T&E COMMITTEE #1
November 18, 2013

Discussion

MEMORANDUM

November 14, 2013

TO: Transportation, Infrastructure, Energy and Environment Committee

FROM: Keith Levchenko, Senior Legislative Analyst
Susan Farag, Legislative Analyst

SUBJECT: **Discussion:** Alternative Fuels

Committee Chair Berliner requested that the T&E Committee discuss the use of alternative fuels in Montgomery County in the context of the County Government fleet as well as by the public in general. The Committee is particularly interested in what steps the County can take to increase alternative fuel use in the short and long term and what the opportunities and challenges are in Montgomery County with regard to the various alternative fuels.

County Government and Agency Efforts

Council Staff suggests that the Committee first hear from its County representatives as to what County Government is currently doing (and planning to do) to increase its use of alternative fuels.

The following County Government representatives are expected to participate in the discussion:

- David Dise, Director, Department of General Services (DGS)
- Eric Coffman, Chief, Energy and Sustainability, DGS
- Bill Griffiths, Chief, Division of Fleet Management Services, DGS
- Richard Jackson, Chief, Facilities Management, DGS
- Dan Locke, Chief, Solid Waste Services, Department of Environmental Protection (DEP)
- Robin Ennis, Collections Section Chief, Solid Waste Services, DEP

DGS staff will provide a short presentation (see ©A-G) on its green fleet initiative. The Committee was last briefed by DGS on this issue on June 21, 2012, so this presentation can get the Committee up to date on these efforts. DGS also provided some additional information regarding its fleet and infrastructure (see ©26-32).

Solid Waste Services staff can summarize some of their efforts (see ©1-5), including working with the County's contracted haulers for trash and recycling over the past several years to transition all of their collection trucks to compressed natural gas (CNG) vehicles. Solid Waste also has its own small fleet of vehicles which utilize biodiesel at some of its solid waste facilities.

Representatives from MCPS and Montgomery Parks will also be available to answer questions regarding their efforts to green their fleets:

- Angel Garcia-Ablanque, Assistant Director of Transportation, MCPS
- Phil McGaughey, Director of Procurement, MCPS
- John Nissel, Deputy Director of Operations, M-NCPPC Montgomery Parks
- Wayne Sonnenberg, Fleet Manager, M-NCPPC Montgomery Parks

Information recently provided by both of these agencies is attached on ©6-7.

Also, Joan Rohlfs, Environmental Resources Program Director, Metropolitan Washington Council of Governments, has been invited to provide a summary of efforts in the region to increase the use of alternative fuels.

Alternative Fuel Discussion

In addition to the County Government staff noted earlier, Council Staff has invited other experts to participate in the discussion to speak to the opportunities and challenges of the major alternative fuels.

- Doug Durante, Executive Director, Clean Fuels Development Coalition (ethanol)
- Michael Krauthamer, Director, Mid-Atlantic Region, NRG, eVgo (electric vehicles)

Information provided by Mr. Durante is attached on ©8-14. Mr. Krauthamer has provided information attached on ©33-50.

Note: Council Staff had sought out experts/advocates on CNG and biodiesel, but as of the date of this memorandum, no participants had been confirmed for the meeting.

Alternative Fuel Considerations

Reducing the need and demand for petroleum based fuels in the transportation sector provides a number of benefits, including: energy diversification, domestic energy security, and a reduction in environmental impact.

All of the major alternative fuels have advantages and disadvantages, and determining the best alternative fuel for a particular use may vary based on a number of complicating factors, including:

- Feasibility and performance by type of vehicle and use: An alternative fuel that may work well for one type of vehicle may be impractical for another type of vehicle.
- Lifecycle cost: (taking into account fuel and maintenance costs over the life of the vehicle)

- Tailpipe emissions
- Environmental footprint
- Infrastructure requirements (and costs)
- Evolving technology

Council Staff has attached some information available from the Department of Energy Alternative Fuels Data Center on ethanol, natural gas, biodiesel, and electricity (see ©15-25).

Of particular interest to the T&E Committee are the tailpipe emissions and environmental aspects of particular alternative fuels. However, even isolating just for these factors can be complicated.

Biofuels (such as ethanol and biodiesel) derived from agricultural feedstocks involve a complex environmental analysis of land-use impacts, transportation costs, and other related impacts. However, biodiesel from waste vegetable oil avoids many of these broader impacts, as would ethanol made from other materials (such as switchgrass, wood chips, and agricultural waste).

While 100% electric vehicles are commonly called "zero" emission vehicles, this is a misnomer in that while there are no tailpipe emissions, an electric vehicle's environmental impact includes the emissions associated with the electricity generated for the vehicle (most likely generated by coal powered plants in the mid-Atlantic region today). However, this profile will change as the country's energy grid increases its use of clean energy such as wind and solar.

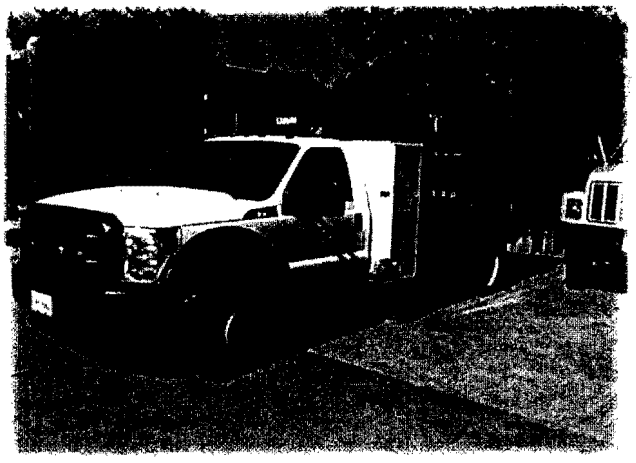
The comparative environmental calculation also keeps changing as certain fuels and technology evolve over time. For instance, low sulfur diesel fuel and clean diesel technologies have substantially reduced tailpipe emissions from diesel vehicles.

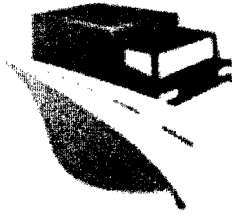
It would be helpful to hear from the meeting participants as to what the major considerations are that Montgomery County should focus on in order to increase the use of one or more alternative fuels in the short and long term. For instance, what infrastructure improvements (such as refueling facilities) and legislative or other actions (either in Montgomery County or the State) would be beneficial to increasing alternative fuel use in the County?

Attachments

KML:f:\levchenko\dep\energy issues\clean energy\t&e discussion 11 18 2013 alternative fuels discussion.doc

Montgomery County
Fleet Management Services

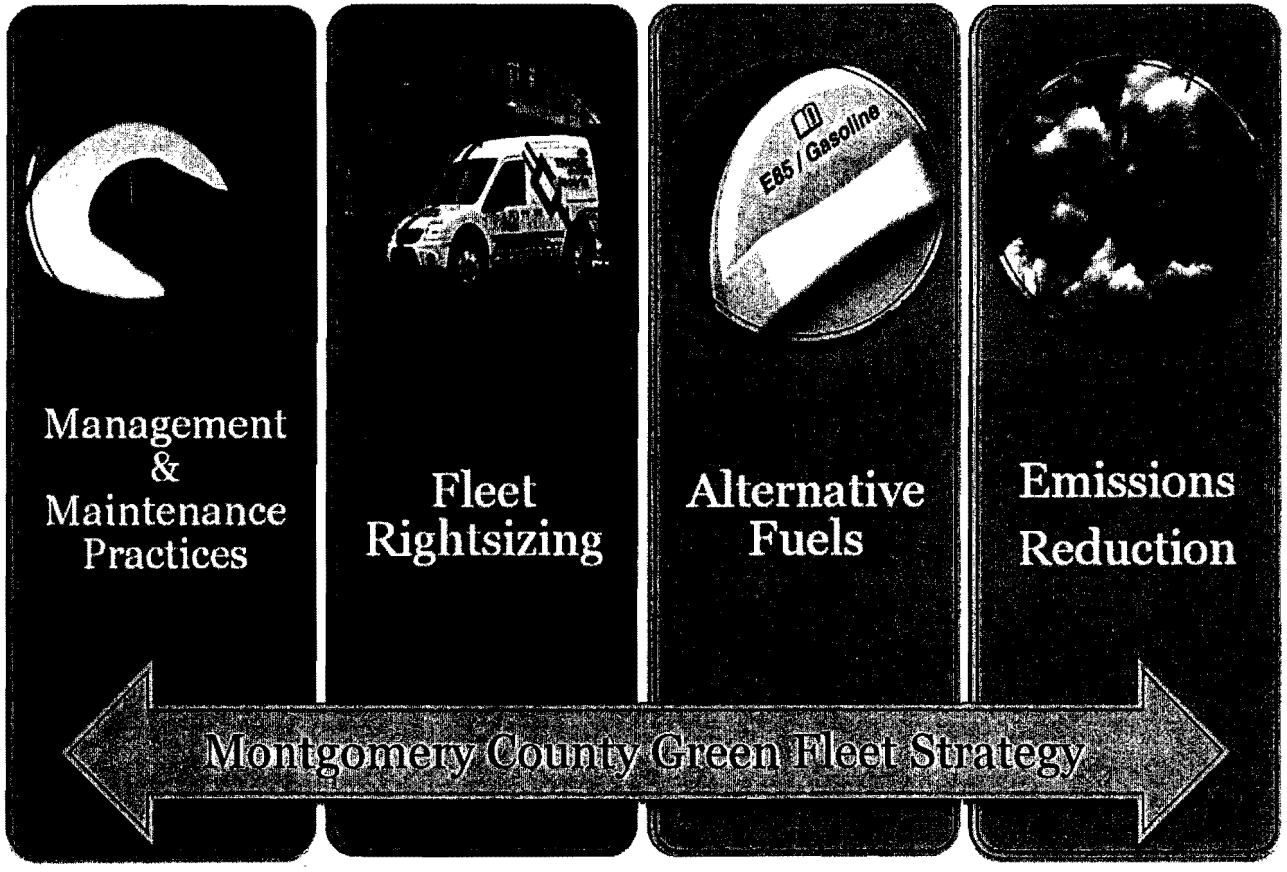




DRIVE GREEN

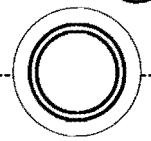
(A)

FMS Green Fleet Strategy



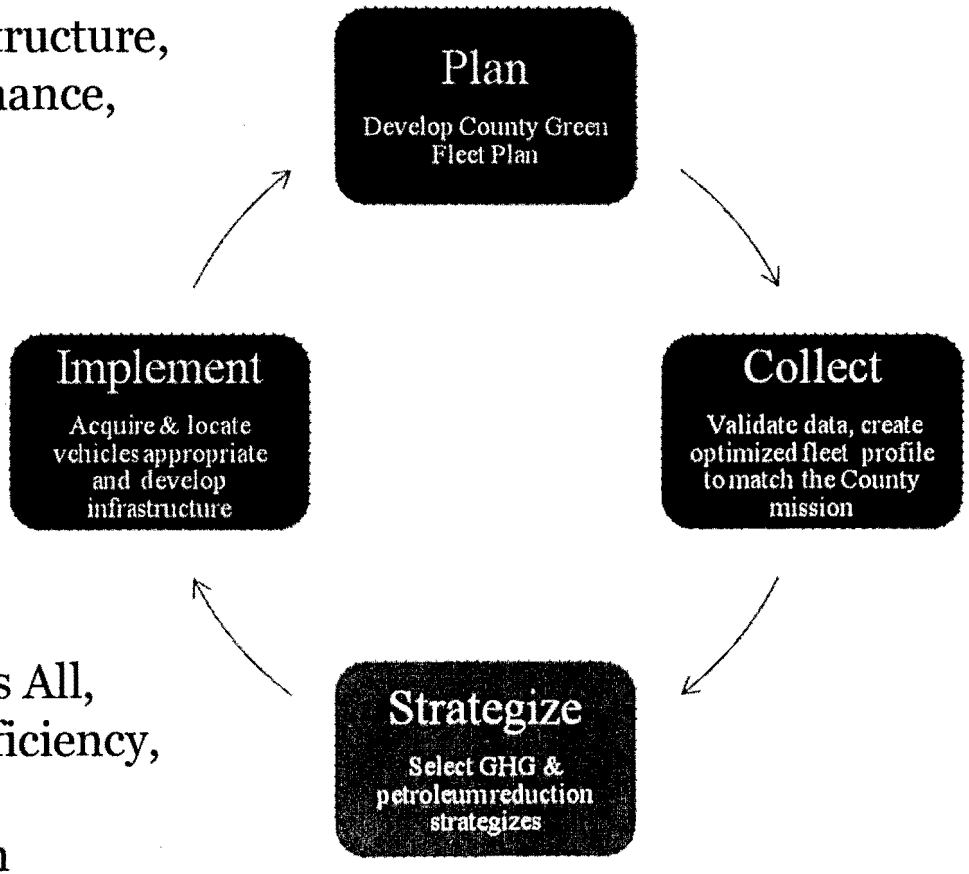
Building a Greener, Cleaner, more Sustainable Fleet

FMS- Getting to Green



Implement
- Installing Infrastructure,
- Monitor Performance,
- Refine

Plan
- Reduce,
- Replace,
- Eliminate,
- Partnership,
- Centralization



Strategize
- Fuel Neutral,
- Not One Size Fits All,
- Increase Fuel Efficiency,
- Reduce Idling,
- Driver Education

Collect
- Optimize,
- Utilization,
- Flexibility,
- Match Mission

Draft –"Drive Green" Objectives

- Petroleum Reduction
  - Reduce on-road petroleum consumption by 20% within 5 years of FY13 Baseline.
- Emission Reduction
  - Reduce Fleet Greenhouse Gas (GHG) Emissions by 2% annually below the amount in the FY13 base year, achieving a 30% reduction through 2030.
  - Increase the use of low carbon alternative fuels by 2% annually.
  - County departments that operates vehicles and mobile equipment are subject to this policy.
    - Decrease total fuel consumption,
    - Strive for a minimum annual two percent reduction of greenhouse gas (GHG) emissions measured against a baseline year of 2013.

