Planning for Electric Power Disruptions

February 2001

Chicago Metropolitan Area
Critical Infrastructure
Protection Program

Critical Infrastructure Assurance
Guidelines for Municipal Governments

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CRITICAL INFRASTRUCTURE ASSURANCE GUIDELINES FOR MUNICIPAL GOVERNMENTS

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PREFACE

The economic prosperity and the well-being of our nation's communities depend on the reliable functioning of critical infrastructures: transportation, banking and finance, information and communications, water supply systems, emergency services, and especially energy (electric power, oil, and natural gas). In the new economy, these infrastructures are increasingly reliant on information technologies and are strongly affected by restructuring and other market forces. They are much more heavily interconnected than ever before, and disruptions in one system can have significant adverse consequences, both locally and regionally. Communities often are not well prepared to deal with widespread infrastructure failures, which could become commonplace in the new millennium.

In response to these concerns, the Presidential Commission on Critical Infrastructure Protection produced a report (*Critical Foundations: Protecting America's Infrastructures, October 1997*) that concluded that it was vital to develop programs to protect critical infrastructures that contribute to public health and safety, economic prosperity, and national security. Subsequently, a Presidential Decision Directive was issued (*PDD-63: Critical Infrastructure Protection, May 1998*), which called for the federal government to engage in "close cooperation and coordination with state and local governments … [to develop] a robust and flexible infrastructure protection program."

The Chicago Metropolitan Area Critical Infrastructure Protection Program addresses the need for better community preparedness. The Chicago Metropolitan Area, which includes the City of Chicago and the six surrounding counties (Cook, DuPage, Kane, Lake, McHenry, Will), has endured significant disruptions to its critical infrastructures. The U.S. Department of Energy's Midwest Electricity Reliability Summit — held in Chicago in October 1999 and co-chaired by Mayor Daley and Secretary of Energy Richardson — recognized the need for increased efforts to enhance the reliability and security of the region's electric power system. The summit led to the establishment of this unique effort, a pilot program based on cooperation between the federal government and local agencies. In January 2000, Paula Scalingi, Director of the Department of Energy's Office of Critical Infrastructure Protection, and William Abolt, Commissioner of the Chicago Department of Environment, signed a Memorandum of Agreement that established a partnership for this pilot program. The Metropolitan Mayors Caucus and ComEd joined in this unprecedented initiative, focused on assuring critical services and assets for the region's municipalities. The program is meant to serve as a model for other regions of the nation to enhance their critical infrastructure emergency preparedness plans.

This report, prepared on behalf of the partnership, is a first-of-a-kind effort to compile this type of information on the electric power system in a form that municipal governments can use and adapt to local conditions. ComEd and Harza Engineering Company have provided valuable support for this effort. Argonne National Laboratory's Infrastructure Assurance Center compiled and integrated the planning information.

How to Use these Guidelines

This document addresses actions that municipal governments can take to protect public health and safety before, during, and after electric power service disruptions. The general term that has been used for this type of planning and preparation is "critical infrastructure assurance."

This document is a set of guidelines, *not* requirements. Each municipality that elects to implement these guidelines will need to make changes and adjustments to the approaches outlined in this document to reflect local needs and conditions. These guidelines are intended to be an information resource that municipalities can draw upon and adapt as needed.

For municipalities that decide to use these guidelines, the first step is to complete the checklist on the following page. It provides a step-by-step procedure for assigning responsibilities, assembling information, and developing plans to deal with electric power disruptions. Each entry in the checklist refers to a section in the guidelines that contains more detailed information about that subject. Some municipalities may have completed many or all of the steps in the checklist, whereas others will be starting from the beginning.

Further Information

Comments and questions concerning the use of these guidelines should be addressed to:

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Checklist for Municipal Government Electric Power Disruption Planning		
✓	**Planning Area/Question**	**Refer to Guidelines Section/Appendix**
	Responsibilities	
	Has a department(s) and/or an individual(s) in the municipal government structure been identified as the primary point of contact for electric power disruption planning?	Section 3.1
	Have the appropriate municipal franchise agreements and ordinances that deal with electric power service been enacted?	Section 3.2, Appendixes B, C
	Are municipal employees aware of the electric-power-related points of contact in other municipalities and in county, state, and federal agencies?	Section 3.3, Points of Contact
	Pre-disruption Planning	
	Have critical facilities been identified and prioritized?	Section 4.1, Appendix D
	Have power-outage-sensitive individuals been identified, for example, persons using medical support systems?	Section 4.2, Appendix E
	Has a vulnerability assessment been carried out that considers the configuration of electric service to the municipality, the connections of critical facilities and power-outage-sensitive individuals, and backup capabilities?	Section 4.3
	Have appropriate protection and mitigation measures been identified, evaluated, and implemented?	Section 4.4, Appendix F
	Disruption Response Planning	
	Has a disruption notification protocol been established with ComEd, including identification of conditions and of people in the municipal government that will need to be notified, information that will be communicated in the notification, and how the notification will be made?	Section 5.2
	Have the procedures for responding to Electricity Alert, Warning, and Emergency situations been developed?	Section 5.3
	Have the procedures for responding to limited, extended, wide area, and regionwide outages been developed?	Section 5.4
	Post-disruption Restoration Planning	
	Have procedures for restoring normal operations following an outage been developed?	Section 6
	Preparedness Exercises	
	Have preparedness exercises been planned and carried out?	Section 7
	Longer-term Preparedness	
	Have building codes, zoning ordinances, and growth and plans been reviewed to assess their effects on the electric power infrastructure?	Section 8
	Plan Development	
	Have the previous items been documented in an electric power disruption plan for the municipality? Does the plan address physical and cyber security considerations?	Sections 9, 10

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1 INTRODUCTION

This document presents guidelines on actions that can be taken by municipal governments to protect public health and safety before, during, and after electric power service interruptions. This type of planning and preparation, referred to as "critical infrastructure assurance," gives communities the ability to prevent or reduce serious impacts associated with critical infrastructure disruptions.

1.1 BACKGROUND

On the National Level

In 1996, the President's Commission on Critical Infrastructure Protection was established to evaluate the vulnerability to disruption of the nation's infrastructures, including electric power, oil and natural gas, telecommunications, transportation, banking and finance, and vital government services. The Commission's report, issued in October 1997, concluded, "Waiting for disaster is a dangerous strategy. Now is the time to act to protect our future."

Presidential Decision Directive 63 — issued in May 1998 — outlined steps to be taken to protect critical infrastructures from disruptions that could seriously affect public health and safety, the economy, or our national security. Included in this Directive was a call for the federal government to engage in "close cooperation and coordination with state and local governments … [to develop] a robust and flexible infrastructure protection program."

On the Local Level

The Chicago Metropolitan Area, which encompasses Cook, DuPage, Kane, Lake, McHenry, and Will Counties, has experienced significant disruptions to electric power service in recent years. These outages have seriously affected critical facilities, as well as those individuals who are particularly sensitive to power failures, such as people who rely on electrically powered medical equipment. Numerous studies have been conducted to identify the root causes of the problems. Commonwealth Edison Company (ComEd), the City of Chicago, the region's municipalities, and the Illinois Commerce Commission have undertaken important actions to deal with the problems.

From these efforts has emerged a consensus that the growth and development of the metropolitan area have increased the region's dependency on the electric power infrastructure — much more now than in the past. Disruptions to the

electric power system occur from various sources, including natural events such as storms, accidents such as equipment failures, and intentional acts such as vandalism or terrorism. These problems can be reduced, but they cannot be eliminated entirely. Therefore, it is in the best interests of public health and safety to prepare in advance for disruptions and to be ready to mitigate their consequences.

In January 2000, the Department of Environment of the City of Chicago and the Office of Critical Infrastructure Protection of the U.S. Department of Energy signed a Memorandum of Agreement, which, among other things, called for a joint effort to develop guidelines for municipalities to use in preparing for and coping with electric power disruptions. Under the terms of this agreement, development of these guidelines would involve a collaborative effort among the City, the suburban communities in the region as represented by the Metropolitan Mayors Caucus and the Councils of Government, the Department of Energy, and ComEd. The Infrastructure Assurance Center of Argonne National Laboratory and Harza Engineering would provide technical support.[1]

1.2 SCOPE

This document is a set of guidelines, *not* requirements, that are intended to be a source of information that municipalities can draw upon and adapt as needed. Each municipality that decides to implement these guidelines will need to make changes and adjustments to the approaches outlined in this document to more clearly reflect local needs and conditions.

These guidelines address steps that municipal governments can take to prepare for and mitigate the consequences of disruptions to the electric power infrastructure. The information presented in these guidelines is organized as shown in Table 1.1.

[1] Argonne National Laboratory is a U.S. Department of Energy facility operated by the University of Chicago. Harza Engineering Company provides support services to the City of Chicago.

Table 1.1 Contents of These Guidelines

Section/ Appendix	Contents
Section 2	Description of the electric power infrastructure in the region
Section 3	Assignment of responsibilities within a municipality
Section 4	Planning to be done before electric power disruptions occur
Section 5	Actions that can be taken during a disruption
Section 6	Actions that can be taken after a disruption to restore conditions to normal
Section 7	Use of exercises to test a municipality's readiness
Section 8	Longer-term preparedness issues
Section 9	Development of an integrated electric power disruption plan
Section 10	Need for security
Appendix A	Glossary of terms
Appendix B	Model franchise agreement
Appendix C	Model electric emergency ordinance
Appendix D	Sample form for gathering information on critical facilities
Appendix E	Sample form for gathering information on power-outage-sensitive individuals
Appendix F	Preparedness measures for critical facilities and power-outage-sensitive individuals
	Points of contact

2 THE ELECTRIC POWER SYSTEM IN THE CHICAGO METROPOLITAN AREA

A summary description of the electric power infrastructure in the Chicago Metropolitan Area is presented, and the possible types of disruptions are discussed.

2.1 COMPONENTS OF THE ELECTRIC POWER SYSTEM

The electric power system is generally described in terms of three components: the generators, the transmission system, and the distribution system (see Appendix A for a glossary of terms).

Generators are power stations that produce electricity. Various technologies are used to generate electricity, including coal, gas, oil, and nuclear. Generators come in many power output sizes — ranging from 1 MW (1 million watts, which is expressed as 1 megawatt or 1 MW) to 1,200 MW. Some plants — called base load units — run continuously, while others — called peakers — run only during periods of high demand. ComEd owns and operates all of the nuclear generators in the region, while other companies own and operate the coal-, gas-, and oil-fired units, both base load and peakers.

Transmission systems are composed of high-voltage equipment that moves large quantities of electricity through the electric power grid. In the Chicago Metropolitan Area, ComEd owns and operates the entire transmission system, including the following components:

- *Transmission lines* – high-voltage power lines. In the Chicago Metropolitan Area, transmission lines operate at voltages of 69,000, 138,000, 345,000, and 765,000 volts (69, 138, 345, and 765 kilovolts [kV], respectively).

- *Transformers* – electrical equipment that either increases or decreases the voltage as required. Transmission system transformers are large and are located in special facilities called transmission substations.

- *Transmission substations* – connection points in the electric power grid where transmission lines are brought together. Substations generally contain several transformers and switching gear. The latter allows electric power to be moved along different pathways. Substations also contain protective equipment (e.g., circuit breakers) that disconnects equipment from the electric power grid if a fault is detected. Multiple transmission substations, some within the Chicago Metropolitan Area and others outside of the region, provide service to the six-county region.

Distribution systems are composed of lower-voltage equipment that brings electricity from the electric grid to individual residential, commercial, and industrial customers. ComEd owns and operates most of the distribution system in the Chicago Metropolitan Area. Several municipalities — Geneva, Naperville, St. Charles, and Winnetka — own and operate their own distribution systems. These municipalities purchase power on a wholesale contract basis from ComEd and other electric companies for distribution to their customers. The distribution system includes the following components:

- *Feeder lines* – higher-voltage lines that carry electricity into a specific area for a number of customers. The Chicago Metropolitan Area includes feeder lines of 4,000, 12,000, or 34,000 volts (4, 12, or 34 kV, respectively). Several thousand feeder lines are used to provide service in the Chicago Metropolitan Area.

