

The previous sections highlight the many programs and activities undertaken by the Office of Sustainability, other County government departments and agencies, non-profit organizations, and residents and businesses in the County. This section provides some metrics to demonstrate the effect of these activities, and the progress the County is making toward meeting its climate change and other sustainability goals.

As with the list of activities in the *Benchmarking Sustainability* section, the metrics presented here do not provide the full picture of the County's progress. Although many key measures are presented, developing a complete set of sustainability metrics will be an evolving process, and require inputs from a wider variety of entities than were asked to contribute to this summary of the DEP Office of Sustainability. The *Benchmarking Sustainability* section introduced the STAR Community Rating System, which has as a fundamental component a comprehensive set of metrics. The Office will continue to explore the use of STAR as a tool to expand the scope of data included in this report, or in a wider sustainability report encompassing the full breadth of sustainability in Montgomery County.

Building Fuel Energy Use

The CPP established targets for reductions in building energy use for the residential and commercial/multi-family sectors. For the residential sector, the plan called for steps to be taken to encourage 50% of the County's homeowners to take steps to reduce energy use by 25% by 2020. In the commercial/multi-family sector, the target was a total reduction of 25% by 2020 across the sector.

Information on building energy use in the County is available from data collected as a result of the County's fuel energy tax, which provides information on the consumption of electricity, natural gas, and other building fuels. These data are broken out by residential and non-residential use, based on the structure of the County's energy tax and the nature of utility tariffs from electricity and gas suppliers. Generally, larger multi-family properties are included in the non-residential data.

Residential building energy use is shown in **Figures 4-1 and 4-2**. Overall, residential building energy use has grown more than 7% from the FY05 base year. Energy use dropped to a low point in FY12, but has grown by more than 26% in the last four years.

Non-residential building energy use is shown in **Figure 4-3 and 4-4**. Non-residential energy use is up by more than 12% from the FY05 base year. Non-residential building energy use has followed the same general trend as residential use, reaching a low point in FY12 but growing by nearly 13% in the last four years.

Determining the reasons for fluctuations in building energy use is complex. Energy use may be influenced by economic activity, weather, and fuel prices. In addition, the data shows total energy use in the building sector and is not adjusted to reflect increases in population or building square footage.

Greenhouse Gas Emissions

The 2009 Montgomery County Climate Protection Plan established the following goals for greenhouse gas (GHG) reductions:

“...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 three primary components of the County’s measured GHG emissions were residential and non-residential building energy use, and on-road transportation. The Office of Sustainability is currently working to develop a standard approach for regularly updating transportation related GHG emissions.

Information from the County’s fuel energy tax provides the raw data for calculating GHG emissions from building related energy use. Utilizing factors established by the U.S. Environmental Protection Agency (USEPA), data on energy consumption can be converted to GHG emissions. In keeping with standard protocols, these emissions are expressed in terms of carbon dioxide equivalents (CO₂e) to account for the global warming potential of other greenhouse gases (methane and nitrous oxide) emitted when electricity is generated or other building fuels are consumed.

Using updated energy use data from energy tax records, and the latest emission factors published by the USEPA, the Office of Sustainability has updated the calculated base year (FY05) GHG emissions associated with building energy use. This update has resulted in an adjustment to the FY05 base year GHG emissions from building energy use reported in the CPP from 8.088 million metric tons MMT (MMT_{CO₂e}) to 7.205 MMT_{CO₂e}. Progress toward meeting the County’s GHG reduction goals defined above will be calculated against this revised base figure.

Building-related GHG emissions are shown in **Figures 4-5 and 4-6**. Despite the increase in building energy use since the FY05 base year, GHG emissions from building fuel use are down. In fact, with a drop of just over 11%, this component of the County’s measured GHG emissions has met the target of a 10% reduction by FY15. Consistent with the pattern of building energy

use in the County, building-related GHG emissions were at their lowest in FY12, down nearly 23% from the FY05 base. Since FY12, however, emissions have increased more than 15%.

The reduction in GHG emissions from buildings is primarily attributable to the greening of the electricity supply. As shown in **Figure 4-7**, the average GHG emissions from the electricity supplied to this region have dropped from 1,145 lbs/MWh CO₂e to 863 lbs/MWh CO₂e, a reduction of nearly 25%. This information is compiled in the U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID), which is comprehensive source of data on the environmental characteristics of the nation's electric power generation system. The data from eGRID is aggregated in a variety of ways. The emissions factors in Figure 4-7 are from the eGRID subregion identified as "RFC East," which is the eastern half of the region managed by Reliability First, one of eight regional entities responsible for ensuring the reliability of the nation's electric power system. Data are not available from eGRID for each year. As a result, in this analysis, GHG emissions from electricity use in a given year are based on the most recent year for which data is available (e.g., emissions for FY12-FY15 are based on 2012 emissions factors). Should updated eGRID emissions data become available for recent years, the County's GHG emissions from building energy use may be lower than that shown in Figures 4-5 and 4-6.

Several points should be noted related to the GHG emissions data. First, the calculated emissions are based on emission factors associated with the combustion of the fuels used to generate the energy. For electricity, this means the emissions at the power plant; for natural gas, LPG, and heating oils, this means at the building where the fuel is used. Line losses in the electric distribution system, fugitive emissions due to the extraction of natural gas and oil, and other indirect emissions are not included in this analysis.

Second, because Maryland is a deregulated electricity market, consumers may obtain their electricity supply from an entity other than their local utility. A number of suppliers offer "green" power, that is, power generated by wind, solar, or another clean, renewable source. The County does not have access to data on how many customers may be using some form of clean electricity. As a result, the actual GHG emissions associated with the electricity used by Montgomery County customers may be lower than the calculated emissions if County customers purchase a greater amount of clean electricity than the average customer in the RFC East eGRID subregion.

Figure 4-1

Residential building energy use has grown more than 7% from the FY05 base year. Energy use dropped to a low point in FY12, but has grown by more than 26% in the last four years.

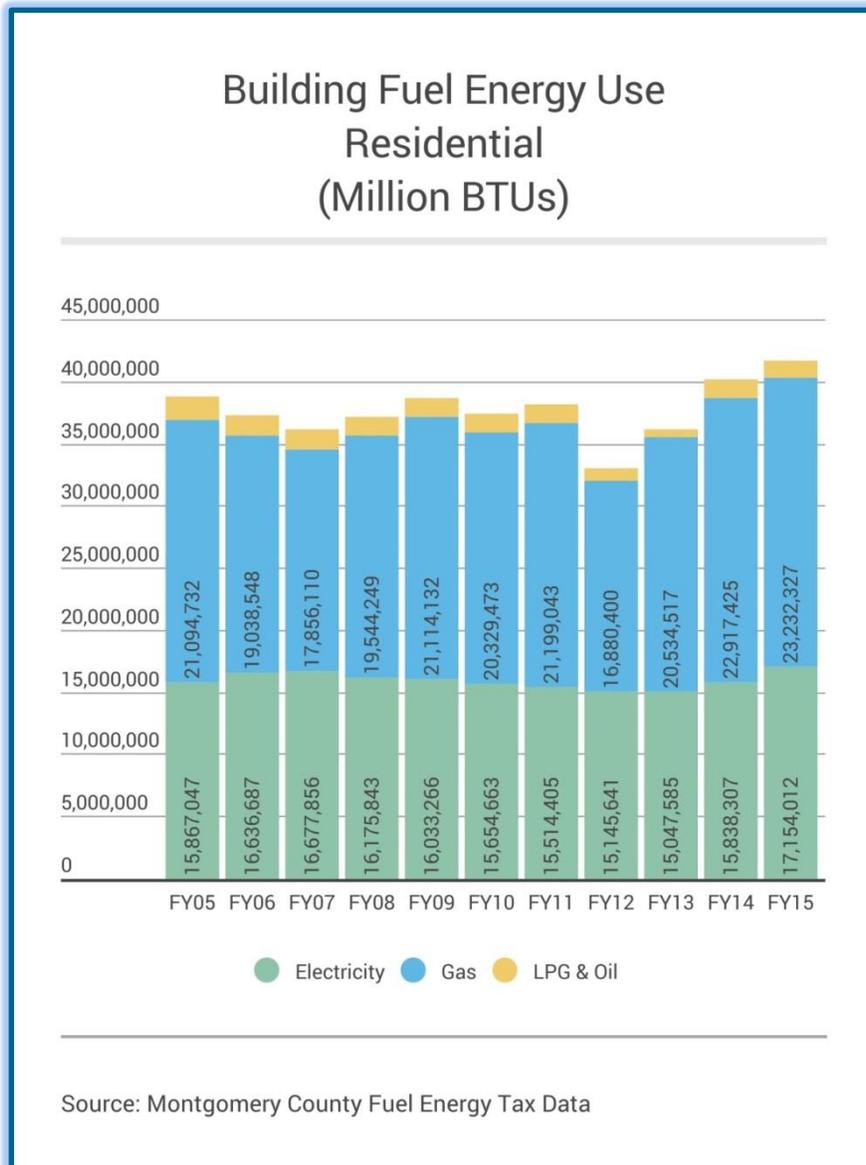


Figure 4-2

Building Fuel Energy Use Residential

	Electricity (KWh)	Gas (Therms)	LPG (Pounds)	No. 1 (Gallons)	No. 2 (Gallons)
FY05	4,650,365,354	210,947,321	11,323,344	43,305	12,030,845
FY06	4,875,934,157	190,385,482	10,503,515	34,586	10,708,490
FY07	4,888,000,090	178,561,097	13,230,472	30,345	9,669,993
FY08	4,740,868,534	195,442,486	11,792,625	23,141	8,629,179
FY09	4,699,081,443	211,141,320	10,466,596	21,033	9,457,683
FY10	4,588,119,300	203,294,730	9,409,540	21,419	9,390,945
FY11	4,547,011,994	211,990,433	9,911,177	12,946	9,347,072
FY12	4,438,933,334	168,804,003	6,912,628	9,156	6,755,713
FY13	4,410,194,935	205,345,168	7,503,922	9,546	3,215,060
FY14	4,641,942,231	229,174,247	7,812,061	6,297	9,179,317
FY15	5,027,553,400	232,323,268	8,642,001	13,636	8,638,634

