

Department Energy Saving Initiatives



d.
District Department of Transportation

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Enhancing the Quality of Life



DDOT is committed to achieving an exceptional quality of life in the nation's capital through sustainable travel practices, improved air and water quality, safer streets and outstanding access to goods and services.

Central to this vision is improving energy efficiency and modern mobility by providing next generation alternatives to single occupancy driving in the city. We are proud to present a summary of our current energy saving practices as well as those planned for the next 5 to 10 years.

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Bike Trails



DDOT's trail system provides convenient bicycle and pedestrian access throughout the city, offering a respite from busy streets and a healthy alternative form of transportation. The District currently has 56 miles of bike trails, which are used, on average, by 200 riders per day per mile.

Over the next 5 to 10 years, the District plans to design and build 11 new miles of trails: Oxon Run, South Capitol Street, Anacostia, Metropolitan Branch and the New York Avenue Trails. These new trails will connect into existing systems and based on user rates of our current trails we expect approximately an additional 200

riders per day per mile. The trail system alone (not including our expanding bike lane network) will support 2,200 miles of riding each day, reducing fuel costs, carbon emissions and improving the District's overall environmental profile.

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Capital Bikeshare



DDOT launched its first bike sharing program, SmartBike DC, in the summer of 2008 with 10 stations and 100 bikes. In the summer of 2010, DDOT restructured its bike sharing efforts under the name Capital Bikeshare and today operates over 100 stations, which hold more than 1,000 bikes. During the next 10 years DDOT will work to increase the size of the system, and early estimates indicate the system could expand to over 500 stations boosting its energy saving potential.

Electricity Savings

Smartbike DC utilized stations which were directly connected to the power grid, incurring electric power generation and usage costs. However, Capital Bikeshare stations are 100 percent self-sufficient through the installation of solar panels that generate

Station Count	KWH	Electricity cost savings per year (KW + Service Charges)
100	49,200	\$ 24,000.00
200	98,400	\$ 48,000.00
500	246,000	\$ 120,000.00

enough electricity to power operations year round.

Gasoline Consumption Savings

A Capital Bikeshare customer relations survey conducted in December 2010 revealed that whereas 57 percent of respondents owned a car, of those, 20.3 percent would consider getting rid of it if the system was expanded. Tied to this, at its current station level of 100 stations, the program generates 1.5 million miles of use per year. Using the results from the survey and the number of miles traveled per year, if 20 percent of those miles traveled per year were transferred from car use to bike sharing, reduction in gasoline consumption and consequent fuel cost savings could be as follows:

Station Count	Gasoline reduction per year (Gal)	Cost Savings per year (\$)
100	15,600.00	\$ 62,400.00
200	30,960.00	\$ 123,840.00
500	77,400.00	\$ 309,600.00

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Fuel Cell Transit Buses



DDOT will be partnering with the Center for Transportation and the Environment (CTE) on the CTE Proterra-Ballard Hydrogen Fuel Cell Bus Demonstration Project from October 2012 to September 2013. This project will illustrate the commercial viability of fuel cell bus technologies and emphasize DDOT's leadership in supporting the national effort to transition to clean and sustainable public transportation solutions.

As part of the project, a 35-foot, 37-passenger hydrogen fuel cell bus will operate along a number of DC Circulator routes and will have its performance tested on different route types such as limited stop and local.

Hydrogen fuel cell buses such as these produce clean electric power in a lighter, quieter, and more aerodynamic design and only emit water vapor. The demonstration project will be used to evaluate potential financial savings of this

new technology and positive environmental impacts, including a possible reduction in air pollution and noise pollution. Proterra calculates that because the bus is twice as energy efficient as a diesel version, operators could realize fuel savings of \$350,000 annually. If this demonstration project is successful, it might lead to the widespread adoption of this technology, leading to cleaner air and lower public transportation costs for cities around the world.

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E85 Vehicles

DDOT shares America's commitment to finding greener transportation alternatives that help the country become more energy independent.

DDOT is trying to accomplish both of these missions by encouraging the use of E85 ethanol flex-fuel vehicles (FFVs), which reduce harmful emissions and lower fuel costs.

Vehicles fueled with E85 (a mixture of 85 percent ethanol and 15 percent gasoline) have lower carbon monoxide and carbon dioxide emissions than conventional gasoline or diesel vehicles. Ethanol is biodegradable and contains far fewer potential contaminants than are found in gasoline.