Draft –"Drive Green" Objectives

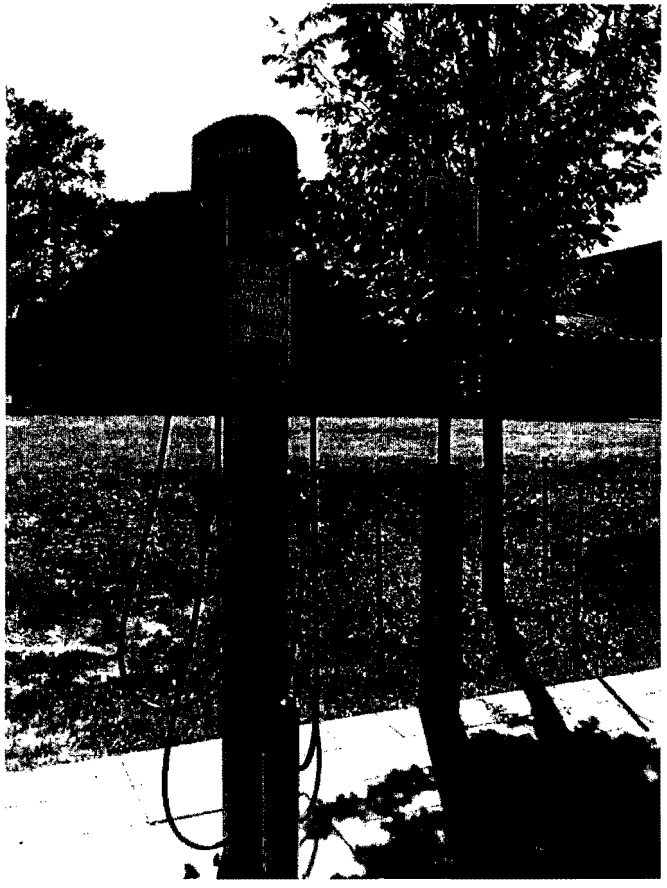
- Increase Fuel Efficiency
  - Make every effort to obtain the most fuel efficient, low- emitting, commercially available fleet vehicles and equipment as measured by;
    - EPA;
    - Emission certification standards;
    - Published by manufactures.
- Optimized County Fleet
  - Create a fleet profile by FY14. This profile will serve as the baseline for initiatives established in this policy and will be updated annually.
  - Conduct a full review of fleet vehicles & equipment annually to ensure all County owned or leased vehicles are being utilized within established standards.
  - Make every effort to consolidate County vehicles and create centrally shared & accessible fleet pools.

Draft "Drive Green"- FY14 Highlights

- EV Infrastructure & Vehicles
  - Install 10 Level 2 Charging Stations across the County
    - Each station capable of charging 2 vehicles.
  - Deploy 5 Electric Vehicles
- Expand CNG Infrastructure
  - Open new Public Use Fueling site in 2014
- Collaboration & Resource Sharing
  - Kick-off County wide Fleet Working Group – MCPS, MNCPPC, WSSC
- Telematics
  - Complete pilot –Demonstrate savings

DRIVE GREEN

Charging Station Examples



DEP Collection Fleet Goals

- Require all new vehicles, including sups and subs
- All vehicles must meet 2010 EPA air quality/ emission standards
- All collection vehicles will be powered with compressed natural gas (CNG)
- Supervisors' vehicles hybrid or CNG

DEP Implementing CNG Goals

- Contractors hired through competitive procurement process (RFP)
- Contract Term = 7 yrs. + 2 renewals
- First RFP issued March '09
- Pre-Proposal Meeting Held
  - engine, fuel, truck vendors participated
- First 20 trucks (2 areas) rolled April '10
- 48 more trucks (5 areas) November '10
- Entire fleet of 125 CNG trucks by June '12

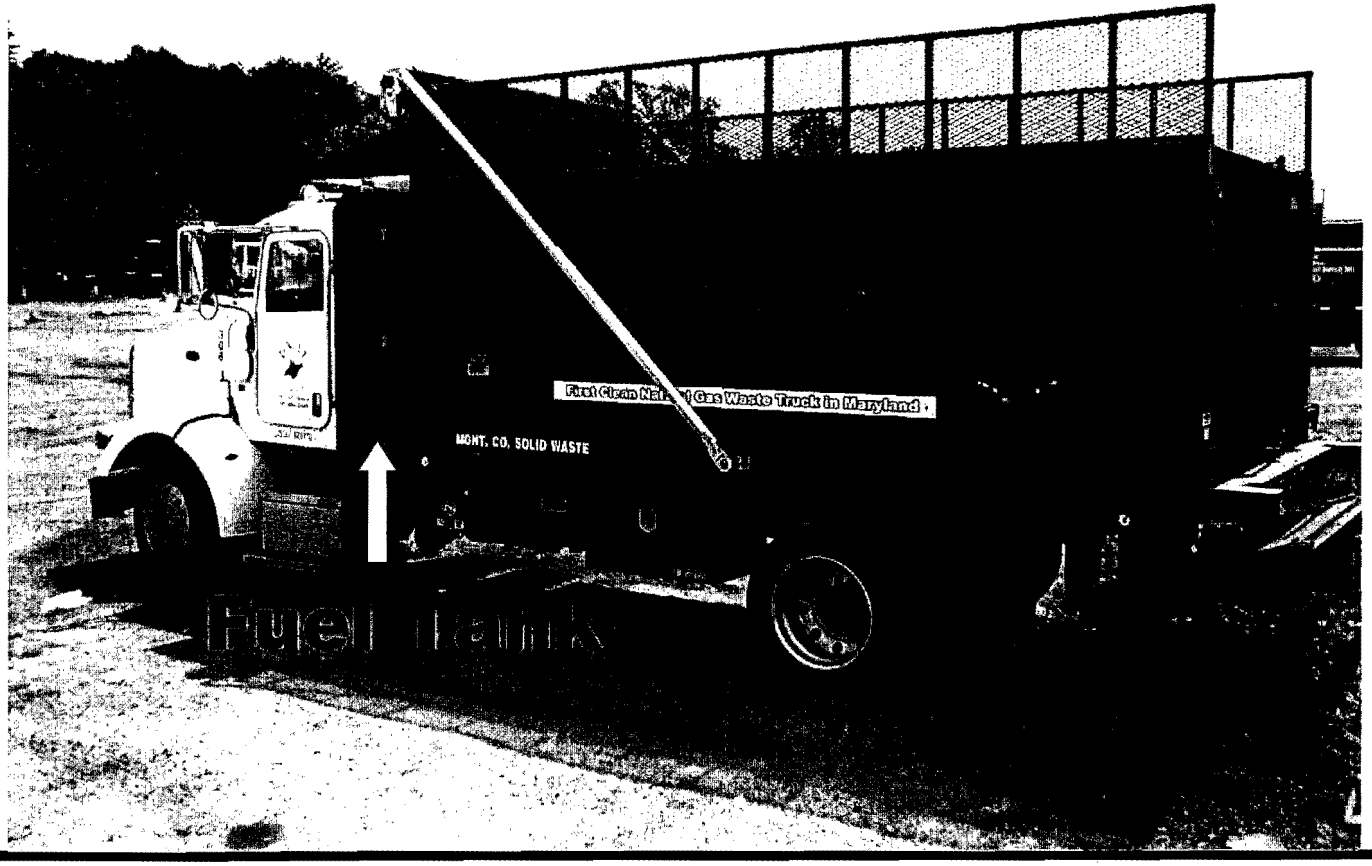
(N)

DEP's New CNG Powered Refuse Truck

(W)

DEP's New CNG Powered Recycling Truck

DEP's New CNG Powered Scrap Metal Truck



Montgomery County Public Schools Fleet Information

- Because Maryland law requires replacement of buses after 12 years, approximately one-twelfth of the fleet is replaced each year, with approximately 106 buses reaching maximum age each year.

- Last year, MCPS noted that depending on the type (regular education, special education, wheelchair lift equipped) of bus, the average replacement cost for an MCPS bus was approximately $115,000, which was up about 20% in recent years due to the new federal emissions standards. The cost of hybrid and alternative fuel school buses is currently prohibitive, especially given the relatively short 12 year cost recovery period.

- MCPS buses are 100% low-sulfur diesel. MCPS tried B5 biodiesel for a while but went back to straight low-sulfur diesel because of its lower cost.

- New federal emissions standards were put in place in both 2007 and 2010. The 2007 standards required all new buses to be equipped with a Diesel particulate filter (DPF). Additional standards enacted in 2010 regulated tailpipe emissions. Buses MCPS has purchased since that time have utilized selective catalytic reduction (SCR) technology to attain these stringent emission standards.

- There are not many school buses anywhere running on anything but diesel. A few districts across the nation are trying CNG and LP, but the results are mixed.

- In Maryland, 100% of the buses are diesel, and only one small county that we know of is using biodiesel at a B5 level. Several other counties are like MCPS in that they tried biodiesel but went back to straight low-sulfur diesel for cost or other reasons. There are a few small Eastern Shore counties from whom MCPS does not have data on what type diesel they are using.

- In terms of cars and light trucks, MCPS has purchased (since 2006):
    - 21 flex fuel vehicles (5 of these are also partial zero emission vehicles (PZEVs)
    - 16 hybrid vehicles

M-NCPPC Fleet Information

Fleet size: 548 on road vehicles

2618 pieces of equipment

3166 total fleet size

Fuel used: 125,774 gallons of B-5 Bio-Diesel dispensed last year (100% B-5 bio-diesel)

242,547 gallons of E10 Gasoline dispensed last year

Hybrids: 1 Toyota Prius

5 Ford Fusions

12 Honda Civics

16 Ford Escapes

2014 Vehicle Bid Contains:

"Our Budget will determine how many of the vehicles below will be purchased"

2014 Ford Fusion Hybrid or equal

2014 Ford Focus EV or equal

2014 Chevrolet Volt or equal

2014 Chevrolet Spark EV or equal

Fuel Site Replacements: Since 2009 we have been systematically replacing our aging fuel dispensing
Infrastructure with updated Fuel-Master computer systems new dispensers and above ground tanks.

We have upgraded 5 sites by removing the underground storage tanks, installing above ground storage and adding the Fuel-Master Fuel Computer System. We have also upgraded two additional sites by installing the Fuel-Master computer system and new dispensers to the existing tanks. We have 5 sites left to upgrade to the Fuel-Master computer with new dispensers. These sites will be upgraded as funding is made available. These upgrades allow us to accurately track our fuel use and protect our environment by storing our fuel above ground. The Fuel-Master system also enables us to maintain a secure fueling site.

The old saying of *"a picture is worth a thousand words"* is spot-on, judging from the mainstream media coverage of this issue.

CNN Health

AIR POLLUTION MAY INCREASE STROKE, HEART ATTACK RISK

THE WALL STREET JOURNAL.

November 8, 2011 — Source: THE WALL STREET JOURNAL

The Hidden Toll of Traffic Jams

Scientists Increasingly Link Vehicle Exhaust With Brain-Cell Damage, Higher Rates of Autism.

By ROBERT LEE HOTZ

Los Angeles Times

December 18, 2010

Proximity to Freeways Increase Autism Risk, Study Finds

REUTERS

Tue Nov 15, 2011 — Source: Reuters

NIGHTMARE ROADS IDENTIFIED IN CONGESTION STUDY

ScienceDaily

Ultrafine Particles in Air Pollution May Heighten Allergic Inflammation in Asthma

July 6, 2010 — Source: Science Daily

Air Pollution's Effect on Asthma

October 6, 2010

TIME

Health & Family

Mom's Exposure to Air Pollution Can Increase Kids' Behavior Problems

By Alice Park

CBSNEWS.com

Harmful New Air Pollutant Found

August 14, 2006

By Cynthia Dickson

8

CFDC CLEAN FUELS DEVELOPMENT COALITION

Montgomery County Council
Committee on Transportation, Infrastructure, Energy & Environment
November 18, 2013

Good morning. My name is Douglas Durante and I am the Executive Director of the Clean Fuels Development Coalition based here in the county with our offices in Bethesda, Maryland. I appreciate the invitation by Chairman Berliner and the Committee to join you today to discuss transportation fuels and specifically ethanol as an option the county should seriously embrace in its efforts to reduce petroleum consumption, costs, and improve air quality.

By way of background, the Clean Fuels Development Coalition is a non-profit 501(C6) organization that has been directly involved in alternative fuel programs for the past 30 years. We are incorporated in Maryland and work closely with a number of local interests including the Maryland Grain Producers Utilization Board and Mid Atlantic Petroleum Properties LLC (MAPP) which is the owner of the W-Express stations that offer the E85 fuel option. I personally served on the negotiating committee for the Mobile Source Provisions of the Clean Air Act Amendments in 1990 that continue to regulate fuels and emissions in most urban areas in the country. We work with ethanol producers, automobile manufacturers, technology developers, building and construction companies, agricultural organizations, and many other government and non-government groups.

As a life-long resident of the county I am very aware of the leadership position we have historically taken on matters of clean energy and transportation. That has been a high priority of Mr. Berliner and he recognizes that it improves our health, our quality of life, and our pocketbooks. However, there is a great deal more that can be done for the county to assume a leadership role that will in turn drive positive policies at the state level which further in turn will be recognized nationally. I want to commend the Council for its role in the Maryland Smart Energy Communities Program and it is my understanding you have adopted the Transportation Petroleum Reduction Policy that is designed to reduce petroleum consumption by 20% within 5 years. Based on what you are doing here today and the opportunities at hand I believe this is a readily attainable goal.

From an air quality standpoint replacing petroleum-based transportation fuels with alternatives is imperative. The use of petroleum-based fuels carries a great cost to us all in not just financial terms but as it impacts our nation's energy and national security, its debilitating effect on our economy, and perhaps most importantly our health. While our organization focuses heavily on biofuels like ethanol, all alternative fuels have an important role to play and all can contribute to what should be our overarching objective, which is reducing petroleum use. Each of the

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alternative fuels has strengths, weaknesses, and ideal applications and our organization encourages aggressive pursuit of all of these fuels. For ethanol, however, it offers unique and specific qualifications that the county truly should embrace.

Background. Before I get to specifics, however, on how we might get more ethanol into the system and used by the county, I want to remind the committee of some important facts. There are 211 operating ethanol plants in 29 states in the U.S. producing nearly 13.5 billion gallons of fuel with additional capacity or under construction for another 50 million gallons. The increase of ethanol production in the U.S. has been nothing short of phenomenal with billions of gallons being added each year to the point where it now represents 10% of the fuel consumed in the U.S. Obviously this results in 10% less petroleum product being used with a great deal of the much ballyhooed reduction in imports being the result. The overwhelming majority of ethanol is currently produced from corn, but new and emerging technologies that use a variety of waste products, non-feed related agricultural crops, and other specialty feedstocks are being developed.