- *Distribution system transformers* – "step down," or decrease, the feeder voltage to the customer service voltage. Most of these transformers are small and are mounted on utility poles. Other distribution transformers are designed to handle higher distribution voltages. These transformers are large and are located in distribution substations.

- *Distribution substations* – connection points in the distribution system where power lines are brought together. Distribution substations are similar to transmission substations, except that they operate at the lower voltages of the distribution system. Some substations serve as both distribution and transmission connection points.

- *Customer service lines* – lines that bring electricity into the customers' facility. Most residential and commercial customer service lines are 110 / 220 volts. Higher-voltage lines might be used to deliver electricity to industrial and special facilities.

2.2 ELECTRIC POWER SERVICE DISRUPTIONS

Several types of disruptions to electric power service can affect customers. The most common disruptions are listed below:

- *Interruption* – a complete loss of electrical service, commonly known as a "power outage." A power outage might affect only one customer (e.g., if the customer's service line is cut) or, in extreme cases, it might be regionwide. Although the Chicago Metropolitan Area has not experienced a regionwide power outage, other parts of the country have had regionwide outages (e.g., the outage in 14 western states in 1996, the blackout in several northeastern states in 1965).

- *Voltage fluctuation* – a change in the voltage of the electricity provided to customers, either up or down, without a total loss of power. A voltage drop, commonly known as a "brownout," is most frequently observed during periods of peak demands for electricity. In times of system overloads, a power company can decrease voltage to avoid outages. The Illinois Commerce Commission allows small decreases in voltage. Voltage increases, or surges, while less common, are potentially more damaging, especially to electronic equipment. Large voltage surges have occurred in other parts of the country.

- *Frequency fluctuation* – a change in the frequency of the AC power that is supplied. The nominal frequency is 60 cycles and normally varies only slightly. Frequency fluctuation is relatively rare. Its most noticeable impact is that clocks and other timing equipment run either fast or slow.

Classification of Interruptions

The electric power industry does not have a universal agreement for classifying interruptions. Nevertheless, it is important to recognize that differing types of outages are possible so that plans can be made to deal with them in an effective manner. Several parameters have been established for classifying interruptions. They are discussed below.

Availability of Advance Notice

At times, an advance warning of an interruption can enable customers to prepare for it. Other times, interruptions occur without warning and cannot be announced in advance. On this basis, interruptions can be grouped into five categories:

- *Intentional interruption – scheduled.* Some interruptions are intentional and can be scheduled in advance. For example, an interruption might be necessary when components of the power system are taken out of service for maintenance or upgrading. Warnings for this type of interruption are generally announced 72 hours in advance for system components that operate at 34 kV or higher and 48 hours in advance for system components that operate at 12 kV or lower. Scheduled intentional interruptions can last from several minutes to several hours.

- *Intentional interruption – unscheduled.* Some intentional interruptions must be done "on the spot." As a result, the level of advance notice dictated by a scheduled interruption cannot be provided. For example, a fire department or a police department might request an interruption in service during a fire or an accident.

- *Intentional interruption – demand-side management.* Some customers (i.e., on the demand side) have entered into an agreement with ComEd to curtail their demand for electricity during periods of peak system loads. In return for agreeing to these interruptions, these customers receive a lower

return for agreeing to these interruptions, customers receive a lower electricity rate and/or a rebate. ComEd has more than a dozen demand-side management options available for selected customers.

- *Intentional interruption – load shedding.* When the power system is under extreme stress because of heavy demand and/or failure of critical components, it is sometimes necessary to intentionally interrupt the service to selected customers to prevent the entire system from collapsing. In such cases, customer service (or load) is cut, sometimes with little or no warning. One form of load shedding — called a "rolling blackout" — involves cutting service to selected customers for a predetermined period (usually not more than two hours). As power is restored to one block of customers, power to another block of customers is interrupted to keep the overall load on the system down. Load shedding plans are included in ComEd's Emergency Load Conservation Plan. This plan is discussed further in Section 5.

- *Unplanned interruption.* Unplanned interruptions are outages that come with essentially no advance notice. This type of interruption is the most problematic. ComEd uses the following categories to classify unplanned interruptions:

  - accident by ComEd, a ComEd contractor, or others
  - dig-in by ComEd, a ComEd contractor, or others
  - malfunction, or equipment failure, due, for example, to age, improper operation, excessive operation, or manufacturing defect; special subcategories cover broken fuse links and underground cable, joint, or termination failures
  - overload on either ComEd's equipment or a customer's equipment
  - reduced capability, that is, equipment that cannot operate within its design criteria
  - tree contact other than from storms
  - vandalism, or intentional damage
  - weather, including ice/snow, lightning, wind, and broken tree limbs
  - wildlife
  - other causes
  - unknown causes

Number of Customers Affected

The number of customers affected during an outage is an important criterion for classifying interruptions. It is essential to recognize that the term "customer" refers to the individual or organization listed as the electricity bill payer. In other words, the number of customers affected is not the same as the number of people affected. Interruption of electrical service to a single customer such as a company office building might, in fact, affect hundreds of individuals.

Duration of Interruption

The duration of an interruption is an important measure of its impact. In general, the duration of an interruption is tabulated in the following categories:

- Less than 1 minute
- Approximately 15 minutes or less
- Approximately 2 hours or less
- Approximately 2–6 hours
- More than 6 hours

While interruptions of a few minutes or less are usually merely a nuisance to customers, on occasion they can be serious. For example, interruptions to computer equipment could result in loss of information; interruptions to manufacturing processes could result in loss of a batch process; and interruptions to individuals who rely on electrically powered life support equipment could result in a medical emergency.

At the other extreme, interruptions of several hours can have serious consequences to public health and safety. In the most serious cases, these disruptions have resulted in a breakdown of civil order.

Special Facility, Customer, or Area Affected

In some cases an interruption of electrical service affects a critical facility (e.g., hospital, school, police station, fire house, water pumping station, high-rise building, airport), a sensitive individual (e.g., one who uses medical support equipment at home), or a special area (e.g., the downtown commercial zone and shopping areas). These interruptions could involve public health and safety issues, significant economic impacts, or other special issues.

Interpretation and Use of Reliability Indices

There is no universally agreed-upon way to measure the reliability of the electric power system. Utilities in various parts of the United States use different measures. Even when the same terminology is used, the way in which the information is gathered and processed is not consistent, which makes it difficult to compare reliability among utilities. Attempts have not yet been successful in establishing a nationally uniform method for measuring system reliability. Until such standards are adopted, the following reliability measures are the only ones available for use in the Chicago Metropolitan Area:

- *Number of interruptions*. ComEd includes all interruptions irrespective of duration, the number of customers affected, the availability of advance

notice, or special areas affected. This measure serves as a gross indicator of how well the system is performing, but it does not take into account the significance of the interruption.

- *System Average Interruption Frequency Index (SAIFI)*. With this index, the reliability of the system is expressed in terms of the average number of interruptions per customer. To determine the SAIFI value, the total number of customer interruptions is divided by the total number of customers in the system. A SAIFI value of 2.0 means that, on average, customers experience two interruptions per year. The SAIFI value is calculated monthly (with information from the previous 12-month period) and is provided for (1) the ComEd system as a whole, (2) the portions of the system that are within the City of Chicago, and (3) the portions of the system that are in the surrounding areas.

- *Customer Average Interruption Duration Index (CAIDI)*. With this index, the reliability of the system is expressed in terms of the average duration of an interruption. To determine the CAIDI value, the total duration (in minutes) of all interruptions is divided by the number of interruptions. Thus, a CAIDI of 90 indicates that the average duration of an interruption was 1½ hours (90 minutes). The CAIDI value is calculated on a monthly basis (with information from the previous 12-month period) and is provided for the same geographical distribution as that for the SAIFI value.

- *System Average Interruption Duration Index (SAIDI)*. With this index, the reliability of the system is expressed in terms of the average number of minutes in a year that service to the typical customer is interrupted. The SAIDI value is calculated by multiplying the value of SAIFI (the average number of interruptions per customer per year) by the value of CAIDI (the average number of minutes per interruption). Thus, with a SAIFI of 2.0 and a CAIDI of 90, the SAIDI value would be 180 (90 x 2.0) — meaning that the average customer would be without power for 3 hours (180 minutes) per year.

- *Worst-performing circuits*. The reliability of the system can also be expressed by identifying the worst-performing feeder circuits. ComEd uses the worst 1% of this category to identify the most problematic circuits. The SAIFI and CAIDI values are calculated for each circuit, and the worst-performing circuits from each measure are identified.

3 ESTABLISHING ELECTRIC POWER DISRUPTION PLANNING RESPONSIBILITIES

The first — and often the most important — element used to prepare to respond to an electric power disruption is the designation of responsibility. The municipal departments and individuals who are responsible for designing and implementing the electric power disruption plan should be clearly identified. In many cases, these responsibilities will overlap with other routine responsibilities, such as public works management, police protection, fire protection, and emergency response. A clear designation of responsibility for electric power issues is an important first step.

3.1 IDENTIFICATION OF LEAD ORGANIZATIONS IN A MUNICIPALITY

Each municipality is organized in a different way and has its own structure for dealing with the electric power system and potential disruptions to it. Table 3.1 lists typical municipal departments and the major responsibilities that relate to the electric power infrastructure. For any municipality, it is important to designate a lead organization(s) to develop an electric power disruption plan and to coordinate the municipality's activities during an actual power outage.

Planning for electric power disruptions should be performed at the same time that a municipality plans for other emergencies such as tornadoes, floods, heavy snowfall, or toxic chemical spills. In most cases, planning for a power outage is an aspect of emergency preparedness, and departments often exercise the same functions that they would perform when responding to other emergency events. Some aspects, however, are unique to power outages (as described in the following sections), and these points should be specifically incorporated into the emergency planning process.

3.2 RELEVANT MUNICIPAL AGREEMENTS AND ORDINANCES

The provision of electrical service in the Chicago Metropolitan Area is generally covered under one or more municipal agreements and ordinances that involve the municipal government and ComEd. With regard to electric power disruption planning, the most important are discussed in the following sections.

Table 3.1 Typical Municipal Departments and Electric Power Responsibilities

Department	Typical Electric Power Infrastructure Responsibilities
Municipal Manager	❑ Oversight of electric power franchise agreement ❑ Preparation of municipal electric power disruption plans
Public Works	❑ Operation and maintenance of municipal electric power equipment ❑ Deployment of emergency generation equipment during disruptions ❑ Reduction of municipal power loads during peak demand periods ❑ Operation of water supply and wastewater treatment facilities during outages
Police	❑ Emergency response during outages ❑ Traffic control when automatic traffic signals are out ❑ Protection against criminal activity during outages ❑ Securing of areas with fallen power lines
Fire	❑ Emergency response during outages ❑ Response to alarms activated by outages ❑ Rescue of people stranded by outages (e.g., in elevators)
Emergency Medical Services	❑ Emergency response during an outage to assist people who use electrically powered medical support equipment ❑ Emergency response to other medical needs during outages
Human Services	❑ Communication with elderly and disabled persons during outages ❑ Assistance in relocating people to shelters during extended outages
School District	❑ Planning and implementation of backup generation in schools ❑ Evacuation of students from school buildings during outages
Public Health	❑ Determination of outage impacts on food spoilage
Emergency Management	❑ Coordination of response during major or extended outages

Municipal Electric Power Franchise Agreement

Most municipalities have a franchise agreement that covers the construction, operation, and maintenance of the electric power system within their boundaries. Appendix B contains a model franchise agreement that has been adopted by many municipalities in the Chicago Metropolitan Area, each with their own modifications, for use with ComEd. The provisions of the model franchise agreement that are most significant to electric power disruption planning are discussed below.

Designation of Representatives

Municipal Electric Representative. Section 1.15 in the model agreement calls for the identification of the person who will represent the municipality during regular business hours.

Municipal Emergency Electric Representative. Section 1.16 calls for the identification of the person who will represent the municipality during emergencies and at times other than regular business hours.

ComEd Representative and ComEd Emergency Representative. Sections 1.6 and 1.7 call for the identification of the ComEd positions that are the counterparts to the municipal representatives described above.

