



5.4.13 Utility Failure

This section presents a profile and vulnerability assessment of the utility failure hazard.

5.4.13.1 Hazard Profile

This section provides profile information including description, extent, location, previous occurrences and losses, and probability of future occurrences.

Description

A utility failure, or power failure, is defined as any interruption or loss of electrical service caused by disruption of power transmission caused by accident, sabotage, natural hazards, or equipment failure (also referred to as a loss of power or power outage). A significant power failure is defined as any incident of a long duration that would require involvement of local and/or state emergency management organizations to coordinate provision of food, water, heating, cooling, and shelter.

Widespread power outages can occur without warning or as a result of a natural disaster. Generally, warning times will be short in the case of technological failure, such as a fire at a sub-station, traffic accident, human error, or terrorist attack. In cases where a power failure is caused by natural hazards, greater warning time is possible. For example, high wind events such as tornados and hurricanes often cause widespread power failure, and are often forecasted before they affect a community. Additionally, severe winter weather conditions such as ice storms, blizzards, and snowstorms often cause power failure. In most cases, incidents such as these afford plenty of warning time, allowing power response crews to stage resources in preparation for power failure.

Power failures can cause secondary hazards that affect health of residents. One potential secondary hazard, chemical accidents, occur after restoration of power to industrial facilities. Power interruptions at chemical handling plants are of particular concern because of potential for a chemical spill during restart (EPA 2001). Chemical spills can exert significant health and environmental impacts.

Another secondary hazard that can result from power failure is loss of communications capability by first responders, which may in turn negatively affect public safety. Backup systems such as amateur radio operators may be required during a disaster to augment communications capabilities. Power outages can also lead to instances of civil disturbance, such as looting.

Wastewater and potable water utility interruption may occur as a result of a power failure. These critical utilities are essential to community continuity and recovery. Interruption of service may result in cascading economic and environmental impacts.

Power failure can significantly affect health of the community. During periods of extreme heat or extreme cold, vulnerable populations such as the elderly and medically frail can suffer during power failures, and are susceptible to hypothermia or heat stroke. Additionally, power failure can lead to food spoilage, which also negatively impacts public health.

Power failure may also lead to an increase in traffic accidents because of lack of functioning traffic control devices such as stoplights and railroad crossing advisory signals. Power outages of long duration will force law enforcement officials to man traffic control points to prevent accidents, which may delay or prevent those officers from responding to other emergency incidents.



Extent

The extent and severity of a power outage depends on the cause, location, duration, and time of year. An incident can range from a small, localized event to a countywide power outage. Impacts from an outage can be significant to the County and its residents. Power outages typically occur because of, or in combination with, other emergency or disaster incidents, such as severe weather and flooding, and can exacerbate such emergencies. Severity of an incident will also depend on the electrical distribution system affected.

Power failures lead to inability to use electric-powered equipment, such as lighting; heating, ventilation, and air conditioning (HVAC) and necessary equipment; communication equipment (telephones, computers, etc.); fire and security systems; small appliances such as refrigerators, sterilizers, etc.; and medical equipment. Interruption of service for any of this equipment can lead a number of issues including food spoilage, loss of heating and cooling, basement flooding due to sump pump failure, and loss of water due to well pump failure.