To the extent that there are concerns with the use of agricultural products, like corn, to produce ethanol there is a staggering misunderstanding of some of the most basic facts related to ethanol production. An average ethanol facility today uses 26,000 Btus of thermal energy to produce a gallon of ethanol, while producing 77,000 Btus of energy contained in the gallon. The average ethanol facility uses less water than an average golf course and almost all plants built over the past decade had to purchase water rights or demonstrate no negative impact on water availability before permits were issued. The energy efficiency is coupled with water use efficiency and most new plants use 50% less water than they did just 10 years ago. Some of the most erroneous reports and greatest areas of misunderstanding relating to ethanol from corn is the fact that feed corn is converted to ethanol where the starch is removed, converted to sugars, and then into alcohol. The remaining product is all protein and returned to the feed chain. A variety of other products are extracted from the corn processing with more than half of the product being returned to the food chain in terms of nutrient value.

Despite the incredible increase in ethanol production, corn demand for feed production, feed exports, reserves, and other uses have all been met while still allowing for the value added production of ethanol. So rather than reports that the ethanol industry consumes roughly 40% of the U.S. corn crop, returning half of that to animal feed makes the accurate number less than 20%. It is important to note that all of this has been done with modest increases in food prices to consumers, but conversely has helped consumers by significantly reducing fuel costs through the replacement of gasoline with much lower priced ethanol. The price of grain itself has spiked several times over the last several years, but that is due to increased global demand and speculators driving the price as they do with many commodities. Corn is now at its lowest point in the last 7 years and while it creates a value added market for farmers, including many Montgomery County farmers, it has leveled off.

The final point to consider is that this increased demand from the fuel sector has driven tremendous advances in agriculture technology that has resulted in significant improvements in terms of the yield per acre. With the same amount of land and a modest increase in water and fertilizer, we are seeing 30% increases in yield with projections as high as 100% in the future. These improvements, ranging from seed development to our ability to provide food to the U.S. and worldwide, are all a result of the simple fact that we have created a new demand sector that keeps us in pursuit of farming efficiencies.

Air Quality/Health Issues. The motivation to use any alternative fuel varies. In some cases states and municipalities will use the fuel to support local or in-state businesses. Others may do it strictly on a cost basis if alternative fuels offer a better value than traditional fuels. Any cost benefit analysis must take into consideration the cost of the vehicle, refueling infrastructure costs, and other factors. Still others may adopt alternative fuels for environmental reasons.

One of the unique aspects of ethanol is that it is easily and immediately mixed with gasoline to improve fuel quality and emissions. Ten percent ethanol blends are used by the petroleum industry to provide octane and do so for what we like to term as "clean octane". Chemically ethanol is an oxygenate and promotes more complete fuel combustion. Ethanol has and continues to be used successfully in carbon monoxide control programs throughout the U.S. Combined with constantly improving engine technology and emissions, oxygenated fuels via ethanol have effectively eliminated carbon monoxide from automobiles as a major health threat. Carbon monoxide continues to be a precursor to ozone formation which is commonly referred to as smog. Therefore, it continues to play an important role as a gasoline additive.

What we are discussing here today is more along the lines of an alternative fuel which is simply defined as those fuels which can replace petroleum in bulk. Ethanol is somewhat limited in its ability to be blended in conventional fuels and used in conventional vehicles to 15% by volume. However, flex fuel vehicles can use any level of ethanol up to 85%. Federal law defines E85 as an alternative fuel equal to natural gas, electricity, and other such fuels. When used as E85, ethanol offers significant CO_2 reductions. They will vary depending on the source of the ethanol itself, but corn ethanol when used as E85 is deemed by the Department of Energy to result in 20% CO_2 reductions and if produced from feedstocks with no or low energy inputs like municipal, agricultural, or forestry wastes can result in carbon reductions of 100% or more. As noted earlier with the new technologies coming online, the lower carbon intensity ethanol will continue to enter the market.

From a health standpoint this high octane fuel would be replacing conventional gasoline where the octane is derived from compounds that are among the worst constituents of the oil barrel. The refiners synthesize these compounds under an umbrella category of air toxics and they include benzene (which is a known carcinogen), toluene, and xylene. Emissions from these compounds can be many times smaller than the width of a human hair. These ultra-fine particulates (UFPs) persist in the air longer and are much smaller than the current measurements regulated by the federal government. Particulate matter historically has been classified as PM10 or PM2.5 and has been associated with emissions from coal plants and diesel fuel. Aromatic hydrocarbons, which are the grouping for these air toxics, make up approximately 20-30% of standard motor fuels. When combusted these compounds produce a host of hazardous air pollutants, including what appear to be lethal fine and ultra-fine particulates. These UFPs are not filtered out by lungs and enter the blood stream creating a direct path to human body. There is growing concern that particulates this small present an inherent problem to young children at the development stage. Air pollution in general is linked to everything from asthma to cancer to growing concerns about autism. Consequently, any effort whatsoever to reduce petroleum consumption by replacing the most dangerous components of gasoline with the most benign is very positive.

One interesting thing to keep in mind is the fact that the recently passed Federal Fuel Economy Standards which call for stringent new mileage requirements and carbon reductions potentially

feed into this problem. Auto industry reports indicate they may be able to meet these new reductions and greenhouse gas emissions while achieving high mileage, but in order to do so they will require small bore, high compression engines. The catch to these vehicles is that they require premium fuels. These premium fuels could be octane as high as 94-97 which as noted is derived from the most toxic compounds that petroleum has to offer. Aromatics, under the family of air toxics, will increase and we may achieve one public policy goal of increased mileage while fanning the flames of another one which is endangering the public health.

Recommendations. From an ethanol standpoint there is a growing list of public refueling stations that county vehicles could conceivably use assuming you have a system in place for county employees to be reimbursed. In many other states where E85 use is quite popular and enforced and encouraged, county or other state/city employees are issued a credit card for refueling. It is my understanding the county refueling facility in Rockville between Gude Drive and Shady Grove Road will continue to offer E85 and it is open to the public along with two other county facilities. This is a good start and is commendable since it encourages the use of this fuel. Flex fuel vehicles can take advantage of the fact that there are now nearly a dozen public stations they can use, including a station that just opened last week in Cabin John Shopping Center in Potomac. Any county vehicle operating from the far reaches of the county towards Frederick to the other side close to the District line could now continually refuel on E85.

One of the challenges we have in the private sector is getting the many owners of these vehicles to realize they have this capability. This problem would seem to exist as well with county employees. My recommendation would be to put some type of sticker on the car itself where the driver is constantly reminded that this is an alternative fuel vehicle and can run on any combination of ethanol up to 85%. We have a private sector link at www.goE85.com but the county could provide this information to both its citizens and its employees by having a simple link on the county website. Encouraging all your employees or perhaps enforcing a requirement in some manner will require them getting used to finding these stations and using this "new" fuel. Again, for both county residents and employees constant reminders such as email blasts, inclusions in newsletters or other forms of communications, signage, and traditional mailings are all helpful.

The key local distributor for ethanol E85 in the area is Mid Atlantic Petroleum Partners LLC. They have indicated an interest in a direct supply of E85 to the county vehicles which could be done in some creative ways. Tanker trucks typically hold in the range of 29,000 gallons. MAPP has indicated they would consider an arrangement where they bring the fuel to the site where county vehicles might typically refuel or return in the evenings.

In short Mr. Chairman, where there is a will there is a way and if the county wants to stay on course to meet its goals under the Maryland Smart Energy Communities Program and reduce petroleum consumption by 20%, E85 ethanol can play an important role. I would like to leave you with these thoughts:

- Increasing awareness among county employees and residents is critical.
- The county has numerous communication mechanisms at its disposal to increase that awareness, such as mailings, websites, signage, and other outlets and means of getting information out.

- Ethanol is likely to continue to be competitively priced in the future as supplies are increasing and the E85 market is developing.

- Most major automobile manufacturers offer flex fuel capable vehicles and in particular Chrysler, Ford, and General Motors have made a major commitment over the past decade which has resulted in them offering the majority of these vehicles.

- County fleet purchases should consider FFVs given the flexibility they offer.

Thank you again for the invitation to address the Committee and on behalf of our organization, the Maryland Grain Producers Utilization Board, and other partners in the effort to provide cleaner renewable fuels in Maryland we thank you.

Maryland

Potomac Sunoco
11355 Seven Locks Road
Potomac, MD 20854
301-299-2090.

Fox Chapel Sunoco
19235 Frederick Road
Germantown, MD 20876
301-540-6547

North Potomac Sunoco
10010 Darnestown Rd
Rockville, MD 20850

Washingtonian W Express
10003 Fields Rd
Gaithersburg, MD 20878

Gaithersburg W Express
100 N Frederick Ave
Gaithersburg, MD 20877

Towncenter W Express
12301 Middlebrook Rd
Germantown, MD 20874

Germantown W Express
20510 Frederick Rd
Germantown, MD 20876

Bethesda W Express
5143 River Rd
Bethesda, MD 20816

Georgetown Sunoco
2450 Wisconsin Ave NW
Washington, DC 20007

Takoma Park W Express
6400 New Hampshire Ave
Takoma Park, MD 20912

Fredericktowne W Express
1395 W Patrick St
Frederick, MD 21702

Citgo
2042 West St
Annapolis, MD 21401
410-571-9676

Navy Exchange - Annapolis
321 Kinkaid Rd
Annapolis, MD 21402
Note: Must have military ID to enter Military Facility
410-757-0005

Shell
811 Bestgate Rd
Annapolis, MD 21401
410-266-3892

Virginia

Schmitz Sunoco Goose Creek
42800 Creek View Plaza
Ashburn, VA 20147
703-724-4422

Washington, DC

Georgetown Sunoco
2450 Wisconsin Ave NW
Washington, DC 20007
202-337-6277

U.S. Department of Energy - Energy Efficiency and Renewable Energy
Alternative Fuels Data Center

Ethanol Benefits and Considerations

Ethanol is a renewable, domestically produced transportation fuel. Whether used in low-level blends, such as E10 (10% ethanol, 90% gasoline), or in E85 (a gasoline-ethanol blend containing 51% to 83% ethanol, depending on geography and season), ethanol helps reduce imported oil and greenhouse gas emissions. Like any alternative fuel, there are some considerations to take into account when contemplating the use of ethanol.

Energy Security

In 2012, the United States imported about 40% of the petroleum it consumed, and transportation was responsible for nearly three-quarters of total U.S. petroleum consumption. Depending heavily on foreign petroleum supplies puts the United States at risk for trade deficits, supply disruption, and price changes. The Renewable Fuels Association's 2013 Ethanol Industry Outlook calculated that, from 2005 through 2012, ethanol increased from 1% to 10% of gasoline supply.

Fuel Economy and Performance

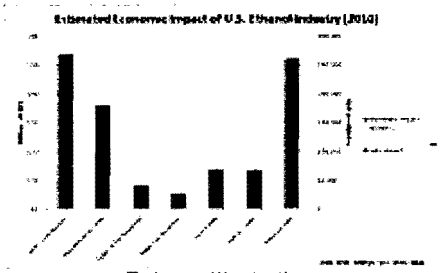
A gallon of ethanol contains less energy than a gallon of gasoline. The result is lower fuel economy than a gallon of gasoline. The amount of energy difference varies depending on the blend. For example, E85 has about 27% less energy per gallon than gasoline (mileage penalty lessens as ethanol content decreases). However, because ethanol is a high-octane fuel, it offers increased vehicle power and performance.

To learn more about fuel economy, GHG scores, and EPA smog scores for flexible fuel vehicles (FFVs), visit FuelEconomy.gov, or see the Clean Cities 2013 Vehicle Buyer's Guide .

Job Opportunities

Ethanol production creates jobs in rural areas where employment opportunities are needed. According to the Renewable Fuels Association, ethanol production in 2012 added more than 365,000 jobs across the country, $40.6 billion to the gross domestic product, and $28.9 billion in household income. (See Estimated Economic Impact of the U.S. Ethanol Industry and Number and Production Capacity of Farmer- and Non-Farmer Owned Ethanol Plants .)

Estimated Economic Impact of the U.S. Ethanol Industry



Enlarge illustration

Source: Renewable Fuels Association (Graph Data)

Lower Emissions

The carbon dioxide released when ethanol is burned is balanced by the carbon dioxide captured when the crops are grown to make ethanol. This differs from petroleum, which is made from plants that grew millions of years ago. On a life cycle analysis basis, corn-based ethanol production and use reduces greenhouse gas emissions (GHGs) by up to 52% compared to gasoline production and use. Cellulosic ethanol use could reduce GHGs by as much as 86%.

Equipment and Availability

More than 95% of the gasoline sold in the United States contains low levels of ethanol. Low-level blends require no special fueling equipment, and they can be used in any conventional gasoline vehicle.

The equipment used to store and dispense ethanol blends above E10 is the same equipment used for gasoline with modifications to some materials. All equipment used in the handling, storing, and dispensing of these blends must be designed specifically for such use. See the Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends for detailed information on compatible equipment.

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FFVs (which can operate on E85, gasoline, or any blend of the two) are available nationwide as standard equipment with no incremental costs, making them an affordable alternative fuel vehicle option. However, because most U.S. ethanol plants are concentrated in the Midwest, fueling stations offering E85 are predominately located in that region. Find E85 fueling stations in your area.

The AFDC is a resource of the U.S. Department of Energy's Clean Cities program.

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Content Last Updated: 10/24/2013

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U.S. Department of Energy - Energy Efficiency and Renewable Energy
Alternative Fuels Data Center

Natural Gas Benefits and Considerations

Compressed and liquefied natural gas are clean, domestically produced alternative fuels. Using these fuels in natural gas vehicles increases energy security and can lower emissions. Using renewable natural gas provides even more benefits. Like any alternative fuel, there are some considerations to take into account when contemplating the use of CNG or LNG.

Energy Security

In 2011, the United States imported about 45% of the petroleum it consumed, and transportation accounted for more than 70% of total U.S. petroleum consumption. With much of the world's petroleum reserves located in politically volatile countries, the United States is vulnerable to supply disruptions. However, because U.S. natural gas reserves are abundant, this alternative fuel can be domestically produced and used to offset the petroleum currently being imported for transportation use.

