District of Columbia
Energy Assurance Plan 2012

DC Department of the Environment
Contract #DCKG-2010-C-1261[1]

DISTRICT
DEPARTMENT
OF THE
ENVIRONMENT

[1] Jerome S. Paige & Associates, LLC is the prime contractor for the project. JSP&A's team includes Jerome Paige, Don Milsten, George Nichols, Gregory Billings, and Richard Lockley. The sub-contractor is The Cadmus Group, Inc. For Cadmus, the key team member is Kim Clemente.

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List of Acronyms

API	American Petroleum Institute
BLS	Bureau of Labor Statistics
CAEA	Clean and Affordable Energy Act of 2008
CIP	Critical Infrastructure Protection
CMT	Consequence Management Team
CUB	DC Consumer Utility Board
DC	District of Columbia
DDOE	DC Department of the Environment
DDOE/EA	DC Department of the Environment/Energy Administration
DOE	US Department of Energy
DDOT	DC Department of Transportation
DoD	US Department of Defense
DRP	District Response Plan
EAP	Energy Assurance Plan
EBTR	Emergency Building Temperature Restrictions
EDC	Energy Distribution Company
EIA	Energy Information Agency
ELO	Emergency Liaison Officer
EOC	Emergency Operations Center
EOM	Executive Office of the Mayor
EPA	US Environmental Protection Agency
EPC	Emergency Planning Council
ESDTP	Energy Supply Disruption Tracking Plan
ESF	Emergency Support Function
FBI	US Federal Bureau of Investigation
HSEMA	DC Department of Homeland Security/Emergency Management Agency
GSP	Gross State Product
JFC	Joint Field Command
LDC	Local Distribution Company
MAPDA	Mid Atlantic Petroleum Distributors Association
MAPGA	Mid Atlantic Propane Gas Association
MOU	Memoranda of Understanding
MWCOG	Metropolitan Washington Council of Governments
NASEO	National Association of State Energy Officials
NCP	National Contingency Plan
NCR	National Capital Region
NRP	National Response Plan
OC/EOM	Office of Communications/Executive Office of the Mayor
ONCRC	Office of National Capital Region Coordination
PACE	Property Assessed Clean Energy
PEPCO	Potomac Electric Power Company

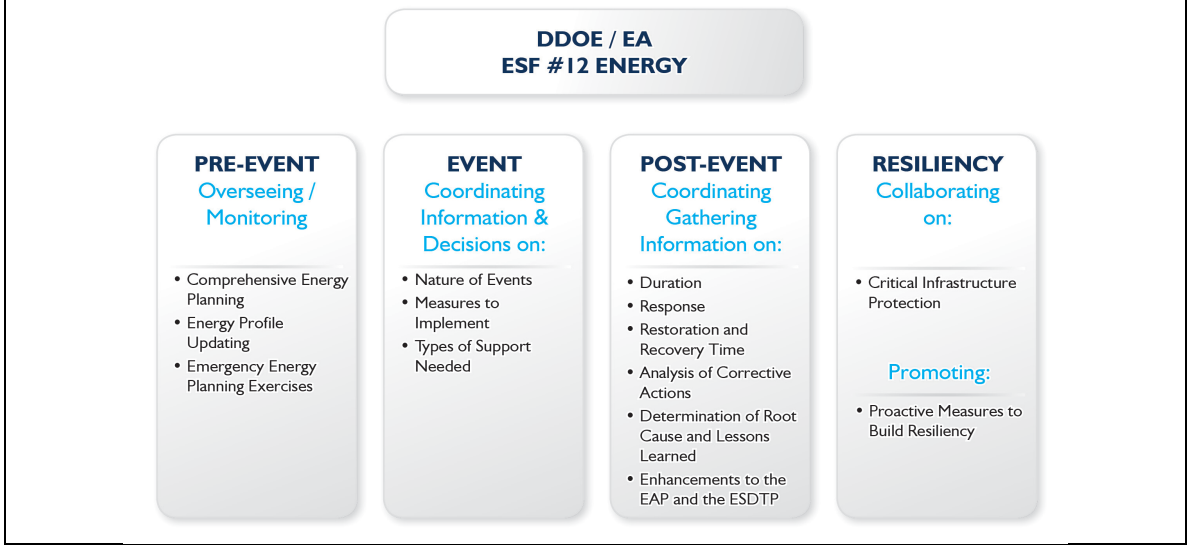
PGA	Propane Gas Association
PJM	PJM Interconnection is a regional transmission organization (RTO)
PIO	Public Information Officer
PSC	DC Public Service Commission
RDP	Renewable Demonstration Program
REIP	Renewable Energy Incentive Program
UASI	Urban Area Security Initiative
WMDA	Washington, Maryland, Delaware Service Station and Automotive Repair Association
WebEOC	Web Emergency Operations Center

1 Executive Summary

The Energy Assurance Plan of the District of Columbia (EAP) updates the District's 2005 Energy Emergency Plan (EEP). This update clarifies the role of the DC Department of the Environment (DDOE) in promoting energy assurance. In the 2005 EEP, the role of the predecessor agency to the current Energy Administration (DDOE/EA) was an "operational role." The guiding principle for the current EAP is that DDOE is an "information sharing and coordinating agency." This shift is due to several reasons: (1) the structure of the energy industry in the District, (2) the structure of the District Homeland Security and Emergency Management Agency (HSEMA), (3) implementation of the Web-based Emergency Operations Center (WebEOC), and (4) the creation of the new DDOE.

DDOE's information and coordinating roles fall into four areas: pre-event, event, post-event and resiliency.

Table E-1: DDOE/EA Roles in Promoting Energy Assurance



1. **Pre-Event Responsibilities:** These include activities such as comprehensive energy planning, maintaining a current energy profile of the District, and planning and participating in emergency planning exercises.

2. **Event Responsibilities:** These relate to coordinating the gathering and sharing of information during an event.

3. **Post-Event Responsibilities:** These relate to coordinating the process to develop "lessons learned" and to share those lessons.

4. **Resiliency Responsibilities:** These relate to participating in policy development related to critical infrastructure protection and promoting policies and programs that enhance the resiliency of the District's energy systems.

Section 2: Purpose of EAP

The purpose of this EAP is to provide information on how the District, in general, and the DDOE, in particular: (1) will respond in case of an energy emergency and (2) will promote the resiliency of the District's energy systems to reduce vulnerabilities. This section provides the basic guide for what DDOE and other Emergency Support Function (ESF) #12 organizations will be doing pre- and post-event by addressing several questions:

1. What types of energy emergencies can occur in the District?
2. Who responds to an energy emergency in the District?
3. What is the planned course of action when an energy emergency occurs?
4. What follow-up is conducted after an energy emergency?

Section 3: Energy Profile of the District of Columbia

Monitoring the energy profile includes keeping track of: (1) The drivers of energy supply, demand and prices, which include the trends in energy costs and expenditures; (2) The energy regulatory environment and the extent to which it supports energy assurance; and (3) The energy market structure and the extent that it fosters or hinders energy assurance. Keeping track of these components of the energy profile in the District provides: (1) information on how well the District is meeting its overall energy goals and objectives, and (2) information to support revising existing energy policies and programs or developing new ones.

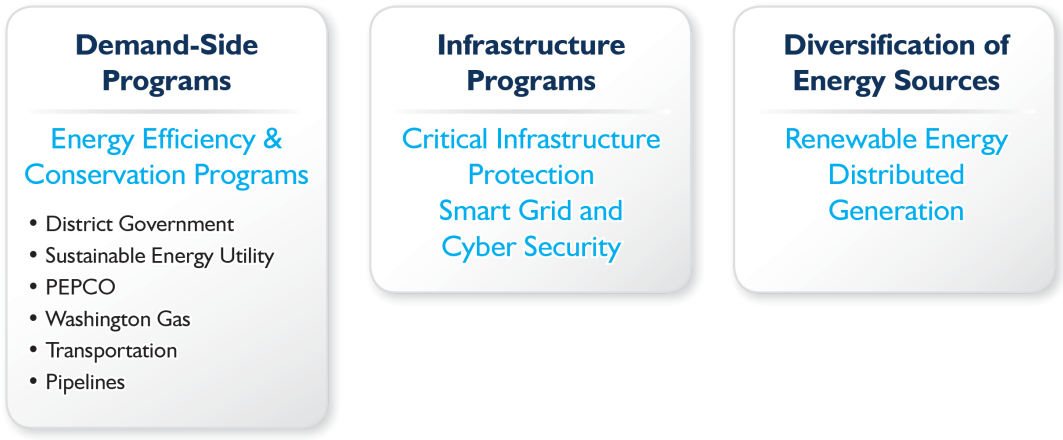
Section 4: Energy Supply Disruption Tracking Plan (ESDTP)

The ESDTP provides a process by which energy supply and demand information is monitored and analyzed regularly.

Section 5: Resiliency

One of the major overarching goals of the Mayor's Sustainability Plan is to promote the resiliency of the energy systems in the District. DDOE's ongoing activities to enhance the resiliency of the District's energy systems include developing and/or promoting demand-side programs and infrastructure programs. DDOE works with ESF #12 and other organizations to insure that policies, programs, and practices are in place to continually enhance the District's energy resiliency.

Figure E-2. DDOE/EA Roles in Promoting Energy Resiliency



Section 6: Emergency Support Function #12 – Energy

This section reproduces the description of the ESF #12 that appears in the 2011 District Response Plan (DRP). The section lists the lead and support agencies and the roles and responsibilities of these agencies.

2 What to do in Case of an Energy Emergency

This section outlines the roles, responsibilities and various steps the District, DDOE, and various partners will take during an energy emergency. The roles, responsibilities, and steps are outlined by providing answers to the following questions:

1. What is the purpose of the EAP?
2. What are the sources and uses of energy in the District?
3. What types of energy emergencies can occur in the District?
4. Who responds to an energy emergency in the District?
5. What is the planned course of action when an energy emergency occurs?
6. What follow-up is conducted after an energy emergency?
7. What can be done to create an increasingly resilient energy system and protect critical infrastructure?

2.1 What is the Purpose of the EAP?

The purpose of this EAP is to provide information on how the District, in general, and the DDOE, in particular: (1) will respond in case of an energy emergency and (2) will promote the resiliency of the District's energy systems to reduce vulnerabilities. This section provides the basic guide for what DDOE and other ESF #12 organizations will be doing pre- and post-event by addressing several questions.[2]

The District previously updated its EAP in 2005. The 2005 EAP identified the major operational roles of DDOE in the event of an energy emergency. Many of those roles were carried over and included in the 2008 and 2011 District Response Plan (DRP). The DRP functions as the District's manual for responding to any emergency situation. Subsequent to the 2005 EAP and the 2008 DRP, particularly after the events of 9/11, many major functions are now being carried out by HSEMA.

Given the characteristics of energy supply and distribution in the District, the energy suppliers and distributors will be the first responders to an energy emergency in terms of restoring service. To that extent, DDOE, in particular, and the District, in general, will have to work closely with the District's energy suppliers and distributors to ensure that responses to an energy emergency are appropriate.

The District's 2012 EAP provides the context for how the District Government will interface with its energy suppliers and distributors, energy consumers, and the public.

[2] This EAP is a functional annex to the 2011 District Response Plan (DRP). The DRP links the District emergencies to responses by agencies of the District Government and its federal and regional partners.

Clarifying this interface process is the key component of this update to the District's Energy Emergency Plan.

In addition to this interface role, DDOE is responsible for promoting the resiliency of the District's energy system. Section 5 of this EAP includes a description of the steps the District has taken to increase resiliency.

In the past, DDOE's role in energy emergency planning has been centered on operations. Since the 2005 EAP, DDOE's role has shifted to include facilitating and coordinating the flow of information during responses to energy events and emergencies. This update follows the National Association of State Energy Officials' (NASEO) 2009 *State Energy Assurance Guidelines.*[3]

2.1.1 Key Premises of this EAP

This EAP is based on two key premises:

1. **HSEMA initiates notification of an energy emergency:** HSEMA initiates government responses to energy emergencies as outlined in the 2011 DRP or future updates to the DRP. The DRP provides the mechanism for the District Government and Intergovernmental Network to coordinate the responses of agencies and other groups.
2. **The District's energy suppliers and providers initiate the primary response in restoring service:** Energy suppliers and energy providers are primarily responsible for identifying and responding to an energy emergency. To that end, DDOE needs to have an ongoing review process for how well its EAP works in conjunction with responses taken by energy suppliers and providers during an emergency. DDOE will work with energy suppliers and providers to ensure that the plans are adequate and that they can provide the appropriate real-time information in the case of an energy emergency.

2.1.2 DDOE's Responsibilities

DDOE has four key responsibilities. DDOE will:

1 Review the EAPs of energy suppliers and providers and make recommendations to them or to their regulatory or legislative bodies. This step will ensure that appropriate procedures are in place to respond to an energy emergency and will provide adequate, real-time information during an emergency. In addition, DDOE will also ensure that these EAPs contain adequate cyber security measures to reduce vulnerability from cyber attacks.

[3] This EAP focuses on energy emergencies, following the guidelines provided by NASEO, and incorporates the operational concept as expressed in the 2011 DRP.

2 Coordinate the flow of information regarding an energy emergency and collaborate with HSEMA, energy suppliers, and distributors to determine the severity of an event and the types of measures that need to be implemented.
3 Coordinate the after-event assessment.
4 Promote policies and programs to improve the resiliency of the District's energy systems.

2.2 What are the Sources and Uses of Energy in the District?

Typically an energy emergency results from the disruption of an energy supply. Any energy supply disruption has the potential to cause economic, health, or other dangers. In the District, tracking and assessing energy emergencies are largely shaped by the relative proportions of energy consumed in the District. See Section 3 for the District's full energy profile.

Figure 1: Sources of Energy in the District of Columbia

Type of Energy	Percentage of Total
Electricity	70.4%
Natural Gas	18.3%
Petroleum	11.3%
All Others	0.1%
Total	**100.0%**

Source: EIA, State Data Systems, District of Columbia (1960-2010)

Based on 2010 data from the Federal Department of Energy's (DOE) Energy Information Administration (EIA), within the geographical boundaries of the District, electricity comprised 70.4% of the energy consumed; natural gas, 18.3%; and petroleum, 11.3%.

2.2.1 Brief Description of Petroleum and Propane Supply Chain

Petroleum

The District's annual petroleum consumption is 3.9 million barrels (21.5 billion btu). Petroleum is used in the District for transportation fuel (gasoline and diesel) and heating.[4] The breakdown of uses is:

- Gasoline—2.7 million barrels
- Distillate (heating oil and diesel fuel)—1.2 million barrels
- Jet fuel—0 barrels

Propane

The District's annual propane consumption is a relatively small share of total energy consumed. It is a relatively clean fuel that does not require significant infrastructure cost on the part of real estate developers. Propane is used in the District for cooking, heating, forklift truck fuel, and other purposes.

[4] 2010 data from DOE's EIA.

A 2004 study for the National Propane Gas Association[5] estimated the uses of propane in the District:

- Residential—48.2%
- Industrial and internal combustion engines—25.1%
- Commercial—21.6%
- Cylinder and farm—5.1%

2.2.2 Brief Description of Natural Gas Supply Chain

The commercial sector consumes 56% of the natural gas in the District and the residential sector consumes 41% of the natural gas used in the District. Natural gas provides heat for 65% of homes in the District.[6]

Figure 2: District of Columbia Natural Gas Consumption in 2010

Sector	Consumption
Residential	13.8 billion cubic feet
Commercial	18.8 billion cubic feet
Industrial	0 cubic feet
Electric Power	0 cubic feet
Internal use in transmission, distribution	0 cubic feet
Total	**33.8 billion cubic feet**

Source: EIA, State Data Systems, District of Columbia (1960-2010)

2.2.3 Brief Description of Electricity Supply Chain

The commercial sector consumes about 79% of the electricity in the District; the residential sector consumes 18%.

Twenty-four percent (24%) of the District's homes are heated with electricity, and there are significant numbers of District employees who work from home, making reliable electric power important to their everyday productivity. The District's commercial and industrial sectors have critical information technology and communications and laboratory activities that are dependent on a reliable supply of electricity. Other energy forms also depend on electricity for pumping, control, and communications.

Figure 3: District of Columbia Electric Energy Consumption in 2010

Sector	Consumption (in million kilowatt hours)
Residential	2,123
Commercial	9,209
Industrial	230
Transportation	315
Total	**11,877**

Source: EIA, State Data Systems, District of Columbia (1960-2010)

The electric supply system is comprised of electricity generation (and its fuel supply), high voltage (hundreds of kilovolts) transmission lines over long distances, and local distribution lines at lower voltage (tens of kilovolts). Electricity then flows to

[5] Energy and Environmental Analysis, Inc. *Study of the Propane Industry's Impact on US and State Economics.* November 2004. Available here: http://www.npga.org/files/public/Economic_Study_Propane_Value_Final.pdf.
[6] 2010 data from DOE's EIA.

transformers serving one to a few customers where the voltage is reduced to utilization voltages (hundreds of volts to a few tens of kilovolts).

Electricity is different from other energy forms in that there is no storage at the local level and only limited storage in hydropower plants at large, central locations. In addition, because electricity is distributed in overhead transmission and distribution lines vulnerable to storm damage, electricity is more prone to outages than other energy forms. These considerations require significant, redundant assets including personnel, trucks, and other resources, that are provided by pooling assets over a wide geographic region. This asset sharing must be coordinated on the basis of meeting a rapidly changing, instantaneous demand. For that reason, federal, regional, state, and local regulation and coordination of the electric supply system is governed by well-defined procedures and communication. There is little room for ambiguity about the existence of a problem—it is either associated with a precisely defined equipment problem (caused by a technical failure, an operator error, or a deliberate act) or an obvious storm situation—which will be a major subject of news programs and public service announcements.

2.3 What Types of Energy Emergencies Can Occur in the District?

2.3.1 Definitions

The DRP uses the definitions of an emergency and a major disaster as defined in the Robert T. Stafford Disaster Relief and Emergency Assistance Act (as amended, 42 U.S.C. 5121 et seq.):

Emergency—any occasion or instance for which, in the determination of the president, federal assistance is needed to supplement state and local efforts and capabilities to save lives, protect property and public health and safety, or lessen or avert the threat of a catastrophe in any part of the United States.

Major disaster—any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion in any part of the United States, which, in the determination of the president, causes damage of this Act to supplement the efforts and available resources of states, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.

An emergency, including a fuel shortage emergency, may sever key components of the District's energy infrastructure. This may constrain fuel supplies in the affected areas and will adversely impact adjacent areas, especially those with supply links to the directly affected areas. Such an event also could affect transportation, communications, and other infrastructure necessary for sustaining public health and safety. It also could affect continuity of government operations as well as a number of critical infrastructures within the District.

2.3.2 Energy Emergencies in the District

Energy emergencies in the District have traditionally fallen into three categories:

1. Supply Disruptions
2. Internal/Distribution Disruptions
3. Price Disruptions

Figure 4: Types of Energy Emergencies	
Supply Disruptions (Shortage)/External	The District, except for a small amount of solar and co-generation, imports all of its energy. Major potential supply disruptions, or delivery disruptions, may occur to the system delivering energy to the District.
Internal/Distribution Disruptions	Internal/distribution disruptions are disruptions to the distribution system that prevent a sufficient energy supply from being delivered to the end user in the District. Internal/distribution disruptions include equipment malfunction, power lines being down, or weather-related supply disruptions.
Price Disruptions/External	Price disruptions occur when there are rapid increases in the price of energy. Since prices are determined to a large degree in international energy markets, a jurisdiction that imports all its energy has little control over the rates of change and level of prices. Rapid increases in energy prices and historically high levels of energy prices can alter public behavior.

2.3.3 Past Energy Disruptions in the District of Columbia

Since the energy crisis of the 1970's, the District has experienced each type of energy emergency.[7] For the District, weather-related events have been the major sources of disruption of electricity. In 2010, major snowstorms in February and major thunderstorms in July significantly interrupted electricity. While Hurricane Katrina in 2005 and the BP Oil Spill in 2010 had the potential to disrupt the flow of natural gas and petroleum, the District did not experience any adverse effects from these two major events.

In 2010, the reliability of electricity distribution in the District became an issue. In December 2010, a major newspaper article analyzed the reliability challenges of PEPCO. Several of the issues reported had been the subject of legislative and regulatory inquiries. In 2012, the June 29 derecho raised additional questions on the reliability and resiliency of the electric grid in the District. More information about this event is presented in Section 5.8.2

The District followed its normal disaster response protocols during major disruptions. Since the District does not have any direct control over the supply of energy, its role is mainly one of monitoring events, providing assistance to the private suppliers (for example, equipment and personnel), and mitigating the effects of energy disruptions (for example, encouraging the curtailment of non-essential uses; in the winter months, heating

[7] See the 2005 EAP for a history of energy vulnerabilities prior to 2005.

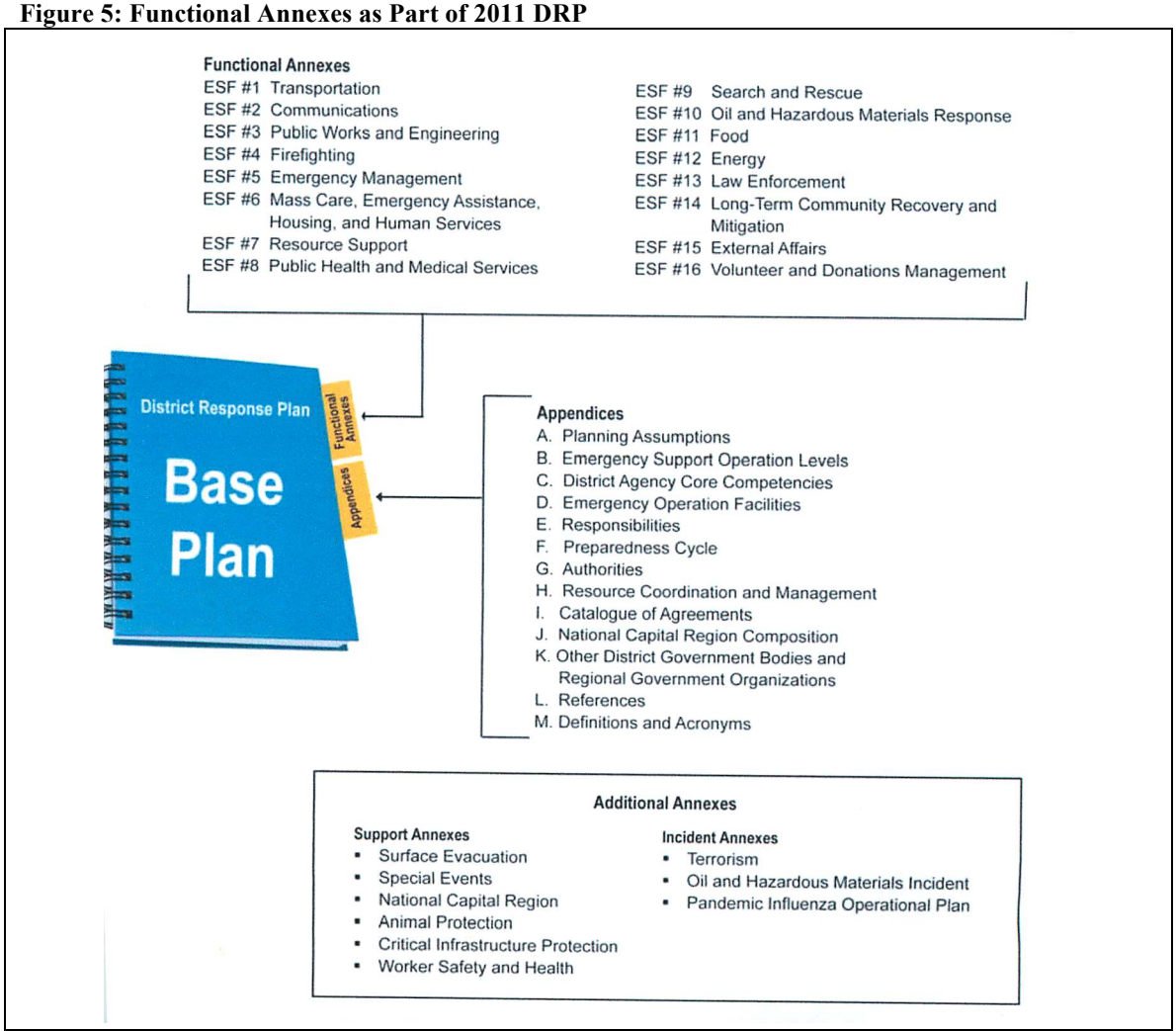
centers are opened and portable heaters provided; and in the summer months, cooling centers are opened and portable fans provided).

2.4 Who Responds to an Energy Emergency in the District?

2.4.1 Legal Authorities, Roles, & Responsibilities

The 2011 DRP identifies several policy guidelines that the District follows in response to an emergency event. This EAP is a functional annex to the 2011 DRP, and incorporates some of the guidelines identified in ESF #12.

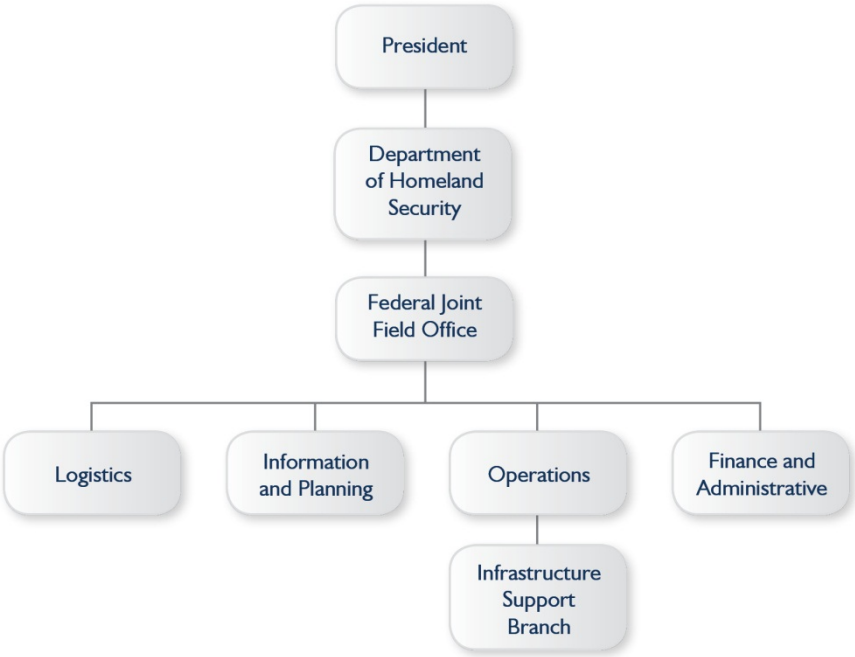
Figure 5: Functional Annexes as Part of 2011 DRP



Source: 2011 DRP

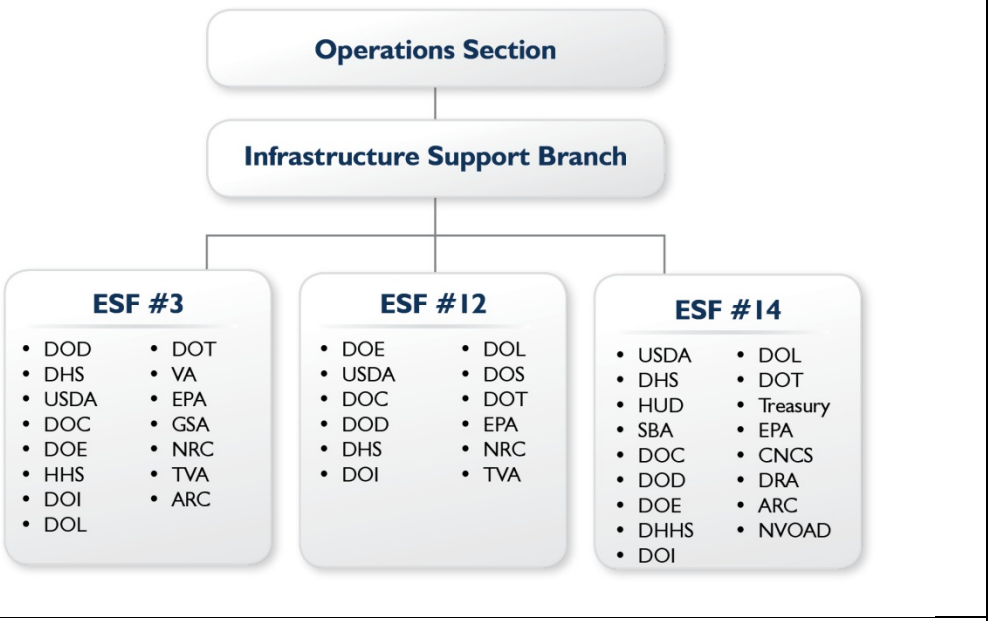
The authorities and roles and responsibilities flow from the federal level, starting with the president of the United States (See Figure 6 and Figure 7), to the mayor of the District, to the agencies in the District (See Figure 8).

Figure 6: Incident Command: Federal



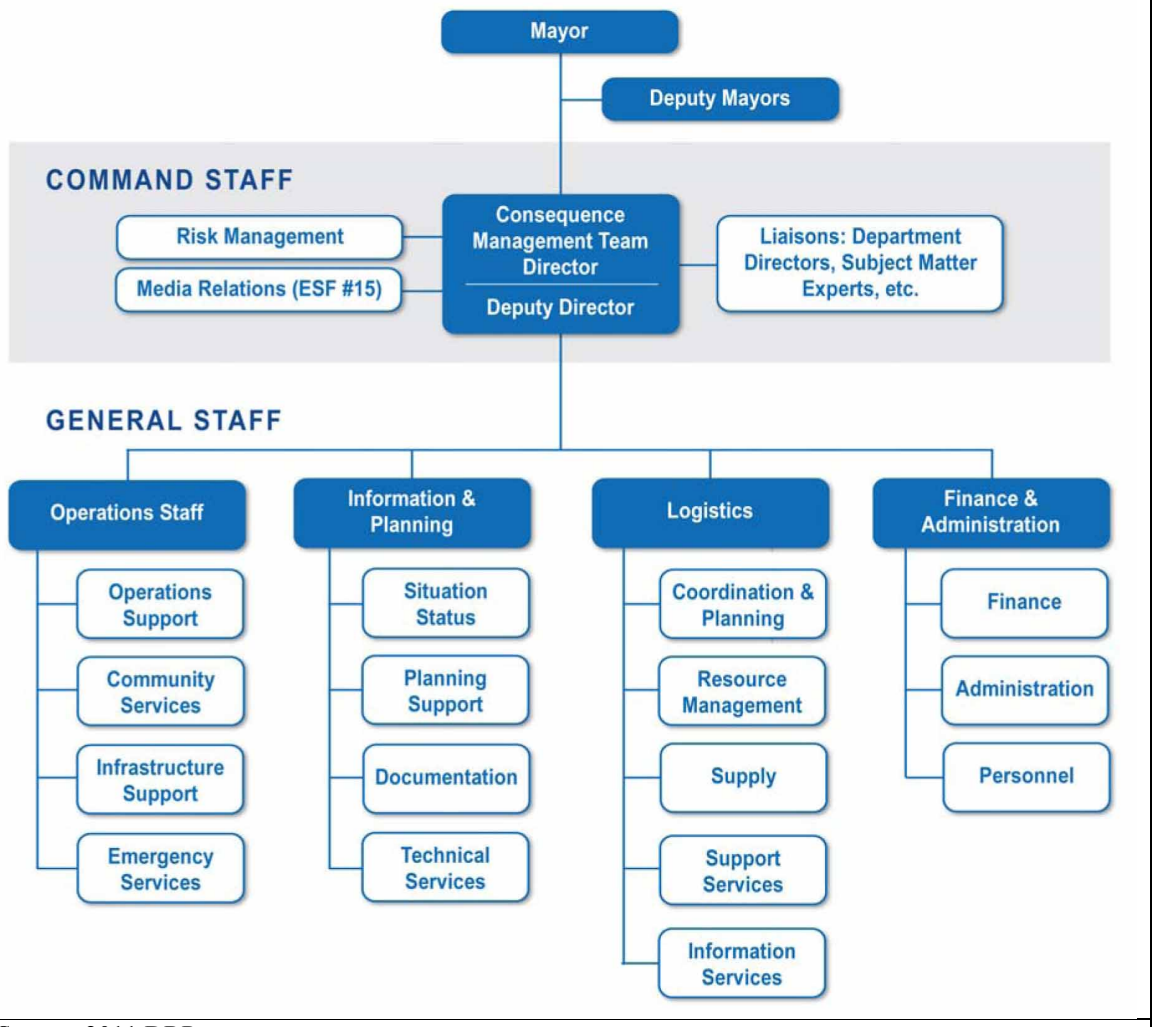
Source: 2011 DRP

Figure 7: Federal Joint Field Command



Source: 2011 DRP and January 2008 National Response Framework

Figure 8: Incident Command: District of Columbia

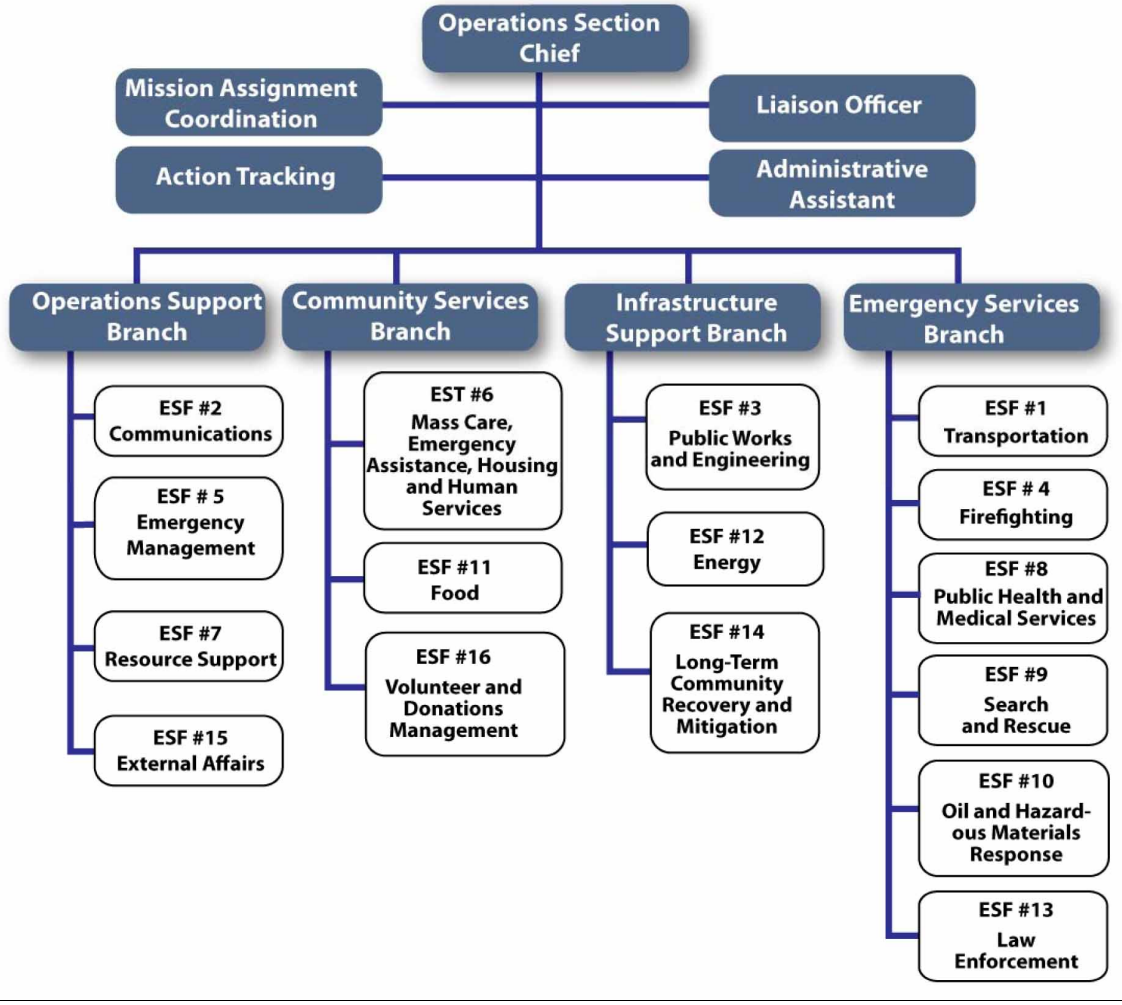


Source: 2011 DRP

2.4.2 Relationship to Other Federal, Regional, and Local Plans

The DRP links the District emergencies to responses by agencies of the District Government and its federal and regional partners. This EAP fits within the DRP's operational concept.