Location

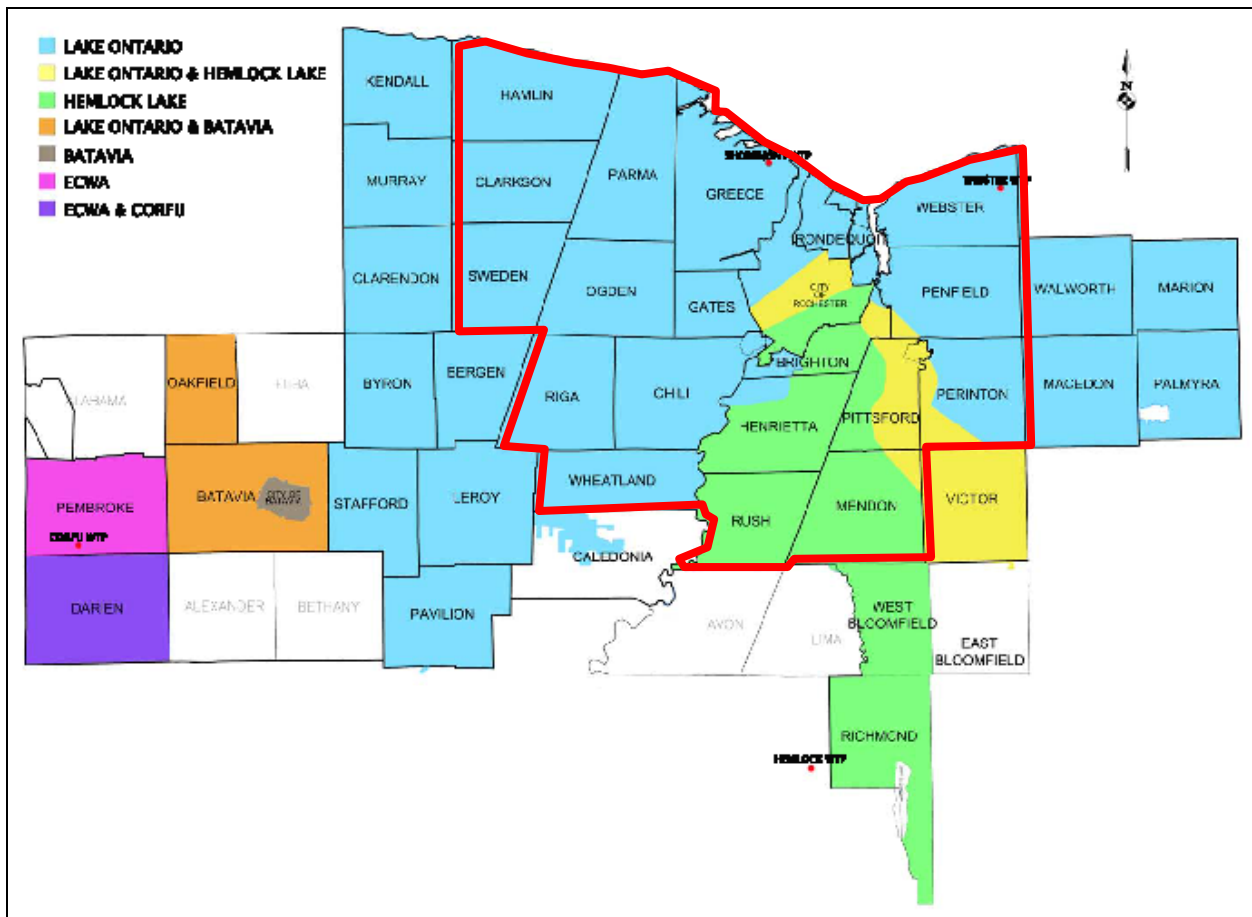
Utility failures in Monroe County are usually localized, and are typically the result of a natural hazard event involving high winds or ice storms. Three major private utilities distribute electrical power and natural gas within Monroe County, as well as three municipal electric providers and one municipal natural gas provider. Some areas depend on residential propane tanks for gas service. Local companies that provide electricity to Monroe County—such as Rochester Gas and Electric Corporation (RG&E), and New York State Gas and Electric Corporation (both Energy East companies), and National Grid—can handle minor interruptions. Interruptions are possible anywhere utility service is provided. Some utility facilities are especially vulnerable, including the sewer infrastructure in aging suburbs such as the Towns of Brighton, East Rochester, and Greece.

Monroe County’s public water supply comes from Lake Ontario, two of the Finger Lakes (Hemlock Lake and Canadice Lake), and from private wells. The two producers of public drinking water within Monroe County are Monroe County Water Authority (MCWA) and City of Rochester Bureau of Water and Lighting. The Villages of Brockport and Hilton, as well as the Seabreeze WD community in the Town of Irondequoit, purchase water from MCWA for re-sale to their customers.

The accompanying maps identify the public supplies, the supplier (Figure 5.4.13-1), and the areas served by public supply and private wells (Figure 5.4.13-2). Water treatment facilities and distribution systems are not identified for security purposes. Many rural areas depend on private wells. Several large industries have their own supply source and treatment facilities. Many fire departments have an alternate water source for firefighting. For instance, the City of Rochester has a parallel supply for fire suppression within the downtown area called the “Holley System,” and many suburban and rural departments have standpipes on natural waterways.