	Electricity (MMBtu)	Gas (MMBtu)	LPG (MMBtu)	No. 1 (MMBtu)	No. 2 (MMBtu)	Total (MMBtu)
FY05	15,867,047	21,094,732	245,241	6,019	1,660,257	38,873,296
FY06	16,636,687	19,038,548	227,485	4,807	1,477,772	37,385,300
FY07	16,677,856	17,856,110	286,546	4,218	1,334,459	36,159,189
FY08	16,175,843	19,544,249	255,405	3,217	1,190,827	37,169,540
FY09	16,033,266	21,114,132	226,686	2,924	1,305,160	38,682,167
FY10	15,654,663	20,329,473	203,792	2,977	1,295,950	37,486,856
FY11	15,514,405	21,199,043	214,656	1,799	1,289,896	38,219,800
FY12	15,145,641	16,880,400	149,714	1,273	932,288	33,109,316
FY13	15,047,585	20,534,517	162,520	1,327	443,678	36,189,627
FY14	15,838,307	22,917,425	169,194	875	1,266,746	40,192,546
FY15	17,154,012	23,232,327	187,168	1,895	1,192,131	41,767,534

Figure 4-3

Non-residential energy use is up by more than 12% from the FY05 base year. Non-residential building energy use has followed the same general trend as residential use, reaching a low point in FY12 but growing by nearly 13% in the last four years.

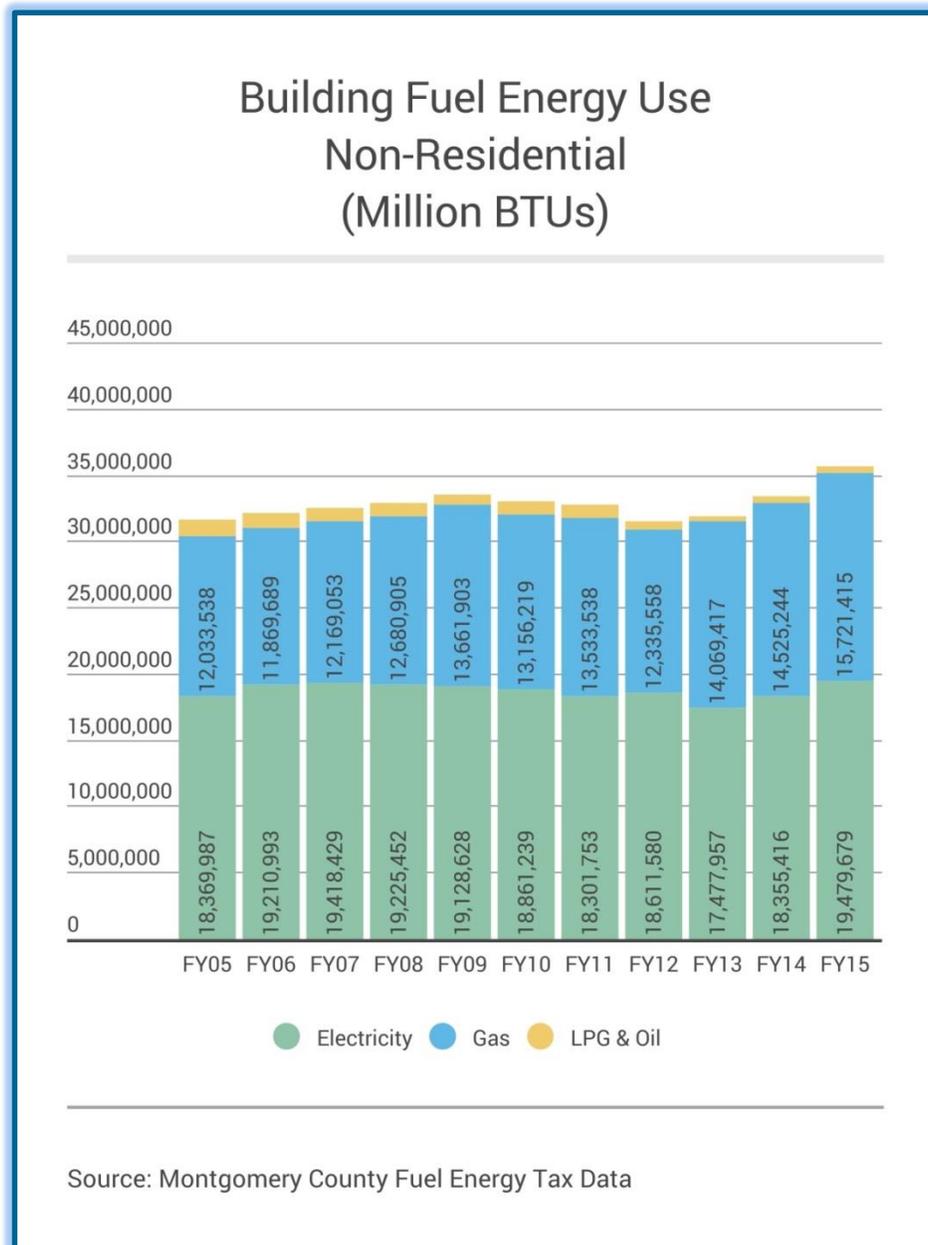


Figure 4-4

Building Fuel Energy Use Non-Residential

	Electricity (KWh)	Gas (Therms)	LPG (Pounds)	No. 1 (Gallons)	No. 2 (Gallons)
FY05	5,383,935,207	120,335,381	6,245,318	176,168	8,070,670
FY06	5,630,419,951	118,696,889	5,345,175	104,661	6,920,213
FY07	5,691,216,069	121,690,531	4,981,122	116,827	6,077,457
FY08	5,634,657,655	126,809,047	6,327,115	89,492	6,735,229
FY09	5,606,280,263	136,619,028	4,725,544	23,249	5,241,570
FY10	5,527,912,879	131,562,194	4,239,639	66,127	6,883,650
FY11	5,363,937,023	135,335,381	4,195,407	102,284	5,842,986
FY12	5,454,742,214	123,355,584	2,692,220	9,179	4,194,417
FY13	5,122,496,129	140,694,168	2,571,274	0	2,396,099
FY14	5,379,664,759	145,252,440	3,891,392	104,679	2,982,058
FY15	5,709,167,414	157,214,153	3,947,640	22,423	2,858,482

	Electricity (MMBtu)	Gas (MMBtu)	LPG (MMBtu)	No. 1 (MMBtu)	No. 2 (MMBtu)	Total (MMBtu)
FY05	18,369,987	12,033,538	135,261	24,487	1,113,752	31,677,026
FY06	19,210,993	11,869,689	115,766	14,548	954,989	32,165,985
FY07	19,418,429	12,169,053	107,881	16,239	838,689	32,550,292
FY08	19,225,452	12,680,905	137,033	12,439	929,462	32,985,290
FY09	19,128,628	13,661,903	102,346	3,232	723,337	33,619,445
FY10	18,861,239	13,156,219	91,822	9,192	949,944	33,068,416
FY11	18,301,753	13,533,538	90,864	14,217	806,332	32,746,705
FY12	18,611,580	12,335,558	58,308	1,276	578,829	31,585,552
FY13	17,477,957	14,069,417	55,689	0	330,662	31,933,724
FY14	18,355,416	14,525,244	84,280	14,550	411,524	33,391,014
FY15	19,479,679	15,721,415	85,498	3,117	394,471	35,684,180

Figure 4-5

Consistent with the pattern of building energy use in the County, building-related GHG emissions were at their lowest in FY12, down nearly 23% from the FY05 base. Since FY12, emissions have increased more than 15%. However, with a drop of just over 11% since the FY05 base year, this component of the County’s measured GHG emissions has met the target of a 10% reduction by FY15.