DDOT has steadily increased its fleet with these alternative vehicles. It currently has 41 FFVs, which make up 11 percent of its fleet. DDOT acquired six FFVs vehicles in 2011 and plans to focus on replacing old fleet vehicles with FFVs in the future. In 5 years, 16 percent of DDOT's fleet is expected to be made up of FFVs, and in 10 years, that figure is expected to grow to at least 21 percent.

General Motor's calculations show that over 15,000 miles, "a small [gas/electric] hybrid car" will consume 120 more gallons of gas than an E85 ethanol flex-fuel Tahoe full-size SUV with a V8 engine. These cars and trucks have the same power, acceleration, payload, and cruise speed as conventionally

fueled vehicles. Maintenance for ethanol-fueled vehicles is very similar to that of regular cars and trucks.

Today, the United States has more than 6 million FFVs on the road. These vehicles are available in a range of models, including sedans, pick-up trucks, and minivans. Several auto manufacturers have announced plans to greatly expand the number of FFV models they offer; DDOT will undoubtedly be interested in making some of these vehicles a part of its greener fleet.

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Electric Vehicles



DDOT plans to add electric vehicles to its existing fleetshare program and increase the availability of public electric vehicle charging infrastructure in the District this year. As the supply of additional plug-in vehicles are introduced to the market and made available, DDOT will need to reassess each year if the existing demand is being met by the following strategy.

Plug-in Fleet Vehicles

Currently, DDOT is planning to procure four electric vehicles to add to its fleetshare program, which participating District government employees can access at DDOT's headquarters at 55 M Street, SE. Additionally, DDOT plans to replace outmoded vehicles with electric vehicles in the future, leading to the addition of at least 20 electric vehicles in the next 10 years.

As energy efficient as electric vehicles are now, future models will inevitably be more energy efficient. For example, the EPA rated the 2011 Chevrolet Volt's overall combined fuel economy rating at 60 mpg-US equivalent (MPG-e). If the Volt replaces an existing Honda Civic Hybrid in our fleet, which has an EPA rating of 40 mpg, DDOT would increase its fuel efficiency by 50 percent, or 20 mpg on each vehicle.

Public Curbside Charging Infrastructure

Since the installation of the District's first public curbside electric charging station on 14th Street NW in November 2010, the total equivalent of 489 Kg of Greenhouse Gas (GHG) savings from vehicular tailpipe emissions has occurred, which is the equivalent to the consumption of

54.8 gallons of gasoline. Later this year, DDOT plans to install three additional public curbside electric vehicle charging stations in order to support the demand and increased availability of electric plug-in vehicles in the District. By 2021, DDOT plans to install 67 additional public curbside electric vehicles chargers throughout the city.

As demand is expected to increase, one charger has the potential of removing the annual GHG emissions equivalent of 7.7 passenger cars per year and the 70 chargers could at a maximum reduce the annual emission equivalent of 539 passenger cars a year, which represents CO from 4,422 gallons of gasoline consumed.

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Efficient Construction Methods

DDOT is encouraging contractors who work on the agency's construction projects to utilize construction equipment that uses electric or solar power in lieu of diesel and gasoline, which promotes energy efficiency and reduces greenhouse gas emissions.

DDOT estimates that encouraging the use of green, energy efficient construction equipment can save about 15 percent of energy costs.

DDOT also encourages the use of recycled materials in transportation construction projects (for example, warm mix asphalt, reclaimed asphalt pavement, waste shingles,

blast furnace slag, using recycled tires in the construction of roadway embankments, and foundry sand). Encouraging the use of green construction equipment and materials helps the environment, reduces the cost of new projects, and creates more jobs.

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Green Alleys



DDOT is striving to make all of its infrastructure and operations more sustainable in order to reduce the amount of stormwater that flows into sewers and streams, which will help reduce stream bank erosion and improve the health of area waterways. One way of achieving this goal is by installing "green alleys".

Green alleys, such as the one pictured above, improve water

quality by allowing water to infiltrate into the ground which recharges the groundwater. They also reduce the amount of runoff from alleys and improve the quality of the water that does run off before it enters nearby storm sewers that deposit the water into area waterways. Lastly, by installing energy efficient lighting in green alleys DDOT can reduce energy consumption in the city as well.