Vehicle Performance

Natural gas vehicles (NGVs) are similar to gasoline or diesel vehicles with regard to power, acceleration, and cruising speed. The driving range of NGVs is generally less than that of comparable gasoline and diesel vehicles because, with natural gas, less overall energy content can be stored in the same size tank as the more energy-dense gasoline or diesel fuels. Extra natural gas storage tanks or the use of LNG can help increase range for larger vehicles.

In heavy-duty vehicles, dual-fuel, compression-ignited engines are slightly more fuel-efficient than spark-ignited dedicated natural gas engines. However, a dual-fuel engine increases the complexity of the fuel-storage system by requiring storage of both types of fuel.

Lower Emissions

Compared with vehicles fueled by conventional diesel and gasoline, natural gas vehicles can produce lower levels of some emissions. And because CNG fuel systems are completely sealed, CNG vehicles produce no evaporative emissions.

Infrastructure and Vehicle Availability

A wide variety of new, heavy-duty natural gas vehicles are available from U.S. original equipment manufacturers (OEM). For options, see the Heavy-Duty Vehicle and Engine Search. The number of light-duty natural gas vehicles from original equipment manufacturers are limited but growing. For availability see the Light-Duty Vehicle Search or Clean Cities 2013 Vehicle Buyer's Guide .

Fleets and consumers also have the option of economically and reliably converting existing gasoline or diesel vehicles for natural gas operation using qualified system retrofitters. It is critical that all vehicle and engine conversions meet the emissions and safety regulations and standards instituted by the U.S. Environmental Protection Agency, the National Highway Traffic Safety Administration, and state agencies like the California Air Resources Board.

Although the United States has an extensive natural distribution system in place, vehicle fueling infrastructure is limited. Therefore, fleets may need to install their own natural gas infrastructure, which can be costly. Finding partners who will commit to use the infrastructure can improve the payback period.

The AFDC is a resource of the U.S. Department of Energy's Clean Cities program.

Biodiesel Basics

Biodiesel is a domestically produced, renewable fuel that can be manufactured from new and used vegetable oils, animal fats, and recycled restaurant grease. Biodiesel's physical properties are similar to those of petroleum diesel, but it is a cleaner-burning alternative. Using biodiesel in place of petroleum diesel significantly reduces emissions of toxic air pollutants.

Biodiesel works well in many applications, such as this B20 transit bus at the University of Colorado at Boulder. *Photo by Pat Corkery, NREL/PIX 18103*

What is a biodiesel blend?

Biodiesel can be blended and used in many different concentrations, including B100 (pure biodiesel), B20 (20% biodiesel, 80% petroleum diesel), B5 (5% biodiesel, 95% petroleum diesel), and B2 (2% biodiesel, 98% petroleum diesel). B20 is a common biodiesel blend in the United States.

Can I use B20 in my vehicle's diesel engine?

For vehicles manufactured after 1993, biodiesel can be used in diesel engines and fuel injection equipment with little impact on operating performance. But if your vehicle is older than that, the engine could be assembled with incompatible elastomers, which can break down with repetitive high-blend biodiesel use.

Most original equipment manufacturers (OEMs) approve blends up to B5 in their vehicles. Some approve blends up to B20, and one manufacturer even approves B100 for use in certain types of its farm equipment. However, some OEMs don't recommend using biodiesel blends above B5 in on-highway vehicles manufactured in model year 2007 and later. In these vehicles, high levels of fuel may accumulate in the engine lubricant under certain conditions. It's not known whether those high levels of biodiesel might affect lubricant performance.

Check your OEM's website or speak with a dealer to determine which biodiesel blend is right for your vehicle. You can also find general and manufacturer-specific information on the National Biodiesel Board website *(www.biodiesel.org)*.

How can I find biodiesel?

Biodiesel is available in all 50 states. According to the U.S. Energy Information Administration, annual consumption of biodiesel in the United States totaled 316 million gallons in 2009.[1] As of June 2009, the country had an annual production capacity of more than 2.69 billion gallons.[2] According to the Alternative Fuels and Advanced Vehicles Data Center (AFDC) website, there are more than 600 B20 fueling sites across the country. To look up biodiesel stations in your area, use the Alternative Fueling Station Locator at *www.afdc.energy.gov/stations*.

Will biodiesel perform as well as diesel?

Engines operating on B20 exhibit similar fuel consumption, horsepower, and torque to engines running on conventional diesel. And biodiesel has a higher cetane number (a measure of the ignition value of diesel fuel) and higher lubricity (the ability to lubricate fuel pumps and fuel injectors) than U.S. diesel fuel. B20's energy content is between those of No. 1 and No. 2 diesel.

Will biodiesel perform well in cold weather?

The cold-flow properties of biodiesel blends vary depending on the amount of biodiesel in the blend. The smaller the percentage of biodiesel in the blend, the better it performs in cold temperatures. Regular No. 2 diesel and B5 perform about the same in cold weather. Both biodiesel and No. 2 diesel have some compounds that crystallize in very cold temperatures. In winter weather, manufacturers combat crystallization in No. 2 diesel by adding flow improvers. For best cold weather performance, drivers should use B20 made with No. 2 diesel manufactured for cold weather.

Clean Cities
U.S. Department of Energy

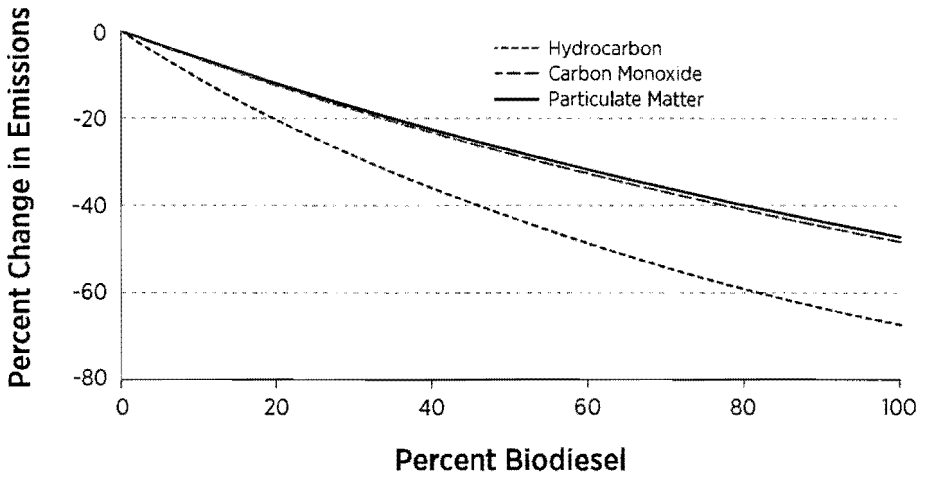
1. U.S. Energy Information Administration Monthly Energy Review, Table 10.4 (www.eia.doe.gov/emeu/mer/renew.html)
2. National Biodiesel Board (www.biodiesel.org/pdf_files/fuelfactsheets/Production_Capacity.pdf)

For more information about cold-flow properties and biodiesel handling, download the Biodiesel Handling and Use Guide from *www.nrel.gov/vehicles andfuels/npbf/pdfs/43672.pdf.*

Will biodiesel plug my vehicle filters?

Biodiesel has a solvent effect. It cleans your vehicle's fuel system and could release deposits accumulated from previous diesel fuel use. The release of deposits may initially clog filters, so you should be proactive in checking for and replacing clogged fuel filters. Once the build-up is eliminated, return to your regular replacement schedule. This issue is less common with B20 and lower-level blends.

Figure 1. Average Emission Impacts of Biodiesel for Heavy-Duty Highway Engines



Environmental Protection Agency. Draft Technical Report, *A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions*, EPA420-P-02-001, 2002.

Will long-term biodiesel use affect my engine?

Studies of B20 and lower-level blends in approved engines have not demonstrated negative long-term effects. Higher-level blends (above B20) can impact fuel system components (primarily fuel hoses and fuel pump seals) that contain elastomer compounds incompatible with biodiesel. The effects are lessened as the biodiesel blend level decreases. For more information, visit *www.biodiesel.org.*

Does biodiesel need to meet any standards?

Biodiesel used in blends should meet specification D6751, a quality standard set by ASTM International. Biodiesel that meets this standard is legally registered as a fuel blendstock or additive with the U.S. Environmental Protection Agency. Biodiesel blends containing 5% or less biodiesel are required to meet the same fuel-quality specifications as conventional diesel fuel, according to ASTM D975. Biodiesel blends containing 6% to 20% biodiesel must meet the requirements of ASTM D7467.

Is biodiesel cleaner-burning than diesel?

The use of biodiesel in conventional diesel engines substantially reduces emissions of pollutants that impact air quality, including unburned hydrocarbons (HCs), carbon monoxide (CO), sulfates, polycyclic aromatic HCs, nitrated polycyclic aromatic HCs, and particulate matter (PM). B100 provides the greatest emissions reductions, but lower-level blends also provide benefits. B20 has been shown to reduce PM emissions by 10%, CO by 11%, and unburned HCs by 21% (see Figure 1). Studies of oxides of nitrogen emissions have provided contradictory results, and additional testing and analysis is ongoing.

Biodiesel use also reduces greenhouse gas emissions. The carbon dioxide released in biodiesel combustion is offset by the carbon dioxide sequestered while growing the feedstock from which biodiesel is produced. B100 use reduces carbon dioxide emissions by more than 75% compared to petroleum diesel. Using B20 reduces carbon dioxide emissions by 15%.

Can I use vegetable oil in my diesel engine?

Straight vegetable oil is not a legal motor fuel and doesn't meet biodiesel fuel specifications or quality standards. For more information, download the fact sheet, "Straight Vegetable Oil as a Diesel Fuel," from the AFDC website at *www.afdc.energy.gov/afdc/pdfs/47414.pdf.*

Where can I read more?

For more information on biodiesel, including production, distribution, and fueling station locations, visit the biodiesel section of the AFDC at *www.afdc.energy.gov/afdc/fuels/biodiesel.html.*

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

Clean Cities Technical Response Service
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Alternative Fuels Data Center

Biodiesel Benefits and Considerations

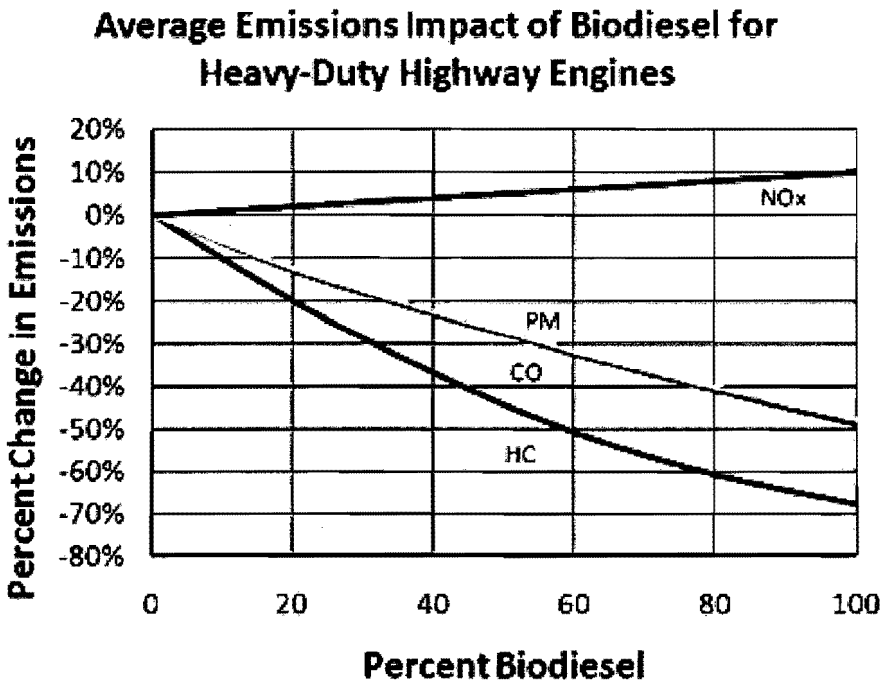
Biodiesel is a domestically produced, clean-burning, renewable substitute for petroleum diesel. Using biodiesel as a vehicle fuel increases energy security, improves public health and the environment, and provides safety benefits.

Energy Security and Balance

The United States imports about half of its petroleum, two-thirds of which is used to fuel vehicles in the form of gasoline and diesel. Depending heavily on foreign petroleum supplies puts the United States at risk for trade deficits, supply disruption, and price changes. Biodiesel can be produced in the U.S. and used in conventional diesel engines, directly substituting for or extending supplies of traditional petroleum diesel.

Air Quality

Compared with using petroleum diesel, using biodiesel in a conventional petroleum diesel engine substantially reduces tailpipe emissions of unburned hydrocarbons (HC), carbon monoxide (CO), sulfates, polycyclic aromatic hydrocarbons, nitrated polycyclic aromatic hydrocarbons, and particulate matter (PM). The reductions increase as the amount of biodiesel blended into diesel fuel increasesfor engines manufactured before 2010. Engines manufactured in 2010 and later have to meet the same emissions standards, whether running on biodiesel, diesel, or even natural gas. Selective catalytic reduction (SCR) technology, which reduces nitrogen oxide (NOx) emissions to near zero levels, makes this possible. For these new technology engines, the emissions from diesel fuel are comparable to those from biodiesel and are very, very low. These new technology engines are some of the cleanest engines on the road. B100 provides the best emission reductions, but lower-level blends also provide benefits. B20 has been shown to reduce PM emissions 10%, CO 11%, and unburned HC 21% (see graph) in older engines Learn more about Biodiesel Emissions.



Source: EPA 2002

Using biodiesel reduces greenhouse gas emissions because carbon dioxide released from biodiesel combustion is offset by the carbon dioxide sequestered while growing the soybeans or other feedstock. B100 use reduces carbon dioxide emissions by more than 75% compared with petroleum diesel. Using B20 reduces carbon dioxide emissions by 15%.

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Greenhouse gas and air-quality benefits of biodiesel are roughly commensurate with the blend. B20 use provides about 20% of the benefit of B100 use. B100 use could increase nitrogen oxides emissions, although it greatly reduces other emissions.

Engine Operation

Biodiesel improves fuel lubricity and raises the cetane number of the fuel. Diesel engines depend on the lubricity of the fuel to keep moving parts from wearing prematurely. One unintended side effect of the federal regulations, which have gradually reduced allowable fuel sulfur to only 15 ppm and lowered aromatics content, has been to reduce the lubricity of petroleum diesel. To address this, the ASTM D975 diesel fuel specification was modified to add a lubricity requirement (a maximum wear scar diameter on the high-frequency reciprocating rig [HFRR] test of 520 microns). Biodiesel can increase lubricity to diesel fuels at blend levels as low as 1%.

