auction of emissions rights. For example, Maryland is allocating revenues from auctioned Regional Greenhouse Gas Initiative allowances to fund electricity rate relief, low-income weatherization programs, energy efficiency programs and clean energy programs. Funding will be distributed through the Strategic Energy Investment Fund (SEIF), administered by the Maryland Energy Administration (MEA). (www.energy.state.md.us/rggi.asp) Some of this funding will be provided to local jurisdictions via competitive solicitations for programs consistent with the fund's mandate. Funding from this source is relatively predictable based on estimates of auction revenue.

- Bonding Authority – Funds from the sale of revenue bonds. The Maryland Clean Energy Center (MCEC), which was created with the authority to issue bonds to fund a

variety of clean energy projects and activities, is expected to be an example of this model. Another example is the Delaware Sustainable Utility (SEU), which was initially funded by a bond issued by the state. The SEU will manage the operations of a competitively bid, for-profit entity that will develop a wide variety of energy services to residents and businesses. The fund will be sustained by "shared savings" from participants in the program, who will pay back to the fund a portion of the savings that accrue from energy efficiency improvements financed by the fund. Funding through this mechanism is based on the authority and financial ability of the governing entity to issue revenue bonds.

- Private Contributions – Funds from private sources. A sustainable energy fund, depending on its design, could receive private contributions and pro-bono services. An example of this is the Maryland Clean Energy Center, which has the authority to accept public and private sector contributions for its operations. Such contributions can be inconsistent and are not likely to be sufficient to entirely fund an SEF. However, they can be used to bolster other streams of revenue where legally authorized.

An SEF could be an effective way for the County to support climate protection programs. However, the structure of these funds is extremely complex, and a number of conceptual, financial, regulatory and legal hurdles must be addressed in order to successfully implement such a fund. The following issues need to be thoroughly researched before establishing a fund:

- *Need and Role* – The need for an SEF should be clearly established in order to avoid the creation of organizations that perform redundant functions. In Maryland, as described previously, utilities will be administering energy conservation programs to residents and businesses as authorized by the PSC, MEA is operating the SEIF, and the MCEC was created to promote clean energy activities throughout the state. In addition, community organizations such as Bethesda Green are promoting energy efficiency. In this case, is a new fund needed or can one of these existing mechanisms be enhanced through close collaboration with, and possible financial support from, the County?
- *Initial and Ongoing Funding Sources* – An effective SEF requires a large injection of capital at its inception and, depending upon its structure, throughout its existence. If a Montgomery County based SEF were established, what would be the source of funding, and are there any opportunities for federal, state or foundation resources to support the fund?
- *Scope and Objectives* – What range of issues would the SEF address? For example, it could focus purely on energy efficiency and renewable energy, or it could be broader to address a wider range of environmental efforts. Many SEFs are involved in economic development activities consistent with the overall goal of the fund, such as "incubating" businesses that provide or develop clean energy products and services and workforce development.
- *Charter Limitations and Governance* – A variety of issues need to be addressed, including the County's authority to establish and operate a fund, and the ability to establish a non-profit administrator to oversee the fund. In addition, if a fund were established, mechanisms must be in place to ensure that the activities of the fund remain consistent with County objectives.

11.3 Cap and Trade Programs

Cap and trade, or emissions trading, programs are designed to provide an economic incentive to control pollution. Under a cap and trade program, a regulatory authority establishes a limit, or cap, on the total amount of a pollutant that can be emitted. Regulated entities are assigned, or buy, the right to emit a specified amount of the pollutant. This right is known as an allowance or credit. The total allowances issued to all regulated entities can not exceed the cap. Those emitters that can find ways to reduce their emissions can sell allowances to those less efficient emitters that exceed their allotted allowances. In this way, those that find a way to reduce emissions are rewarded while those that pollute more pay for the right to do so. Over time, allowances can be "retired" so that the cap, or total amount of the pollutant that can be emitted, is reduced.

One approach to a cap and trade program is a "full auction market" where all of the allowances are sold rather than assigned, and market participants bid for their allowance needs. A program of this type has been promoted by the Obama administration as an opportunity to use the market to drive change while generating revenue for the federal government, preferably for reinvestment in climate mitigation and adaptation programs.

Cap and trade schemes can be applied at the full economy scale, or on a subset of large polluters such as power plants and large industrial facilities. It is not unusual for policy makers to target large facilities hoping that large scale reductions in these facilities will meet objectives while avoiding the administrative and political challenges associated with addressing less significant emitters such as smaller businesses, homes or vehicles.

Mandatory Cap and Trade Programs

Currently, the only mandatory cap and trade program active in Maryland is RGGI, which is a collaborative of ten Northeastern and Mid-Atlantic States – Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. It was the first mandatory, market-based CO2 emissions reduction program in the United States. Under RGGI, each participating state established criteria (consistent with a RGGI Model Rule) to regulate fossil fuel fired power plants over 25 megawatts. Regulated power plants will be able to use emissions allowances issued by any of the ten participating states to demonstrate compliance with the state program governing their facility. (www.rggi.org)

Within Maryland, the emissions allowances are auctioned. The two auctions to date generated a total of $34 million, with the proceeds being allocated to electricity rate relief for consumers, the State's SEIF, low-income weatherization programs and solar grants. RGGI is expected to generate approximately $70 million annually in new funding for energy efficiency and clean energy. RGGI is anticipated to have a minimal impact on, or potentially lower, utility rates in Maryland as a result of the deployment of more efficient technologies and investment in energy efficiency. (http://www.mde.state.md.us/assets/document/Air/ClimateChange/Chapter4.pdf, page 14)

The classic "benchmark" for cap and trade programs is the one for sulfur dioxide emissions, which led to the dramatic abatement of acid rain. While initially opposed by many industries, in hindsight this pivotal regulation reduced acid rain at an overall cost to industry lower than a more regulated approach. It is the general consensus among leading scientists and many policy makers that a cap and trade programs are one of the most effective tools to reduce emissions rates low enough to achieve climate stabilization.

If a national cap and trade program is instituted under the Obama administration, it would either supersede mandatory schemes like RGGI, or force a reconciliation of such programs with the new national process. While early programs such as RGGI have paved the way for more comprehensive cap and trade programs and formed the basis for trading platforms, some confusion by market providers in achieving compliance will likely occur if these are merged with a broader effort.

Given the likelihood of national cap-and-trade legislation being proposed, and difficulties in administering a cap and trade program effectively at the local level, it is not recommended that Montgomery County develop or enter into a local or regional effort at this time. However, Montgomery County should monitor and, if appropriate, support a federal economy wide cap and trade program, particularly if the program results in federal, state and local initiatives that stimulate new energy efficiency and clean energy technologies or other climate change mitigation and adaptation measures.

Voluntary Cap and Trade Programs

There are voluntary cap and trade programs. Under a voluntary approach, an organization commits to participate and adopt a legally binding emissions cap. Verifiable surplus emissions reductions achieved below the cap can be marketed to other participants to help them achieve their commitments. Similarly, each participant who exceeds their capped emission allowance must purchase allowances via a trading platform to make up for their shortfall.

The most prominent of the voluntary cap and trade efforts is the Chicago Climate Exchange (www.chicagoclimatex.com). Under the exchange, participants agree to reduce GHG emissions 6% from baseline levels by 2010. Currently the exchange has hundreds of participants from a diverse range of organizations, including eleven municipalities and counties, among them King County, WA; Sacramento County, CA; and Miami-Dade County, FL.

The potential benefits for a local government to participate in a voluntary program like the Chicago Climate Exchange include:

- Legally binding commitment to reduce GHG emissions – provides "authority" to reduce emissions in the absence of a regulated requirement.
- Access to relatively low-cost verified emissions credits – in the event local emission reduction goals are not achieved, jurisdictions can contribute to overall emissions reductions at a reasonable cost.

- Ability to sell surplus credits into markets – potential source of revenue. (However, sale of credits relinquishes the right to claim the credit towards emission reduction goals because emissions are increased elsewhere.)
- Early experience in carbon markets – the jurisdiction has experience in verifying, buying and selling emission credits in the event a regulated cap and trade program is established.

Liabilities associated with participating in such a program include:

- Need for verification of emissions – tracking of emissions may be difficult and require staffing or contractor support.
- Increased budget needs – investment may be needed to achieve emission reductions required under program (6% by 2010 in the case of the Chicago Climate Exchange), and unanticipated costs may occur if emissions reductions are not achieved and credits must be purchased.
- Potential revenue may not offset costs - At current pricing, the revenue from the sale of credits may not be sufficient to offset administrative and staffing costs.

Once again, due to the uncertainty of future mandated cap and trade initiatives, and the start-up costs and administrative efforts associated with participating in a voluntary cap and trade program, it would not be prudent for the County to participate in such a program at the present time.

12.0 Adaptation

To date, the SWG has addressed climate change principally by promoting the reduction of GHG emissions. The rationale for such mitigation efforts is that if GHG concentrations are stabilized or reduced, ultimately the severity of climate change can be alleviated. While there is no doubt that mitigation activities are necessary to the long-term well-being and stability of the global environment, we must also explore the inevitable question of adaptation to climate change that cannot be prevented.

Some degree of future climate change will occur regardless of efforts to control GHG emissions. Reducing emissions will minimize the impact of climate change but, since GHGs remain in the atmosphere for decades or centuries after they are produced, today's emissions will affect the climate for years to come, just as the changes being felt today are the result of emissions produced in the past. (www.pewclimate.org/docUploads/Adaptation_0.pdf)

Because worldwide GHG emissions continue to rise, adaptation measures will be necessary to reduce the cost and severity of climate change impacts. Climate-sensitive systems in society and the natural environment will need to adapt to a changing climate or possibly face diminished productivity, functioning and health. In unmanaged natural systems, adaptation is not planned but occurs when forced to do so. For example, tree and animal species may migrate northward to remain in suitable climatic conditions and habitat (to the extent that human barriers, such as roads and cities, allow such migration). In man made systems, adaptation must be planned and treated as a risk-management strategy. The effectiveness of any specific adaptation requires consideration of the expected value of the avoided damages against the costs of implementing the adaptation strategy. (www.epa.gov/climatechange/effects/adaptation.html)

The need for adaptation is not uniform. Some systems and societies are more vulnerable to the impacts of climate change than others. In general, the ability of natural systems to adapt to climate change is generally more limited than built systems. Some countries or regions, such as the United States, may be better able to adapt to climate change, or have a greater "adaptive capacity," than others. Even within developed countries, adaptive capacity varies. It is important for communities, particularly those at greater risk, to understand their vulnerabilities and lay the groundwork for actions to reduce risks to human life, ecosystems, infrastructure, and the economy.

Federal adaptation policies and programs will be important, particularly related to areas such as water resources that span local and state boundaries. Many of the most critical decisions and actions, however, will need to be made at the local and regional level. States and localities have authority over land use planning decisions, including zoning and building codes, as well as transportation infrastructure. In order to determine appropriate adaptive measures, a community must determine its:

- Exposure – What types of climate changes impacts will the community experience, and what will be the magnitude of those changes?

- Sensitivity – What is the sensitivity of the community to those changes?

- Adaptive Capacity – Can the community adapt to or cope with these changes?

The Sustainability Working Group has not had time to investigate the full range and degree of potential or anticipated climate change effects that should be addressed. However, potential concerns include:

- Drought or unusually wet conditions
- Periods of extreme heat
- Severe storms, including more frequent and more dangerous hurricanes
- The effects of sea level rise on the Blue Plains Wastewater Treatment Plant on the tidal Potomac River, which processes much of Montgomery County's wastewater

While the State of Maryland has explored issues related to adaptation, it has focused mainly on the coastal counties that are most at risk from rising sea levels. More applicable to Montgomery County are the initial recommendations by MWCOG in its July 2008 Climate Report. These recommendations, related to research and stakeholder engagement/ workshops, are summarized below:

Additional Research

- Partner with a major university to prepare a report on the expected changes to the region by 2050 as a result of climate change and possible adaptation strategies.
- Analyze changes and risks to the Metropolitan Washington region, its transportation infrastructure, buildings, and population living in low-lying areas.
- Develop regional adaptation polices based on the results of the adaptation research efforts, including policies for infrastructure, land-use and emergency response planning.

Stakeholder Workshops

- Explore the long-term (2030 and beyond) prospects for sufficient water supply in the event of an unprecedented drought coupled with the anticipated regional population growth-related rise in demand.
- Assess the risk that current building codes may be inadequate for future conditions.
- Assess the capacity of the region's emergency response and health care systems to respond to acute increases in heat and air pollution.
- Drawing on the experience of other locales, explore opportunities to take actions (such as reducing demand for energy and water and expanding tree cover) that generally align with other program priorities, and also provide mitigation and/or adaptation benefits.

Policymakers in the County should begin to assess the vulnerability and adaptive capacity of the County in cooperation with regional organizations like MWCOG, and with critical agencies like WSSC, the District of Columbia Water and Sewer Authority (which operates Blue Plains), and electric and gas utilities serving Montgomery County.

In addition, prospective impact disparities must be identified and addressed. For example, the County's most vulnerable populations will be least able to cope with the adverse impacts from climate change – including the ability to respond to natural disasters, exacerbated medical conditions, etc. – and will thus require particular attention and support. Similarly, a seasonal drought might not affect the broad population until drinking water becomes scarce, but it will surely impact the County's agricultural community. In short, given the County's socio-economic and geographic diversity, policy makers must recognize both the variability in adaptive capacity as well as the differing impacts resulting from climate change.

13.0 Next Steps

This first Climate Protection Plan is a start toward achieving the GHG emission reduction goals set by Montgomery County. The SWG, which was convened for this purpose, has assembled a group of recommendations that will build on existing programs and, if implemented, significantly reduce GHG emissions. But this is only the first step. Due to the short time that the SWG worked, it was difficult to evaluate and determine the potential costs and benefits of each recommendation or the impact of all the recommendations taken together. The Working Group will continue to work with the County and its consultants to assure that a thorough evaluation methodology is developed so that these and future recommendations can be analyzed quantitatively. The SWG will also investigate new ideas and technologies that could further contribute to achieving the goal.

The Climate Protection Plan, as approved by the SWG, will be presented to the County Executive and the County Council on January 15, 2009, as prescribed by law. The SWG will continue to be active as the Executive and Council review the plan, providing further information and conducting additional research as necessary to assist them in their deliberations. Once the Executive and Council have completed their review, the SWG will assist in implementation by facilitating discussions with the County government, the Planning Board, businesses, and the community to advance the adopted recommendations.

Work will begin immediately on the next iteration of the County's Climate Protection Plan. The Working Group suggests that the County consider changing the date of the annual Plan update so that the recommendations included in the Plan can be factored into the planning and budgeting process in a timely manner.