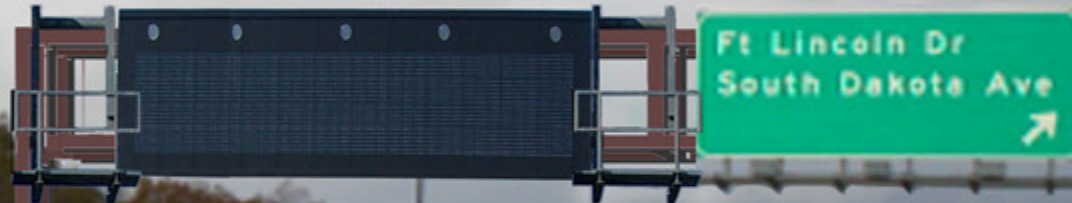
DDOT began constructing green alleys as pilot projects in the fall of 2011. In the upcoming years, DDOT will install even more green alleys as the effectiveness and durability of the materials used in the construction process improves.

Image Courtesy of CDOT

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ITS Technology



Intelligent Transportation Systems (ITS) improve transportation safety and mobility by integrating advanced communication technologies into the transportation network.

Dynamic Message Signs

DDOT and the Federal Highway Administration are designing 11 new Dynamic Message Signs (DMS) at 9 critical sites in the District.

It is expected that this project will reduce congestion in the District by providing real-time traffic incident information, which will lead to more

efficient incident management. By reducing congestion, DDOT will substantially increase energy efficiency and reduce harmful emissions. In addition, the District's new DMSs will use energy-saving LED technology.

Wireless Vehicle Detection System

DDOT is in the process of installing more than 120 wireless vehicle detection systems citywide. Outfitting a typical intersection with wireless sensor technology helps DDOT reduce its energy consumption. Wireless Vehicle Detection Systems consume

approximately a third of the energy that similar vehicle detection systems powered by other means (for example, microwave radar technology).

It gets better. Within the next 5 to 10 years DDOT plans to install additional wireless sensors with a power consumption of 7 milliwatts.

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LED Streetlights



Light Emitting Diode (LED) Lighting Program for Alleys

In 2010, DDOT completed a study to determine the most efficient Light Emitting Diode (LED) lights available to use to replace outmoded incandescent and mercury vapor alley lights that are expending too much energy illuminating alleys in the District.

The LED lights that DDOT settled on, which last three times longer than some alley lights that are currently installed around the city,

are anticipated to cut the agency's energy and maintenance costs in half.

DDOT received \$1 million under the American Recover and Reinvestment Act (ARRA) of 2009 to replace over 1,000 non-energy efficient alley lights in the city. Construction to replace these lights began in late 2011.

LED Lighting Program for Roadways

DDOT also conducted a study of LED street lighting with funding

from the Department of Energy.

The intent of the study is to evaluate different LED fixtures designed for street lighting.

DDOT has selected three test locations in the city (Joshua Barney Drive, NE; Overlook Avenue, SE; and in front of the Washington Nationals Stadium on N Street, SE).

The study could lead to the agency installing LED streetlights in many of its new projects.

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LEED Certified Facilities



In 2011 DDOT moved its headquarters to a LEED Gold certified building at 55 M Street, SE. The agency is also evaluating how to retrofit its other facilities to meet the U.S. Green Building Council LEED Standards in the following areas:

LEED for Existing Buildings: Operations & Maintenance

The intent of LEED for Existing Buildings: Operations and Maintenance is to certify the operations and maintenance of the building and create a plan for ensuring high performance over time. LEED for Existing Buildings: Operations and Maintenance helps building owners and managers solve building problems

and improve building life cycle performance.

Staff Development and Training

DDOT plans to employ at least one team member that is accredited as a LEED Facilities Professional.

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Low Impact Development (LID)

The District must improve the quality of the water running into waterways to comply with the Clean Water Act and other local and federal regulations. DDOT is striving to make all of its infrastructure and operations more sustainable in order to reduce the amount of storm water that flows into area waterways to avert stream bank erosion and improve the health of area waterways for people, wildlife, and the entire ecosystem. One way of achieving this goal is using Low Impact Development Techniques (LIDs).