Figure 5.4.13-1. Monroe County Public Water Service Area by Supply



Source: MCWA 2014

Note: Monroe County is indicated with the red outline.



Table 5.4.13-1. Utility Failure Events in Monroe County, 1959 to 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
January 4, 2015	High Wind	N/A	N/A	Deepening low pressure tracked from western Lake Erie across far southern Ontario to Quebec dragging a cold front across the region. Strong winds increased to near 60 miles per hour (mph) about 2 to 3 hours after the cold front passage. The strong winds downed trees and wires across western New York. Damage was reported along St. Paul Boulevard in the Town of Irondequoit. Scattered power outages resulted throughout the region.
August 1, 2014	Flood	N/A	N/A	Thunderstorms developed in a moderately unstable airmass along the lake breeze boundary that extended across the lower Genesee Valley and Western Finger Lakes. The thunderstorms produced damaging winds that downed trees and wires in the Town of Greece. The heavy rains that fell resulted in urban flooding. Storm sewers were not able to keep up with the intense rainfall, and streets closed in the Town of Greece.
July 8, 2014	Thunderstorms	N/A	N/A	A line of intense thunderstorms blew through the Rochester region the afternoon of July 7. High winds, torrential rains, and plentiful lightning damaged many parts of RG&E's electric distribution system, and caused outages for more than 31,000 customers across all areas of its system. At the peak of the storm, more than 27,000 RG&E customers were out of service, 290 of them within Monroe County. Areas with the most outages in Monroe County included the Towns of Pittsford (156), Perinton (43), and Webster (Town and Village) (75). Power was restored by the end of the next day.
December 21, 2013	Ice Storm	N/A	N/A	A surface front stalled across the region and acted as a pathway for periods of heavy precipitation. North of the front, the precipitation fell as freezing rain, coating trees, power lines, and all exposed surfaces with ice. Across the Niagara Frontier, ice accumulations of 0.5 to 1 inch were reported. Across the north country, where the freezing rain persisted the longest, ice accumulations ranged from 1 to 2 inches. Weight of the heavy ice brought down trees and power lines. In some cases, trees fell on homes, buildings, and automobiles. Tens of thousands were left without power.
December 20, 2013	Phone Outages	N/A	N/A	At approximately 9:25 a.m., the Monroe County 911 Center called Frontier, a telephone service company, to report a problem with 911 telephone service. Frontier started trouble shooting and called its 911 manager. While Frontier was trouble shooting, the 911 Center contacted local media to inform them of the situation. Frontier's 911 manager instructed the 911 Center to activate the emergency backup switch, which routed all 911 traffic to the back-up Norstar system, displaying Caller-ID only. Frontier discovered a scan point circuit failure due to a defective trunking cable between Fitzhugh St. and Field St. in the City of Rochester, and made repairs.
November 26-28, 2013	Winter Storm	N/A	N/A	Power lines and electric utility equipment were damaged by an overnight storm that dumped between 6 and 10 inches of heavy, wet snow. RG&E estimated that more than 17,500 customers total and 1,331 in Monroe County lost power at some point during the storm that toppled trees, knocked down 216 power lines, and fractured 12 utility poles



