

New York State Energy Research and Development Authority

Study to Assess the Need for Backup Generation at Upstate Retail Fuel Outlets

Final Report

January 2014

Report Number 14-01



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NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

Mission Statement:

Advance innovative energy solutions in ways that improve New York's economy and environment.

Vision Statement:

Serve as a catalyst—advancing energy innovation and technology, transforming New York's economy, empowering people to choose clean and efficient energy as part of their everyday lives.

Core Values:

Objectivity, integrity, public service, partnership, and innovation.

Portfolios

NYSERDA programs are organized into five portfolios, each representing a complementary group of offerings with common areas of energy-related focus and objectives.

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Helping to build a generation of New Yorkers ready to lead and work in a clean energy economy – including consumer behavior, youth education, workforce development, and training programs for existing and emerging technologies.

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Study to Assess the Need for Backup Generation at Upstate Retail Fuel Outlets

Executive Summary

In the New York State 2013-14 State Budget, the New York State Energy Research and Development Authority (NYSERDA) was directed to “conduct a study evaluating the efficacy of potential alternate generated power source provisions at retail gasoline outlets that are located outside the Downstate region...” (See Part S, subsection 4 of Chapter 58 of the Laws of 2013).

In response to this direction, the NYSERDA Study developed several scenarios and station proximity analyses, examining back-up generation at retail gasoline stations. These scenarios included a scenario that is similar to the program for Downstate retail stations, which was designed to support retail gas stations in responding to extended power outages, and maintain the ability to deliver fuel to the general public. While the Study was informed by historical information and data on incidents resulting in prolonged outages and disruptions to retail fuel delivery, the Study is also taking account of the recent shift in storm patterns, which have demonstrated an increased frequency and severity, and which have resulted in substantial effects on the fuel delivery systems. This Study therefore attempts to understand the need to plan for and develop responses to these changing realities, and recommends actions based on these new realities, taking into account the systems and demographics of the Upstate region.

To help inform the findings of this study, NYSERDA retained an independent contractor, ICF International, to help describe the dynamics of the Upstate fuel delivery systems, the history of prolonged electric power outages that resulted in curtailed delivery of gasoline to the retail market, as well as other issues that could affect the success of an Upstate program. The results of that examination have informed the conclusions of this study.

NYSERDA has concluded that it would be prudent to provide for back-up power capacity at strategically located retail gas stations along critical highways in the Upstate Region. Due to different circumstances in the Upstate region, such a strategy may be sufficient as compared to the Downstate retail station program, which includes all limited-access highways as well as 30 percent of gas station chain locations beyond the half-mile from highways. The defined Upstate region¹ presents a different set of population characteristics and fuel distribution system dynamics than the Downstate region that is the subject of the existing backup generator program. The populations of Upstate New York are less dense than in Downstate and tend to have more expansive geographic mobility due to greater reliance on automobiles for personal transport. As a result, Upstate also has a road network that supports longer distance traffic patterns than Downstate. Further, the Upstate petroleum fuel system functions in a manner that allows for greater ability to move fuel from various supply scenarios to a locality that may experience a supply disruption, and has a high level of adaptability and supply redundancies, as

¹ For purposes of this study, the Upstate region consists of the all counties in New York situated north and west of Westchester and Rockland counties.

compared to the Downstate system which faces more restrictive geography that impacts system redundancy.

The conclusions of this Study take account of the interrelationship and interdependency between the petroleum fuels sector and electric reliability, as well as the transportation infrastructure and demographics of the region. Given the characteristics of the Upstate fuel distribution system, and the ability for the population to have greater access to fuel sources, an Upstate backup power program targeting facilities within a modest distance of critical highways (1/2 mile) in the Upstate region would appear to provide a baseline level of resiliency to support the region.

Overview of Downstate Backup Generation Program

The Downstate program was created as a result of a recommendation from Governor Cuomo's Ready Commission, which was empanelled to identify strategies to build resiliency in New York's energy infrastructure, among other issues, due to the experiences of Superstorm Sandy, as well as the experience learned from the impacts of Hurricane Irene and Tropical Storm Lee in 2011. Clearly revealed through these events were the interrelationship and interdependency between the petroleum fuels sector and electric system reliability. Electric power outages affect the ability of all segments of the petroleum fuels sector to move fuel, ultimately to retail customers. As the storm events of the past two years demonstrate, a catastrophic event could impair electric service for prolonged periods of time in any region of the State, and such catastrophic scenarios are now a new baseline from which to plan needed emergency response activities. Such prolonged electric outages can potentially cascade through the entire supply chain for petroleum transportation fuels: pipelines, terminals, and retail gasoline stations. To provide resiliency to the retail distribution segment of the system, the backup generator program for the Downstate region was created. Through that program, approximately half of all Downstate gas stations are required to have back-up power in the event of an emergency, including:

- Stations within a half-mile of a highway exit or hurricane evacuation route in these Downstate areas will need to be wired with a transfer switch by April 1, 2014. They must deploy and install a generator within 24 hours of losing power in an emergency.
- Thirty (30) percent of all retail outlets that are part of a chain further than half-mile from highway exits and evacuation routes in these Downstate areas will be required to install a transfer switch by August 1, 2015. They must deploy and install a generator within 48 hours of losing power.
- Gas stations selling less than 75,000 gallons of fuel per month may apply for an exemption from NYS Agriculture and Markets.
- All newly constructed gas stations for which a building permit is issued on or after April 1, 2014 will be required to have wiring to deploy a generator or have a back-up generator installed.

- Transfer Switches - The Downstate Gas Station Back-Up Power Program is providing grants to defray the costs for the installation of the transfer switches that are necessary for backup generators. Grants may be up to \$10,000 for the installation of a transfer switch or up to \$13,000 for the installation of both a transfer switch and permanently affixed emergency generator. Variations in the actual cost of transfer switch installation include station location, flood zone concerns, age of the gas station, condition of the existing electrical system, any necessary electrical system upgrades, space to install the switch or and/or generator, and size of the transfer switch and/or generator can affect the cost of an installation.
- Portable Emergency Generators – NYSERDA issued a solicitation for the creation of a pool of portable emergency generators that could be deployed in the event of a declared energy emergency. Information sought through the solicitation include both feasibility and costs for: mobilizing and demobilizing the generator, deployment of the generator to the gas station and recovery after the emergency, connection by a licensed electrician, fueling and maintenance. Information that is learned from the responses to this solicitation will provide additional information in the design of an Upstate program, for which NYSERDA may elect to pursue some or all of these features.