Many municipalities have designated either the municipal manager or the director of public works as their electric representative and the chief of the fire department or the police department as their emergency representative. The important point is that someone should be designated to represent the municipality on electric power issues on an around-the-clock basis.

Service Interruptions

Section 5.5 of the model agreement deals with service interruptions, both planned and unplanned. The model agreement provides these definitions:

- *Interruption.* Any condition in which the voltage is reduced to less than 50% of the standard voltage for a period of 1 minute or more.

- *Major service interruption.* Any interruption that results in (1) an outage of 1,000 kVA that persists for 15 minutes or more, or (2) an outage that lasts for 15 minutes or more and has a "significant impact," where the term is to be defined by mutual agreement between the municipality and ComEd.

As part of the service interruption section, the model agreement calls for ComEd to notify the municipality of any major service interruptions within 1 hour, to provide 24-hour advance notice of maintenance or repair work that will cause an interruption, to maintain records of all interruptions, and to provide reports to the municipality on a regular basis.

Apart from these provisions and some related items, the model franchise agreement does not specifically spell out steps to be taken for dealing with electric power disruptions.

Municipal Emergency Energy Ordinance

To cover the issues associated with emergency conditions, some municipalities have adopted a special emergency energy ordinance. Appendix C contains a model ordinance that was developed by the Northwest Municipal Conference, one of the Councils of Government in the region. It has been distributed to all municipalities that participate in the Metropolitan Mayors Caucus.

The model emergency energy ordinance focuses on dealing with controlled rotating interruptions, or rolling blackouts, which ComEd uses in times of significant stress on the electric system. ComEd has developed a plan whereby

sections of a service area will be cut off from electrical service, usually during periods of 2 hours or less at a time, in periods of stress. As one section is restored to service, the next one in the sequence is cut off. This process is a drastic measure used by ComEd to keep the entire electric system from collapsing under pressures of high demand, failed components, and/or cascading failures that are the result of problems outside the ComEd service area.

The model ordinance requires ComEd to prepare an emergency energy plan that covers the situations during which it would be necessary to implement rolling blackouts. The plan must also be submitted to the municipality for review and approval. The plan must provide details on the following:

- Circumstances that will require implementation of the plan,
- Stages of the plan,
- Geographical areas that will be affected,
- Number of customers that will be affected,
- Critical facilities (e.g., police, fire, hospitals, etc.) that will be affected,
- Persons on medical support equipment that will be affected, and
- Anticipated sequence and duration of interruptions.

The ordinance requires ComEd to notify the affected municipality that the plan will be implemented. A separate notification that rolling blackouts will be used must be given at least 30 minutes (if possible, 2 hours) before they commence.

The model ordinance focuses on dealing with situations that might require rolling blackouts. It does not address interruptions that occur under other conditions (e.g., storms, equipment failure), nor does it address response procedures for interruptions or restoration activities.

3.3 OTHER ORGANIZATION RESOURCES AND RESPONSIBILITIES

Municipalities can draw on other organizations for information, technical advice, and sharing of experiences in electric power disruption planning. The most significant contacts are described in the following sections. The final section of this report contains a detailed directory of points of contact.

County Organizations

All six counties in the Chicago Metropolitan Area have emergency management agencies — the county organizations most involved with emergency preparedness. These organizations have the responsibility for preparing and implementing countywide emergency plans that cover a wide variety of events and emergency conditions. Municipalities can draw on the resources maintained by the county emergency management agencies for their own planning efforts.

State Organizations

The Illinois Emergency Management Agency (IEMA) is the organization charged with dealing with all major emergency situations in Illinois. IEMA is responsible for coordinating the efforts of the state, private organizations, political subdivisions, and the federal government in disaster mitigation, preparedness, response, and recovery activities.

The Illinois Commerce Commission is the state organization that regulates public utilities, including ComEd, in Illinois. It establishes the rules and regulations under which electricity is provided and priced.

Federal Organizations

The Federal Emergency Management Agency (FEMA) has responsibility for supporting state and local governments in dealing with disasters that require more than local resources can handle. FEMA becomes involved once the President, at the request of a state's governor, has declared a region a disaster area. FEMA coordinates the activities of federal agencies that can provide services, resources, and personnel to perform necessary functions, such as transporting food and potable water to the area, assisting with medical aid and temporary housing for people whose homes are uninhabitable, and providing generators for electric power to keep hospitals and other essential facilities in operation. FEMA also works with states, territories, and communities during nondisaster periods to help plan for disasters, develop mitigation programs, and anticipate what will be needed when major disasters occur.

Among its other functions, FEMA coordinates the development of the *Federal Response Plan*, which "…establishes a process and structure for the systematic, coordinated, and effective delivery of [f]ederal assistance to address the consequences of any major disaster or emergency declared under the Robert T. Stafford Disaster Relief and Emergency Assistance Act…." [2] Section 12 of the plan identifies the federal agencies responsible for providing support during an energy emergency. Among the federal agencies that are providing assistance in declared disasters that involve energy, including electric power disruptions, are the following:

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[2] The *Federal Response Plan* is issued by the Federal Emergency Management Agency as document 9230.1-PL. The most recent issue is dated April 1999.

- The Department of Energy serves as the primary agency and is the focal point for energy issues in all response and restoration efforts.
- The Department of Defense deals with restoring energy service to critical defense facilities.
- The Department of State coordinates involvement of foreign nations and international organizations.
- The Department of Transportation focuses on issues that deal with pipelines that provide natural gas and oil.
- The National Communications System provides assistance in the restoration of telecommunications service.
- The Nuclear Regulatory Commission provides assistance related to nuclear power plants.

4 PREDISRUPTION PLANNING

A municipality can take various steps to prepare for electric power disruptions. Figure 4.1 illustrates these steps, which are described in more detail in this section.

4.1 CRITICAL FACILITIES

Identification of Critical Facilities

Critical facilities are those buildings, areas, or systems that could experience significant impacts if electrical service were lost. While every home, office, commercial establishment, or industrial factory is affected by the loss of electrical service, some are more important than others when considering the allocation of scarce municipal resources to protect them from damage. General guidelines for identifying a facility as "critical" include the following:

- *Impact on public health and safety.* The loss of electrical service to some facilities can significantly affect public health and safety. Examples of such facilities include police and fire stations, hospitals, nursing homes, water pumping stations, railroad crossings, and industrial facilities that handle hazardous materials.

- *Impact on orderly functioning.* At some facilities, the loss of electrical service can cause significant disruption to the orderly functioning of government, business, and private citizen activities. Although direct health and safety issues might not be a consideration, the loss of electrical service can have significant consequences. Examples of these types of facilities include traffic intersections, where heavy congestion can develop; elevator-served, high-rise buildings, where people can be forced to climb many steps to get into or out of the building; auditoriums, where loss of power can create difficulties for a large number of people exiting the facility; and facilities equipped with security alarms that are triggered by loss of power and that require numerous investigations by municipal response personnel.

- *Impact on the economy.* Some facilities might experience significant economic loss as a result of electrical service disruptions. Examples include industrial factories, food-handling establishments (restaurants, supermarkets), and computer-based businesses. Facility owners might

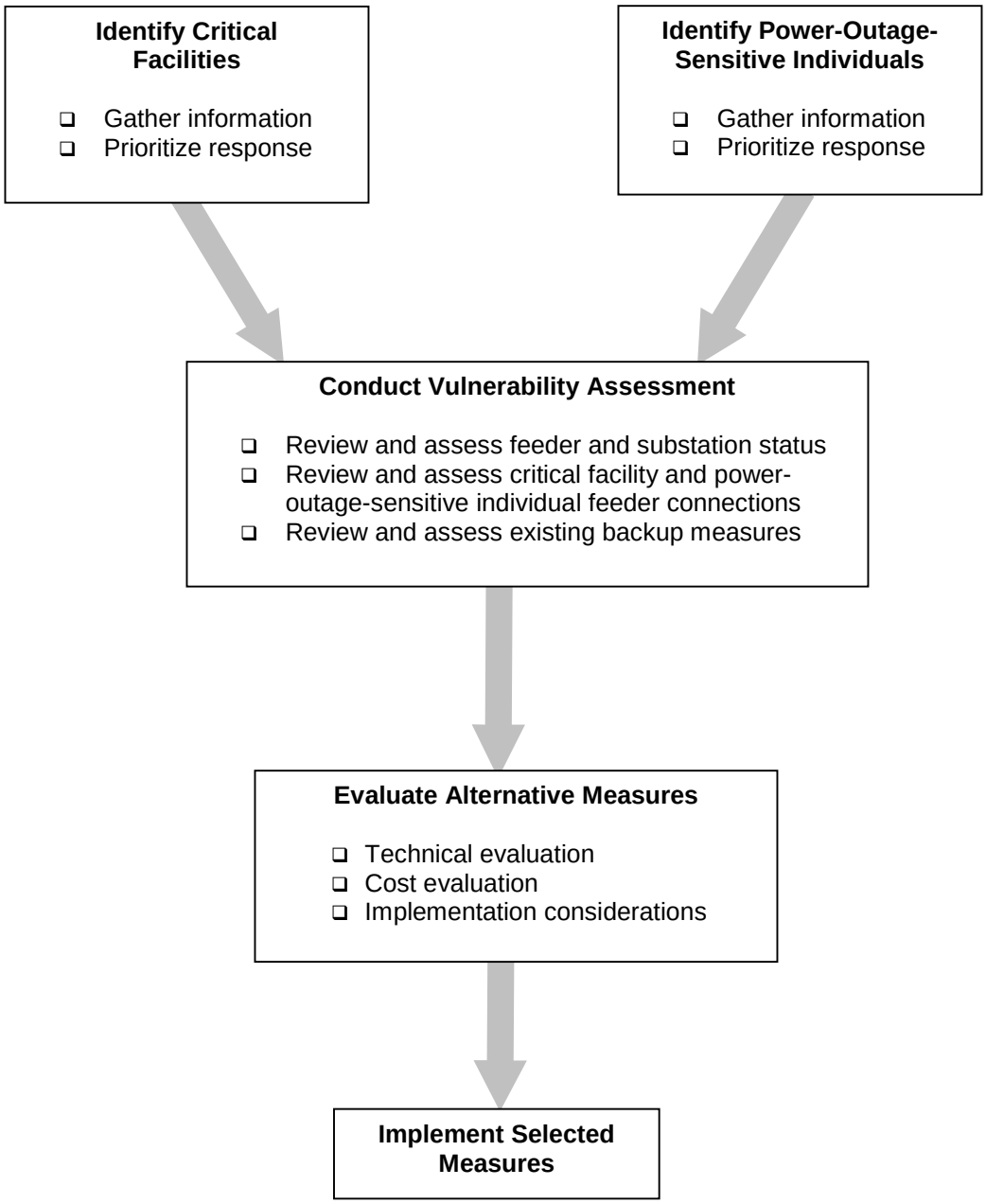

Figure 4.1 Predisruption Planning Process

experience economic impacts in the short term (e.g., food spoilage), or the municipality might experience impacts in the long term, such as relocation of businesses that cannot cope with frequent power outages.

- *Impact on other infrastructures.* Loss of electrical service at some facilities can affect other infrastructures. For example, loss of power at a telephone switching office can interrupt communications, and loss of power at a natural gas compressor station can affect gas delivery. In worst-case conditions, these effects, known as "infrastructure interdependencies," can cascade into an emergency situation.

In applying these general guidelines, more specific criteria must also be considered to ensure that available resources are properly allocated. It is more important to identify as critical facilities those that will require a significant municipal response (e.g., fire, police, emergency medical services, public works) during a power outage rather than those that will require little or no municipal response. Currently, no universally accepted set of criteria is in place for use in identifying critical facilities in all situations.

Table 4.1 lists facilities that can be classified as "critical" and examples of specific criteria that can be used to focus on the most important facilities. The types of facilities and the specific criteria in the table are intended to be illustrative rather than comprehensive. Municipalities should modify these criteria to meet local needs and requirements.