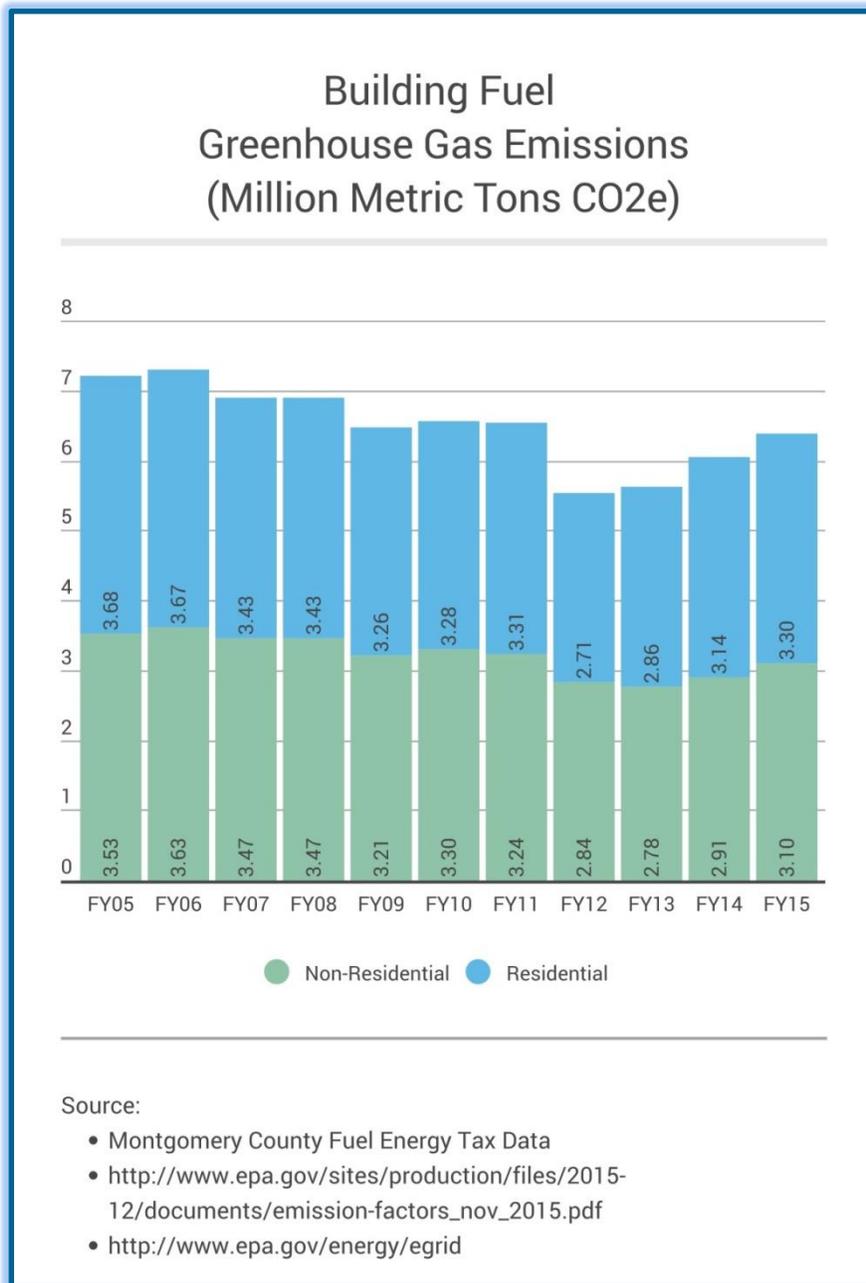


Figure 4-6

Residential Building-Related GHG Emissions

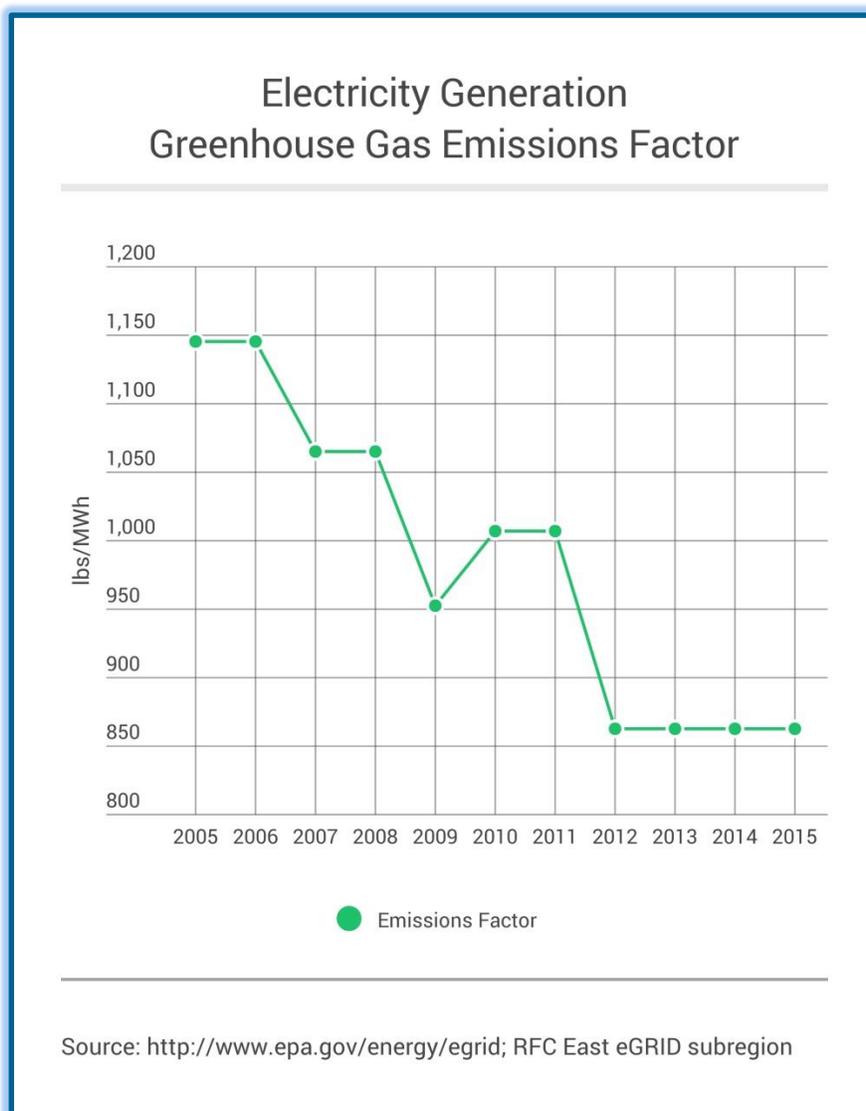
	Electricity (MMTCO ₂ e)	Gas (MMTCO ₂ e)	LPG (MMTCO ₂ e)	No. 1 (MMTCO ₂ e)	No. 2 (MMTCO ₂ e)	Total (MMBtu)
FY05	2.416	1.120	0.015	0.000	0.123	3.676
FY06	2.533	1.011	0.014	0.000	0.110	3.669
FY07	2.361	0.948	0.018	0.000	0.099	3.427
FY08	2.290	1.038	0.016	0.000	0.088	3.433
FY09	2.030	1.121	0.014	0.000	0.097	3.263
FY10	2.096	1.080	0.013	0.000	0.096	3.285
FY11	2.077	1.126	0.014	0.000	0.096	3.312
FY12	1.737	0.897	0.009	0.000	0.069	2.712
FY13	1.726	1.091	0.010	0.000	0.033	2.860
FY14	1.816	1.217	0.011	0.000	0.094	3.138
FY15	1.967	1.234	0.012	0.000	0.088	3.302

Non-Residential Building-Related GHG Emissions

	Electricity (MMTCO ₂ e)	Gas (MMTCO ₂ e)	LPG (MMTCO ₂ e)	No. 1 (MMTCO ₂ e)	No. 2 (MMTCO ₂ e)	Total (MMBtu)
FY05	2.797	0.639	0.009	0.002	0.083	3.529
FY06	2.925	0.630	0.007	0.001	0.071	3.635
FY07	2.749	0.646	0.007	0.001	0.062	3.466
FY08	2.722	0.674	0.009	0.001	0.069	3.474
FY09	2.422	0.726	0.006	0.000	0.054	3.208
FY10	2.525	0.699	0.006	0.001	0.070	3.301
FY11	2.450	0.719	0.006	0.001	0.060	3.235
FY12	2.134	0.655	0.004	0.000	0.043	2.836
FY13	2.004	0.747	0.004	0.000	0.025	2.779
FY14	2.105	0.772	0.005	0.001	0.031	2.913
FY15	2.234	0.835	0.005	0.000	0.029	3.104

Figure 4-7

GHG emissions per unit of electricity generated have dropped nearly 25% from the FY05 base year. These data are from the U.S. EPA’s Emissions & Generation Resource Integrated Database (eGRID) database, a comprehensive source of data on the environmental characteristics nation’s electric power generation system.



Sustainable Buildings

Two indicators of a more sustainable building are achieving the ENERGY STAR label from the U.S. EPA or certifying a building through the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) certification process. Montgomery County has more ENERGY STAR labeled and LEED certified buildings than any jurisdiction in Maryland.

Figure 4-8 shows the number of buildings in the County achieving the Energy Star label in a given year (the label must be earned each year) and the number achieving building design and construction (BD&C) certification in a given year (LEED BD&C certification is a one-time action). As of January 2016, 198 buildings in Montgomery County had achieved LEED BD&C certification based on USGBC data.

There are different levels of LEED BD&C certification – Certified, Silver, Gold, and Platinum.

Figure 4-9 shows the number of buildings achieving each certification level in the County by year since 2004.

Montgomery County Public Schools (MCPS) is one of the largest property managers in the County. Dating back to the adoption of an energy conservation policy in 1973, MCPS has had a history of incorporating sustainability into the design of its schools. Current building design practices include the installation of geexchange heating/cooling and solar PV systems. All newly constructed schools go through the LEED certification process. **Figure 4-10** illustrates the growing number of schools in the MCPS system incorporating one or more of these features.

There has been explosive growth across the country in the installation of on-site solar PV systems. Montgomery County has been no exception. **Table 4-11** shows the number of permit applications for solar PV systems received by the Office of Permitting Services from FY14 through the first half of FY16. Applications for residential systems in the first half of FY16 have surpassed the total received in all of FY15, while applications for commercial systems have increased five-fold.

In 2008, the Maryland General Assembly passed the EmPOWER Maryland Energy Efficiency Act. This legislation directed Maryland's utilities to develop incentives to encourage energy efficiency measures on residential and commercial buildings in the state. As illustrated in **Figure 4-12**, Pepco's commercial and industrial customers in the County have utilized more than \$40 million of incentives, saving more than 106,000 MWh of electricity.

Figure 4-8

ENERGY STAR data reflects the number of buildings achieving the ENERGY STAR label in a given year; the label must be earned each year. LEED data reflects the number of buildings achieving building design and construction (BD&C) certification in a given year; LEED BD&C certification is a one-time action. As of January 2016, there were 198 LEED certified buildings in Montgomery County.