APPENDIX A

Selected Current County Programs Contributing to GHG Reductions

Renewable Energy Programs		
Policy or Program	**Brief Description**	**Department**
Clean Energy Rewards	First in the nation rebate program for residents and small/medium businesses that offsets the premium associated with the purchase of clean electricity.	DEP
Clean Energy Purchase	Voluntary purchase of clean energy by the County Government and 17 agencies and municipalities.	DGS/ Agencies
Long-Term Clean Energy Purchase	Montgomery County is working with the State of Maryland and University System of Maryland to explore long-term purchasing options for clean energy supply through a joint procurement.	DGS/Agencies
Long-Term Clean Energy Purchase	WSSC signed a 10 year wind power purchase agreement (PPA) with Constellation Energy Services for 85% of a regionally sited wind farm's output.	WSSC
Landfill Gas to Energy	The Division of Solid Waste Services is in the final stages of constructing and commissioning generators on the County's two closed landfills.	DEP
Solar Photovoltaic Program	Installing solar photovoltaic systems on school roofs to the extent feasible with production to start in 2009.	MCPS
Solar Photovoltaic Program	Division of Solid Waste Services is preparing to issue an RFP for on-site solar system on at least one major facility.	MCPS/DEP
Geoexchange HVAC Systems	Schools are installing geoexchange HVAC on new and renovated properties where feasible.	MCPS
Renewable Energy Property Tax Credit	Property tax credit available for up to 50% of system cost for on-site photovoltaic solar, up to 50% of system cost or $5,000 for geothermal heat pump or solar heating installations and up to $1,500 for solar water heating systems. Total of $250,000 annually available.	Finance
Dickerson Waste to Energy Facility	The County operates a 55 MW solid waste resource recovery facility located in Dickerson, Maryland. The facility provides energy recovery from municipal solid waste, diverting waste that would otherwise be landfilled.	DEP

Residential Building Energy Efficiency Programs		
Policy or Program	**Brief Description**	**Department**
Residential Disclosure Requirements	Requires the disclosure of energy cost and consumption data for single family and attached homes at time of sale. Also requires sellers to provide information, approved by the DEP, on energy audits and energy conservation practices.	DEP/OCP

Selected Current County Programs Contributing to GHG Reductions

Residential Building Energy Efficiency Programs		
Policy or Program	**Brief Description**	**Department**
Energy Efficiency Property Tax Credit	Provides a property tax credit for energy conservation measures including heating and cooling system improvements, upgrades to windows and doors, insulation, home sealing and other measures. Up to $250 annually per resident with a total of$250,000 of funding available.	Finance
ENERGY STAR Homes Mandate	Requires all new single family and attached residential construction to meet ENERGY STAR requirements for new homes by 2010. The SWG may identify an alternative that provides equivalent environmental benefits.	DPS/DEP

Commercial, Multi-Family, and Public Building Energy Efficiency Programs		
Policy or Program	**Brief Description**	**Department**
Energy Efficiency Improvements and New Building Design	County agencies have had ongoing efforts to improve the energy performance of County facilities, including energy management systems and projects.	DGS/Agencies
Green Building Mandate (Bill 17-06)	Requires new commercial and multi-family construction over 10,000 square feet to meet the requirements of the US Green Building Council's LEED rating system's certified level and new public facilities to achieve silver.	DPS
New building construction	New and modernized schools are now registered and designed to achieve LEED Silver. Great Seneca Creek ES was awarded LEED Gold certification in 2007.	MCPS
School Energy and Recycling Team (SERT)	Well established program to reduce utility consumption and increase recycling percentages using school-based teams. SERT teams are supported by energy facilitators and incentives for performance. Promotional materials, contests, and recognition events maintain program momentum and school focus to fulfill the SERT mission.	MCPS
Green Building Property Tax Credit (Bill 37-06)	Provides a property tax incentive for commercial and multi-family buildings that significantly exceed green building requirements. Incentive variable depending on the type of building and level of LEED achievement. Up to $2.5 million available annually.	
Light Emitting Diode (LED) Traffic Signals	Upgrade all County intersections with energy-efficient LED traffic signals where appropriate. County is currently completing a five year program to upgrade all County controlled intersections.	DOT

Selected Current County Programs Contributing to GHG Reductions

Transportation Programs		
Policy or Program	**Brief Description**	**Department**
Ride On Bus Fleet	Approximately 375 buses provide mass transportation to 30 million boarding riders per year, averaging 95,000 boardings per day. The buses travel 14.4 million miles and consume approximately 2.5 million gallons of diesel fuel annually.	DOT/DGS
Alternatively Fueled Buses	The County currently has 95 CNG Buses, 53 diesel electric hybrid buses, and 5 post-2007 clean diesel buses. By fall 2009, the County will add an additional 64 post-2007 clean diesel buses and 39 diesel electric hybrid buses. Fleet management began phasing in biodiesel in the traditionally diesel fleet.	DOT/DGS
Alternatively Fueled Administrative Vehicles	There are 166 flexible fueled vehicles in the fleet that can use either E-85 or unleaded fuel. Currently there are about 20 hybrid compact/small SUV fleet vehicles. Fleet Management is evaluating the purchase of additional hybrid, E-85 and CNG vehicles as replacements for vehicles in its administrative fleet.	DGS
Alternative Fuel for Public	Fleet Management provides CNG to public natural gas vehicle owners. The E-85 fuel site is also open to the public with a second fuel site planned for the Brookville Redevelopment in Silver Spring	DGS
Anti-Idling	Fleet Management has developed a vehicle idling policy for its maintenance fleet, and is currently working on an idling policy and identifying technology to address the County's administrative fleet. Transit Services has developed a bus idling policy that includes specific idling limitations for various times and circumstances.	DGS
Administrative Fleet Overhaul	Fleet Management is in the process of removing under utilized vehicles from the County fleet.	DGS
Commuter Outreach	Commuter Services conducts extensive outreach to employers in the County to impart awareness of commuting alternatives and the availability of other services and programs.	DOT
Transportation Management Districts	The Silver Spring, Friendship Heights, Bethesda and North Bethesda transportation management districts (TMDs) allow the County to focus its employer outreach efforts in these highly urbanized areas where alternative transportation is readily available. Similar efforts are also conducted in other areas of the County.	DOT

Selected Current County Programs Contributing to GHG Reductions

Transportation Programs		
Policy or Program	**Brief Description**	**Department**
Regional Commuter Partnerships	Montgomery County is an active participant in MWCOG's Commuter Connections, which provides a region wide mechanism for conducting programs to reduce congestion and improve air quality, as well as for sharing ideas and information. Commuter Connections also serves as the clearinghouse and service provider for vanpool/carpool ride matching and the Guaranteed Ride Home program.	DOT
Commuter Services	Free Carpool and Vanpool Matching to encourage ridesharing; County employees can ride free on Ride On buses with a photo ID card; Ride On offers reduced fares to seniors and children ride free; Ride On buses are equipped with bicycle racks to allow riders to further reduce their use of automobiles; fare matching programs are available to employers who subsidize their employees' public transportation commuting costs; Park & Ride commuter lots provide free parking along major transportation corridors and many are served by public transportation.	DOT
Pedestrian Facilities/ Bikeways	DOT builds over six miles of sidewalks and two miles of new bike paths each year. These provide alternatives to single occupant driving and connect to schools and other public facilities as well as to public transportation; bikeway maps that feature bike and pedestrian routes serving the many dining, shopping, and entertainment destinations as well as activity centers are available from DOT.	DOT
Congestion Mitigation	DOT promotes the viability of transit and alternative transportation options to reduce car travel during peak periods; optimizes traffic signal timing at intersections on major corridors; and constructs key roads/additional lane miles that improve operating speeds and reduce gridlock.	DOT
Hybrid Car Share Program	Under the one-year pilot program, the County will make 30 hybrid and sub-compact vehicles available at three locations for shared use by employees. The program will reduce gas consumption and make more efficient use of fleet vehicles. If successful, the County could also save money by permanently reducing the number of cars and trucks in our fleet.	DGS

Selected Current County Programs Contributing to GHG Reductions

Forestry & Agriculture Programs		
Policy or Program	**Brief Description**	**Department**
Forest Conservation Law	The Forest Conservation Law aims to save, maintain, and plant forested areas by regulating development activity that disturbs forests and trees on all projects other than state projects.	M-NCPPC
Forest Conservation Act	Regulates development activity that disturbs forests and trees mostly on state projects (roads) in Montgomery County	MD DNR
Forest Stewardship Program	Provides assistance to landowners to sustainably manage forest lands through forest stewardship plans, cost-share programs, and tax incentives	MD DNR
Forever Green Park System	Maintains both developed and undeveloped parkland throughout Montgomery County including the stream valley park system. Total acres: 32,725; developed: 8,811; undeveloped: 23,913.	M-NCPPC
State Parks	Maintains both developed and undeveloped parkland in Montgomery County	MD DNR
Federal Parks	Maintains both developed and undeveloped parkland in Montgomery County primarily along the Potomac River	NPS
Water Supply Reservoirs	WSSC owns and preserves 3,100 acres, almost entirely wooded, to protect two water supply reservoirs	WSSC
Area Master Plans	Area Master Plans consider natural resources and open space requirements when planning for development	M-NCPPC
Green Infrastructure Plan	The Green Infrastructure Plan is a functional master plan under development to provide greater environmental viability, value, and function than the sum of individual resources. It will provide a guide for regulators like the Planning Board as they seek to balance growth with natural resource protection.	M-NCPPC
Water Resources Pan	The Water Resources Plan is a functional master plan under development to help avoid adverse environmental impacts of stormwater and non-point source pollution, in part by protecting and enhancing wetlands.	M-NCPPC
Agricultural Preserve Area	An area dedicated to protecting agricultural resources in Montgomery County. Includes 91,000 acres excluding parkland; 47% is protected by easements.	M-NCPPC and DED

Selected Current County Programs Contributing to GHG Reductions

Forestry & Agriculture Programs		
Policy or Program	**Brief Description**	**Department**
Cost-share programs	There are various cost-share programs in the County for implementing a wide array of agricultural Best Management Practices	DED and Soil Conservation District
Legacy Open Space	A comprehensive program that provides permanent protection to irreplaceable unprotected open space including forests and other significant natural resources primarily through purchases and easements	M-NCPPC
WeedWarriors	Volunteer-based program to manage non-native invasive plant species in M-NCPPC parks	M-NCPPC
Deer Management Program	Montgomery County's deer management program aims to reduce deer-human conflicts to a level that is compatible with human priorities and land uses	M-NCPPC
Weed Management Program	Montgomery County’s weed management program aims to assist all landowners with controlling noxious weeds across the County	DED
Gypsy Moth Suppression Program	A cooperative program to manage gypsy moth populations and limit negative impacts of outbreaks	DEP and MD Department of Agriculture
Maryland Roadside Tree Law	Regulates actions on trees in all maintained rights-of-way including maintenance, planting, and removal of trees, regardless of jurisdiction	MD Department of Natural Resources
Street Tree Maintenance Program	Maintains, plants, and removes street trees on all county-maintained rights-of-way	DOT
Street Tree Inventory	DOT is currently evaluating methods to create and maintain a comprehensive county-wide street tree inventory	DOT
Tree Canopy Coverage	DEP is currently developing a mechanism to estimate tree canopy cover across the county on a regular interval to assess current coverage and trends	DEP
Forest Coverage	M-NCPPC is currently updating the forest cover across the county	M-NCPPC

APPENDIX B

M E M O R A N D U M

December 10, 2008

TO: Phil Andrews, Council President

FROM: Keith Levchenko, Senior Legislative Analyst and Chairman of the Biodiesel Working Group

SUBJECT: **Biodiesel Working Group Next Steps**

On behalf of the Biodiesel Working Group, I am submitting the following information consistent with the requirements set forth in Resolution 16-402, "Establishment of a Working Group to Study the Potential Local Generation of Biodiesel Fuel from Restaurant Grease."

Background

On December 11, 2007 the Montgomery County Council approved Resolution 16-402 (attached) establishing an interagency working group to study the potential local generation of Biodiesel fuel from restaurant grease for use by County agency fleets.

The working group includes representatives from County Government, the Washington Suburban Sanitary Commission (WSSC), Montgomery County Public Schools (MCPS), and the Maryland-National Park and Planning Commission (M-NCPPC) (see list of members at the end of this memorandum) and was asked to report back to the Council within one year with recommendations as to how to move forward with the effort.

The working group has utilized other staff as needed from the different agencies and has also met with numerous outside groups and individuals with an interest and expertise in this initiative.

A comprehensive report is being drafted and will be forwarded to the Council within the next month. In advance of that report, as required by Resolution 16-402, this memorandum includes below a list of next steps the Working Group is pursuing.

Next Steps

The next steps outlined on the following page do not require new resources or Council action at this time. However, it is anticipated that in the coming months, one or more initiatives may be identified that may require policy review by the County Executive and Council and ultimately fiscal support in the form of operating and/or capital dollars.

- **Identify a "champion" department in the Executive Branch to continue this initiative.**

  The Working Group has researched a variety of issues and identified the next steps needed. However, successful implementation will require that a lead department be identified to pursue and implement any future initiative or initiatives.

  Once some of the other next steps below occur, it is likely that the County will need to consider funding choices both in a capital and operating context. These issues will require review by County staff in one or more departments as well as possible consultant support. Possible departments for this "champion" role include:

  - Department of Environmental Protection
  - Department of Economic Development
  - Department of General Services

  The Working Group plans to meet with Executive officials to discuss which department may be best positioned to take on this role.

- **Work with various government and non-governmental partners to better identify waste vegetable oil quantities generated in Montgomery County and current restaurant practices regarding the storage and collection of waste vegetable oil.**

  The Biodiesel Working Group has worked with WSSC to revise its Fats, Oils, and Grease (FOG) Program Food Service Establishment Wastewater Discharge Permit Application to include information categories on waste vegetable oil quantities and collection information.

  The Biodiesel Working Group is also working with County Health Department staff on possible revisions to its annual restaurant license application to include questions regarding waste vegetable oil quantities and collection.

  The Biodiesel Working Group is working with Bethesda Green to develop and implement a survey of Bethesda Central Business District restaurants regarding waste vegetable oil quantities and collection.

- **Develop and advertise a Request for Expressions of Interest (REOI) that seeks private sector partners (potentially for-profit and not-for profit entities) interested in working with the County on one or more initiatives associated with collecting waste vegetable oil from restaurants, converting the waste vegetable oil to Biodiesel, and having County agency fleets utilize local or regional Biodiesel generated from waste vegetable oil.**

  The initiatives could include the construction of a local Biodiesel facility and/or cooperative waste vegetable oil collection programs to existing or future regional

facilities, and/or partnering with regional Biodiesel producers to accept restaurant waste vegetable oil from the County and provide Biodiesel for county agency fleets.

Assuming a champion department has been identified (per the first item above) the REOI responses can be reviewed by a committee established by the champion department and follow-up work requirements regarding any particular responses will be identified.

- **Continue to coordinate with WSSC as it considers new septage and trap grease initiatives**.

  WSSC's ongoing FOG disposal planning efforts may avail the County of some potential partnering opportunities with regard to the local collection of waste vegetable oil and possible local generation of Biodiesel and/or other biofuels.