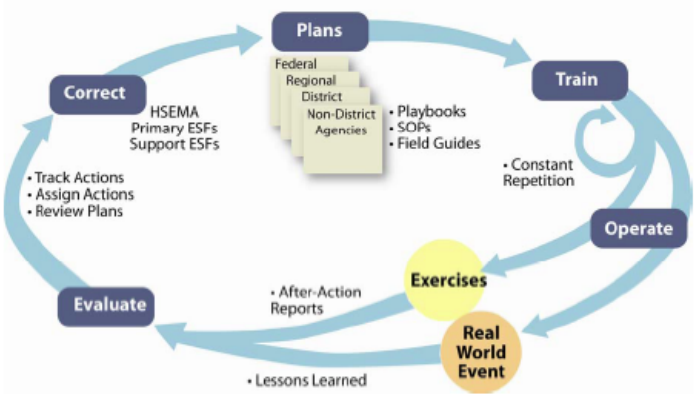
Figure 9: HSEMA Operations Section



Source: 2011 DRP

Parties responsible for implementing this EAP will receive training on the plan and tabletop exercises will be held. Based on the training and the exercises, the EAP will be evaluated and corrected. Likewise, after a real-world event, this EAP will be evaluated and corrected.

Figure 10: DRP Operational Concept

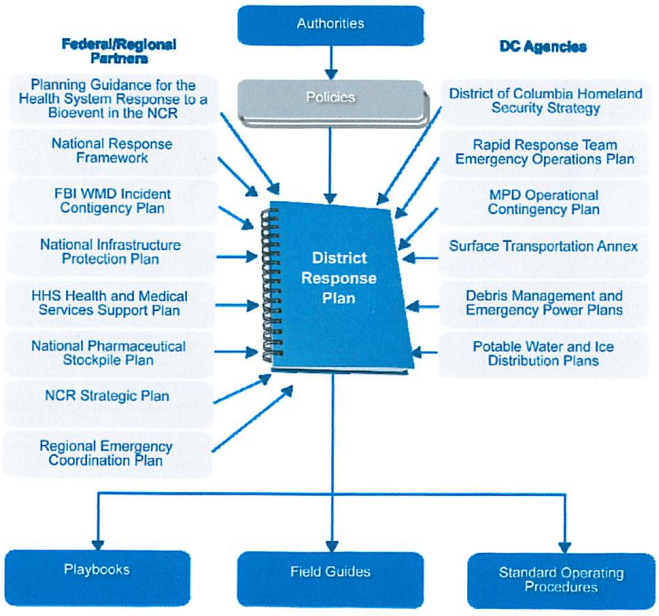


Source: 2011 DRP

While the DRP focuses on the coordination and capabilities of District Government agencies, the plan also recognizes that the District Government can take few actions in major disaster operations that do not directly or indirectly impact and need the support of its regional partners.

The DRP is intended to address the functional interaction with jurisdictions outside of District boundaries in coordination with regional councils, especially in the areas of communications, public information, transportation, public safety, health, schools, and utilities. The District will continue to work with regional councils to enhance and maintain this functional interaction.

Figure 11: Relationships of the DRP to Other Plans



Source: 2011 DRP

The combined emergency management authorities, policies, procedures, and resources of the District, in addition to regional partners, the federal government, and other entities (e.g., international organizations, voluntary disaster relief organizations, and the private sector) constitute an intergovernmental emergency response network for providing assistance following an emergency.

Within this network, the District may provide personnel, equipment, supplies, and facilities, as well as managerial, technical, and advisory services in support of emergency assistance efforts. Various District, regional, and federal statutory authorities and policies establish the basis for providing these resources. A list of emergency response and recovery-related directives, together with a summary interpretation of each legal citation, has been compiled in the 2011 DRP. The DRP may be used in conjunction with partner state and local plans, federal emergency operational plans developed under statutory authorities, and Memoranda of Understanding (MOU) among various federal agencies.

The DRP may be implemented concurrently with a number of federal and regional emergency operation plans (e.g., the National Contingency Plan (NCP) and the Federal Bureau of Investigation (FBI) Weapons of Mass Destruction Incident Contingency Plan). The DRP is supported by tactical policies and procedures (e.g., standard operating procedures). District agencies with major operational roles also maintain operations plans specific to their agency's emergency response roles and responsibilities.

2.4.3 DDOE's Roles as Outlined in the 2011 DRP

The DRP is modeled on the National Response Plan (NRP). The NRP organizes agencies into functional groups called ESFs. The ESFs provide an organizational means for agencies to coordinate their resources to respond to an emergency. ESF #12 is the designated ESF for energy. The 2011 DRP specifies DDOE as the lead for ESF #12.

Figure 12: DDOE's ESF #12 Energy Functions

ESF	Area	DDOE's Primary Function
ESF #12	Energy	Emergency Support Function (ESF) #12—Energy helps restore the District of Columbia's energy systems during and/or following an emergency. The DDOE is the primary agency in the District responsible for coordinating with all other governmental department response elements and utilities to restore the District's energy systems. ESF #12 gathers, assesses, and shares information on energy system damage and estimates the impact of energy system outages/shortages within the District. The purpose of this ESF is to facilitate restoration of energy systems and fuel supplies during and/or following an emergency. Power and fuel are critical to protecting lives and property and maintaining the continuity of the government.
Source: 2011 DRP		

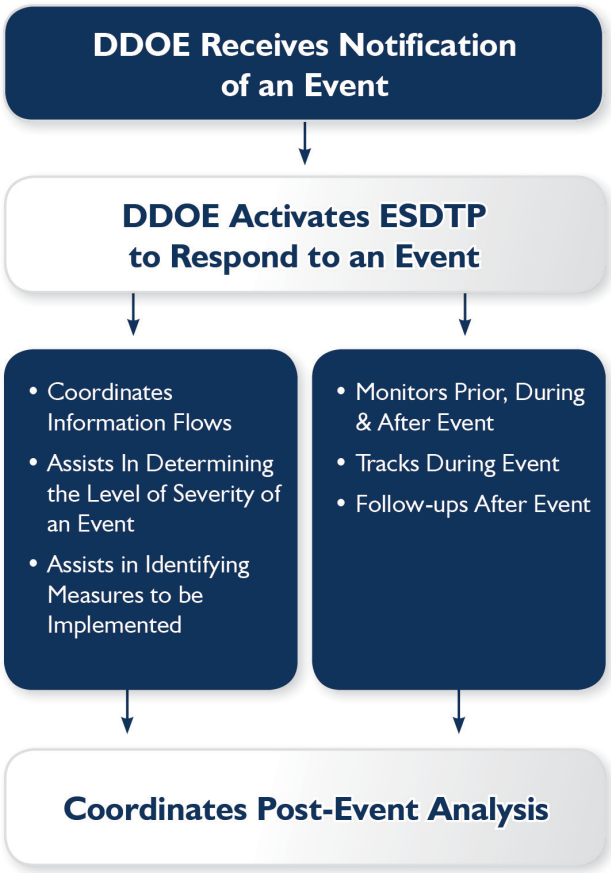
Figure 13: DDOE's ESF Support Functions Related to Energy		
ESF	**Area**	**DDOE's Support Functions**
ESF #2	Public Works & Engineering	Will coordinate with ESF #2 to help facilitate the restoration of energy systems and fuel supplies following an emergency.
ESF #3	Communications	Will coordinate with ESF #3 to help facilitate the restoration of energy systems and fuel supplies following an emergency. DDOE will also (with DC Water) provide the necessary representation at the Emergency Operations Center (EOC), and the Consequence Management Team (CMT) emergency liaison officer (ELO) will remain at the EOC until deactivated or released by the CMT Director.
ESF #5	Emergency Management	Will provide the "ESF Essential Elements of Information" outlined in Section 2.5.2.1, and provide situational awareness.
ESF #15	External Affairs	Will provide timely, effective, and accurate information to the citizens and visitors of the District. In the event of an emergency, each District entity shall coordinate the distribution of information to ESF #15. Information will be disseminated to the public, the media, and other involved organizations through the Office of Communications, Executive Office of the Mayor (EOM) to ensure accurate, consistent, timely, and reliable information.
ESF #17	Private-Sector Coordination	Will assist with ESF #17 in ensuring energy needs are met for long-term recovery efforts.
Source: 2011 DRP		

2.4.4 DDOE's Roles & Responsibilities At-A-Glance

The 2011 DRP identifies responsibility for management decisions in case of an emergency. The DRP places management decisions for an energy emergency in ESF #12—Energy. ESF #12 outlines the concept of operations and the incident life cycle.

In the case of an emergency event, DDOE (1) must participate in the pertinent decision-making processes, (2) help determine the level of severity of the event, and (3) suggest the types of measures to implement, if necessary. DDOE must have a process in place to help monitor, track, and assess an event. DDOE will use the framework of its ESDTP.

Figure 14: DDOE's Roles &Responsibilities At-A-Glance*



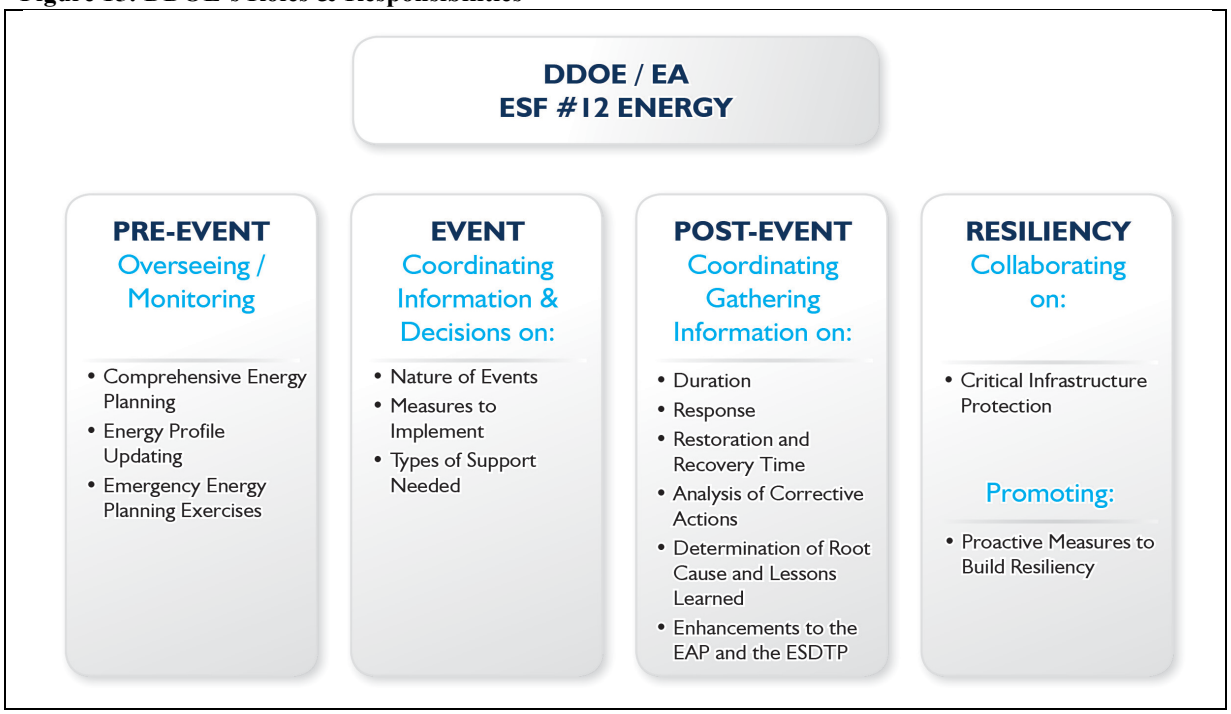
*These roles and responsiblities flow from the concept of operations and incident life cycle outlined in the 2011 DRP.

Source: 2011 DRP

DDOE's responsibilities fall into four broad categories:

5. **Pre-Event:** Responsibilities include DDOE's activities related to monitoring and readiness. They are part of the on-going operations of the DDOE/EA and include such activities as comprehensive energy planning, maintaining a current energy profile of the District, and planning and participating in emergency planning exercises.
6. **Event:** Responsibilities include DDOE's activities related to coordinating the gathering and sharing of information during an event.
7. **Post-Event:** Responsibilities include DDOE's activities related to coordinating the process to develop "lessons learned" and to share those lessons.
8. **Resiliency:** Responsibilities include DDOE's activities related to participating in policy development related to critical infrastructure protection and promoting policies and programs that enhance the resiliency of the District's energy systems.

Figure 15: DDOE's Roles & Responsibilities



Considering the patterns of energy supply in the District, the first-line respondents to an energy supply disruption will be the energy suppliers/providers. It is important for the District to have a structure in place to work with energy suppliers and distributors that:

1. Coordinates information flows about the event.
2. Assists in determining the level of severity of an event.
3. Assists in identifying measures to be implemented.
4. Coordinates post-event analysis.

Given the above conditions, the role of DDOE in an energy emergency is circumscribed. DDOE will:

1. Coordinate information gathered from external sources. The District will use its tracking and assessing plan as a framework for working with other supporting organizations. This framework ensures that there is a timely flow of information to the mayor, energy users, and the public in the case of an energy supply disruption.
2. Coordinate with all ESF #12 support agencies to help facilitate the flow of information needed by the mayor, energy users, and the public about the restoration of energy systems and fuel supplies following an emergency.
3. Coordinate the assessment of how an energy supply disruption was handled so that "lessons learned" can be shared with the mayor, supporting agencies, energy users, and the public.
4. Use the tracking and assessing plan to monitor and share the type of information that the mayor, energy users, and the public will need to know during and after an energy supply disruption.

5. Work with the Council and the Public Service Commission (PSC) to ensure that there is an appropriate level of regulation of energy suppliers, particularly in reporting on and responding to energy emergencies.
6. Use energy programs to promote energy resiliency.

2.5 How Will DDOE Respond to an Energy Emergency?

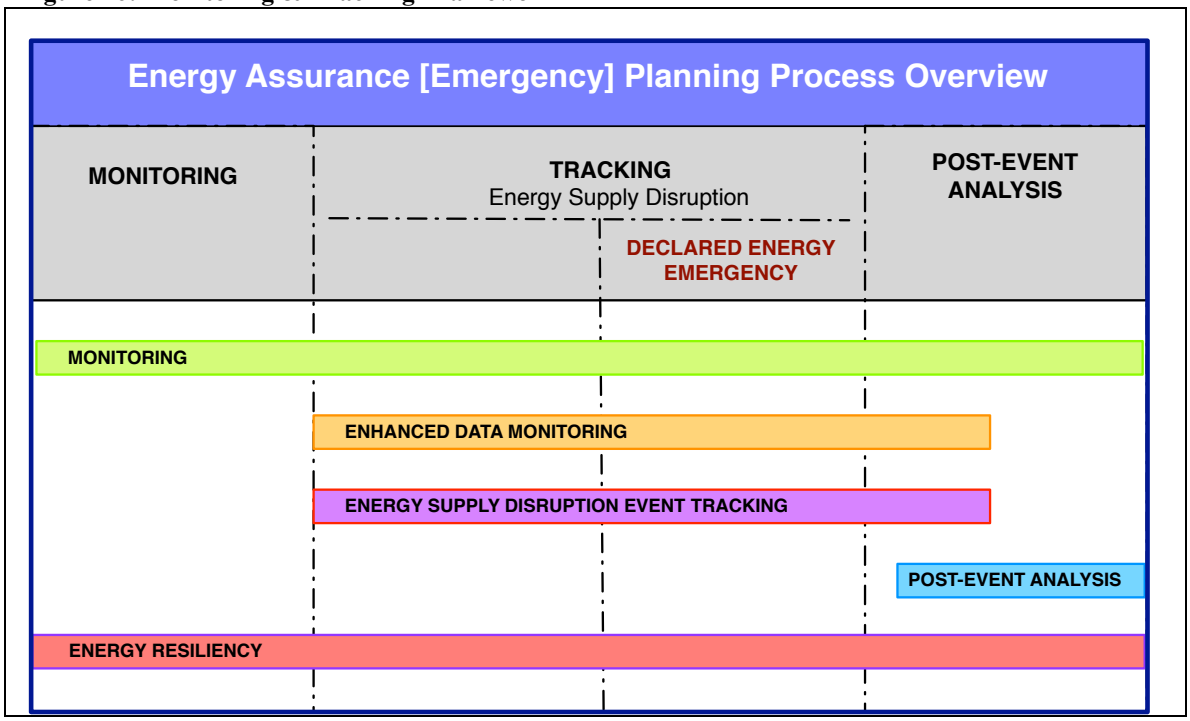
In the event of an energy emergency, DDOE will:

1. Track information during an event.
2. Provide situational awareness of the event.
3. Assist in developing management decisions to respond to the event.

2.5.1 Tracking Information during an Event

To track events, DDOE will utilize a framework for tracking energy supply disruptions. See Section 4.

Figure 16: Monitoring & Tracking Framework



To track an event, DDOE will need to obtain information from energy suppliers and distributors. DDOE will seek information necessary to maintain a real-time log—an Energy Supply Disruption Tracking log. When conditions return to normal, the log will be used to prepare the post-event analysis report for the event. The log will normally contain the information shown in Figure 17.

Figure 17: DDOE's Energy Supply Disruption Tracking Log	
Time and date of each entry	2:00 PM April 28, 2011 (examples only)
Name of person making the entry	Jane E. Wind (examples only)
Source of information	EIA, PEPCO, US DOE, Washington Gas (possible sources as examples)
Type of disruption	Supply Disruptions (Shortage)/External
Start date of disruption	April 26, 2011
Duration to date	April 28, 2011
Estimated Recovery Amount (prior estimate and current estimate)	25,000 gallons and 15,000 gallons
End date of disruption	July 10, 2011
Symptoms	Long gasoline lines
Impact on end users	Closure of neighborhood gasoline stations
Number of end users affected	Number of registered vehicles in District
Region of state affected	Region-wide
Corrective actions being taken or planned	Odd and even day purchases; work schedule alteration for District employees; Limited fuel purchases
Date and time when each corrective action is initiated	7:00 am July 1, 2011
By whom	Mayor
Effect of each corrective action	Orderly distribution of limited supplies
Was the issue resolved	Yes
Is the situation improving or worsening	Improving
Date and time when each corrective action is completed or terminated	7:00 am July 15, 2011

2.5.2 Providing Situational Awareness by Coordinating Information Flows & Information

2.5.2.1 Situational Awareness

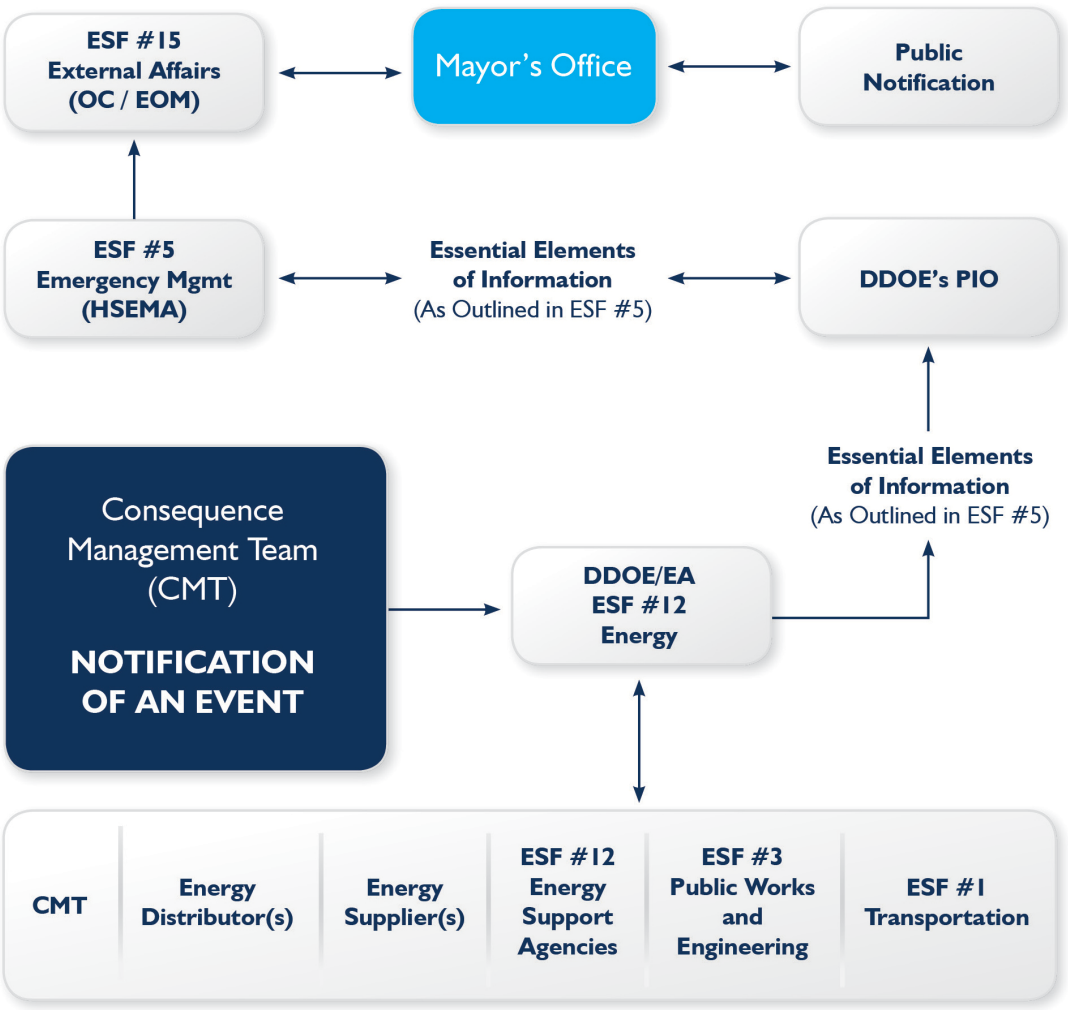
ESF #5, Emergency Management, coordinates emergency response planning and HSEMA is responsible for collecting, analyzing, processing, and disseminating information to create situational awareness. Under ESF #12, DDOE will help track and coordinate the flow of information received.

Situational awareness is the ability to identify, process, and comprehend the critical elements of what is happening as an event unfolds. From the CMT perspective, this means knowing where emergency needs are greatest; what assets are needed; how to get assets into areas where they are needed; and what the status of assets are as they move on-scene and perform actions.

Figure 18: Essential Elements of Information Coordinated By ESF #12	
1. Status of transportation systems 2. Status of key personnel 3. Major issues/activities of ESFs 4. Resource shortfalls 5. Overall priorities for response 6. Status of upcoming events 7. Location of the impacted area 8. Social, economic, and political impacts 9. Jurisdictional boundaries involved 10. Status of ESF activation	11. Historical and demographic information 12. Status of energy systems 13. Status and analysis of initial assessments (needs assessments and damage assessments, including preliminary damage assessments) 14. Status of efforts under federal emergency operations plans 15. Injuries and medical emergencies 16. Logistical problems
Source: 2011 DRP	

DDOE will assist with the flow of information regarding an event by communicating with key partners and providing information to decision-makers, stakeholders, and the public.

Figure 19: DDOE Providing Situational Awareness



INFORMATION FLOWS -- SHARING & COORDINATING -- SITUATIONAL AWARENESS		
Energy suppliers & distributors: • Identify emergencies and their implications • Notify CMT • Provide real-time information • Mitigate situation • Participate in after-event assessment	**CMT:** • Initiates response process	**DDOE:** • Coordinates information flows to promote real-time situational awareness • Assists in recommending emergency measures • Coordinates after-event assessment

2.5.2.2 Sharing & Providing Information

During an energy shortage, it is vital that accurate and timely information is provided to the public on the extent and expected duration of the shortage; what local government,

business, and industry are doing; and what individual actions should be taken by the populace to help reduce their energy consumption.

Coordinated messages and the timely dissemination of information will help dispel rumors and hearsay, minimize confusion, and boost public support and confidence. For that reason, effective communication is a vital instrument in reducing panic (e.g., it may prevent the public from stockpiling consumable energy resources like gasoline and heating oil).

ESF #15 will provide these coordinated messages. See Figure 19 above.

2.5.2.3 Documenting Actions

Based on Figure 19 above, DDOE will provide accurate and timely documentation of event actions for input into information systems and situation reports.

This documentation will:

- Provide all agencies involved with the effective communication needed to maintain situational awareness.
- Provide individuals with emergency event information which they can use to adjust their actions.

2.5.2.4 Assisting in Developing and Implementing Management Decisions

As noted earlier, DDOE will participate in decision making processes during an energy emergency. There are three types of management decisions in which DDOE must participate. Decisions must be made on:

1. The nature of an event.
2. Measures to implement.
3. Types of support needed.

2.5.3 Decisions Regarding the Nature of an Event

Figure 20: Management Decisions		
Decisions on the:		
Nature of an Event	**Measures to Implement**	**Types of Support Needed**
• Type of event • Level of severity of event • Duration of event • Remediation of event	• Supplier/distributor support measures • Demand reduction measures • User/consumer support measures • Other measures	• District • Regional partners • Federal government • International organizations • Voluntary disaster relief organizations • Private sector

The 2011 DRP outlines five operation levels to classify the estimated impact of an emergency event on the operations of the District Government. HSEMA has lead responsibility in making an initial determination of emergency event impact. DDOE will work with HSEMA to determine operation levels and the extent to which they have to be modified throughout an incident cycle.

Figure 21: District Response Plan's Operation Levels	
Operation Level 1 – Normal	Level 1 is the routine posture of District agencies as they carry out daily activities in the absence of an emergency situation while still ensuring readiness. During the course of normal operations, agencies are engaged in preparedness, training, exercise activities, and maintaining resource activities to ensure continual readiness. Operations plans are reviewed and equipment is checked to ensure that everything is ready, should the need arise.
Operation Level 2 – Guarded	Level 2 is triggered by a potential or actual emergency requiring the coordinated response of select District agencies. HSEMA alerts those District agencies and ESF agencies that would need to take action if the potential event escalates. Throughout this level, HSEMA provides regular status alerts on the threat.
Operation Level 3 – Elevated	Level 3 is typically triggered by an emergency or threat that requires most or all District agencies to respond, or prepare to respond, for a localized event that threatens life or property.
Operation Level 4 – High Risk	Level 4 requires activation of those agencies within the CMT that are directly affected by the emergency. It is triggered by highly probable hazardous conditions and a strong potential for property damage or loss of life.
Operation Level 5 – Severe Risk	Level 5 requires full CMT activation and is triggered by extremely hazardous conditions that are imminent or in progress. All primary agencies and ESF agencies are notified. Regional or federal resources may be requested to support response activities.
Source: 2011 DRP	

DDOE will work with HSEMA, energy suppliers, and distributors to determine operation levels and the extent to which they must be modified throughout an incident cycle.

2.5.4 Decisions Regarding Types of Measures

In the event of an energy shortage or disruption, District Government personnel refer to three broad categories of measures that can be implemented—demand reduction measures, supplier/distributor support measures, and user/consumer support measures. (See Figure 22.)

Figure 22: DDOE's Coordinating Types of Measures		
Demand Reduction Measures	**Supplier/Distributor Support Measures**	**User/Consumer Support Measures**
• Voluntary measures • Mandatory measures	• Personnel • Equipment • Supplies • Facilities • Managerial, technical & advisory services	• Information • Advice • Appliances (e.g. portable fans & heaters & generators) • Supplies (e.g., ice, sandbags)

2.5.5 Demand Measures

First, the District Government may appeal to the public to implement voluntary demand reduction measures. (See Figure 23, Figure 24, and Figure 25.)

2.5.6 Voluntary Measures

Figure 23: Voluntary Measures—Electricity Shortage
Encourage customers to: • Adjust indoor regulated space temperature • Reduce hot water temperature • Participate in demand response programs and opt-in programs sponsored by utilities
Electricity customers can: • Turn off lights, electronic equipment (such as computers and televisions), and appliances when not in use • Reduce wattage of light bulbs and replace traditional light bulbs with fluorescent bulbs • Clean the lint screen on washers and dryers after each load of laundry • Use electricity-intensive appliances during off-peak times only • Reduce outdoor illumination to essential lighting only (such as for security purposes)
Customers with electric heating/cooling systems should: • Clean/replace air filters monthly • Close off unused rooms and close vents in these rooms • Reduce heat level when not using space • Cover holes, gaps, and broken windows

Figure 24: Voluntary Measures—Natural Gas Shortage
Encourage customers to: • Reduce indoor heated space temperature • Reduce hot water temperature • Reduce operating hours
Natural gas consumers can: • Clean/replace air filters monthly • Close off unused rooms and close vents in these rooms • Reduce heat level when not using space • Cover holes, gaps and broken windows

Figure 25: Voluntary Measures—Petroleum Shortage
Encourage the public to: • Use public transportation • Provide priority gasoline for vanpools • Stagger retail service station operating hours • Alter work schedules
Promote: • Ridesharing • Slugging • Trip consolidation • Bicycle use • Telecommuting/teleconferencing/videoconferencing   ○ Vehicle maintenance

2.5.7 Mandatory Measures

If the voluntary measures are ineffective and/or the severity of the supply shortage worsens, the mayor may declare a state of emergency so that the District can institute mandatory demand reduction measures. (See Figure 26, Figure 27, and Figure 28.)

Figure 26: Mandatory Measures--Electricity Shortage
Upon recommendation by DDOE, the Mayor may issue an Executive Order to: • Reduce indoor regulated space temperature • Reduce hot water temperature • Reduce government facility hours • Close government facilities • Reduce advertising lighting

Figure 27: Mandatory Measures--Natural Gas Shortage
Upon recommendation by DDOE, the mayor may issue an Executive Order to: • Reduce indoor heated space temperature • Reduce hot water temperature • Notify interruptible natural gas customers • Reduce government facility hours • Close government facilities

Figure 28: Mandatory Measures--Petroleum Shortage	
Upon recommendation by DDOE, the mayor may issue an Executive Order to:	
• Limit amount of fuel one can purchase at a time • Institute odd-even days to purchase gasoline • Mandate employer ridesharing • Reduce vehicle use by District Government employees	• Mandate Emergency Building Temperature Restrictions (EBTR) • Implement a compressed work week • Mandate one- or two-day vehicle sticker plan • Reduce retail hours

2.5.8 Decisions Regarding Types of Support Measures Needed

Within its emergency management authorities, the District may provide personnel, equipment, supplies, and facilities; and managerial, technical, and advisory services in support of emergency assistance efforts. (See Figure 29 and Figure 30.)

Figure 29: Supplier/Distributor Support Measures	
Types	**Examples**
Personnel	Workers to assist in supporting response efforts
Equipment	Tree and branch removal
Facilities	Staging areas for response events
Managerial, technical & advisory services	Identifying expertise and making it available

Figure 30: User/Consumer Support Measures	
Types	**Examples**
Information	General information on emergency
Advice	Best practices
Appliances (e.g. portable fans & heaters & generators)	Government and relief agencies
Supplies (e.g., ice, sandbags)	Identification of pickup locations by supply type
Providing in-place assistance	Community Services and Infrastructure Support Branches of the Operations Staff Section
Providing recovery sites	Identification of staging sites and shelters, e.g., RFK stadium, DC Armory, etc.

2.6 What Follow-up is Conducted after an Energy Emergency?

2.6.1 Stand Down

Once incident goals and objectives have been achieved, and/or a centralized District coordination presence is no longer required, the CMT implements the demobilization plan. This action will transfer responsibilities to recovery assistance for program oversight and monitoring. Following complete demobilization, responsibilities shift back to individual agencies' District offices.

2.6.2 How Will the Event be Followed Up?

After an emergency event has been resolved, DDOE will participate in a post-event analysis. The analysis will evaluate all events associated with the disruption from the first indication to its resolution. (See Figure 31.)

Figure 31: Elements of a Post-Event Analysis
• Duration—length of time of energy supply disruption • Response—corrective actions taken • Restoration and recovery time • Analysis of corrective actions—determining effectiveness • Determination of root cause and lessons learned • Revisions or enhancements to the EAP and the ESDTP

This analysis begins with the first indication of a problem (including data monitored prior to the disruption). The analysis then proceeds with industry/supplier and District actions taken, their effectiveness, and the effects of the actions on the District, supply chain participants, end users, and the public.