Before using biodiesel, be sure to check your engine warranty to ensure that higher-level blends of this alternative fuel don't void or affect it. High-level biodiesel blends can also have a solvency effect in engines that previously used petroleum diesel.

Safety

Biodiesel is nontoxic. It causes far less damage than petroleum diesel if spilled or released to the environment. It is safer than petroleum diesel because it is less combustible. The flashpoint for biodiesel is higher than 130°C, compared with about 52°C for petroleum diesel. Biodiesel is safe to handle, store, and transport.

The AFDC is a resource of the U.S. Department of Energy's Clean Cities program.

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U.S. Department of Energy - Energy Efficiency and Renewable Energy
Alternative Fuels Data Center

Benefits and Considerations of Electricity as a Vehicle Fuel

Hybrid and plug-in electric vehicles can help increase energy security, improve fuel economy, lower fuel costs, and reduce emissions.

Energy Security

In 2012, the United States imported about 40% of the petroleum it consumed, and transportation was responsible for nearly three-quarters of total U.S. petroleum consumption. With much of the world's petroleum reserves located in politically volatile countries, the United States is vulnerable to price spikes and supply disruptions.

Using hybrid and plug-in electric vehicles instead of conventional vehicles can help reduce U.S. reliance on imported petroleum and increase energy security. Hybrid electric vehicles (HEVs) typically use less fuel than similar conventional vehicles, because they employ electric-drive technologies to boost efficiency. Plug-in hybrid electric vehicles (PHEVs) and all-electric vehicles (EVs) are both capable of using off-board sources of electricity, and almost all U.S. electricity is produced from domestic coal, nuclear energy, natural gas, and renewable resources.

Fuel Economy

HEVs typically achieve better fuel economy and have lower fuel costs than similar conventional vehicles. For example, the 2012 Honda Civic Hybrid has an EPA combined city-and-highway fuel economy estimate of 44 miles per gallon, while the estimate for the conventional 2012 Civic (four cylinder, automatic) is 32 miles per gallon. However, some HEV models employ hybrid technology to boost power rather than efficiency and consequently do not have substantial fuel economy advantages over similar conventional vehicles. Use the Find A Car tool on FuelEconomy.gov to compare fuel economy ratings of individual hybrid and conventional models.

PHEVs and EVs can reduce fuel costs dramatically because of the low cost of electricity relative to conventional fuel. Because they rely in whole or part on electric power, their fuel economy is measured differently than in conventional vehicles. Miles per gallon of gasoline equivalent (mpge) and kilowatt-hours (kWh) per 100 miles are common metrics. Depending on how they're driven, today's light-duty EVs (or PHEVs in electric mode) can exceed 100 mpge and can achieve 30-40 kWh per 100 miles.

The fuel economy of medium- and heavy-duty PHEVs and EVs is highly dependent on the load carried and the duty cycle, but in the right applications, they can maintain a strong fuel-cost advantage over their conventional counterparts as well.

Infrastructure Availability

PHEVs and EVs have the benefit of flexible fueling: They can charge overnight at a residence (or a fleet facility), at a workplace, or at public charging stations. PHEVs have added flexibility, because they can also refuel with gasoline or diesel (or possibly other fuels in the future) when necessary. Both types of vehicles can take advantage of distributed sources of renewable energy, such as solar panels on a rooftop.

Public charging stations are not as ubiquitous as gas stations, but charging equipment manufacturers, automakers, utilities, Clean Cities coalitions, municipalities, and government agencies are establishing a rapidly expanding network of charging infrastructure. The number of publicly accessible charging units surpassed 7,000 in 2012. Search for electric charging stations near you.

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Costs

Although fuel costs for hybrid and plug-in electric vehicles are generally lower than for similar conventional vehicles, purchase prices can be significantly higher. However, prices are likely to decrease as production volumes increase. And initial costs can be offset by fuel cost savings, a federal tax credit, and state incentives. The federal Qualified Plug-In Electric Drive Motor Vehicle Tax Credit is available for PHEV and EV purchases through 2014 (or until manufacturers meet certain thresholds of vehicle sales). It provides a tax credit of $2,500 to $7,500 for new purchases, with the amount determined by the size of the vehicle and capacity of its battery.

Use the Vehicle Cost Calculator to compare lifetime ownership costs of individual models of HEVs, PHEVs, EVs, and conventional vehicles.

Emissions

Hybrid and plug-in electric vehicles can have significant emissions benefits over conventional vehicles. HEV emissions benefits vary by vehicle model and type of hybrid power system. EVs produce zero tailpipe emissions, and PHEVs produce no tailpipe emissions when in all-electric mode.

The life cycle emissions of an EV or PHEV depend on the sources of electricity used to charge it, which vary by region. In geographic areas that use relatively low-polluting energy sources for electricity production, plug-in vehicles typically have a life cycle emissions advantage over similar conventional vehicles running on gasoline or diesel. In regions that depend heavily on conventional fossil fuels for electricity generation, PHEVs and EVs may not demonstrate a strong life cycle emissions benefit. Use the Vehicle Cost Calculator to compare life cycle emissions of individual vehicle models in a given location.

Batteries

Like the engines in conventional vehicles, the advanced batteries in plug-in electric vehicles are designed for extended life but will wear out eventually. Several manufacturers of plug-in vehicles are offering 8-year/100,000 mile battery warranties. Test and simulation results from the National Renewable Energy Laboratory indicate that today's batteries may last 12 to 15 years in moderate climates (eight to 12 years in extreme climates).

Check with your dealer for model-specific information about battery life and warranties. Although manufacturers have not published pricing for replacement batteries, some are offering extended warranty programs with monthly fees. If the batteries need to be replaced outside the warranty, it may be a significant expense. Battery prices are expected to decline as battery technologies improve and production volumes increase.

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Be Part of the Solution

Join States and Communities Throughout the Northeast and Mid-Atlantic that Are Becoming "EV Ready"

Electric vehicle (EV) auto manufacturers have chosen the Northeast and Mid-Atlantic states as an early market to deploy their products, making this region a leader in EV sales. Over a dozen models are now available in the region, and more will be introduced in the coming year. Residents are choosing to purchase EVs because they are convenient, environmentally friendly, fun to drive, and can save thousands of dollars in fuel costs over the life of the vehicle.

Electric vehicles are also an important part of the larger solution to help the U.S. become more energy secure and less dependent on foreign oil, and can attract clean energy companies that create jobs for local communities.

What Local Governments Can Do to Promote EVs

The Transportation and Climate Initiative (TCI), a collaboration of Northeast and Mid-Atlantic state transportation, environment, and energy agencies, has developed a suite of documents to help communities become EV-ready as part of its Northeast Electric Vehicle Network project. Local governments may wish to reference these documents at **www.northeastEVs.org** when developing an EV readiness plan. Guidance documents include EV-Ready Codes, recommendations for permitting, zoning, and parking, siting, and design guidelines, and educational resources.

Local options to consider include:

Government Actions

- Create a plan to deploy strategically placed public EV charging infrastructure.
- Lead by example by purchasing EVs for municipal fleets.
- Work with local utilities, car sharing companies, and charging station manufacturers to discuss public-private partnerships that bring EVs to communities.

Policy Actions

- Streamline permitting and inspections to make it easier for EV owners to install a home charging station and for businesses to install workplace charging stations.
- Adopt EV-friendly zoning and parking ordinances.
- Adopt EV-friendly building codes.
- Identify other policies and incentives that may promote EV use, such as free parking for EVs, or tax credits for businesses that offer EV charging.

Education and Awareness

- Encourage elected officials to drive EVs.
- Encourage local employers to offer workplace EV charging.
- Offer first responder training to police and fire personnel.
- Promote EVs through a public education campaign.

EV Leaders in the Region

Below are examples of a few of the actions that cities around the region are taking:

Baltimore

- Recently installed public EV charging stations in nine city-owned parking garages.
- Is actively involved with the State of Maryland's Electric Vehicle Infrastructure Council.

Boston

- Launched the citywide "**EVboston**" initiative, preparing the city for growth in the EV market.
- Awarded a grant to install 22 free dual electric vehicle charging stations throughout the city and is working with more than 100 stakeholders to prepare for the emergence of EVs.

New York City

- Promotes EVs through its comprehensive sustainability plan, "**PlaNYC**" and has purchased more than 70 EVs for its municipal fleet.
- Working with utility **Con Edison** and automakers to streamline the installation process for home chargers, and with stakeholders to install public EV chargers throughout the city.

Philadelphia

- Partnered with **PhillyCarShare** to introduce EVs to the city's car-share market. The project has deployed 16 EVs, and will install 20 EV charging stations.
- Enacted a city policy providing reserved spaces for EVs on city property if the adjacent building owner provides an EV charging station.

Washington, DC

- Works with utilities, the EV industry, and non-profit groups, through the Metropolitan Washington Council of Governments' Electric Vehicle Working Group to support EV deployment in the region.

West Hartford

- Participating in an EV research project with Connecticut Light and Power to learn how customers charge their EVs away from home and under a variety of conditions.
- Installed an EV charging station in a municipal parking lot, and is providing free electricity while the customer uses the metered space.

Additional Resources

The following guides can help communities become EV-ready:

Northeast Electric Vehicle Network, Guidance Documents including EV-Ready Codes, Guide to Planning and Policy Tools, and Siting and Design Guidelines: **www.northeastEVs.org**

"Ready, Set, Charge: A Guide to EV Ready Communities": **www.rmi.org/Content/Files/Readysetcharge.pdf**

Puget Sound Regional Council and Washington State Department of Commerce, "Electric Vehicle Infrastructure: A Guide for Local Governments in Washington State: **www.psrc.org/assets/4325/EVI_full_report.pdf**

The Northeast Electric Vehicle Network is a project of the Transportation and Climate Initiative—a regional collaboration of the energy, environment, and transportation agencies from Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Early planning efforts for the Network have been supported by a U.S. Department of Energy Planning Grant, which was awarded to TCI, and project partners NYSERDA, the Georgetown Climate Center, and 16 of the region's Clean Cities Coalitions.

NORTHEAST ELECTRIC VEHICLE NETWORK

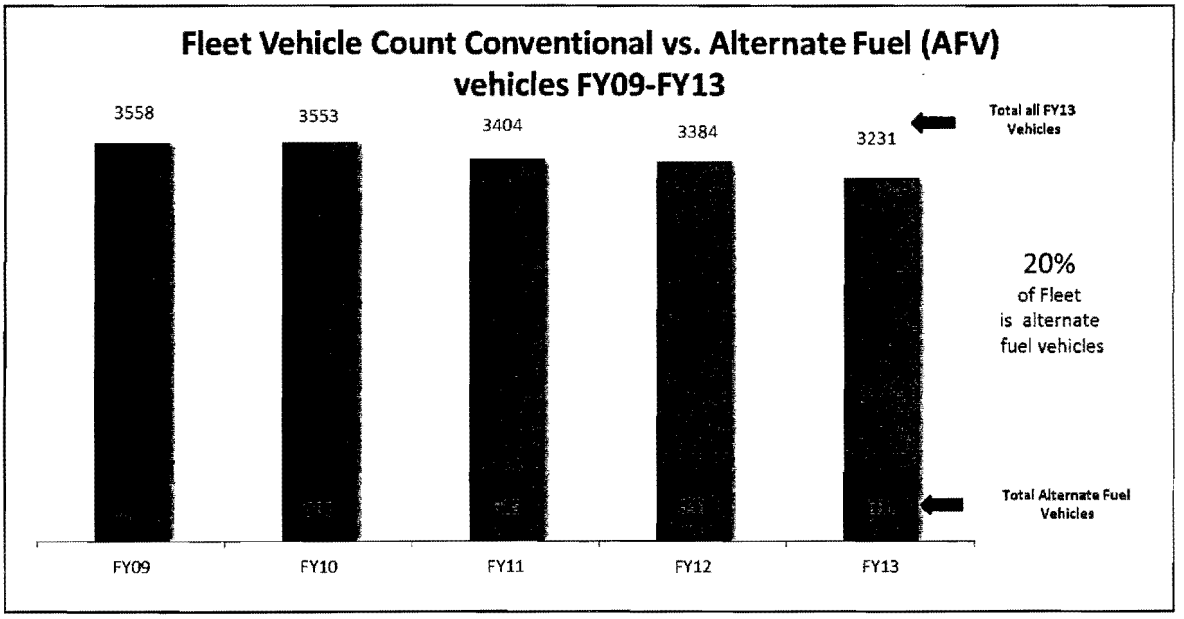
TRANSPORTATION & CLIMATE INITIATIVE
Of the Northeast and Mid-Atlantic States

Clean Cities
U.S. Department of Energy

November 18th T & E Committee Questions

Fleet Totals

- Fleet size has decreased 4.5% since FY12 & 9.1% since FY09
- AFV percentage decreased by 2.2% from FY12. Decrease is due to end of life vehicles removed from service as part of fleet reduction strategy.