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				across its service area. The largest outages occurred in the Towns of Brighton (478), Pittsford (303), and Henrietta (146), and the City of Rochester (108). Power was restored to RG&E customers less than 2 days later.
November 18, 2013	High Wind	N/A	N/A	Rapidly deepening low pressure tracked from the Upper Great Lakes to James Bay, and brought strong winds to the entire region. The winds, gusting as high as 68 mph, brought down trees and power lines throughout the region, reflected in numerous reports of damage from downed trees. Power outages were in the tens of thousands. Specific measured wind gusts included one at 63 mph at Rochester Airport.
November 1, 2013	High Wind	N/A	N/A	Deep low pressure lifted across the Great Lakes region. The system brought strong winds to much of the region on Friday, November 1st. Winds gusted as high as 62 mph. Approximately 13,600 RG&E customers lost power after the high winds knocked down trees and branches, took down transmission and distribution lines, and snapped utility poles in the area. In total, more than 27,000 RG&E customers in Monroe, Wayne, and Ontario counties lost power as result of the storm, with the towns along Lake Ontario bearing the worst of the damage. The most significant outages were in the Towns of Greece (3589), Ogden (2952), Webster (1481), Irondequoit (1298), Chili (1204), Gates (638), Penfield (411), and Parma (349); and in the City of Rochester (1175). Power was restored by the evening of November 2.
July 18, 2013	Thunderstorm Wind	N/A	N/A	Scattered thunderstorms developed during the afternoon hours. An isolated thunderstorm over Monroe County produced damaging winds that downed trees and power lines in the Town of Greece. The Towns of Greece, Irondequoit, and Webster, and the northern portion of the City of Rochester took the brunt of the damage in Monroe County, where 2,900 RG&E customers were without power for up to 3 days.
February, 2013 – January, 2014	Power Outages	N/A	N/A	Parts of the Town of Webster were affected by repeated power outages over a series of months, including five mini-blackouts that affected the same 4,250 customers. A 1.5-mile stretch of a 49-year-old, sub-transmission line in the west part of the Town of Webster known as Circuit 745 went out of service twice in November because of contact by tree limbs, and then failed on Dec. 28, Jan. 6, and on Jan. 11, each time breaking at a point where it previously had been spliced together. Parts of the town not served by Circuit 745 also underwent repeated losses of electric service, and the town logged more customer-hours with no electricity over a one-year period than any other municipality in Monroe County.
January 31, 2013	High Wind	N/A	N/A	Low pressure moved across the lower Great Lakes, swinging a strong cold front across the region. In the wake of the front, strong westerly winds overspread the area. The wind downed trees and power lines. Utility companies reported scattered outages across the region. Specific wind gusts recorded included one of 59 mph at the Rochester Airport.



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January 20, 2013	High Wind	N/A	N/A	A deepening storm system moved across the Upper Great lakes. The system brought strong, damaging winds to the entire region late Saturday night into Sunday (20th-21st). Trees, power poles, and wires were brought down by the winds. Utilities reported tens of thousands without power for a time. Specific measured gusts included one of 59 mph at the Rochester Airport.
October 29, 2012	High Wind	N/A	N/A	Remnants of Superstorm Sandy brought strong winds and heavy rains to western and north central New York. The high winds downed trees and power lines throughout the region. Wind gusts were measured to 60 mph, for example, at Irondequoit Bay. Tree damage was greater than usual with such wind speeds because of saturated ground and northeast winds—opposite of the normal prevailing southwest direction. Utilities reported tens of thousands of customers without power across the entire region. On the 30 th , RG&E reported that 22,300 Monroe County customers were without power, though by the end of the day only 13,800 customers remained in the dark. Power was restored to all RG&E customers by November 2 nd .
May 29, 2012	Hail	N/A	N/A	A strong cold front was accompanied by severe thunderstorms that produced hail up to 1.75 inches in diameter, and damaging winds which downed trees and power lines. Utilities reported tens of thousands without power scattered throughout the region.
March 3, 2012	High Wind	N/A	N/A	Deep low pressure moved from the Midwest across Lake Huron into Quebec. Southeast winds gusting to 55 mph quickly shifted to the southwest, and increased to 30 to 40 mph with gusts nearing 70 mph. The strong winds downed trees and power lines. Utilities reported several tens of thousands without power at the peak of the storm. Specific gusts included one of 66 mph at Rochester Airport and 59 mph in the Town of Irondequoit.
February 24, 2012	High Wind	N/A	N/A	Low pressure over the Ohio Valley deepened as it lifted northeast across the Great Lakes then down the St. Lawrence Valley. The low brought strong winds to the region. Trees and power lines were downed. Scattered power outages were reported. Measured gusts included one of 53 mph at Rochester Airport.
January 17, 2012	Thunderstorm Wind/High Wind	N/A	N/A	Low pressure moved across southern Ontario and pulled a strong cold front across the region during the evening hours. Thunderstorms accompanying the front produced wind gusts to around 70 mph. The strong winds downed trees and power lines and poles. Power outages were scattered throughout the region, with utilities reporting several thousand without power at its worse. Utilities reported several tens of thousands without power at the peak of the storm. Specific gusts included one of 72 mph at Rochester.
August 28, 2011	Hurricane Irene	EM-3328	Yes	Hurricane Irene tracked northeast along the Atlantic Coast and brought gusty winds to eastern sections of the area. Measured winds gusted to 40 to 45 mph. Normally, winds of this magnitude are not strong enough to cause damage; however, the ground was wet and the north to northeast flow of wind was opposite of the prevailing direction for the region.