Upstate Wholesale Fuel Infrastructure Conditions

In general, the Upstate petroleum fuel distribution system, including terminals, pipelines, marine facilities and rail, has demonstrated itself to be adaptive to a variety of conditions that may arise. Although the system largely functions along two independent upstream systems, through marine sources in Eastern New York and through pipelines in the Central and Western regions of the State, the wholesale fuel supply system has realized high levels of resiliency in Upstate, which is strengthened by the proximity of alternative supply sources within and outside of New York, including supply sources in neighboring states and Canada, as well as the mobility of the truck transport industry and an extensive road network. While there do exist certain key vulnerabilities to the Upstate system, the embedded diversification in the system provides a level of resiliency that is not existent in the Downstate system.

The concern about reduced fuel flow from primary supply sources is mitigated to some degree by the relatively higher levels of inventory held at Upstate terminals. While companies do not report their specific inventory levels, on average, terminals supplied by marine, such as those in the Hudson Valley Region, hold inventories equal to several days of supply on hand at any given time, depending on the timing of deliveries. In the Central & Western Region, pipeline deliveries along the main pathway – the Buckeye Pipeline – run on a 10-day delivery cycle, and hold more than 10 days of supply on average. Inventory levels in these Upstate markets contrast starkly with inventory at terminals in the Downstate New York area, which may hold as little as 2-3 days of supply at any given point. The higher inventory levels in Upstate markets allow it to withstand longer disruptions to critical fuel supply pathways.

Furthermore, systems supplying Upstate markets have a greater ability to make up lost deliveries after a disruption event has ended. In the Hudson Valley Region, additional barges can be contracted from the

New York Harbor shipping market to make up for lost deliveries, and supplemental deliveries be can made by tanker truck (in consideration that the distance between the primary holding terminals in Linden, NJ and the distribution terminals at the Port of Albany is roughly 160 miles). The Buckeye Pipeline system, which supplies markets in the Central & Western Region, typically runs at 75 to 80 percent of capacity and is out of operation 3 to 4 days per month due to lack of demand for volumes. This provides additional capacity for deliveries, and the pipeline throughput can be ramped up after a disruption event to compensate for lost supply.

This availability of fuel supply further reinforces the importance of back-up power capacity at strategically located gas stations, since gas stations are likely to have access to product that can reach the public as well as critical responders.

Electric Reliability

Examples of major power outages in the Upstate region include those recently experienced with Hurricane Irene and Tropical Storm Lee, as well as historical outages, including the 1998 North Country Ice Storm. The 1998 North Country Ice Storm resulted in widespread power outages affecting more than 3 million people across the U.S., including New York and two Canadian provinces with some regions out of power for two weeks. The duration of typical outages, on average, would not significantly impair the ability of the petroleum distribution industry to recover quickly from such outages. However, outages of the scale of the North Country Ice Storm or a storm event Upstate with a magnitude of Superstorm Sandy could disrupt the Upstate fuel distribution system. As learned from Sandy, New York State must be prepared before such severe weather events impact the State.

Storm-related damages to key supply facilities in the New York Harbor area have had a significant impact on fuel supply to Upstate markets. Although those damages would not have been alleviated by greater electrical hardening measures at Upstate New York facilities, having a reserve of fuel located in the Upstate region would help to alleviate impacts to Upstate caused by disruptions to the system in the New York Harbor area.

Retail Fuel Supply System

At the retail level, Upstate New York is served by a broadly distributed industry of gasoline service stations and convenience stores. Many of these are located within several miles of limited access highways in proximity to the numerous Upstate cities. And many more outlets have been developed to serve diffuse populations throughout the rural and suburban regions of Upstate, principally located on State highways.

As shown in Table 1 , at the Upstate county level, gasoline stations and other motor fuel outlets are distributed broadly. Data from New York State Agriculture and Markets (Ag & Mkts) identifies 3,503 gasoline stations in Upstate New York. The three largest concentrations of gasoline stations by county

are Erie County (355), Monroe County (252), and Orange County (186). The lowest concentrations are in Yates County (11), Hamilton County (15), and Livingston County (15).

Table 1: Distribution of Gasoline Stations by County in Upstate NY

County	Locations	County	Locations	County	Locations	County	Locations
Albany	108	Essex	41	Oneida	106	St. Lawrence	81
Allegany	39	Franklin	41	Onondaga	182	Steuben	72
Broome	111	Fulton	31	Ontario	60	Sullivan	70
Cattaraugus	36	Genesee	40	Orange	186	Tioga	25
Cayuga	37	Greene	42	Orleans	26	Tompkins	16
Chautauqua	80	Hamilton	15	Oswego	83	Ulster	97
Chemung	37	Herkimer	32	Otsego	58	Warren	54
Chenango	33	Jefferson	75	Putnam	53	Washington	29
Clinton	77	Lewis	19	Rensselaer	85	Wayne	56
Columbia	61	Livingston	15	Saratoga	39	Wyoming	30
Cortland	25	Madison	38	Schenectady	72	Yates	11
Delaware	45	Monroe	252	Schoharie	24		
Dutchess	160	Montgomery	40	Schuyler	16		
Erie	355	Niagara	63	Seneca	24	Total	3,503