The most common LID projects that DDOT has undertaken involve:

1. Planting trees, installing tree box planters, and expanding grass space around the District
2. Bioretention cells
3. Vegetated swales

DDOT has undertaken 20 LID projects to date and has 20 more under construction for 2011. DDOT has also worked with private entities to integrate LID projects in the public right-of-way. Recently, DDOT has added to its toolbox by

adding permeable materials for sidewalks and alleys. In the near future, DDOT is looking to install LID projects in the city's roadways.

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Recycled Wood School Project

DDOT's Urban Forestry Administration (UFA) has been exploring projects that recycle wood collected from the pruning and removal of street trees in the District. Working with a diverse coalition of partners such as the Northeastern Area State and Private Forestry Programs, the Community Woodlands Alliance, and the Metropolitan Washington Council of Governments, UFA has supported several wood utilization projects and educational lectures.

One project that shows promise is a "Fuels for Schools" project in which a school's wood (and waste) utilizing boiler would replace the current HVAC technology. The use of wood-based biomass as fuel is an excellent energy conservation measure that reduces non-renewable fossil fuel use, energy consumption, and greenhouse gas emissions in the District. New technology has produced wood-based biomass systems that release very small amounts of particulate matter into the atmosphere.

Here are some facts about the use of wood-based biomass as fuel in the District:

- Typically, wood-based biomass fuel can provide a 50 percent to 75 percent annual savings over non-renewable fossil fuels at current prices. Savings increase when non-renewable fossil fuel prices increase. The District's annual energy savings, when using our own wood waste, could reach close to 100 percent for the fossil fuel offset.
- Utilization of urban wood waste as a fuel eliminates tipping fees to landfills.
- Wood is considered carbon neutral and provides a full reduction of carbon emissions for the fossil fuel that is offset by wood fuel. Carbon credits for a wood utilization project may be sold on the voluntary market and has a current value of about \$5 per ton.
- Utilization of urban wood waste as a fuel keeps energy funding in the local community.
- Utilization of urban wood waste

as a fuel reduces dependence on fossil fuels.

- Modern wood combustion technology (already deployed in many places across the country) has emissions between natural gas and fuel oil for most pollutants of concern. Particulates are higher for wood combustion than for fuel oil or natural gas, but still very low.
- Modern wood chip storage systems in combination with modern wood combustion systems are fully automated and require minimal maintenance from current maintenance staff.
- Seattle, Washington; St. Paul, Minnesota; and Concord, New Hampshire are examples of major US cities using wood waste for energy. Plants are located within the downtown areas for these cities.

Photo Credit:
Christopher Sessums

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Signal Optimization



Due to redevelopment, regional growth, traffic signal installation, changing travel patterns, and conflicts between different modes of travel, the District Department of Transportation (DDOT) has decided to perform a city-wide traffic signal

optimization project to retime its traffic signals.

Signal retiming has significant environmental benefits. Because this optimization project will reduce delays for motorists, it will

result in fewer idling cars, which will lead to reduced fuel consumption and fewer harmful emissions. This project will help keep our roadways, and our air, free and clear.

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Snow Removal Techniques



Image Courtesy of NCDOT

DDOT is utilizing organic ingredients to help keep the District's roads clear of snow and ice.

The District Snow Team (a partnership between DDOT and DPW) has worked to produce a organic brine made of rock salt (sodium chloride), a beet juice additive, and water to pre-treat roads before impending winter storms. This mixture helps prevent ice and snow from bonding with the roadway and is less taxing on the city's environment, infrastructure, and budget than rock salt, which

is the de-icer of choice for most jurisdictions. While rock salt is the still the District's primary deicing material to combat winter storms, the District Snow Team is utilizing a brine mixing system that can hold up to 60,000 gallons and eight liquid spray trucks to treat District roads with this new, organic mixture.

Brine information

One main benefit of using the beet juice additive in the brine mixture is that it allows the brine to bond

with the pavement, so that the mixture can effectively melt snow and ice days after it is applied. Without the beet juice, a straight salt brine would be lifted off the pavement sooner by passing traffic. The organic brine mixture, which is effective to -25° Fahrenheit, increases full application rates from 30 percent to 45 percent. Using the beet juice additive reduces the use of, and expenditures on, tons of rock salt, which has the added effect of saving the environment and the city's roadways from the overuse of this corrosive material.