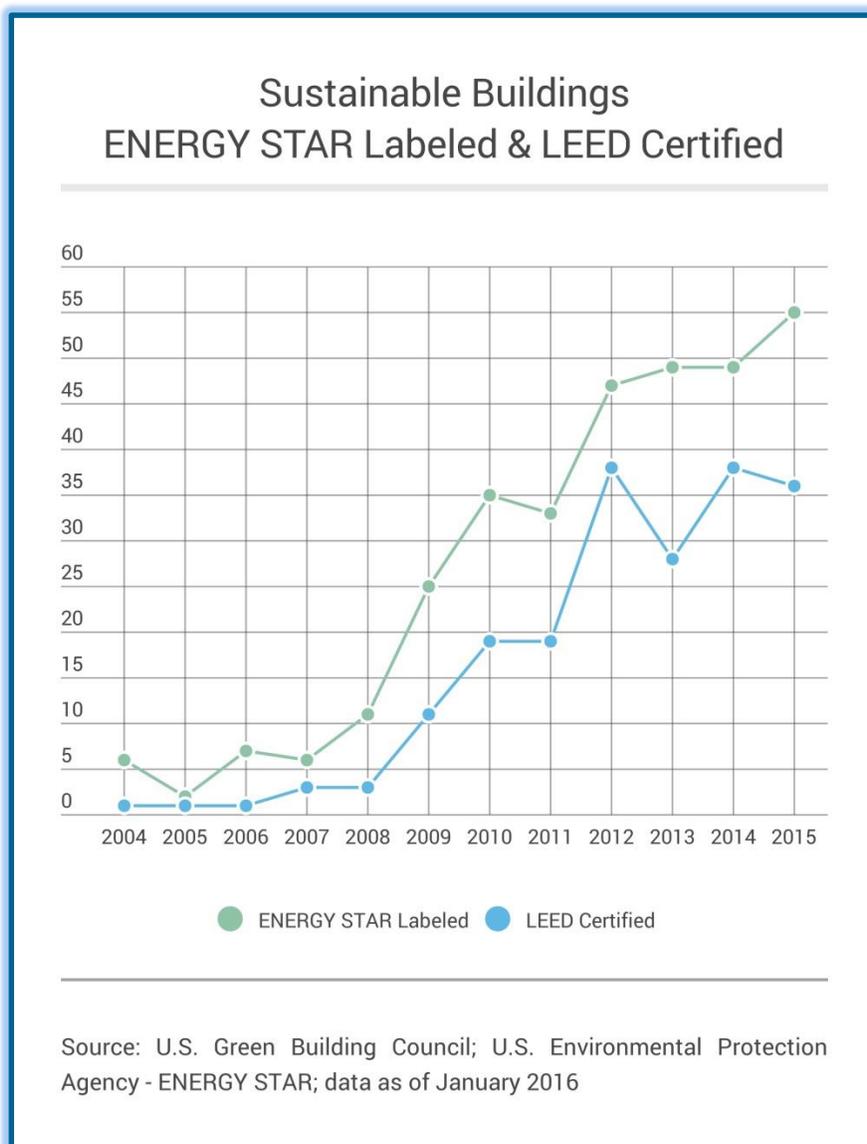


Figure 4-9

ENERGY STAR data reflects the number of buildings achieving the ENERGY STAR label in a given year; the label must be earned each year. LEED data reflects the number of buildings achieving building design and construction (BD&C) certification in a given year; LEED BD&C certification is a one-time action.

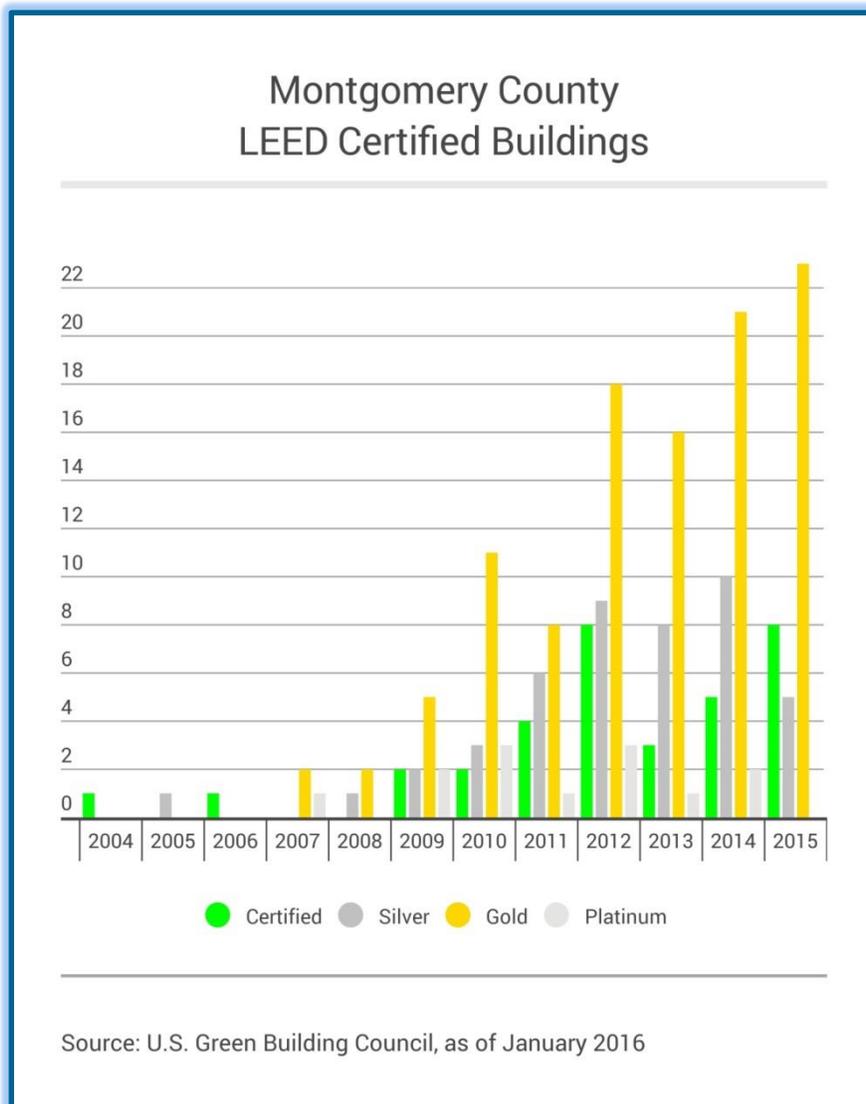


Figure 4-10

Sustainable features incorporated into Montgomery County Public School buildings include geothermal heating/cooling and solar PV systems. All newly constructed schools go through the LEED certification process. Of MCPS's 22 LEED certified schools, 21 are LEED Gold.

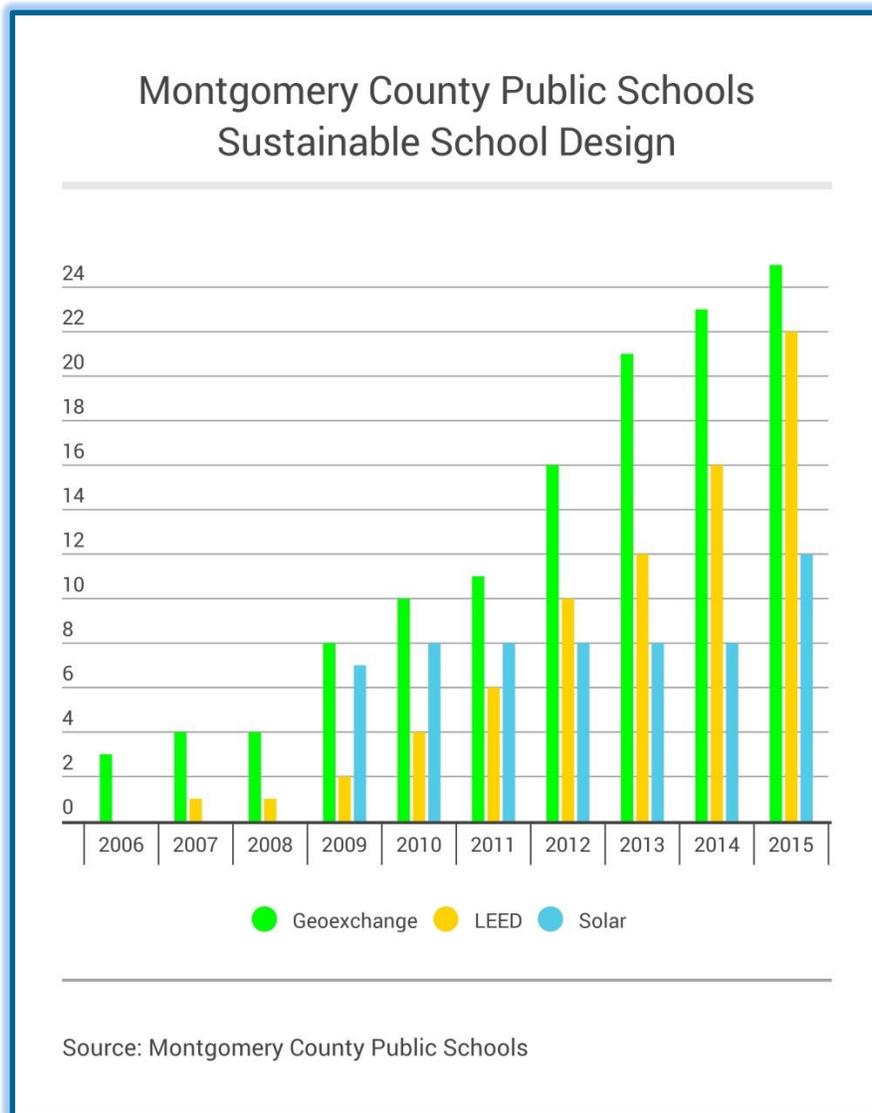


Figure 4-11

Applications for residential solar PV systems in the first half of FY16 have surpassed the total received in all of FY15, while applications for commercial systems have increased five-fold.