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				Trees are anchored for the prevailing direction and are susceptible to even marginally strong winds from the opposite direction. Downed trees and lines were reported in the Town of Greece and the City of Rochester. Utilities reported several thousand customers without power.
August 19, 2010	Thunderstorm Wind	N/A	N/A	Thunderstorms developed ahead of an approaching cold front during the late afternoon hours. In Monroe County, the thunderstorms produced strong winds that downed trees and power lines. At the Long Pond Shores apartment complex in the Town of Greece, a large tree fell on part of the building. Fallen limbs were scattered along Lakeshore Road in the Town of Irondequoit. Electric Utilities reported about 150 homes without power in the Towns of Irondequoit and Webster.
July 21, 2010	Thunderstorm Wind	N/A	N/A	Thunderstorms developed ahead of an approaching cold front. The thunderstorms produced large hail and damaging winds. Thunderstorm winds downed trees and power lines in the City of Rochester and Town of Brighton. Utility companies reported thousands without power.
July 17, 2010	Power Outage	N/A	N/A	About 1,000 households were temporarily without power in Monroe and Ontario Counties after a tree fell onto electrical wires at 2:45 p.m. Affected areas in Monroe County included the Town of Henrietta, the Village of Honeoye Falls, and the Town of Webster until restoration by 5:30 p.m.
May 8, 2010	High Wind	N/A	N/A	Deep low pressure passed over western New York with its trailing cold front rapidly sweeping east across the region. Winds increased within a few hours of the approaching front to gust speeds of 60 to 65 mph. Tens of thousands were left without power. There were reports of vehicles and/or buildings damaged by falling trees. RG&E's Monroe County and Canandaigua service areas were hardest hit.
June 2, 2008	Power Outage	N/A	N/A	Roughly 900 RG&E customers were without power for just over an hour, starting at 9:00 p.m. Power was restored by 10:23.
September 7, 2007	Power Outage and Water Supply Failure	N/A	N/A	School was cancelled in Spencerport because of a failed electric transmission line that affected more than 38,000 RG&E customers in western Monroe County. Power was restored to most customers less than 2 hours after failure. OEM files indicate this was not an Electric Grid problem. This was a supply failure on a 115 kilovolt (KV) transmission line that was scheduled for comprehensive maintenance testing within a week of the failure. RG&E's analysis of the problem and the system included inspection from the ground, the air, and thermal imaging. They also removed a section of the damaged line for testing and analysis. This failure resulted in some water pressure problems and water supply failure at the Wheatland-Chili School. With system redundancy through switching, all customers were restored.