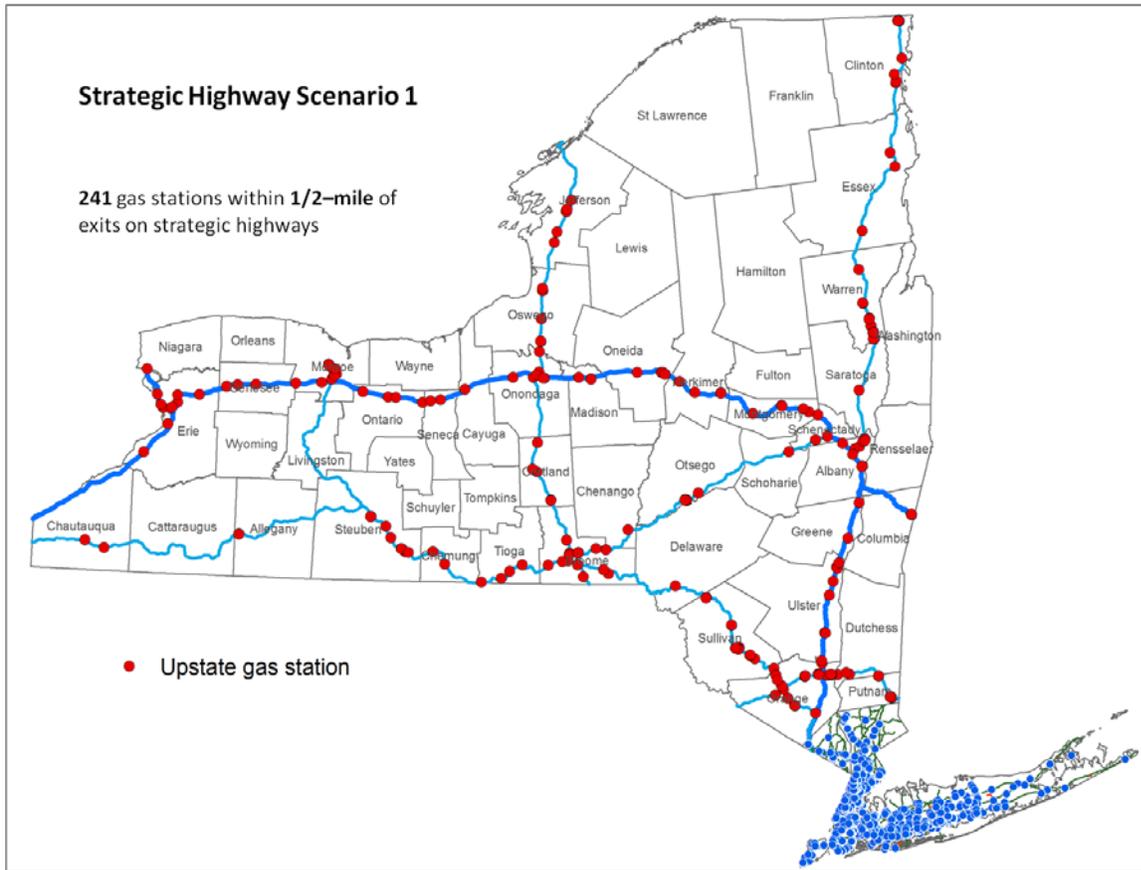
Source: NYS Agriculture and Markets

Several scenarios of retail facilities were completed to identify the dispersal of such facilities throughout the Upstate region. These scenarios demonstrate that there is a robust distribution of facilities along critical and strategic highways, when examining facilities within a modest distance of those highways, in this case within ½ mile.

Analysis of Gasoline Stations in Proximity to Strategic Highways

The Strategic Highway Scenarios 1 - 4 identified specific strategic highways that serve Upstate, including I-87 (NYS Thruway and Northway), I-90 (NYS Thruway and Mass Pike spur), I-81, I-84, I-88, Southern Tier Expressway/Rt. 17, and I-390. A buffer analysis of exits on these highways identified: 241 gasoline stations within 0.5 of exits (Figure 1); 354 gasoline stations within 1.0 mile of exits (Figure 2); 637 gasoline stations within 2.0 miles of exits (Figure 3); and, 1,418 gasoline stations within 5.0 miles of exits on these highways (Figure 4). Each of these scenarios included 24 gasoline stations along the NYS Thruway.

Figure 1: Strategic Highway Scenario 1 - Gasoline Stations within 0.5 Miles of Strategic Highways in Upstate New York

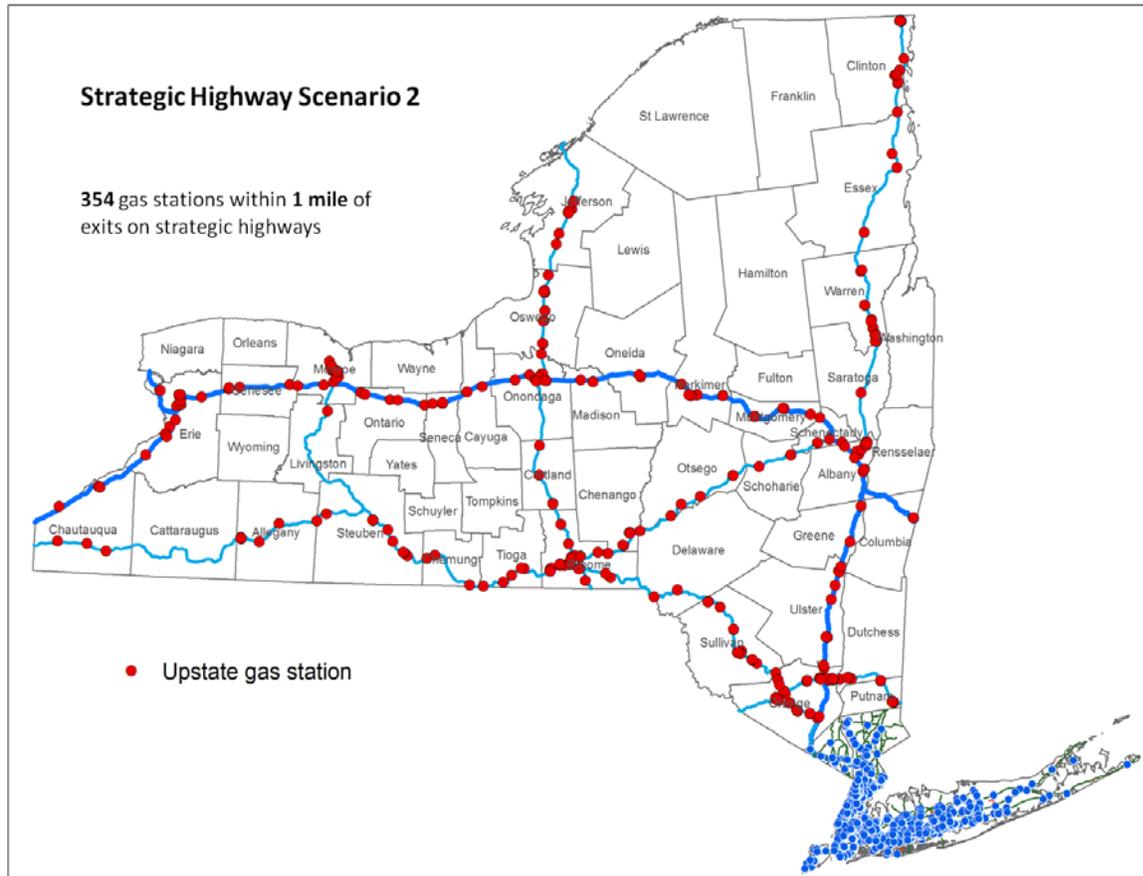


The County distribution for Strategic Highway Scenario 1 is shown in Table 2:

Table 2: Strategic Highway Scenario 1: Gasoline Stations Within 0.5 Miles of Strategic Highways

Strategic Highway Scenario 1: Gasoline Stations Within 0.5 Miles of Strategic Highways							
Albany	10	Dutchess	3	Oneida	6	Steuben	11
Allegany	2	Erie	11	Onondaga	8	Sullivan	13
Broome	19	Essex	3	Ontario	4	Tioga	4
Cayuga	1	Genesee	4	Orange	33	Ulster	8
Chautauqua	2	Greene	2	Oswego	8	Warren	15
Chemung	3	Herkimer	4	Otsego	6		
Chenango	1	Jefferson	7	Putnam	7		
Clinton	9	Madison	3	Saratoga	1		
Columbia	3	Monroe	11	Schenectady	3		
Cortland	5	Montgomery	6	Schoharie	1		
Delaware	1	Niagara	1	Seneca	2	Total	241

Figure 2: Strategic Highway Scenario 2 - Gasoline Stations within 1.0 Mile of Strategic Highways in Upstate New York

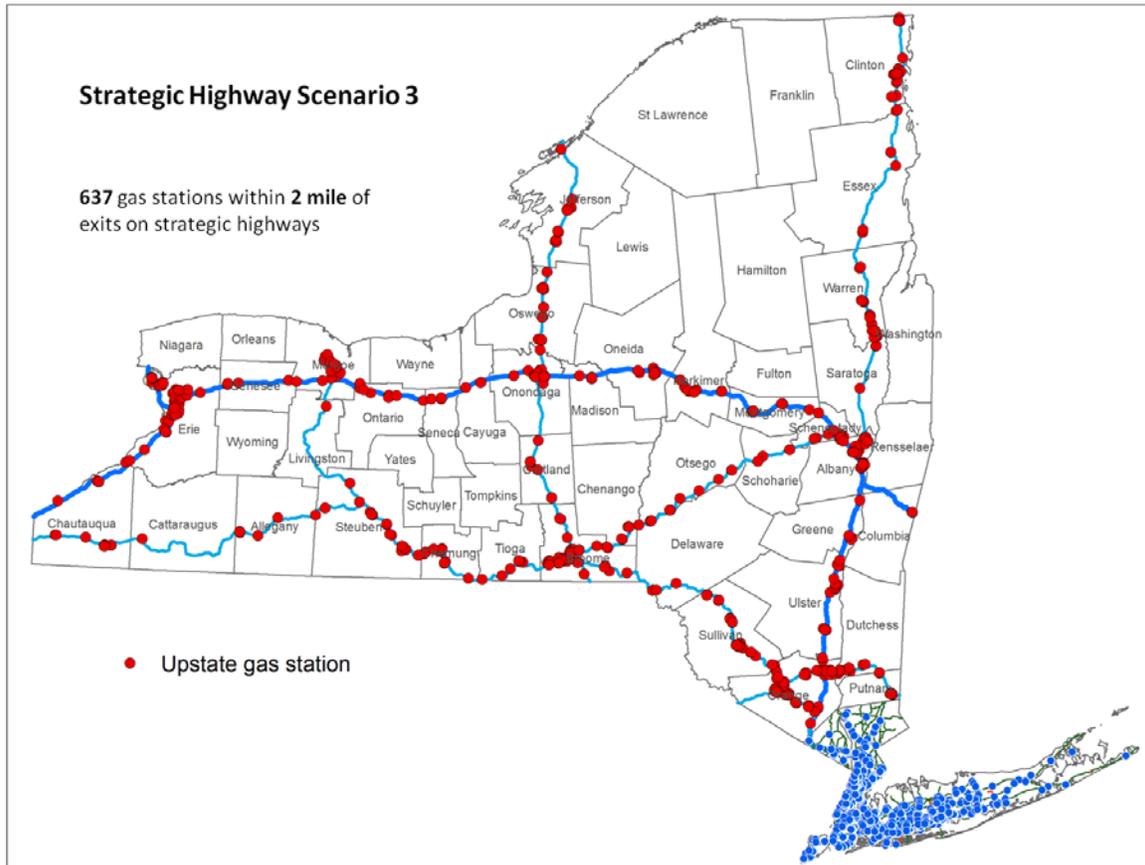


The County distribution for Strategic Highway Scenario 2 is shown in Table 3:

Table 3: Strategic Highway Scenario 2: Gasoline Stations Within 1.0 Miles of Strategic Highways

Strategic Highway Scenario 2: Gasoline Stations Within 1.0 Mile of Strategic Highways							
Albany	15	Dutchess	5	Oneida	2	Steuben	12
Allgany	6	Erie	22	Onondaga	13	Sullivan	16
Broome	34	Essex	3	Ontario	5	Tioga	5
Cayuga	2	Genesee	5	Orange	48	Ulster	9
Chautauqua	8	Greene	2	Oswego	15	Warren	18
Chemung	4	Herkimer	10	Otsego	6		
Chenango	6	Jefferson	8	Putnam	8		
Clinton	15	Livingston	1	Saratoga	1		
Columbia	3	Madison	3	Schenectady	5		
Cortland	4	Monroe	16	Schoharie	4		
Delaware	4	Montgomery	8	Seneca	3	Total	354

Figure 3: Strategic Highway Scenario 3 - Gasoline Stations within 2.0 Miles of Strategic Highways in Upstate New York