If Councilmembers have any questions regarding the work discussed above or the Biodiesel issue in general, the Working Group would be happy to meet with Councilmembers individually or formally brief the Council upon request.

cc: Biodiesel Working Group Members
- Al Astorga, Chief of Central Maintenance, M-NCPPC
- Dan Locke, Chief of Solid Waste Services, Department of Environmental Protection
- Zohreh Movahed, Regulatory Services Group Leader, WSSC
- John Matthews, Director, Department of Transportation, MCPS

Attachment
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APPENDIX C

ENERGY ANALYSIS

MONTGOMERY COUNTY, MARYLAND
DIVISION OF OPERATIONS, DPWT
101 Orchard Ridge Drive
Gaithersburg, Maryland 20878

ENERGY ANALYSIS
of
MONTGOMERY COUNTY FACILITIES

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A. Executive Summary

1. Project Scope

EMG has been commissioned by Montgomery County Maryland, Department of General Services, Division of Real Estate and Management Services to focus on elements of the requirements of County Council Bill 30-07. The intent of adopted Bill 30-07 is for Montgomery County to lead by example by implementing enhanced energy management programs that reduce the energy consumption and Greenhouse gas footprint of county facilities. The Bill specifies that energy consumption of County facilities must be reduced by 25% by 2020. EMG is to focus on the following key elements of the adopted Bill:

- Provide energy consulting services to the Montgomery County Sustainability Workgroup.
- Energy Benchmark and develop an energy baseline for all facilities listed in the County portfolio.
- Develop a utility unit savings plan and a cost savings plan.
- Assist in assembling the initial report for County Council submission and approval.
- Create a database with energy usage data by building that will become the platform for tracking future usage and comparing targets and benchmarks.
- Support the Sustainability Workgroup at public hearings.
- Prepared Energy Analysis

2. Energy Analysis Methodology

EMG has designed this program to be consistent with the mission and goals of the County Council for Montgomery County, Maryland. We understand the needs of the program and have performed similar services in the past. The following chart depicts the overall flow from Data gathering, thru benchmarking and prioritization, and energy plan implementation.

The goal of this Energy Analysis is to support a summarized condition plan for:

1.) Reducing the total energy consumption of all building owned and operated by Montgomery County.
2.) Reducing the cost of the consumption through procurement strategies.
3.) Replace energy consumed with clean or renewable energy sources where applicable.

The Project Approach to collect, document and analyze the County facilities energy data has been designed to achieve the following:

- Gather utility data for each building and benchmark against models by square footage, facility use, and type of structure.
- Create a prioritized list of buildings in comparison to the benchmarks with respect to buildings where significant savings can be expected.
- Provide an energy consumption target for each county facility.
- Provide an energy cost reduction target for each facility.
- Provide back up information and calculations to the County.
- Provide recommendations for follow up and implementation.

Of the 124 facilities considered, the following facilities were not included in the overall energy analysis:

Facilities:	**Reason:**
4 Facilities	Aquatic Centers
10 Facilities	Insufficient Utility Data
5 Facilities	Outside Variance Tolerance

A Variance Analysis should be instituted prior to Energy Audit engagement to validate input information of certain facilities including the 19 facilities not included in this analysis report.

The following facility types are included in the energy analysis:

Facility Type	**# of Facilities**
Courthouse	5
Educational	7
Entertainment and Culture Centers	4
Fire and Police Stations	11
Healthcare	8
Libraries	20
Lodging	3
Offices	9
Public Order and Safety Centers	7
Recreation	23
Service Facilities	7
Warehouses	1
Total:	**105**

Benchmarking of each of Montgomery County's facilities has been undertaken to establish a baseline, compare against the national average, and to prioritize the efforts of this Energy Analysis.

Based on the results of then benchmarking, the facilities have been prioritized based on their total anticipated annual energy cost reductions and reasonable targets have been set for reducing energy consumption, cost, and green house gas emissions.

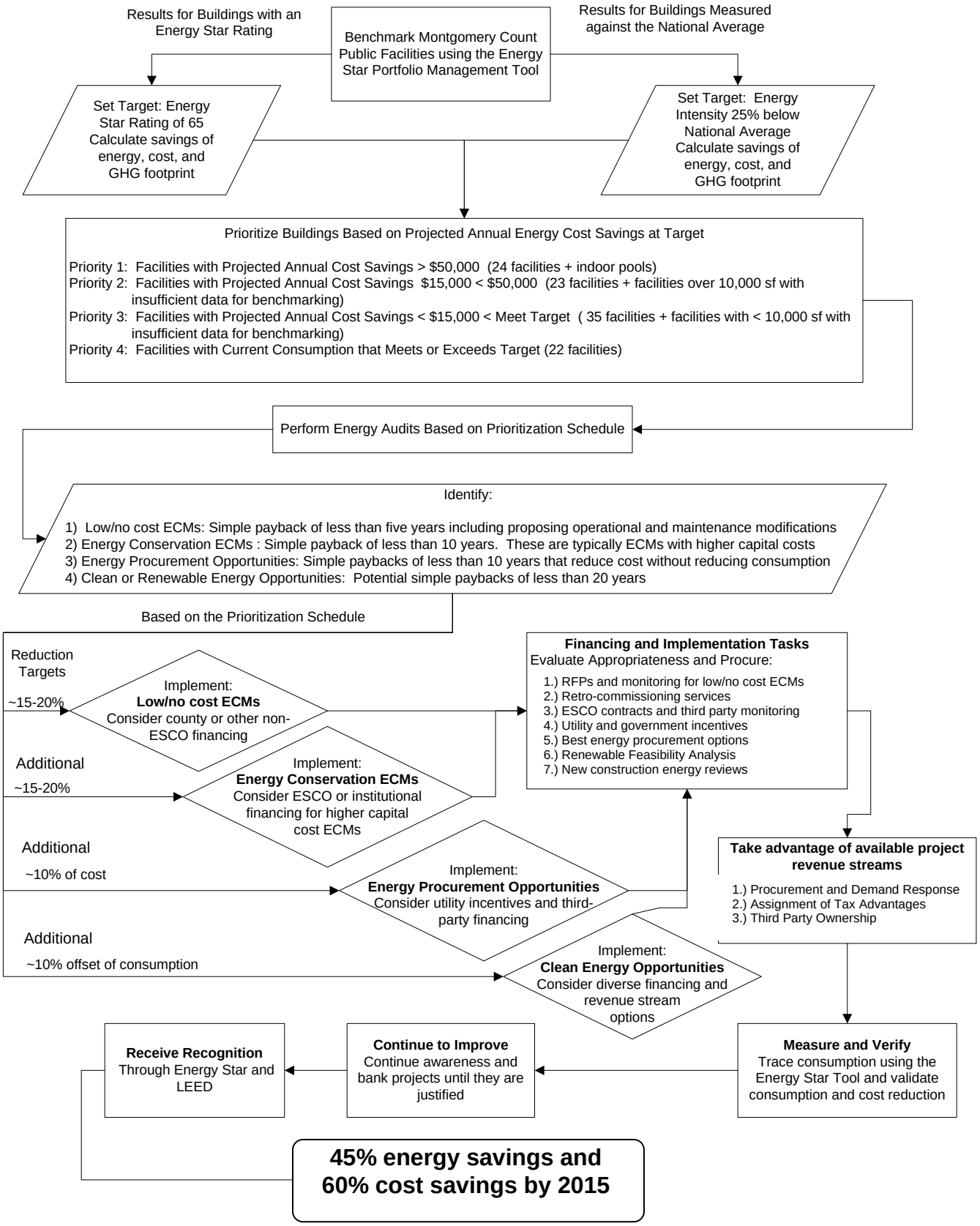
The following chart shows the anticipated annual cost, energy consumption and green house gas emission savings and a gross representation of the corresponding capital investment anticipated for the implementation of measures required to reach the goal.

Phase	Target Completion Date	Gross Capital Cost	Annual Energy Savings @ Target (MMBTU)	Annual Energy Savings @ Target (%)	Annual Cost Savings @ Target ($)	Annual Cost Savings @ Target (%)	GHG Reduction (MtCO2e)
I	2013	$33 – 36 M	136,000	51%	$4.2 – 4.8 M	51%	24,000
II	2014	$5.8 – 6.3M	25,000	39%	$760,000	39%	2,500
III	2015	$1.9 -2.2M	9,000	24%	$240,000	24%	1,500
IV (if needed)	2016	If Needed	If Needed	If Needed	If Needed	If Needed	If Needed
Procurement	2013	$9.0-11M	0	0%	$1,100,000	100.0%	0
Renewables	2013	$ 8.0 -10M	0	0%	$ 980,000	100.0%	30,000
Totals	2015	$57-67M	170,000	45%	$7,200,000	60%	58,000*

*This is the equivalent of removing over 10,000 cars off of Montgomery County's Roads.

Phase Four is optional, based on Progress and Realizations of Savings of first three Phases. Phase IV includes the potential of facilities that already meet our target to become even more energy efficient.

It should be noted that capital costs could potentially be offset with an array of incentive programs and financing options detailed later.


Results for Buildings with an Energy Star Rating
Benchmark Montgomery Count Public Facilities using the Energy Star Portfolio Management Tool
Results for Buildings Measured against the National Average
Set Target: Energy Star Rating of 65 Calculate savings of energy, cost, and GHG footprint
Set Target: Energy Intensity 25% below National Average Calculate savings of energy, cost, and GHG footprint
Prioritize Buildings Based on Projected Annual Energy Cost Savings at Target
Priority 1: Facilities with Projected Annual Cost Savings > $50,000 (24 facilities + indoor pools)
Priority 2: Facilities with Projected Annual Cost Savings $15,000 < $50,000 (23 facilities + facilities over 10,000 sf with insufficient data for benchmarking)
Priority 3: Facilities with Projected Annual Cost Savings < $15,000 < Meet Target (35 facilities + facilities with < 10,000 sf with insufficient data for benchmarking)
Priority 4: Facilities with Current Consumption that Meets or Exceeds Target (22 facilities)
Perform Energy Audits Based on Prioritization Schedule
Identify:
1) Low/no cost ECMs: Simple payback of less than five years including proposing operational and maintenance modifications
2) Energy Conservation ECMs : Simple payback of less than 10 years. These are typically ECMs with higher capital costs
3) Energy Procurement Opportunities: Simple paybacks of less than 10 years that reduce cost without reducing consumption
4) Clean or Renewable Energy Opportunities: Potential simple paybacks of less than 20 years
Based on the Prioritization Schedule
Reduction Targets
~15-20%
Implement: Low/no cost ECMs Consider county or other non-ESCO financing
Additional
~15-20%
Implement: Energy Conservation ECMs Consider ESCO or institutional financing for higher capital cost ECMs
Additional
~10% of cost
Implement: Energy Procurement Opportunities Consider utility incentives and third-party financing
Additional
~10% offset of consumption
Implement: Clean Energy Opportunities Consider diverse financing and revenue stream options
Financing and Implementation Tasks
Evaluate Appropriateness and Procure:
1.) RFPs and monitoring for low/no cost ECMs
2.) Retro-commissioning services
3.) ESCO contracts and third party monitoring
4.) Utility and government incentives
5.) Best energy procurement options
6.) Renewable Feasibility Analysis
7.) New construction energy reviews
Take advantage of available project revenue streams
1.) Procurement and Demand Response
2.) Assignment of Tax Advantages
3.) Third Party Ownership
Measure and Verify
Trace consumption using the Energy Star Tool and validate consumption and cost reduction
Continue to Improve
Continue awareness and bank projects until they are justified
Receive Recognition
Through Energy Star and LEED
45% energy savings and 60% cost savings by 2015

To achieve the stated goals, the EMG team first gathered and populated the benchmarking tool developed by the EPA. Once the benchmarking performance ranking or comparison rating was established, the EMG team prioritized the facilities into four energy study categories or phases.

3. BENCHMARKING

The U.S. Environmental Protection Agency has developed an Energy Management Program to assist public and private sector building owners and managers o benchmark and track energy performance in their buildings. The program is the Energy Star Portfolio Manager. The Portfolio Manager tool allows the input of historical utility data of a facility to be compared to normalized data of a large database of buildings of its peers. This Energy Performance Rating System is based on a simple 1-100 "score" where 50 is an average building. The rating normalizes factors such as weather, occupancy, operating hours, and other building-specific characteristics. The rating is based on actual billed energy data and captures the interactions of building systems not individual equipment efficiency. Energy Star Portfolio Manager can establish a rating in 11 building categories. There are not enough facilities entered into the database for other building types outside of the 11 building categories for Energy Star Portfolio Manager to establish a rating. The database is sufficient enough for these other building types to establish energy use comparisons. Montgomery County has 15 facilities that are in categories that can achieve a rating. There are 100 facilities that have energy use comparisons. There are 4 pool facilities that do not have either a rating or energy use comparison. The pool facilities have high energy consumption and will also be evaluated for energy consumption and cost reduction.

The energy consumption data that has been initially analyzed are electricity, natural gas, fuel oil, and propane. Water usage and water consumption data will be analyzed during the individual facility energy audit process. The following energy unit cost have been established for the benchmarking analysis; $0.128 per Kwh of electricity, $1.55 per therm of natural gas, and $2.60 per gallon of fuel oil and propane.

Actual Building Information received from Montgomery County includes:

- Facility name
- Address
- Ownership entity
- Square footage
- Age (some facilities)
- Operating Hours (some facilities)
- 12 months of Energy Consumption data

Assumed Building Information includes:

- Age (some facilities)
- Number of computers
- Number of workers on Main Shift
- Operating Hours (some facilities)
- Energy Cost (standard blended rate used for all facilities)

B. Energy Analysis Results

1. Results

Variance Analysis

A variance analysis of the data produced by the benchmarking process was conducted to look for anomalies in the data.

Once the facility information and utility data is entered for each facility, it becomes possible to measure the difference between the national average and actual energy intensity for each facility. This difference can be studied to determine if there are anomalies in the input data that could allow us to suspect error.

From the raw data resulting from the analysis of each facility's energy consumption analysis through Energy Star's Portfolio Manager Tool, it was determined that an energy intensity factors greater than four correlated to data that was outside a three sigma (~95%) confidence level. The energy intensity factor is calculated as a ratio of the national average intensity of a facility against the actual energy intensity. For example, an energy intensity factor of four would correlate to a facility that had a calculated energy intensity of either one fourth (.25 = -4) or four times (400% = 4) that of the national average energy intensity level for that particular facility.

Facilities with an energy intensity factor greater than two are included in the following chart. Five facilities with energy intensity factors greater than four were excluded from the rest of the study as it is assumed that there are errors in our known assumptions concerning each of these facilities.

Facility Name	National Average Site EUI (kBtu/Sq. Ft.)	Baseline Site Energy Intensity (kBtu/Sq. Ft.)	Energy Intensity Factor	Building Type
AFI Mobile Production Unit	65	16.4	2.96	Recreation
B.C.C. Seniors Center	65	288.6	(3.44)	Recreation
Center on Domestic Violence*	124	857.2	(5.91)	Health Care: Long Term Care (Nursing Home, Assisted Living)
CSAAC	77	15.8	3.87	Office
DFR – Aspen Hill Shelter*	87	3.1	27.06	Lodging
Gaithersburg Maintenance Depot	77	24.8	2.10	Service (Vehicle Repair/Service, Postal Service)
Germantown Police*	78	1,358.00	(16.41)	Fire Station/Police Station
Mental Health House*	124	11.3	9.97	Health Care: Long Term Care (Nursing Home, Assisted Living)
Piccard Drive Health Center*	124	657.1	(4.30)	Health Care: Long Term Care (Nursing Home, Assisted Living)
Police at Ardennes	78	340.9	(3.37)	Fire Station/Police Station
Police Special Operations	77	322.6	(3.19)	Office
S.S. Maint. Depot Building A	77	305.5	(2.97)	Service (Vehicle Repair/Service, Postal Service)

*Facilities with an Energy Intensity Factor greater than 4 were removed from the study pending confirmation of facility input data

The output energy intensity factor of eight additional facilities was between two and four. These facilities were left in the study.