Figure 32: Questions Needing Answers
• Would additional data or more frequent monitoring have provided earlier indications of problems? • Were the data collected during the event adequate in determining effective corrective actions? • Were the data helpful in managing the event? • Were the corrective actions successful? Based on the assessment of this information, recommendations to change the ESDTP, and perhaps the EAP itself, will be made.

Following an emergency, the DDOE submits an after-action report through the CMT Information and Planning Section to HSEMA. The report details problems encountered and key issues affecting District performance. Data from these issues and targeted reviews are analyzed and provided, as appropriate, to HSEMA management and to the Emergency Planning Council (EPC) for consideration. After a major disaster or unique emergency operation, HSEMA may convene an interagency forum to identify lessons learned. Each District agency involved is encouraged to keep records of its activity in preparation of its own after-action report.

2.7 What Can Be Done to Create an Increasingly Resilient Energy System?

As outlined in Figure 15 above, there are four areas related to DDOE's roles and responsibilities: 1) pre-event, 2) event, 3) post-event and 4) resiliency.

There are two primary roles and responsibilities when considering the District's plan for energy resiliency, the pre-event roles and responsibilities of "overseeing and monitoring" and the resiliency roles and responsibilities of "collaborating on critical infrastructure protection and promoting measures to build resiliency."

2.7.1 Enhancing the Resiliency of Energy Systems in the District

Developing a plan to increase resiliency prior to an energy emergency ensures that the District can quickly mitigate or help lessen the impacts of an energy disruption or emergency. Section 5 outlines the full array of actions the District and its partners are taking to increase the resiliency of its energy systems.

Resiliency defined: The federal DOE defines resiliency as "the ability to respond effectively to an energy emergency and to recover quickly from damage."[8]

Resiliency is enhanced with an effective EAP that will help restore energy services quickly following an energy disruption. Identifying critical infrastructure facilities and developing a plan to protect these facilities from threats and vulnerabilities during an energy emergency are key steps towards successfully building this resiliency.

2.7.2 Providing On-Going Monitoring

DDOE's ongoing monitoring activities include the following:

1. Comprehensive energy planning.
2. Assessing reports of the District's Sustainable Energy Utility (DCSEU).
3. Promoting programs to enhance the resiliency of the District's energy systems.
4. Reviewing, as part of emergency planning exercises, the emergency plans of energy providers and suppliers in the District, noting possible gaps, and suggesting ways to close those gaps.
5. Reviewing, as part of emergency planning exercises, the related portions of emergency plans of federal agencies that relate to energy supply disruptions, noting possible gaps, and identifying processes to close gaps if they exist.
6. Updating the District's energy profile.
7. Continuing to keep abreast of the activities of the Metropolitan Washington Council of Governments (MWCOG) National Capital Region (NCR) Critical Infrastructure Protection (CIP) Working Group (see Section 2.7.4).
8. Continuing to keep abreast of the activities of MWCOG's Energy Advisory Committee, Climate, Energy, and Environment Committee, and the Chief Administrative Officer's Committee, and continue to coordinate response efforts in accordance with MWCOG's Regional Emergency Coordination Plan.[9]
9. Periodically incorporating additional best practices and lessons learned from energy emergencies into the EAP as needed.
10. Monitor the progress of PEPCO's installation of smart grid technologies and cyber security efforts.
11. Researching the potential for creation of micro grids in the District and review the potential for energy storage solutions.
12. Ensuring that energy suppliers, critical infrastructure facilities, and the largest employers in the District have adequate emergency operations plans, or continuity of operations plans in place. The District may want to engage in on-going coordination efforts with privately-owned facilities to ensure that adequate energy backup systems are in place prior to an energy emergency.

[8] U.S. DOE. O.E. "Enabling States and Localities to Improve Energy Assurance and Resiliency Planning." Undated brochure. Available here: http://www.energyassurance.us/docs/EAP%20Brochure_092310.pdf.
[9] MWCOG. Regional Emergency Coordination Plan. Available here: http://www.mwcog.org/security/security/download/RECP_final.pdf.

13. Remain aware of any changes in energy curtailment and restoration priorities in place made by energy utilities.

2.7.3 Reducing Vulnerabilities

The District has taken steps to reduce vulnerabilities before an energy disruption occurs by:

- Helping to deploy smart grid technologies and increasing cyber security efforts (see Section 5.8 for more information on PEPCO's smart grid implementation and cyber security efforts in place to protect customer information, and Section 5.8.6 for additional benefits of smart grid technologies).
- Encouraging energy efficiency in homes, businesses, and government offices (see Figure 73 and the text that follows for energy efficiency programs in place, or in development in the District).
- Encouraging the use of renewable forms of energy and transportation (see Section 5.5 for information on renewable energy, and Section 5.11 for information on transportation).
- Diversifying energy sources to help reduce the frequency and/or duration of certain energy disruptions by reducing reliance on a limited number of energy sources (encouraging renewable energy sources and alternative transportation fuels helps diversify the District's energy sources; see Section 5.5 for information on renewable energy, and Section 5.11 for information on transportation).

The District's efforts in promoting resiliency are outlined in detail in Section 5.

2.7.4 Protecting Critical Infrastructure

A working group in the District comprised of many departments, including DDOE, is responsible for maintaining the list of critical facilities and key resources in the District. The group helps ensure that critical infrastructure is protected and that restoration priority for critical facilities is set before an energy emergency occurs. The working group communicates with relevant partners to ensure that electricity, natural gas, and transportation and heating fuel supplies are restored to these critical facilities first. The District also maintains a critical infrastructure protection plan with an energy sector-specific plan. The inventory of critical facilities and key resources and the critical infrastructure protection plan are updated periodically by the working group. All relevant information is securely stored. Critical infrastructure information is protected and only authorized personnel are permitted to access the information. Due to the sensitive nature of the critical facilities list and the critical infrastructure protection plan, this information has not been included in this version of the energy assurance plan. (See Section 5.)

2.8 Conclusion

By their nature, energy emergencies are unexpected events. However, since we understand the basic contours of "known emergencies," the District has policies, plans, and procedures in place that can guide responses when an emergency situation occurs. This EAP, together with the 2011 DRP, provides guidance on how to prepare for and respond to an energy emergency in the District.

3 An Energy Profile of the District of Columbia

Monitoring energy in the District is an on-going activity. It is a "Level 1" activity within the 2011 DRP, which outlines the necessary steps to respond to an energy emergency. For a more detailed description of operation activities, see Figure 21 above.

Monitoring the energy profile includes keeping track of:

1. The drivers of energy supply, demand and prices, which include the trends in energy costs and expenditures.
2. The energy regulatory environment and the extent to which it supports energy assurance.
3. The energy market structure and the extent that it fosters or hinders energy assurance. The energy market structure comprises the number of suppliers and distributors.

Keeping track of these components of the energy profile in the District provides (1) information on how well the District is meeting its overall energy goals and objectives, and (2) information to support revising existing energy policy and programs or developing new ones.

Figure 33 below shows the information included in the District's energy profile. This monitoring information will be updated periodically by DDOE.

Figure 33: Information Monitored

Area		Information Monitored
1	Demographic	Income and population trends
2	Energy Demand	Income, population, and energy consumption and usage by sector
3	Energy Supply	Energy sources and suppliers
4	Energy Prices	Price trends
5	Largest Energy Users	Largest employers as a proxy for largest energy users
6	Distributed Generation	Current status of distributed generation

Figure 34 below shows key findings of the information monitored in the District.

Figure 34: Key Findings

Area		Key Findings
1	Demographic	**Income:** In 2009, the District had an annual median family income of $58,553 (in 2009 dollars), while the national median was $52,029. However, recent data shows that the District, in 2009, had an average poverty rate of 16.9%, which is above the national average of 13.2%. Although middle- and upper-income households constitute the largest components of the residential sector, the District has a relatively large number of low-income households, which are

Figure 34: Key Findings		
Area		**Key Findings**
		vulnerable to rising energy prices. **Population:** Population in the District peaked at 802,178 in 1950. It began to decline after 1950 and reached its lowest point in 2000 at 572,059. Recent data (2011 estimate) indicates the District population is 617,996. This is the first time that the District's population has exceeded 600,000 since 1990. **Employment:** In 1980, there were approximately 673,000 jobs in the District. As of November 2010, there were approximately 783,000 jobs.
2	Energy Demand	While overall economic activity has increased, energy consumption has increased at a slower rate, suggesting a trend towards greater energy efficiency. The commercial sector's demand for electricity continues to be the major driver of energy usage in the District.
3	Energy Supply	In 2009, the District imported over 99% of its energy. Electricity comprised 70.8% of the energy consumed; natural gas, 18.4%, and petroleum, 10.6%. With deregulation and restructuring, both PEPCO and Washington Gas are energy distributors in the District. The District has not faced a contract fulfillment issue with any of the 50 electricity suppliers, 13 natural gas providers and eight (8) major petroleum suppliers.
4	Energy Prices	Historically, energy prices in the District have been relatively high. In 2009, the District paid the 4th highest price per million Btu of any state in the country for energy.
5	Largest Energy Users	The largest employers act as a proxy for the largest energy users. In November 2010, there were 738,300 jobs in the District. The Government sector accounted for 34% of the jobs. Thirteen of the top 20 private employers in the District included colleges, universities, and hospitals. Based on the data from November 2010, two hospitality chains—Hyatt and Marriott—were among the 20 largest employers in the District. The Leisure & Hospitality Sector accounted for 59,800 jobs or eight (8) percent of the total jobs. DC Water and the Washington Metropolitan Area Transit Authority (WMATA) were also large energy users.
6	Distributed Generation	Distributed Generation is on a relatively small scale at this time.

3.1 Energy Demand in the District

3.1.1 Income and Population

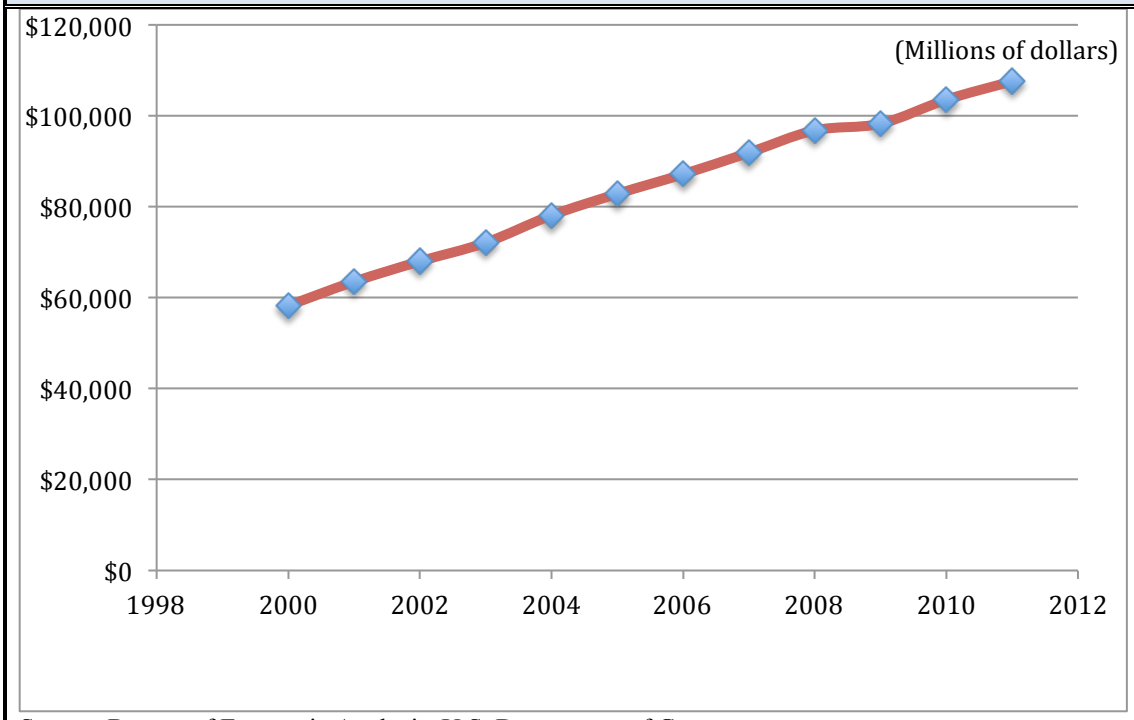
In general, the 29-year period from 1980-2009 typifies one of great economic prosperity. The District saw stable growth in the local economy, homeownership rates, per capita income levels, and expanded office construction. However, over the same period, the District saw a decrease in population and number of housing units while District-wide energy consumption remained steady.

3.1.2 Economy

Gross state product (GSP) can be defined as the market value of goods and services produced in a particular area. In the District, the GSP rose steadily from 1980-2011. Growth was substantial in the 1980s, continued steadily at a somewhat slower rate throughout the 1990s, and began to grow more quickly again in 2000. During the 1980s, total nominal growth in GSP for the District was approximately 95%, an average of 7.7% per year. For the period of 1990-1999, GSP increased 37%, an average of approximately 4.0% per year. Between 2000 and 2011, the GSP increased 84.6%, an average of approximately 5.8% each year. Figure 35 and Figure 36 below present this data.

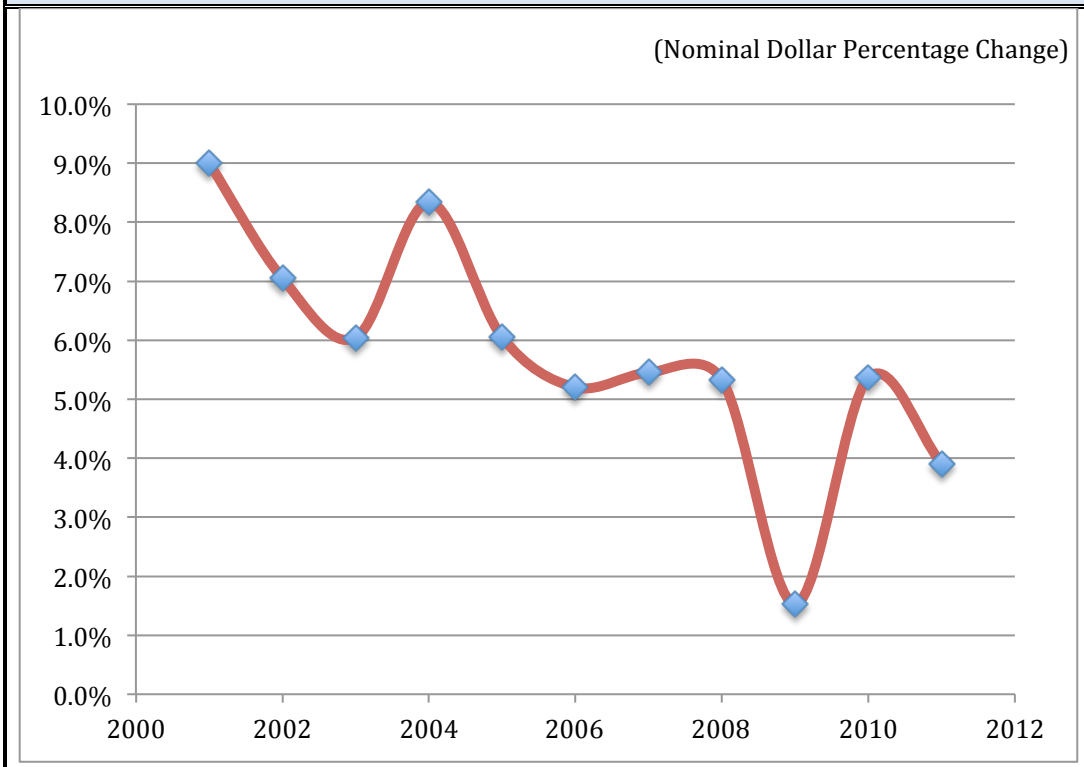
In 2011, Census data for the District reported an annual median family income of $58,526 (in 2011 dollars). This figure was higher than the national median of $51,914. Still, recent data shows that the District had an average poverty rate of 18.5% in 2011, which is above the national average of 13.8%. While middle- and upper- income households comprise a large percentage of the residential sector, the District also has a significant amount of low-income households. These low-income households will be most vulnerable to rising energy prices.

Figure 35: Gross State Product for the District of Columbia



Source: Bureau of Economic Analysis, U.S. Department of Commerce

Figure 36: Percentage Change in Gross State Product for the District of Columbia



Source: Bureau of Economic Analysis, U.S. Department of Commerce

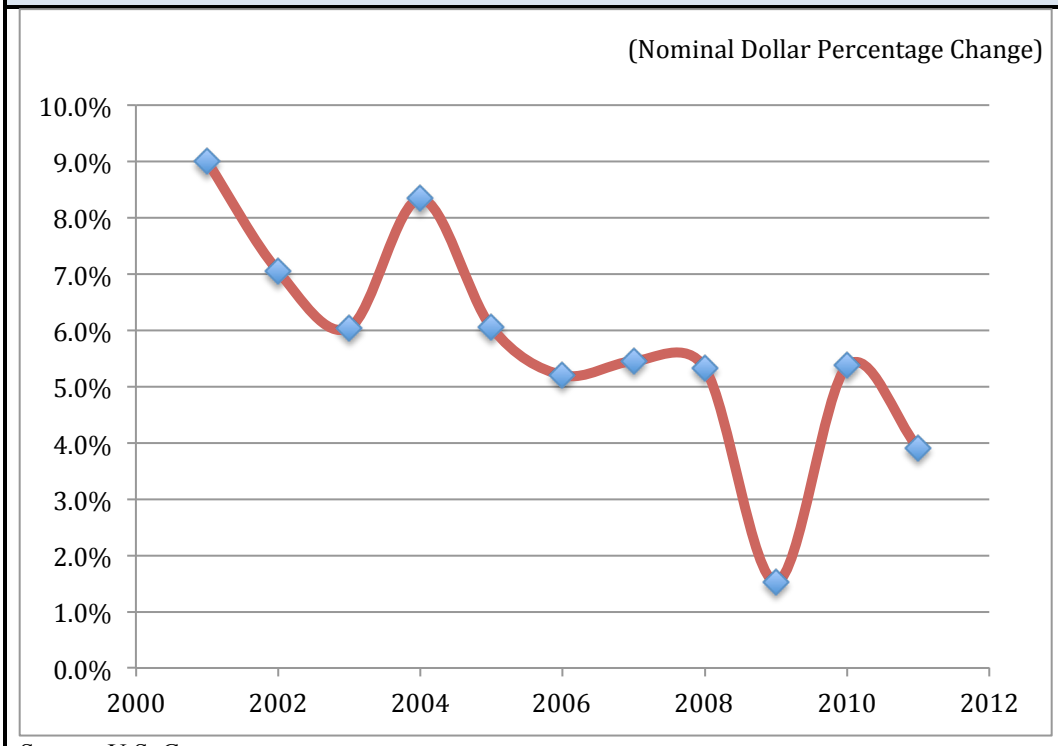
3.1.3 Population

Figure 37: Population and Employment of the District, 1980 and 2011		
	1980	**2011**
Population	638,432	617,996
Employment	616,100	728,300 (Nov. 2010)
Source: U.S. Census		

The population in the District declined significantly in the last 30 years.[10] In 1980, the population was 638,432. By 1985, the District's population had decreased by about 0.7% to 634,549 residents, followed by another decrease of 4.4% to 606,900 residents in 1990, and another still in 1995 by an additional 9.2% to 551,273 residents. The population dropped as low as 519,000 in 1999, but rebounded to 572,059 in 2000. Recent data (2011) indicates the District population is 617,996. This is the first time that District's population has exceeded 600,000 since 1990.[11]

The population is projected to increase to 650,000 by 2015 and to 702,000 by 2025. Figure 37 above shows the population and employment levels in 1980 and 2011. The decline in population (Figure 38) and the increase in employment (Figure 39) indicate 1) an expanding economy and 2) why the commercial energy sector is so dominant.

Figure 38: Population of the District of Columbia, 2000-2011

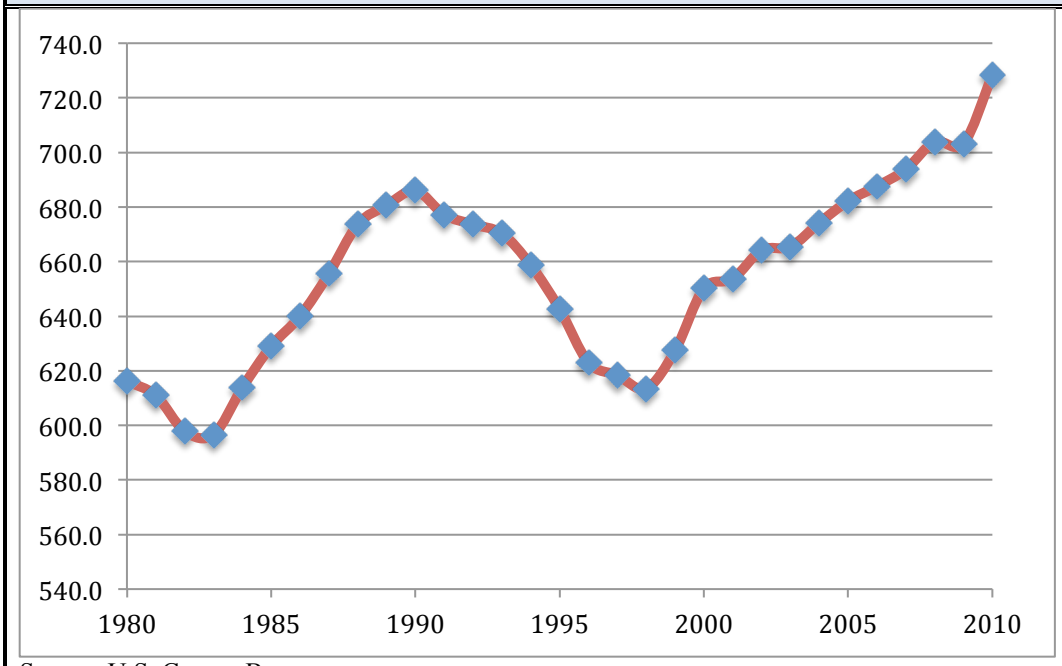


Source: U.S. Census

[10] http://planning.dc.gov/DC/Planning/DC+Data+and+Maps/DC+Data/Tables/Data+by+Topic/Population/Washington+Metropolitan+Statistical+Area+Population+1900+to+2009 (Last visited 1/19/2011).

[11] http://planning.dc.gov/DC/Planning/About+Planning/News+Room/District+Population+Tops+600,000 (Last visited 1/19/2011).

Figure 39: Employment in the District of Columbia, 1980-2010



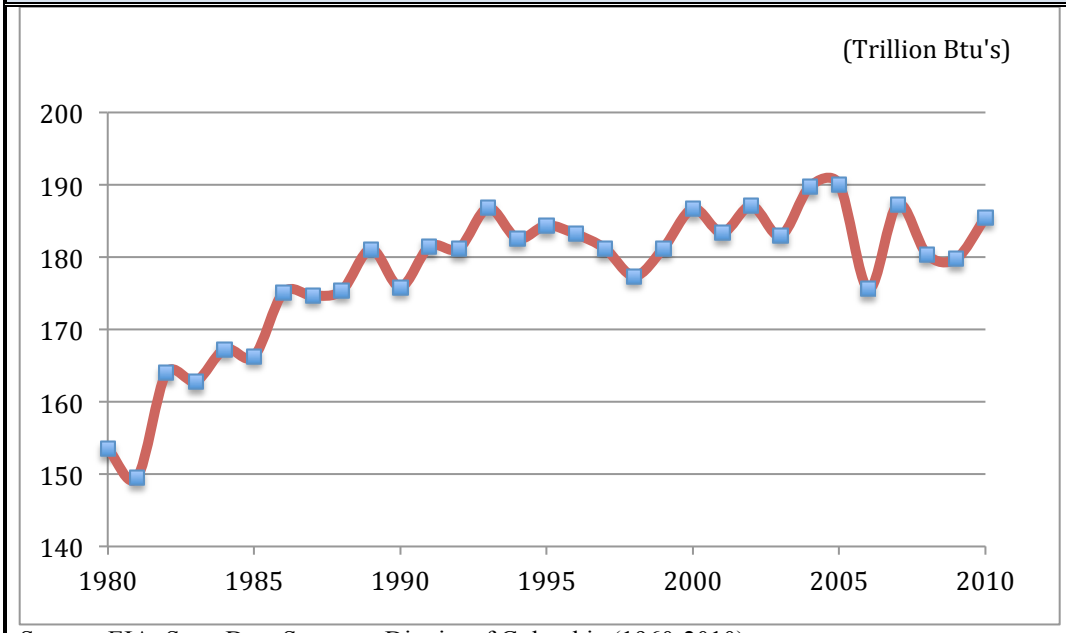
Source: U.S. Census Bureau

3.2 Energy Consumption in the District of Columbia

Total energy consumption in the District has remained relatively constant during the 1980s and 1990s, notwithstanding a slight increase. Consumption grew 10.9% between 1980 and 2008, rising from 153.5 trillion Btu to 180.4 trillion Btu. Figure 40 below illustrates total energy consumption in the District for this period. The District's residential, commercial, industrial, and transportation sectors consumed Btu directly through the use of coal, natural gas, and petroleum products. The electric utility used coal, oil, and natural gas to generate electricity.

Historically, energy prices in the District have been relatively high. In 2010, the District paid the 2nd highest price per million Btu of any state in the country. The District paid $26.19 per million Btu, while the national average was $18.73 per million Btu. The District ranked 23rd in energy expenditure per person (e.g., the District spent $4,033per person, compared to $3,895 per person nationally). The District was ranked 31st in 1999 and 29th in 2010 in per capita consumption, indicating that the District has reduced its energy consumption.

Figure 40: Energy Consumption in the District of Columbia



Source: EIA, State Data Systems, District of Columbia (1960-2010)

3.2.1 Usage by Sector

Residential Sector: Residential energy consumption accounts for approximately 21.84% of total energy use in the District and has remained relatively flat since 1990.

There are several key factors that will drive residential energy demand in the District in the near future:

1. Continued increases in residential electricity and natural gas consumption in both single-family and multi-family dwellings.
2. Projected increases in the residential population resulting from and causing new single- and multi-family housing to be built and thereby increasing energy demand, particularly for natural gas and electricity.
3. Projected increases in the number and diversity of low-income households in the requesting energy-related financial and service assistance from utilities and the District Government.

Commercial/Industrial Sector: In the commercial/industrial sector, there has been an unprecedented increase in commercial office space, with almost 53 million square feet added from 1980-2009. The total commercial office space available in the District is approximately 121.4 million square feet in 2009, with a vacancy rate of 16.4%. Commercial energy use, at approximately 124.0 trillion Btu in 2010, accounts for approximately 66.6% of all energy use in the District.

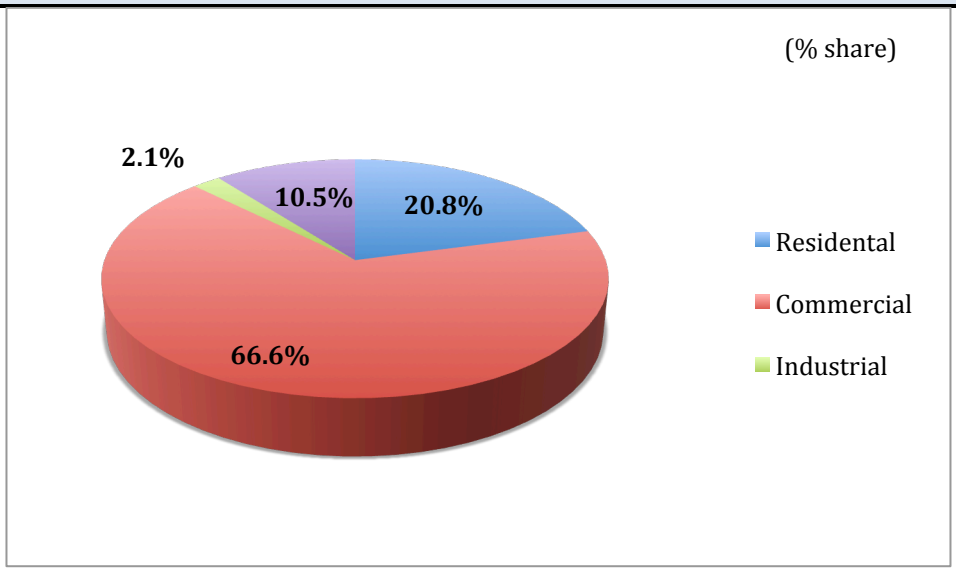
Transportation Sector: Energy consumption in the transportation sector accounts for 19.5 trillion Btu or 10.5% of the total 186.2 trillion Btu of energy used annually in the

District. This breaks down into approximately 109.2 million gallons of reformulated motor gasoline; 42 million gallons of distillate (diesel fuel for trucks and buses primarily); and approximately 31,905 million cubic feet of natural gas. Annual energy consumption in the transportation sector has remained virtually unchanged since 1980. Distillate consumption for transportation also remained relatively steady. While fuel sales and transit ridership by residents of the District diminished, traffic and transit associated with suburban commuters increased.

Industrial Sector: Although the industrial sector only accounts for approximately 2.1% of total energy use in the District (4.0 trillion Btu), the energy consumption in this sector is expected to rise as production equipment ages.

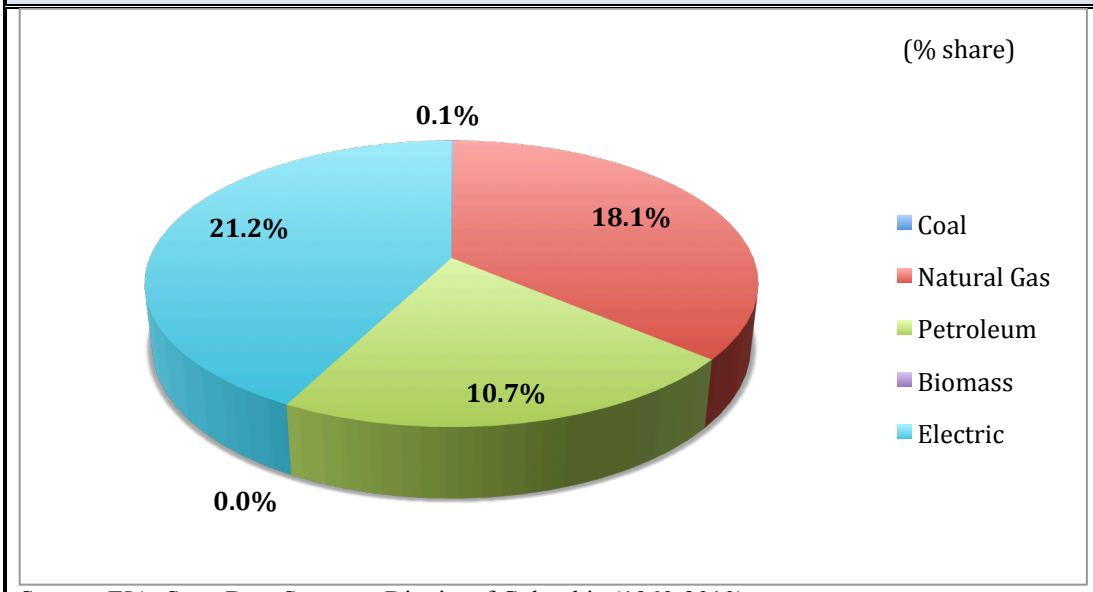
Figure 41 and Figure 42 below show the 2010 energy consumption by sector and by type in the District based on data from the EIA.

Figure 41: District of Columbia Energy Consumption by Sector – 2010



Source: EIA, State Data Systems, District of Columbia (1960-2010)

Figure 42: District of Columbia Energy Consumption by Type - 2010

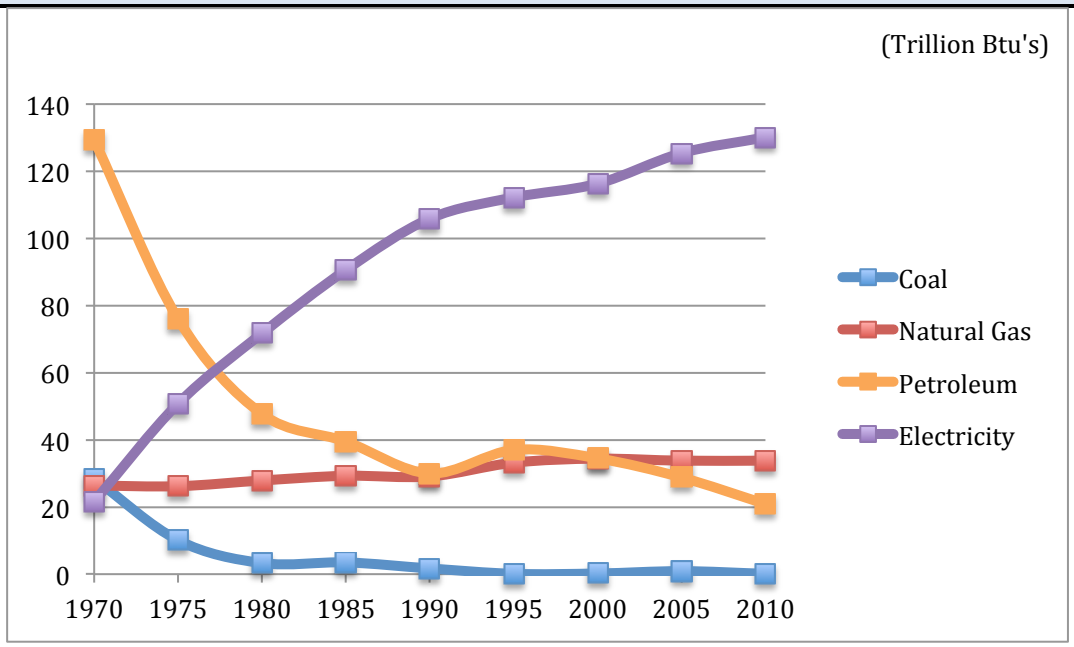


Source: EIA, State Data Systems, District of Columbia (1960-2010)

3.2.2 Usage by Source

Figure 43 illustrates the trends in energy consumption by fuel source.

Figure 43: District of Columbia Energy Consumption by Fuel Source



Source: EIA, State Data Systems, District of Columbia (1970-2010)

Petroleum: Petroleum consumption dropped 83.8% or 108.5 trillion Btu over the period from 1970-2010. The share of total energy consumption relying upon petroleum fell from 62.9% in 1970 to 10.2% in 2010.