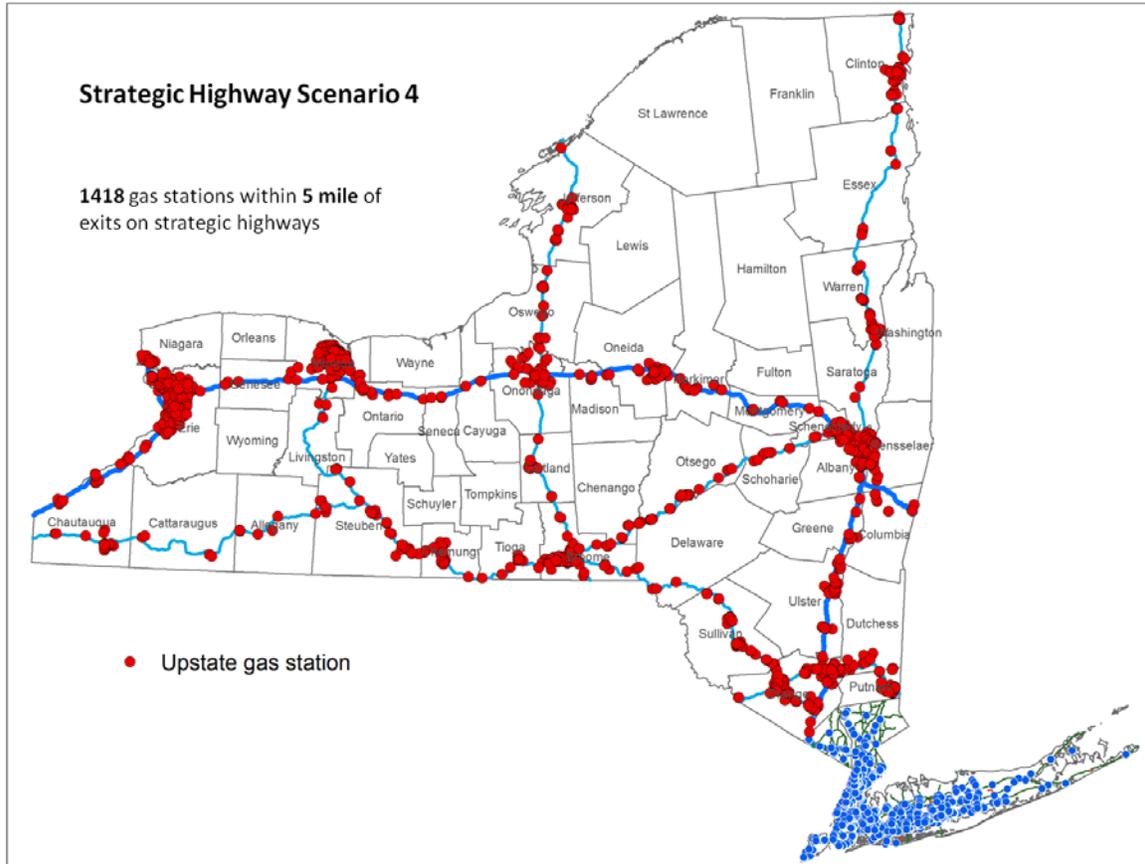


The County distribution for Strategic Highway Scenario 3 is shown in Table 4:

Table 4: Strategic Highway Scenario 3: Gasoline Stations Within 2.0 Miles of Strategic Highways

Strategic Highway Scenario 3: Gasoline Stations Within 2.0 Miles of Strategic Highways							
Albany	34	Delaware	8	Montgomery	11	Seneca	3
Alligany	6	Dutchess	14	Oneida	10	Steuben	23
Broome	55	Erie	82	Onondaga	15	Sullivan	29
Cattaraugus	1	Essex	5	Ontario	9	Tioga	7
Cayuga	3	Genesee	5	Orange	73	Ulster	18
Chautauqua	15	Greene	5	Oswego	18	Warren	27
Chemung	12	Herkimer	14	Otsego	11		
Chenango	6	Jefferson	13	Putnam	9		
Clinton	28	Livingston	1	Saratoga	3		
Columbia	3	Madison	4	Schenectady	15		
Cortland	7	Monroe	30	Schoharie	5	Total	637

Figure 4: Strategic Highway Scenario 4 - Gasoline Stations within 5.0 Miles of Strategic Highways in Upstate New York



The County distribution for Strategic Highway Scenario 4 is shown in Table 5:

Table 5: Strategic Highway Scenario 4: Gasoline Stations Within 5.0 Miles of Strategic Highways

Strategic Highway Scenario 4: Gasoline Stations Within 5.0 Miles of Strategic Highways							
Albany	75	Delaware	13	Montgomery	15	Schenectady	56
Allegany	7	Dutchess	27	Niagara	17	Schoharie	10
Broome	97	Erie	233	Oneida	35	Seneca	3
Cattaraugus	4	Essex	7	Onondaga	33	Steuben	41
Cayuga	3	Genesee	7	Ontario	15	Sullivan	39
Chautauqua	43	Greene	8	Orange	140	Tioga	14
Chemung	29	Herkimer	17	Oswego	21	Ulster	44
Chenango	6	Jefferson	24	Otsego	24	Warren	40
Clinton	42	Livingston	3	Putnam	26		
Columbia	13	Madison	8	Rensselaer	22		
Cortland	14	Monroe	139	Saratoga	4	Total	1,418