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- CAPITAL BIKESHARE ▶
- FUEL CELL TRANSIT BUSES ▶
- E85 VEHICLES ▶
- ELECTRIC VEHICLES ▶
- EFFICIENT CONSTRUCTION METHODS ▶
- GREEN ALLEYS ▶
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- LEED CERTIFIED PROFESSIONALS ▶
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- UPS ▶
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- LED TRAFFIC SIGNALS ▶
- SOLAR COMPACTORS ▶

d.

Solar Powered Parking Meters



DDOT has been at the forefront of adopting green solutions to power its metered parking program.

DDOT currently has 550 solar powered multispace parking meters (MSMs) in service. Solar powered MSMs have batteries with a lifespan of approximately seven years. At the end of their useful life these batteries can be recycled.

In November of 2010 DDOT installed 1,200 solar-powered single space meters, and the agency is currently adding more of these meters in commercial areas. The expected battery life of these meters is 3 to 5 years and the

batteries can also be recycled at the end of their useful life.

DDOT plans to fully commit to environmentally-friendly parking solutions, by solely installing solar powered parking meters in the future.

A Drain on the Environment

Prior to using solar-powered meters, DDOT had two types of single space meters – Duncans and Mackays. On an annual basis, DDOT used 31,000 9V Alkaline batteries for the Duncan single space meters and 16,000 AA Alkaline batteries for the Mackay

meters. Approximately 4,400 pounds of batteries were disposed annually.

A Brighter Future

DDOT's commitment to solar-powered parking meters will lead to:

- Less infrastructure investment
- No ongoing electricity costs
- Annual savings of about 16 lbs. of CO2 emissions per meter
- Less material and labor costs
- Less hazardous waste from disposing of dead batteries

- BIKE TRAILS ▶
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d.

Streetcars



The new 37-mile streetcar network is forecast to accommodate more than 147,000 daily trips by 2030 and improve travel times by up to 38 percent. The streetcar plan is a key part of DDOT's mission to achieve its climate and energy efficiency goals in the transportation sector. For example, below are the following projected energy savings for the Anacostia Streetcar Line, which is currently underway:

Reduction in Vehicle Miles Traveled

Based on the regional travel demand model, it is estimated that the Anacostia Streetcar Line project will result in a reduction of

approximately 315,600 vehicle miles traveled (VMT) per year.

Reduction in Fuel Consumption

With the projected reduction in VMT, the resulting reduction in fuel consumption was estimated to be 13,960 gallons of gasoline per year (based on 2008 Federal Highway Administration (FHWA) fleet average fuel economy for passenger vehicles).

Estimated Reduction in Vehicle Emissions

Pollutant	Abbreviation	Reduction in Emissions (Tons per Year)
Carbon Monoxide	CO	0.40
Nitrous Oxide	NO _x	0.39
Volatile Organic Compounds	VOC	0.02
Particulate Matter	PM-10	0.03
Carbon Dioxide	CO ₂	150.49

Source: Regional Travel Demand Forecasting Model, Mobile source emission factors for the Washington DC region.

This reduction will decline over time as the fleet average fuel economy improves.

Reduction in Vehicle Emissions

Based on the estimated reduction in VMT, the resulting passenger vehicle emissions reductions were also expected to decline (see table below).

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Increasing Urban Tree Canopy

In addition to enhancing the quality of life for the District's residents, Washington's Urban tree canopy (UTC) provides many environmental benefits, including reducing storm-water runoff and the city's carbon footprint, improving air quality, providing habitat for wildlife, and contributing to savings on energy bills.

A 2000 study showed that urban areas contain an estimated 3.8 billion trees with an average tree canopy cover of 27 percent. The District's 35 percent UTC far exceeds the national urban forest average.

A 2004 survey determined that the District had an estimated 1.9 million trees. The survey estimated

how much this massive UTC helped improve air quality in the District, and the results were significant:

- 474,000 metric tons of Carbon (C) stored (\$10.8 million value)
- 14,600 metric tons/year of C sequestered (\$334,000 value)
- 490 metric tons/year total pollution removal (\$3.7 million value)
- 23 metric tons/year of CO removed (\$32,000 value)
- 65 metric tons/year NO2 removed (\$645,000 value)
- 196 metric tons/year of O3 removed (\$1.9 million value)
- 66 metric tons/year of SO2 removed (\$160,000 value)
- 140 metric tons/year of PM10 removed (\$928,000 value)

Expanding the Urban Forest

The 2010 DC UTC report showed that the UTC cover in the District is 35 percent.