Gathering of Critical Facility Information

Municipalities can gather information on critical facilities from various sources. In fact, many municipalities already have assembled a list of important facilities as a result of other emergency planning activities. The recent Y2K planning efforts, for example, resulted in the development of relatively up-to-date lists. Many county and state emergency preparedness organizations also maintain such lists.

A key piece of data on critical facilities for electric power disruption planning is the current electrical service at each facility. In addition to the general information about a facility, it is important to gather details about the following items:

- ComEd feeder line(s) that serve the facility,
- Availability of electric power backup systems,
- Type of backup system (e.g., diesel generator, battery system),
- Maximum operation time of backup system,

Table 4.1 Typical Critical Facilities and Criteria

Type of Facility[a]	Example[a]	Typical Criteria That Can Be Applied to Determine Criticality[b]
Emergency Services	Police stations Fire stations Paramedic stations Emergency communication transmitters	All facilities considered critical
Water System	Water supply pumping stations Wastewater pumping stations and treatment plants	Facilities needed to provide sufficient pumping capacity to maintain minimum flow rates and minimum pressure
Transportation	Traffic intersections Aviation terminals and air traffic control Railroad crossings Electric rail systems	Major traffic intersections only All aviation facilities All protected rail crossings All electric rail systems
Medical	Hospitals, nursing homes Mental health treatment facilities Specialized treatment centers (e.g., out-patient surgery, dialysis, cancer therapy) Rehabilitation centers Blood donation centers	All facilities that require a state license to operate Facilities with any patients on electrically powered life support equipment
Schools	Nursery schools, kindergarten, elementary schools, high schools, colleges, business and trade schools	All schools when in session
Day Care	Registered day care facilities Sitter services After school centers	All facilities that require a state license to operate
Senior	Senior citizen centers Retirement communities	All facilities that require a state license to operate
Social Service	Homeless/transient shelters Missions and soup kitchens Youth, family, and battered person shelters Heating/cooling shelters	Facilities that require regular municipal fire safety inspections
Detention Centers	Jails Youth detention centers	All facilities
Community Centers	Libraries Civic centers Recreational facilities	Facilities that require regular municipal fire safety inspections
Public Assembly	Sports stadiums, concert auditoriums, theaters, cinemas, religious facilities, shopping malls, conference centers, museums, art centers	Facilities that require regular municipal fire safety inspections
Hotels	Hotels, motels, boarding houses	Facilities required to register under tax laws
High-rise Buildings	Apartments, condos, office buildings	Buildings seven stories or higher
Food Service	Restaurants Grocery stores Supermarkets Food processing facilities	Facilities required to register under tax laws Facilities with significant food quantities stored on the premises
Industry	Hazardous material handling	All facilities

[a] The types of facilities and examples are illustrative rather than comprehensive.

[b] These specific criteria are illustrative. There is no universal agreement on the numbers or types of facilities shown here. Municipalities must adjust these criteria to meet local needs.

- Availability of rapid connection capability for hook-up of portable generators, and

- Suitability of the facility as a temporary shelter during widespread, extended outages.

Appendix D contains a sample survey form that can be used to collect the necessary information on critical facilities.

In addition to using a survey form to gather information, municipalities can conduct on-site inspections of selected facilities to determine the specifics of their electric power supply system and to identify any enhancements that are necessary. For the most part, municipalities will perform this type of inspection for municipality-owned and -operated facilities. On occasion, it might prove beneficial to inspect selected privately owned facilities as well.

Prioritization of Critical Facilities for Response

Once the information on critical facilities has been gathered, it is important to review the list and establish priorities for response during different types of electric power disruptions. Some critical facilities might require an immediate response in the event of any interruption of service because of the potential for immediate, significant public health and safety impacts. Other critical facilities might require a response only in the event of a lengthy disruption. Also, if a widespread interruption affected numerous critical facilities, it might be necessary to allocate available response resources (e.g., police, fire, emergency medical) to those critical facilities most in need. This type of "facility triage" might already be included as part of response plans that deal with other emergencies. These other plans should be reviewed to determine how they deal with electrical service interruptions.

Response priorities for critical facilities vary according to local requirements and needs. Some of the factors to be considered are listed below:

- *Length of time before the occurrence of serious impacts*. Critical facilities that might experience effects almost immediately warrant rapid response.

- *Nature of potential impacts*. Critical facilities that involve potential public safety impacts might warrant a more rapid response than those with just potential inconvenience impacts.

- *Availability of backup power supplies*. Critical facilities with backup generation capability might not need immediate response.

- *Number and groups of people potentially affected*. Critical facilities where a large number of people would be affected might warrant a more rapid response than those where only a few would be affected. Also, critical

facilities that serve primarily seniors or children might require more rapid response than those that serve primarily able-bodied adults.

Table 4.2 gives categories that can be used to prioritize critical facility responses. This listing, however, is intended to be illustrative, not comprehensive. Section 5 discusses how an actual response might be implemented for different types of outages.

Table 4.2 Sample Response Priority Classification for Critical Facilities

Critical Facility Response Priority	Examples of the Types of Critical Facilities That Might Be Included in This Priority Class[a]
Immediate Response ❑ Highest priority for response under any interruption conditions ❑ Potential for immediate, serious impacts ❑ Most of these high-priority facilities will have or should have power backup capability.	Emergency service facilities, including police, fire, and emergency medical services Medical facilities, for example, hospitals Road intersections Railroad crossings
Response in First 2 Hours ❑ High priority for response for all disruptions up to 2 hours ❑ Contact is initiated with all facilities in this category to determine needed response.	Medical facilities, including nursing homes and medical offices Schools, including nursery schools and elementary schools High-rise buildings
Response in First 6 Hours ❑ Priority for response when disruptions last longer than 2 hours ❑ Response needed within 6 hours ❑ Contact is initiated with all facilities in this category to determine the necessary response.	Water facilities, including water supply and wastewater treatment
Response on Call ❑ Lower priority, but still critical ❑ Response is made upon a request for assistance from a facility.	Public assembly Commercial or industrial property

[a] The facilities listed in each response category are for illustrative purposes only. Municipalities must develop these response priorities to meet local needs.

Special Considerations for Infrastructure Interdependencies

As noted previously, in some critical facilities, the loss of electrical service could affect other infrastructures (e.g., telephone switching offices, natural gas compressor stations). These installations, many of which are owned and operated by private companies, are not usually included on a municipality's critical facility list. Nevertheless, it is in the best interest of a municipality to identify these facilities and discuss with the owners how their facilities should be treated during a power outage. There could be situations in which the municipality could assist the company owner in protecting the facility from, and/or mitigating against, any damage from power outages. Such actions could prevent a cascading infrastructure failure event that could have serious impacts on the municipality.

4.2 POWER-OUTAGE-SENSITIVE INDIVIDUALS

Identification of Power-outage-sensitive Individuals

Power-outage-sensitive individuals are people who would be seriously affected by an interruption in electrical service, including individuals who use electrically powered medical support equipment, elderly people who live alone, and disabled individuals. For those people who use medical support equipment (e.g., respirators, automatic medication dispensers), short-term interruptions can be serious or even life threatening.

Gathering of Information on Power-outage-sensitive Individuals

Collecting information on power-outage-sensitive individuals can require a great deal of effort and resources. To be genuinely useful, the information must be kept up to date. There are two basic ways to gather this information: use existing government agency contacts or rely on self-reporting.

Social service organizations and emergency response agencies within a community (e.g., public health department, human resources department, emergency medical services, 911 response center) often have lists of individuals who need special attention for medical purposes or other reasons. These lists generally include people who would be considered power-outage-sensitive. The manner in which such social service and emergency response lists are compiled and updated varies widely among communities. In addition, the extent to which this information is available to a municipality for purposes of electric power disruption planning is variable. In any case, a municipality that decides to compile a list of power-outage-sensitive individuals should first consult with local social service and emergency response organizations to determine whether this information is already available. In addition to local organizations, county and state organizations are also potential sources of this information.

The second method used for gathering this information is to rely on individual self-reporting. Appendix E gives an example of a survey questionnaire that is used for self-reporting. It was developed by one of the communities in the Chicago Metropolitan Area. The structure of the questionnaire lends itself to collecting information that is useful for dealing with emergencies other than power outages.

Whatever technique is used to gather information on power-outage-sensitive individuals, it is extremely important to maintain the privacy of the individuals. There are both legal and ethical requirements to ensure that this information is not disclosed to unauthorized people. Section 10 gives guidelines on information security.

Prioritization of Power-outage-sensitive Individuals for Response

In cases of extended electric power interruptions, municipal resources might be stretched thin, and responding to the needs of power-outage-sensitive individuals might require the establishment of priorities or "triage." Because an extensive power outage could result in a large number of calls for assistance, it is important to plan for a prioritized response. Many municipalities already have a prioritization scheme in place to deal with other emergencies.

4.3 ASSESSMENT OF POTENTIAL VULNERABILITIES

A municipal electric power vulnerability assessment combines the information on the status of the electric power system in the jurisdiction with information on the critical facilities and power-outage-sensitive individuals. The objective of this assessment is to determine the municipality's reliance on the electric power infrastructure and to project what the impacts might be if parts of it were disrupted. Note that this is not an assessment of the probability that the power will go out; ComEd performs this type of analysis. Rather, it is an assessment of the potential impacts on the municipality from various types of outages. An electric power vulnerability assessment requires a municipality to perform the following tasks:

- *Review and assess feeder and substation status*. The feeders and substations that serve the community are identified from information provided by ComEd. The feeders that serve the municipality are reviewed to determine whether any are on the list of worst-performing feeders or are projected to be overloaded during peak system loads. The substations that serve the municipality are also reviewed to determine whether any are on the projected overload list. Further, the feeder connections to substations are reviewed to determine whether failures at one or a few substations could significantly affect the municipality.

- *Review and assess feeder connections for critical facilities and power-outage-sensitive individuals*. The feeder connections for critical facilities and power-outage-sensitive individuals are reviewed to determine whether any are on the worst-performing feeder or projected overload list. The feeder connections also are reviewed to determine whether several critical facilities and/or power-outage-sensitive individuals are connected to the same feeder. If so, the loss of one feeder might disrupt a number of facilities and sensitive individuals simultaneously.

- *Review and assess backup measures in place for critical facilities and power-outage-sensitive individuals*. The backup systems (e.g., battery systems, on-site backup generators, portable generators, quick-connect circuit boxes) available at critical facilities and for power-outage-sensitive individuals are reviewed and evaluated to determine whether they are adequate. In general, municipalities undertake this type of review for the facilities they own and operate. Some municipalities might find it useful to provide this review as a service to privately owned facilities as well.

  The forms in Appendix D, for gathering basic information on critical facilities, also provide a means for conducting this review. In some cases, however, it might be necessary for municipal staff or their contractors to conduct an on-site inspection of a facility to clarify the actual status and condition of the backup measures.

4.4 EVALUATION OF ALTERNATIVE PREPAREDNESS MEASURES

Once a vulnerability assessment has been completed, municipalities should consider implementing measures that can protect critical facilities and power-outage-sensitive individuals from the serious impacts that could result from a disruption. These measures should be considered carefully to ensure that scarce municipal resources are allocated to those areas that would have the greatest impact on the protection of public health and safety.

Available Measures

Several measures can be used to help critical facilities and power-outage-sensitive individuals deal with potential disruptions in electrical service. Some measures (e.g., backup generation) provide alternative sources of electric power to replace that which is normally supplied by the power system. Other measures (e.g., heating and cooling shelters) provide services needed to protect public health and safety while an outage is in progress. Table 4.3 summarizes some of the available options. The list is illustrative, not comprehensive. Appendix F provides more detailed information.