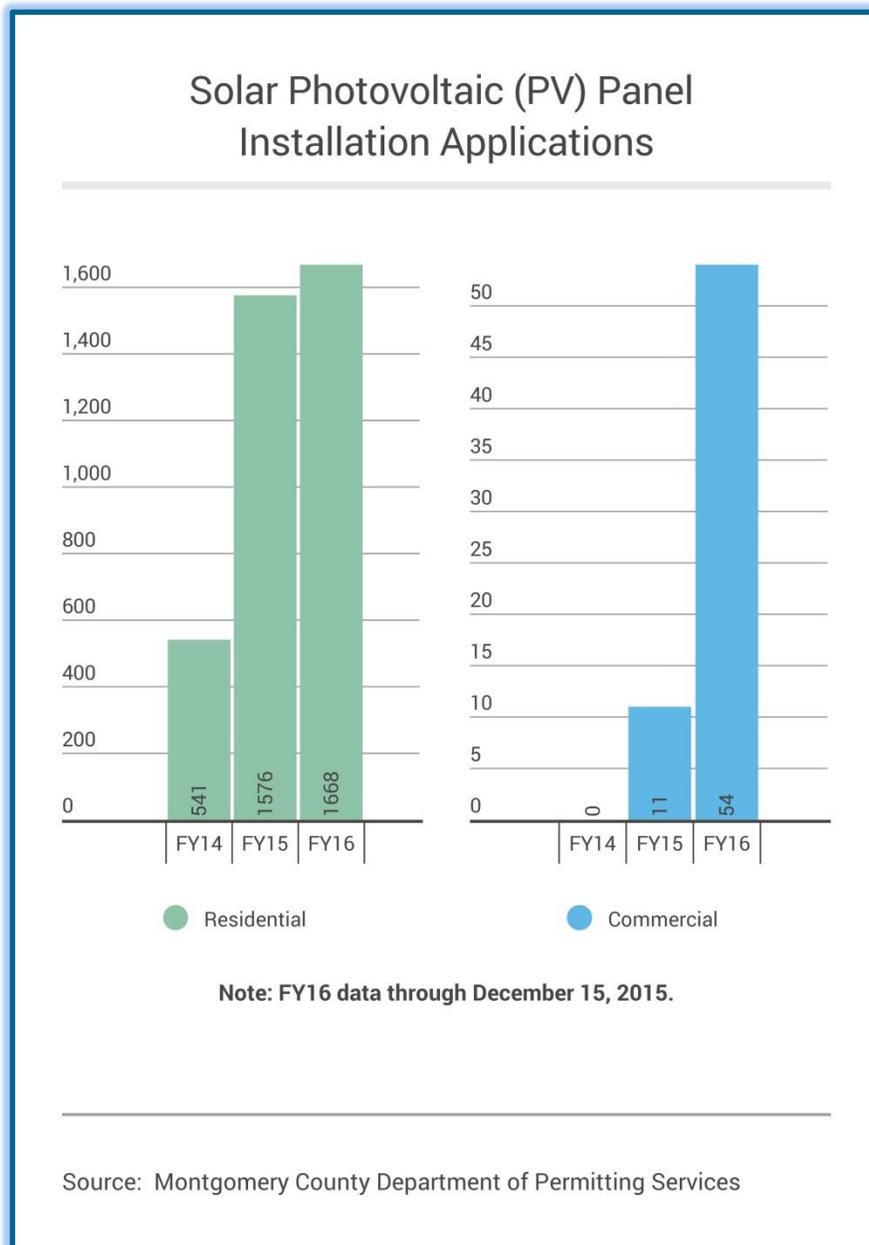
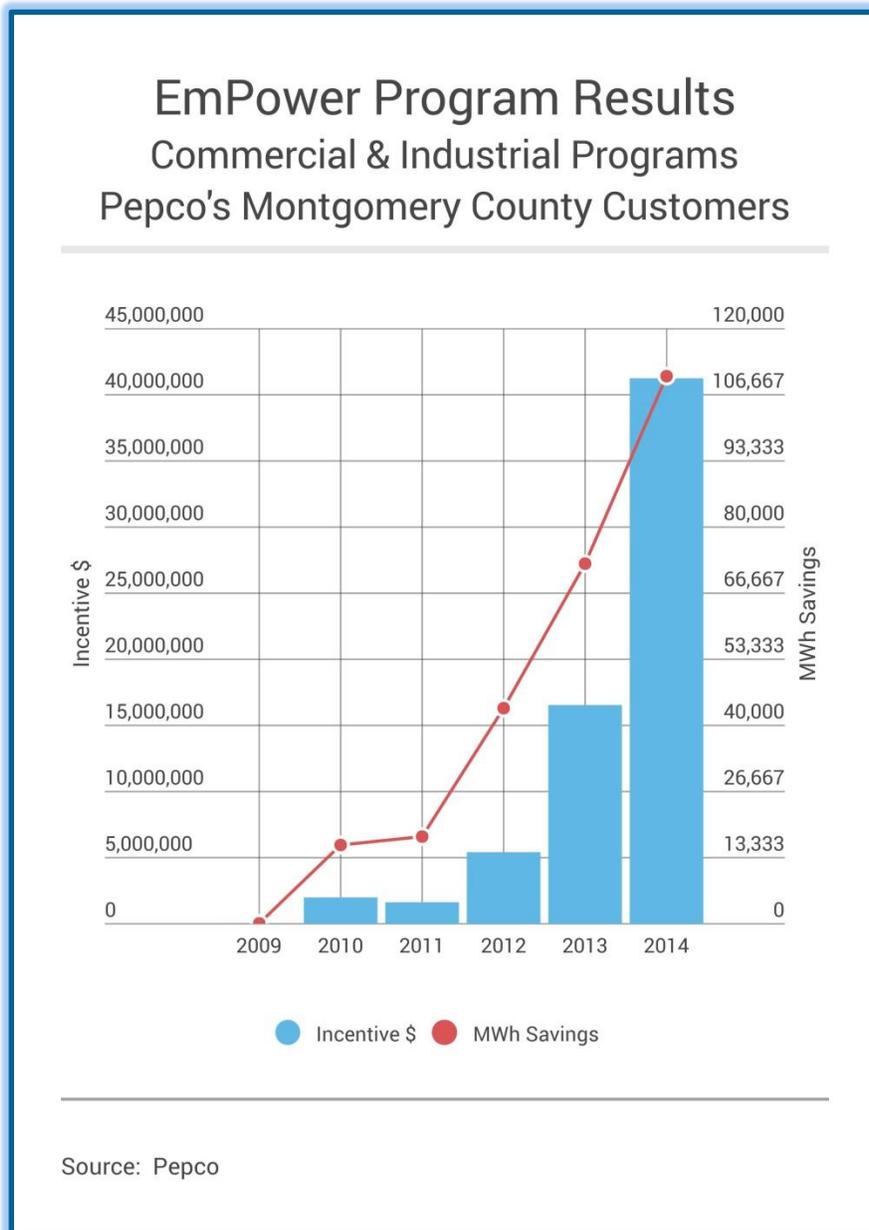


Figure 4-12

Pepco’s commercial and industrial customers in Montgomery County have utilized more than \$40 million of incentives, saving more than 106,000 MWh of electricity.



Transportation Choices

One hallmark of a sustainable community is a variety of transportation options. Montgomery County is served by an extensive public transportation network, including the Washington Metropolitan Transit Authority's Metrorail and Metrobus system, and the County's Ride On bus system. Current development patterns, and infrastructure installed by the private sector and the Department of Transportation, have enhanced the County's network of sidewalks, bike lanes, and pedestrian and bike paths.

Figure 4-13 illustrates the travel mode split of Montgomery County commuters. According to data from the U.S. Census Bureau, since 2005 the percentage of workers traveling by vehicle alone has dropped slightly from around 67% to around 64%. There have been equivalent increases in other modes, or in the number of individuals working at home.

According to the Maryland Motor Vehicle Administration, there were nearly 775,000 vehicles registered in Montgomery County in FY15, the largest number ever. On a per capita basis, however, the number of vehicle registrations has dropped in the last five years from roughly 0.77 vehicles per capita in 2010 to 0.74 vehicles per capita in 2014. With a total population of more than one million people, this translates to 30,000 fewer vehicles currently registered in the County as compared to the 2010 rate. As shown in **Figure 4-14** the County's per capita registration rate is similar to Prince George's County and less than other Maryland counties in the region. As shown in **Figure 4-14**, alternative vehicles make up just over 3% of the vehicles registered in Montgomery County, with the vast majority of these being gas/electric hybrid vehicles. Electric and electric hybrid vehicles are able to charge up at a growing number of publically available electric vehicle charging stations in the County.

The introduction of Capital Bikeshare into Montgomery County has increased opportunities for biking. There are 52 Bikeshare stations in the County, concentrated in Silver Spring/Takoma Park, Bethesda, and Rockville. These stations have a total capacity of 800 bikes. As shown in **Figure 4-16**, since the start of the program in the County, more than 91,000 trips have been taken, totaling more than 220,000 miles.

The Department of Transportation has an extensive capital improvement program to install new sidewalks, replace sidewalks that don't comply with the Americans with Disabilities Act (ADA), and connect the sidewalk network to bus stops. **Figure 4-17** shows the cumulative linear feet of sidewalk installed under this program in the last five years.

Figure 4-13

Since 2005 the percentage of workers traveling by vehicle alone has dropped slightly from around 67% to around 64%. There have been equivalent increases in other travel modes, or in the number of individuals working at home.