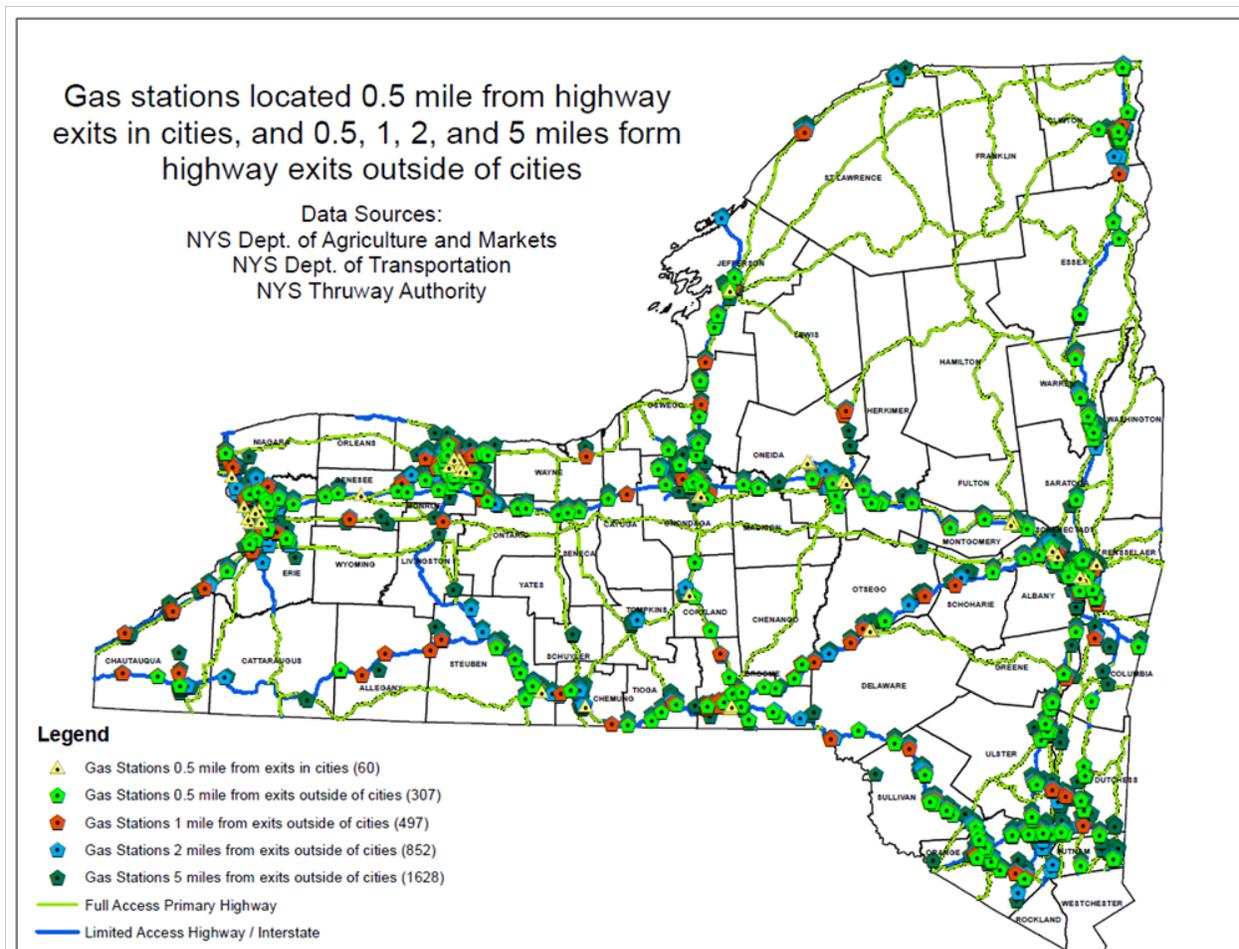
Gasoline Station All Highways Proximity Analysis

A separate proximity analysis identified 1,628 retail gasoline locations within five miles of exits on both limited access highways (i.e. Thruway, interstate highways) and full access primary highways (i.e. State highways), including 24 on the New York State Thruway. Within cities, there are 60 gasoline stations within 0.5 miles of exits on limited access highways.

Areas outside of cities, on full access, primary highways (i.e. State highways) are also well served by retail gasoline locations. A summary of distributions and map follows. (Figure 5)

- Gas stations within 0.5 miles from exits in cities: 60
- 0.5 miles from exits outside of cities: 283 (plus 24 NYS Thruway)
- 1 mile from exits outside of cities: 473 (plus 24 NYS Thruway)
- 2 miles from exits outside of cities: 828 (plus 24 NYS Thruway)
- 5 miles from exits outside of cities: 1,604 (plus 24 NYS Thruway)

Figure 5: Gas Stations Located 0.5 Miles from Highway Exits in Cities, and 0.5, 1, 2, and 5 Miles from Highway Exits Outside of Cities



Proximity Scenario 1: This scenario examines the distribution of gasoline stations within 0.5 mile of city exits on limited access highways, including interstates. In the Upstate region, 60 locations were identified and their distribution by county is shown in Table 6.

Table 6: Proximity Scenario 1 - Gasoline Stations by County within 0.5 Miles from City Exits

Limited Access Highways Proximity Scenario 1 - 0.5 Miles From City Exits							
Albany	2	Genesee	1	Niagara	1	Schenectady	6
Broome	4	Jefferson	1	Oneida	7	Steuben	1
Chemung	1	Madison	1	Onondaga	2		
Cortland	1	Monroe	11	Otsego	5		
Erie	8	Montgomery	6	Rensselaer	2	Total	60

Proximity Scenario 2: This scenario examines the distribution of gasoline stations within 0.5 mile of exits on limited access highways and full access highways outside of cities. In the Upstate region, 283 locations were identified and their distribution by county plus the Thruway stations is shown in Table 7.

Table 7: Proximity Scenario 2 - Gasoline Stations by County within 0.5 Miles from Rural Exits

All Highways Proximity Scenario 2 - 0.5 Miles From Rural Exits							
Albany	11	Dutchess	9	Niagara	2	Schenectady	4
Allegany	2	Erie	31	Oneida	7	Schoharie	1
Broome	20	Essex	3	Onondaga	9	Seneca	1
Chautauqua	2	Genesee	2	Ontario	2	Steuben	11
Chemung	2	Greene	1	Orange	31	Sullivan	13
Chenango	2	Herkimer	5	Oswego	9	Tioga	4
Clinton	10	Jefferson	6	Otsego	1	Ulster	9
Columbia	4	Madison	2	Putnam	8	Warren	15
Cortland	4	Monroe	32	Rensselaer	3	Total	283
Delaware	1	Montgomery	3	Saratoga	1	NYS Thruway	24

Proximity Scenario 3: This scenario examines the distribution of gasoline stations within 1.0 mile of exits on limited access highways and full access highways outside of cities. In the Upstate region, 473 locations were identified and their distribution by county plus the Thruway stations is shown in Table 8.

Table 8: Proximity Scenario 3 - Gasoline Stations by County within 1.0 Miles from Rural Exits

All Highways Proximity Scenario 3: 1 Mile From Rural Exits							
Albany	16	Dutchess	17	Niagara	6	Schoharie	4
Allegany	6	Erie	53	Oneida	13	Seneca	2
Broome	37	Essex	3	Onondaga	15	St Lawrence	2
Cayuga	1	Genesee	5	Ontario	4	Steuben	13
Chautauqua	10	Greene	2	Orange	46	Sullivan	16
Chemung	4	Herkimer	7	Oswego	16	Tioga	5
Chenango	6	Jefferson	8	Otsego	6	Ulster	11
Clinton	16	Livingston	1	Putnam	9	Warren	18
Columbia	5	Madison	2	Rensselaer	7	Wayne	1
Cortland	4	Monroe	53	Saratoga	1	Total	473
Delaware	4	Montgomery	6	Schenectady	12	NYS Thruway	24

Proximity Scenario 4: This scenario examines the distribution of gasoline stations within 2.0 miles of exits on limited access highways and full access highways outside of cities. In the Upstate region, 828 locations were identified and their distribution by county plus the Thruway stations is shown in Table 9.