Table 4.3 Typical Preparedness Measures for Critical Facilities and Power-outage-sensitive Individuals

Measure	Example
Enhanced Grid Connection Measures designed to provide more connections to the electric power network and/or to provide power routing options.	❑ Connection to multiple feeders ❑ Connection to multiple substations ❑ Networked systems
Alternative Power Supply ***Emergency On-site Backup Generation*** An emergency generator permanently installed on site and started whenever an interruption occurs.	❑ Diesel-engine-driven ❑ Natural-gas-driven ❑ Manual or automatic startup
Emergency Portable Generation An emergency generator mounted on a truck or trailer that can be moved into position during an extended power outage.	❑ Diesel-engine-driven ❑ Gasoline-engine-driven ❑ Quick-connection couplings
Battery Backup Systems Battery-based systems designed to provide power for a limited time, usually on the order of minutes or hours.	❑ Uninterruptible power supplies ❑ Emergency lights ❑ Traffic signal backup
Distributed Generation On-site generation equipment that runs continuously to provide electricity.	❑ Conventional generation units (e.g., natural-gas-powered, diesel) ❑ Renewable energy units (e.g., wind, solar, biomass) ❑ Advanced technology units (e.g., fuel cells)
Demand-side Management Measures whereby customers (on the demand side) voluntarily reduce their demand for electricity during periods of peak load. Customers receive lower electricity rates and/or rebates for lowering their demand.	❑ Various options offered by ComEd for different customers
Outage Notification Systems Automatic outage notification units that can provide instant communication to ComEd and/or the municipality of a power failure at a facility.	❑ Residential, commercial units ❑ Industrial units
Backup Communication Communication equipment that can be used during power outages	❑ Battery-powered emergency radio equipment ❑ Backup battery recharge equipment
Manually Operated Traffic Control Traffic control equipment that can be operated manually.	❑ Drop-down stop signs ❑ Manual railroad crossing equipment
Shelters Shelters that can be used to house people during a prolonged or widespread outage.	❑ Summer cooling shelters ❑ Winter heating shelters

Evaluation of the Measures

A municipality should perform three types of evaluations to assess power outage preparedness measures: technical, economic, and implementation. These evaluations are discussed in the following sections.

Technical Evaluation

The technical evaluation, which addresses the feasibility and effectiveness of a specific measure, should consider the following issues:

- *Applicability.* This issue addresses the question of whether the specific measure under consideration would be effective. For example, adapting a critical facility to use dual feeders would not be useful if both feeders were connected to the same substation and the substation experienced an outage.

- *Design.* This part of the evaluation addresses the appropriate size and operation of the measure under consideration. For example, a backup generator must be appropriately sized to handle all or part of the load at the facility where it is installed.

- *Configuration.* The manner in which the measure is configured can significantly affect its effectiveness during an outage. For example, an emergency generator with a manual startup would not be useful if the operator could not reach it in time to get it into service when needed.

Economic Evaluation

An economic evaluation analyzes the costs of the measures necessary to ensure preparedness. The following cost elements should be considered:

- *Capital cost.* The capital cost is primarily the expense of purchasing the equipment from a vendor.

- *Installation cost.* This cost covers the installation of the equipment. In cases where equipment is being retrofitted to an existing installation, this cost could be a significant expense.

- *Operation and maintenance costs.* These costs include expenses incurred to (1) keep the equipment ready to operate and (2) repair and maintain the equipment. Costs for both labor and materials should be included. For example, a qualified operator must test standby generators on a regular basis and operate them during disruptions. Components must also be replaced on a regular basis even if they are used only sporadically. Equipment vendors do not always itemize operation and maintenance costs, and these can add up to a major expense for the overall implementation of a measure.

In addition to calculating these conventional costs, a cost-effectiveness or cost/benefit evaluation should be carried out. These evaluations systematically compare the cost of a measure with the benefits or outcomes that might result from implementing it. These types of evaluations of the benefits of minimizing the likelihood or severity of possible adverse situations are often described by the terms *risk analysis* or *risk management*. In essence, this type of evaluation is used to determine whether the cost of a measure (capital, installation, and operating) is justified when compared with the potential impacts of an electric power disruption.

A risk analysis that determines the cost/benefit of a particular measure can be either very simple or very complex. In its simplest form, the question asked is, "Is it reasonable to pay $X for this measure, which will enable the provision of uninterrupted service during a power outage?" A qualitative assessment of the situation is made, and a course of action is selected. For example, many computer users are willing to pay very high costs to keep their systems operating during power outages. The potential economic losses far outweigh the cost of the equipment. As an alternative example, many municipalities do not want to incur the costs of battery backup systems for all traffic lights in the community. Drop-down stop signs, which may be suitable for all but the busiest intersections, cost much less.

A risk assessment also can be a rigorous quantitative evaluation of alternative measures. In this type of assessment, an attempt is made to quantify the costs of a power outage. These values can then be compared with the cost of the measure being considered. If the cost is lower than the impact costs, the measure is considered to be cost-effective. In general, detailed risk analyses, which can be both time- and effort-intensive, are carried out only when large investments are under consideration.

Implementation Evaluation

In addition to the technical and economic considerations, some measures need to be evaluated for implementation issues. These issues can sometimes be the basis for a "go/no-go" decision even when the technical and economic issues have been resolved. Examples of implementation issues are given below:

- *Environment and safety*. Some measures require consideration of environmental impacts (e.g., noise and air pollution from a backup generator) and safety considerations (e.g., on-site fuel storage) before a decision can be made.

- *Installation*. Some measures require special equipment or configurations to be truly effective (e.g., quick-change electrical connections for using a portable generator).

- *Interdependencies*. Some measures rely on the continued operation of a different infrastructure, which may not always be available. For example,

natural-gas-fired backup generators are not useful in the event gas supply is interrupted at the same time as electric power. Automatic outage notification devices will not function if the telephone system is not working.

Implementation of Measures

Once the evaluations have been completed, the measures that offer the most benefit should be implemented. The process by which implementation is done depends on the measure and on the operational and procurement procedures of each municipality. The only guidance that can be given on this issue is that municipalities should consider implementation in the context of long-term perspectives. Recent problems with system reliability will improve as ComEd implements planned upgrades and enhancements. However, the system will never be immune to disruptions. Natural events (e.g., storms), accidental events (e.g., equipment failure), and intentional events (e.g., vandalism) will always cause some degree of disruption to electric power service. Municipalities should keep this reality in perspective as they work to allocate scarce resources. Protective measures for electric power outages will always compete with other municipal priorities. A careful consideration of the issues is needed to avoid undesirable and unacceptable consequences.

5 DISRUPTION RESPONSE PLANNING

If an electric power disruption appears imminent or actually occurs, the municipal government must respond rapidly, effectively, and appropriately. The steps involved in planning proper response actions are examined in this section.

5.1 PLANNING FOR A STAGED RESPONSE

The concept of a "staged response" to an impending or actual disruption in electric power service is based on the understanding that not all threatening conditions (e.g., prolonged heat, storms) cause disruptions, and not all disruptions affect the public to the same degree. Responses must be measured, or "staged," to meet the expected and actual severity of the situation. Doing less than is necessary could jeopardize public health and safety. Doing more than is necessary could increase costs yet provide little or no real benefit to the public.

Table 5.1 shows a classification scheme for impending electric power disruptions, which can help planners develop appropriate actions in anticipation of disruptions. Table 5.2 shows a classification scheme for actual interruptions. These classification schemes are not intended to be exact or precise; rather, they provide a general framework for planning staged responses to disruptions under different conditions.

5.2 NOTIFICATION AND COMMUNICATION

Experience gained during previous interruptions of electric power service has highlighted the importance of early notification and communication. Early notification about impending problems gives emergency responders lead time to prepare to take effective actions. Continuing and accurate communication during a disruption minimizes public anxiety and maintains confidence that the situation is under control.

Types of Notification Received from ComEd and Channels of Communication

The primary means of notification and communication about electric power disruptions originates with ComEd and is then given to municipal officials. The agreements between a municipality and ComEd identify the specific channels of communication and the details of what is to be communicated. Section 2

Table 5.1 Classification Scheme for Impending Electric Power Disruptions

Electricity Alert
This phase provides an early warning of potential problems. There are indications that the electric power system is becoming stressed. Actual interruptions may or may not have occurred, but the potential for multiple outages is increasing. Indicators that lead to issuing an Alert include the following: ***Heat Watch***. Issued by the National Weather Service. Indicates the possibility of a heat index between 90°F and 104°F on any given day in the next three-day period. ***Tornado Watch***. Issued by the National Weather Service. Indicates that weather conditions are favorable for the formation of tornadoes or for tornadoes to move into the area. ***Winter Storm Watch***. Issued by the National Weather Service. Indicates that conditions are favorable for the development of severe winter weather. ***ComEd Alert***. Issued when the electric power system may not be able to supply energy for one or more hours, or when energy constraints, load, or weather conditions prompt the company to implement steps in its Emergency Load Conservation Plan (to avoid or prepare for controlled rotating interruptions) or in its Summer Emergency Preparedness Plan.
Electricity Warning
This phase indicates further deterioration of the electric power system and a high likelihood for widespread power outages. Indicators that lead to issuing a Warning include the following: ***Heat Warning***. Issued by the National Weather Service. Indicates the possibility of a heat index between 90°F and 104°F for at least a three-day period. ***Tornado Warning***. Issued by the National Weather Service. Indicates that weather radar and/or weather spotters and law enforcement officials have sighted a tornado. ***Winter Storm Warning***. Issued by the National Weather Service. Indicates that severe winter weather is forecast for the area. ***ComEd Warning***. Issued when reserve power levels are being used at a rate that results in a high probability that service may need to be curtailed. ComEd begins to implement steps in its Emergency Load Conservation Plan or in its Summer Emergency Preparedness Plan. Also, ComEd opens its Transmission and Distribution (T&D) Command Center.
Electricity Emergency
This phase indicates that the electric power system is stressed to the limit, and a single event (e.g., equipment failure) could cause a major outage that affects a wide area for an extended period of time. Indicators that lead to issuing an Emergency include: ***Heat Emergency***. Issued when the heat index is forecast to reach 105°F or higher. ***ComEd Emergency***. Issued when reserve power has dropped below acceptable levels and a single event would cause a major outage. ComEd implements steps in its Emergency Load Conservation Plan or in its Summer Emergency Preparedness Plan. Also, the ComEd T&D Command Center becomes fully operational.

Table 5.2 Classification Scheme for Actual Electric Power Disruptions

Limited Disruption
A localized interruption that affects a small number of customers **and** an interruption that is of short or medium duration (approximately 2 hours or less). Some of the conditions that can lead to a Limited Disruption include: ❑ Failure of a customer service line or transformer ❑ Tree contact or wildlife intrusion into equipment ❑ Dig-ins ❑ Vandalism A Limited Disruption can be either planned (e.g., for maintenance/upgrade) or unplanned.
Extended Disruption
A disruption that affects a neighborhood(s) or similar areas where multiple customers are affected, **and/or** a disruption of long duration (between approximately 2 and 6 hours). Some of the conditions that can lead to an Extended Disruption are the same as those that would lead to a Limited Disruption and include: ❑ Feeder line failure ❑ Distribution substation failure ❑ Major maintenance or upgrade of system components ❑ Storm damage An Extended Disruption can be either planned or unplanned.
Wide Area Disruption
A disruption that affects a wide area or perhaps an entire municipality **and/or** a disruption of extended duration (more than 6 hours). Some of the conditions that can lead to a Wide Area Disruption are the same as those that lead to Limited or Extended Disruptions and include: ❑ Transmission line or substation failure ❑ Multiple failures Wide Area Disruptions are generally unplanned, although some major system maintenance and upgrade activities can lead to such disruptions.
Regionwide Disruption
A disruption that affects a large part or perhaps all of a metropolitan area or an even larger area that could extend across state lines. The conditions that can lead to a Regionwide Disruption include: ❑ Generation shortages in the region ❑ Major transmission system failures ❑ Cascading failure of the power grid due to problems outside the region Regionwide Disruptions are unplanned.

described some general features of the municipal franchise agreement and the municipal emergency energy ordinance. The items that govern notification and communication, along with other issues, are summarized here.

Conditions That Require Notification

Depending on the details of the agreement between ComEd and a municipality, the utility might be required to notify the municipality about the following electric power events:

- *Planned interruptions for maintenance and upgrades.* Generally, ComEd must provide 24-hour advance notice of any planned interruptions.

- *Unplanned interruptions.* Usually, ComEd must report all unplanned interruptions of 1 MW or more or that last 15 minutes or more within 1 hour of onset.