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January 28, 2007	Sanitary Sewer	N/A	N/A	Residents of aging suburbs like the Towns of Irondequoit, Brighton, East Rochester, and Greece faced flooding caused by insufficient storm sewer capacity. Irondequoit residents reported that heavy precipitation led to sewage in their basement and tens of thousands of dollars of damage to their properties. An Irondequoit DPW employee estimated that nearly 10,000 homes were impacted by decaying sewer infrastructure. Some infrastructure pipes were laid early in the 1900s.
February 16, 2007	Power Outage	N/A	N/A	An equipment failure at a substation left about 2,500 RG&E customers without power for over an hour during the afternoon of February 16th. The power outage affected customers in Corn Hill and the western part of South Wedge in the City of Rochester.
November 17, 2006	Gas Leak	N/A	N/A	More than 300 Town of Greece families (700 residents) had to find temporary housing after a routine inspection of natural gas lines at the Cedar Commons apartment complex detected leaks so dangerous that the complex’s gas service had to be immediately disconnected for safety purposes. RG&E assisted Cedar Commons to locate materials and qualified workers needed to make the repairs as soon as possible. Jeff McCann, Greece Town Deputy Supervisor, said the town was made aware of the problem, and that complex managers told the town they would voluntarily relocate more than 316 families from the complex during repairs. All residents were able to return with availability of heat and hot water 5 days later after more than 9,000 feet of gas line had been replaced throughout the complex.
August 14, 2003	Power Outage	EM-3186	Yes	<p>Known as one of the biggest blackouts in North America history, millions of people lost power shortly after 4:00 p.m. The blackout covered an area of 50 million people throughout the Northeast, affecting cities in New York, New Jersey, Ohio, Connecticut, Michigan, Massachusetts, as well as several major cities in Canada, including Toronto and Ottawa.</p> <p>In Monroe County, the Emergency Operations Center (EOC) was activated for 16.5 hours beginning on August 14th. County Executive Jack Doyle declared a State of Emergency for all of Monroe County on August 14th, and ordered no unnecessary travel. The declaration and order were rescinded on August 15th.</p> <p>Approximately 67-80 percent of RG&E customers (about 400,000) in the County were without power. Niagara Mohawk customers within the County were also affected. Kodak Park shifted electric load back to company generation for mission-critical areas, but otherwise did not alter normal operations.</p> <p>Frontier, a distributor of telephone service in the region, reported that fewer than 1,000 telephone customers lost land-line service during Thursday’s power outage.</p>



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				<p>The company operated some central offices and loop stations by use of batteries/back-up generators.</p> <p>City of Rochester Fire Chief Floyd Madison reported 12 minor fires on Thursday night and Friday morning, 6 of which were blackout-related. In addition, three fire stations lost power and were not able to acquire back-up power.</p> <p>Ginna Nuclear Generating Station in Wayne County shut down. Ginna is one of six in the State and nine nationally that were shut down. Dark traffic lights numbered 575. Hospitals operated by use of back-up generators. The generator at Park Ridge Hospital in the City of Rochester failed. County Pure Waters deployed a generator, and its electricians worked with RG&E crews to repair the hospital’s generator. Commercial power was restored in under 2 hours.</p> <p>The Rochester Airport lost outside power, and one of its two back-up generators failed, leaving passengers unable to board flights for nearly 3 hours. Monroe County Water Authority and the Pure Waters District (sewage) both had pump stations operating by use of generated power. Red Cross and County Health Department opened two venues for people with medical appliances who needed power access.</p> <p>On the morning of the 15th, RG&E and Niagara Mohawk both announced that “rolling blackouts” were ordered by the ISO to stabilize the restoration effort. Governor Pataki asked for federal emergency declaration to provide federal money for relief efforts.</p>
November 9, 1965	Power Outage	N/A	N/A	<p>Monroe County was “in the dark” with most of the east coast after a faulty relay broke in an Ontario Hydro power plant in Queenston, Ontario, near Niagara Falls, triggering a cascade of power surges that shut down electrical systems throughout the Northeast. The Great Northeast Blackout, as it came to be known, caused outages for more than 4 hours in the City of Rochester, beginning just around the time of evening rush hour.</p> <p>Intersections became clogged as traffic signals went down, service stations could not pump gasoline, people were stuck in elevators, television stations were knocked off the air, and seven aircraft had to circle above what then was called Rochester-Monroe County Airport when landing strip lights blinked out. Civil defense officials mobilized, and off-duty police officers and firefighters were called to work in case of unrest. None occurred.</p> <p>RG&E costumers were affected, while customers of Niagara Mohawk Corp. in the Towns of Riga, Wheatland, Rush, and parts of Henrietta and Mendon still had power.</p>



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Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				<p>RG&E’s power-generating system, which normally could produce enough power to cover its service area, was connected with other power companies in upstate New York that provided power through an eight-county area. When the relay broke in Ontario, power demands from the other utilities caused a power drain that overtaxed RG&E’s generators and shut them down.</p> <p>Once RG&E engineers disconnected their system from the other companies, their own generators resumed operation. By 7:15 p.m., restoration of power began to hospitals and other priority users, and full restoration had occurred by 9:45 p.m.</p>
1959 - 1965	Power Outage	N/A	N/A	<p>Major blackouts occurred throughout the Northeast in 1959, 1961, and 1965. Anywhere from one to a few cables failed in isolated places, causing overloads in a few more cables, and then a larger cascade of failures. The cascade gained momentum, produced catastrophe through the medium of the grid, and finally produced a shutdown of the whole system.</p>

Source: NOAA-NCDC, 2015; Monroe County 2010 HMP; Democrat and Chronical, 2006, 2007, 2008, 2010, 2014; RG&E 2015.