Table 9: Proximity Scenario 4 - Gasoline Stations by County within 2.0 Miles from Rural Exits

All Highways Proximity Scenario 4: 2 Miles From Rural Exits							
Albany	37	Dutchess	31	Oneida	21	St Lawrence	7
Allegany	6	Erie	124	Onondaga	18	Steuben	24
Broome	55	Essex	5	Ontario	7	Sullivan	29
Cattaraugus	1	Genesee	5	Orange	78	Tioga	7
Cayuga	2	Greene	4	Oswego	19	Tompkins	1
Chautauqua	16	Herkimer	11	Otsego	11	Ulster	19
Chemung	12	Jefferson	13	Putnam	10	Warren	27
Chenango	6	Livingston	1	Rensselaer	12	Wayne	1
Clinton	29	Madison	3	Saratoga	3		
Columbia	6	Monroe	98	Schenectady	29		
Cortland	7	Montgomery	9	Schoharie	5	Total	828
Delaware	8	Niagara	9	Seneca	2	NYS Thruway	24

Proximity Scenario 5: This scenario examines the distribution of gasoline stations within 5.0 miles of exits on limited access highways and full access highways outside of cities. In the Upstate region, 1,604 locations were identified and their distribution by county plus the Thruway stations is shown in Table 10.

Table 10: Proximity Scenario 5 - Gasoline Stations by County within 5.0 Miles from Rural Exits

All Highways Proximity Scenario 5: 5 Miles From Rural Exits							
Albany	74	Delaware	13	Niagara	25	Schuyler	3
Allegany	7	Dutchess	74	Oneida	43	Seneca	2
Broome	97	Erie	247	Onondaga	32	St Lawrence	15
Cattaraugus	4	Essex	7	Ontario	13	Steuben	41
Cayuga	2	Genesee	10	Orange	140	Sullivan	40
Chautauqua	41	Greene	7	Oswego	23	Tioga	14
Chemung	29	Herkimer	14	Otsego	26	Tompkins	7
Chenango	6	Jefferson	24	Putnam	27	Ulster	46
City of Dunkirk	3	Livingston	3	Rensselaer	31	Warren	40
Clinton	43	Madison	7	Saratoga	4	Wayne	4
Columbia	22	Monroe	201	Schenectady	56	Total	1,604
Cortland	14	Montgomery	13	Schoharie	10	NYS Thruway	24

Rural Region Highway Proximity Analysis

In order to identify gasoline stations that serve predominantly rural regions, a third analysis included all gasoline stations that were one or two miles from a full access highway, but were not within five miles of a limited access highway exit. (**Figure 6**) This proximity analysis identified gasoline stations not previously identified in the other analyses but also included better identification of North Country, Adirondack, and Catskill region gasoline stations. The incremental number of stations between the one and two mile buffers was 112, indicating the bulk of gasoline stations in these regions are within one mile of full access highways (typically State or US highways).

Rural Region Highway Proximity Analysis 1: At one mile from full access highways, the analysis identified 661 gasoline stations outside of the previous analyses. (Table 11)

Table 11: Rural Region Highway Proximity Analysis 1 - Gasoline Stations by County - 1 Mile from Full Access Highways and 5 Miles Outside of Limited Access Highway Exits

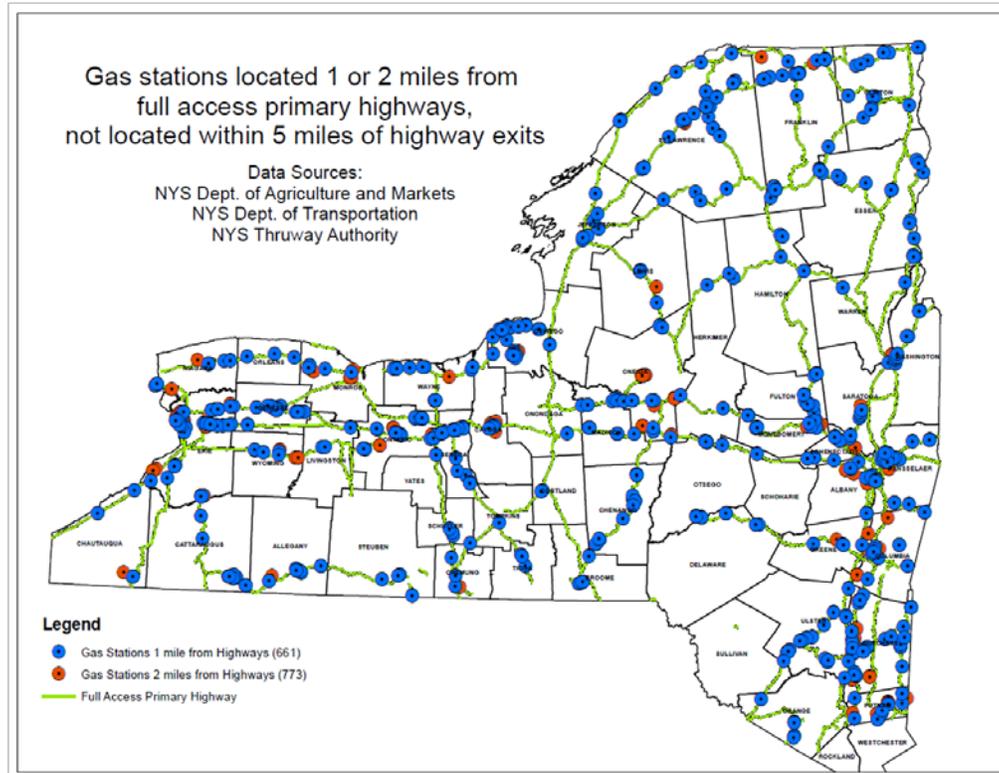
1 Mile from Full Access Highways - Outside of 5 Miles of Limited Access Highway Exit									
Albany	14	Delaware	6	Lewis	4	Oswego	35	Tioga	3
Allegany	10	Dutchess	39	Livingston	3	Otsego	12	Tompkins	1
Broome	5	Erie	54	Madison	13	Putnam	15	Ulster	20
Cattaraugus	14	Essex	21	Monroe	5	Rensselaer	29	Warren	3
Cayuga	11	Franklin	28	Montgomery	14	Saratoga	6	Washington	14
Chautauqua	4	Fulton	14	Niagara	10	Schenectady	10	Wayne	14
Chemung	3	Genesee	22	Oneida	14	Schoharie	1	Wyoming	5
Chenango	21	Greene	5	Onondaga	1	Schuyler	5		
Clinton	16	Hamilton	5	Ontario	26	Seneca	17		
Columbia	20	Herkimer	3	Orange	7	St Lawrence	41		
Cortland	2	Jefferson	8	Orleans	3	Steuben	5	Total	661