- *Electricity Alert, Warning, Emergency.* ComEd has internal criteria for declaring an Alert, Warning, or Emergency condition. Some municipalities have asked to be notified whenever the company declares one of these conditions.

- *Emergency Load Conservation Plan implementation.* ComEd has a 15-step program to deal with situations when load is expected to exceed available supply. Some municipalities have asked to be notified whenever one or more of these steps is implemented. Step 15 is the implementation of controlled rotating interruptions (rolling blackouts). Municipalities that have adopted the municipal energy emergency ordinance (see Appendix C) are to receive a 1-hour advance notice of an impending rotating interruption.

- *Opening of ComEd Transmission and Distribution (T&D) Command Center.* The ComEd T&D Command Center generally is opened when Alert, Warning, or Emergency conditions have been declared and/or when one or more steps in the Emergency Load Conservation Plan have been implemented. There are also some occasions when the center is opened in the absence of these conditions. Some municipalities have asked to be notified whenever the center is opened as an early warning of potential problems.

- *Single or last contingency situation.* When a piece of equipment (e.g., transformer, cable) is out of service — either for maintenance or as a result of a failure — and the failure of one more of the remaining components of the system could lead to a significant interruption, the system is said to be on either “single contingency” or “last contingency.” Some municipalities have asked to be notified about such conditions if the last contingency would affect their residents.

Municipal Personnel to Be Notified

Generally, a number of individuals in a municipality receive notifications from ComEd on the basis of agreements that have been reached with the company. As a rule, municipalities should make multiple contacts available during business and nonbusiness hours. The identification of a municipal electric representative and a municipal emergency electric representative is provided in Sections 1.15 and 1.16, respectively, of the model franchise agreement in Appendix B.

Manner of Notification

The manner in which ComEd notifies a municipality depends on the communication equipment available and the arrangements made between the company and the municipality. At a minimum, the ComEd representative advises a municipality about various situations by telephone and/or sends the municipal office a fax. Under more extensive arrangements, the ComEd representative notifies municipal personnel by using an electronic pager. In all cases, the notification depends on the continued operation of the communications equipment in the municipal office that is to receive the information. For example, if a municipal office is to be notified via fax, but the equipment does not have backup power, the notification process would be ineffective.

Recently, ComEd introduced an Internet-based system for providing communications interruption information. The system — called E-Outage — is available to all municipalities and provides an almost real-time summary of outage situations. Municipalities can contact their ComEd representative to obtain the necessary software and access authorization. As is the case for other systems, the municipality must have its computer system operating on backup power to access E-Outage during an actual interruption.

Information to Be Provided in a Notification

The information provided to municipalities varies, depending on the arrangements that have been made with ComEd. To take appropriate steps, the municipality must receive adequate information; however, it is counterproductive for a municipality to receive so much information that it cannot be interpreted or used effectively. “Information overload” during routine system operating conditions can lead a municipality to discard very useful information in an actual emergency.

During actual interruptions, the following information should be considered the minimum amount that a municipality should be given as part of its notification agreement with ComEd:

- Start time of the interruption,
- Geographical area affected,
- Number of customers affected,

- Expected duration, and
- Need for any municipal services (e.g., police, fire, emergency medical) to assist ComEd crews in the restoration process.

Municipalities that are interested in receiving detailed information, and that have the technical staff available to interpret and utilize it, can request more details, including:

- Feeder(s) involved in the interruption,
- Substation(s) involved in the interruption,
- Equipment involved in the interruption, and
- Cause of the interruption.

Municipalities that are interested in receiving notification of last contingency conditions can request the following:

- Start time of the condition;
- Expected duration of the condition;
- Nature of the contingency condition
  - routine, advisory only
  - alert, significant probability of an interruption;
- Equipment involved, including feeders, substations, and other equipment;
- In the event of an interruption
  - geographical area that would be involved
  - number of customers that would be affected; and
- Notice of the end of the contingency condition.

Notification Received from Local Citizens

The municipal office or 911 dispatch center often receives notification of an interruption in electric service from a resident or business in the municipality. When this occurs, it is important for municipalities or the 911 dispatch center to advise residents and businesses to contact ComEd to report any outage. In many cases, ComEd does not have any indication of an outage until a customer reports it. Contrary to popular misconceptions, it is not possible for an electric utility to detect all interruptions automatically. Automatic outage notification equipment that plugs into a customer's outlet and dispatches a notification to the company via the telephone is undergoing tests. However, the equipment is costly and not suitable for installation at every customer's location. Municipal officials and 911

dispatchers responding to resident calls about power outages can best assist in the restoration process by advising customers to call ComEd.

5.3 RESPONSE PROTOCOLS IN ANTICIPATION OF A DISRUPTION

The following sections present some guidelines on ways in which municipalities can respond to a notice of an impending disruption. Advance warnings provide a municipality with the opportunity to mobilize personnel and equipment. Experience has shown that this action provides important lead-time for dealing with the most critical conditions in a timely manner and for mitigating the consequences of a disruption.

In each of the actions identified in the following protocols, a responsible municipal agency is identified. As discussed in Section 2, it is important to determine who in a municipality is responsible for each aspect of dealing with the electric power infrastructure. To implement the response protocols, it is essential to know which municipal department is responsible for each action. The following sections suggest an approach. Both the protocols and the assignment of responsibilities must be adapted to meet specific local needs.

Response Protocol for Planned Interruptions

Planned interruptions generally offer the most lead-time — from days (for scheduled maintenance or system upgrades) to hours (for rotating blackouts). The focus of the response protocol for planned interruptions is to take the steps necessary to prepare for the outage and to minimize the impacts. Table 5.3 lists the actions required for this protocol. The actions are not necessarily sequential, and it might be preferable to conduct some in parallel.

Response Protocol for an Electricity Alert

An Electricity Alert indicates the onset of problems that could result in a power outage. The focus of the response protocol for an Electricity Alert is to notify municipal staff of the impending situation and to begin preparations. In general, at the time of an Alert, significant disruptions to electrical service have not yet occurred. Only preliminary actions are taken at this stage to avoid unnecessary expense and diversion of municipal personnel from other duties. Table 5.4 lists the actions required for this protocol.

Response Protocol for an Electricity Warning

An Electricity Warning indicates that the probability of a significant power outage has increased. The focus of the response protocol for an Electricity Warning is to take steps to reduce power consumption and to begin implementing more substantial actions. Significant power interruptions may or may not have

begun. It is not necessary for actual interruptions to have occurred in order to implement Electricity Warning response actions. Table 5.5 lists the actions required for this protocol.

Response Protocol for an Electricity Emergency

An Electricity Emergency indicates that the situation has deteriorated to the point that a single event could lead to a widespread power outage. The focus of the response protocol for an Electricity Emergency is to begin to deploy available backup systems, to alert the public to be prepared for the high likelihood of an outage, and to move municipal equipment and personnel into rapid response positions. In general, some actual interruptions will have occurred at this stage; however, it is not necessary for actual outages to have occurred in order to implement the response protocol. Early implementation could decrease the magnitude and impact of any outages. Table 5.6 lists the actions required for this protocol.

Table 5.3 Response Protocol for Planned Interruptions

Action	Responsible Municipal Agency	Description
Receive notice from ComEd of the planned interruption.	Municipal electric representative	ComEd provides notice that an interruption will occur, identifies the geographical area to be affected, and gives the expected duration.
Inform municipal departments.	Municipal response manager	Appropriate municipal departments (e.g., police, fire, emergency medical, public works) are informed of the planned interruption.
Advise critical facilities of the planned interruption.	Municipal public affairs office	The location of any critical facility that will be affected by the planned interruption is identified. The facility is notified of the expected time and duration of the interruption. (Note: ComEd can issue this notification, depending on arrangements with the municipality.)
Advise power-outage-sensitive individuals of the planned interruption.	Human services	Power-outage-sensitive individuals who could be affected by the interruption are identified and notified. A determination is made if special assistance (e.g., medical service) is needed for the duration of the interruption. (Note: ComEd can issue this notification, depending on arrangements with the municipality.)
Dispatch municipal crews to the affected municipal facilities.	Public works	Municipal crews are sent to any municipality-owned critical facilities to start backup generation and/or to deploy any other available measures during the planned outage.
At the end of the interruption, verify the status of critical facilities and power-outage-sensitive individuals.	Municipal public affairs office Human services	Critical facilities and power-outage-sensitive individuals are contacted following the scheduled completion of the interruption to verify that they have returned to normal conditions.

Table 5.4 Response Protocol for Electricity Alert

Action	Responsible Municipal Agency	Description
Declare an Electricity Alert.	Appropriate municipal official	Upon receipt of information that the conditions for an Electricity Alert have occurred (see Table 5.1), the appropriate municipal official declares an Alert in the municipality.
Inform municipal departments.	Municipal response manager	Appropriate municipal departments (e.g., police, fire, emergency medical, public works) are informed of the Electricity Alert.
Establish contact with the ComEd representative.	Municipal electric representative	A communication channel is established with the designated ComEd representative. Regular communication is maintained to track the progress of the situation.
Advise residents and businesses in the municipality.	Municipal public affairs office	By using the communication media available to the municipality (e.g., municipal cable channel), residents and businesses are advised of the Electricity Alert. The public is advised to check the status of any backup equipment and to monitor the situation.
Check the status of municipal backup generation equipment.	Public works	The status of municipal backup generation equipment is determined. The availability of generator fuel is checked. Operational readiness is verified. Required corrective steps are taken to prepare for operation.
Check the status of municipal backup communications equipment.	Police Fire Emergency medical Communication center	The status of backup communications equipment is determined. Operational readiness is verified. Required corrective steps are taken to prepare for operation.
If conditions improve, declare an end to the Electricity Alert.	Appropriate municipal official	Upon receipt of information that the conditions for an Electricity Alert have passed, the appropriate municipal official declares an end to the alert. Municipal departments are advised to return to normal operating status. The public is advised.

Table 5.5 Response Protocol for Electricity Warning[a]

Action	Responsible Municipal Agency	Description
Declare an Electricity Warning.	Appropriate municipal official	Upon receipt of information that the conditions for an Electricity Warning have occurred (see Table 5.1), the appropriate municipal official declares an Electricity Warning in the municipality.
Inform municipal departments.	Municipal response manager	Appropriate municipal departments (e.g., police, fire, emergency medical, public works) are informed of the Electricity Warning.
Maintain contact with the ComEd representative.	Municipal electric representative	The communications channel established with ComEd's designated representative is maintained. Regular communications continue so that the progress of the situation can be tracked.
Advise residents and businesses in the municipality to reduce electricity consumption.	Municipal public affairs office	By using the communication media available to the municipality (e.g., municipal cable channel), residents and businesses are advised of the Electricity Warning. The public is advised to reduce electricity consumption to take load off the system. (Note: The public is also notified directly by ComEd by means of broadcast media.)
Reduce municipal electricity consumption.	All municipal departments	Electricity consumption at municipal facilities is reduced, including turning off nonessential lighting and equipment, reducing air-conditioning loads, and deferring nonessential electricity-consuming activities.
Position municipal crews to operate backup equipment.	Public works	Municipal personnel responsible for starting and operating on-site backup generation equipment and portable generators are dispatched. Crews put equipment into "ready standby" mode to prepare for startup.
Delay municipal staff shift changes.	Police Fire Emergency medical Public works	Shift changes of selected municipal personnel are delayed to ensure that adequate resources are available if the situation deteriorates.
Conduct an operational test of municipal backup communications equipment.	Police Fire Emergency medical Communication center	Backup communications equipment is tested to verify its operational readiness.
Advise shelters to prepare to accept people.	Human services	Staffs for heating shelters (in winter) and cooling shelters (in summer) are advised to prepare to accept people who might be affected by outages.
If conditions improve, declare an end to the Electricity Warning.	Appropriate municipal official	Upon receipt of information that the conditions for an Electricity Warning have passed, the appropriate municipal official declares an end to the warning. Municipal departments are advised to return to normal operating status. The public is advised.

[a] It is assumed that the actions for an Electricity Warning will be preceded by the actions for an Electricity Alert. In some cases, it will be necessary to proceed directly to the Electricity Warning stage.