DPW Department of Public Works

ISO International Organization for Standardization

KV Kilovolt

mph Miles per Hour

NCDC National Climatic Data Center

NOAA National Oceanic and Atmospheric Administration

RG&E Rochester Gas and Electric



Probability of Future Events

While the probability of future utility failure incidents in Monroe County is difficult to predict, the historical record indicates that utility failures have occurred as a result of high winds, lightning, and winter weather.

Section 5.3 of this Hazard Management Plan (HMP) lists the ranking of all identified hazards of concern for Monroe County. Probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, probability of occurrence of utility failures in the County is considered “frequent” (likely to occur within 25 years).

Climate Change Impacts

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue and become more significant. Impacts related to increasing temperatures and sea level rise are already evident in the State. The Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision makers with information on the State’s vulnerability to climate change, and to facilitate development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA] 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Monroe County is part of Region 1, Western New York and Great Lakes Plain. Some characteristics of and issues affecting this region associated with climate change include highest agricultural revenue in the State, relatively low rainfall, increased summer drought risk, high value crops requiring irrigation, and projected improved condition for grapes (NYSERDA 2014).

Temperatures are expected to increase throughout the State by 2 °F to 3.4 °F by the 2020s, 4.1° F to 6.8° F by the 2050s, and 5.3° F to 10.1° F by the 2080s. The lower ends of these ranges assume lower greenhouse gas emissions scenarios, and the higher ends assume higher greenhouse gas emissions scenarios. Annual average precipitation is projected to increase by up to 1 to 8 percent by the 2020s, up to 3 to 12 percent by the 2050s, and up to 4 to 15 percent by the 2080s. By the end of the century, the greatest increases in precipitation are projected to be in the northern parts of the State. Although seasonal projections are less certain than annual results, this additional precipitation will most likely occur during the winter months, with the possibility of slightly reduced precipitation projected for the late summer and early fall. Table 5.4.13-2 lists projected precipitation changes within the Western New York Great Lakes ClimAID Region (NYSERDA 2014).

Table 5.4.13-2. Projected Seasonal Precipitation Change in Region 1, 2020-2100 (% change)

Baseline (1971-2000) 34.0 inches	Low Estimate (10 th Percentile)	Middle Range (25 th to 75 th Percentile)	High Estimate (90 th Percentile)
2020s	0 percent	+ 2 to + 7 percent	+ 8 percent
2050s	+ 2 percent	+ 4 to + 10 percent	+ 12 percent
2080s	+ 1 percent	+ 4 to + 13 percent	+ 17 percent
2100	+ 3 percent	+ 4 to + 19 percent	+ 24 percent

Source: *NYSERDA 2014*

Annual temperatures throughout New York State have been rising since the start of the 20th century. State average temperatures have increased by approximately 0.6°F since 1970, with winter warming exceeding 1.1°F per decade. Extreme heat events are likely to increase throughout New York State, and short-duration warm season droughts will become more common.

Climatologists predict an increase in the number and intensity of severe weather events. More storms with higher winds will increase the chance that the power infrastructure will be impacted. Extreme temperatures are





predicted to increase as well. During the hot summer months, potential for power overload will increase as demand for power increases. Additionally, climatologists predict an increase in precipitation, which may lead to more winter weather, thus causing additional power failures.