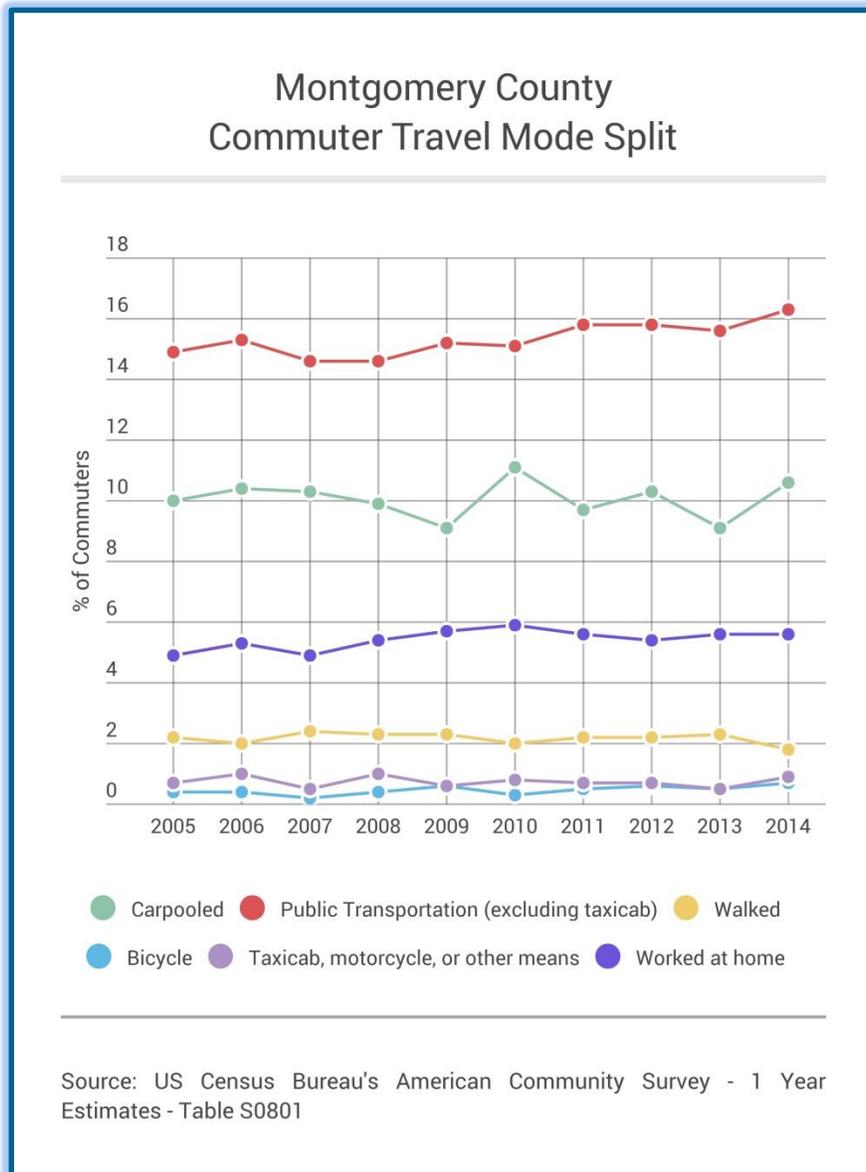


Figure 4-14

On a per capita basis, the number of vehicle registrations in Montgomery County has dropped in the last five years from roughly 0.77 vehicles per capita in 2010 to 0.74 vehicles per capita in 2014. With a total population of more than one million people, this translates to 30,000 fewer vehicles currently registered in the County as compared to the 2010 rate.

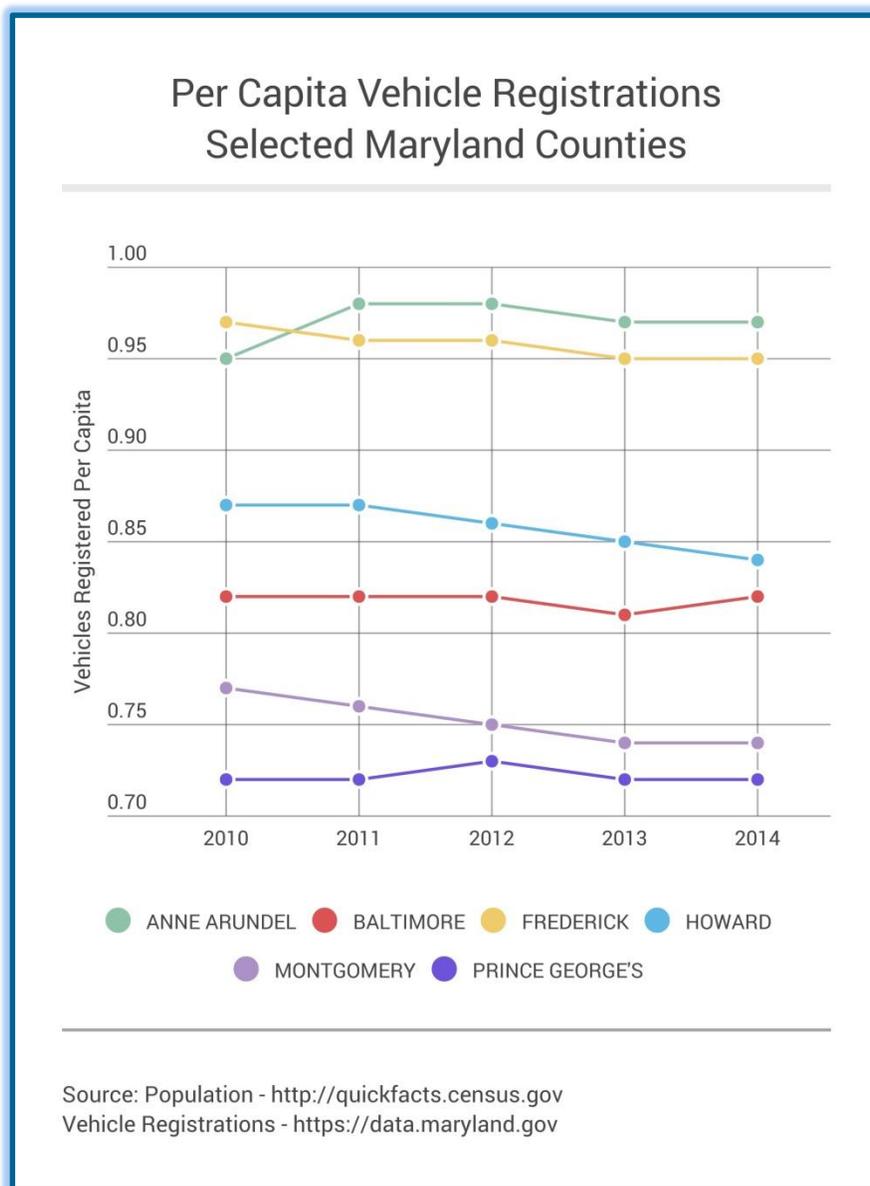


Figure 4-15

Alternative vehicles make up just over 3% of the vehicles registered in Montgomery County, with the vast majority of these being gas/electric hybrid vehicles. There are a growing number of publically available electric vehicle charging stations in the County.

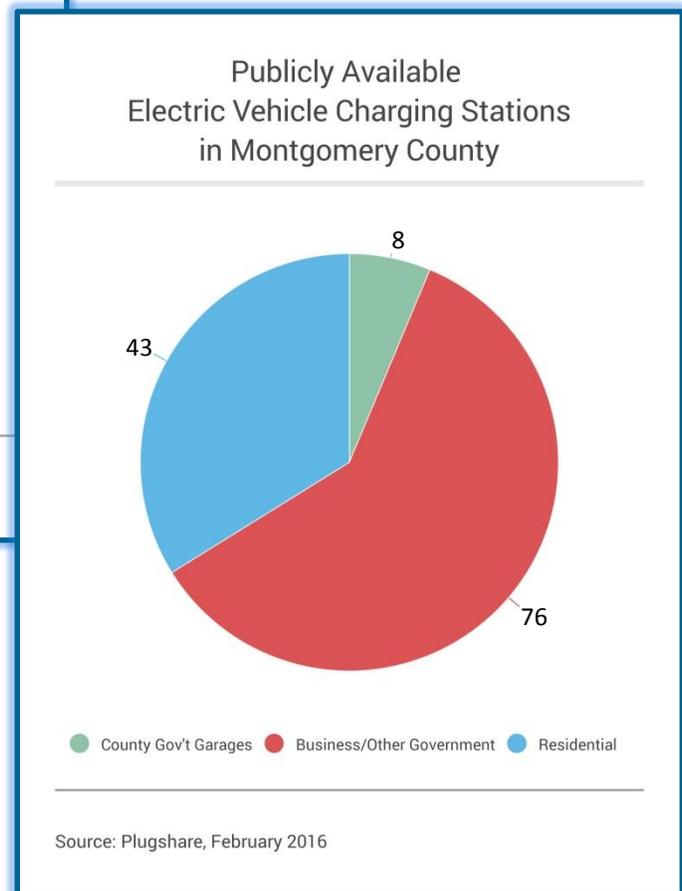
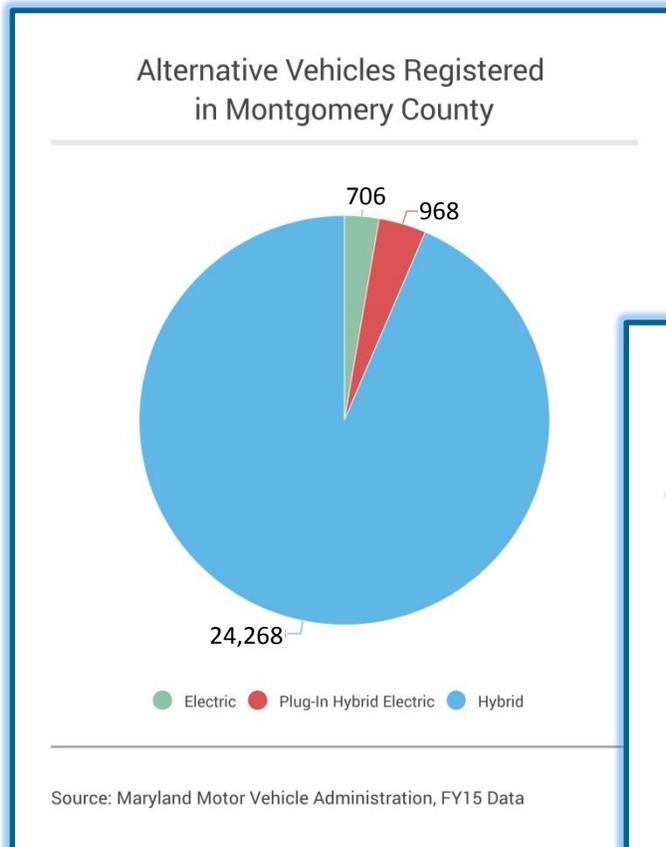


Figure 4-16

The introduction of Capital Bikeshare into Montgomery County has increased opportunities for biking. There are 52 bikeshare stations in the County, with a total capacity of 800 bikes. Since the start of the program in the County, more than 91,000 trips have been taken, totaling more than 220,000 miles.