In April 2009, the District set an UTC goal of 40 percent coverage by 2035. To increase the UTC by 5 percent, DDOE, and nonprofit and community partners, to encourage private property owners to plant more trees on their land. In addition, UFA will plant more trees on District-owned properties. Both of these projects will further increase air quality in the city, while adding to the District's reputation as "The City of Trees."

BIKE TRAILS ▶

CAPITAL BIKESHARE ▶

FUEL CELL TRANSIT BUSES ▶

E85 VEHICLES ▶

ELECTRIC VEHICLES ▶

EFFICIENT CONSTRUCTION METHODS ▶

GREEN ALLEYS ▶

ITS TECHNOLOGY ▶

LED STREETLIGHTS ▶

LEED CERTIFIED PROFESSIONALS ▶

LID ▶

RECYCLED WOOD SCHOOL PROJECT ▶

SIGNAL OPTIMIZATION ▶

SNOW REMOVAL TECHNIQUES ▶

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STREETCARS ▶

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LED TRAFFIC SIGNALS ▶

SOLAR COMPACTORS ▶

d.

Uninterruptible Power Supply (UPS)

The District Department of Transportation (DDOT) in conjunction with the Federal Highway Administration is deploying battery based Uninterruptible Power Supply (UPS) systems at critical intersections.

It is expected that this project will increase safety for all modes of travel within the District by maintaining traffic signals in full operation during power outages.

This project will also substantially increase energy efficiency and promote a clean environment, by greatly reducing the need to travel to the affected intersections and having to deploy a backup generator during power outages. The District maintains 200 emergency backup generators that are only installed during a power outage. These generators must be transported to the intersection and

secured to the cabinet and refueled every 6 hours.

Traffic signal Cabinets are being retrofitted with bolt on battery backup units. These units will sense a power outage and have been designed to run a standard '2 legged intersection' with Pedestrian signals for 6 hours. These systems return to full power after an hour of continuous power from the electrical grid.

Between April 1st 2010 and July 14th, 2011, the District traffic signal system experienced loss of local utility power at approximately 543 signalized intersections. Of these events, Generators were deployed in response to approximately half of these events.

The current emergency generators expend 3.5 gallons of fuel every 6 hours.

The expected benefits of integrating UPS systems to traffic signals include:

1. Eliminating or reducing the need for transport vehicles
2. Reducing the need for refueling backup generators every 3 hours.

The current deployment will include approximately 200 UPS units (including additional funding realized from other grant sources including ARRA and TIGER initiatives.

DDOT has also obligated funding through 2015, expecting to deploy at least 100 new UPS units per year.

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Warm Asphalt



Warm mix asphalt (WMA) is identical to conventional asphalt, but is produced at a lower temperature through the use of chemical additives or foaming agents. Producing asphalt through this process is helping transportation organizations limit energy use and greenhouse gas emissions, without forsaking quality or durability.

While hot mix asphalt is usually produced at about 280-340° F, warm mix asphalt is produced at approximately 215-275° F. The amount of energy that is saved by producing WMA could lead to dramatic reductions in carbon dioxide emissions in the District and the United States at large. Studies indicate that a 30 percent

reduction in carbon dioxide production might be possible using WMA technology. Even with a conservative estimate of a 15 percent reduction in carbon dioxide emissions, full scale implementation of WMA throughout the U.S. would reduce carbon dioxide emissions by an equivalent of 210,000 cars per day, per year.

DDOT is using WMA now, and plans to reduce even more carbon dioxide emissions and energy costs in the future by expanding its use of WMA.

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d.

Water Quality in Construction

Current erosion and sediment control practices on construction sites have been demonstrated to provide a range of water quality improvements in storm water discharges, but considerable polluted run-off still remains.

However, it is possible to quickly mitigate needed construction

disturbances if the skill and motivation are in place. In the near future, DDOT will do the following:

1. Develop and implement erosion and sediment training for inspectors of construction activities for all.
2. Develop and implement an Environmental Inspection

Team to inspect DDOT construction projects including projects under ID/IQ and Street & Bridge Maintenance.

3. Expand the available Erosion and Sediment Control Measures that can be used.

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d.