The decrease in motor gasoline use may be the result of a number of factors. One is the apparent trend toward greater Metro ridership from locations outside the District. Another is the turnover in the vehicle fleet. The recent rapid increase in gasoline prices has prompted some consumers to condense errands and cut out unnecessary trips. Also, gasoline availability is slightly less convenient as the number of service stations in the District has decreased from 141 in 1987 to 108 in 2009. In 2007, Federal Corporate Average Fuel Economy (CAFE) goals were raised with the passing of the Energy Independence and Security Act of 2007, requiring automakers to boost fleet-wide gas mileage to 35 mpg.

Prices that District consumers pay for energy products were second highest in the country at $26.19 per million Btu in 2010, compared to the national average of $18.73 per million Btu in 2008. District consumers paid the 22nd highest energy expenditures per person of $4,033, while the national average was $3,895. This suggests that the District's use of energy is less efficient than the national average.

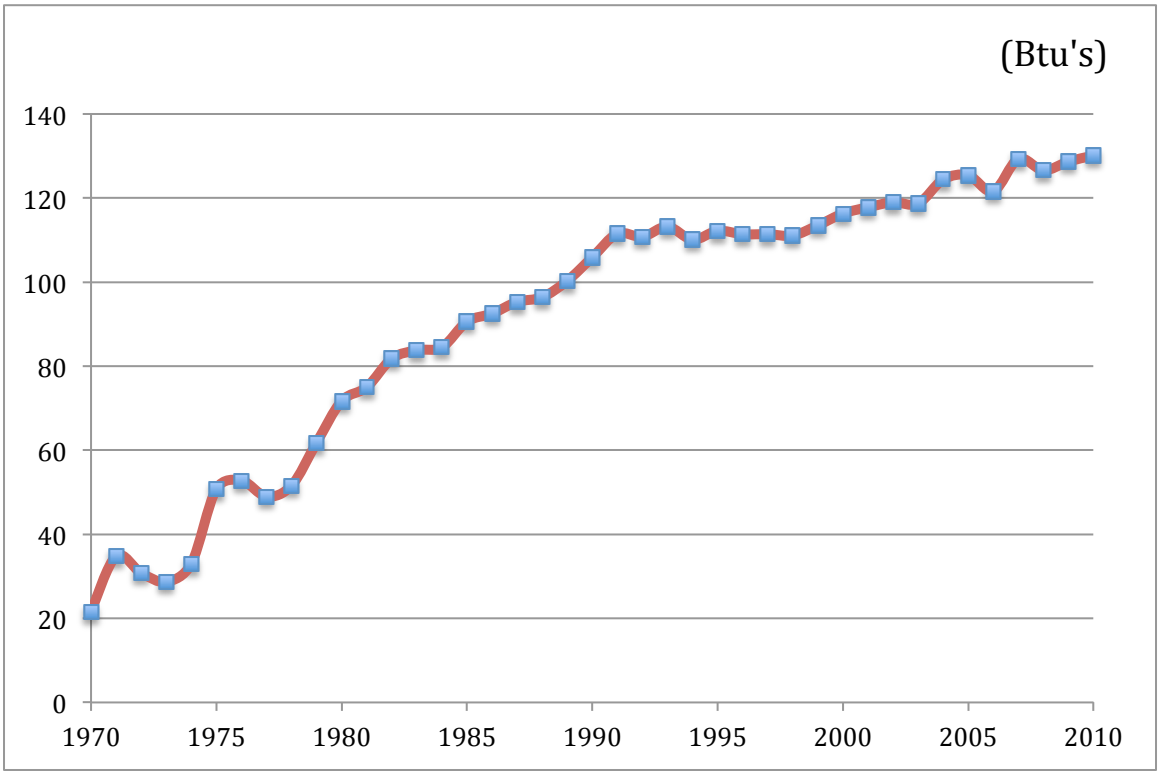
Natural Gas: Between 1980 and 2010, natural gas consumption increased modestly due to the growth in the commercial sector. Overall consumption increased between 1980 and 1990 and has remained relatively flat since then. Increases in natural gas use by the commercial sector have been offset by decreases in use by the residential sector. Natural gas accounted for 18.3% of total energy consumption in the District in 2010, a marginal change when compared to 18.5% in 1980.

Coal: In 1980, coal consumption was 3.3 trillion Btu. Since then, the District has seen a rapid decline in the use of this fuel. By 1990, coal consumption had decreased to 1.7 trillion Btu and by 2010, the District consumed just 0.1 trillion Btu. Coal has historically been used in the District to generate steam.

Electricity: Electricity as a share of total energy consumed in the District has increased significantly since the 1970s. Large increases in electricity consumption occurred during the mid- and late-1970s as consumers shifted demand from petroleum products to electricity. Electricity consumption as a share of the total energy market in the District continued to increase during the 1980s, but at a slower rate than the 1970s. Since 1990, electricity consumption relative to total energy use in the District has slowed to 70.4% in 2010. Electricity consumption in the District is shown in Figure 44 below.

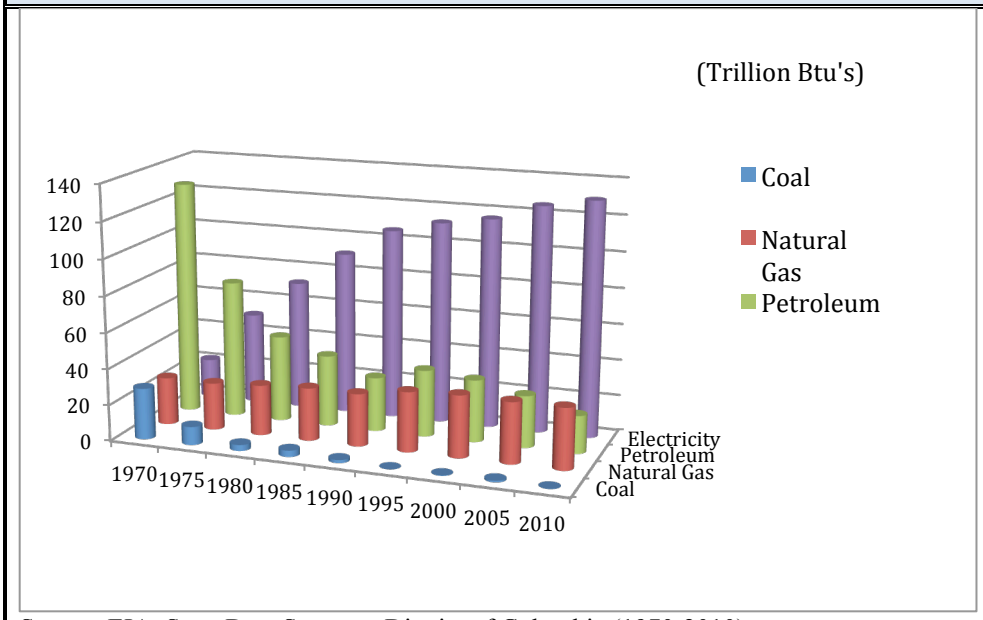
Other figures that complete the energy picture of the District are shown below.

Figure 44: Electricity Consumption in the District of Columbia 1970-2010



Source: EIA, State Data Systems, District of Columbia (1970-2010)

Figure 45: District of Columbia Energy Consumption by Type



Source: EIA, State Data Systems, District of Columbia (1970-2010)

The DOE Energy Efficiency and Renewable Energy office uses a measurement of energy efficiency called "energy intensity," which is the ratio of energy input per unit of economic output. Between 1980 and 2009, the District's energy intensity has decreased significantly from nearly 8,000 Btu/dollar to approximately 3,000 Btu/dollar.

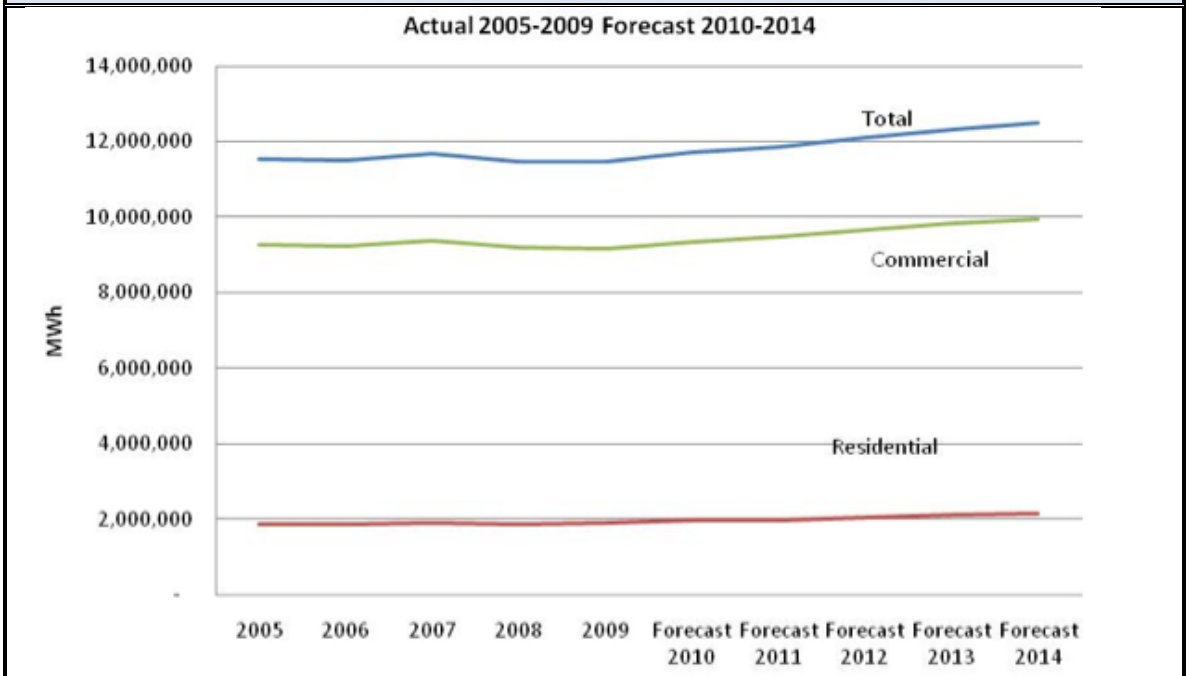
3.2.3 Electricity Consumption Trends

The historical (2005-2009) and forecast (2010-2014) values of electricity consumption are presented in Figure 46.

Total electricity consumption declined in 2009, led by a decline in commercial consumption, arising from the economic recession. Total usage in 2009 was lower than in 2005, but residential consumption was slightly higher.

The forecast values show a slow growth rate of about 1.3% per year regarding total energy consumption, with residential consumption increasing at a higher growth rate of 1.8% per year. The accuracy of this forecast will depend upon the overall trends in the national and local economy, given the dominant role of the commercial sector.

Figure 46: District of Columbia Consumption of Electricity: Actual and Forecast

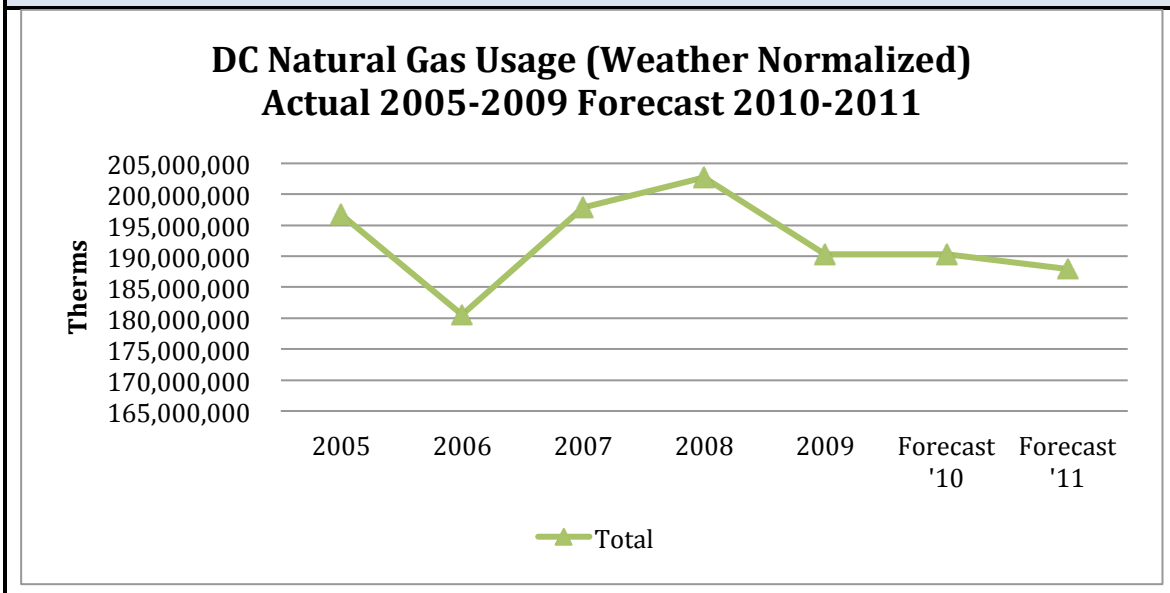


Source: DCSEU Performance Benchmarks, DCKG-2010-R-2287

3.2.4 Natural Gas Consumption Trends

The weather-normalized consumption of natural gas in the District has fluctuated unevenly in the recent past, but the overall trend is a decline in total natural gas usage (See Figure 47). There was a drop in usage in 2009, in part due to the recession. The forecast prepared by Washington Gas shows a slow decline in consumption in 2010 and 2011.

Figure 47: District of Columbia Natural Gas Usage (Weather-Normalized): Actual and Forecast



Source: DCSEU Performance Benchmarks, September 2010

3.2.5 Increasing Renewable Energy Generating Capacity in the District of Columbia

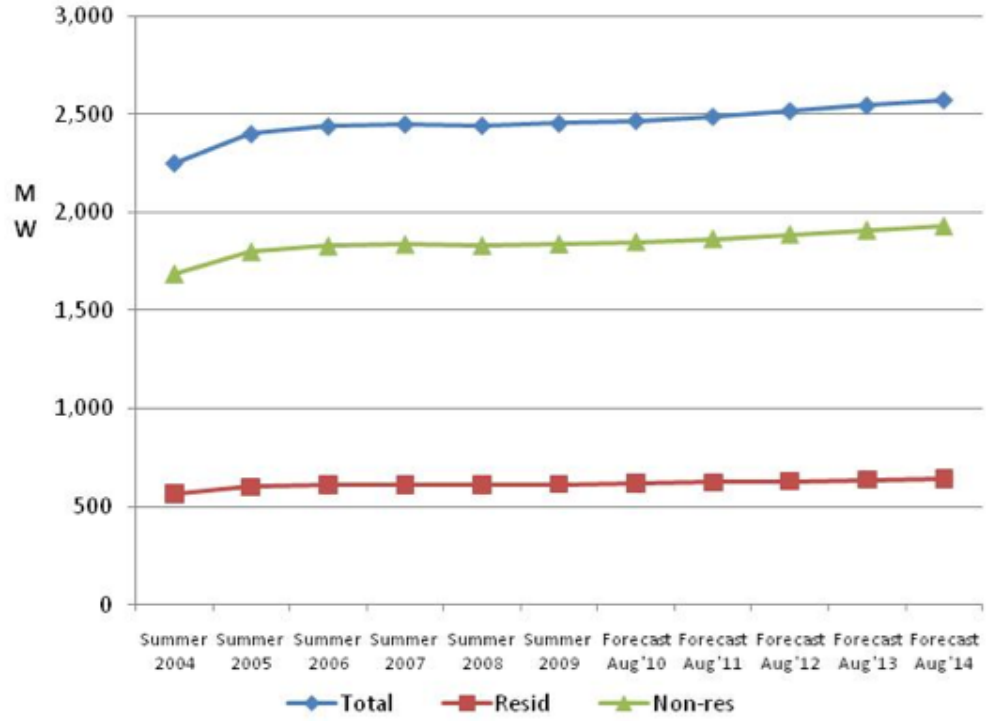
The promotion of renewable energy generating capacity in the District began with the Renewable Demonstration Program (RDP), which has been succeeded by the Renewable Energy Incentive Program (REIP). In practice, REIP has focused on small-scale solar photovoltaic systems. So far, only a limited number of systems have been installed, and there is very limited data available about these installations.

3.2.6 Reducing Growth of Peak Demand in the District of Columbia

Like total electricity consumption, peak demand has been increasing slowly in the District after a jump from 2004 to 2005 (See Figure 48). Each subsequent year experienced an increase in peak demand by about 1% a year for five years.

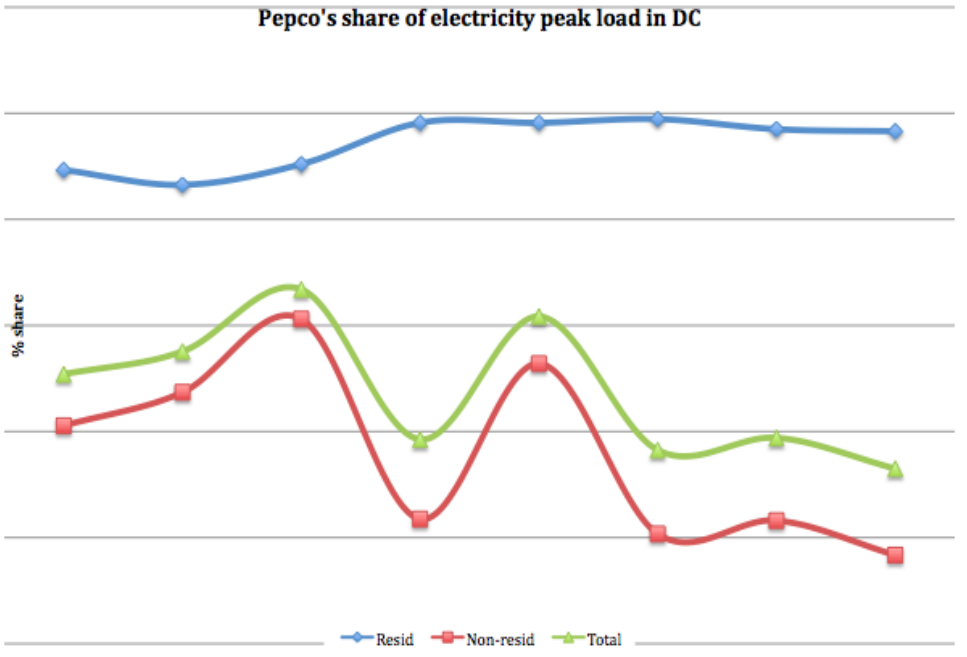
Following deregulation, PEPCO is not the only supplier of electricity in the District, and customers are free to choose alternative suppliers. (PEPCO provides electricity distribution service to all customers in the District regardless of which company sells generation services.) In fact, over time, PEPCO's share of the peak load has decreased while the share of alternative suppliers has increased (Figure 49).

Figure 48: District of Columbia Peak Demand



Source: DCSEU Performance Benchmarks, September 2010

Figure 49: Electricity Peak Demand: Total, Non-Residential and Residential: PEPCO's Share of electricity peak load in District of Columbia



Source: DCSEU Performance Benchmarks, September 2010

What Figure 49 suggests is that PEPCO's loss of providing service to non-residential customers is a major reason for the decline in the company's share of peak load in the District. Other indications include:

1. Non-residential customers are responsible for the peak load in the District and companies other than PEPCO are providing service to these customers.
2. Non-PEPCO non-residential customers are responsible for the bulk of the peak load in the District.

3.2.7 Sustainable Energy Utility and Property Assessed Clean Energy Program

Two programs have been instituted to reduce energy consumption in the District. The District's Clean and Affordable Energy Act of 2008 (CAEA), requires the mayor, through DDOE, to contract with a private entity to manage sustainable energy programs in the District. The CAEA authorizes the creation of the DCSEU and designates the DCSEU to be the primary resource for energy efficiency and renewable energy services for District residents and businesses[12]. The DCSEU contractor will serve under a performance-based contract with DDOE with input and recommendations from the DCSEU Advisory Board and oversight from the Council of the District of Columbia. The DCSEU is the private contractor selected to develop, coordinate, and provide programs to promote sustainable energy use in the District. Six benchmarks have been set for the DCSEU:

- Benchmark 1: Reduce per capita energy consumption
- Benchmark 2: Increase renewable energy generating capacity
- Benchmark 3: Reduce growth in peak electricity demand
- Benchmark 4: Improve energy efficiency in low-income housing
- Benchmark 5: Reduce growth of energy demand of largest energy users
- Benchmark 6: Increase number of green-collar jobs

The Property Assessed Clean Energy (PACE) program is a program to finance energy efficiency retrofits in residential and commercial properties. Many states and municipalities nationwide are trying this innovative financing program. Typically, property owners borrow money from this financing program and repay their energy retrofit loan over a 10 to 20 year period through a special assessment on their property tax bill.

The Mayor and the Council of the District of Columbia authorized PACE in April 2010 with up to $250 million worth of PACE bonds to get the program to scale. Currently, about 70% of the District's electricity is consumed by buildings, and buildings cause 75% of the District's greenhouse gas emissions. The government's intent is to greatly reduce the District's electricity use and reduce greenhouse gas emissions, as well as catalyze a

[12] The DCSEU is a program of DDOE (www.dcseu.gov) and currently operated under contract by the Vermont Energy Investment Corporation (http://www.veic.org).

green economy that will create business opportunities and jobs for District companies and residents.

The PACE program is voluntary and property owners will not be charged a special assessment unless they have applied for and been approved for PACE financing (see Section 5.4.6 for more information on PACE financing).

3.3 Energy Supply in the District of Columbia – Electricity

Since the 1980s, over 90% of the District's annual electricity needs have been met by importing electricity from outside the city. In January 2001, all residential and commercial electricity customers were allowed to choose their supplier of electricity generation and transmission services. There are approximately 52 generation and transmission service suppliers approved by the District's PSC.

PEPCO is the sole provider of electricity distribution services in the District. The electricity distribution network in the District includes 28 transmission lines, more than 800 distribution lines, and 60 substations. Sixty percent (2,636 miles of lines) of PEPCO customers are served by underground power lines. The remaining 40 percent of customers (1,433 miles of lines) are served by above-ground power lines that are vulnerable to heavy winds, fallen trees, and other natural and man-made hazards. PEPCO is an active member of PJM Interconnection (PJM), the regional power pool that oversees the operation of the largest wholesale electricity market in the United States. The PJM structure helps ensure an adequate supply of electricity within the region and the economical use of available generating and transmission facilities.

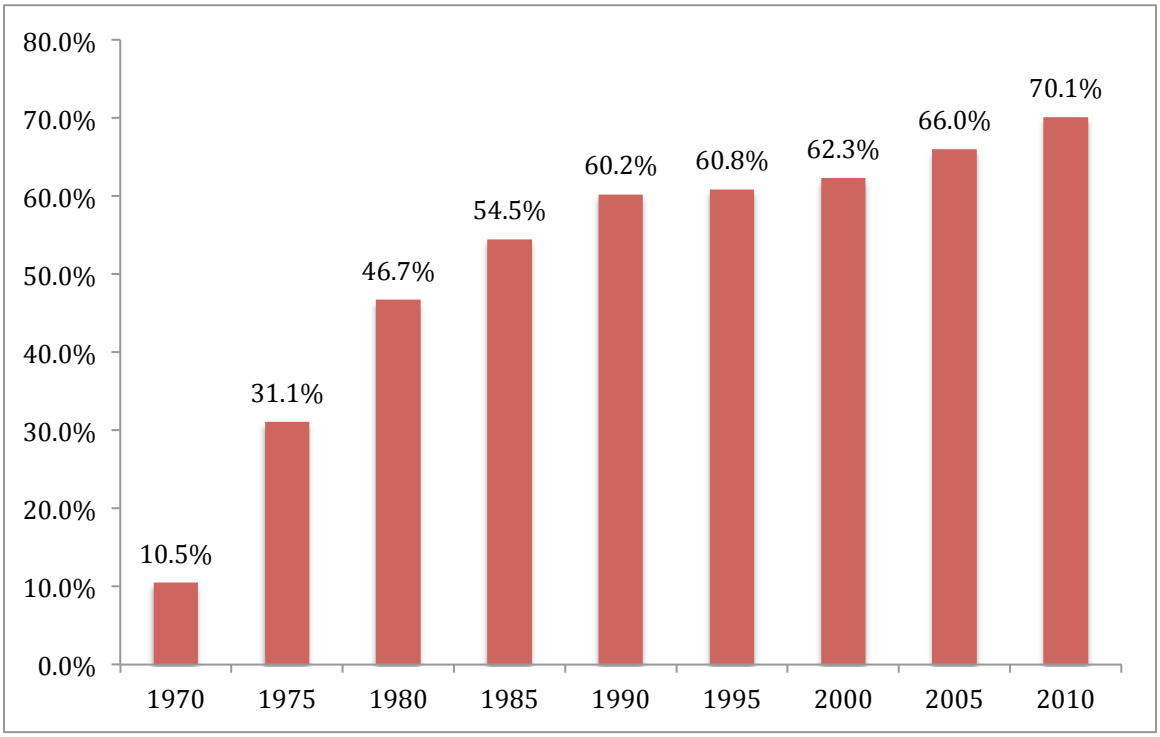
There are two power plants in the District: Buzzard Point (16 units, 256 MW generating capacity) and Benning Road (2 units, 550 MW generating capacity). The sale of power from these generating plants, managed by PJM, has dwindled significantly over the years. They are primarily used now to provide peaking capacity. Both plants are scheduled to retire in 2012.

Since 2007, all electricity suppliers (including PEPCO) have been required to meet minimum requirements for fuel resources derived from renewable energy. The minimum requirement was 5% for 2009 and will increase to 20% by 2020.

In the event of a potential energy emergency in the District, additional energy supplies can be purchased through PJM by submitting an Emergency Energy-Bid form. The form indicates when additional electricity will be needed, how much will be needed, and the proposed bid price. The form is sent to PJM, which calls the bidder to verify the request and evaluate the bid based on price, minimum run time, and notification time.

While electricity consumption as a share of the total energy market has increased, electricity production in the District has decreased. Since the 1970s, the District has increasingly relied on electricity imports to meet its electricity needs. The figure below shows the increase in net imports from 1970 to 2009.

Figure 50: Percentage of Electricity Imported into the District of Columbia



Source: EIA, State Data Systems, District of Columbia (1970-2010)

3.3.1 Energy Supply in the District of Columbia – Competitive Electricity Suppliers

The companies listed in Figure 51 sell electricity to commercial and residential customers in the District. As the District's only electricity distributer, PEPCO distributes the electricity purchased from these other service providers.

Figure 51: Competitive Electricity Suppliers in the District of Columbia		
1	Allegheny Energy Supply	Provides electricity services to commercial customers.
2	Ambit Energy	Provides electricity services to residential and commercial customers.
3	Amerada Hess	Provides electricity services to commercial customers.
4	American Electric Power Service Corporation	Provides electricity services to commercial customers.
5	AOBA Alliance	Provides electricity services to commercial customers.
6	BGE Home	Provides electricity services to commercial customers.
7	BlueStar Energy Services	Provides electricity services to commercial customers.

Figure 51: Competitive Electricity Suppliers in the District of Columbia		
8	Clean Currents Energy Services	Provides electricity services to residential and commercial customers.
9	Clearview Electric	Provides services to residential and small commercial customers
10	Consolidated Edison Solutions	Provides electricity services to residential and commercial customers.
11	Constellation NewEnergy	Provides electricity services to commercial customers.
12	Cook Inlet Power	Provides electricity services to residential customers.
13	Devonshire Energy	Provides electricity services to commercial customers.
14	Direct Energy Services	Provides electricity services to commercial customers.
15	DTE Energy	Provides electricity services to residential, commercial and industrial customers.
16	Dominion Retail	Provides electricity services.
17	EnergyWindow	Provides electricity services to commercial customers.
18	First Energy Services	Provides electricity services to commercial customers.
19	GEXA Energy	Provides electricity services to residential and commercial customers.
20	Glacial Energy	Provides electricity services to residential and commercial customers.
21	Green Mountain Energy	Provides electricity services to residential and commercial customers.
22	Hess Corporation	Provides electricity services to residential and commercial customers.
23	Horizon Power and Light	Provides electricity services to residential and commercial customers.
24	IDT Energy	Provides services to residential and small commercial customers
25	Integrys Energy Services	Provides electricity services to residential, commercial and industrial customers.

Figure 51: Competitive Electricity Suppliers in the District of Columbia		
26	Liberty Power	Provides electricity services to commercial customers.
27	MidAmerican Energy Company	Provides electricity services to commercial customers.
28	Mid-Atlantic Aggregation Group Independent Consortium	Provides electricity services to commercial customers.
29	NextEra Energy Services	Provides electricity services to residential and commercial customers.
30	Noble Americas Energy Solutions	Provides electricity services to commercial customers.
31	People's Power & Gas	Provides electricity services to residential, commercial and industrial customers.
32	PEPCO	Provides electricity services to residential and commercial customers. Under Standard Offer Service (SOS), PEPCO purchases electricity for customers who do not choose a competitive energy supplier. PEPCO's SOS customers comprise approximately 93% of the total electricity market in the District, with 94% of residential customers and 80% of non-residential customers participating.
33	PEPCO Energy Services	Provides electricity services to residential, small commercial and large commercial customers, and offers PowerChoice renewable energy source services to residential and small commercial customers.
34	PPL Energy Plus LLC	Provides electricity services to residential, commercial and industrial customers.
35	Public Power	Provides electricity services to residential and commercial customers.
36	Reliant Energy Solutions East	Provides electricity services to commercial customers.
37	Select Energy	Provides electricity services to commercial customers.
38	Sempra Energy Solutions	Provides electricity services to commercial customers.
39	SmartEnergy	Provides electricity services to residential customers.

Figure 51: Competitive Electricity Suppliers in the District of Columbia		
40	South Jersey Energy	Provides electricity services to residential, commercial and industrial customers.
41	Starion Energy	Provides electricity services to residential and commercial customers.
42	Stream Energy	Provides electricity services to residential and commercial customers.
43	Strategic Energy	Provides electricity services to residential and commercial customers.
44	SUEZ Energy Resources	Provides electricity services to commercial customers.
45	Tractabel Energy Services	Provides electricity services to commercial customers.
46	UGI EnergyLink	Provides electricity services to commercial customers.
47	Viridian Energy	Provides electricity services to residential and commercial customers.
48	Washington Energy Consortium	Provides electricity services to commercial customers.
49	Washington Gas Energy Services	Provides services to residential, small commercial and large commercial clients.
50	Clean Currents	Provides residents and businesses in Washington DC with renewable wind power through the electric grid.

3.4 Energy Supply in the District of Columbia – Competitive Natural Gas Providers

The District does not have natural gas reserves and therefore does not produce, process, or store natural gas or supplemental supplies. Natural gas supplies are delivered to the District primarily from Virginia pipelines, but a small amount is delivered from Maryland pipelines. The District's use of natural gas accounts for 0.2% of nationwide residential use, 0.7% of commercial deliveries nationwide, and 0.1% of natural gas used as vehicle fuel nationwide.

There are four pipeline systems (Williams Transeo, Columbia, Dominion Transmission, and Dominion Cove Point) that supply the District with natural gas. Washington Gas is the primary distributor and supplier of natural gas in the District. Other suppliers in the District include PEPCO Energy Services, Washington Gas Energy Services, ECONnergy, and NOVEC.

3.4.1 Energy Supply in the District of Columbia – Competitive Natural Gas Suppliers

Figure 52: Competitive Natural Gas Suppliers in the District of Columbia		
1	BGE Commercial Building Systems	Provides services to commercial customers.
2	Bollinger Energy Corporation	Provides services to commercial customers.
3	Constellation New Energy	Provides services to commercial customers.
4	Gateway Energy Services	Provides services to commercial customers.
5	Glacial Natural Gas	Provides services to commercial customers.
6	Hess Corporation	Provides services to commercial customers.
7	MetroMedia Energy	Provides services to commercial customers.
8	NOVEC	Provides services to residential and commercial customers.
9	PEPCO Energy Services	Provides services to residential, small commercial and large commercial customers.
10	Tiger Natural Gas	Provides services to commercial customers.
11	UGI Energy Services/Gasmark	Provides services to commercial customers.
12	Washington Gas Energy Services	Provides services to residential, small commercial and large commercial customers.
13	Washington Gas Company	Provides services to residential, small commercial and large commercial customers. Washington Gas is the largest provider of natural gas in the District, supplying natural gas to approximately 89% of residential and 69% of non-residential customers. The company has underground propane storage sites in Rockville, MD and Springfield, VA that serve as peaking facilities on the coldest winter days to supplement the normal pipeline supply. There is a storage field located in West Virginia.

3.5 Energy Supply in the District of Columbia – Petroleum

According to the EIA, the District does not produce or refine petroleum products, nor are there any major distribution pipelines located in its borders. Approximately 100 retail outlets provide motor gasoline for vehicles. Gasoline sold in the District must be reformulated to reduce vehicle emissions of ozone-forming and toxic air pollutants. In 2010, the District's total petroleum consumption was 3,976,000 barrels, which ranked 51st out of 51 states.

3.5.1 Energy Supply in the District of Columbia – Petroleum Suppliers

There are a large number of petroleum fuel providers that service private retailers in the District. The District Government's petroleum needs are handled by the District Department of Public Works (DPW). The DPW, through the US Department of Defense, has contracts with five fuel suppliers for vehicle fuel and heating oil needs:

- Conectiv Energy (doing business as Petron Oil)
- Fannon Petroleum
- Mansfield Oil Co.
- Ohio Energy Specialties
- Petroleum Traders

In addition to the fuel suppliers listed above, DDOE has agreements with the following petroleum fuel suppliers for heating oil and other fuel uses:

- District Line
- Griffith Energy Services
- Petro

The District can also work with the following organizations to identify potential sources of petroleum products during an energy emergency:

Figure 53: Petroleum Associations with Whom the District Government Can Work	
Mid Atlantic Petroleum Distributors Association (MAPDA)	This organization consists of independent marketers of branded and unbranded petroleum products (fuel oil, gasoline, and diesel) who can supply retail outlets that do not obtain their products directly from a refiner.
Washington, Maryland, Delaware Service Station and Automotive Repair Association (WMDA)	This trade association serves independent service stations, repair facilities, convenience stores, and others; it also represents retail outlets that purchase their fuel directly from refiners.
American Petroleum Institute (API)	This organization is the primary trade association for the petroleum and natural gas industries. The Eastern Region of the API, which includes the District of Columbia, represents distributors in the Eastern United States.