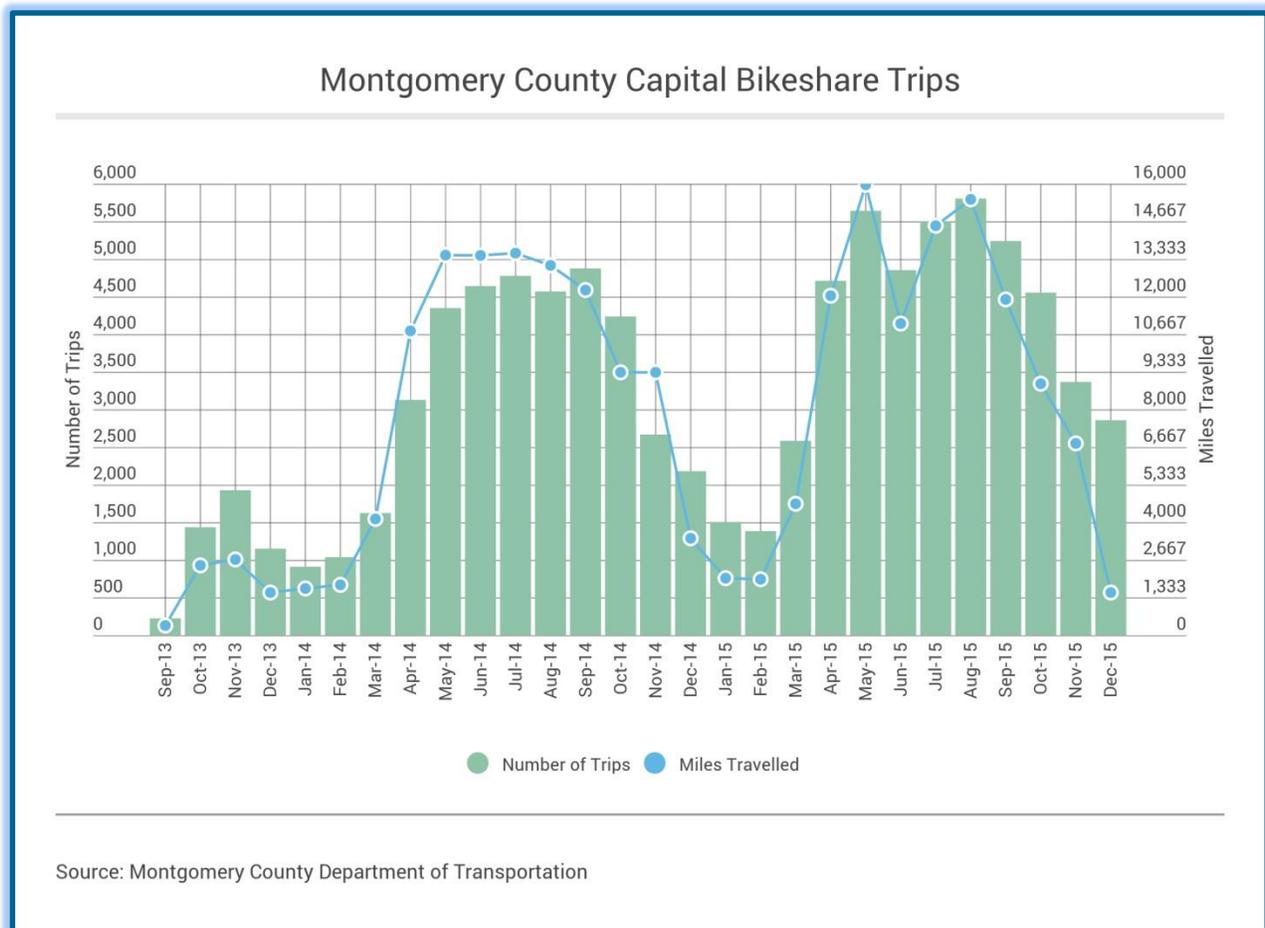
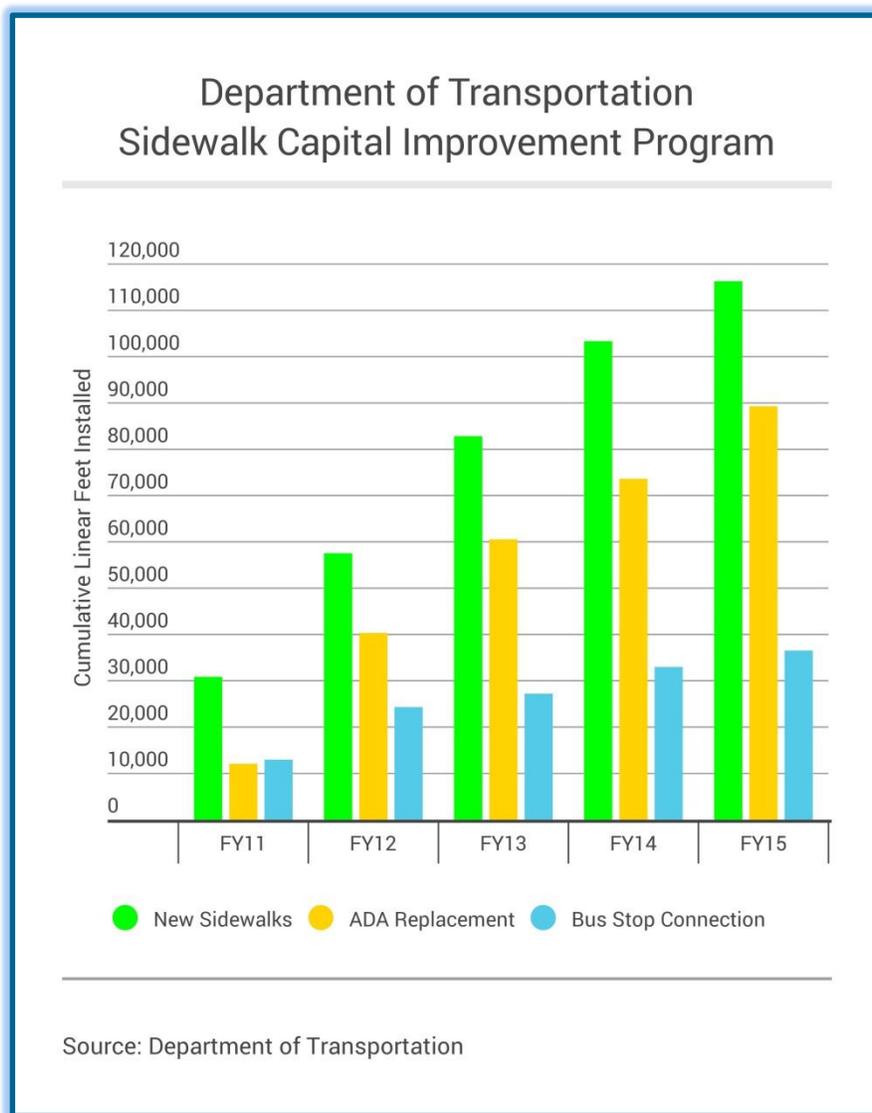


Figure 4-17

The Department of Transportation (DOT) has an extensive capital improvement program to install new sidewalks, replace sidewalks that don't comply with the Americans with Disabilities Act (ADA), and connect the sidewalk network to bus stops. In the last five years, DOT has installed or replaced more than 45 miles of sidewalk.



Other Sustainability Metrics

As described in detail in section about the Office of Sustainability, the County has a Green Business Certification Program to support and recognize businesses that incorporate sustainability into their operations. The program recognizes businesses certified by B Lab, DEP (under two different programs for offices and landscapers), Green America, the Green Restaurant Association, and Green Seal. **Figure 4-18** shows breakdown of businesses recognized under these programs, as well as the growth of the program since its inception in FY10.

An important component of a sustainable community is a robust solid waste management system that places an emphasis on reducing the volume of waste generated, recycling to the greatest extent possible, and minimizing the amount of waste disposed. Since the development of the materials recovery facility for mixed containers in the early 1990s, the County's recycling goal has steadily increased. In 2012, Montgomery County established a goal of recycling or diverting 70% of the material in the solid waste stream by the end of 2020. The County utilizes a methodology approved by the Maryland Department of the Environment (MDE) in accordance with the Maryland Recycling Act for determining the waste diversion rate. The waste diversion rate is the recycling rate plus a source reduction credit, which is earned based upon waste reduction efforts. Montgomery County typically earns the maximum source reduction credit of 5%. **Figure 4-19** shows the County's waste diversion rate over time. The figure for 2015 is a projection pending MDE review.

As noted in the Benchmarking Sustainability section, the Montgomery County Public Schools (MCPS), Washington Suburban Sanitary Commission (WSSC), and Montgomery College (MC) have taken a number of steps to address the sustainability of their operations. Each of entities tracks a variety of data documenting their efforts. **Figure 4-20** shows graphs MCPS includes in their annual Environmental Sustainability Management Plan related to GHG emissions and energy use. These graphs are updates of the data in the report which can be found at the "School Energy" link on the MCPS Department of Facilities homepage at <http://www.montgomeryschoolsmd.org/departments/facilities/>.

Similarly, WSSC and MC track energy use and GHG emissions. **Figure 4-21** illustrates how the incorporation of renewable energy has affected the carbon footprint of these entities.

Figure 4-18

The Green Business Certification Program recognizes businesses certified by B Lab, DEP (under two different programs for offices and landscapers), Green America, the Green Restaurant Association, and Green Seal. The program has grown to recognize 84 businesses as of the end of FY15.