Wind/Solar Streetlights

DDOT has recently installed prototype solar and wind powered LED streetlights in the District. The agency has installed prototype solar powered lights along the Metropolitan Branch Trail and a prototype solar/wind powered light outside of its headquarters at 55 M Street, SE. DDOT is currently evaluating the sustainability, performance and efficiency of these innovative street lights.

The possible energy and cost savings that solar and wind powered LED streetlights could provide are substantial. A typical streetlight cost the District about \$25,000 to \$30,000 for parts and installation. However, solar and

wind powered LED streetlights only cost about \$12,000 to \$15,000 for their parts and installation.

In addition to the potential installation cost savings there are the potential energy savings that could be provided from these units. The energy cost for a typical streetlight is about \$150 annually. However, solar and wind powered LED streetlights are self-sufficient and do not have any direct energy costs. Batteries do need to be replaced every 3 years at a cost of about \$300.

A minimum of four hours of sunlight per day is required to provide illumination through the

night. On wind turbine equipped models, wind power can be used to supplement or replace the energy that is generated by the solar panels. A daily wind speed average of about 5 mph is enough to replace the energy that would be typically generated by the solar panels.

These fixtures are off-the-grid, green alternatives to conventionally powered street lights and DDOT is continuing to work with manufacturers of these prototype units in their development. DDOT hopes to one day implement the use of solar and wind powered LED streetlights on a larger scale throughout the District.

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d.

Computers and Technology

DDOT's Office of Information Technology and Innovation (OITI) has decreased the amount of energy and paper the agency uses. These solutions have streamlined the agency and helped improved the services DDOT provides to the public.

Reducing the Paper Trail

- OITI has implemented web based applications (such as, TOPS, Cityworks, and the NOV system) to reduce the agency's paperwork. The TOPS system, a web based public space permitting website, reduces the need for applicants to travel by

allowing the printing of forms at home and via local kiosks

- OITI has introduced electronic forms and plans to implement robust workflow automation tools using document management software to reduce the need for generating multiple copies of documents.
- DDOT has reduced the number of its paper-based fax machines by more than 75 percent. The agency is adopting digital methods to send documents that previously would have been faxed.

Doing More With Less

- DDOT has reduced its number of personal printers by more than 50 percent and encourages employees to print documents using centralized, LEED certified printers.
- OITI reduced the number of computer servers it uses to upkeep DDOT's computer network from 40 to 4, which is anticipated to save the agency hundreds of thousands of dollars over a five year period.
- OITI only purchases Energy Star certified electronic equipment.

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LED Traffic Signals



DDOT is in the process of refurbishing more than 70,000 LED traffic signals in the District.

The LED re-lamping program will outfit traffic signals with new, advanced LED technology that offers enhanced reliability and energy efficiency.

The use of LED lamps to illuminate traffic signals in the city has proven to be more cost effective than using incandescent lamps. LED traffic signals have been shown to provide drastic energy savings and reduce maintenance cost. LED traffic signals consume 88% less energy than a comparable incandescent traffic signal.

Cost Savings

	Incandescent Traffic Signal Lamp	Red LED Traffic Signal Lamp
Annual energy use (kWh)	559	67
Energy use for 7 years (kWh)	3912	472
Lamp cost	\$3	\$75
Lamp cost over 7 years	\$21	\$75
Total cost over 7 years	\$412.20	\$122.20
Total maintenance cost 7 years	\$1050	0

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Solar Compactors



In 2010, DDOT began installing Solar Trash and Recycling Receptacles in Ward 6 on Capitol Hill. Solar powered trash compaction and recycling demonstrates DDOT's commitment to simultaneously protecting the environment while conserving resources.

The receptacles offer on-site compaction of solid waste and separation of recyclable materials.

This compacting receptacle is self-powered by obtaining 100% of its energy from solar power. They are the same size as standard trash receptacles; however, because of improved compacting technology, their capacity is five times greater than a standard receptacle. They are equipped with 50-gallon leak proof bins that help to decrease odor and eliminate the potential of pollutant runoff into the Anacostia River.

As a result of their greater capacity, fewer collection trips are required. Fewer collection trips add up to many environmental benefits that include reduced emissions of greenhouse gases and other pollutants, as well as cost savings from reduced fuel use, labor, and maintenance. It was also designed to keep out unwanted pests, thus providing a safer and cleaner environment.

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