Fleet Breakdown by Type

- Public Safety – ***1559***
- Heavy - ***476***
- Fire & Rescue - ***111***
- Administrative - ***748***
- Transit Bus – ***337***

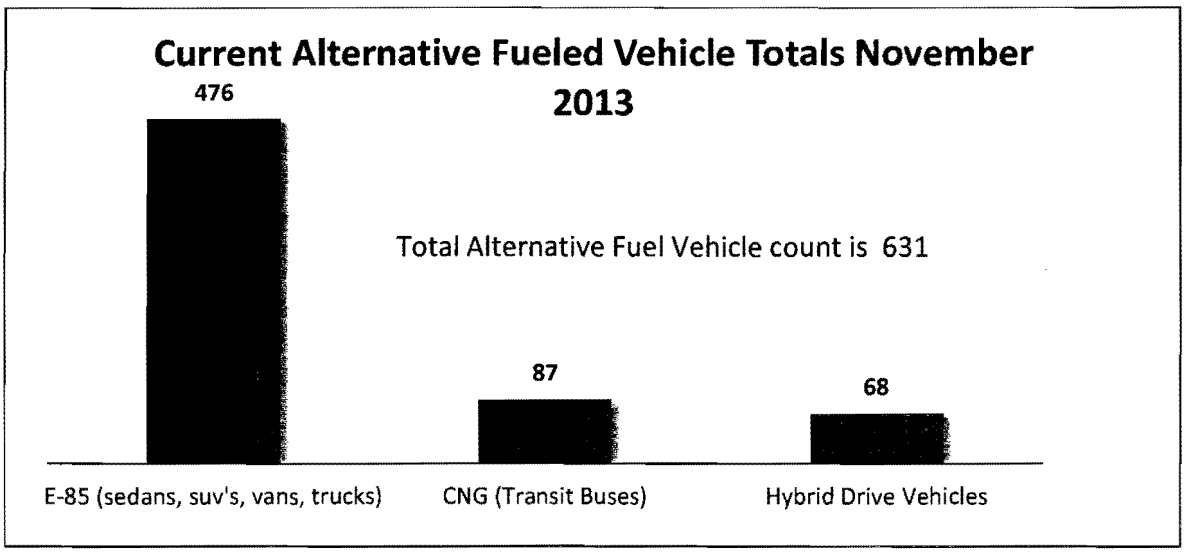
Facts

- Public Safety Represents 43% of the Fleet – Average Age 5.6 Years
- Administrative represents 24% - Average Age 9.7 Years
- Heavy represents 15% of the Fleet - Average Age 10.7 Years

Transit Bus Fleet Composition

Ride On Assignment January 2013				
Year	Manufacturer	Fuel	Length	Total
1997	Orion	Diesel	30&	30
1999	Gillig	Diesel	35&	7
1999	Orion	Diesel	40	17
2000	Orion	CNG	40	15
2001	Orion	Diesel	35	43
2004	Orion	CNG	35	33
2004	Mid-sales	Diesel	28&	0
2006	Orion	CNG	35	24
2006	New Flyer	CNG	40	15
2006	Gillig	Hybrid	40	5
2007	Gillig	Hybrid	40	9
2008	Gillig	Diesel	40	21
2008	Gillig	Diesel	29	6
2009	Gillig	Diesel	40	11
2009	Gillig	Hybrid	40	35
2009	Gillig	Diesel	29	25
2011	Gillig	Hybrid	40	1
2011	Gillig	D-Hy	40	12
2012	Gillig	Hybrid	40	7
2013	Gillig	Diesel	29	28
2013	Gillig	Hybrid	40	12
Totals				337

Fleet AFV Composition



Fleet Replacements

In FY14 the County began the first year of a 6 year replacement strategy to begin to make headway into a 6 year, $40M 1024 vehicle replacement backlog. As part of this plan, DGS presented a comprehensive strategy focused on lifecycle costs and fleet optimization. This innovative best practice model identified a targeted group of replacements based on maximizing cost savings. DGS established standard replacements models for each class of vehicle and equipment in the fleet. This "cleaner –greener" approach focuses on purchasing the fuel efficient and lowest GHG emitting vehicle commercially available. The FY14 budget included $11M in capital replacement funds. To date $ 7.9M has been expended for 104 vehicles such as sedans, police cars, and dump trucks. We anticipate that by the end of FY14 we will have replaced approximately 225 vehicles and equipment.

Moving forward, we continue to optimize the fleet and match the right vehicle to the mission. Moreover, the 6 year plan outlines 10% fleet reduction, a 25% reduction in petroleum consumption and a 20% reduction in greenhouse gas (GHG) emissions. Below is a projected summary of replacement totals

- FY15-***332***
- FY16-***313***
- FY17-***205***
- FY18-***251***
- FY19-***254***

Transit Bus Replacement

At present, DGS is working with DOT / Ride-On to develop a 10 year bus strategic plan. This plan is scheduled to be completed by the spring 2014. Concurrently, DFMS is completing a new 5 year bus procurement contract. Based on the ongoing work with the consultant, current depot capacities, and fuel site constraints, below is the total buses projected to be replaced between FY14 and FY18.

Type	**Clean Diesel**		**Diesel Hybrid Electric**		**CNG**	**CNG Articulated**
Length	30'	40'	30'	40'	40'	60'
Total	**12**	**67**	**7**	**5**	**72**	**13**

Fuel Information

Fuel Consumption FY09-FY13

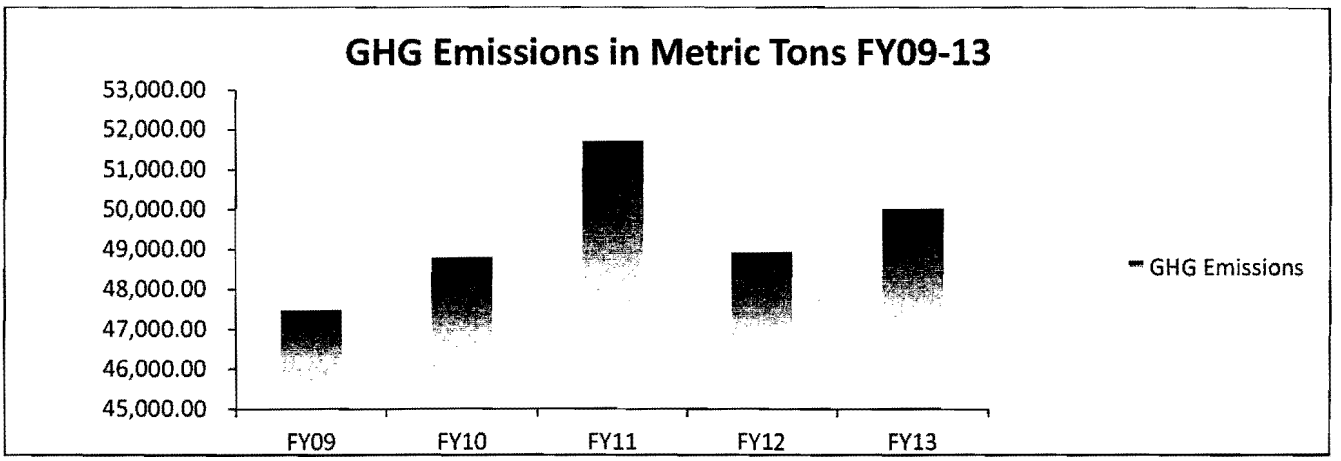
- Consumed 1,365,523 gallon equivalents GGE of alternative fuel; an increase of 15% from FY12
- Reduced petroleum consumption by 8% from FY12

Fuel Type	FY09	FY10	FY11	FY12	FY13
UNLEADED	2,213,032	2,354,666	2,263,455	2,154,029	2,103,204
% of Change	-	*6.40%*	*-3.87%*	*-4.83%*	*-2.36%*
DIESEL	2,773,106	2,779,207	3,146,063	2,966,861	3,118,735
% of Change	-	*0.22%*	*13.20%*	*-5.70%*	*5.12%*
ETHANOL	12,381	18,459	23,041	20,573	21,609
% of Change	-	*49.09%*	*24.82%*	*-10.71%*	*5.04%*
CNG	1,137,339	1,013,055	1,208,641	1,159,375	1,343,914
% of Change	-	*-10.93%*	*19.31%*	*-4.08%*	*15.92%*

Current Fuel Contracts & Pricing

Fuel Type	Current Price	Contract Price/differential	Unit	Contractor	Contract Type	Comments
Diesel	$3.16	$ (0.0110)	Gallon	Mansfield Oil Company	COG Contract	Contract is Differential + (plus) the OPIS Gross Wholesale ULSD rack average at the Baltimore Terminal on Monday at the Close of Buisness
Unleaded	$2.80	$ 0.0050	Gallon	Truman Arnold Companies	COG Contract	Contract is Differential + (plus) the OPIS Gross Wholesale E10 rack average at the Baltimore Terminal on Monday at the Close of Buisness
CNG (Natural Gas) Commodity	$2.04	$ 0.5160	Therm	Washington Gas	COG Contract	Commodity price for natural gas. CNG price billed to user agencies include the cost of utilities as well as maintenace calculated in diesel gallon equivelent (DGE). Natural Gas rates are locked in annually.
E85	$2.96	$ 0.0638	Gallon	Trigas and Oil	Informal Procurement	Contract is the differential + (plus) the OPIS Gross E85 Rack average at the Baltimore terminal at the time of purchase. This item is currently listed as a line item on the new version of the COG unleaded contract scheduled to go into procurement shortly
B20	$3.37	$ 0.1265	Gallon	Trigas and Oil	Bridged DC Government Contract	Contract is Differential + (plus) the OPIS Gross Wholesale SME Biodiesel rack average at the Richmond, Va Terminal at the time of Purchase

GHG Emissions - The Chart below depicts Montgomery County fleet GHG Emissions.



Fuel Sites

DGS is responsible for operating and maintaining 11 County central fueling facilities. Three new sites are also planned. A new CNG site at the new Equipment Maintenance Transit Operations Center (This site will also be publicly accessible). The latter two sites are for 3rd District Police Station and the Multi-Agency Service Park. Both new locations will include E85 and will be for County vehicles only.

As part of the County Green Fleet Plan, DGS will be installing 10, Level 2, Electric Vehicle charging stations strategically placed around the County. These sites will represent the first phase of our EV infrastructure and will be used to benchmark and expand our County wide plan.

DGS Owned and Maintained Fuel Sites

Site Number	Site Location	Fuel Type	Notes
1	EMTOC Bus Lane 16624 Crabbs Branch Way Rockville, MD	DIESEL CNG/FAST FILL	***Buses Only*** (2) 20,000 Diesel Tanks CNG Fast Fill Transit Site
2	Bus Maintenance Facility 8710 Brookville Rd Bottom of the hill Silver Spring, MD	DIESEL	***Buses Only*** (2) 10,000 Diesel Tanks
3	Council Office Bldg Motor Pool, 100 Maryland Ave & Jefferson St Rockville, MD	DIESEL UNLEADED	(1) 12,000 gallon Diesel Tank (1) 12,000 gallon Unleaded Tank
4	New Gaithersburg Service Park, 17000 Crabbs Branch Way, Rockville, MD	UNLEADED DIESEL E85 CNG/FAST FILL	(1) 12,000 gallon Unleaded Tank (1) 12,000 gallon Diesel Tank (1) 10,000 gallon E85 Tank
5	Silver Spring HWY Maintenance Depot, 8710 Brookville Rd Top of the Hill, Silver Spring, MD	UNLEADED DIESEL E85	(1) 12,000 gallon Unleaded Tank (1) 12,000 gallon Diesel Tank (1) 10,000 gallon E85 Tank
6	Automotive Equipment Section 1283 Seven Locks Rd Rockville, MD	DIESEL UNLEADED	(1) 12,000 gallon Diesel Tank (1) 12,000 gallon Unleaded Tank

7	Colesville Service Park 14335 Cape May Rd Silver Spring, MD	DIESEL UNLEADED	(2) 10,000 gallon Diesel Tanks (2) 10,000 gallon Unleaded Tanks
8	Germantown Police Station 2000 Aircraft Dr Germantown, MD	DIESEL UNLEADED	(1) 12,000 gallon Diesel tank (1) 12,000 gallon Unleaded Tank
9	Damascus Depot 26149 Ridge Rd Damascus, MD	DIESEL UNLEADED	(1) 6,000 gallon Diesel Tank (1) 10,000 gallon Unleaded Tank
10	Poolesville HWY Maintenance Depot 19200 Jerusalem Rd Poolesville, MD	DIESEL	(1) 6,000 gallon Diesel Tank
11	Kensington Bus Facility 4935 Nicholson Ct Kensington, MD	DIESEL	***Buses Only*** (1) 10,000 gallon Diesel Tank
12	3rd District Police Station Intersection of MD 29 and MD 650 Silver Spring, MD 20904	UNLEADED E85	***Police Only*** (1) 6,000 gallon Unleaded Tank (1) 4,000 gallon E85 tank ***Currently under construction***
13	Webtrack MASP 8751 Snouffer School Road Gaithersburg, MD 20879	UNLEADED DIESEL E85 CNG/FAST FILL	(1) 12,000 gallon Diesel Tank (1) 12,000 gallon Unleaded Tank (1) 12,000 gallon E85 Tank (1) CNG Site ***Currently under construction***

Alternative Fuel Vehicles & infrastructure Information

Incremental cost of Alternative Fuel Vehicles

Fuel Type	Light Duty Fleet Cost	Transit/Heavy Fleet Cost	Emissions Savings*	Comments
E85	-$1K-$5K	N/A	10- 20%&	Not available for Heavy Vehicle Applications
B20	$8-$10K	$0	10-20%	Fuel has life cycle. additional Maintenance required on startup, fuel quality critical, LDV cost is associated with the premium for a diesel vehicle compared to a gasoline vehicle
Hybrid	$7-$16K	$20-$200K	15-25%	Cost varies depending on the number of batteries required
EV	$10-$20K	$100-$200K	100%	Infrastructure required. limited range, cost varies depending on the number of batteries required
CNG	$4-$10K	$30-$50K	20-30%	Cost varies depending on the number of tanks and associated equipment required
Propane	$3-$6K	$11K-$15K	15-25%	Cost varies depending on the number of tanks and associated equipment required

Alternative Fuel Infrastructure Costs

Fuel Type		Cost	Maintenance Per Gallon Equivalent	Operating per Gallon Equivalent	Pros	Cons
CNG						
	Automotive Site	$ 300,000	$ 0.100	$ 0.120	Low GHG Emissions, readily available, low fuel cost, Fuel future projected cost low	High infrastructure cost, High O&M Cost, Wide variances in technical ability of equipment, Limited Availability of infrastructure
	Heavy Vehicle Site	$ 3,200,000	$ 0.180	$ 0.120		
Electric						
	Level 1	$ 4,165	$ 0.005	$ 0.001	Operating and maintenance cost less than traditional fuel site, Electric cost less than traditional fuels, low to Zero GHG Emissions, relatively low infrastructure cost for Level 1 and Level 2 infrastructure	Range fear, limited public infrastructure, wide variances in the technical ability of equipment, cost of level 3 commercial applications can be high.
	Level 2	$ 18,519	$ 0.005	$ 0.001		
	Level 3	$ 200,000	$ 0.005	$ 0.001		
Propane						
	Small Site	$ 25,000	$ 0.010	$ 0.003	Operating and maintenance cost less than traditional fuel site, Fuel cost less than traditional fuels, low GHG Emissions, relatively low infrastructure cost for small site	Wide variances in the technical ability of equipment, cost of large sites that dispense high volumes of fue can be expensive, Energy less dense than gasoline
	Large Site	$ 175,000	$ 0.010	$ 0.003		
E85						
	Automotive Site	$ 200,000	$ 0.010	$ 0.005	Operating and maintenance costs are inline with traditional fuels, GHG Emissions are less than traditional fuels	Requires a separate tank, dispenser, pump, lines and fitting that are rated to dispense E85. fuel costs closely tied to the petroleum index, Energy less dense than gasoline
B20						
	Automotive Site	$ 1,000	$ 0.010	$ 0.005	Operating and maintenance costs are inline with traditional fuels, GHG Emissions are less than traditional fuels, does not require special equipment to dispense.	Fuel costs are closely tied to the petroleum index. Requires certified fuel supplier, fuel life. vehicle maintenance increased during integration. Warranty concerns, weather factors.