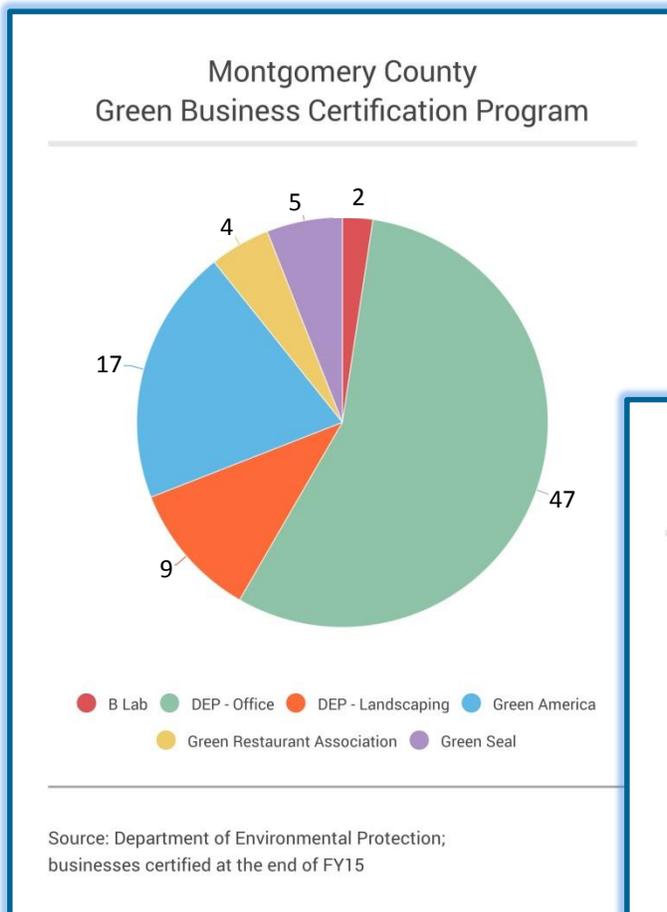


Figure 4-19

Montgomery County’s goal is to divert 70% of the material in the solid waste stream by the end of 2020. In accordance with the Maryland Recycling Act, the waste diversion rate is the recycling rate plus a source reduction credit, which is earned based upon waste reduction efforts. The figure for 2015 is a projection pending review by the Maryland Department of the Environment.

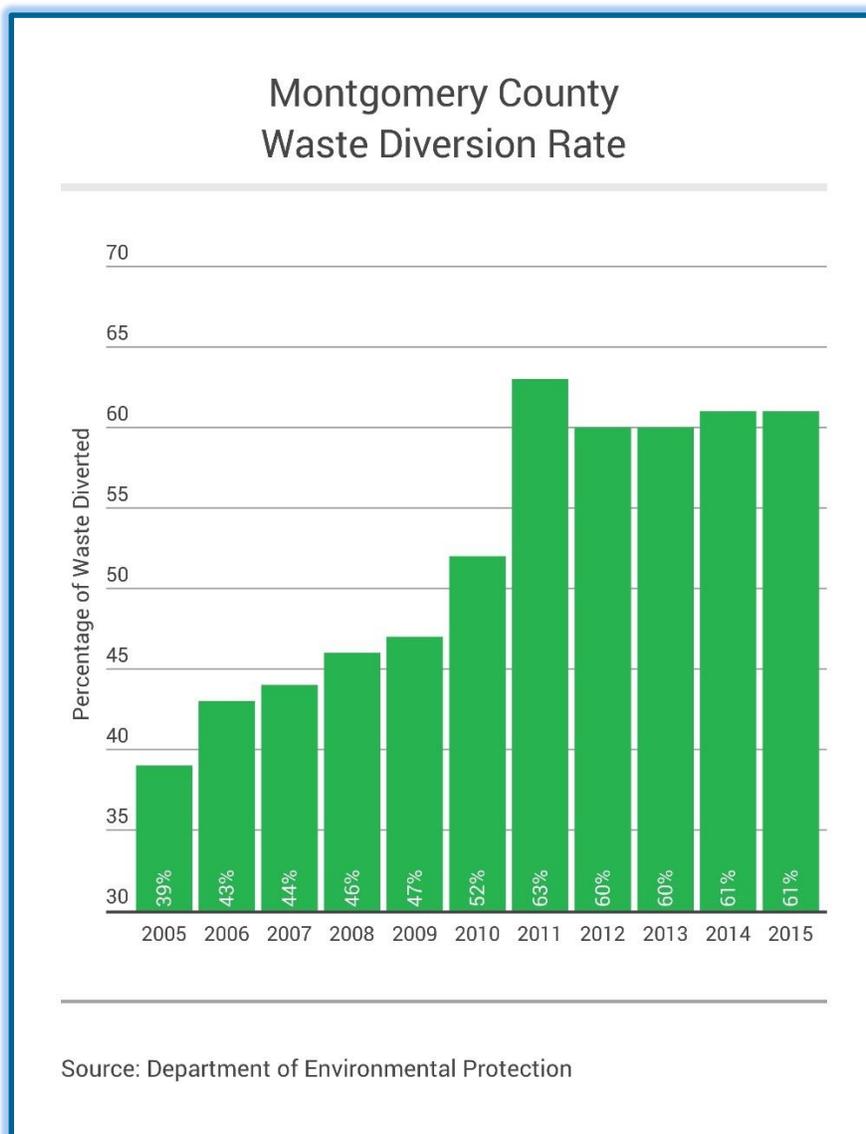


Figure 4-20

Montgomery County Public Schools (MCPS) extensively tracks GHG emissions and energy use. These figures are updates of charts included in MCPS’s Environmental Sustainability Management Plan, which can be found at the “School Energy” link on the MCPS Department of Facilities homepage at <http://www.montgomeryschoolsmd.org/departments/facilities/>.

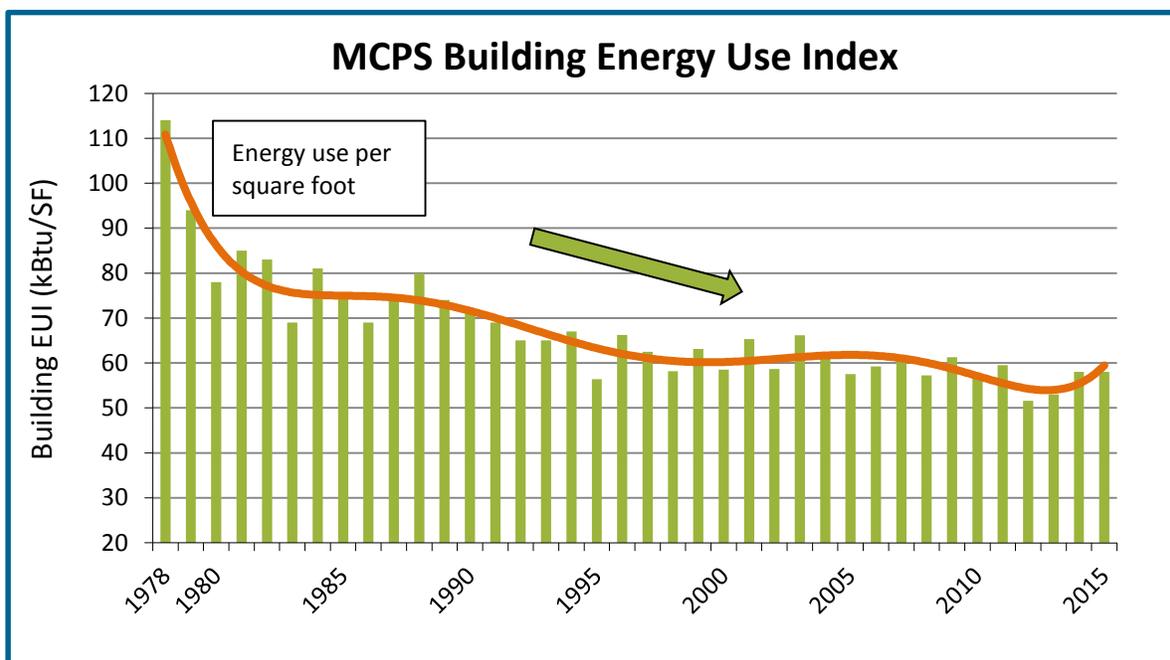
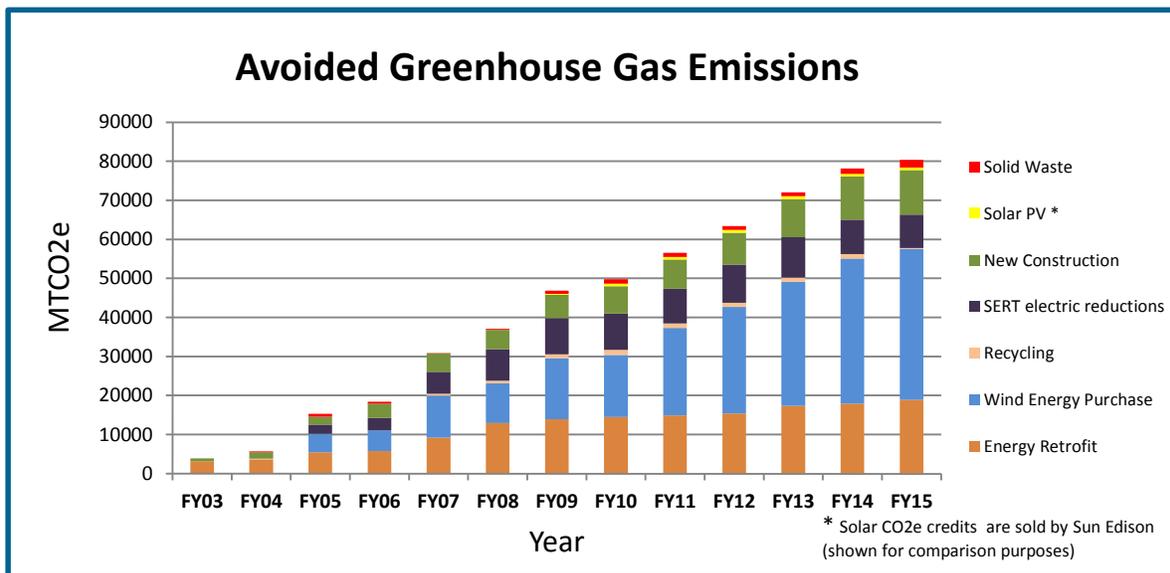


Figure 4-21

As part of their sustainability strategy, WSSC and Montgomery College both utilize renewable energy to meet their energy use and GHG emission reduction goals.