Rural Region Highway Proximity Analysis 2: At two miles, the analysis identified 773 gasoline stations. (Table 12)

Table 12: Rural Region Highway Proximity Analysis 2 - Gasoline Stations by County - 2 Miles from Full Access Highways and 5 Miles Outside of Limited Access Highway Exits

2 Miles from Full Access Highways - Outside of 5 Miles of Limited Access Highway Exit									
Albany	19	Delaware	6	Lewis	5	Oswego	37	Tioga	3
Allegany	11	Dutchess	49	Livingston	3	Otsego	12	Tompkins	1
Broome	5	Erie	75	Madison	14	Putnam	21	Ulster	20
Cattaraugus	14	Essex	21	Monroe	11	Rensselaer	30	Warren	5
Cayuga	17	Franklin	30	Montgomery	17	Saratoga	7	Washington	14
Chautauqua	5	Fulton	14	Niagara	12	Schenectady	13	Wayne	15
Chemung	4	Genesee	22	Oneida	30	Schoharie	1	Wyoming	9
Chenango	21	Greene	8	Onondaga	1	Schuyler	5		
Clinton	16	Hamilton	5	Ontario	33	Seneca	17		
Columbia	25	Herkimer	3	Orange	7	St Lawrence	42		
Cortland	2	Jefferson	8	Orleans	3	Steuben	5	Total	773

Figure 6: Gas Stations Located 1 or 2 Miles from Full Access Primary Highways; Not Located within 5 Miles of Limited Access Highway Exits



Financial Assistance

A backup generator program should consider financial support for the pre-wiring of gasoline stations for rapid installation of portable generators (i.e. transfer switch) or the installation of permanent generators. In some cases, consideration to advance a program for permanent placement of a backup generator is also advisable.

Public Outreach

In accordance with Part S, subsection 4, NYSERDA targeted outreach to representatives of the public, county associations and industry.

Surveys were developed and distributed through participating associations asking for information related to public needs, cost considerations, historic storm electrical outages and durations, fuel supply interruptions, and specific to fuel outlets, existing backup generator and electric transfer switch capacity already in place. Follow-up telephone calls to these surveys were also conducted. Respondents

generally identified impacts from major storms or electric interruption events such as the 1998 North Country Ice Storm, the August 2003 Northeast Blackout, Hurricane Irene (2011), Tropical Storm Lee (2011), and Superstorm Sandy (2012). Naturally, duration of impacts varied greatly depending on location. The 1998 North Country Ice Storm had a significant impact on that part of the State, while the further north and west the locality, generally the lower the impact of Superstorm Sandy. To avoid potential impacts from future storms and outages, identification of backup generation at stations along interstate routes was noted as a reasonable approach.

Several retail fuel outlet operators noted they have a percentage of outlets with electric transfer switches already installed. These switches allow for the expedited connection of generators when needed and some retailers have generators in place. Some concern was expressed regarding the costs involved to install either transfer switches or generators. They noted that deciding factors impacting installation consideration included; costs, sales volumes to support the installation, frequency of electric power interruptions, and type of community served by a specific outlet.

Conclusions

A backup generator program for Upstate retail gasoline stations, based on a scenario targeting stations within a modest distance from critical highways (1/2 mile) will likely add valuable resiliency to the Upstate petroleum distribution system and will provide adequate disbursement of facilities to cover significant populations throughout Upstate. This conclusion is based on several findings from this study:

1. Future storm events of the magnitude of Superstorm Sandy may cause even more severe impacts to the Upstate system than have been experienced to date. Recent storm events of the last few years suggest that high-impact storms may occur with more frequency than previous history.
2. Strategically spaced gas stations with back-up power capacity will provide a greater level of resiliency along critical highways in New York and will ensure a minimum level of fuel is available to motorists and emergency responders in the event of a widespread electrical outage.
3. The same level of coverage for Upstate as provided in the Downstate gas station program does not appear necessary given the higher level of resilience in the Upstate wholesale distribution system relative to that in Downstate, primarily as the result of the diversification of potential alternate supply pathways. There is also a generally higher level of mobility of Upstate populations, given the existing network of roads, and the ability of the population to seek multiple geographic alternatives to obtain fuel at retail locations.

Given the dependence of Upstate terminals on supplies originating in the New York Harbor region, consideration should be given to an Upstate Strategic Fuel Reserve that could alleviate supply disruptions caused by events in the Downstate region. The size of the Reserve should take into consideration the relatively larger storage capacity in Upstate and excess pipeline capacity that could be used to accelerate supply deliveries following a distribution disruption.

There exist other issues that warrant continuous assessment over time to ensure the adequacy of the petroleum distribution system to withstand electric power outages of long duration. At the retail system level, there should be further consideration given to the identification of critical highways that could be targeted for inclusion in a program, as well as consideration for the more remote areas of the Upstate region, and whether expansion of a backup generator program to additional critical highways and remote areas is warranted. At the wholesale system level, issues relating to operation, maintenance, and investment of key assets including pipelines, marine facilities, and storage terminals, the interruption of which can have cascading effects into the retail supply system, should be further examined, and are the subject of other NYSERDA studies examining the need to harden upstream fuel distribution facilities. In addition, other emergency response activities could be expanded to further help contain the impacts of fuel distribution disruptions, including the distribution of information and demand control measures during periods of outages. As outage information from utilities becomes more available in real-time, this could be compared with the locations of gas stations.

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Final Report
January 2014

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