3.6 Energy Prices in the District

Total energy prices have increased in the District from $8.70 per million Btu in 1980 to $26.19 per million Btu in 2010 in terms of nominal dollars. The national average for 2010 was $18.73 dollars per million Btu. Energy prices in all sectors, excluding commercial, have increased between 1980 and 2010, as shown in Figure 54 below.

Figure 54: Energy Price Estimates for the District of Columbia for Four Sectors, 1980-2010 (Nominal Dollars per Million Btu)

Year	Residential	Commercial	Industrial	Transportation
1980	7.07	8.51	10.20	9.44
1985	9.67	12.67	17.08	9.92
1990	9.49	11.59	14.68	10.26
1995	11.15	13.86	11.01	10.59
2000	13.05	16.25	11.79	12.21
2005	18.82	20.75	28.29	18.67
2010	21.84	18.04	30.39	27.44

Source: EIA, State Data Systems, District of Columbia (1960-2010)

The period-to-period analysis of energy prices (in nominal dollars) indicates that the rate of increase rose sharply from 2000-2007. The figure below shows the period-to-period percentage change in energy prices for the District.

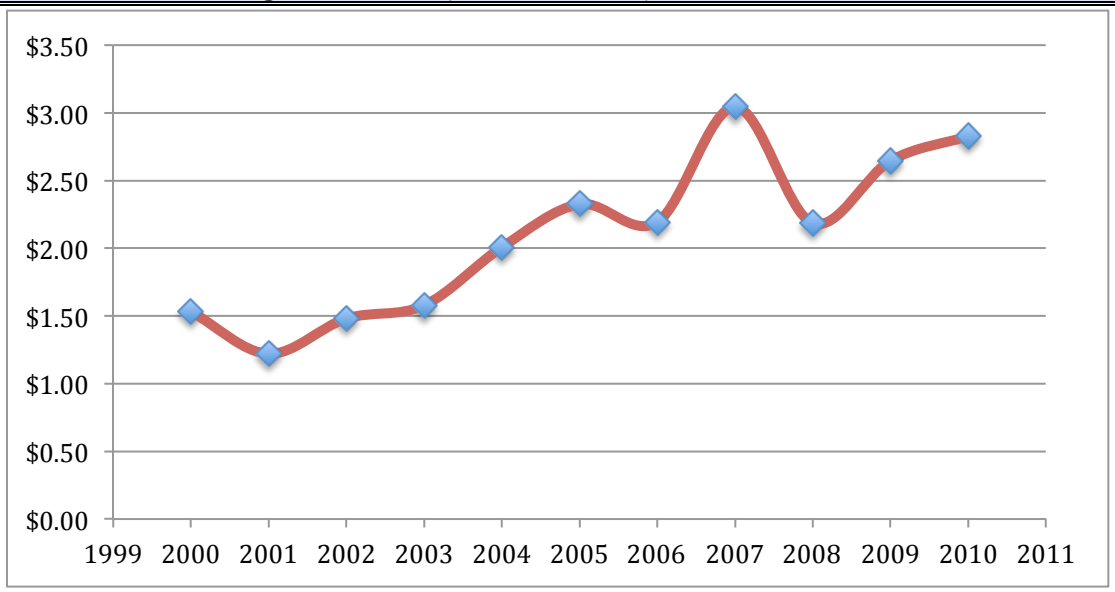
Figure 55: Energy Price Estimates for the District of Columbia
(Period-to-Period Percentage Change)

Year	Residential	Commercial	Industrial	Transportation
1980-1985	37%	49%	67%	5%
1985-1990	-2%	-9%	-14%	3%
1990-1995	17%	20%	-25%	3%
1995-2000	17%	17%	7%	15%
2000-2005	44%	28%	140%	53%
2005-2010	16%	-13%	7%	47%

Source: EIA, State Data Systems, District of Columbia (1960-2010)

The average retail price per gallon has increased substantially since 2000. The following graph shows the increase of regular unleaded gasoline in retail price per gallon through November 2010. Prices are projected to increase as supply markets remain tight and demand remains constant or continues to increase.

Figure 56: Average Price Per Gallon of Regular Unleaded Gasoline Washington-Baltimore (DC-MD-VA-WV)



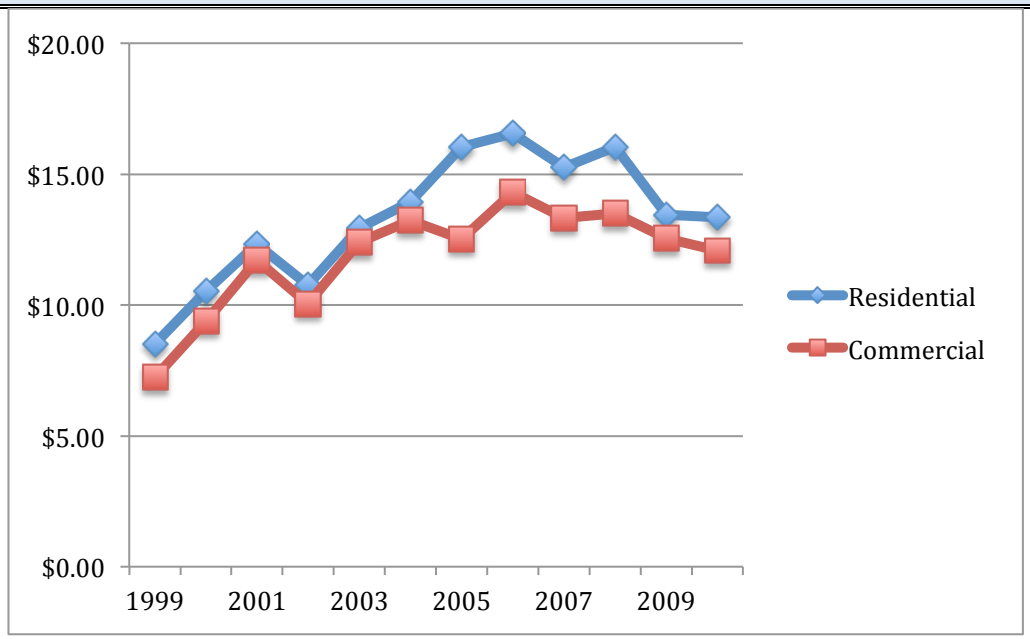
Source: Bureau of Labor Statistics (BLS), Series ID: APUA31174714

The price of natural gas for residential, commercial and vehicle use has ranged from $10.06 to $16.04 between 2002 and 2010. There are two trends: one putting upward pressure on natural gas prices; and one putting downward pressure on them:

1. Prices for natural gas are projected to increase as a strong economy and skyrocketing international petroleum prices drive additional consumer demand in the natural gas market.
2. Shale gas such as found in the Marcellus Formation[13] are projected to decrease natural gas prices and those declines may continue for two to four decades.

[13] http://geology.com/articles/marcellus-shale.shtml, http://geology.com/gas-shales, http://www.marcellusshaleformation.com/. (Last visited May 15, 2011.)

Figure 57: Average Annual Price of Natural Gas of the District of Columbia



Source: EIA, State Data Systems, District of Columbia (1960-2010)

3.7 Largest Energy Users in the District of Columbia

Due to deregulation and restructuring, both PEPCO and Washington Gas are distribution energy companies operating in the District. The District has not faced an issue with any of the 50 electricity suppliers, 13 natural gas providers, or even the 8 major petroleum suppliers being unable to fulfill their contracts.

As noted above, the commercial sector is the largest energy consumption sector. However, energy providers typically do not provide public information about their largest users for proprietary reasons.

The largest energy users generally have building energy managers and engineers who manage energy issues. These managers enhance energy reliability through longstanding relationships with private market energy service companies (ESCOs) such as Ameresco, Honeywell Building Solutions, Carrier, PEPCO Energy Services, Johnson Controls, Lockheed Martin Services, and many others.

Given the nature of the types of entities that comprise the largest users and given that private buildings with more than 50,000 square feet will be reporting their energy usage by 2013, the DCSEU is expected to track energy usage trends for the top energy users. The DCSEU is also expected to track energy trends for commercial buildings with over 50,000 square feet as that data becomes available. This information will be used to make recommendations on meeting energy reduction targets consistent with the overall goal of reducing total energy usage.

Also noted above, electricity is the major source of energy in the District. As part of the DCSEU and the PACE legislation, the District is instituting policies and programs to reduce the demand for electricity and natural gas by the largest users in the District. As noted in Section 5, the District is taking a number of steps to increase its resiliency.

The largest energy users in the district can be estimated by using the number of employees as a guide. In November 2010, there were 738,300 jobs in the District. The Government sector accounted for 34% of the jobs.

Figure 58: Total Private & Government Employment, November 2010

Sector	Totals in 000's	Percentage of Total
Total	**728.30**	**100%**
Total Private Sector	479.40	66%
Total Government Sector	248.90	34%
Source: BLS		

The Federal Government is the largest employer in the District. The District Government is the second largest employer.

Figure 59: Federal and State Government Employment in the District of Columbia, November 2010

Sector	Totals in 000's	Percentage of Total
Government	**248.90**	**34%**
Federal Government	211.50	29%
State Government & Transportation	37.40	5%
State Government	33.60	5%
Public Transportation	3.80	1%
Source: BLS		

Thirteen of the top 20 private employers in the District include colleges, universities and hospitals.

Figure 60: Top 20 Employers in the District of Columbia 2009*	
1. Georgetown University 2. George Washington University 3. Washington Hospital Center 4. Children's National Hospital 5. Howard University 6. Georgetown University Hospital 7. American University 8. Fannie Mae 9. The Catholic University Of America 10. Providence Hospital	11. Howard University Hospital 12. Sibley Memorial Hospital 13. The George Washington Hospital 14. Admiral Security Service 15. The Washington Post 16. Hyatt Corporation 17. Safeway Inc. 18. Gallaudet University 19. Computer Science Corporation 20. Marriott Hotel Services
*Ranking by size of workforce	
Source: D.C. Department of Employment Services, Office of Labor Market Research & Information. http://www.does.dc.gov/does/frames.asp?doc=/does/lib/does/Top200.pdf	

The Educational & Health Services employment sector accounts for 111,100 jobs or 15% of the jobs in the District.

Figure 61: Educational & Health Services Employment in the District of Columbia, November 2010		
Sector	Totals in 000's	Percentage of Total
Educational & Health Services	**111.10**	**15%**
Educational Services	53.20	7%
Colleges, Universities, and Professional Schools	*39.10*	*5%*
Health Care and Social Assistance	57.90	8%
Ambulatory Health Care Services	*15.20*	*2%*
Hospitals	*26.00*	*4%*
Nursing & Residential Care Facilities	*7.90*	*1%*
Source: BLS		

Two hospitality chains—Hyatt and Marriott—are among the 20 largest employers in the District. The Leisure & Hospitality sector accounts for 59,800 jobs or eight (8) percent of the total jobs in the District.

Figure 62: Leisure & Hospitality Employment in the District of Columbia, November 2010		
Sector	Totals in 000's	Percentage of Total
Leisure & Hospitality	**59.80**	**8%**
Arts, Entertainment & Recreation*	7.10	1%
Accommodations & Food Services	52.70	7%
Accommodation	*15.10*	*2%*
Food Service & Drinking Places	*37.60*	*5%*
Full-Service Restaurants	19.50	3%
Limited-Service Eating Places	11.10	2%
Special Food Services	4.20	1%
Source: BLS *Note that the sectors presented here are a subset of the entire sector, and totals do not add due to rounding in the source data presented by BLS.		

According to their budget reports, both DC Water and WMATA have large annual utility bills.

Figure 63:Utility Budgets of DC Water & WMATA FY 2010	
DC Water	$36 million (FY 2010)
WMATA	$44 million (FY 2010)
Source: Agency Budgets	

Because of their size and function, the following venues are among the largest users of energy in the District:

- Convention Center
- Nationals Baseball Stadium
- Verizon Center

3.8 Distributed Generation in the District

In February 2009, the DC PSC adopted interconnection regulations. These regulations apply to systems up to 10 MW that are operated in conjunction with the electric distribution system and are not subject to the interconnection requirements of PJM. For all distributed generation—solar, wind, combined heat and power, fuel cells, and any other nontraditional power source—interconnection with the local electric grid provides back-up power and an opportunity to participate in net-metering and sell-back contracts with utilities. It is very important for the economic viability of most distributed generation projects to be interconnected with the grid. However; adding small generators at various spots along an electric grid can raise a number of safety concerns and

operational issues for a utility. For these reasons, utilities generally work with the District PSC to develop interconnection standards that clearly delineate the manner in which distributed generation systems may be interconnected.

3.9 Micro Grids & Energy Storage

As noted some evolving aspects of the energy profile will include micro grids and energy storage. The potential role for these aspects is outlined in Section 5.

4 District of Columbia Energy Supply Disruption Tracking Plan 2012

4.1 Purpose of Plan

An ESDTP is utilized during an energy emergency event to track basic information regarding the duration and severity of the event and the response actions taken. Additionally, the ESDTP reports some measurement of the outcome in relation to the event.

The ESDTP provides a process by which energy supply and demand information is monitored and analyzed on a regular basis. Outlined in the ESDTP is the necessary framework to implement specific data collection or tracking mechanisms during significant energy disruptions up to, and including, a declared energy emergency.

4.2 DDOE's Roles & Responsibilities

The DDOE has been delegated vital roles in the implementation of energy emergency and contingency response planning. In the 2011 DRP, DDOE is designated as the primary District agency for ESF #12. DDOE gathers, assesses, and shares information on energy system damage and estimates the impact of energy system outages within affected areas during plan activation. DDOE/EA is the key unit within DDOE to carry out these responsibilities.

4.3 Energy Consumption and Tracking & Assessing Supply Disruptions

All fuel sources are important for tracking and assessing purposes, and the tracking and assessing challenges are shaped by the percentages of energy consumed in the District. Based on 2009 data from the EIA, within the geographical boundaries of the District, energy consumption was as follows:

Figure 64:Energy Consumption in the District by Fuel Type, 2010

Type of Energy	Percentage of Total
Electricity	70.8%
Natural Gas	18.4%
Petroleum	10.6%
All Others	0.2%
Total	100.00%

Source: EIA

This distribution of energy consumption in the District frames how DDOE/EA will track and assess energy supply disruptions.

4.3.1 Electricity

In the District, there is one electricity distribution company (PEPCO) for which the District PSC regulates and has in place performance requirements.

Many of the tracking and assessing activities outlined in the plan will fall within the purview of the PSC and PEPCO. DDOE/EA's responsibilities will mainly be an information coordinating and sharing role to ensure that the mayor, users, and the public have adequate information in case of an electricity supply disruption. PEPCO and PSC are support agencies to DDOE under ESF #12.

4.3.2 Natural Gas

Similar to electricity, there is one natural gas distribution company in the District (Washington Gas). Washington Gas, like PEPCO, is regulated by the PSC. Many of the activities in the tracking and assessing plan will be under the purview of Washington Gas and the PSC. DDOE/EA's responsibilities will be mainly information coordinating and sharing.

4.3.3 Petroleum

Unlike electricity and natural gas, there is no local regulatory body for petroleum products. DDOE/EA will maintain contacts with the various associations that focus on petroleum products and will help facilitate the flow of information to the mayor, energy users and the public. In addition, DDOE/EA will work closely with the federal agencies that track and assess the petroleum industry to ensure that the mayor and public are getting timely information.

4.3.4 All Others

DDOE/EA will work with various petroleum product suppliers, supplier associations and with federal agencies to ensure the timely flow of information.

4.4 Supply Disruptions versus Distribution Disruptions

Energy supply disruptions in the District fall into two major categories: 1) Disruptions that are external to the District; and 2) Disruptions that are internal.

4.4.1 External/Supply Disruptions

The District, except for a small amount of solar and co-generation, imports all of its energy. Consequently, a major potential supply disruption may occur to the system delivering energy to the District, causing a delivery disruption. DDOE/EA will facilitate the flow of information that is gathered by such organizations as the MWCOG, other state energy offices, regional supply networks, and federal agencies.

4.4.2 Internal/Distribution Disruptions

Internal/distribution disruptions are disruptions to the distribution system that prevent a sufficient energy supply from being delivered to the end user in the District. An internal/distribution disruption includes an equipment malfunction, power lines being down, or weather-related supply disruptions. DDOE/EA will facilitate the flow of information during an internal/distribution disruption.

4.5 DDOE's Roles and Responsibilities in Tracking & Assessing Energy Supply Disruptions

As noted above, due to the nature of the structure of the energy industry and the fact that the District imports most of its energy, DDOE/EA will primarily coordinate information garnered from external sources. The District will use the tracking and assessing plan as a framework for working with other supporting organizations to ensure that there is a timely flow of information to the mayor, energy users, and to the public in the case of an energy supply disruption.

DDOE/EA will coordinate with support agencies to help facilitate the flow of information needed by the mayor, energy users, and the public about the restoration of energy systems and fuel supplies following an emergency.

DDOE/EA will also coordinate the assessment of how an energy supply disruption was managed so that "lessons learned" can be shared with the mayor, the supporting agencies, energy users and the public.

DDOE/EA will use the ESDTP to monitor and share the type of information the mayor, energy users, and the public will need to know during and after an energy supply disruption.

4.6 Data for Profiling and Tracking

Section 3 contains the District's complete energy profile. This section provides the type of data that DDOE/EA maintains on an on-going basis. These data are primarily based on the information compiled by the EIA and tend to have a two-year lag. For example, the most recent data available are for 2009 and 2010. As the District's SEU becomes operational, additional information will be available on electricity and natural gas consumption in the District.

Energy profile data are used primarily for understanding consumption, price, and expenditure trends in the District. During an energy supply disruption, DDOE/EA will have to rely primarily on the energy companies and local and national regulators for tracking data.

4.7 Energy Assurance Planning Overview Process

The general approach for the ESDTP includes monitoring, tracking and post-event analyses. Figure 16 above depicts an overview of how the ESDTP and the energy assurance (emergency) planning process work.

The ESDTP activities monitor the balance between energy supply and demand and how well energy is being delivered to end users.

The tracking and assessing plan follows the general approach for tracking and assessing including monitoring, tracking, and post-event analyses. Tracking and assessing activities monitor the balance between energy supply and demand and how well energy is being delivered to end users. The monitoring process is designed to identify potential and actual disruptions to the energy supply and disruptions to the energy end users' delivery system.

4.8 Monitoring

Thoughtful data monitoring is critical to DDOE's capability to identify energy supply disruption triggers and to provide guidance during disruptions or declared energy emergencies. The monitoring effort serves as the foundation of the entire energy assurance planning effort. The monitoring activity utilizes data and information depicting whether or not the energy supply is adequate to meet the demands of end users and that the delivery system is functioning normally.

Monitoring efforts may include a review of the following:

- Annual forecasts of energy consumption and supply;
- Daily or weekly information on supply system status;
- Weather forecasts;
- Alerts indicating a supply system problem; and
- Requests for exemption from various rules or regulations that suppliers may need relief from in order to respond more effectively.

The following information will help identify a potential energy supply disruption event:

- Supply
  - Current/recent information
  - Forecasted information

- Demand
  - Current/recent information
  - Forecasted information

- Weather
  - Forecast of several days of very hot or cold weather

- — Forecast of heavy winds, rain, snow or icing conditions
- — Forecast of tornadoes or hurricanes
- — Atlantic storms interfering with shipping

- Infrastructure
  - — Significant electric generation capacity outages
  - — Failures of major electric transmission lines and/or major electric substations
  - — Failures in the propane, petroleum, or natural gas supply system (i.e., equipment, refineries, trucking, shipping, roadways, etc.)

- Other
  - — Geological events causing interruption of energy supply system (earthquakes, tsunamis, volcanic activity)
  - — Solar flares and eruptions
  - — Terrorist attacks (physical or cyber)

- Price
  - — Increases in spot prices
  - — Strikes involving energy supply or delivery systems
  - — International embargoes of energy supplies

Figures 81 through 82 (at the end of this section) provide DDOE with international, national, regional and District of Columbia data sources that will assist in establishing norms and identifying situations where deviation from acceptable norms is about to occur or has occurred.

Data monitoring will assist in the following:

- Identifying levels at which energy supply chain action is required;
- Identifying levels at which public action or government action is required;
- Identifying abnormalities due to unusual weather conditions;
- Maintaining regular updates of key information, including: storage status, expected outages for maintenance, and other information obtained from automated data reporting systems and contacts with key sources of information. This not only defines data, but also serves as a check on availability of contacts, changes in contact information, etc.;
- Reviewing media reports regarding supply source status including refinery shutdowns, international events/problems, etc.;
- Reviewing key news media to identify problems involving customers; and
- Issuing alerts when increased monitoring frequency and/or state action is required.

If monitoring indicates a stress condition either in the supply of or demand for energy, additional information or more frequent updates will be used to gain a better perspective on the situation. Furthermore, it will help determine whether action by industry/suppliers or by governmental entities is required. Over time, regular monitoring efforts will

indicate the parameters on which determinations of stress conditions can be based. Once corrective actions are deemed to be necessary, the tracking phase begins.

4.9 Tracking

Tracking involves enhanced data monitoring to maintain an awareness and sensitivity regarding developments of an energy supply disruption. It also includes tracking corrective actions taken by industry/suppliers and/or the state based on the severity of the disruption.

Additional information to be monitored will depend on the specific disruption and could include:

- Status of storage inventories for propane, petroleum, and natural gas;
- Estimated timing of departure and arrival of additional shipments of resources by sea or rail;
- Estimated restoration times for equipment outages;
- Effectiveness of demand reduction efforts;
- Weather forecasts indicating end of extreme conditions;
- Other appropriate information indicating system stress including: settlement of a rail strike which involves propane shipments from Canada; accidents with marine, pipeline, rail or truck shipping; easing of an international dispute that could lead to an embargo.

The following data sources may be useful in tracking:

- US Weather forecasts for Mid-Atlantic, East Coast states and the Gulf of Mexico;
- International Energy Agency;
- EIA of the US DOE;
- Data on the supply situation from Propane Gas Association (PGA), Mid Atlantic Propane Gas Association (MAPGA), Independent System Operator PJM (PJM);
- Operating information for District of Columbia EDCs and LDCs, gas pipeline companies, propane suppliers and the petroleum product supply chain;
- District of Columbia Department of Transportation (DDOT) as a source of information on road conditions and traffic problems;
- District of Columbia Department of Motor Vehicles as a source of information on requests for driver service hour waivers; and
- Financial reporting organizations as a source for spot pricing information for energy to indicate when a supply problem is expected.

4.10 Energy Supply Disruption Tracking Log

Tracking a disruption event includes collection of all relevant information associated with the corrective actions taken. Examples of such information include: the number of customers without service, geographic areas impacted, resources required to resolve or mitigate consequences of the problem, resources deployed for restoration activities,

progress on restoration activities, estimates of time required for restoration of normal conditions, effectiveness of industry/supplier actions on resolution of the problem and effects of the disruption on public health, safety and the economy.

All pertinent planned and ongoing activities taken to resolve an energy supply disruption will be documented using a real-time log—the Energy Supply Disruption Tracking Log. When conditions return to normal, the log will be used to prepare the post-event analysis report. The log will normally contain the following:

- Time and date of each entry;
- Name of person making the entry;
- Source of information;
- Type of disruption;
- Start date of disruption;
- Duration to date;
- Estimated Recovery Time (prior estimate and current estimate);
- End date of disruption;
- Symptoms;
- Impact on end users;
  - Number of end users affected
- Region of state affected;
- Corrective actions being taken or planned;
- Date and time when each corrective action is initiated;
  - By whom
  - Effect of each corrective action
- Was the issue resolved?;
- Is the situation improving or worsening?; and
- Date and time when each corrective action is completed or terminated.

4.11 Post-Event Analysis

After a disruption event has been resolved, a post-event analysis will be conducted. The analysis will evaluate all events associated with the disruption from the first indication to its resolution, including:

- Duration—length of time of energy supply disruption;
- Response—corrective actions taken;
- Restoration and recovery time;
- Analysis of corrective actions—determining effectiveness;
- Determination of root cause and lessons learned;
- Incorporation of enhancements into the EAP and the ESDTP.

This analysis begins with the first indication of a problem from data monitored prior to the disruption, industry/supplier and state actions taken and their effectiveness, and the effects of the actions on the state, supply chain participants, end users and the public. The purpose of the analysis is to determine:

- Whether additional data or more frequent monitoring would have provided earlier indications of problems;
- Whether the data collected during the event were adequate to determine effective corrective actions;
- The data were helpful in managing the event; and
- The corrective actions were successful. Based on the assessment of this information, recommendations to change the ESDTP, and perhaps the EAP itself, will be made.

The following are examples of the types of information and/or questions that should be addressed in the post-event analysis of an energy supply disruption:

- Using the Energy Supply Disruption Tracking Log and any other pertinent information, prepare a detailed chronology of the disruption event including: key data monitored, alerts issued, and actions taken from the first indication of a problem through return to normal conditions. Specific information will be documented in regard to the duration, response, restoration, and recovery time for energy supply disruption events.
- Analyze the effectiveness of all the corrective actions taken.
- If appropriate, conduct a root cause analysis to factually determine the initiating causes of the disruption.
- From the root cause analysis, determine what actions are necessary to prevent recurrence and the cost of the actions.
- Characterize the consequences of the disruption in terms of public health and safety; interruption of critical government functions; interruption of customer service; and economic effects for the public, commerce, industry, and state government.
- Did the historical data and thresholds provide proper response?
- Did the data and monitoring frequency provide adequate warning?
- Was there timely response to the alerts by the proper organizations (state, supply chain, media, and public)?
- Was the assessment accurate in defining the extent of the problem?
- Were the assessment and action steps executed in an appropriate timeframe?
- Could a faster assessment and action or different action have yielded better results?
- Document the lessons that have been learned from this incident and share them with the appropriate stakeholders.
- Suggest changes to energy supply system that would avoid the problem or mitigate its effects.

- What changes to the ESDTP and/or the EAP should be made to achieve a better result?

The analysis of an energy supply disruption will be documented in a post-event analysis report for historical reference, as a future training tool, and for the purpose of revising the ESDTP and EAP, as appropriate.

Figure 65 depicts the progression of an energy disruption when intervening corrective actions cannot resolve the issue. It follows the disruption from the initial stages to the declaration of an energy emergency.

These activities are similar for each energy form, but may differ to a degree due to differences in regulation, complexity of the supply and delivery system, and the ability to store energy. Generally, the order of complexity and formality of the supply and delivery system increases from petroleum to natural gas and, finally, to electricity.

4.12 Energy Source Review and Discussion: Petroleum and Propane

4.12.1 Brief Description of Petroleum and Propane Supply Chain

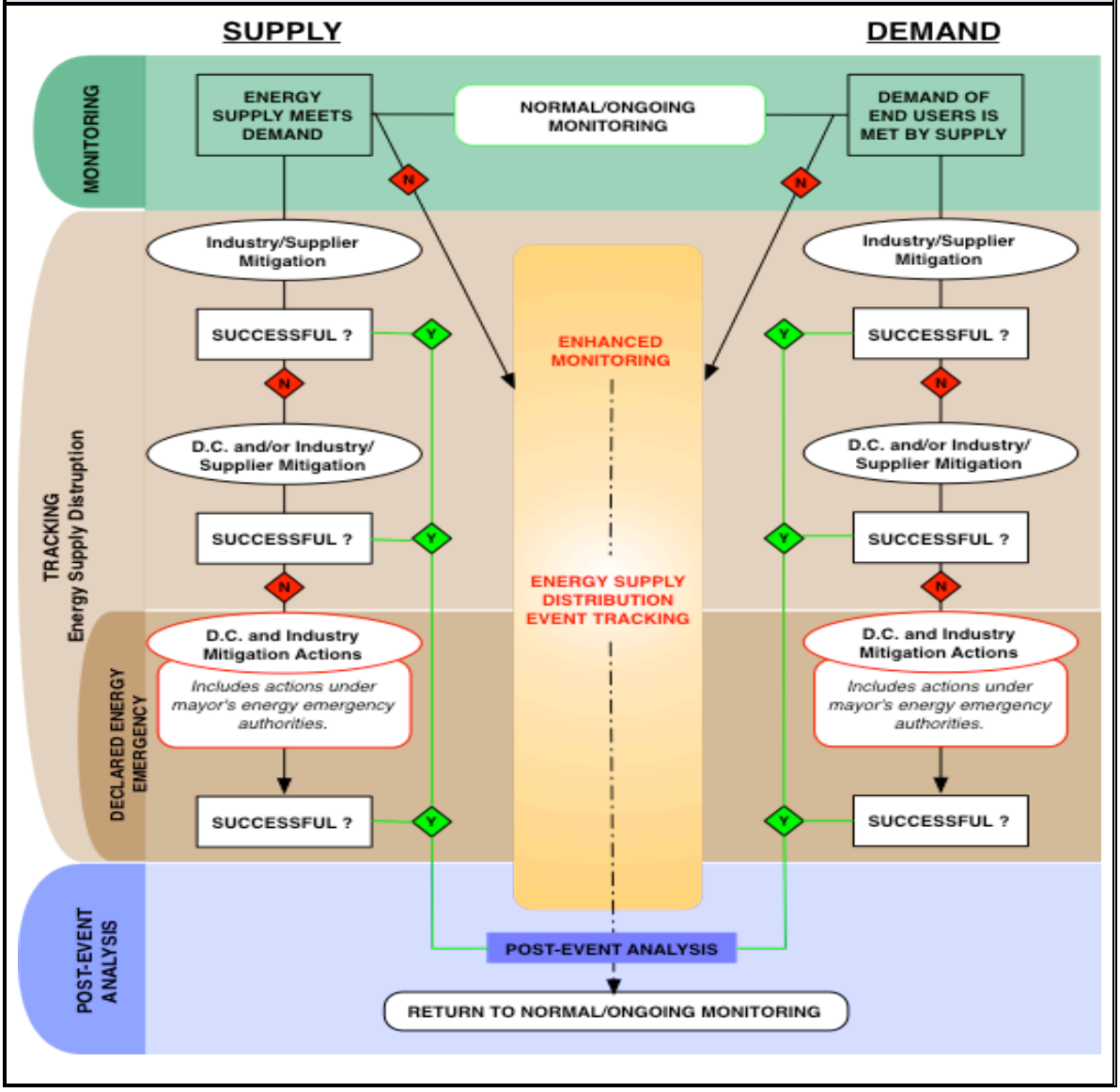
Petroleum

The District's annual petroleum consumption is 3.6 million barrels (151.2 million gallons). Petroleum is used in District of Columbia for transportation fuel (gasoline and diesel), and heating.[14] The breakdown of uses is:

- Gasoline—2.6 million barrels
- Distillate (heating oil and diesel fuel)—1.0 million barrels
- Jet fuel—0 barrels

[14] Data for 2008 from Energy Information Administration of US Department of Energy.

Figure 65: Process to Detect and Correct Potential and Actual Energy Supply Disruptions



Propane

The District's annual propane consumption is a relatively small share of total energy consumed. It is a clean fuel that does not require significant infrastructure cost on the part of real estate developers. Propane is used in the District for cooking, heating, forklift truck fuel, and other purposes.

A 2004 study for the National Propane Gas Association (*Study of the Propane Industry's Impact on US and State Economics*, Energy and Environmental Analysis, Inc., November 2004) estimated the uses of propane in the District:

- Residential—48.2%
- Industrial and internal combustion engines—25.1%

- Commercial—21.6%
- Cylinder and farm—5.1%

This study also estimated that in the District, 2% of homes are heated with propane. This agrees with estimates provided by US DOE EIA State Energy Profiles.

4.12.2 Monitoring the Petroleum and Propane Supply Chain

A number of issues can interrupt the supply of petroleum products. This document focuses specifically on issues that may arise after the product reaches its distribution point. The following may require monitoring:

- Supply
  - Transportation of supply once it reaches distribution
  - Construction projects interfering with transportation
  - Storage capacity at site of distribution

- Demand
  - Curtailment of interruptible fuel oil supplies

- Weather
  - Weather (may impact both supply and demand)
  - Forecast of several days of very cold weather
  - Forecast of heavy winds, rain, snow or icing conditions that will interfere with bulk trucking or shipping schedules
  - Forecast of tornadoes or hurricanes, which will affect oil production or refining along the Gulf Coast

- Infrastructure
  - Loss of electric power needed to operate pumps and controls throughout the petroleum or propane distribution system
  - Equipment failures in the petroleum or propane distribution system

- Other
  - Geological events causing interruption of energy supply system (earthquakes, tsunamis, volcanic activity)
  - Terrorist attacks (physical or cyber)
  - Solar flares (in cases where controls could be subject to solar flare interruptions)

- Price
  - Increases in spot prices
  - Strikes involving energy supply or distribution systems
  - International embargoes which interrupt shipments to the seaports serving the Northeast

- Increasing crude or refined product futures speculation attributed to various potential or anticipated market conditions (e.g., predicted but yet unrealized political or natural disaster situations)

Data that might be monitored fall into two general categories:

1. Data that represent months and years tend to provide forecasted information related to supply and demand.
2. Data that represent days and weeks tend to provide current or recent information related to actual supply and demand.

Figure 68 at the end of this section provides specific detail for petroleum data sources. Figure 69 at the end of this section provides specific detail for propane data sources.

4.12.3 Petroleum and Propane Supply Disruption Event Monitoring and Tracking Log

Refer to ESDTP – Section 4.10: Energy Supply Disruption Tracking Log, which applies to all energy forms, for details on information to be logged during an energy supply disruption event.

4.12.4 Petroleum and Propane Supply Disruption Post-Event Analysis Report

Refer to ESDTP – Section 4.11: Post-Event Analysis, which applies to all energy forms, for details on information to be considered for the analysis and reporting on energy supply disruption events.

4.13 Energy Source Review and Discussion: Natural Gas

4.13.1 Brief Description of Natural Gas Supply Chain

The District of Columbia's annual natural gas consumption by sector was obtained from DOE's EIA. The breakdown for 2010 is provided in Figure 66.