It is recommended that all of the assumptions regarding all of these facilities be confirmed either at the onset of the energy audit phase or before. All assumptions can be found in the checklist included in the "Statement of Energy Performance" that has been generated from each facility's data.

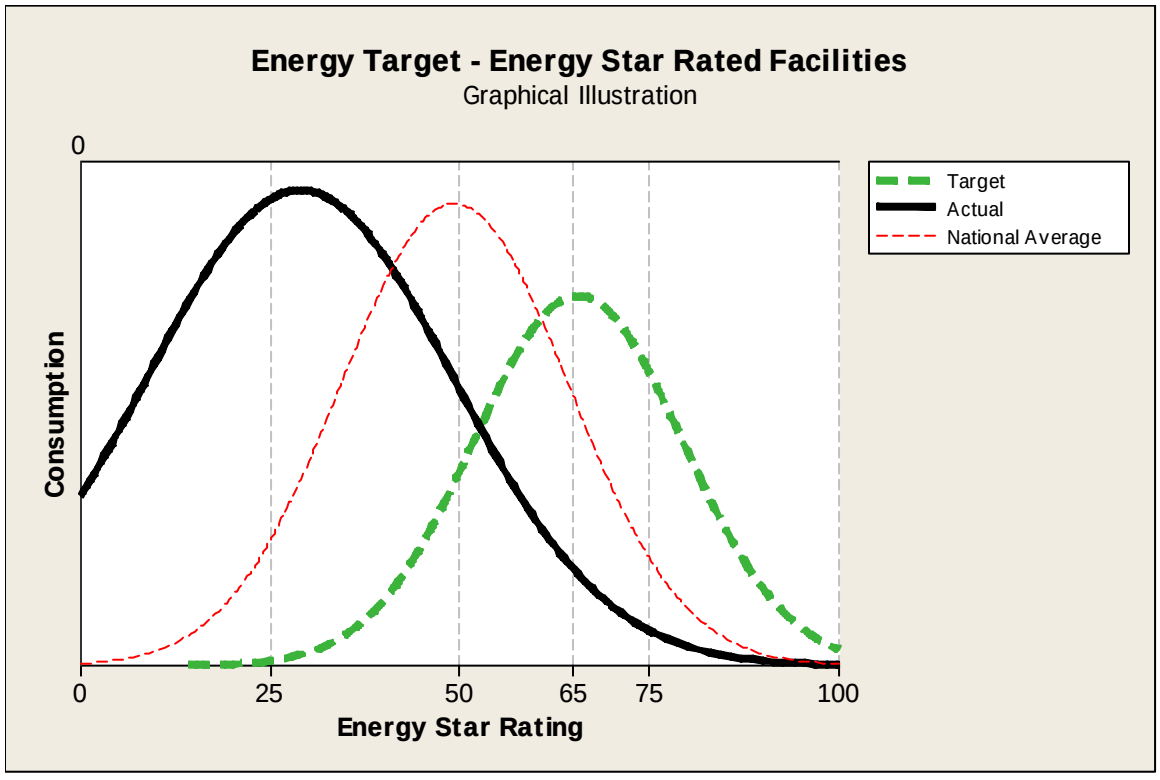
Results

Energy Star's Portfolio Manager tool has the capability of comparing some building types energy use against data in its database related to buildings of the same type and giving the facility a 1-100 ranking. This is due to the fact that they have a significantly large data set to which to compare the facility and can compare the facility to the distribution of similar facilities in its database.

Of the 105 remaining facilities, fifteen are categorized as Courthouses, Warehouses, and Office Buildings and were able to receive an Energy Star Rating. The Energy Star Ratings of these buildings varied between 4 and 66. The fifteen Energy Star rated facilities represent nearly an annual consumption of 150,000 MMBTU at a cost of just over $5.1 million.

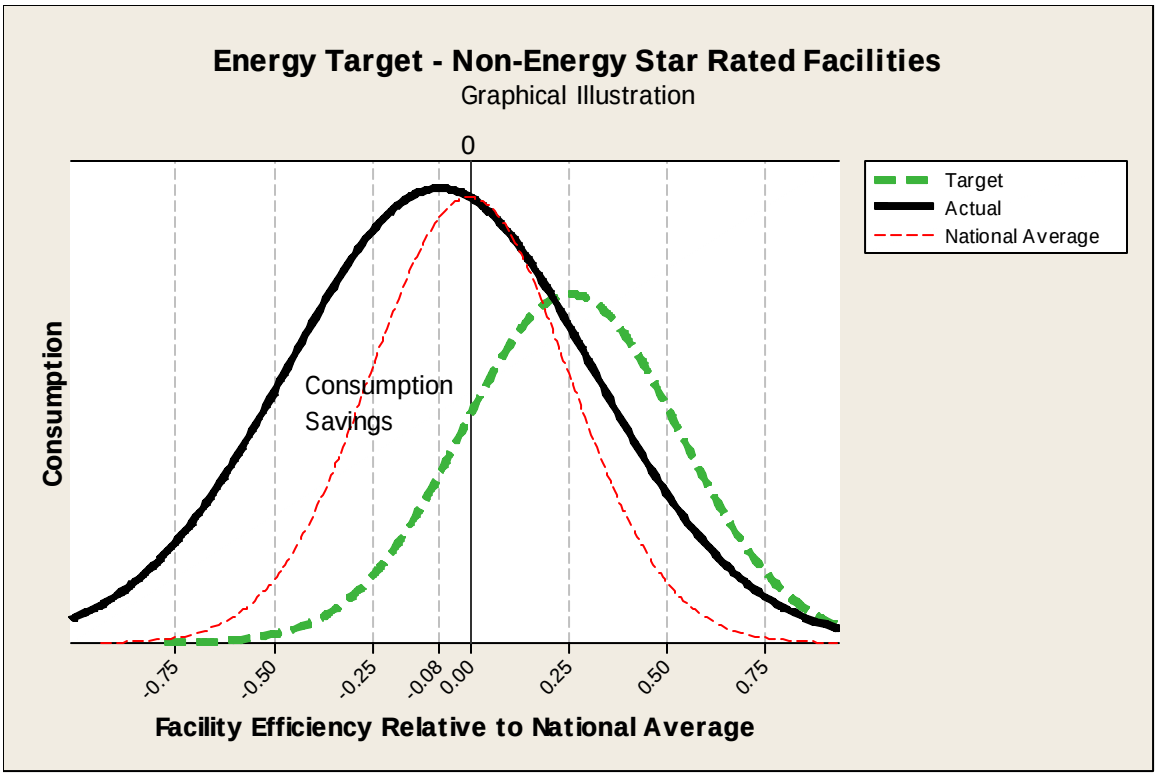
Based on an average Energy Star Rating of 65, we calculated the energy and cost savings of each building type and found that the county would save approximately $2.1 million. As a rating of 65 is required for consideration in the LEED existing building program, this level of energy consumption was chosen as the target for these facilities.

The following graph illustrates consumption of the current, national average, and target consumption for building types rated by Energy Star. The savings of cost, consumption and GHG emissions is represented by the difference in area of the current and target histograms.



The remaining 90 buildings are of types that the Portfolio Manager does not give a rating. Instead, it measures these facilities against the national average of buildings of similar type in its database.

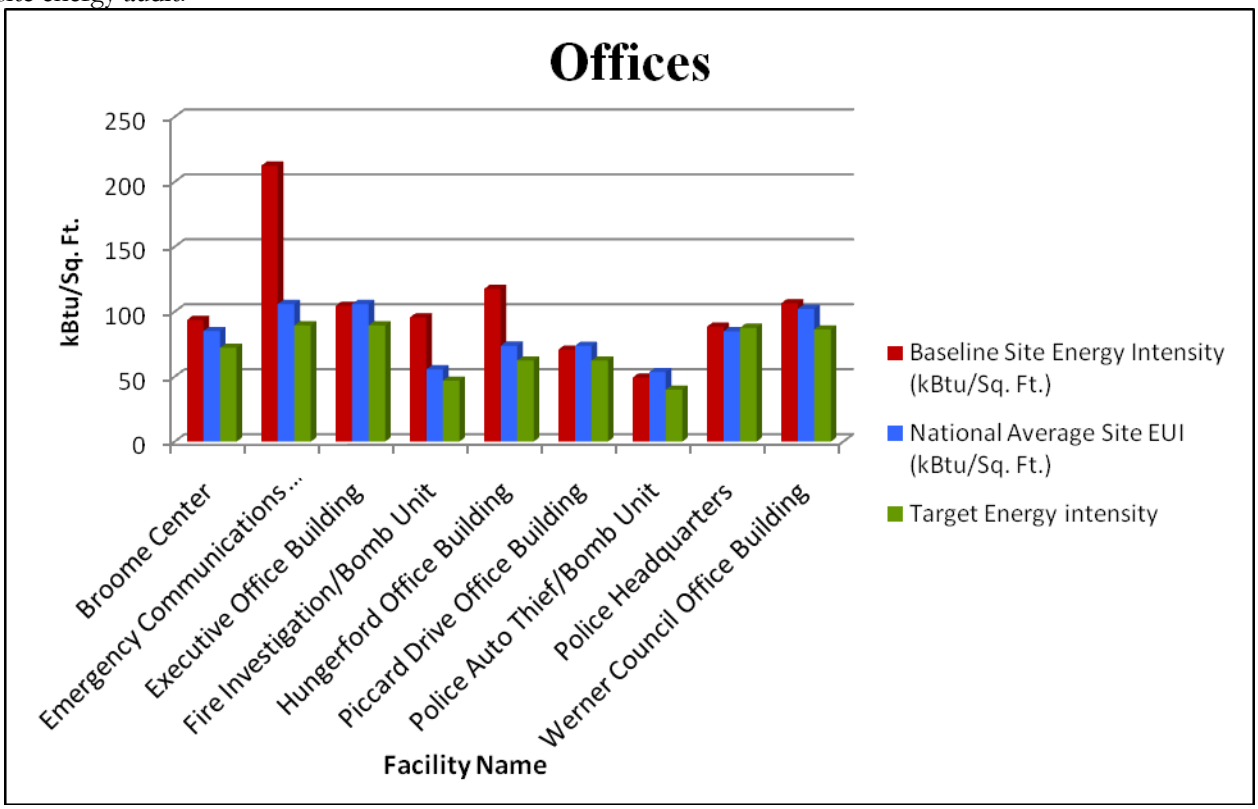
A histogram (shown below) displays the results in a distribution of the facilities relative to the national average. This data shows that the facilities average eight percent above the national average. Based on the energy consumption of these facilities and the goals of Montgomery County, we have chosen a target of 25% above the national average. Meeting this goal will result in an annual savings of approximately $3.1 million. Graphically, cost and energy consumption savings is represented by the difference between the in the Actual and Target consumption histograms.



2. FACILITY ANALYSIS

Each building type was analyzed based on energy intensity. Energy intensity is typically expressed in kbtu/sf/yr. This allows for a normalized comparison of building type of different sizes as well as converting both electrical and heat energy units to the same base energy unit. The following graphs compare the Actual energy intensity with that of the national average and that of our target. The energy intensities of some facilities are notable from the graphs located in Appendix A. The graph illustrating the results of the Office Buildings is included below.

The facilities that were identified in the variance analysis can be identified in these bar chart as well. Again, the reasons for some of the large differences between the national average of consumption and the actual consumption may be that utility data is missing, square footage data is incorrect, or the building shares a meter with a non-typical load among other things. A checklist confirming the data entered will be compared to observed conditions during an on-site energy audit.



Offices

It also should be noted that non-anticipated loads have a higher proportional effect on the energy intensity of smaller buildings and energy audits should reveal these loads.

3. PRIORITIZATION

Based on the results of our benchmarking, we developed a prioritization plan based on four phases designed to capture the facilities with the largest potential energy consumption and cost savings.

3.1 PRIORITIZATION PHASES

Based upon the results established by Portfolio Manager, the facilities were categorized into 4 priorities or further study and implementation phases.

Priority Phase	Description
1	Facilities that have a potential to achieve $50,000 or greater annual energy cost savings if target is met. 24 facilities and 4 indoor pools in Phase 1.
2	Facilities that have a potential to achieve $15,000 to $50,000 annual energy cost savings if target is met. 23 facilities in Phase 2.
3	Facilities that have a potential to achieve $0.00 to $15,000 annual energy cost savings if target is met. 35 facilities in Phase 3.
4 (optional)	Facilities that are currently at target. 22 facilities in Phase 4. Phase Four is optional, based on Progress and Realizations of Savings of first three Phases. If savings targets are not met, Phase IV will be implemented. Cost and Savings will be later determined.

C. ENERGY PLAN IMPLEMENTATION

1. RECOMMENDED SERVICES

Based on the list of facilities in each of the four Priority Phases and in order to achieve the established goals, the following list of services is recommended:

- Countywide Operations and Maintenance Program
- Full Energy Audit for each facility
- Identify and Implement No/Low Cost Energy Conservation Measures
- Identify and Implement High Cost Energy Conservation Measures
- Identify Clean or Renewable Opportunities
- Identify Energy Procurement Opportunities
- Identify Financing Options
- Measure and Verify Results

1.1 COUNTYWIDE OPERATIONS AND MAINTENANCE PROGRAM

The Countywide Operations and Maintenance Program is designed to establish facility operation and maintenance procedures for each category. The procedures will be instituted by the maintenance personnel associated with each building. The intent is to provide an ongoing, routine inspection of equipment and systems. The Program will be reevaluated and modified and updated after the initial On Site Energy Audit.

1.2 ENERGY AUDIT AND ENERGY CONSERVATION MEASURES

The energy audit will include an analysis of all utility consumption data, included will be electrical, natural gas, fuel oil and propane consumption. The energy audit consists of an on-site assessment to determine current conditions, itemize the energy consuming equipment (i.e. air conditioning, fans and blowers); review lighting systems both exterior and interior; and review efficiency of all such equipment. In addition, The Auditors will also consider structural elements, such as the building envelope, for energy efficiency. Recommendations will be made on implementing cost-saving energy conservation materials and methods. The Auditors will estimate the projected payback period on each energy-saving recommendation and prioritize accordingly.

1.2.1 Energy and Water Usage

The Auditors will survey 100% of the facility, common areas, office areas, maintenance facilities and mechanical rooms to document utility related equipment, including heating systems, cooling systems, air-handling systems and lighting systems.

1.2.2 Recommendations for Energy Savings Opportunities

Based on the information gathered during the energy audit, the utility rates and recent consumption data and engineering analysis, the Auditors will identify opportunities to save energy and provide probable construction costs, projected energy/utility savings and provide a simple payback analysis.

1.2.3 Analysis of Energy Consumption

Based on the information gathered during the on-site assessment and the utility billing history, the Auditors will conduct an analysis of the energy usage of all equipment, and identify which equipment is using the most energy and what equipment upgrades may be necessary. This information will be used to identify which equipment upgrades or replacements that may provide a reasonable return on the investment by Montgomery County. The analysis for any upgrades or replacements should include life cycle cost analysis for economic justifications.