Table 5.6 Response Protocol for Electricity Emergency[a]

Action	Responsible Municipal Agency	Description
Declare an Electricity Emergency.	Appropriate municipal official	Upon receipt of information that the conditions for an Electricity Emergency have occurred (see Table 5.1), the appropriate municipal official declares an Electricity Emergency in the municipality.
Inform municipal departments.	Municipal response manager	Appropriate municipal departments (e.g., police, fire, emergency medical, public works) are informed of the Electricity Emergency.
Maintain contact with the ComEd representative.	Municipal electric representative	The communications channel established with ComEd's designated representative is maintained. Regular communications continue so that the progress of the situation can be tracked.
Advise residents and businesses in the municipality to minimize electricity consumption.	Municipal public affairs office	By using the communication media available to the municipality (e.g., municipal cable channel), residents and businesses are advised of the Electricity Emergency. The public is advised to reduce electricity consumption to absolute minimum levels. (Note: The public is also notified directly by ComEd by means of broadcast media.)
Minimize municipal electricity consumption.	All municipal departments	Electricity consumption at municipal facilities is reduced to minimal levels, including turning off all electricity-consuming equipment except that required for emergency communications and operations.
Start backup generation equipment.	Public works	In coordination with ComEd, backup generation equipment at selected facilities is started, and the facility is switched over to reduce load on the ComEd system. (Some facilities might not begin using backup generation unless an actual outage is experienced.)
Recall municipal staff.	Police Fire Emergency medical Public works	Extra municipal personnel are recalled to duty to provide adequate resources to handle the situation.
Conduct an operational test of municipal backup communications equipment.	Police Fire Emergency medical Communications center	Backup communications equipment is tested to verify its operational readiness.
Open shelters.	Human services	Staffs open heating shelters (in winter) and cooling shelters (in summer) and begin to accept people who might be affected by outages.
If conditions improve, declare an end to the Electricity Emergency.	Appropriate municipal official	Upon receipt of information that the conditions for an Electricity Emergency have passed, the appropriate municipal official declares an end to the emergency. Municipal departments are advised to return to normal operating status. The public is advised.

[a] It is assumed that the actions for an Electricity Emergency will be preceded by the actions for an Electricity Alert and/or an Electricity Warning. In some cases, it will be necessary to proceed directly to the Electricity Emergency stage.

5.4 RESPONSE PROTOCOLS DURING A DISRUPTION

The previous section dealt with a municipality's response in anticipation of impending problems with the electric power system. Those response protocols are designed to be implemented even in the absence of any actual power outages. This section addresses response protocols for actual interruptions, which might occur without warning at any time of the year. They might also be predictable as the system becomes stressed and the Alert, Warning, and Emergency phases are implemented. Whatever the cause of the outage, the protocols described in this section follow the "staged response" concept described earlier and in Table 5.2.

Response Protocol for Limited Disruptions

Limited disruptions affect only a few customers and extend for short periods of time (less than approximately 2 hours). The primary focus here is to respond to the needs of power-outage-sensitive individuals and/or critical facilities that might be affected on an "as-called" basis. In general, municipal personnel on duty can handle a limited disruption. Table 5.7 presents the response protocol.

Response Protocol for Extended Disruptions

Extended disruptions affect a larger area, multiple customers, and might last for a relatively long time (between 2 and 6 hours). The focus of the response is to identify all critical facilities and power-outage-sensitive individuals that might be affected and to dispatch municipal personnel to provide assistance. This action is taken on a proactive basis without necessarily receiving calls for assistance. Some prioritization of response might be required to allocate available municipal personnel. Table 5.8 presents the response protocol.

Response Protocol for Wide Area Disruptions

In a wide area disruption, large areas of the municipality, or perhaps the entire municipality, are without electric power. The response protocol is essentially the same as for an extended disruption, except that a complete prioritization of responses is necessary because municipal resources will, in general, not be adequate to meet all the needs for assistance. In addition, it might be necessary to ask surrounding municipalities for assistance under mutual aid pacts. Table 5.9 presents the response protocol.

Response Protocol for Regionwide Disruptions

A regionwide disruption that affects large portions, or all, of a metropolitan area has not occurred in the Chicago area but has occurred elsewhere in the country. The response protocol includes invoking general disaster plans and mobilizing county, state, and federal resources. Table 5.10 presents the response protocol.

Table 5.7 Response Protocol for Limited Disruptions

Action	Responsible Municipal Agency	Description
Receive notification of a disruption.	Municipal electric representative	Notice is received from ComEd, an affected facility, or the public.
Determine the possible impact on critical facilities and/or power-outage-sensitive individuals.	Municipal electric representative	The list of critical facilities and power-outage-sensitive individuals is consulted. Police, fire, and emergency medical services personnel are advised to prepare to respond if a call for assistance is received.
Dispatch personnel to deal with:		
Traffic issues	Police	If the disruption involves a traffic situation (e.g., traffic lights out, railroad crossing gates inoperative), police are dispatched.
Downed power lines	Police Fire	If the disruption involves a downed power line, police and fire personnel are dispatched to secure the area until ComEd cuts power to the affected line.
Fire and security alarms	Fire Police	If the disruption triggers fire and security alarms, fire and police personnel are dispatched to investigate.
Medical needs	Emergency medical services	If a call for medical assistance is received from a power-outage-sensitive individual, emergency medical services personnel are dispatched.
Affected municipal facilities	Public works	If the disruption involves a municipality-owned facility, personnel are dispatched to start backup generation equipment.

Table 5.8 Response Protocol for Extended Disruptions

Action	Responsible Municipal Agency	Description
Receive notification of a disruption.	Municipal electric representative	Notice is received from ComEd, an affected facility, or the public. Notice might also be available via the ComEd E-Outage Internet site.
Establish contact with the ComEd representative.	Municipal electric representative	A communication channel is established with the designated ComEd representative. Regular communication is maintained to track the progress of the situation.
Determine the possible impact on critical facilities and/or power-outage-sensitive individuals.	Municipal electric representative	The list of critical facilities and power-outage-sensitive individuals is consulted, and those affected are identified. Response priority is established. Phone calls to affected facilities and individuals are initiated to determine whether assistance is needed.
Advise emergency responders.	Municipal response manager	Police, fire, and emergency medical services personnel are advised of the extent of the disruption. Requests for assistance, based on information obtained during telephone calls with the affected facilities and individuals, are conveyed to the appropriate emergency responder.
Dispatch personnel to deal with:		
Traffic issues	Police	If the disruption involves a traffic situation (e.g., traffic lights out, railroad crossing gates inoperative), police are dispatched.
Security issues	Police	If the disruption raises the possibility of increased criminal activity, police are dispatched to potential problem areas.
Downed power lines	Police Fire	If the disruption involves a downed power line, police and fire personnel are dispatched to secure the area until ComEd cuts power to the affected line.
Fire and security alarms	Fire Police	If the disruption triggers fire and security alarms, fire and police personnel are dispatched to investigate.
Medical needs	Emergency medical services	If a call for medical assistance is received from a power-outage-sensitive individual, emergency medical services personnel are dispatched.
Critical facility needs	Police Fire Emergency medical services	If the disruption creates needs at critical facilities, appropriate municipal personnel are dispatched.
Affected municipal facilities	Public works	If the disruption involves a municipality-owned facility, personnel are dispatched to start backup generation equipment.
Coordinate with ComEd to provide support for repair crews.	Municipal electricity representative	The need for municipal support to ComEd crews is determined, and appropriate arrangements are made, including traffic routing priority for repair crews, traffic control for the movement of heavy repair equipment, and security for repair crews.

Table 5.9 Response Protocol for Wide Area Disruptions

Action	Responsible Municipal Agency	Description
Receive notification of a disruption.	Municipal electric representative	Notice is received from ComEd, an affected facility, or the public. Notice might also be available via the ComEd E-Outage Internet site.
Establish contact with the ComEd representative.	Municipal electric representative	A communication channel is established with the designated ComEd representative. Regular communication is maintained to track the progress of the situation.
Determine the possible impact on critical facilities and/or power-outage-sensitive individuals.	Municipal electric representative	The list of critical facilities and power-outage-sensitive individuals is consulted, and those affected are identified. Response priority is established. Phone calls to affected facilities and individuals are initiated to determine whether assistance is needed.
Advise emergency responders.	Municipal response manager	Police, fire, and emergency medical services personnel are advised of the extent of the disruption. Requests for assistance, based on information obtained during telephone calls to the affected facilities and individuals, are conveyed to the appropriate emergency responder.
Dispatch personnel to deal with:		
Traffic issues	Police	If the disruption involves a traffic situation (e.g., traffic lights out, railroad crossing gates inoperative), police are dispatched.
Security issues	Police	If the disruption raises the possibility of increased criminal activity, police are dispatched to potential problem areas.
Downed power lines	Police Fire	If the disruption involves a downed power line, police and fire personnel are dispatched to secure the area until ComEd cuts power to the affected line.
Fire and security alarms	Fire Police	If the disruption triggers fire and security alarms, fire and police personnel are dispatched to investigate.
Medical needs	Emergency medical services	If a call for medical assistance is received from a power-outage-sensitive individual, emergency medical services personnel are dispatched.
Critical facility needs	Police Fire Emergency medical services	If the disruption creates needs at critical facilities, appropriate municipal personnel are dispatched.
Affected municipal facilities	Public works	If the disruption involves a municipality-owned facility, personnel are dispatched to start backup generation equipment.
Evacuate residents to shelters as needed.	Emergency medical services Police	For long-duration disruptions, sensitive residents (e.g., elderly, sick) are evacuated to heating centers (in winter) or cooling centers (in summer).
Coordinate with ComEd to provide support for repair crews.	Municipal electricity representative	The need for municipal support to ComEd crews is determined, and appropriate arrangements are made, including traffic routing priority for repair crews, traffic control for the movement of heavy repair equipment, and security for repair crews.

Continued

Table 5.9 (Cont.)

Action	Responsible Municipal Agency	Description
Recall municipal staff.	Police Fire Emergency medical Public works	Extra municipal personnel are recalled to duty to provide adequate resources to handle the situation.
Request assistance under mutual aid pacts.	Appropriate municipal official	If available municipal resources are inadequate for dealing with the situation, assistance from surrounding communities is requested. County and state resources are also asked to provide assistance.
Invoke disaster plan.	Appropriate municipal official	If the situation warrants, the municipal disaster plan is put into operation.

Table 5.10 Response Protocol for Regionwide Disruptions

Action	Responsible Municipal Agency	Description
All of the actions listed under Wide Area Disruptions are taken. See Table 5.9 for descriptions.	-	-
Establish communications with county and state emergency preparedness agencies.	Appropriate municipal official	Communication is established with the appropriate county emergency preparedness agency and with the Illinois Emergency Management Agency. Coordination of information and response across the region is established. Federal assistance is requested through the state agency.

6 RESTORATION PLANNING

This section provides guidelines for municipal actions designed to return to normal operation after the Alert, Warning, or Emergency phase or after an actual disruption.

ComEd is responsible for carrying out the primary efforts involved in the restoration of service following an electric power disruption, including repair and/or replacement of equipment, reconnection of transmission or distribution cables, or resetting of system controls to normal operational modes. There are, however, a number of important actions that municipalities can take to facilitate and expedite the restoration process. These actions are summarized in Table 6.1

Before a disruption is over and while repairs are still being made, ComEd may need support from municipal personnel (e.g., police, fire, public works) to gain entry to equipment sites, to secure repair sites from unauthorized access, or to provide other support services. It is important for municipalities to have an established procedure for providing this support to ComEd. The communication protocol for ComEd to request this support and the manner in which municipal personnel can provide this support should be worked out prior to any emergency situation. Further, municipal personnel must be informed of the limits to their ability to provide support in order to avoid dangerous exposure to electrical equipment with which they may not be familiar. Likewise, municipal personnel should be discouraged from attempting any repairs on their own on ComEd equipment because of the potential safety problems involved.

At the end of a disruption event, all of the backup and emergency equipment should be returned to standby conditions to be ready for any subsequent situations. It is tempting to delay this process, particularly in the wake of a disruption event that may have strained municipal personnel. However, the need to be prepared for any additional emergency conditions that may occur within a short time must be recognized.