Figure 66: District of Columbia Natural Gas Consumption in 2010	
Sector	Consumption
Residential	13.6 billion cubic feet
Commercial	18.5 billion cubic feet
Industrial	0 cubic feet
Vehicle Fuel	0.934 cubic feet
Internal use in transmission, distribution	0.213 cubic feet
Total	**33.3 billion cubic feet**
Source: EIA	

Natural gas provides heat for 65% of the homes in District of Columbia.[15]

4.13.2 Monitoring the Natural Gas Supply Chain

A number of issues can interrupt the supply of natural gas. The following may require monitoring:

- Supply
  - Transportation of supply once it reaches distribution
  - Shortage of transport vehicles once product reaches distribution

- Demand
  - Curtailment of natural gas supplies

- Weather
  - Forecast of several days of very cold weather
  - Forecast of heavy winds, rain, snow, or icing conditions that will interfere with bulk trucking or shipping schedules
  - Forecast of tornados or hurricanes in or along the Gulf of Mexico
  - Atlantic storms interfering with shipping

- Infrastructure
  - Loss of electric power needed to operate compressors and controls throughout the natural gas distribution system
  - Equipment or pipeline failures in the distribution system
  - Tanker accidents

- Other
  - Geological events causing interruption of energy supply system (earthquakes, tsunamis, volcanic activity)
  - Terrorist attacks (physical or cyber)
  - Solar flares (in cases where controls could be subject to solar flare interruptions)

- Price
  - Strikes involving tanker trucks or ships
  - Market pricing diverting supply from the US
  - International embargoes which interrupt shipments to the seaports serving the Northeast

Data that might be monitored fall into two general categories:

[15] Energy Information Agency.

1. Data that represent months and years tend to provide forecasted information related to forecasts of supply and demand.
2. Data that represent days and weeks tend to provide current or recent information related to actual supply and demand.

Figure 70 at the end of this section provides specific detail for natural gas data sources.

4.13.3 Natural Gas Supply Disruption Event Monitoring and Tracking Log

Refer to ESDTP – Section 4.10: Energy Supply Disruption Tracking Log, which applies to all energy forms, for details on information to be logged during an energy supply disruption event.

4.13.4 Natural Gas Supply Disruption Post-Event Analysis Report

Refer to ESDTP – Section 4.11: Post-Event Analysis, which applies to all energy forms, for details on information to be considered for the analysis and reporting on energy supply disruption events.

4.14 Energy Source Review and Discussion: Electricity

4.14.1 Brief Description of Electricity Supply Chain

The District of Columbia's annual electric energy consumption by sector was obtained from DOE's EIA. The breakdown for 2010 is provided in Figure 67.

Figure 67:District of Columbia Electric Energy Consumption in 2010

Sector	Consumption (Million kilowatt hours)
Residential	2,123
Commercial	9,209
Industrial	230
Transportation	315
Total	**11,877**

Source: EIA

Twenty-four percent (24%) of the District's homes are heated with electricity (EIA State Energy Profiles) and there are significant numbers of District employees who work from home, making reliable electric power important to their effectiveness. The District's commercial and industrial sectors have critical information technology, communications, and laboratory activities that are dependent on a reliable supply of electricity. Other energy forms also depend on electricity for pumping, control and communications.

The electric supply system is comprised of electricity generation (and its fuel supply), high voltage (hundreds of kilovolts) transmission lines over long distances, and local distribution lines at lower voltage (tens of kilovolts). Electricity then flows to

transformers serving one to a few customers where the voltage is reduced to utilization voltages (hundreds of volts to a few tens of kilovolts).

Electricity is different from other energy forms in that there is no storage at the local level and only limited storage in hydropower plants at large, central locations. In addition, because electricity is distributed in overhead transmission and distribution lines vulnerable to storm damage, electricity is more prone to outages than other energy forms. These considerations require significant, redundant assets that are provided by pooling assets including personnel, trucks, and other resources, over a wide geographic region. This asset sharing must be coordinated on the basis of meeting a rapidly changing, instantaneous demand. Consequently, federal, regional, state, and local regulation and coordination of the electric supply system is governed by well-defined procedures and communication. There is little room for ambiguity about the existence of a problem—it is either associated with a precisely defined equipment problem (caused by a technical failure, an operator error, or a deliberate act) or an obvious storm situation—which will be a major subject of news programs and public service announcements.

4.14.2 Monitoring the Electricity Supply Chain

A number of issues can interrupt the supply of electricity. The following may require monitoring:

- Supply
  - Loss of natural gas, coal, nuclear, fuel oil, solar power, or wind power supply

- Demand
  - Extreme temperature conditions lasting several days

- Weather
  - Forecast of several days of very cold or hot weather
  - Forecast of heavy winds, rain, snow or icing conditions
  - Forecast of tornados or hurricanes

- Infrastructure
  - Loss of major equipment in the generation, transmission, or distribution system
  - Loss of a major transmission line
  - Failure of protective relays to isolate a fault
  - Loss of a large generating station

- Other
  - Geological events causing interruption of energy supply system (earthquakes, tsunamis, etc.)
  - Solar flares or eruptions
  - Terrorist attacks (physical or cyber)

- Price
  - Strikes involving generation plants

Data that might be monitored fall into two general categories.

1. Data that represent months and years tend to provide long-term information related to forecasts of supply and demand.

2. Data that represent days and weeks tend to provide short-term information related to actual supply and demand.

Figure 71 at the end of this section provides specific detail for electricity data sources.

4.14.3 Electric Supply Disruption Event Monitoring and Tracking Log

Refer to ESDTP – Section 4.10: Energy Supply Disruption Tracking Log, which applies to all energy forms, for details on information to be logged during an energy supply disruption event.

4.14.4 Electric Supply Disruption Post-Event Analysis Report

Refer to ESDTP – Section 4.11: Post-Event Analysis, which applies to all energy forms, for details on information to be considered for the analysis and reporting on energy supply disruption events.

Figure 68: Information Details for Petroleum						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Annual/long-term Information						
Annual Energy Outlook by EIA	Forecasts long-term energy supply perspective	Early release--December, full publication--March	Identifies long-term sources of supply, pricing, and provides baseline	Current	EIA	www.eia.doe.gov
Petroleum Product Dealer Registration	Identifies petroleum distributors, location and size of storage tanks	Annual	Used only in a petroleum supply disruption to assess inventories	Current		
Monthly, Weekly or Specific Event Information						
EIA Short-term Energy Outlook	Updates supply, storage and pricing information	Monthly	Identifies short-term supply, storage, pricing outlook, and provides baseline	Current	EIA	www.eia.doe.gov
Weather data	Heating degree day information with comparisons to prior years and projections of long cold snap	Daily	Weather forecast which in past years led to supply/transportation problems	Current	NOAA, DC HSEMA	
Weekly State Heating Oil and Propane Program (SHOPP) Teleconference	DC Energy Officials, EIA, Coast Guard and when supply is tight, industry representatives	Weekly, more frequently in tight supply situations	Statements on supply situation	Current		
Natural gas customer curtailment						
Crude Oil, Gasoline and Heating Oil Futures	Data from NYMEX	Daily (M-F)	Indicates long-term supply problem	Current		
Crude Oil, Gasoline and Heating Oil Spot Prices	Data from Wall Street Journal	Daily (M-F)	Indicates long-term supply problem	Current		

Figure 68: Information Details for Petroleum						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Retail gasoline and heating oil prices in DC	Based on weekly survey in DC	Weekly	Increase indicates supply problem	Current		
Wholesale gasoline prices		Daily (M-Sat)	Increase indicates supply problem	Current		
Wholesale heating oil prices		Daily (M-Sat)	Increase indicates supply problem	Current		
Heating Oil Futures	Based on NYMEX Data	Daily (M-F)	Increase indicates longer term supply problem	Current	NYMEX	
Natural Gas Inventories	Shows whether supply is adequate for this time of year	Weekly (Thursday)	Decrease below seasonal experience indicates problems	Current	EIA	www.eia.gov
Pipeline Status Bulletin Boards	All pipelines serving DC have them	Daily and current	Identifies supply issues associated with pipeline status	Current	Pipelines	
Stocks of crude oil, gasoline and distillate at various points of the distribution system	Comparison	Weekly (W)	Identifies available inventory and comparison with prior week and year data indicates whether situation is normal	Current	EIA	www.eia.gov
Request for driver hour waivers for petroleum tank trucks	Caused by backups at terminals or difficult driving conditions	As required	Indicates delivery capacity problem	Current	DMV	DMV
Media reports on supply chain interruptions within the U.S. and internationally including information on political instability in countries from which petroleum is imported	Indicates problems with petroleum	As required	Indicates possible problem	Proposed	Automated search services such as Google Alerts, NY Times	

Figure 68: Information Details for Petroleum						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Media reports of customer problems with supply in DC	Indicates problems have reached customer	As required	Problem is severe and has reached customer	Current		
Information During Stress Conditions						
Customer complaints, press reports on supply problems	Information may be through telephone, e-mail or broadcasts	As it happens	Indicates problem with supply or delivery	Current		
Inventory in tanks	Request by DDOE	As indicated	Can show level of problem, geographic variations	Current		
Status of restoration efforts	Information may include number of customers without service, stocks of petroleum products, comments on restoration effort by those involved	As indicated	Shows progress toward resolution of disruption	Proposed		

Figure 69:Information Details for Propane						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Annual/long-term Information						
Pre-Heating Season Meeting with Propane Gas Association	Discussion of Current Supply Situation and Projection for Heating Season	Annual	Expression of concern for supply adequacy	Current	LPG association	
DOE Annual Winter Fuels Outlook Conference	Forecasts heating season supply situation	Annual	Forecast problem, pricing	Proposed	EIA	http://tonto.eia.doe.gov/oog/info/hopu/hopu.asp
Annual Energy Outlook	Projection of long-term outlook for demand and supply of energy--no specific information for propane, but oil and natural gas information affects propane situation	Annual in March with early release in December	Forecast problem, pricing	Proposed	EIA	http://www.eia.doe.gov/oiaf/aeo/index.html
CSX RR Union Contract Status	Indication of probable strike	Annual, at contract renewals	Failure to reach new contract prior to end of current contract	Proposed	Automated search services such as Google search, NY Times	
International Outlook for countries from whom propane is imported	Indication of problems, possibility of supply disruption	Annual and when indicated	Threats to curtail supply to marine terminals	Proposed	US Department of State, General News Sources, International Energy Agency	
Market pricing in Europe which exceeds that in the	Indication that propane supplies may be diverted to	Annual and when indicated	Price which historically has resulted in diversion of supplies to Europe	Proposed	EIA	http://www.eia.doe.gov/emeu/international/oilprice.ht

Figure 69:Information Details for Propane						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
U. S. and diverts supply to the European market	Europe					ml
Monthly, Weekly or Specific Event Information						
Weather data	Heating degree day information with comparisons to prior years and projections of long cold snap	Daily	Weather forecast which in past years led to supply/transportation problems	Current	NOAA	
Propane Spot Prices	Comparison to futures prices shows problem when difference increases sharply	Daily (M th F)	Spike in prices	Current	Wall Street Journal	
DC Retail Propane Prices	Current propane price	Weekly Survey (W)	Rapid increase in prices	Current	EIA	http://tonto.eia.doe.gov/oog/info/twip/twip.asp http://tonto.eia.doe.gov/oog/info/hopu/hopu.asp
Propane Inventories	Stocks of propane	Weekly (W)	Stocks significantly below normal	Current	EIA	http://tonto.eia.doe.gov/oog/info/twip/twip.asp http://tonto.eia.doe.gov/oog/info/hopu/hopu.asp
DC Heating Oil and Propane Program Weekly teleconference	DC Energy Officials, EIA, Coast Guard and when supply is tight, industry representatives.	Weekly (Tue)	Statement of supply problem	Current	Mid-Atlantic States, EIA, USCG, VA, MD, sometimes LPG associations	

Figure 69:Information Details for Propane						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Applications for Driver Hour Waivers in the District	Request to DC DMV by propane association	As they happen	Indicates high demand and problems with supply and/or transport capacity	Proposed	DMV	
Curtailment of natural gas to interruptible customers	Propane is a back-up to natural gas for some customers	As it happens	Indicates demand for propane will increase	Proposed	PSC & PJM	
Media reports on supply chain disruptions or events which could result in supply chain disruptions		As it happens		Proposed	Automated search services such as Google search, NY Times	
Customer complaints to DRES and media mention of shortages		As it happens		Current	Phone calls and e-mails to DRES	
Information During Stress Conditions						
Applications for driver hour waivers in other states	Applications in neighboring states indicate supply and transportation stress	As appropriate	Waiver Applications	Proposed	National Propane Gas Association	http://www.npga.org/i4a/sss/index.cfm?pageid=832
Supply Status	Contacts with LPG Association	As appropriate	Allocation status, inventory status	Proposed		
Allocation Status, Inventory Status	Ask during weekly phone call for price information or request through Petroleum Vendors Registration Process	As appropriate	Allocation status, inventory status	Proposed	Weekly phone call survey companies	

Figure 70: Information Details for Natural Gas						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Annual/long-term Information						
Design Day Submittal to PSC by LDC's	Shows maximum demand day over 30 year period and approach to meet demand	Biennially	Provides benchmark for daily information on supply	Current	LDCs/PSC	PSC
Emergency Curtailment Plan submittal to PSC by LDC's	Provides sequence of actions in the event of a supply deficiency	Biennially	Defines actions by LDC in event of supply deficiency	Current	LDCs/PSC	PSC
Pre-Heating Season Briefing by _____?	Forecasts any anticipated supply problems	Annual--November	Identifies any projected supply problems	Current	Gas companies or others?	
Annual Energy Outlook by EIA	Forecasts long term energy supply perspective	Early release--December, full publication--March	Identifies long-term sources of supply, pricing, and provides baseline	Current	EIA	www.eia.doe.gov
Northeast Gas Association Communications Plan	Identifies who will be informed regarding supply issues--PSC and DDOE are included in the recipients	As appropriate		Current	Regional gas association or other	
Mutual aid agreements	Shows how personnel to restore gas service will be provided by participating gas companies	As appropriate		Current	LDCs/PSC, Northeast Gas Association as Coordinator	LDCs/PSC
Communication, supply delivery, mutual aid drills	Shows readiness to implement plans	Annual	Drill failure indicates plan deficiency	Current	Regional gas association or other	
Pipeline Safety	Shows pipeline	Biennially	Indicates pipeline deficiencies	Current	PSC Gas	

Figure 70: Information Details for Natural Gas						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Audit for Transmission and Distribution Pipelines	deficiencies versus CFR 192 Transportation of Natural and other Gases by Pipeline; Minimum Federal Safety Unit audits				Pipeline Safety Unit	
Monthly, Weekly or Specific Event Information						
EIA Short-term Energy Outlook	Updates supply, storage and pricing information	Monthly	Identifies short term supply, storage, pricing outlook, provides baseline	Current	EIA	www.eia.doe.gov
Weather data	Heating degree day information with comparisons to prior years and projections of long cold snap	Daily	Weather forecast which in past years led to supply/transportation problems	Current	NOAA, DEMHS	
Natural Gas Futures	Sensitive to integrated perspective of weather and supply prospects	Daily (M -F)	Rapid increase indicates supply problems	Current	NYMEX	
Natural Gas Spot Prices	Sensitive to integrated perspective of weather and supply prospects	Daily (M-F)	Rapid increase indicates supply problems	Current	Wall Street Journal/Platts	
Natural Gas Inventories	Shows whether supply is adequate for this time of year	Weekly (Thursday)	Decrease below seasonal experience indicates problems	Current	EIA	
Pipeline Status Bulletin Boards	All pipelines serving DC area have them	Daily and current	Identifies supply issues associated with pipeline status	Current	Pipelines	Links on www.northeastgas.org
NGA Gas Supply	Summary sent to	Weekly or daily in	Identifies supply problems and	Current	Regional gas	www.northeastgas

Figure 70: Information Details for Natural Gas						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Task Force teleconference	PSC, DC DEEA	emergency	approach to resolution		association or other	.org
Notification of Flow control order	Basis for customer curtailment, PSC is notified informally or formally once threshold number of customers is exceeded	As required	Shows gas delivery is being curtailed	Current	LDCs/PSC	LDCs/PSC
Request for Driver hour waivers for LNG tankers	Could be limited to LNG supply or to overall gas supply	As required	Indicates LNG supply capacity problem	Current	DMV	DMV
Natural Gas Inventories	Informal communication from regional authorities and LDC's	As required	Indicates changes in severity, duration of supply deficiency	Current	LDCs	
Pipeline Status Bulletin Boards	Shared with local emergency response officials and PSC	As required	Defines process and expected timing of restoration	Current	LDCs	Personal communication between LDC person in charge and local emergency and PSC officials
NGA Gas Supply Task Force --if any…..Teleconference	Posted on LDC web sites	As required	Indicates status, progress	Current	LDCs	
Media reports on problems in the natural gas supply chain	Indicates supply problem	As required	Depends on situation	Proposed	Media including automated search services such as Google alerts, NY	

Figure 70: Information Details for Natural Gas						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
					Times	
Customer Complaints to DDOE or PSC and/or 311	Shows problem has reached customer	As required	Indicates severe supply problem	Current	Phone calls and e-mails to DDOE	
Information During Stress Conditions						
Updates of Supply Situation		As required	Indicates changes in severity, and duration of supply deficiency	Proposed	Informal communication from Northeast Gas Association and LDCs	
Restoration Plans	Defined by LDC and reviewed with PSC and local officials	As required	Defines process and expected timing of restoration	Current	Shared with local emergency response officials and PSC	
Numbers of Customers Without Gas	Shows towns with problems and indicates changes	As required	Indicates status and progress	Proposed	Posted on LDC web sites	
Local LNG Storage Inventory	x # of tanks in DC have significant capacity	As required	Indicates time available before major curtailment is needed	Proposed	LDCs	

Figure 71: Information Details for Electricity						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Annual/long-term Information						
PEPCO Emergency Plan	Identifies PEPCO actions in event of emergency	Updated every few years		Current	EDCs, PSC	
Annual Energy Outlook by EIA	Forecasts long term energy supply perspective	Early release--December, full publication--March	Identifies long-term sources of supply, pricing, provides baseline	Current	EIA	www.eia.doe.gov
Generation and Transmission Capacity Requirements Forecasts	A number of reports published by PJM with near- and long-term needs forecasts	Annual	Indicates new capacity needs	Current	PJM	www.pjm.com
Monthly, Weekly or Specific Event Information						
EIA Short-term Energy Outlook	Updates supply, storage and pricing information	Monthly	Identifies short-term supply, storage, pricing outlook, provides baseline	Current	EIA	www.eia.doe.gov
Weather data	Heating degree day information with comparisons to prior years and projections of long cold snap	Daily	Weather forecast which in past years led to supply/transportation problems	Current	NOAA	
Seven day forecast	Forecasts weather, demand and capacity available	Daily	Severe weather or probable capacity deficiencies	Current	PJM	www.pjm.com
Monitoring of weather 4 days in advance by mutual aid groups		Current	Severe weather forecasts	Current	EDCs	
Morning Report	Current weather and power system conditions	Daily	Severe weather or probable capacity deficiencies	Current	PJM	www.pjm.com

Figure 71: Information Details for Electricity						
Information Description	**Comments**	**Frequency**	**Indication of Stress or Emergency**	**Current or Proposed**	**Source**	**Site/contact specifics**
Alerts	Notice of abnormal conditions, operating restrictions	As required	Specific problems identified	Current	PJM	www.pjm.com
Customer calls	Defines location of outage	As required	Specific customer outage identified	Current	EDCs, PSC, DRES	
Information During Stress Conditions						
Power Watch and Warning	Watch--turn off all unnecessary electrical equipment during 11 AM to 4 PM peak period, Warning- immediately turn off unnecessary electrical equipment	As required	Warning that a severe delivery problem exists, radio and TV public service announcements	Current	PJM	www.pjm.com
Plans for resolution of generation and transmission outages		As required	Addresses specific problems	Current	PJM	Information provided to DC HSEMA and PSC
Plans for resolution of distribution system outages	Done in coordination with PSC and local emergency management officials	As required	Addresses specific problems	Current	EDCs, PSC	Information provided to DC HSEMA, PSC and local emergency management personnel
Number of customers without power by area of DC	Shows status and progress of service restoration	Daily or more frequent	Shows status and progress of service restoration in text and map formats	Current	EDCs, PSC	

5 District of Columbia Plan for Energy Resiliency

As outlined in Figure 15 above, there are four areas related to DDOE's roles and responsibilities: 1) pre-event, 2) event, 3) post-event and 4) resiliency.

There are two primary roles and responsibilities when considering the District's plan for energy resiliency, the pre-event roles and responsibilities of "overseeing and monitoring" and the resiliency roles and responsibilities of "collaborating on critical infrastructure protection and promoting measures to build resiliency."

5.1 Pre-Event: Providing On-Going Monitoring

Providing on-going monitoring is an on-going activity. This activity falls under Level 1 within the HSEMA operational procedures, as shown in Figure 21. It is also a major component of DDOE's Monitoring & Tracking Framework (Figure 21).

5.1.1 What Will DDOE Monitor?

DDOE will monitor the following:

Energy profile of the District

1. The energy profile of the District that is outlined in Section 3 above. This monitoring includes the drivers of energy supply, demand and prices, which includes the trends in energy costs and expenditures.
2. The energy regulatory environment and the extent to which it supports energy assurance.
3. The energy market structure and the extent that it fosters or hinders energy assurance.
4. The energy market structure; that is the number of firms that comprise the number of suppliers and distributors.

Resiliency

5. Policies and programs that promote resiliency.

Critical infrastructure protection

6. Policy and programs that protect the critical infrastructure.

Emergency response planning

7. Planning exercises and Emergency response planning involving critical infrastructure.

DDOE's ongoing monitoring activities include the following:

8. Comprehensive energy planning.
9. Assessing reports of the District's Sustainable Energy Utility.
10. Promoting programs to enhance the resiliency of the District's energy systems.
11. Reviewing, as part of emergency planning exercises, the emergency plans of energy providers and suppliers in the District, noting possible gaps, and suggesting ways to close those gaps.
12. Reviewing, as part of emergency planning exercises, the related portions of emergency plans of federal agencies that relate to energy supply disruptions, noting possible gaps, and identifying processes to close gaps if they exist.
13. Updating the District's energy profile.
14. Continuing to keep abreast of the activities of the Metropolitan Washington Council of Governments (MWCOG) National Capital Region (NCR) Critical Infrastructure Protection (CIP) Working Group (see Section 2.7.4).
15. Continuing to keep abreast of the activities of MWCOG's Energy Advisory Committee, Climate, Energy, and Environment Committee, and the Chief Administrative Officer's Committee, and continue to coordinate response efforts in accordance with MWCOG's Regional Emergency Coordination Plan.[16]
16. Periodically incorporating additional best practices and lessons learned from energy emergencies into the EAP as needed.
17. Monitor the progress of PEPCO's installation of smart grid technologies and cyber security efforts.
18. Researching the potential for creation of micro grids in the District and review the potential for energy storage solutions.
19. Ensuring that energy suppliers, critical infrastructure facilities, and the largest employers in the District have adequate emergency operations plans, or continuity of operations plans in place. The District may want to engage in on-going coordination efforts with privately-owned facilities to ensure that adequate energy backup systems are in place prior to an energy emergency.
20. Remain aware of any changes in energy curtailment and restoration priorities in place made by energy utilities.

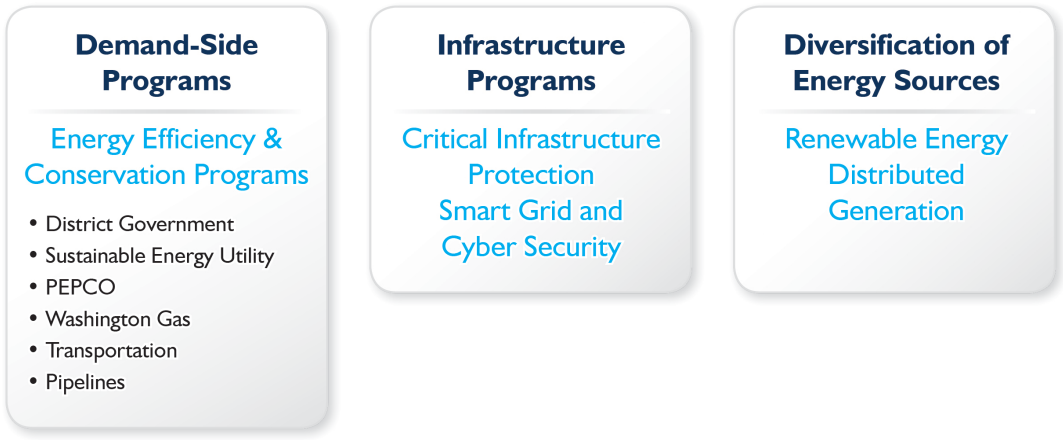
5.2 State Plan for Resiliency: Critical Infrastructure Protection and Promoting Resiliency

Promoting resiliency is an on-going activity. This activity falls under Level 1 within the HSEMA operational procedures, as shown in Figure 21. Enhancing resiliency is also a major component of DDOE's Monitoring & Tracking Framework (Figure 16).

DDOE's ongoing activities to enhance the resiliency of the District's energy systems include demand-side programs and infrastructure programs.

[16] MWCOG. Regional Emergency Coordination Plan. Available here: http://www.mwcog.org/security/security/download/RECP_final.pdf.

Figure 72: DDOE's Programs to Enhance Resiliency



Resiliency Defined: Resiliency, as defined by US DOE, is "the ability to respond effectively to an energy emergency and to recover quickly from damage."[17] An effective energy assurance and response plan helps restore energy services quickly following an energy disruption.

Resiliency ensures that the District can quickly mitigate or help lessen the impacts of an energy disruption or emergency. Resiliency is enhanced 1) by identifying critical infrastructure facilities and 2) by developing a plan to protect these facilities from threats and vulnerabilities during an energy emergency. A diversification of energy sources also enhances resiliency. Diversification helps reduce the frequency and/or duration of certain energy disruptions by reducing reliance on a limited number of energy sources. The diversification of these energy sources helps ensure the reliability of the District's energy supply and increases resiliency after an energy emergency. This section outlines steps that the District has taken to increase resiliency and includes ways the District can build upon these efforts.

5.3 Critical Infrastructure Protection Responsibilities

Critical Infrastructure Defined: Section 1016(e) of the USA Patriot Act of 2001 (42 U.S.C. 5195c(e)) defines critical infrastructure as "systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters." Key resources is defined by section 2(9) of the Homeland Security Act of 2002 (6 U.S.C. 101(9) as "publicly or privately controlled resources essential to the minimal operations of the economy and government."

[17] U.S. DOE. O.E. "Enabling States and Localities to Improve Energy Assurance and Resiliency Planning." Undated brochure. Available here: http://www.energyassurance.us/docs/EAP%20Brochure_092310.pdf.

The 2009 National Infrastructure Protection Plan[18] builds upon these definitions by categorizing the nation's critical infrastructure into 18 main sectors, including:

1. Agriculture and food (food supply safety, farms, food storage facilities, etc.)
2. Defense industrial base (Department of Defense (DOD) facilities, private contractors to the DOD, and other privately owned facilities.)
3. Energy (all energy production and distribution infrastructure, pipelines, oil refineries, electric grids, natural gas facilities and pipelines, etc.)
4. Healthcare and public health (hospitals, nursing homes, blood donation centers, mental health facilities, laboratories, etc.)
5. National monuments and icons (any monuments, statues, etc. of national or historical importance)
6. Banking and finance (financial institutions, buildings, financial communications systems, banks, automated teller machines, etc.)
7. Drinking water and wastewater (water and wastewater pumping stations, treatment plants, distribution systems, etc.)
8. Chemical (basic, specialty, or agricultural chemicals, pharmaceuticals, and consumer goods and related facilities)
9. Commercial facilities (any facilities that are privately owned, can include indoor and outdoor sporting and recreational areas, amusement parks, sports arenas, casinos, hotels, conference centers, entertainment and media venues, real estate, and retail centers)
10. Critical manufacturing (primary metal, machinery, electrical equipment, appliance, and component, and transportation equipment manufacturing, and all related facilities.)
11. Dams ("assets, systems, networks, and functions related to dam projects, navigation locks, levees, hurricane barriers, mine tailings impoundments, or other similar water retention and/or control facilities")
12. Emergency services (fire, law enforcement, emergency medical services, hospitals, 911 dispatch call centers and computer and communications equipment, hazardous materials and other emergency response teams, search and rescue operations, bomb squads, tactical teams, etc.)
13. Nuclear reactors, materials, and waste
14. Information technology (computer systems, networking equipment, hardware, software, etc. that is critical to the protection of information technology and data systems)
15. Communications (phone and cable lines, cell phone towers, computers, satellite and wireless transmission systems, etc.)

[18] U.S. Department of Homeland Security. National Infrastructure Protection Plan. 2009. Available here: http://www.dhs.gov/files/programs/editorial_0827.shtm.

16. Postal and shipping (post offices, distribution centers, processing facilities, local delivery units, transport vehicles, other privately-owned shipping facilities and related infrastructure, etc.)
17. Transportation systems (public transportation systems, roadways, airports, traffic signals, aviation towers, railroad crossings, ports, waterways, etc.)
18. Government facilities (could include any government-owned or government-leased facility, jails, prisons, office buildings, archives, museums, court houses, embassies, etc.)

The NCR CIP Working Group Homeland Security is organized with equal representation from Maryland, Virginia, the District of Columbia, and the Office of National Capital Region Coordination (ONCRC). The committee has taken responsibility for coordinating the development and execution of the regional CIP strategy that builds on the utilization of non-Urban Area Security Initiative (UASI) funding awarded prior to the development of the current UASI program. A draft strategy was prepared in 2010. In summary, the NCR CIP Strategy is organized into seven sections that provide guidance to the NCR partners on the development of policies and processes to coordinate an effective Critical Infrastructure Protection program. These sections are as follows:

1. Strategy Participants and their Roles and Responsibilities
2. Asset Identification
3. Vulnerability Determination
4. Identifying Solutions
5. Program Management
6. Operational Integration of the Strategy
7. Strategy Implementation Work Plan

As cited above, this NCR CIP Strategy concludes with a Work Plan that establishes Goals, Objectives, Initiatives, Implementation Tasks, and Projects that would aid in the coordination and implementation of an effective CIP Strategy. Among other things, a specific task may include identification of key assets. DDOE should continue to keep abreast of the activities of the MWCOG NCR CIP Working Group.

This working group:

1. Maintains the list of critical facilities and key resources in the District that ensures that critical infrastructure is protected and that restoration priorities for critical facilities are set before an energy emergency occurs.
2. Collaborates with relevant partners to ensure that electricity, natural gas, or transportation and heating fuel supplies are restored to these critical facilities first.
3. Maintains a critical infrastructure protection plan with an energy sector-specific plan.
4. Periodically updates the infrastructure protection plan and securely stores all the relevant information. **Critical infrastructure information is protected and only authorized personnel are permitted to access the information. Due to the sensitive nature of the critical facilities list and the critical infrastructure**

protection plan, this information has not been included in this version of the energy assurance plan.

In addition, MWCOG, the USDOE, USDHS, and the U.S. Department of Defense (USDoD) play a role in examining and protecting critical infrastructure within the District, and within the NCR. In a Memorandum of Understanding between USDOE and USDoD in 2010, both agencies agreed to protect critical infrastructure and enhance energy security.[19]

Protecting critical infrastructure and key assets is integral to energy assurance planning. Once individual facilities are identified as critical, state and local governments can work with utility companies and the private sector to develop a list of priorities for restoration of energy services where practical. Identification of critical infrastructure and key assets also allows states to identify interdependencies between infrastructures, and can help the District further assess vulnerabilities of critical infrastructure to energy disruptions, and continue planning efforts to mitigate the effects of energy disruptions.

During an energy emergency:

1. DDOE, DPW, and HSEMA share responsibility for coordinating delivery and installation of backup generators at critical infrastructure facilities during energy emergencies. The Department of General Services (formerly the Department of Real Estate Services) is responsible for coordinating with DPW to disconnect emergency generators once power has been restored. The responsibility of each agency and local stakeholders during an energy disruption or an energy emergency (e.g., PEPCO, Washington Gas, etc.) is provided in more detail in the Roles and Responsibilities section of the report.

2. Based on the nature of the emergency, the Mayor, through HSEMA, will identify the government sector facilities that comprise critical infrastructure. Depending on the emergency, the types of functions that need to be carried out may vary, as may the structures and other resources needed to support those functions.

3. Once the facilities and the functions have been identified, then DDOE—as the lead for ESF #12—will provide the monitoring and coordinating roles that are outlined in the EAP.

5.4 Proactive Measures to Build Resiliency

5.4.1 Sustainable DC

On April 24, 2012, Mayor Vincent Gray officially launched a program entitled Sustainable DC—a community collaboration designed to improve the District along eleven dimensions, "with the ultimate goal of making DC more socially equitable,

[19] http://energy.gov/sites/prod/files/edg/media/Enhance-Energy-Security-MOU.pdf.

environmentally responsible and economically competitive."[20] Energy is one of the dimensions that Sustainable DC addresses. Specifically, the Mayor's goal is to cut energy use by 50% and increase the use of renewable energy 50% by 2032. Increasing the use of renewable energy sources reduces reliance on fossil fuels, helps diversify the District's energy sources, and increases the Districts' resiliency. Combined with new technologies (e.g., smart grid components), reducing energy use and diversifying its energy sources will allow the District to meet its sustainability goals.

5.4.2 Proactive Measures

The District has taken steps to reduce vulnerabilities before an energy disruption occurs by:

- Helping to deploy smart grid technologies and increasing cyber security efforts (see Section 5.8.2 for more information on Pepco's smart grid implementation and cyber security efforts in place to protect customer information, and Section 5.8.6 for additional benefits of smart grid technologies).
- Encouraging energy efficiency in homes, businesses, and government offices (see Figure 73 and the text that follows for energy efficiency programs in place, or in development in the District).
- Encouraging the use of renewable forms of energy and transportation (see Section 5.5 for information on renewable energy, and Section 5.11 for information on transportation).
- Diversifying energy sources to help reduce the frequency and/or duration of certain energy disruptions by reducing reliance on a limited number of energy sources (encouraging renewable energy sources and alternative transportation fuels helps diversify the District's energy sources; see Section 5.5 for information on renewable energy, and Section 5.11 for information on transportation).

The District and many local partners already have plans or programs in place that will continue to enhance resiliency and help protect critical energy infrastructure. These efforts are listed in the table below and described in more detail in the sections that follow.

In most cases, DDOE is listed as the responsible District office, but some of these programs are now under the purview of the DCSEU.[21] In other cases, programs were part of a two-year pilot program funded by the Reliable Energy Trust Fund (RETF) and the Natural Gas Trust Fund (NGTF).

The Sustainable Energy Trust Fund (SETF) and the Energy Assistance Trust Fund (EATF) under the CAEA of 2008 replaced these funding sources. Some of the projects

[20] Sustainable DC Web site: http://sustainable.dc.gov/.
[21] The DCSEU is a program of DDOE (www.dcseu.gov) and currently operated by the Vermont Energy Investment Corporation (http://www.veic.org).

originally funded have been discontinued. These discontinued programs are not discussed here. Some of the programs that ended as of September 30, 2011 are highlighted below to provide examples of the types of activities that DDOE under took to promote energy resiliency.