1.2.4 Energy Audit Process

- Interview Montgomery County staff and review plans and past upgrades;
- Perform energy audit for each facility;
- Perform a preliminary evaluation of the utility system serving each facility;
- Analyze findings utilizing Energy Conservation Measure cost benefit worksheets.
- Determine if any energy efficiency measures are required;
- Make preliminary recommendations for system improvements, if needed.
- Determine what incentives are available for energy efficiency opportunities;
- Estimate initial cost and changes in operating and maintenance costs based on implementation of energy efficiency measures;
- Ranking of recommended cost measures based on largest payback; and
- Determine what cost-effective measures can be taken, including the projected payback timeframe.

1.3 CLEAN AND RENEWABLE ENERGY OPPORTUNITIES

Clean energy is defined as energy that is generated and used in the highest feasible mode of environmental and social responsibility. Power from sources such as the sun (solar power) and wind are renewable and do not cause harmful emissions. Fuel cell generators are also considered renewable energy.

State and Federal government agencies are dedicated to promoting clean energy as an alternative to traditional sources of energy. As such, they have developed a number of programs to promote the use of clean energy sources by potentially providing technical assistance and/or financial incentives based on project feasibility

The following table summarizes some potential applications of Clean/ Renewable Energy Sources for the Montgomery County Facilities.

Clean/ Renewable Energy Sources	Technical Description
Solar Power	Use reflective materials that concentrate the sun's heat energy to drive a generator that produces electricity.
Photovoltaics (Solar Panels)	Use semiconductor materials to convert sunlight directly into DC electricity.
Geothermal	Geothermal energy uses the ground temperature as a thermal sink for heat rejection in the summer and heat gain in the winter which allow for more efficient HVAC systems
Solar Heating	Use solar collectors to absorb the sun's energy to provide low-temperature heat used directly for hot water or space heating. Used in applications with high hot water usage.
Wind Turbine	Uses motion of wind spinning a propeller to generate electricity from the mechanical rotation of a small generator.
Fuel Cell	Uses chemical reaction involving hydrogen and oxygen to create electric power. It continuously produces power as long as there is a supply of hydrogen gas and oxygen (from the air)
Combined Heat and Power (CHP) (co-generation)	Simultaneous production of electricity and heat from a single fuel source. It provides onsite generation of electrical and/or mechanical power and waste-heat recovery for heating, cooling, dehumidification, or process applications.

1.4 Low/No Cost ECMs

1.4.1 Low/No Cost ECMs

Low/No Cost ECMs are defined as being Energy Conservation Measures that require little or no capital relative to its associated energy cost savings. Some of these measures may be recommending changes to the programming of a facility's energy management system, changing light fixtures or bulbs, sealing the envelope of the building with weather-stripping or door seals, repairing steam traps or outside air dampers, etc. It is important that these measures are undertaken first to aid in determining the financial payback of more expensive ECMs.

For example; Assume an older facility with a water boiler that consumes $1M worth of heating fuel a year. A equipment vendor would suggest that this would justify the installation of a $1M condensing boiler that would result in a 10% improvement in efficiency and a annual savings of $100,000 with a simple payback of ten years. It may be found that by controlling air leakage through some doorways, retro-commissioning the energy management system and repairing some broken ventilation dampers could for an initial cost of $40,000 could cut the annual fuel bill to $700,000. The new water boiler now has a simple payback of over 14 years.

1.4.2 Commissioning

After a facility is constructed and before the general contractor turns over the keys to the new owner, the facility should be commissioned. This I the process of making sure that all of the building systems are operating s designed. From an energy perspective, the commissioning of the HVAC and other energy consuming systems is critical. By commissioning a facility, an HVAC contractor assures the new owner that the HVAC will consume the energy that it was designed to consume. Commissioning is always recommended and should be included in the scope of any significant renovation or new construction project.

1.4.2.1 Enhanced Commissioning

As a result of the energy efficiency ratings required to obtain LEED and Energy Star building certifications and to hold designers and system installers accountable for their system designs, some facility owners are asking for commissioning of building systems to be performed by a third party to the installation contractor of the designer. This is being called "enhanced commissioning" and gives the facility owner the benefit of an independent opinion as to the fitness and energy efficiency of newly installed equipment. This service is independent of the design and build contracts and should be weighed regarding cost/benefit as a buildings energy consumption will be known after a year of service and can then be compared against the design consumption. Buildings with expected annual energy costs greater than $100,000/yr. as well as buildings designed to meet strict energy efficiency target (for LEED points, for example) typically could justify enhanced commissioning. Done to meet LEED standards, enhanced commissioning is worth one LEED point.

1.4.2.2 Retro-commissioning

Retro-commissioning or re-commissioning is the process of performing the commissioning process on a facility in which the buildings functions or original design parameters have changed since the original commissioning. It is not uncommon for even young buildings to be utilized and operated in a manner different than was originally intended and retro-commissioning is almost always a justified low cost ECM for facilities that haven't been commissioned in the past three to five years. Retro-commissioning for a small facility may be as minor as checking set temperatures on water heating equipment and making sure that programmable thermostats are set and operating correctly. Sometimes, these items can be checked and/or recommended in an energy audit and implemented by on-site maintenance personnel. Retro-commissioning for a large, complex facility can be very involved and require a few days to weeks of on-site work by a qualified service provider. It is not uncommon for a simple retro-commissioning project to decrease a facilities energy consumption by 10% or more. In short, retro-commissioning is a service that typically pays for itself in a short period.

1.4.3 Financing for Low/No cost ECMs

Financing for low cost ECMs can come from many sources. Sometimes minimal capital costs can be met through an existing annual facility or maintenance budget. Utilities and state and federal programs often provide financial assistance for many simple projects. If self-financing is not an option, these ECMs can be carefully blended with higher capital cost ECMs in an energy performance contract.

Low/No cost ECMs should be identified and specified in an energy audit.

1.5 TYPICAL ENERGY CONSERVATION MEASURES

A typical Energy Conservation Measure (ECM) requires capital investment in order to implement. In many cases, significant investments in a building system can provide a return on investment through energy efficiency. HVAC and building envelope upgrades can often be justified by their resulting reduction in energy costs. Government-owned buildings often take advantage of an energy service companies to provide funding, development, and installation for these projects. ESCO financing will be discussed later.

An energy audit will identify potential higher capital ECMs that should be considered. A good energy audit will consider and explain the interactions of competing ECMs such as the boiler example in the previous section.

1.6 ENERGY PROCUREMENT OPPORTUNITIES

1.6.1 Load Management and Smart Metering

Energy efficiency improvement is defined as reducing the energy required for a given unit of physical work or economic output. Efficiency gains are distinct from load management (short-term reductions in use during peak demand periods) or reductions in energy use from reduced economic activity. Two load side management programs available are demand response and smart metering. A Smart meter generally refers to a type of advanced meter (usually an electrical meter) that identifies consumption in more detail and more frequent intervals than a conventional meter; and optionally, but generally, communicates that information via some network back to the local utility for monitoring and billing purposes. It is anticipated that the Montgomery County facilities will be able to implement projects that will take advantage of Smart Meters for a reduction in cost of provided electricity.

1.6.2 Demand Response

In electricity grids, demand response (DR) is similar to dynamic demand mechanisms to manage customer consumption of electricity in response to supply conditions, for example, having electricity customers reduce their consumption at critical times or in response to market prices. The difference is that demand response mechanisms respond to explicit requests to shut off, whereas dynamic demand devices passively shut off when stress in the grid is sensed. Demand response can involve actually curtailing power used or by starting on site generation which may or may not be connected in parallel with the grid. PJM is the Regional Transmission Organization that offers Demand Response program to Maryland. They have multiple Demand Response programs that can lead to a reduction in electricity cost and/or cash rebates for participation. Projects can be implemented to maximize the value of these programs.

1.7 SOURCES OF FUNDING

1.7.1 Self-funding

Sometimes, energy efficiency projects that have rapid returns on investment or have low capital requirements can be self-funded by governments. Maintenance or permanent improvement funds can potentially be tapped and later refunded by the savings in the utility budget. Self-funding can often be augmented with state, federal, and utility incentive programs. The benefit of this funding mechanism is that all of the savings stay internal t the finances of the facility. The drawbacks are that of internal implementation responsibility as well budgetary constraints on even small capital projects.

1.7.2 Energy Performance Contracting: ESCO

The most common form of funding for energy efficiency projects is energy performance contracting.

The advantage of an energy performance contract is that the facility owner hires one Energy Service Company (ESCO) with single source responsibility who can likely complete large, complex projects in a short time frame. In addition, the ESCO has the responsibility of project financing and is repaid through future energy savings.

Although a energy performance contract is often the preferred financing arrangement, there are some drawbacksthat should be considered. , such as:

- It is common for an ESCO to offer energy solutions that focus on their area of expertise and product lines that they represent. This may not be the optimum solution for the facility of the county.
- It is in an ESCOs best interest to maximize their profit. Depending on the contract language, this can lead to either a situation that only includes the most profitable energy efficiency projects or it could include more machinery than is necessary in order to take advantage of profits that can only be realized with projects with a high initial capital cost.
- There is a booming demand for energy performance contracts and that many ESCOs are new to the marketplace and more established companies are being forced to rely on less experienced project managers and may emphasize profits over quality of service.
- The most effective whole building approach including maintenance and operational measures as well as clean technology opportunities are often not identified and addressed by ESCOs as it is not necessarily their area of expertise or in their financial interest.

In order to take advantage of the benefits of energy performance contracts while avoiding their pitfalls, the following is recommended:

- An energy audit should be completed for each facility to determine if a performance contract is a viable option for the facility. It would also serve to develop an energy base line and the potential scope of ECMs that will be needed should the county decide to develop an RFR for procurement of an Energy Performance Contract.

- Typical performance contracts can be complex with many considerations that may be used to maximize profits of the ESCO in place of maximizing benefit to the municipality. There are many contract parameters that need to be well understood and negotiated with ESCOs including the parameters used to establish the baseline energy consumption, methods for adjusting the baseline, the finance rate, the terms of any required maintenance agreements, the baseline fuel costs, anticipated utility rate inflation, etc. The energy auditors can be used as a third party to serve on the RFR development team and/or lead the procurement process.

It is generally agreed that Energy Performance Contracting can be an excellent method for financing energy capital projects in the public sector, but care nust be taken in the procurement process to maximize their benefit.

1.7.3 Other Sources of Project Financing

The federal government has many tax incentives that can be utilized by government agencies even though they do not pay taxes. Federal tax credits are currently offered for renewable energy. Sale of these tax credits or third-party ownership of the renewable energy equipment with sale of the energy back to the agency are two ways that tax credits can be taken advantage of by a governmental agency. In addition, EPACT, is a federal program that allows tax deductions for building energy efficiency improvements. Although the benefit of this tax deduction is usually taken by private building owners against profits, the legislation allows the designer of facilities for government agencies or nonprofit organizations to take the tax deduction for buildings that meet EPACT standards. Understanding this benefit can assist the government agency to negotiate the best rate for their services.

1.8 MEASUREMENT AND VERIFICATION

Some implemented energy conservation measures will require performance verification. For these measures, it is necessary to develop a Measurement and Verification (M&V) Plan.

The objective of this plan is to make sure that the equipment is performing as originally specified and that the projected savings are being realized.

M&V can be performed at the system or component level, and might include:

- Chillers
- Boilers
- Variable speed drive applications
- Pumps
- Lighting systems

The equipment will be monitored using sensors and data collection equipment to determine energy efficiency curves. For example, in a typical chiller test, the chiller is monitored for a certain period so varying load conditions can be recorded. Then, the developed chiller efficiency curves will be compared to the manufacturer's published efficiency curve.

1.8.1 General Requirements

During M&V, the engineering company will require the following assistance from the operating staff of the facility:

A copy of the manufacturer's published performance curves for each device to be tested.

Operating conditions for the equipment performance curves. (For example, for a chiller test, the engineers will need to know the chiller hot water temperature, chilled water temperature, air temperatures, and so on. For a variable speed drive, they will require the temperature and frequency of the drive.)
Address, contact information, and procedures for accessing the facilities where the equipment is housed.

It is necessary to work directly with the building operating staff to determine which equipment to run during the tests and at what settings. (For example, which chiller to lead with, the condenser water set point, chilled water set point, and other information that is needed to conduct the test.)

1.8.2 M&V Deliverables

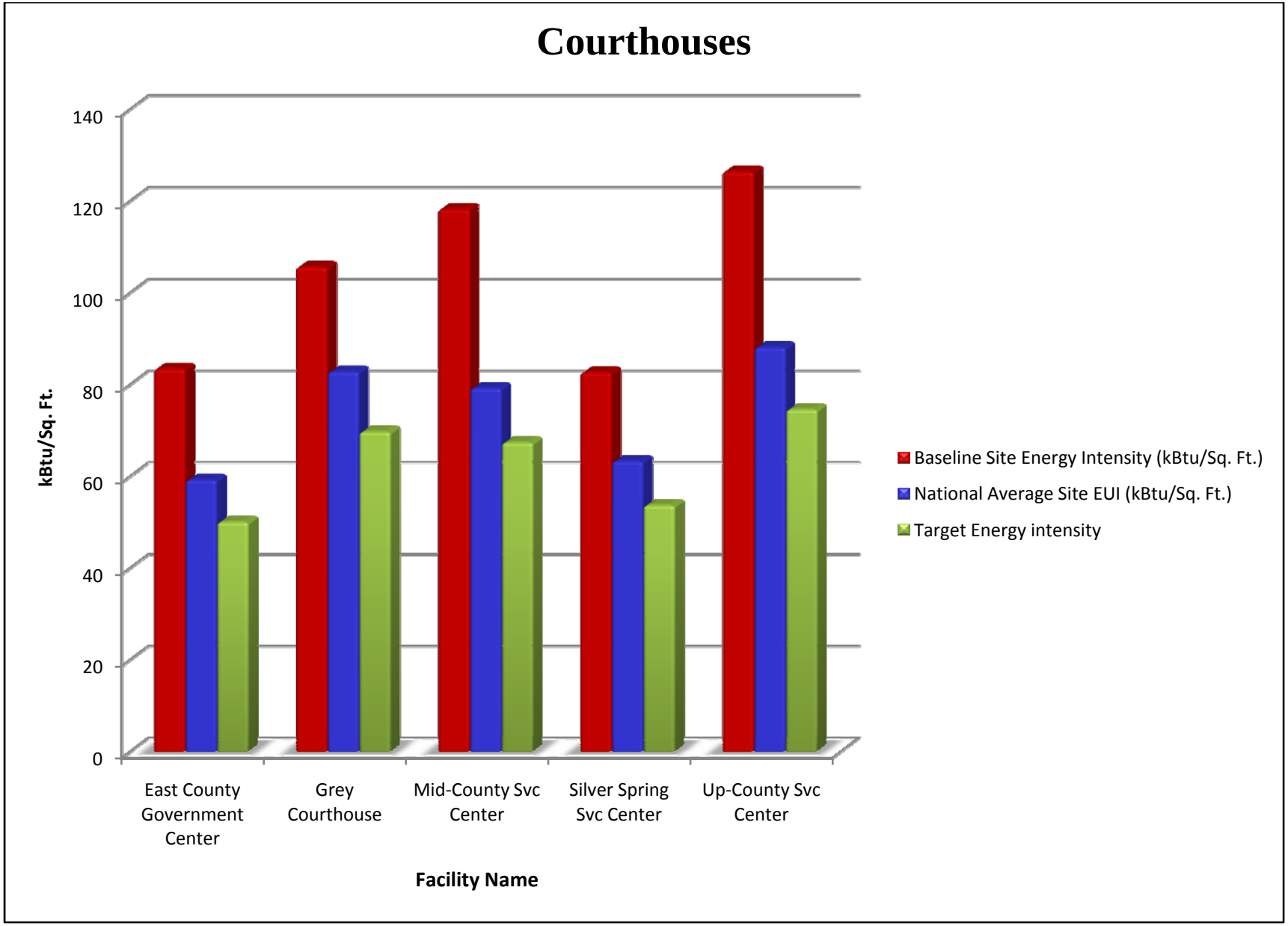
At the end of the M&V assessment, a report is compiled that presents the findings of the equipment tests. The manufacturer's data is incorporated into the report for comparative purposes. This report will include a brief summary of findings along with performance curves.