601 13th St., NW
Washington, DC 20005
www.eVgoNetwork.com

Michael Krauthamer
Director, Mid-Atlantic Region

Michael Krauthamer is responsible for building out the NRG eVgo ecosystem in the Mid-Atlantic region. Prior to joining eVgo, Michael served as the Executive Policy Advisor to the Maryland Public Service Commission, where he was responsible for representing the Commission at both the Federal Energy Regulatory Commission and PJM Interconnection, the world's largest wholesale electricity market. Before working at the Maryland PSC, Michael was an attorney at the Federal Energy Regulatory Commission. Michael holds a JD and an MBA from American University, and a BBA and an MPA from the George Washington University.

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The power to change life.

Electric Vehicle Charging

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@NRGeVgo

November 16, 2013

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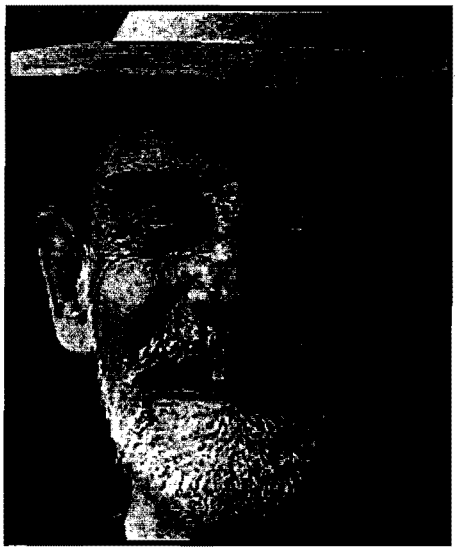
"Look at those danged fools in their horseless carriages!"



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History Repeating Itself

<u>1914</u>

Standard Oil opens chain of 34 standardized filling stations.

<u>2011-2013 and beyond</u>

eVgo opens 40 (and counting!) DC-Fast charging stations.

NRG Energy Overview

- The nation's largest wholesale competitive power generator.
- One of the nation's largest private investors in solar power.
- $8.4 billion in revenues, 2.2 million customers.
- Generating capacity of ~47,000 MW, enough for 40 million homes.

Green Mountain Energy®

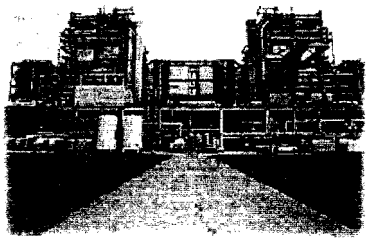
NRG SOLAR

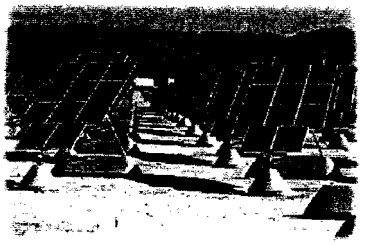
nrg®

The power to change life.
The energy to make it happen.

nrg.
Residential Solutions

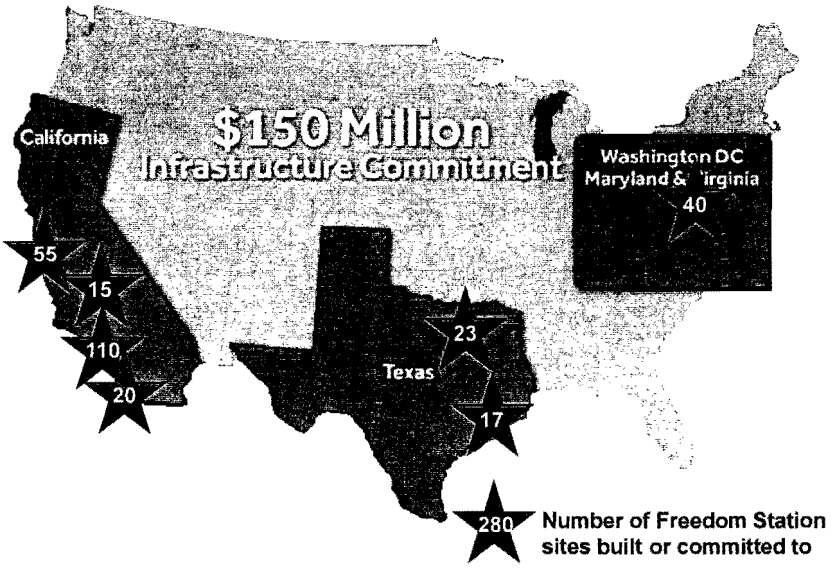
ENERGY PLUS





eVgo Overview

- eVgo is a wholly-owned subsidiary of NRG Energy, a Fortune 500 company.
- We have built the nation's largest privately-funded comprehensive car charging network.



The eVgo ecosystem

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eVgo's value proposition

SUSTAINABLE.

Privately funded. Not dependent on public financing.

SMART.

We support all major auto manufacturers.

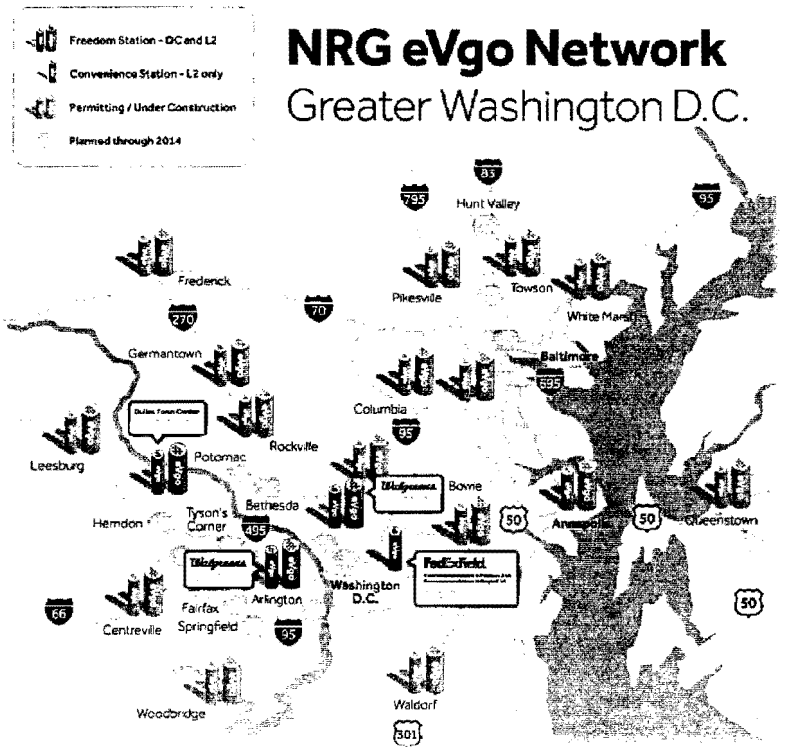
TURNKEY.

We will work with you to design and install an efficient and effective solution. We also employ first-in-class IT, marketing and promotion.

PRACTICAL.

Complete solution with low monthly prices.

Our local market



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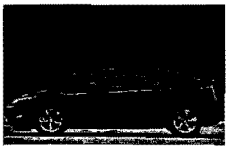
EV Sales

Nissan Leaf
37,000+ on US roads
From $21,300
24kWh

World Car of the Year (2011)
European Car of the Year (2011)
Breakthrough Award
-- Popular Mechanics



Chevrolet Volt
50,000+ on US roads
From $31,645
16kWh

Car of the Year (2011)
-- Motor Trend
Auto of the Year (2011)
-- Automobile Magazine
10Best
-- Car & Driver

Toyota Prius Plug-in
22,000+ on US roads
From $29,500
4.4kWh

Tesla Model S
15,000+ on US roads
From $62,400
60kWh and 80kWh

Fiat 500e
From $25,000
24kWh

BMW i3
Coming in 2014
From $35,000
22kWh

Ford C-Max Energi
7,000+ on US roads
From $29,900
8kWh

Ford Focus Electric
2,000+ on US roads
From $27,700
23kWh

Toyota RAV4
1000+ on US roads
From $42,500

Honda Fit EV
500+ on US roads
From $29,500

Smart ED
1000+ on US roads
From $18,250
17kWh

Source: Automaker data, National Auto Dealer Association. All prices reflect base models and applicable tax credits.

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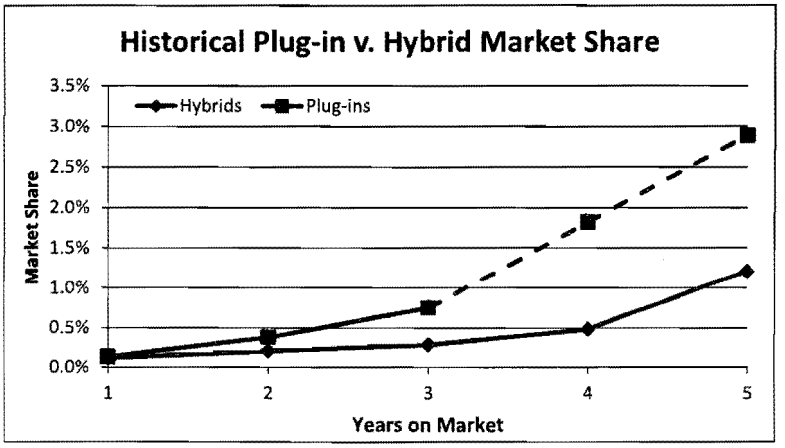
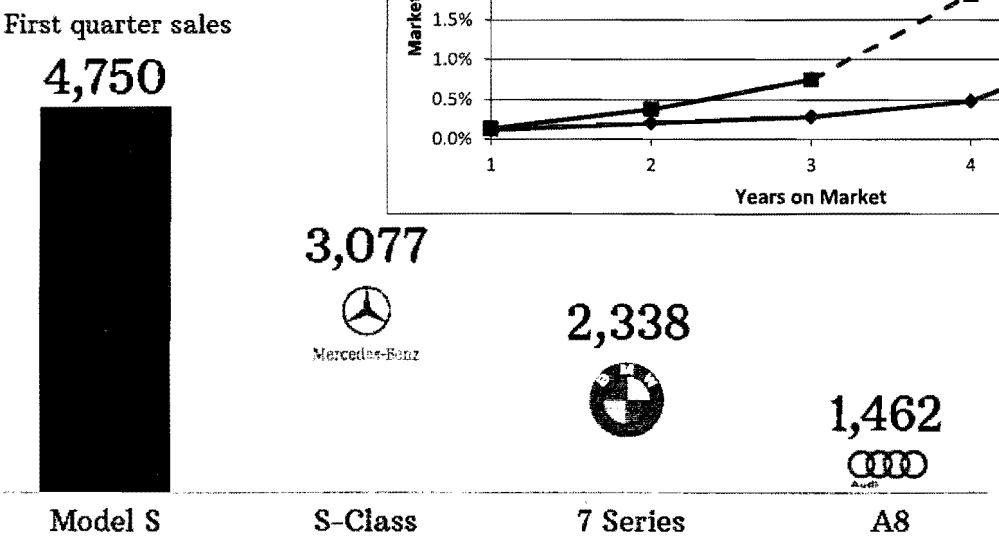
The power to change life





NOTE: TESLA ESTIMATED AS TESLA DOES NOT PROVIDE MONTHLY SALES DATA; SOURCE: LMC AUTOMOTIVE

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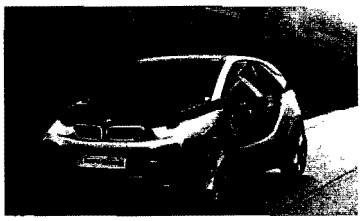
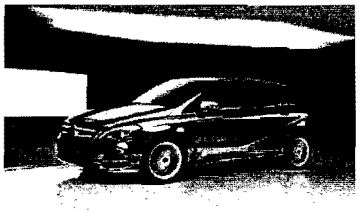
More OEMs are responding

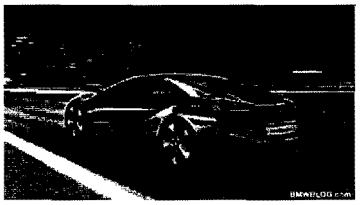


BMW i3
Coming in 2014
From $35,000



Mercedes B-Class
Coming in 2014

Audi A3 e-Tron
Coming in 2014



BMW i8
Coming in 2014

Porsche Panamera E-Hybrid
Coming in 2014

Investment in EV Technology

EV OEMs | EV Battery OEMs | Charger OEMs | Infrastructure Owner/Operators

Industry Investment in EVs (to date)

Vehicles	Batteries	EVSEs	Charging Networks
$20+ billion	**$10+ billion**	**$1+ billion**	**$1+ billion**
Nissan: $5+ billion	**Altairnano**	**Aerovironment** (L2, DC)	**NRG eVgo**
-- Nissan Leaf	**Axeon**	**ABB** (L2, DC)	
GM: $1+ billion	**Dow Kokam:** $350 MM	**Aker Wade** (DC)	**Car Charging Group:** $72 MM market cap on $100k in revenue. **Purchased Blink network** (with 12,500 Public L2 and 110 DC locations) from ECOtality
-- Chevy Volt, Chevy Spark	**Hitachi:** $500 MM	**ClipperCreek** (L2)	
-- Cadillac ELR	**Johnson Controls:** $600+ million	**Coulomb** (EVSE software)	
Mitsubishi: i, Outlander PHEV	**LG Chem:** $3 billion	**Eaton** (L2, DC)	**Tesla:** Battery swapping and inter-city fast charging
Toyota: Prius PHEV, RAV4 EV	**NEC:** $2+ billion	**ECOtality** (L2, DC)	
Tesla: $22 billion market cap	**Panasonic:** $300 MM	**Efacec** (L2, DC)	**Chargepoint:** Deploying public, workplace, and multifamily chargers under $37 MM stimulus grant
Ford: Fusion, Focus, C-Max	**Samsung:** $500 MM	**GE** (Wattstation – L2)	
Honda: Fit EV, Accord PHEV	**Sanyo**	**Leviton** (L2)	
BMW: ActiveE, i3, i8	**Toshiba:** $300 MM	**Nissan** (DC)	
Audi: etron (A1, A3)	**Toyota:** JV with Panasonic	**Schneider** (L2, DC)	
VW: eGolf		**SemaConnect** (L2)	
Mercedes: B-class, S500		**Siemens** (L2)	
Porsche: Panamera, Cayenne, 918		**SPX** (L2)	
Smart: ForTwo, ForFour			
Fiat: 500e		**Competing Standards**	
Kia: Soul EV		Chademo / SAE / Tesla	

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Who drives EVs?