5.4.13.2 Vulnerability Assessment

To understand risk, a community must evaluate the assets that are exposed or vulnerable within the identified hazard area. For the utility failure hazard, all of Monroe County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile (Section 4 of this HMP), are vulnerable to a utility failure. This section discusses the potential impact of the utility failure hazard on the County. Specifically, this section addresses:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on (1) life, health, and safety of residents; (2) general building stock; (3) critical facilities; (4) economy; and (5) future growth and development
- Change of vulnerability as compared to that presented in the 2011 Monroe County Hazard Mitigation Plan
- Further data collections that will increase understanding of this hazard over time.

Overview of Vulnerability

The entire County is vulnerable to the utility failure hazard. Loss of power can exert serious impacts on the health and welfare of residents, continuity of businesses, and ability of public safety agencies to respond to emergencies. Individuals with medical needs are vulnerable to power failures, because medical equipment such as oxygen concentrators requires electricity to operate. The elderly are also vulnerable to the effects of power failure, as power failure could expose older residents to extreme heat or extreme cold. According to the U.S. Census 2009-2013 American Community Survey, 40,456 housing units or approximately 13.6% of housing units in Monroe County rely on electricity to power in-home heating systems. Individuals living in these households will be exposed to significantly colder (winter months) or hotter (summer months) indoor temperatures during a utility failure. The 238,808 housing units, or 80.4% of total, that use utility gas for home heating will be less vulnerable.

During power failure events, water purification systems may not function. Further, populations relying on private wells will not have access to potable water. Many power outage events are caused by storm events that can lead to flooding. Without electricity, residents would be unable to pump water from their basements, potentially causing structural and content damage to their homes. Section 5.4.3 (Flood) includes a more detailed discussion of the County's vulnerability to the flood hazard.

Data and Methodology

Data were collected from Monroe County and the Planning Committee. Insufficient data were available to model long-term potential impacts of a utility failure on the County. Over time, additional data will be collected to allow better analysis of this hazard. Available information and a preliminary assessment are provided below.

Impacts on Life, Health, and Safety

For the purposes of this HMP, the entire population in Monroe County is considered vulnerable to utility failure events. Section 4 of this HMP includes a summary of population statistics for the County. Utility failures pose potential health impacts including injury and death. Other issues pertaining to power outages include food safety from lack of refrigeration and carbon monoxide poisoning from misuse of generators.



Individuals with medical needs are vulnerable to power failures, because medical equipment such as oxygen concentrators requires electricity to operate. The elderly are also vulnerable to the effects of power failure, as power failure could expose older residents to extreme heat or extreme cold. During power failure events, water purification systems may not function. Further, populations relying on private wells will not have access to potable water. Many power outage events are caused by storm events that can lead to flooding. Without electricity, residents would be unable to pump water from their basements, potentially causing structural and content damage to their homes.

Impacts on General Building Stock

The entire building stock of Monroe County is exposed and is considered vulnerable to the utility failure hazard. Section 4 of this HMP (County Profile) summarizes the building inventory of the County.

Impacts on Critical Facilities

During a power outage event, the County may undergo losses because of an interruption of critical services. Further, increased costs such as providing shelters, and costs related to cooling and heating centers may be incurred. Extended power outages will require officials to shelter victims who require heat and power for activities of daily living. Power interruptions can cause economic impacts stemming from lost income and spoiled food and other goods, costs to the owners/operators of the utility facilities, and costs to government and community service groups. FEMA's benefit-cost analysis (BCA) methodology measures loss of electrical service on a per-person-per-day-of-lost-service basis for the service area affected. For the electrical utility, the standard value is \$131 per person per day (BCA module version 5.1).

Future Growth and Development

As discussed in Sections 4 and 9 of this HMP, areas targeted for future growth and development have been identified across Monroe County. Any areas of growth could be impacted by the power outage hazard because the entire County is exposed and vulnerable. Specific areas of development are indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.

Change of Vulnerability

Overall, the County's vulnerability has not changed since the HMP was developed in 2011, and the entire County will continue to be exposed and vulnerable to the utility failure hazard.

Additional Data and Next Steps

For future plan updates, the County can track data on power outage events and obtain additional information on past and future events, particularly in terms of any injuries, deaths, shelter needs, pipe freeze incidents, and other impacts. These data will help to identify any concerns or trends for which mitigation measures should be developed or refined. In time, quantitative modeling of estimated power outage events may be feasible as data are gathered and improved.