1.9 STAY COMMITTED TO SUSTAINABILITY

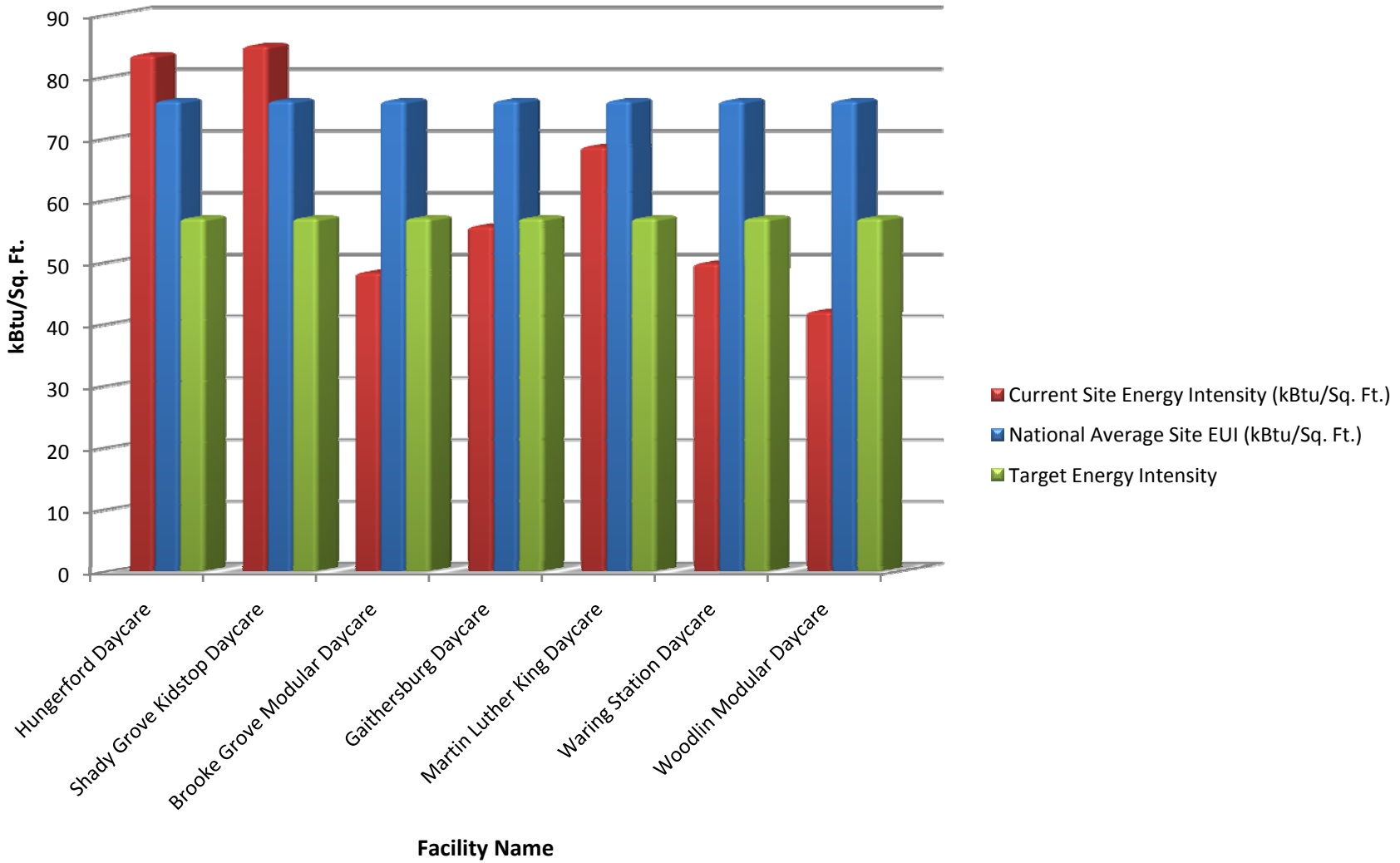
Energy awareness should be maintained at all of Montgomery County's facilities. No/low cost ECMs including operation and maintenance practices should be continually reviewed for additional energy conservation potential. And, as a result of the energy audits and clean technology and procurement related feasibility studies, some potential projects will return simple payback periods that extend them past the intended payback of our target. These projects should be banked and periodically reviewed against energy cost and potential incentives to re-evaluate their justification.

Once justified ECMs, procurement, and clean technology have been implemented and their savings realized and measured, Montgomery County can receive recognition through the national LEED program as well as the Energy Star program.

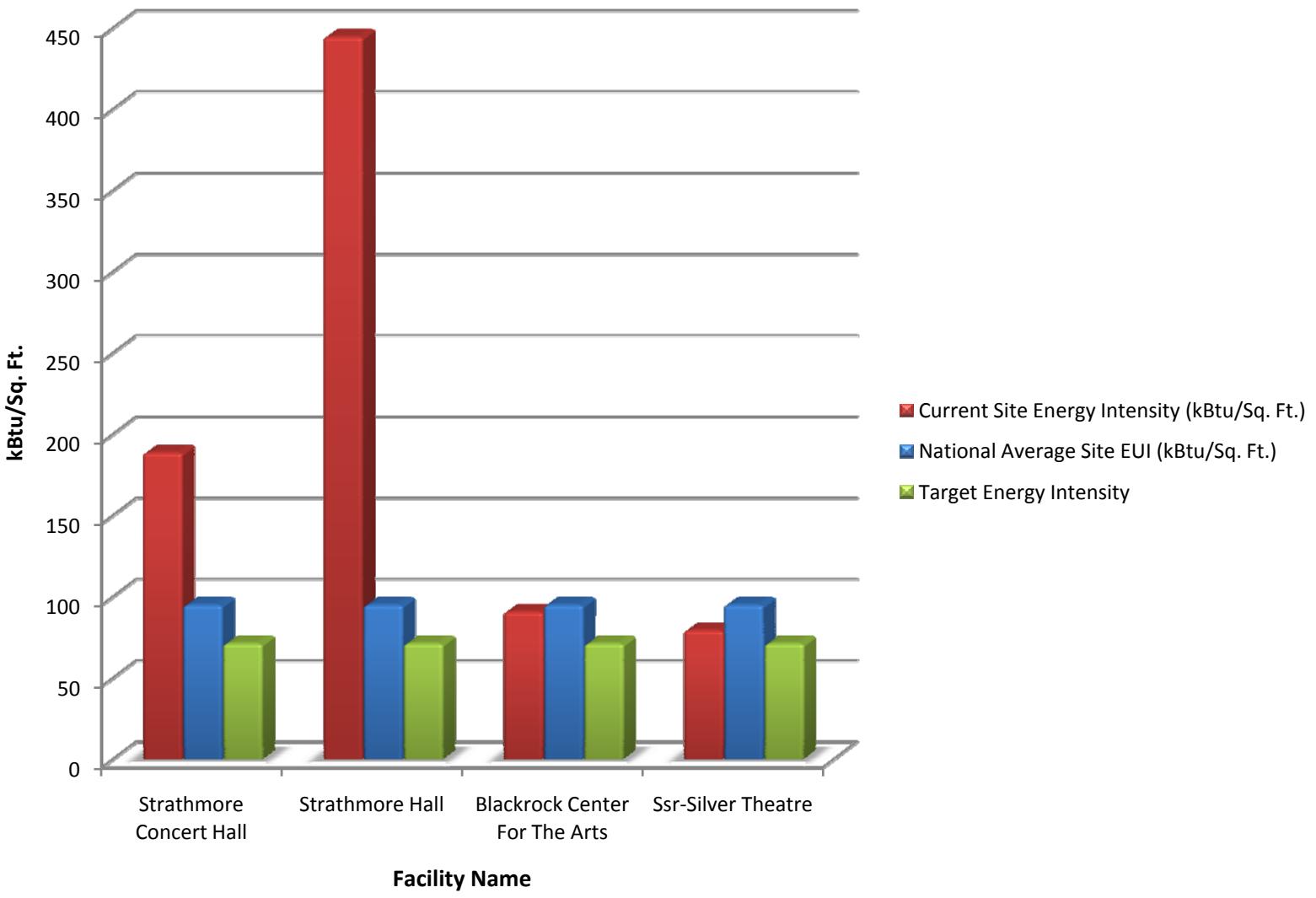
APPENDIX A
CATEGORY BAR CHARTS

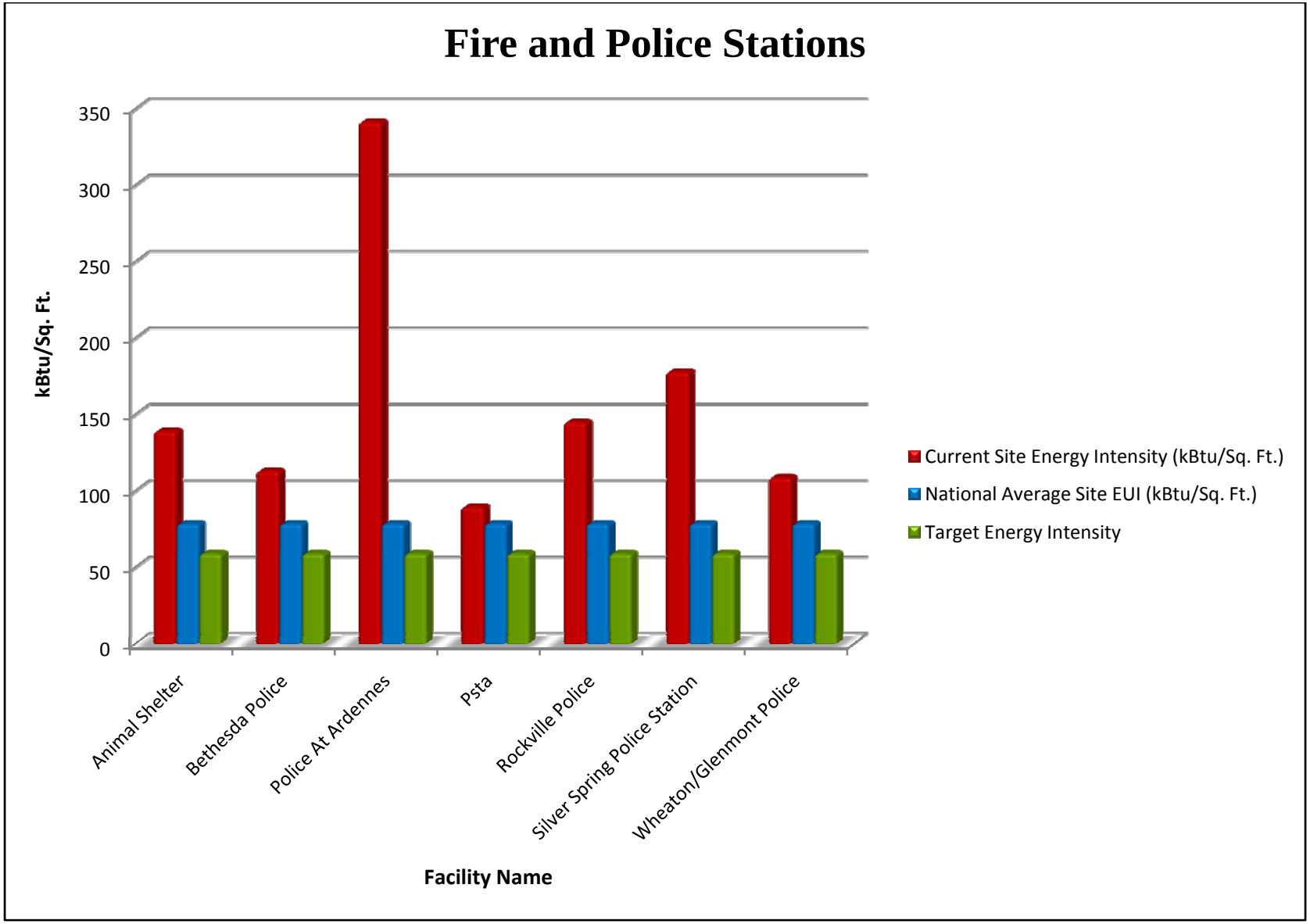

Courthouses
140
120
100
80
60
40
20
0
kBtu/Sq. Ft.
East County Government Center
Grey Courthouse
Mid-County Svc Center
Silver Spring Svc Center
Up-County Svc Center
Facility Name
Baseline Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy intensity