The DCSEU is now responsible for implementing energy efficiency programs in the District, and will continue to develop additional programs that will help enhance resiliency. Additional information on energy efficiency programs will be posted by the DCSEU on its website http://dcseu.com/index.aspx.

Figure 73: Sustainable Energy Programs in the District

Sustainable Energy Programs	District Office/Organization Responsible for Program	Program Status
Electricity		
Weatherization Plus	DDOE, funded through the Sustainable Energy Trust Fund (SETF)	Discontinued, seeking reinstatement
Weatherization	DDOE, funded through U.S Department of Energy	Active
Low Income Home Energy Assistance Program (LIHEAP) Expansion and Energy Education	DDOE, funded through the Energy Assistance Trust Fund (EATF)	Active
Saving Energy in DC Schools	DDOE, funded through the SETF	Completed
Property Assessed Clean Energy Bond Program	DDOE	In the planning stages
Residential Lighting and Appliance	PEPCO	Discontinued
Non-Residential Prescriptive Rebate	PEPCO	Discontinued
Custom Incentive	PEPCO	Discontinued
Non-Residential heating, ventilation, and air conditioning system (HVAC) Efficiency	PEPCO	Discontinued
Non-Residential Building Commissioning	PEPCO	Discontinued
Renewable Energy Incentive Program	DDOE, funded through the SETF	Active
Business Energy Rebates Program	DCSEU	Active (note that rebates are also offered for natural gas-operated equipment)
Low-Income Multifamily (LIMF) Services	DCSEU	Applications were accepted until April 23, 2012
Commercial and Institutional Services	DCSEU	Active – some services are active only through September 15, 2012.
Transportation Fuel Efficiency and Conservation		
CapitalBikeshare Program	DDOT	Active, was called the SmartBike DC program until 2011
Streetcar Program	DDOT	Active
Charge Point America Program	Coulumb Technologies	Active
Alternative Fuel Vehicle Fleet	DDPW	Active
Natural Gas Efficiency and Conservation		

Figure 73: Sustainable Energy Programs in the District		
Sustainable Energy Programs	**District Office/Organization Responsible for Program**	**Program Status**
Heating System Repair, Replacement	DDOE, funded through the SETF	Discontinued
Residential Weatherization and Efficiency	DDOE, funded through the SETF	Discontinued
Residential Essential Service Expansion and Awareness Program	DDOE, funded through the EATF	Active
Source: http://rrc.dc.gov/green/lib/green/pdfs/CAEA_Q4-10.pdf http://green.dc.gov/green/lib/green/pdfs/CAEA_Q1-11.pdf http://rrc.dc.gov/green/cwp/view,a,1244,q,461338.asp http://dcseu.com/index.aspx		

5.4.3 Electricity Energy Efficiency and Conservation Programs

Energy efficiency and conservation programs help the District reduce dependence on electricity by reducing the overall consumption of electricity. As the District reduces the amount of electricity used, reliance on electricity is reduced. Lowering the total amount of electricity required puts the District is in a better position to respond to an energy emergency. Energy efficiency and conservation ultimately help increase the continued viability of the electrical supply. This, in turn, increases the District's resilience during an energy emergency. The District's goal is to reduce overall energy consumption by 1% per year.

5.4.4 Low Income Electricity Energy Efficiency and Conservation Programs

While these programs ended September 30, 2011, they indicate the types of programs that support "resiliency." For example, DDOE maintained a few low-income programs that promoted energy efficiency that were funded by the US DOE and through the SETF: Weatherization Assistance Program (WAP); Weatherization Plus; and the Weatherization Rehabilitation Program. The programs reduced energy usage by a total of 6,255.7 MWH, or 1.347 MW.[22] The District had received an $8.1 million federal American Reinvestment and Recovery Act (ARRA) grant in support of the base WAP grant.

The Weatherization Plus program was an expansion of what was the Weatherization Assistance Program. Energy audits were conducted and suggested energy efficiency measures were installed in low-income housing units. The program provided insulation, weather stripping, and energy efficient lighting. The program also replaced windows and doors, air conditioners, and replaced or repaired heating and cooling systems. Hot water heaters were wrapped or replaced, and faucet aerators, showerheads, and programmable

[22] DOXA, Inc., DDOE Independent Evaluator, "Impact Evaluation Study of the District Department of the Environment's Two-Year Pilot Reliable Energy Trust Fund Programs," docketed May 19, 2008, FC 945.

thermostats were replaced. This program decreased energy usage, which reduced load on the electrical system, saved residents money, and reduced pollution and greenhouse gas emissions. Over 1,217 applications were received by the District for the Weatherization Plus program, and more than 420 installations were completed.[23] In April through June 2011, 43 audits, and 19 installations were completed. Through the end of February, 2011, 989 homes were weatherized through the District's overall Weatherization Assistance Program.[24]

Under the Weatherization and Rehabilitation Program, energy audits were performed and electricity-saving measures were installed in rehabilitated low-income housing units. The District focused on non-profit and community based organizations that were improving multi-family low-income units. In 2010, 223 installations were completed.[25] In April through June 2011, 130 installations were completed. A total of 217 applications were received by the District.[26]

With funds from the EATF, the District was responsible for the Low-Income Home Energy Assistance Program Extension and Education Program. The funds supplemented funding received from the federal LIHEAP. Funds for the 2010 fiscal year were depleted by May, 2010, with 2,808 households signed up for assistance.[27] During April through June 2011, 6,949 households were enrolled in the program.[28]

The DCSEU also sponsors some low income programs as part of its Low-Income Multifamily (LIMF) Services. Applications for the Low Income Multifamily Comprehensive Program were available to "to affordable housing developers and property owners who incorporate energy-efficient systems and measures in the new development, redevelopment, or substantial rehabilitation of affordable housing in DC."[29] Applications were accepted through April 23, 2012, and additional information on the program is forthcoming from the DCSEU. The LIMF Property Manager Direct Installation Program is also available for a limited time, and offers "owners and property managers of qualified affordable housing developments energy-efficient products at no cost for installation in their buildings through the Property Manager Direct Installation (PMDI) Program."[30]

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[23] DDOE. "Clean and Affordable Energy Act Quarterly Report, July 2010 through September 2010. November 12, 2010 to the DC Council.

[24] U.S. DOE. "Weatherization Assistance Program. Homes Weatherized by State in February, 2011 (Calendar Year)." Undated. Available here: http://www1.eere.energy.gov/wip/pdfs/arra_homes_weatherized_february2011_041411.pdf.

[25] DDOE. "Clean and Affordable Energy Act Quarterly Report, July 2010 through September 2010. November 12, 2010 to the DC Council.

[26] DDOE. "Clean and Affordable Energy Act Quarterly Report, April 1, 2011 – June 30, 2011." August 15, 2011 to the DC Council.

[27] DDOE. "Clean and Affordable Energy Act Quarterly Report, July 2010 through September 2010. November 12, 2010 to the DC Council.

[28] DDOE. "Clean and Affordable Energy Act Quarterly Report, April 1, 2011 – June 30, 2011." August 15, 2011 to the DC Council.

[29] http://dcseu.com/for_your_business/Low_Income_Multifamily/LIMF-Comprehensive.aspx.

[30] http://dcseu.com/for_your_business/Low_Income_Multifamily/LIMF-PMDI.aspx.

5.4.5 Saving Energy in DC Schools

This program was also ended September 30, 2011. Under this program, the District educated students about energy efficiency and helped reduce energy usage in participating schools and in students' homes. Students were also trained in the DC Green Summer Jobs Corps under this program.[31] As of June 2011, 27 teachers and 557 students at 24 schools have been trained on energy efficiency measures and on conducting energy audits.[32]

5.4.6 Property Assessed Clean Energy Bonds (PACE)

This program will provide a funding mechanism for installation of energy efficient or renewable energy retrofits for residents and commercial facilities. The funding will come from bonds or other financing sources offered by their city, county, or state. The PACE program was authorized in the District in April 2010 and the protocols for the program are in place. The District is authorized to spend up to $250 million in PACE bonds. A private company administers the program. Homeowners or businesses can apply for loans that are paid back over 10 to 20 years with interest as an assessment on their property taxes. Essentially, a lien is placed on the home until the loan is repaid. If the property is sold before the loan is paid off, the new property owner will pay the remainder of the loan. The PACE program will encourage property owners to retrofit their homes to increase energy efficiency. This may include replacing windows and doors, adding/replacing insulation, installing a smart meter, or installing renewable energy technologies, such as a solar photovoltaic system.[33] A National Capital Energy Fund may make PACE bond proceeds available for use;[34] as the loans are paid off, the District may be able to further invest bond proceeds in energy efficiency initiatives.

5.4.7 State Energy Program

The State Energy Program (SEP) had received $22 million in ARRA funds for energy efficiency and renewable energy efforts in the District. The funds supplemented base SEP grants for existing programs and funded new programs. Projects included: improving government building energy efficiency; energy efficiency and conservation public education programs; replacing mechanical and electrical equipment with energy efficient equipment, including high-efficiency lighting; replacement of heating and air conditioning units at six public schools; and the creation of a "Live Near Your Work

[31] DDOE. "Clean and Affordable Energy Act Quarterly Report, July 2010 through September 2010. November 12, 2010 to the DC Council.
[32] DDOE. "Clean and Affordable Energy Act Quarterly Report, April 1, 2011 – June 30, 2011." August 15, 2011 to the DC Council.
[33] District of Columbia Web site: http://green.dc.gov/green/cwp/view,a,1244,q,463655.asp.
[34] DC Council Bill 18-0666, Act 18-0339, signed by Mayor on March 22, 2010 and projected law date May 21, 2010.

Program" to encourage residents to live within 1.5 miles of their workplace, so that they may use public transportation or walk to work.[35]

5.4.8 Energy Efficiency and Conservation Block Grant Program

The District had received a $9.6 million grant for energy efficiency and conservation initiatives. Funds from the block grant helped retrofit government buildings with energy efficiency improvements. These changes will result in significant savings for taxpayers and a decrease in energy consumption and greenhouse gas emissions.[36] Part of this funding supported residential, small business, and non-profit energy audits, and provided some funding to encourage small businesses to make energy efficiency improvements.

5.4.9 Changes in DC Building Codes

The Green Building Act of 2006 required that all public buildings in the District meet the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) standards. Under this act, new, privately-owned buildings in the District that are 50,000 square feet or larger are required to meet LEED standards by 2012.[37] This new building code helps the District build resiliency by reducing energy consumption and demand.

The CAEA of 2008 requires government and private buildings to benchmark energy usage with the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR® measurement and tracking tool—Portfolio Manager. Publicly owned buildings have been required to conduct this benchmarking since 2009, and privately owned buildings are required to benchmark starting with 2010 data. [38] In addition, this act requires electricity suppliers in the District to increase the amount of renewable energy sources used in their energy portfolio every year from 2008 through 2020. Adding this additional renewable energy sources to the District's electricity grid will help reduce reliance on non-renewable sources of energy over time and increase resiliency.

5.5 Renewable Energy Initiatives

DDOE offers rebates for residents and businesses to encourage the use of solar photovoltaic systems and wind turbines. Up to $2 million is set aside each year for fiscal years 2009 through 2012 and each project was eligible for up to a $33,000 rebate.[39] Beginning in October 2011, the new rate structure for the rebates limits the value of each

[35] USDOE. Recovery Act State Memos. Washington D.C. as of June 1, 2010. Available here: http://energy.gov/recovery/documents/Recovery_Act_Memo__DC.pdf.
[36] DDOE. "District Department of the Environment Releases Plan for Using Stimulus Funds for Far-reaching Energy Efficiency and Conservation Efforts." Undated. Available here: http://recovery.dc.gov/recovery/lib/recovery/pdf/sep_and_eecbg_energy_stimulus_factsheet_5_13_09_(2).pdf.
[37] District of Columbia Web site: http://green.dc.gov/green/cwp/view,a,1231,q,460953.asp.
[38] District of Columbia Web site: http://green.dc.gov/green/cwp/view,a,1231,q,460953.asp.
[39] District of Columbia Web site: http://green.dc.gov/green/cwp/view,a,1244,q,461562.asp.

project to $16,500.[40] Solar thermal projects also became eligible for rebates and incentives during fiscal year 2012. DDOE may also offer incentives for geothermal HVAC systems, biomass, and methane/waste gas capture. The program has been a huge success in the District. DDOE plans to continue promoting the program and offering rebates and incentives for solar photovoltaic and solar thermal technologies.

Recently, a feasibility study was conducted to review the potential for installing solar photovoltaic panels on public schools in the District.[41] To date, the status of the project is unknown, but installing solar panels could significantly reduce electricity use in schools in the District. Integration of renewable energy sources into the District's energy supply helps diversify energy sources. This diversification is critical in case of a shortage of oil or coal used by traditional electricity generating plants that supply electricity to the District. This helps reduce vulnerability and increase reliability and resiliency in case of an energy emergency.

5.6 Business Energy Rebates Program

The DCSEU announced a new rebate incentive program for energy and natural gas efficiency for small and medium businesses in the District on May 1, 2012.[42] The DCSEU offers rebates for installing energy efficient: lighting, HVAC systems, compressed air systems, refrigeration equipment, open drip-proof and totally enclosed fan cooled motors; plug-load occupancy sensors; gas coin-operated/Laundromat clothes washers; food service and vending equipment; and offers rebates for installing water efficient items such as faucet aerators, low flow showerheads, and spray rinse valves which will also result in energy savings.

5.7 Commercial and Institutional Services

The DCSEU also offers a limited-time rebate program for commercial and institutional facilities in the District–the Commercial Lighting Energy Efficient Replacement (CLEER) T12 Program.[43] The CLEER program runs from March 12 through September 15, 2012, and offers rebates of up to $20 per T12 lighting fixture replaced with more efficient T8 lighting fixtures for small and medium-sized commercial and industrial facilities. Under the Commercial and Institutional Custom Program,[44] the DCSEU

[40] DDOE. "Clean and Affordable Energy Act Quarterly Report, April 1, 2011 – June 30, 2011." August 15, 2011 to the DC Council.
[41] http://www.optony.com/en/Solutions.aspx?id=79.
[42] http://dcseu.com/for_your_business/business_rebates/biz_rebates.aspx.
[43] http://dcseu.com/for_your_business/commercial-institutional/CLEER.aspx.
[44] http://dcseu.com/for_your_business/commercial-institutional/custom.aspx.

provides custom energy services including: "financial incentives, technical and design assistance, and coordinating services to assist consumers, design professionals, vendors, and contractors in overcoming the barriers to installing energy-efficient equipment."[45]

5.8 Smart Grid Deployment Initiatives

5.8.1 PEPCO Smart Grid Deployment Activities

PEPCO received a $44.6 million grant to invest in smart grid technologies[46] and is installing smart meters for all customers in the District. Installation of the new meters began in October 2010. As of June 29, 2012, PEPCO has installed 263,088 smart meters (237,420 of which have been activated), with 8,404 meters left to be replaced. The effort is 97.4% complete.[47] The smart meters allow two-way communication between customers and PEPCO, record hourly energy use information, allow customers to make decisions on their energy usage, and target ways to reduce energy usage. Customers have access to their own data on PEPCO's online portal—MyAccount—so they can better monitor their energy usage. The meters send PEPCO a "last gasp" message after a power loss, and notify PEPCO when power is restored. To keep customers informed, PEPCO also maintains outage information on their Web site. Once approved by the PSC, PEPCO will include monthly energy usage graphs on customer bills.[48]

PEPCO is testing remote connect, disconnect, and new service functionality, and evaluating home automation technologies that can work with smart meters, such as in-home display technology to present energy usage information.[49]

The smart meters are net-metering capable and can be programmed by PEPCO to accept energy from renewable generation technologies, such as solar photovoltaic arrays. PEPCO is working with manufacturers who may be able to construct devices permitting retrieval of production data so that this capability can be added to the existing smart meters.[50] Once net metering is fully functional, PEPCO can better manage energy sources.

To protect customer information, and increase cyber security efforts, all smart grid technology and systems meet the National Institute of Standards and Technology's Advanced Encryption Standards.[51] PEPCO ensures that data are protected by computer

[45] http://dcseu.com/for_your_business/commercial-institutional/custom.aspx.
[46] U.S. DOE. "District of Columbia Recovery Act Snapshot." Available here: http://energy.gov/recovery/dc.htm.
[47] Pepco's Web site: http://www.pepco.com/energy/blueprint/smetersdc/default.aspx and the District of Columbia Public Utility Commission Web site: http://www.dcpsc.org/.
[48] PEPCO Response to OPC Data Request No. 16. District of Columbia Formal Case No. 1056. July 30, 2012. Available at http://www.dcpsc.org/.
[49] PEPCO Response to OPC Data Request No. 16. District of Columbia Formal Case No. 1056. July 30, 2012. Available at http://www.dcpsc.org/.
[50] Pepco's Web site: http://www.pepco.com/_res/documents/SmartMetersFAQPepcoWebSite.pdf.
[51] Pepco's Web site: http://www.pepco.com/_res/documents/SmartMetersFAQPepcoWebSite.pdf.

firewalls, and local area network connections are encrypted to further protect customer information.

5.8.2 PEPCO and Smart Meter Performance during the June 29, 2012 Derecho

Section 2.3.3 above provided a brief overview of past responses to energy emergencies in the District. In this section, we provide information on the energy emergency that resulted from a major wind storm in the District and surrounding jurisdictions.

On the night of June 29, 2012, very strong thunderstorms with straight-line winds (derecho) of 60 to 80 miles per hour knocked out power to more than 107,000 PEPCO customers in the District; some customers were without power for up to eight days.

Smart Meters: Of the active smart meters installed, 84,132 smart meters sent a last gasp signal to PEPCO. PEPCO notes that this number does not include older meters, and the data collisions resulting from "a high volume of concentrated and simultaneous last gasp messages."[52] PEPCO also reports that the meters were used to resolve 796 outage orders by pinging meters to determine their status. This allowed field crews to focus efforts in other outage areas. The meters also allowed PEPCO to more efficiently dispatch field crews to areas with confirmed outages. In this instance, PEPCO was not able to reroute power to working parts of its network; PEPCO reports that "during major storms when there is a high probability of downed wires, these systems are not employed for public safety reasons. In addition, when the system is incurring a large number of outages an automatic reconfiguration system is unable to restore power as the alternate supplies are also de-energized." [53]

Smart Grid: Pepco's application to install the smart grid claimed the following benefits:

- Improved Outage Reporting
- Accurate dispatching of repair crews
- Enhanced Customer Service

The Smart Grid technology is still being developed. PEPCO reports that at this point, the company is unable to quantify how the smart grid improved Pepco's ability to quickly restore service after the storm.[54]

PEPCO's Performance: According to PEPCO: "more than 3,000 personnel including PEPCO forces and mutual assistance crews worked to restore power."[55] PEPCO replaced

[52] PEPCO Response to OPC Data Request No. 16. District of Columbia Formal Case No. 1056. July 30, 2012. Available at http://www.dcpsc.org/.
[53] PEPCO Response to OPC Data Request No. 16. District of Columbia Formal Case No. 1056. July 30, 2012. Available at http://www.dcpsc.org/.
[54] PEPCO Response to OPC Data Request No. 16. District of Columbia Formal Case No. 1056. July 30, 2012. Available at http://www.dcpsc.org/.
[55] Graham, Thomas H., President, PEPCO Region. Letter to PEPCO customers. August 3, 2012.

"almost 300 utility poles and almost 200 transformers – a significant amount more than what was replaced after Hurricane Irene in 2011." [56] PEPCO also noted that more work is needed to be able to provide customers with a better estimation of when power will be restored.[57]

Post-Event Discussions: An oft-discussed solution to decreasing outages in the District has been to bury power lines, which would reduce the number of outages caused by trees taking down power lines. A 2010 study estimated the costs of three strategies to burying power lines, ranging in cost from $1.1 billion to $5.8 billion, eliminating approximately 65 to 100% of outages.[58] The 2010 study also reported on the disadvantages of installing power lines underground: construction would affect existing trees in the district, inconvenience street traffic and sidewalks, underground power lines have a shorter life-expectancy than overhead lines due to degradation of insulation, and potential animal activity, and more customers might be affected by an underground power outage than from an outage from overhead lines. In addition, the cost of construction could be prohibitive, unless it can be combined with already-planned construction or upgrade projects, and questions remain on whether PEPCO's customers would pay the costs of construction with rate increases. Mayor Vincent Gray has established a commission to study the issue of burying power lines.[59]

5.8.3 PEPCO Smart Grid Enabled Demand Response

Demand response is similar to energy efficiency and conservation programs in the way it helps manage consumer demand for electricity. However, the energy reductions from demand response are only temporary: during a period when there is a need for less electricity consumption, such as an energy emergency, demand response is used to provide temporary reductions in consumption to improve the ability of the electric grid to meet consumer demand. Thus, demand response enhances energy resiliency.

As part of its "Blue Print for the Future" program, PEPCO plans to offer various smart grid-enabled demand response programs. In one program, smart thermostats will be provided to interested customers. This voluntary program would allow PEPCO to send signals directly to the thermostat to manage air conditioners, thereby reducing electric

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[56] Graham, Thomas H., President, PEPCO Region. Letter to PEPCO customers. August 3, 2012.

[57] Davis, Aaron C., and Mary Pat Flaherty. "Pepco defends its response to derecho storm, saying it 'mobilized quickly.'" July 30, 2012. The Washington Post. Available at: http://www.washingtonpost.com/local/pepco-defends-its-response-to-derecho-storm-saying-it-mobilized-quickly/2012/07/30/gJQAmxuVLX_story_1.html.

[58] Shaw Consultants International, Inc. for the PSC. Final Report. Study of the Feasibility and Reliability of Undergrounding Electric Distribution Lines in the District of Columbia. Formal Case No. 1026. FC 1026-E-96. July 1, 2010. Available at: http://dcpsc.org/pdf_files/hottopics/Study_Feasibility_Reliability_Undergrounding_Electric_Distribution_Lines.pdf.

[59] http://www.washingtonpost.com/blogs/mike-debonis/post/dc-task-force-will-explore-burying-power-lines/2012/08/16/5216ef3e-e7da-11e1-8487-64e4b2a79ba8_blog.html

consumption. This is accomplished by altering heating and air conditioning use.[60] PEPCO will offer options to customers by presenting varying electric rates for time periods corresponding with the supply of electricity. During periods in which there is a significant supply of electricity, prices would be lower. When the demand for electricity rises to the level of available supply, prices would increase. By varying the price of electricity, PEPCO will be able to manage the demand for electricity and therefore improve the efficiency of its electricity output.

PEPCO had also planned to initiate a demand side management tariff that would have charged customers for consumption during periods of peak demand. This would have reflected the cost of starting additional generators to meet demand. However, this tariff was not included in the 2011 rate structure. A ruling on PEPCO's requested rate increases is expected to be made in September 2012.[61]

Going a step further, PEPCO may institute a real-time pricing program to further manage their energy sources, help reduce the amount of resources needed to meet peak demand, reduce costs and overall energy use, while increasing reliability and resiliency. In the real-time pricing program, customers would receive pricing updates and decide what level of consumption they would be willing to undertake. By managing the prices, PEPCO could reduce electricity demand to a level which the grid could support.

Another demand response program was piloted by the Smart Meter Pilot Program, Inc., which sponsored the Powercents DC pilot program. Members of this non-profit organization include the Consumer Utility Board, the District Office of the People's Counsel, the District of Columbia PSC, the International Brotherhood of Electrical Workers and PEPCO. Customers were provided with smart meters and some were provided with smart thermostats. Three separate demand response pricing plans were tested. In these plans, customers were informed of different times of day, or days, where energy prices were expected to increase. Results of the pilot test showed that consumers reduced energy usage in response to receiving pricing information and customers with smart thermostats used less energy than customers without smart thermostats.

Through the use of demand response programs, offering new pricing strategies, notification to customers, and temporary, strategic energy reductions, the District's resiliency could continue to be improved. Electricity demand could be managed more efficiently, and electrical shortages and/or outages could be avoided.[62]

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[60] Pepco's Web site: http://www.pepco.com/energy/blueprint/president/.
[61] Zapana, Victor. "PEPCO will ask for another rate hike this year." August 7, 2012. The Washington Post. Available here: http://www.washingtonpost.com/local/md-politics/pepco-will-ask-for-another-rate-hike-this-year/2012/08/07/4d4680c0-e0ad-11e1-a19c-fcfa365396c8_story.html.
[62] PowerCents DC. "PowerCents DC ™ Program Final Report." September 2010. Available here: http://www.powercentsdc.org/ESC%2010-09-08%20PCDC%20Final%20Report%20-%20FINAL.pdf.

5.8.4 PEPCO Holdings, Inc. Smart Grid Deployment Initiatives

PEPCO Holdings, Inc. received over $4 million in ARRA funding to support workplace education for approximately 700 existing and new employees to help implement, operate, and improve the smart grid. Employees will also be trained to educate the public.

5.8.5 PJM Smart Grid Deployment Initiatives

PJM is responsible for managing the interconnected regional electrical grid for the District and other states in the region. As PJM is responsible for monitoring the electrical grid, deployment of smart grid technologies will help PJM improve reliability of service and increase resiliency. To help maintain visibility of conditions on the grid, there are already 20 phasor measurement units (or synchrophasors) in place. Funded in part by a matching funds grant from the US DOE, PJM and its partners will install approximately 80 more phasor measurement units over a three-year period. The measurement units monitor voltage and current more than 30 times per second and allow this information to be relayed to grid operators. This will help grid operators respond quickly to problems, "increase available transmission and ease the integration of highly-variable, renewable sources of power such as wind and solar."[63]

PJM is also working to connect additional renewable sources of power into the regional electrical grid. The number of renewable sources being connected to the grid is forecast to significantly increase in the future. Integrating renewable sources of energy into the power grid poses challenges for those managing the grid due to the intermittent nature of renewable energy production. For instance, much of the energy produced by wind energy is generated when electricity demand is low. In addition, solar and wind energy may not be available during peak load periods. To more effectively incorporate renewable energy sources into the grid, and to better manage the intermittent nature of renewable energy production, PJM is working with its partners to research ways to expand electricity storage capacity.

PJM currently operates a one megawatt battery array. The lithium-ion batteries are stored in a trailer and can absorb and store excess energy from the grid or return power back to the grid by discharging the batteries to help manage electricity supply. Fly-wheel storage, compressed-air energy storage, and the use of plug-in hybrid electric vehicles are additional electricity storage solutions. PJM is evaluating the use of compressed-air energy storage and the possibility of using plug-in hybrid electric vehicle batteries as storage. This latter technique would utilize car batteries during exceptional peak demand and then recharge them as demand decreased.

PJM also coordinates regional outage exercises and manages risks related to energy costs.

[63] Midwest ISO and PJM. Press Release: Midwest ISO, PJM Interconnection Collaborate on Smart Grid Project. July 7, 2010. Available here: http://www.pjm.com.

5.8.6 Potential Benefits of Additional Smart Grid Deployment for the District

The smart grid could help the District create a more reliable electricity supply, lessen the frequency of outages, and allow the District to respond quickly to energy outages. The actual benefits realized by the District will depend on the particular smart grid technologies deployed.

As conceptualized, the smart grid may also allow integrated communications between power generators, substations, transmission and distribution lines, customers, service providers, and grid operators. It could allow grid managers to adjust both supply and demand for electricity, and specific applications could be programmed to automatically control the amount of energy entering the grid. Automatic controls may allow an electric utility to reduce electricity load by turning off equipment via the use of smart meters and smart thermostats. Additional sources of electricity could be turned on as demand increases. These automated controls could make it easier for utilities to manage the intermittent supply of energy from renewable energy sources.

Automated smart grid controls can be programmed to have self-healing capabilities. For instance, if a power line is knocked down, a signal can be sent directly to the electric utility so power can be re-routed around the downed line, restoring electricity service to critical infrastructure almost immediately. Field crews could be quickly dispatched to fix the downed lines. This would help the District avoid cascading power failures and decrease the duration of outages, limiting impacts on residents.

With increased deployment of digital smart grid technologies in the District, the need for protecting sensitive information increases. Smart grid deployment may raise security concerns and may increase the vulnerability of infrastructure to cyber attacks. Ensuring that adequate protection and numerous layers of controls are built into smart grid technologies will also help the District ensure a reliable supply of electricity and increase resiliency.

The District's Office of the Chief Technology Officer is responsible for general information technology protection within the District. DDOE may want to work with PEPCO to understand and monitor cyber security controls that are being installed in smart meters to protect customer information, and to reduce the vulnerability that the addition of smart meters may introduce to the electric grid in the District.

5.9 Micro Grids

Creating a micro grid or numerous micro grids within the District would allow sections of the city to operate independently from the central electricity grid in the District during an energy emergency. Micro grids can rely on their own power sources (e.g., renewable systems), and combined heat and power (CHP) systems. CHP systems recycle waste heat to create energy. Howard University is in the process of creating a micro grid. The university plans on increasing energy efficiency of existing systems and using renewable energy resources. "The project will utilize highly efficient cogeneration technologies, or

CHP, to simultaneously produce electric and thermal energy that can be used for space heating and cooling or for other purposes."[64] CHP systems themselves can be very cost-effective ways to generate power, or to heat and cool buildings. Howard University is planning a micro grid for its campus. [65] The Howard University project may also be an opportunity for public-private partnerships that could successfully create a more extensive micro grid in the area powered by renewable energy. DC Water is currently revamping its Bryant Street pumping facility, which is very close to the university. The Southwest Ecodistrict initiative seeks to create a micro grid within a 15-block radius south of the National Mall. This micro grid would generate its own power from renewable resources and is still in the planning stages. More information on the project can be found here: http://www.ncpc.gov/plans/swecodistrict/.

District energy is also being used successfully on Capitol Hill in the entire complex of federal buildings, and in the General Services Administration building. DC Water is also installing a CHP system at its Blue Plains wastewater treatment facility. The system will generate 13 MW of power for DC Water, potentially saving the utility $10 million annually.

Military facilities in the District and in the National Capitol Region work on energy reliability issues including micro grids, energy test beds, and net-zero energy buildings (a building that has no, or zero net energy consumption). Coordination between military bases and research facilities with local communities in the District could further influence the development of micro grids which would increase energy reliability and resiliency in the District.

5.10 Energy Storage

When using renewable energy systems, one common issue is that if a resource is not available, the system cannot generate or store energy. Recent technological advances in battery storage capabilities can allow the District to capture and store renewable energy so that it can be used at any time. Battery storage can be used in conjunction with a diesel generator to provide power during an electricity outage, ensuring continuity of operations for a building. Energy storage systems can be used for specific buildings in a city (i.e., a hospital, a university or secondary school campus, etc.), or can be combined in micro grid systems. The City of Boston is installing solar powered lighting with battery backup capability along evacuation routes to help ensure proper lighting of the route during an energy emergency. Similar systems could be used in the District for street lighting, school crossing signs, street lights, and buildings, thereby increasing the District's

[64] Howard University Press Release. June 25, 2010. Available at: http://www.howard.edu/newsroom/releases/2010/100625HowardandParetoEnergyAnnouncePartnershipToDevelopaCampusMicrogrid.htm.

[65] U.S. Department of Energy, Oak Ridge National Laboratory. "Combined Heat and Power: Effective Energy Solutions for a Sustainable Future." By Anna Shipley, et al. December 2008. http://www1.eere.energy.gov/industry/distributedenergy/pdfs/chp_report_12-08.pdf.

resiliency, while decreasing reliance on the electric grid.[66,67] On-site feasibility studies would need to be conducted to ensure that there is enough space for energy storage systems; the physical amount of battery storage will differ significantly based on the particular renewable technology being used. In addition, the capacity of battery storage must be addressed—battery storage should be able to last for at least three days. DDOE staff have participated in several briefings on the potential for energy storage in the District to enhance energy assurance.

5.11 Fuel Cells

Fuel cells convert chemical energy into electricity. Fuel cells can be as large as a power plant, vehicles, or can be used to provide electricity to smaller devices, like a laptop computer. Fuel cells powered by hydrogen are more efficient, and cleaner than burning fossil-fuels to create electricity. The only emissions from hydrogen fuel cells are water and waste-heat.

Fuel cells can also be powered by natural gas, or biogas (including biodiesel), which can be derived from organic waste. Over the past few years, corporations and municipalities have been installing renewable fuel cell systems to meet building energy needs, using the electric grid as a backup electricity supply, instead of a diesel generator.[68]

The largest non-utility fuel cell operation is in the planning stages to power eBay's data center in Utah. The fuel cell will produce 1.75 million kWh of electricity annually, and should be operational by mid-2013.[69] The data center will rely on the electric grid as a backup power source.

The commercial fuel cell industry has been growing, and as technology prices decrease, additional opportunities may exist for its use as a cost-effective fuel source in the District.[70,71] Fuel cells may also be able to help the District encourage more substantial development of micro grids, which will help increase the community's resiliency. A recent report notes that buses in the District may run on fuel cells in the future.[72]

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[66] Public Technology Institute (PTI). "Energy Efficiency and Energy Assurance Planning for Local Governments." 2012. Available at: http://www.energyassurance.us.
[67] PTI, "Renewable Energy and Energy Assurance Planning for Local Governments. 2012. Available at: http://www.energyassurance.us.
[68] Bloom Energy Web site: http://www.bloomenergy.com/newsroom/press-release-06-21-12/.
[69] Bloom Energy Web site: http://www.bloomenergy.com/newsroom/press-release-06-21-12/.
[70] U.S. DOE Web site: http://www1.eere.energy.gov/hydrogenandfuelcells/news_detail.html?news_id=18614.
[71] U.S. DOE Web site: http://www1.eere.energy.gov/hydrogenandfuelcells/accomplishments.html.
[72] U.S. DOE Web site: http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/state_of_the_states_2012.pdf.