- Average HHI:
  - Volt owner ~ $150,000
  - Leaf owner ~ $125,000
- Well-educated and technologically savvy
- Environmentally focused, yet pragmatic
- Analytical decision makers
- Enjoy role as early adopter and promoting electric vehicles as viable alternatives to internal combustion engines
- Number-one traded in vehicle is the Prius, but the Ford F-150 is in the top 10!

Why Drive an EV?

- Low cost of ownership
  - —Cheap fuel, no price fluctuation, low maintenance costs
  - —Attractive tax credits ($7500 federal) and warranties (9/12 bars for 5 years or 60,000 miles)
- A healthier environment
  - —Lower emissions
- Better for the economy
  - —$75 billion to defend foreign oil sources + $433 billion for oil itself
- They're fun to drive!
  - —Nissan LEAF: 187 lb-ft of torque, 107 horsepower, 80kW motor
  - —BMW i3: 0-60 in 7.2 seconds, 125kW motor
  - —Fiat 500e: 111 horsepower, 147 lb-feet of torque, 83kW motor

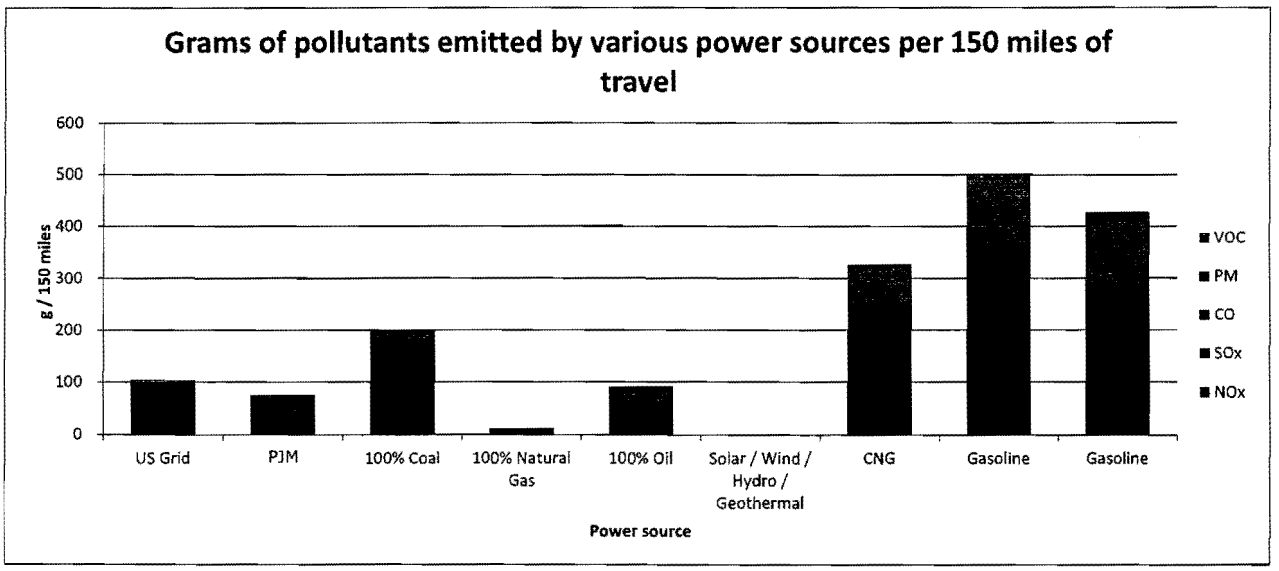
Cost of Driving an EV

Gasoline ($/gal.)	30 mpg	20 mpg
$3.75	$125.00	$187.50
$4.00	$133.30	$200.00
$4.25	$141.70	$212.50
$4.50	$150.00	$225.00
$4.75	$158.30	$237.50

Electricity at today's price (4 miles/kWh @ $0.12/kWh)

$30.00

Emissions

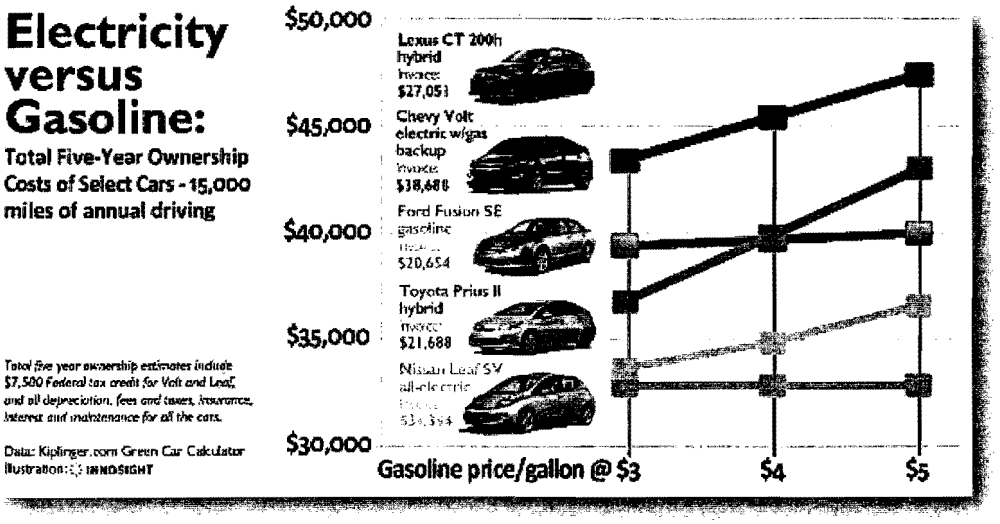


[1] Includes emissions from upstream processes (refining, E&P, transportation, etc.)

[2] Excludes emissions from upstream processes (refining, E&P, transportation, etc.)

Sources: EPA National Emissions Inventory 2008, Federal Highway Administration, Bureau of Transportation Statistics

Low cost of ownership



When purchasing new fleet vehicles, consider life-cycle economic and environmental impacts.

Types of charging

Level 1

Voltage: 120V AC

Slow; not practical for daily usage.

Charging rate:

3-6 miles / hour

Level 2

Voltage: 240V AC

Recommended home and workplace charger

Charging rate:

12-24 miles / hour

4 times as fast as a Level 1 charger

Level 3

"DC Fast Charger"

Voltage: 480V DC

Available at all eVgo Freedom Stations

Charging rate:

150 miles / hour

Requires a DC port

Charging Times

	Level 2		DC Fast eVgo Freedom Station
	Volt (3.3kW)	Focus (6.6kW)	
Charge time	7 hours	3 hours	~ 20 minutes
Miles gained per 20 min.	4 miles	8 miles	50 miles

DC Fast charging, especially when part of a network, is appealing because it offers customers a familiar and valuable service.

eVgo pricing overview

Initial 60 days' network access for $5.95.

Option 1
- $14.95 monthly fee
- $0.10/minute ($1/plug-hour for L2)

Option 2
- No monthly fee
- $4.95 per session + $0.20/minute ($1.50/plug-hour for L2)

Option 3
- Call-in credit card, $9.95/session ($2.50 for L2)

Option 4
- $20/month unlimited with home plan

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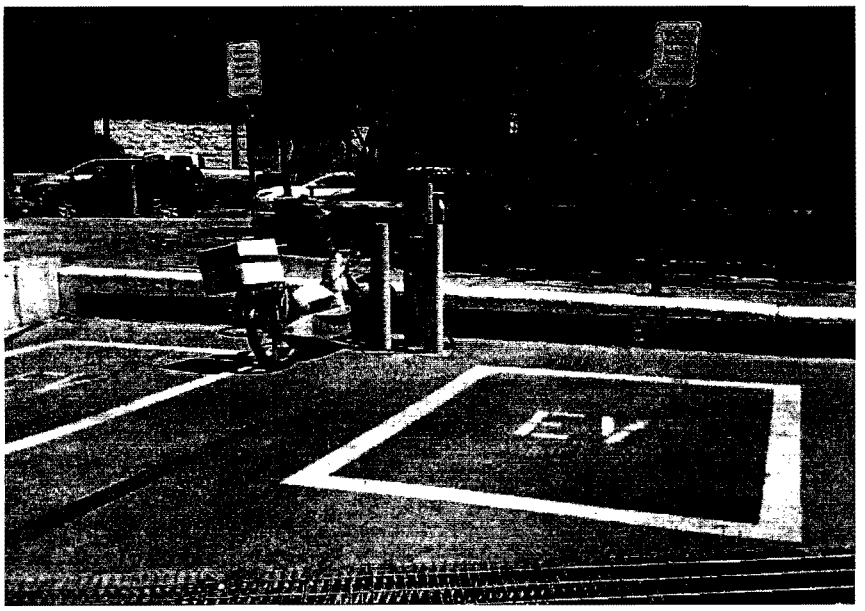
EV charging today



An eVgo Freedom Station
(Dulles Town Center)

(44)

Centreville, VA

Van Ness

Arlington, VA

Rockville, MD (coming soon)

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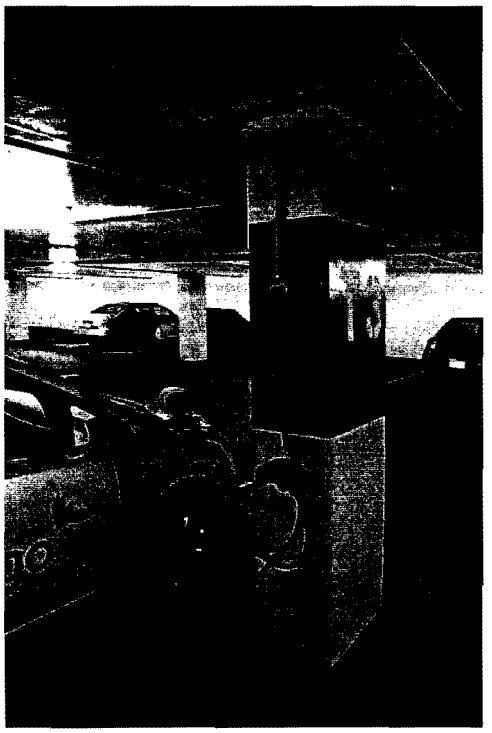
Multi-Family Communities

1. Treat EV chargers essentially like satellite dishes.
2. Require condominium and other community associations to timely respond to requests to install EV charging infrastructure (i.e., 30 days).
3. Prohibit such organizations from imposing unreasonable requirements on such installations (e.g., insurance, aesthetics).*



* Subject to compliance with applicable electrical code requirements.

Taxes, fees, registration

- $7500 federal and various state tax credits and other fee reductions should be maintained. Georgia now has a $5000 tax credit. Maryland's EV tax credits:

Battery Size	Tax Credit
4.0 – 10.0 kWh	$600
10.1 – 15.0 kWh	$700
15.1 kWh +	$1000

- No annual fees: A $100 annual fee would be comparable to gas taxes paid by a 40 mpg vehicle driving 15,000 miles/year (assuming ~ $0.27/gallon tax).
- EV ownership reporting requirements with MVA have uncertain value and may inconvenience and intimidate EV buyers.

Adopt a "Green Fleet" policy

- Establish programs to purchase Plug-In Electric Vehicles for use by city, county, and state employees
- Consider life-cycle costs such as fuel, maintenance, and operational costs (CapEx vs OpEx). EVs lack nearly all of the parts of a traditional vehicle that require maintenance, such as:

GASOLINE			
Alternator	Starter	Transmission	Engine
Fuel pump	Catalytic converter	Spark plugs	Radiator
Fan belt	Oil filter	Fuel filter	Most fluids

- Encourage the selection of vehicles of a smaller class size whenever possible to achieve increased miles per gallon and lower emissions

Policy issues

- For zoning purposes, EV charging is an accessory use
- Parking for EV charging does not result in a reduction in parking
- Expedite the permit process and inspections for EV charging infrastructure
- Waive electrical permit fees for residential EV chargers
- Provide incentives such as cash grants for employers / landlords who install workplace charging infrastructure
- Develop standard regulations governing PEV infrastructure across the region
- Provide free HOV access and free or preferred parking

New construction standards

- One- and two-family dwellings and townhouses must be equipped with at least one PEV charging outlet (208/240 volt, 40 amp outlet or panel capacity and conduit for such outlet installation.
- Other residential buildings that have a common parking area must be equipped with PEV charging outlets in at least 5% of the total parking spaces or panel capacity and conduit for these upgrades in the future.
- The parking area of new high-rise residential and non-residential buildings must include PEV charging outlets in at least 5% of the total parking spaces.
- *See, e.g.,* Los Angeles Green Building Code.

Regulation of charging not required

- **EV chargers are UL-certified consumer devices**, no different than ovens, clothes dryers, air conditioners, and pool pumps.
- Reporting requirements have uncertain value and may inconvenience and intimidate EV buyers.
- **EV charging is simply the use of an electrical product, not the sale of electricity**, and therefore not a jurisdictional activity. Unnecessary regulation will constrain product and service innovation.
- **Utilities possess non-competitive advantages**; allowing them to participate will drive innovative business models out of the market.

Keep it simple, let the market develop

- **Government and electric distribution companies should not get into the charging business.**
- The competitive retail energy suppliers will offer innovative products and services that protect distribution sufficiency, offer customers innovative services and competitive pricing, while also motivating optimal customer behavior such as charging at night and accepting interruptibility.
- NRG supports technology such as smart meters and time-based metering to unlock the value in PJM markets. Such data and information should be shared with all suppliers.

Regulators' role

Support the market

- Do not compete with the private sector in offering EV charging, whether free or otherwise.
- Encourage a public awareness campaign. High-profile support would be appropriate.
- Promote incentives from a variety of sources.
- Require new construction to include EV charging infrastructure.
- Assistance for building retrofitting and wiring is needed.

There is no substitute for private capital and a competitive market.