Educational Facilities

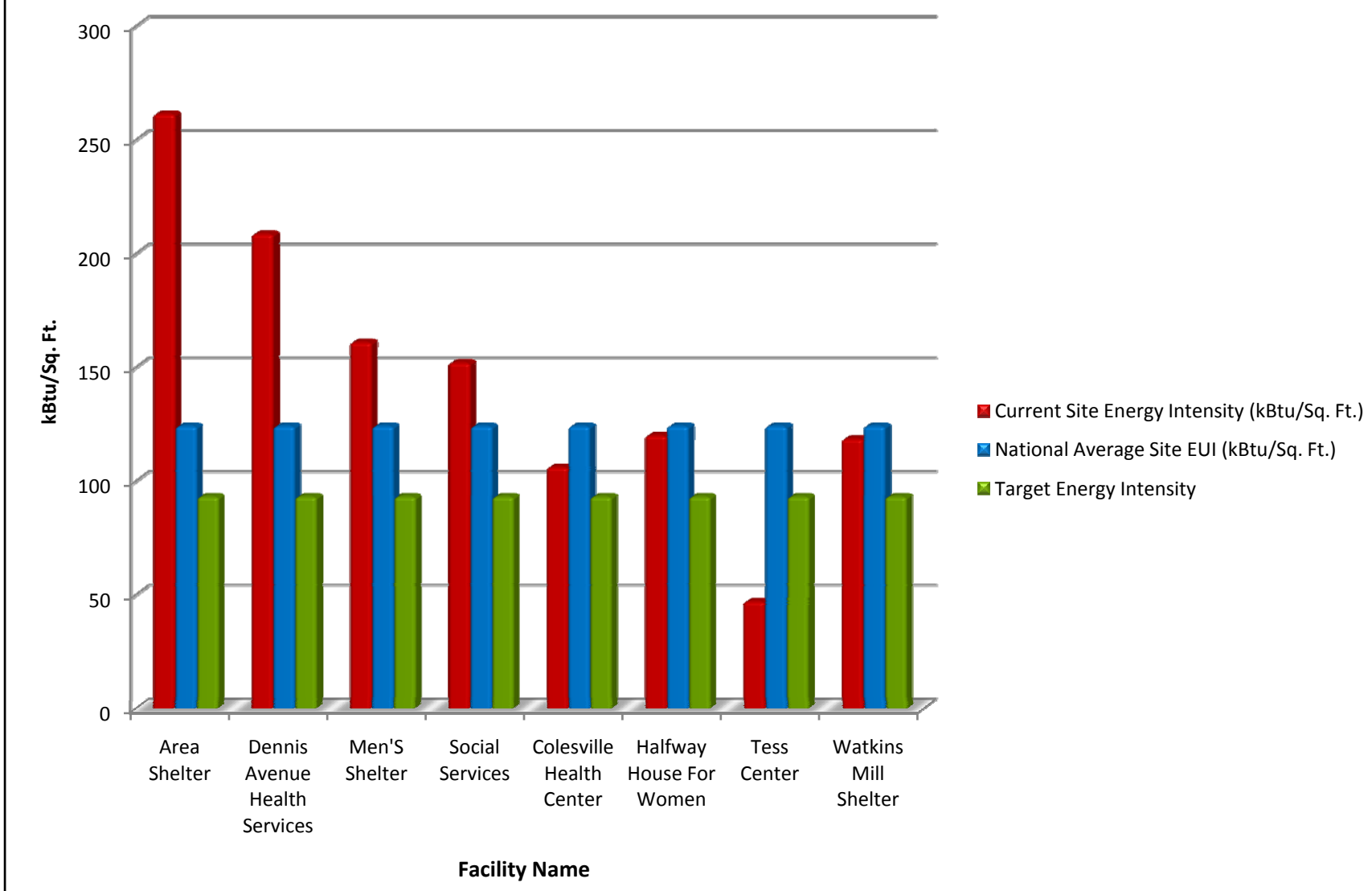


Entertainment and Cultural Facilites

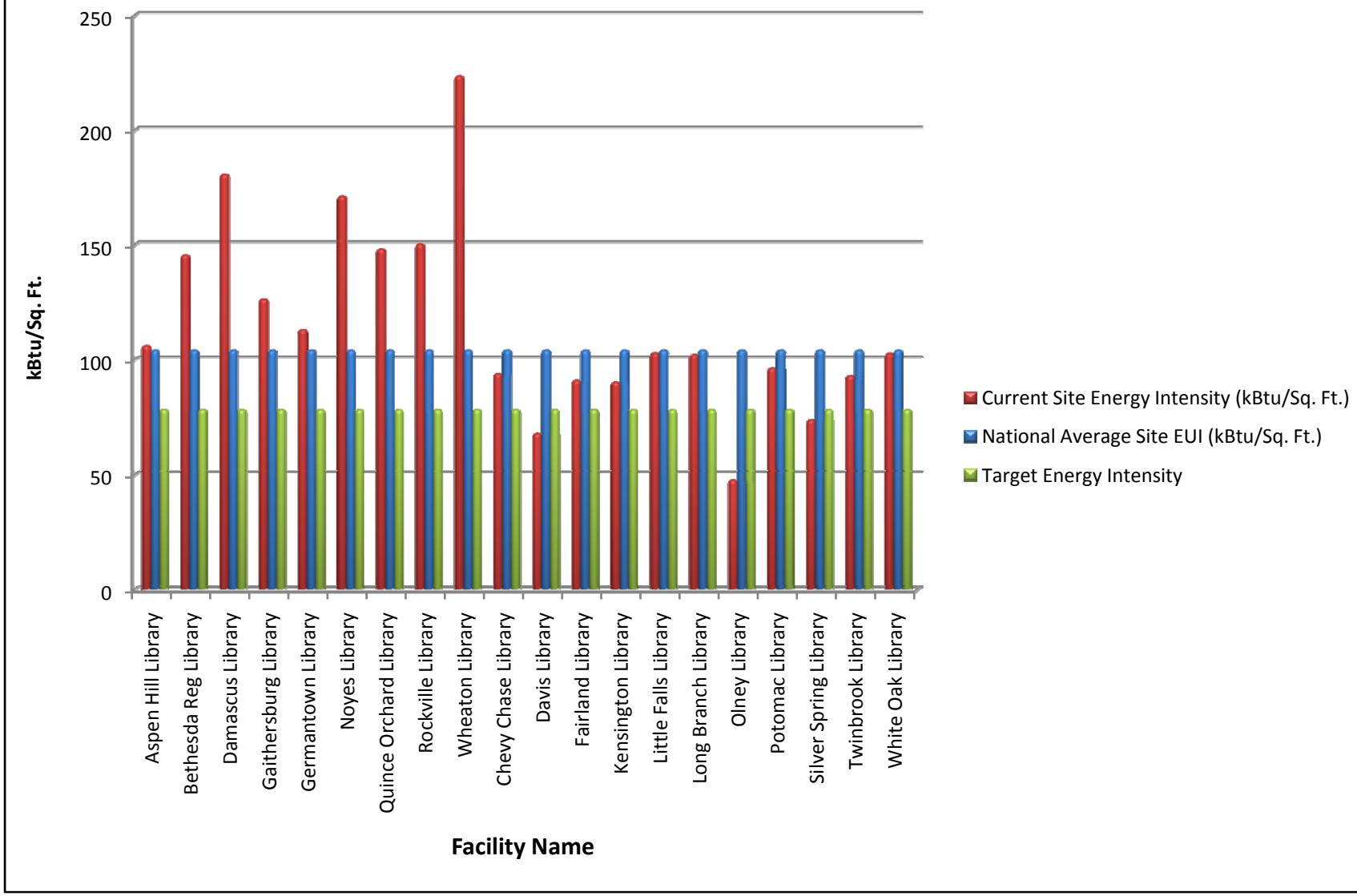



Fire and Police Stations
kBtu/Sq. Ft.
350
300
250
200
150
100
50
0
Animal Shelter
Bethesda Police
Police At Ardennes
Psta
Rockville Police
Silver Spring Police Station
Wheaton/Glenmont Police
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