5.12 Transportation Fuel Efficiency and Conservation Projects

5.12.1 CapitalBikeshare Program

The SmartBike DC program encourages the use of bicycles as transportation and provides an alternative to using cars.[73] Because of the success of the program, the District is expanding the program. On January 2, 2011, the DDOT began removing the current bike sharing infrastructure and transitioned to the CapitalBikeshare (CaBi) program. Over 1,500 bicycles at over 160 stations will be available in the District and Arlington, Virginia.[74] The new program allows bicycles to be rented for a day, three days, a month, or a year. The program will help encourage residents and tourists to reduce reliance on traditional forms of gasoline-powered transportation. There are over 20,000 annual pass CaptialBikeshare members, and over 150,000 trips were made in March 2012 alone. [75]

5.12.2 DDOT's Streetcar Program

The District DOT and the Washington Metropolitan Area Transit Authority (WMATA) have developed a long-term transportation plan for the District. The District's DOT began construction of a new 37-mile[76] streetcar line in Anacostia and is planning for additional lines throughout the District.[77] The Anacostia line is expected to be in service in 2012, with an additional line expected to be in service in 2012 and will enhance the existing transportation system in the District. [78] Streetcars will help connect neighborhoods in the District and encourage the use of public transportation, which may help reduce the District's dependency on gasoline-powered automobiles.[79]

5.12.3 Electric Vehicles

The first public electric vehicle charging station in the District— ChargePoint—was made available on November 16, 2010.[80] The charging station allows for two electric vehicles to be recharged at one time. The goals of the ChargePoint America program are to reduce gasoline consumption and pollution and to encourage the production and use of electric vehicles. The project is sponsored by Coulomb Technologies and partially funded by ARRA grants. The ChargePoint® Network is "Smart Grid ready with built in Utility

[73] SmartBikeDC Web site: http://www.SmartBikedc.com.
[74] CapitalBikeShare Program Web site: http://www.capitalbikeshare.com/.
[75] CapitalBikeShare Program Web site: http://www.capitalbikeshare.com/.
[76] DC Streetcar Web site: http://www.dcstreetcar.com/.
[77] http://ddot.dc.gov/DC/DDOT/On+Your+Street/Mass+Transit+in+DC/View+All/DC+Streetcar.
[78] DC Streetcar Web site: http://www.dcstreetcar.com/.
[79] District of Columbia Department of Transportation. "DC's Transit Future System Plan. Final Report." April 2010.
[80] District DOT. "Fenty Administration Unveils First Public Curbside ChargePoint Charging Station in the District." November 16, 2010 Press Release. Available here: "http://mayor.dc.gov/DC/DDOT/About+DDOT/News+Room/Fenty+Administration+Unveils+First+Public+Curbside+ChargePoint+Charging+Station+in+the+District.

Grade Capable Metering, Time of Use (TOU) pricing and Demand Response control."[81] Utilities and station owners have the capability to set their own prices or offer free charging services. Smart phones can also be used to find open charging stations, which use a contactless credit card payment system.

The charging stations collect information on the duration of charging sessions, can alert network administrators of "a disruption in service from vandalism or utility demand response," and can send emails or text messages to drivers on information from their charging session.[82] The networked charging stations can also be remotely accessed for troubleshooting. Data on station usage and electricity used will be forwarded to the federal DOE to help evaluate the program.

5.13 Alternative Fuel Vehicles

The District currently maintains over 1,400 alternative fuel vehicles in its fleet, which help reduce fuel consumption.[83] In FY 2010, 20% of the District's fleet used alternative fuels.[84] These vehicles use bio-diesel, E-85, electricity, compressed natural gas (CNG), and ultra-low sulfur diesel fuels. The District also maintains a DC FleetShare motor pool for employees that helps reduce the total number of vehicles needed.[85] "The D.C. FleetShare pool includes 78 compressed natural gas (CNG), gas-electric hybrid and E-85 (15 percent gasoline/85 percent ethanol) vehicles." [86] The District is also using $1.1 million in ARRA funds to replace 18 medium and heavy duty vehicles with vehicles using alternative fuels in FY 2011.[87] In February 2012, 10 alternative fuel vehicles were purchased and will be used for trash collection, street sweeping, snow removal, and other District services.

5.14 Green Servicing (Car-Sharing Services)

Car-sharing services, such as Zipcar and Car2go can help the District reduce the number of vehicles on the road, and decrease the volume of transportation fuel needed. In

[81] District DOT. "Fenty Administration Unveils First Public Curbside ChargePoint Charging Station in the District." November 16, 2010 Press Release. Available here: http://mayor.dc.gov/DC/DDOT/About+DDOT/News+Room/Fenty+Administration+Unveils+First+Public+Curbside+ChargePoint+Charging+Station+in+the+District.
[82] ChargePoint America Web site: http://chargepointamerica.com/faq-drivers.php.
[83] District of Columbia Web site: http://green.dc.gov/release/mayor-vincent-c-gray-and-epa-regional-administrator-shawn-garvin-announce-acquisition.
[84] Track DC Web site: http://track.dc.gov/Agency/KT0.
[85] District of Columbia Web site: http://dcps.dc.gov/DC/DPW/About+DPW/Who+We+Are/Fleet+Management/Fleet+Management.
[86] District of Columbia Web site . http://green.dc.gov/release/mayor-vincent-c-gray-and-epa-regional-administrator-shawn-garvin-announce-acquisition.
[87] District of Columbia. Testimony of William O. Howland Jr., Director. Hearing on the Department of Public Works Fiscal Year 2011 Proposed Budget. May 5, 2010. Available here: http://film.dc.gov/DC/DPW/About+DPW/News+Room/Testimonies/Hearing+on+the+Department+of+Public+Works+Fiscal+Year+2011+Proposed+Budget.

addition, Car2go's fleet consists of economy-sized fuel efficient vehicles, which will further reduce the use of petroleum.

5.15 Natural Gas Efficiency and Conservation Projects

5.15.1 DDOE-Sponsored Natural Gas Efficiency Programs

Under the Heating System Repair, Replacement, and Tune-up Program, energy audits are performed and natural gas-fired heating systems are tuned-up, repaired, or replaced for low-income residents. Older, inefficient hot water heaters and thermostats are also replaced. In 2010, and 2011, 314, and 167 heating systems were repaired, replaced, or tuned-up, respectively.[88] DDOE plans to continue publicizing the program to increase participation.

DDOE also sponsors the Residential Weatherization and Efficiency Program that is designed to increase the efficiency of natural gas usage. The program offers incentives for installing energy efficient natural gas equipment and weatherizing homes. In April through June 2011, 84 rebates were provided for gas boilers, furnaces, water heaters, and weatherization activities.[89]

The EATF provided funding for the Residential Essential Service Expansion and Awareness Program that provides discounts for gas customers to increase affordability of their total gas bills. Over 4,000 gas customers were enrolled in the program.[90]

5.15.2 Washington Gas Energy Services

Many residents and businesses in the District receive natural gas supplies from Washington Gas Energy Services. Washington Gas maintains an interruptible customer program for commercial and industrial customers that use at least 60,000 therms per year and maintain an adequate alternate back-up fuel supply.[91] These customers then reduce or curtail their use of natural gas and switch to their alternate fuel supply when natural gas demand is high (generally during the winter months), ensuring an adequate supply of natural gas to other customers. Interruptible customers receive a discounted rate and can review their natural gas usage online.

To help ensure the reliability of supply and adequate protection of natural gas supplies and the public, Washington Gas plans to install a new communications network to better

[88] DDOE. "Clean and Affordable Energy Act Quarterly Report, July 2010 through September 2010. November 12, 2010 to the DC Council, and DDOE. "Clean and Affordable Energy Act Quarterly Report, April 1, 2011 – June 30, 2011." August 15, 2011 to the DC Council.
[89] DDOE. "Clean and Affordable Energy Act Quarterly Report, April 1, 2011 – June 30, 2011." August 15, 2011 to the DC Council.
[90] DDOE. "Clean and Affordable Energy Act Quarterly Report, April 1, 2011 – June 30, 2011." August 15, 2011 to the DC Council.
[91] Washington Gas Web site: http://www.washgas.com.

manage their network of underground natural gas supply pipes.[92] The enhanced network will allow real-time, or near real-time, monitoring of pipelines so that management can be alerted to potential disruptions within the system.

5.16 Petroleum Pipelines

There are three registered pipeline operators within the District: Colonial Pipeline, Nustar Terminals Operations Partnership L.P., and Washington Gas & Light Company. While Colonial Pipeline has deactivated its pipeline, Nustar Terminals Operation Partnership L.P. and Washington Gas are currently sending energy through their pipelines.

Washington Gas transports natural gas through its pipelines, while Nustar utilizes its pipeline to pump non-highly volatile liquids (including petroleum) to Andrews Air Force Base. The following website documents the current operators and provides a mapping of the current pipelines within the city: https://www.npms.phmsa.dot.gov/FindOperator/PublicSearch.aspx.

There are a large number of suppliers of petroleum, gasoline and heating oil to residential, commercial and industrial users within the District. However, none of them are transporting their products via pipelines. Most use ground transportation to ship these types of products.

5.17 Framework Supporting Public-Private Partnerships

Energy resiliency will be enhanced if the District continues to build relationships with private-sector partners, including PEPCO, PJM, Washington Gas, and other pipeline operators.

PEPCO held an informational briefing in 2011 that numerous District public safety agencies attended. PEPCO discussed plans for smart grid technologies and the smart grid's effects on energy management and energy assurance. Continued communications with PEPCO will help the District continue to build resiliency.

Enhancing already-existing partnerships with organizations such as MWCOG, the National Capital Planning Council, the largest energy users, and the largest employers in the District will help the District encourage reductions in energy use, and increase the use of renewable energy systems.

Additionally, DDOE should partner with federal agencies, including the military, the DOE, and the DoD to continue to encourage and enhance energy efficiency, energy conservation, and the use of renewable resources to increase energy security and resiliency in the District.

[92] Alcatel-Lucent Web Blog. "Optimizing Washington Gas' Communications Network." August 19, 2010. Available here: http://www2.alcatel-lucent.com/blogs/corporate/2010/08/optimizing-washington-gas-communications-network/.

5.18 Summary

The District and other public and private partners have taken significant steps towards building resiliency. The programs discussed above will help the District respond to and recover from an energy emergency much more efficiently.

Many of the programs above were funded in part by one-time ARRA grants and are designed to invest in long-term growth. Continued implementation of these programs, especially investment in smart grid technologies, will help the District continue to build on this resiliency.

6 Emergency Support Function #12 – Energy

Primary District Agency:	District Department of the Environment
Support District Agencies:	Department of General Services[93] Department of Public Works District Department of Transportation
Other Support Agencies and Organizations:	Maryland Energy Administration Potomac Electric Power Company Public Service Commission Virginia Department of Mines, Minerals, and Energy Washington Gas Company
Primary Federal Agency:	U.S. Department of Energy
Support Federal Agencies:	District of Columbia National Guard U.S. Department of Defense/U.S. Army Corps of Engineers

[93] Formerly Department of Real Estate Services.

I. Introduction

A. Purpose

Emergency Support Function (ESF) #12 - Energy helps restore District of Columbia (the District) energy systems during and/or following an emergency. The District Department of the Environment (DDOE) is the primary agency responsible for coordinating with other governmental response elements and utilities to restore energy delivery.

B. Scope and Applicability

ESF #12 gathers, assesses, and shares information on energy system damage and estimates the impact of energy system outages/shortages within the District. The purpose of this ESF is to facilitate restoration of energy delivery and fuel supplies during and/or following an emergency. Power and fuel are critical to protecting lives and property and maintaining the continuity of the government, business, transportation, emergencyservices and other critical infrastructure within the District. Also, ESF #12 will provide generator support.

ESF #12 support agencies have a variety of assets and resources available to mitigate energy or hazardous problems. Damage to an energy system in one geographic region may affect energy supplies in other regions that rely on the same delivery systems.

C. Incident Management Actions

ESF #12 focuses on those activities that are directly related to an evolving incident or potential incident rather than steady-state preparedness or readiness activities for energy resources.

ESF #12 provides a framework to enable the management of cascading impacts and multiple incidents as well as the prevention of and preparation for subsequent events. Examples of incident management actions from the District perspective include:

- Assessment of the stability of the energy infrastructure
- Coordinating Federal support in the aftermath of an incident involving disruption to the energy infrastructure;
- Enabling immediate recovery activities, as well as addressing long-term consequences in the impacted area.

II. Policies

The ESF #12 priorities will be to aid in the restoration of energy delivery and provide generator support. DDOE will assign an ESF emergency liaison officer (ELO) to

temporary duty at the Homeland Security and Emergency Management Agency (HSEMA) Emergency Operations Center (EOC) or other augmentation facility. A DDOE representative will be appointed, as needed, to be a member of the Consequence Management Team (CMT).

III. Situation

A. Disaster Condition

An emergency (including a fuel shortage emergency) may sever key energy infrastructure, thereby constraining supply in affected areas and adversely impacting adjacent areas, especially those with supply links to the directly affected areas. Such an incident has the potential to affect transportation, communications and other infrastructure necessary for sustaining public health and safety. Also, it could affect continuity of government as well as critical infrastructure within the District.

B. Planning Assumptions

1. There may be widespread and possibly prolonged electric power outages or interruptions.
2. There may be widespread and possibly prolonged disruption to the supply and distribution of natural gas.
3. Transportation and telecommunication infrastructures may be affected by a disruption in power.
4. Delays in the delivery of petroleum-based products may occur as a result of loss of commercial electric power.

IV. Concept of Operations

A. General

1. ESF #12 will consolidate utility reports, identify the assessment of fuel and electric power damage, energy supply and demand, and estimate repair such systems, as follows:

   a. Coordinate closely with officials to establish priorities to restore critical customer facilities and coordinate the provision of temporary, alternate or interim sources of emergency fuel and power.

   b. Obtain current information regarding damage to the energy supply and distribution systems and obtain estimates for restoration.

2. ESF #12 will provide timely and credible energy supply assessments and restoration forecasts in times of disaster in coordination with the U.S. Department of Energy (USDOE).

3. ESF #12 will coordinate with technical experts on energy supply production and delivery to facilitate energy information exchange.

4. ESF #12 will coordinate with other ESFs in order to provide timely and accurate energy impact information and recommend options to mitigate impacts.

5. ESF #12 will provide an ELO to the HSEMA EOC during an emergency situation.

6. ESF #12 will attain information regarding energy impacts and provide input to situation and other reports through the EOC.

7. ESF #12 will coordinate among federal and mutual aid state officials and energy industries in the region regarding priorities to repair damaged energy systems.

B. Organization

DDOE will coordinate all ESF #12 activity. Each support agency may be represented at the HSEMA EOC; ESF #12 will maintain 24-hour contact with those representatives, as necessary, at those locations for the duration of the emergency response period. Support agency representatives will have sufficient knowledge of the capabilities and resources of their agencies, with appropriate authority to commit resources to the response effort.

Upon issuance of a presidential disaster declaration, the ESF #12 team leader is the point of contact (POC) within the District and will represent this ESF in its dealings with the District of Columbia coordination officer (DCCO), who will issue requests for federal assistance to the federal coordinating officer (FCO). The Federal Emergency Management Agency (USDHS/FEMA) will issue a mission assignment to a federal ESF agency; DDOE will coordinate the delivery of assistance for ESF #12 with the appropriate federal partner. The ESF will have an ESF Emergency Liaison Officer present or available for duty at the joint field office (JFO) on a 24-hour basis for the duration of the emergency response period.

C. Notification

1. The EOC will notify ESF #12 of the activation of the CMT. ESF #12 will notify support agencies and appropriate officials by telephone, pager, and/or e-mail regarding the nature of the event and any potential ESF # 12 issue.

2. The ESF #12 team leader will attend any CMT meetings and be available, as necessary, for the duration of the initial response period.

D. Response Actions

1. Initial Actions

a. Use available information to determine the status and assess the energy impacts of the emergency, including public agency and government resources needed to respond.

b. Coordinate with utility representatives to establish priorities to repair damage and communicate regarding restoration of priority facilities.

c. Coordinate with utility representatives to identify government actions that will help obtain needed resources to repair or restore damaged energy systems.

d. Coordinate with and follow the guidance of USDOE to access fuel supplies in the petroleum reserve, in the event of a fuel shortage.

e. Receive and respond to requests for information from neighboring states, local governments, regional bodies, federal agencies and industry.

2. Activation

a. Activate disaster response procedures.

b. Dispatch an ESF #12 ELO to the EOC.

c. Provide periodic situation and any other reports to the EOC as directed by HSEMA.

3. Continuing Actions

a. Serve as the focal point for receipt of reports on damage to energy supply and distribution systems and requirements for system restoration.

b. Advise and assist industry, District and local authorities on priorities and actions for energy restoration and supply.

c. Locate fuel for transportation, communications and emergency operations. Coordinate with the U.S. Army Corps of Engineers (USACE) and the District of Columbia National Guard (DCNG) for the transportation of fuel.

d. Coordinate the collection and reporting of energy supply information to the public.

e. Recommend actions to conserve petroleum fuel, electric power, and natural gas, and to ration energy, as necessary.

f. Monitor the fuel supply system in coordination with gas station owners and companies to ensure the District possesses and maintains adequate supplies.

4. Public Information/Crisis Communications

a. The Joint Information Center (JIC) structure provides a supporting mechanism to develop, coordinate and deliver messages; it supports the Incident Commander or Unified Command and the associated elements of the ICS. ESF #15, in consultation with ESF #5, will develop a strategic communications plan to prepare and deliver coordinated and sustained messages to the public.

b. All public information and external affairs for ESF #12 will be coordinated with ESF #15.

c. ESF #12 will provide up-to-date information and situational awareness on any energy emergency to the EOC that may be used in public information and crisis communications.

d. As needed, ESF #12 will send a liaison to the JIC to assist with public information and crisis communications, such as providing technical information relative to energy emergencies.

5. Resource Requirements

ESF #12 will coordinate directly with ESF #5 upon depletion of District resources. During the immediate aftermath of an incident and Presidential declared emergency/disaster under the Stafford Act, the Mayor may request the President to direct the Secretary of Defense to utilize the resources of the DOD for the purpose of performing on public and private lands any emergency work that is made necessary by such incident and that is essential for the preservation of life and property.

All requests for resources will be tracked in the WebEOC system for maximum federal reimbursement subsequent to a federal emergency/disaster declaration.

6. Demobilization

Once incident goals and objectives have been achieved and/or a centralized District coordination presence is no longer required, the CMT will direct implementation of the incident demobilization plan. The Planning and Information Section is responsible for the development and implementation of the incident demobilization plan. Demobilization planning will begin during the response period. Indicators to start demobilization planning include the following:

- No request for additional resources
- End of incident is in sight
- Unassigned resources

Once the incident demobilization plan has been approved, the Information and Planning Branch Chief shall ensure that it is distributed to all activated ESF's. In consultation with the CMT and Incident Commander and Emergency Operations Chief, establishing release priorities of the following:

- Critical resources
- Critical personnel, specialize teams, EOC personnel
- Establishing recall roster in case reactivation is required
- Notifying personnel to be released of the specific times for released
- Establishing demobilization checkout

The Documentation Branch will ensure that all incident documents are submitted prior to demobilization. The EOC Manager will conduct the brief-out to EOC personnel (HSEMA staff and Emergency Liaison Officers) and request a final incident operational update for inclusion in the SITREP. In cases where the EOC is deactivated but there are recovery activities in progress, the responsible ESF agency will continue to provide the HSEMA Disaster Recovery Manager of ongoing activities.

a. Once ESF #12 is no longer needed to support an incident, the ESF will follow the demobilization plan to transfer responsibilities to recover assistance program oversight and monitoring.

b. Following complete demobilization, responsibilities of ESF #12 lead and support agencies shift back to individual agencies' District offices.

V. Responsibilities

A. Primary District Agency

1. District Department of the Environment (DDOE)

As the primary District agency for ESF #12, DDOE will use the framework of its Energy Supply Disruption Tracking plan to complete the following actions:

a. Coordinate information flow.

b. Assist in determining the level of event severity.

c. Assist in identifying measures to be implemented.

d. Monitor energy supply prior, during and after the event.

e. Track energy supply during the event.

f. Conduct follow-ups after the event.

In the event of an energy emergency, DDOE will complete the following actions:

a. Track information during the event.

b. Provide situational awareness of the event.

c. Assist in developing management decisions to respond to the event.

B. Support District Agencies

1. Department of General Services (DGS) will complete the following actions:

Provide generator support by identifying available generators to be used in response operations, in coordination with HSEMA.

2. Department of Public Works (DPW) will complete the following actions:

a. Support the restoration of energy delivery and fuel supplies during and/or following an emergency.

b. Assist in the transport of generators during an emergency.

c. Provide generator fuel supplies as needed.

3. District Department of Transportation (DDOT) will complete the following actions:

a. Facilitate and coordinate in the restoration of damaged transportation infrastructure within the public right-of-way to reestablish utilities.

b. Coordinate with PEPCO regarding downed power lines caused by trees.

C. Other Support Agencies and Organizations

1. Maryland Energy Administration (MEA) will complete the following actions:

a. Serve as the lead agency for Maryland for ESF #12.

b. Provide support as requested under the Emergency Management Assistance Compact (EMAC).

2. Potomac Electric Power Company (PEPCO) will complete the following actions:

a. Provide electrical services to the public and businesses of the District.

b. PEPCO will ensure constant communications with the EOC and provide an ELO to the EOC to ensure effective communications and coordination of emergencies, specifically monitoring the power grid and its impact on the District.

c. Provide operational/restoration information reports on response activities to the EOC.

d. Support HSEMA in preparing an impact statement outlining the effects of a long-term power outage on government operations and on the potential threat to the health, welfare, and safety of citizens in the affected areas.

3. Public Service Commission (PSC) will complete the following actions:

Provide emergency regulatory action, as appropriate, to facilitate PEPCO, Washington Gas Company and any other suppliers under its mandate in the restoration of services to their customers.

4. Virginia Department of Mines, Minerals and Energy (DMME) will complete the following actions:

a. Serve as the lead agency for Virginia for ESF #12.

b. Provide support as requested under EMAC.

5. Washington Gas Company (WGC) will complete the following actions:

a. Provide natural gas to the public and businesses of the District.

b. Provide an ELO to the EOC to ensure continuous effective communications and coordination of emergencies, specifically monitoring the natural gas supply and its impact on the District.

c. Provide operational/restoration information reports on response activities to the EOC.

d. Support HSEMA in preparing an impact statement outlining the effects of a long-term natural gas outage on government operations and on the potential threat to the health, welfare, and safety of citizens in the affected areas.

D. Primary Federal Agency

1. U.S. Department of Energy (DOE) will complete the following actions:

a. Serve as the primary federal agency for ESF #12.

b. Provide direct, technical and other support and guidance to the District through its District counterpart.

c. Support the District in the event of a weapons of mass destruction (WMD) incident. Note: This USDOE support is outlined in Attachment J to the *National Capital Region Weapons of Mass Destruction Incident Contingency Plan*.

Note: Upon issuance of a presidential declaration of an emergency or major disaster, under the authority of the Robert T. Stafford Disaster Relief Act as Amended, April 1999, federal agencies initially will operate out of the U.S. Department of Homeland Security (USDHS) National Response Coordination Center (NRCC). When the JFO is established near the disaster area, ESF representatives that comprise the Emergency Response Team (ERT) will be in the JFO.

E. Support Federal Agencies

1. DC National Guard (DCNG) will complete the following actions:

Support the distribution of fuels and other services when requested and coordinated by HSEMA.

2. Department of Defense/U.S. Army Corps of Engineers (DOD/USACE) will complete the following actions:

a. Respond in support of DOE during a federally declared disaster.

b. Serve as the coordinating federal agency for ESF #3.

c. Provide electrical generators and other support services as needed to supplement the District's efforts in the temporary restoration of electrical service.

Glossary

Alternative Fuel Vehicle	A vehicle that runs on a fuel other than "traditional" petroleum fuels (petrol or diesel); Refers to any technology of powering an engine that does not involve solely petroleum (e.g. electric car, hybrid electric vehicles, solar powered). (Internet)
BTU (British Thermal Unit)	The amount of heat needed to raise one pound of water at maximum density through one degree Fahrenheit. (Internet)
Comprehensive Energy Plan	The CEP provides an energy vision for the District as a national leader, with specific short (1 to 5 years) and long-term energy goals, strategies, and initiatives for accomplishing these energy goals within the next 10 years; provides strategies that align the CEP with the Mayor's Sustainable DC Plan and the Climate Action Plan ("CAP"); and provides a comprehensive set of energy efficiency and renewable energy goals and recommendations that will put the city on a path to reducing energy consumption, increasing local generation and clean power usage, ensuring energy reliability and affordability, and creating of green jobs for District residents. (DDOE)
Concept of Operations	A concept of operations is a document describing the characteristics of a proposed system from the viewpoint of an individual who will use that system. It is used to communicate the quantitative and qualitative system characteristics to all stakeholders. (Internet)
Consequence Management	Predominantly an emergency management function and included measures to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the consequences of terrorism. The requirements of consequence management and crisis management are combined in the National Response Framework (NRF). See also Crisis Management. (DRP 2011)

Critical Infrastructure (CI)	Systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters. (DRP 2011)
Cyber Security	Cyber security is the body of technologies, processes and practices designed to protect networks, computers, programs and data from attack, damage or unauthorized access. In a computing context, the term security implies cyber security. (Internet)
Demand Response Programs	In electricity grids, demand response (DR) is similar to dynamic demand mechanisms to manage customer consumption of electricity in response to supply conditions, for example, having electricity customers reduce their consumption at critical times or in response to market conditions. (Internet)
Demand Side Programs	Energy demand management, also known as demand side management (DSM), is the modification of consumer demand for energy through various methods such as financial incentives and education. Usually, the goal of demand side management is to encourage the consumption reduction. (Internet)
Demobilization	Stand Down/Demobilization: Once incident goals and objectives have been achieved and/or a centralized District coordination presence is no longer required, the CMT implements the demobilization plan to transfer responsibilities to recovery assistance program oversight and monitoring. Following complete demobilization, responsibilities transition back to normal District agency. (DRP 2011)
Distributed Generation	Distributed generation, also called on-site generation, dispersed generation, embedded generation, decentralized generation, decentralized energy or distributed energy, generates electricity from many small energy sources. (Internet)

Emergency	As defined by the Stafford Act, an emergency is "any occasion or instance for which, in the determination of the president, federal assistance is needed to supplement state and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States." (DRP 2011)
Emergency Operations Center (EOC)	The physical location at which the coordination of information and resources to support domestic incident management activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction. EOCs may be organized by major functional disciplines (e.g., fire, law enforcement, and medical services), by jurisdiction (e.g., federal, state, regional, county, city, tribal), or by some combination thereof. (DRP 2011)
Emergency Support Function (ESF)	A grouping of government and certain private- sector capabilities into an organizational structure to provide the support, resources, program implementation, and services that are most likely to be needed to save lives, protect property and the environment, restore essential services and critical infrastructure, and help victims and communities return to normal, when feasible, following domestic incidents. The ESFs serve as the primary operational-level mechanism to provide assistance to state, local, and tribal governments or to federal departments and agencies conducting missions of primary federal responsibility. (DRP 2011)
Energy Disruptions--Internal/Distribution	Internal/distribution disruptions are disruptions to the distribution system that prevent a sufficient energy supply from being delivered to the end user in the District. An internal/distribution disruption includes an equipment malfunction, power lines being down, or weather-related supply disruptions. (EAP 2012)

Energy Emergency (Event)	An emergency (including a fuel shortage emergency) may sever key energy infrastructure, thereby constraining supply in affected areas and adversely impacting adjacent areas, especially those with supply links to the directly affected areas. Such an incident has the potential to affect transportation, communications and other infrastructure necessary for sustaining public health and safety. Also, it could affect continuity of government as well as critical infrastructure within the District. (EAP 2012)
Energy Emergency (Post-Event)	Post-Event Responsibilities: These relate to coordinating the process to develop "lessons learned" and to share those lessons. (EAP 2012)
Energy Emergency (Pre-Event)	Pre-Event Responsibilities: These include activities such as comprehensive energy planning, maintaining a current energy profile of the District, and planning and participating in emergency planning exercises. (EAP 2012)
Energy Profile	Monitoring the energy profile includes keeping track of: 1) The drivers of energy supply, demand and prices, which include the trends in energy costs and expenditures: 2) The energy regulatory environment and the extent to which it supports energy assurance; 3) The energy market structure and the extent that it fosters or hinders energy assurance; and 4) the energy market structure comprises the number of suppliers and distributors. (EAP 2012)
Energy Sector-Commercial	Commercial sector: An energy-consuming sector that consists of service-providing facilities and equipment of businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments. (EIA)

Energy Sector-Industrial	An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity manufacturing (NAICS codes 31-33); agriculture, forestry, fishing and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); and construction (NAICS code 23). Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the above-mentioned industrial activities. (EIA)
Energy Sector-Residential	An energy-consuming sector that consists of living quarters for private households. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances. The residential sector excludes institutional living quarters. (EIA)
Energy Sector-Transportation	An energy-consuming sector that consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another. Included are automobiles; trucks; buses; motorcycles; trains, subways, and other rail vehicles; aircraft; and ships, barges, and other waterborne vehicles. Vehicles whose primary purpose is not transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse tractors and fork lifts) are classified in the sector of their primary use. (EIA)
Energy Storage Systems	When using renewable energy systems, one common issue is that if a resource is not available, the system cannot generate or store energy. Recent technological advances in battery storage capabilities can allow the District to capture and store renewable energy so that it can be used at any time. Battery storage can be used in conjunction with a diesel generator to provide power during an electricity outage, ensuring continuity of operations for a building. (EAP 2012)

Energy Supply Tracking Disruption Plan (ESDTP)	An ESDTP is utilized during an energy emergency event to track basic information regarding the duration and severity of the event and the response actions taken. Additionally, the ESDTP reports some measurement of the outcome in relation to the event. The ESDTP provides a process by which energy supply and demand information is monitored and analyzed on a regular basis. (EAP 2012)
Fuel Cells	Fuel cells convert chemical energy into electricity. Fuel cells can be as large as a power plant, vehicles, or can be used to provide electricity to smaller devices, like a laptop computer. Fuel cells powered by hydrogen are more efficient, and cleaner than burning fossil fuels to create electricity. The only emissions from hydrogen fuel cells are water and waste-heat. Fuel cells can also be powered by natural gas, or biogas (including biodiesel), which can be derived from organic waste. Over the past few years, corporations and municipalities have been installing renewable fuel cell systems to meet building energy needs, using the electric grid as a backup electricity supply, instead of a diesel generator. (EAP 2012)
Green Servicing (Green Servizing)	Green "Servizing" focuses on "business models that promote efficient use of energy. Two visible "green servicing" models in the District are bike sharing and car sharing. (EPA)
Incident	An occurrence or event, natural or human caused that requires an emergency response to protect life or property. Incidents can, for example, include major disasters, emergencies, terrorist attacks, terrorist threats, wild land and urban fires, floods, hazardous materials spills, nuclear accidents, aircraft accidents, earthquakes, hurricanes, tornadoes, tropical storms, war-related disasters, public health and medical emergencies, and other occurrences requiring an emergency response. (DRP 2011)
Information Monitored	See "Energy Profile" and "Energy Tracking Disruption Plan".
Infrastructure Programs	See "Resiliency".

KWh (Kilowatts per Hour)	The kilowatt hour, or kilowatt-hour, (symbol kW·h, kW h or kWh) is a unit of energy equal to 1000 watt hours. (Internet)
Major Disaster	See "Emergency" and "Energy Emergency"/
Management Decisions	The 2011 DRP identifies responsibility for management decisions in case of an emergency. The DRP places management decisions for an energy emergency in ESF #12—Energy. ESF #12 outlines the concept of operations and the incident life cycle. There are three types of management decisions in which DDOE must participate. Decisions must be made on: 1) The nature of an event; 2) Measures to implement; and 3) Types of support needed. (EAP 2012)
Measures	In the event of a an energy shortage or disruption, District Government personnel refer to three broad categories of measures that can be implemented—demand reduction measures, supplier/distributor support measures, and user/consumer support measures. (EAP 2012)
Micro Grids	A micro grid allows a section of the city to operate independently from the central electricity grid in the District during an energy emergency. Micro grids can rely on their own power sources (e.g., renewable systems), and combined heat and power (CHP) systems. CHP systems recycle waste heat to create energy. (EAP 2012)
Monitoring	See "Energy Profile" and "Energy Tracking Disruption Plan".
MW (Mega Watts)	The megawatt is equal to one million (106) watts.
Operational Levels	The 2011 DRP outlines five operation levels to classify the estimated impact of an emergency event on the operations of the District Government. HSEMA has lead Operation Level 1 – Normal. Operation Level 2 – Guarded. Operation Level 3 – Elevated. Operation Level 4 – High Risk. Operation Level 5 – Severe Risk responsibility in making an initial determination of emergency event impact. (DRP)
Renewable Energy	Unlike fossil fuels, which are exhaustible, renewable

	energy sources regenerate and can be sustained indefinitely. The five renewable sources used most often are: 1) Biomass — including: (wood and wood waste, municipal solid waste, landfill gas and biogas, ethanol, and biodiesel; 2) Water (hydropower); 3) Geothermal; 4) Wind; 5) Solar. (EIA)
Resiliency	US DOE defines resiliency as "the ability to respond effectively to an energy emergency and to recover quickly from damage." Resiliency is enhanced with an effective EAP that will help restore energy services quickly following an energy disruption. Identifying critical infrastructure facilities and developing a plan to protect these facilities from threats and vulnerabilities during an energy emergency are key steps towards successfully building this resiliency. (EAP 2012)
Response	Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of incident mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes. (DRP 2011)
Situational Awareness	Situational awareness is the ability to identify, process, and comprehend the critical elements of what is happening as an event unfolds. From the CMT perspective, this means knowing where emergency needs are greatest; what assets are needed; how to get assets into areas where they are needed; and what the status of assets are as they move on-scene and perform actions. (EAP 2012)
Smart Grid	"Smart grid" generally refers to a class of technology people are using to bring utility electricity delivery systems into the 21st century, using computer-based remote control and automation. These systems are made possible by two-way communication technology and computer processing that has been used for decades in other industries. (DOE)

Stand Down	Once incident goals and objectives have been achieved, and/or a centralized District coordination presence is no longer required, the CMT implements the demobilization plan. This action will transfer responsibilities to recovery assistance for program oversight and monitoring. Following complete demobilization, responsibilities shift back to individual agencies' District offices. (EAP 2012)
Sustainable DC	The Mayor's Sustainability Vision/Plan is the overarching guide to improving energy efficiency. The Mayor's Vision is for DC to become the most sustainable city in the country, the District has drafted an ambitious, yet achievable, vision that creates the framework to become a healthier, cleaner and greener city. This vision creates a better tomorrow by focusing on social equity, economic competitiveness and environmental quality. (http://sustainable.dc.gov/)
Therm	See "BTU".