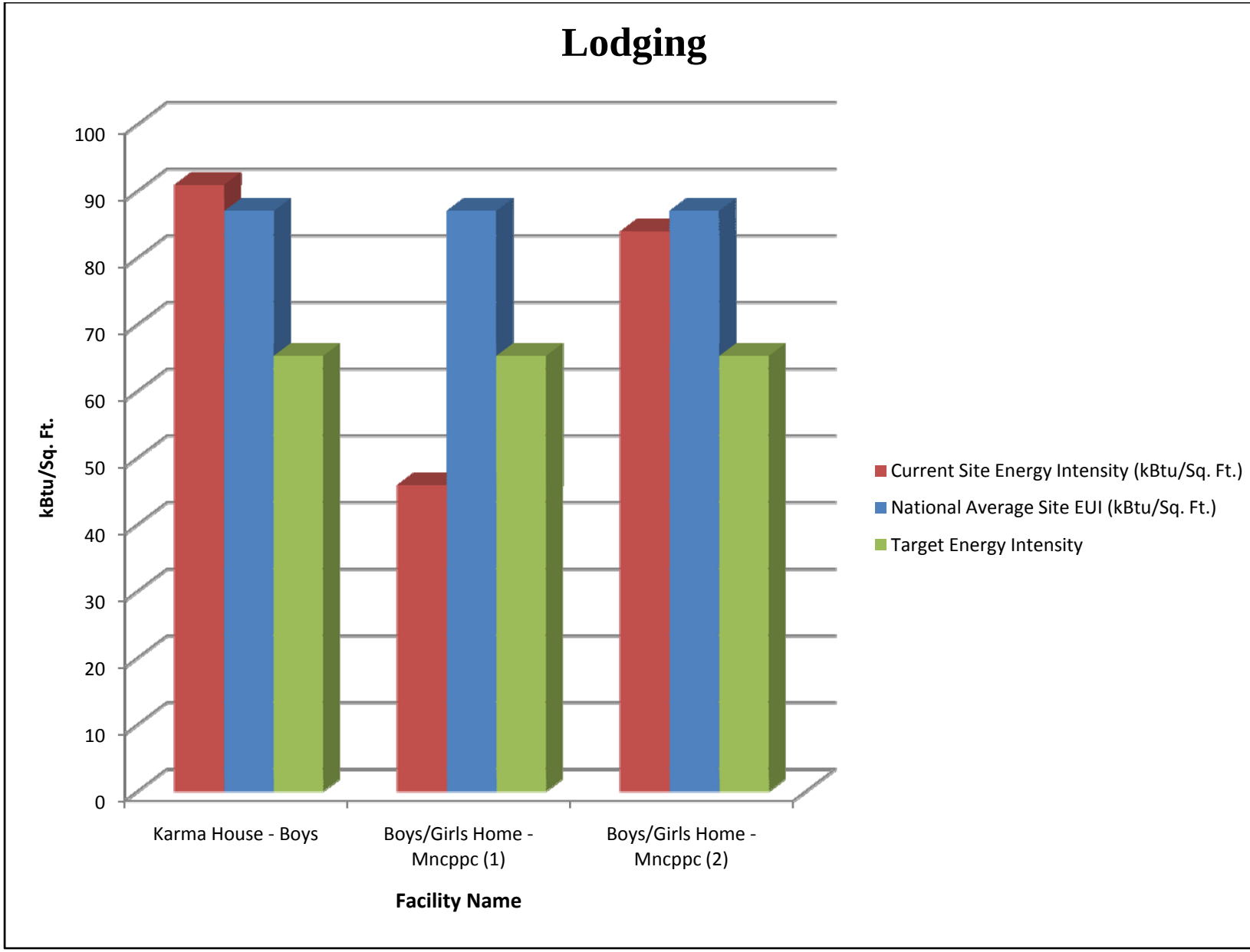
Healthcare Facilities

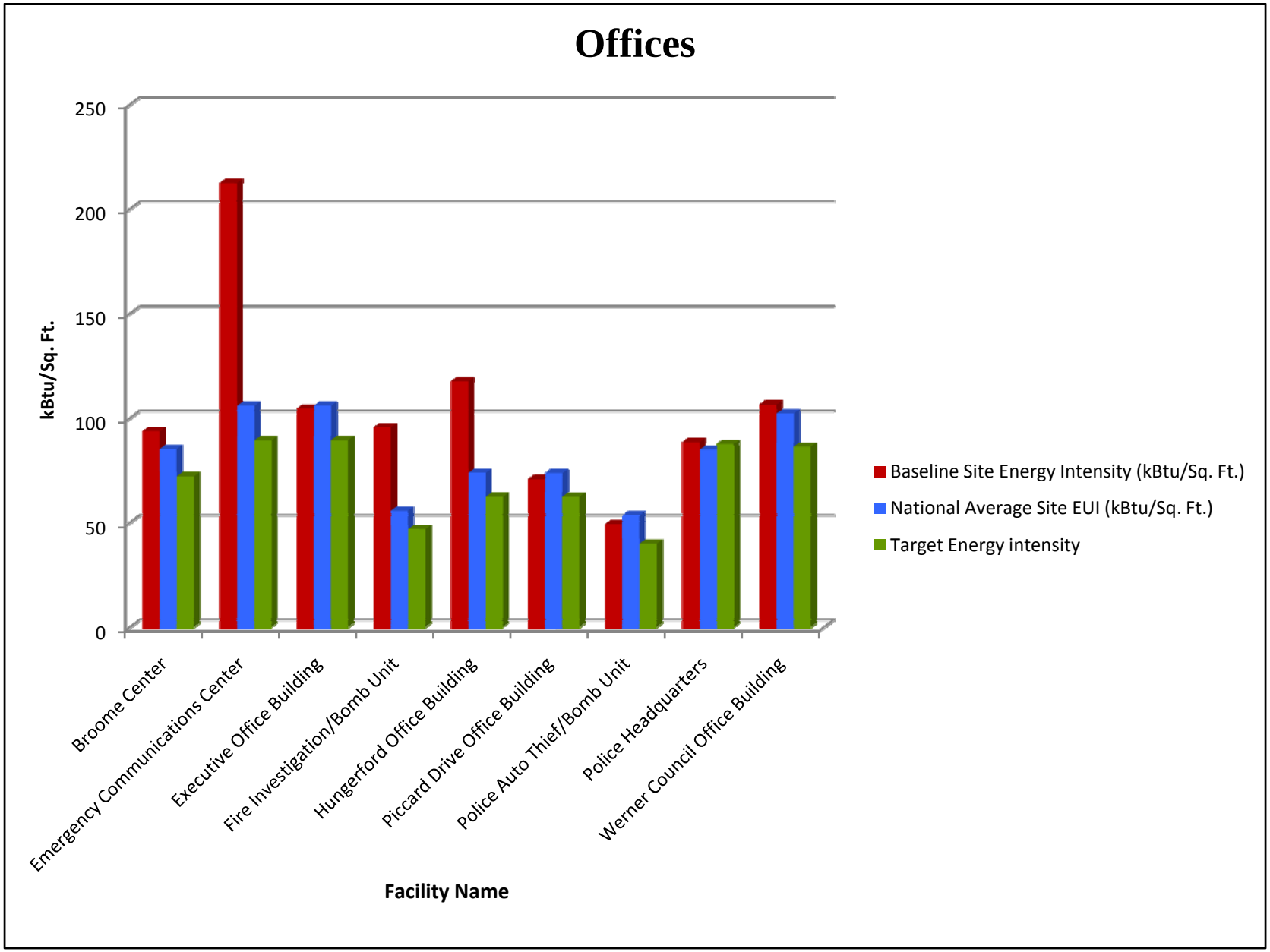


Libraries

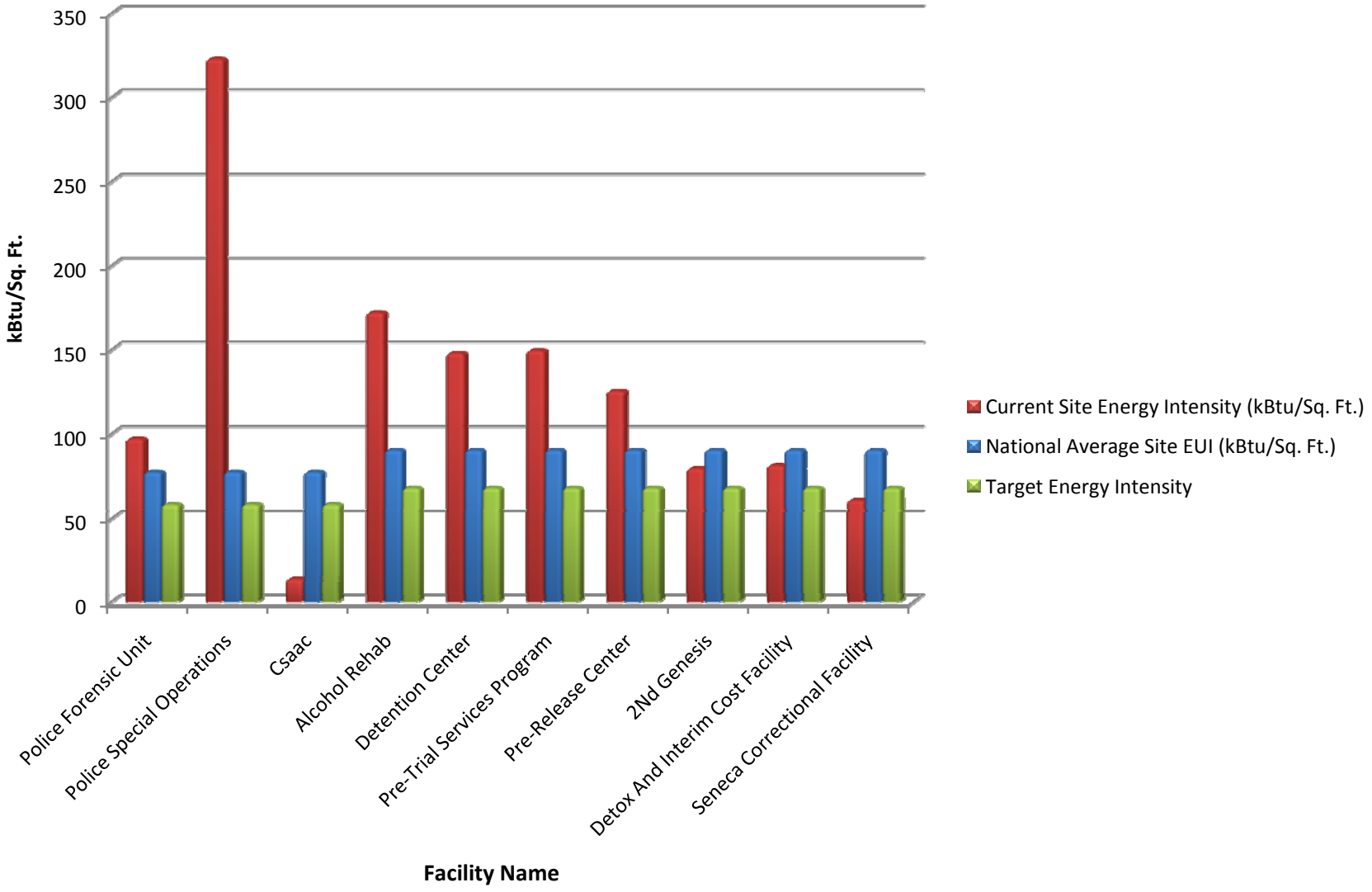

250
200
150
100
50
0
kBtu/Sq. Ft.
Aspen Hill Library
Bethesda Reg Library
Damascus Library
Gaithersburg Library
Germantown Library
Noyes Library
Quince Orchard Library
Rockville Library
Wheaton Library
Chevy Chase Library
Davis Library
Fairland Library
Kensington Library
Little Falls Library
Long Branch Library
Olney Library
Potomac Library
Silver Spring Library
Twinbrook Library
White Oak Library
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

Lodging

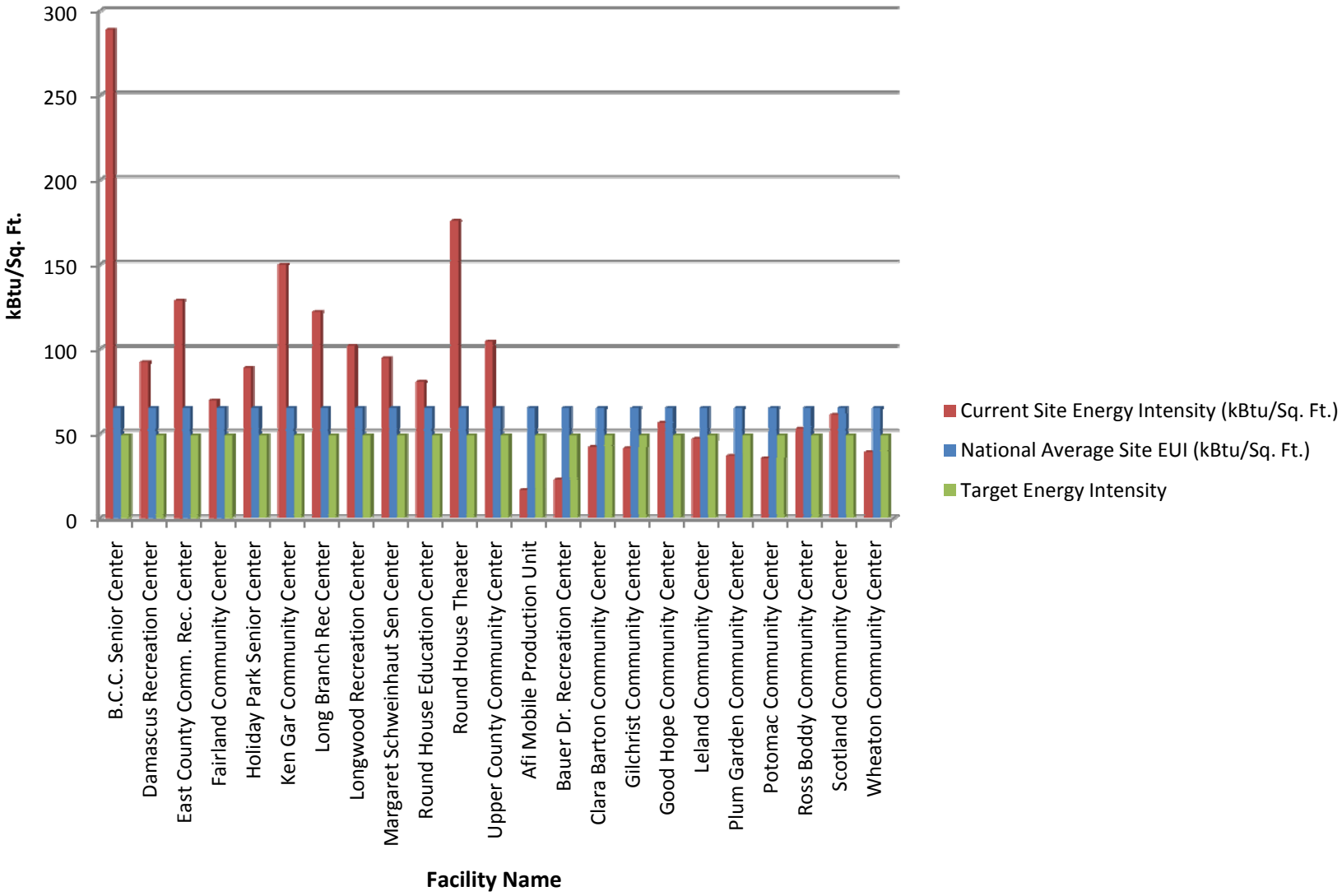

100
90
80
70
60
50
40
30
20
10
0
kBtu/Sq. Ft.
Karma House - Boys
Boys/Girls Home - Mncppc (1)
Boys/Girls Home - Mncppc (2)
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

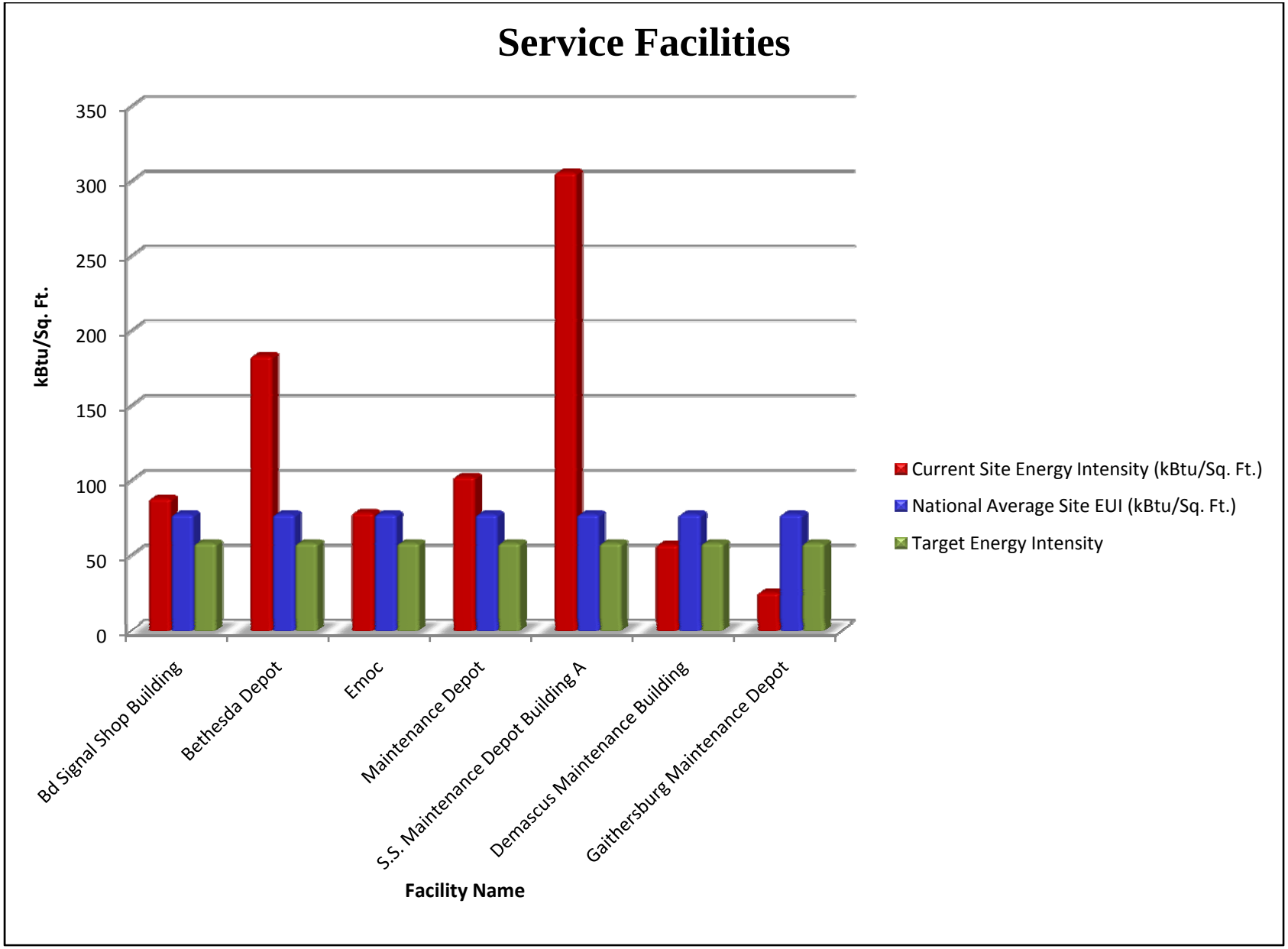

Offices
250
200
150
100
50
0
kBtu/Sq. Ft.
Broome Center
Emergency Communications Center
Executive Office Building
Fire Investigation/Bomb Unit
Hungerford Office Building
Piccard Drive Office Building
Police Auto Thief/Bomb Unit
Police Headquarters
Werner Council Office Building
Facility Name
Baseline Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy intensity

Public Order and Safety

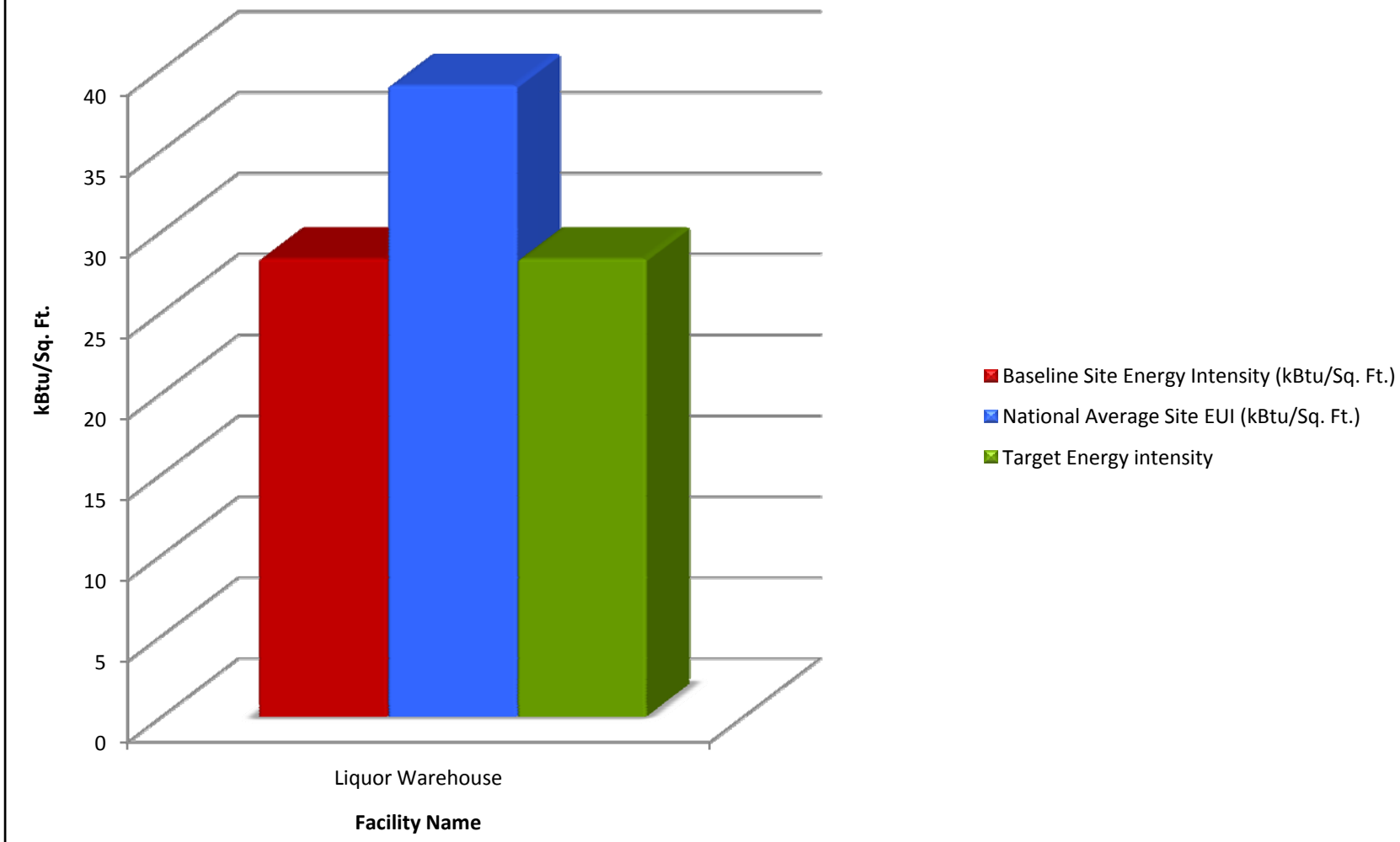


Recreational Facilities




Service Facilities
350
300
250
200
150
100
50
0
kBtu/Sq. Ft.
Bd Signal Shop Building
Bethesda Depot
Emoc
Maintenance Depot
S.S. Maintenance Depot Building A
Demascus Maintenance Building
Gaithersburg Maintenance Depot
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

Warehouses


40
35
30
25
20
15
10
5
0
kBtu/Sq. Ft.
Liquor Warehouse
Facility Name
Baseline Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy intensity