Following a disruption event, it is important for municipal departments to review the situation and identify any weaknesses in the overall response. The conduct of this type of debriefing can assist in the preparedness for the next outage.

Disruption warnings that do not materialize into an actual loss of service (e.g., the Alert, Warning, or Emergency phases do not actually experience any outages) can create special problems. Municipalities will generally return personnel and equipment to normal operating mode. A frequent occurrence of these warning conditions without actual disruptions taking place can lead to a

temptation to take successive warnings less seriously and become complacent in the level of preparedness. A measure of discipline is needed to avoid being unprepared for when the next outage does occur.

Table 6.1 Restoration Actions

Action	Responsible Municipal Agency	Description
Provide support to ComEd repair crews.	Police Fire Public works	Appropriate support from municipal personnel is provided to ComEd crews that must carry out repair operations on public or private property. Communication is maintained with ComEd to allocate resources where needed.
Declare an end to the event.	Appropriate municipal official	After receipt of notice from ComEd that the situation has been restored to normal, the appropriate municipal official declares an end to the event (i.e., the Alert, Warning, or Emergency stage and/or actual disruptions). In some cases, a period of continuous power operation (e.g., 30 minutes) is used to signal the end of an event.
Inform municipal departments.	Municipal response manager	Appropriate municipal departments (e.g., police, fire, emergency medical, public works) are informed of the end of the event and are directed to begin restoration activities.
Shut down emergency generation and retransfer to ComEd power.	Municipal electricity representative Public works	Municipal emergency generation is shut down, and load is transferred back to the ComEd system. Coordination with ComEd on the timing of the retransfer is crucial to avoid large, simultaneous load increases that could trigger new problems.
Remove portable generators.	Public works	Portable generators that had been moved into position are disconnected and returned to their staging areas.
Return backup equipment to standby status.	Public works	All backup equipment is checked and returned to a standby condition so that it is ready for future deployment. Backup fuel supplies are replenished.
Reset traffic signals.	Public works	Where necessary, traffic signals are reset to normal operating mode.
Repair buildings, grounds, street damage.	Public works	Repairs are made to buildings, grounds, and streets that might have been damaged during emergency operations. Repair operations are coordinated with ComEd.
Attend debriefing.	Municipal response manager	A debriefing session is held with municipal departments and with ComEd to review the events and to identify weaknesses in the response actions. Modifications are made in preparation for the next event.

7 PREPAREDNESS EXERCISES

Preparedness exercises are critical for the effective implementation of an electric power disruption plan. This section describes the steps needed to develop and conduct effective exercises.

7.1 EXERCISE FOUNDATIONS

A preparedness exercise is a controlled learning activity for the staff of various municipal departments that tests plans for responding to an electric power disruption. Such an exercise is guided by a realistic scenario of disruption events, which allows the staff to practice response actions, evaluate the degree of integration and coordination of the response, and uncover weaknesses and gaps in the response plan. An exercise should include an evaluation and grading by observers, followed by a post-exercise critique. An exercise should culminate with the participants preparing a documented record of lessons learned from the experience.

To be of maximum value, an exercise should be a condensed, "low-pressure" experience that maximizes participation by many types of response organizations. It should provide a positive learning experience that forms the basis for additional planning and training. During an exercise, the participants should learn as much as possible about their strengths, weaknesses, gaps, and duplications associated with responsibilities, training needs, and resources. The greatest benefit of preparedness exercises is that they allow those responsible for planning emergency responses and obtaining emergency response resources to test the implementation and workability of plans at minimal cost, without risk to emergency workers, and without the pressure of an actual emergency.

7.2 TYPES OF EXERCISES

Several types of exercises could be implemented. When planning an exercise program, municipalities should decide which types of exercises make the best use of their resources.[3]

[3] The Illinois Emergency Management Agency (see Appendix D) offers training courses on emergency exercises and other emergency planning activities.

Training Drills

Training drills are exercises conducted by each individual municipal department (e.g., fire, police, public works) to determine procedures and steps for responding to an electric power disruption. Such instructional drills allow the participants to ask questions, obtain clarification about their responsibilities and procedures, and get immediate feedback from trainers while they are performing their emergency response roles. Training drills for electric power outages should be coordinated with other departmental preparedness exercises.

Tabletop Exercises

Tabletop exercises bring together representatives from all municipal departments that need to respond to a power outage. As "tabletop" indicates, these exercises are conducted around a conference table rather than in the field. Under the guidance of a facilitator(s), tabletop exercises use disruption scenarios that enable participants to represent their organizations' roles and responsibilities. Participants go through each scenario of power outage events and describe how their department would respond and what measures would be implemented. Tabletop exercises are one of the most frequently used forms of preparedness exercises because they help to identify major emergency response issues (e.g., effective communications during an event) while minimizing cost and disruption to normal departmental activities.

Functional Exercises

Functional exercises allow the testing of specific emergency response functions in the field without concern for their integration or interface with other response functions. For example, police, fire, or public works functions could be exercised without involving emergency management or social service departments.

Full-scale Exercises

Full-scale exercises are the most comprehensive type of preparedness exercise. These efforts involve the activation of key individuals who would be responsible for the full range of emergency functions and are augmented with field demonstrations of the essential capabilities and knowledge required by emergency workers. Full-scale exercises involve all municipal emergency response departments in an actual field test of procedures. In this type of exercise, municipal personnel and equipment are deployed to exercise sites, and response protocols are simulated. These exercises have been used extensively in planning for such events as hazardous material accidents and airplane crashes, but they have been used infrequently in planning for electric power outages.

7.3 DESIGNING AND CONDUCTING AN EXERCISE

The activities involved in designing and implementing an effective power outage preparedness exercise are discussed in the following sections.

Determine the Scope and Objectives of the Exercise

Planning must begin with a clear statement of the scope of the exercise and its objectives. For example, an exercise can be designed to test the full functionality of a power outage response plan under the most severe conditions or to test only a portion of the plan. It is important to decide how much of the emergency plan can be reasonably tested, given the funding and time available for planning. The organizations that need to participate are identified, and the number of representatives from each organization is determined. These parameters are used as guidelines for preparing specific objectives that the participants need to demonstrate during the exercise.

Develop Scenarios

A power outage exercise should test municipal responses under various outage scenarios. Such scenarios can include responding to impending disruptions (see Table 5.1) and/or actual disruptions (see Table 5.2). A timeline and a series of events that describe a disruption scenario are prepared. The objectives and the scenario outline are used as a guide for preparing a narrative description of the scenario and for developing a Master Scenario Events List that shows the sequence of events and a timeline. The scenario also indicates the times that participants will be given information in the form of messages during the exercise. This type of exercise generally includes a number of different events designed to test participants' responses under complicated circumstances that reflect realistic conditions. It is important to refrain from revealing the details of the scenarios to the participating departments before the exercise so that their response actions will be more realistic.

Develop a Plan for Administering the Exercise

In addition to including personnel from the necessary municipal departments, a well-planned exercise also consists of controllers and observers/evaluators who plan the exercise, know the scenario, and observe the response. These individuals, however, do not actually participate in the exercise. The controllers' purpose is to facilitate the exercise; prepare "read-ahead" materials that describe the purpose, scope, and objectives of the exercise; and distribute this information to participants before the exercise. The controllers run the actual exercise and initiate the events to which the municipal department participants must respond. The observers/evaluators take notes on the response actions and document the participants' performance.

Conduct the Exercise

On the day of the exercise, participants, including controllers and observers/evaluators, attend a briefing to review how the exercise will be run. Any pre-exercise reference material is distributed, and the rules of conduct for the exercise are reviewed. The pre-exercise briefing assists all participants in understanding their roles and responsibilities. After the initial conditions have been described, the exercise begins with the first event that requires the participants to respond. As the exercise evolves, subsequent escalating events are introduced in accordance with the pre-planned timeline to sustain a pace that actively engages the participants. At the conclusion of the scenario, the exercise facilitator(s) lead a critique, which elicits the reactions of and lessons learned by the participants.

In the exercise, all participants play roles. It is important to maintain a measure of "role-playing discipline"; that is, all participants should proceed as if the scenario events were actually happening. Encouraging participants to speak and act as though they were carrying out their responses under actual conditions helps to maintain focus and improves the value of the exercise.

Document Lessons Learned

An essential part of any exercise is a formal evaluation and documentation of lessons learned. The evaluation should be fair, objective, and comprehensive in identifying strengths and weaknesses with regard to the entire municipal response to the simulated power outage scenarios. An effective exercise provides for the retention of lessons learned from the experience. It is important to capture the participants' comments, reactions, and lessons learned — both during the exercise and at the post-exercise critique.

The exercise facilitator develops a brief written report and distributes it to the participants within two weeks after the exercise. This report should consist of a list of the participants and the organizations that they represented. It also should summarize the exercise and specify future actions (e.g., planning, training, resource development) needed to rectify or improve gaps in emergency response capabilities. If the report might be distributed to individuals or organizations that did not participate in the exercise, a draft report should be given to the participants for their review and comments. The resulting "after action" report is important for building consensus about the actions and priorities recommended from the results of the exercise, and it provides the necessary documentation needed to obtain any additional resources for the next steps.

8 LONGER-TERM PREPAREDNESS

Municipal governments can take steps that will improve their ability to cope with electric power disruptions in the longer term. These steps include the use of building codes, zoning ordinances, and growth and development projections.

8.1 BUILDING CODES

Building codes are used to ensure that construction in a community meets the minimum standards required for public health and safety and for quality workmanship. Building codes can also be used to increase a community's ability to deal with disruptions to the electric power infrastructure by requiring facilities to be adequately prepared for power outages.

Communities that adopt building codes as part of their municipal code — thus making compliance mandatory — frequently use several model codes developed by national organizations. While model codes provide basic guidance, municipalities often amend and modify them to meet specific local requirements. A number of model codes are used frequently and have material that is relevant for dealing with power outages. These are listed in Table 8.1.

Table 8.1 also summarizes the features of the model codes that are most relevant for increasing a facility's ability to deal with power outages. The codes are carefully constructed and contain multiple cross-references, applicabilities, and exceptions. The table serves as a broad outline of the information contained in the codes. Municipalities should consult the detailed documentation of the codes to obtain a complete and accurate description of the requirements.

The Chicago Municipal Code can be used as an example of how model codes are adapted to meet local conditions. Table 8.2 summarizes some of the features of the Chicago code that differ from those used in the national model codes.

Current building codes require only selected facilities to have backup power systems, primarily used for emergency lighting. Health care facilities, high-rise buildings, and other facilities can require more extensive backup capability in addition to emergency lighting. Municipalities should determine whether they need a more extensive set of requirements to cover more facilities and/or a requirement to have backup systems capable of handling special needs.

Table 8.1 Summary of Power-outage-relevant Portions of Model Building Codes

Life Safety Code[a]
❑ Provides definitions and requirements for 15 classes of facilities and 10 special structures. ❑ For most facility classes and special structures, mandates the use of emergency lighting for means of egress. In the event of a power outage, lighting must have battery backup to last at least 1½ hours. ❑ Requires the use of standby power (e.g., backup generators) for high-rise (i.e., more than 75 ft high) buildings. ❑ References NFPA 99, *Standard for Health Care Facilities*, as providing requirements for health care facilities.
National Building Code[b]
❑ Provides definitions and requirements for structures falling into 10 use groups and 21 special-use and occupancy facilities. ❑ Defines an "emergency electrical system" as a system designed to pick up essential loads within 10 seconds of a power outage. Defines a "standby power system" as a system designed to pick up selected loads (other than those classified as emergency use) within 60 seconds of a power outage. ❑ Requires the use of standby power systems in high-rise buildings. A 2-hour fuel supply must be on site. ❑ Requires the ability to connect emergency communications equipment, emergency lighting, fire pumps, and at least one elevator to the standby system.
National Electrical Code[c]
❑ Provides requirements for electrical equipment, including additional requirements for 25 special occupancy facilities. ❑ Prescribes requirements for emergency systems designed to provide backup power for facilities and equipment essential for safety reasons. Battery systems must have 1½ hour capability. Generator systems must have an on-site fuel supply for 2 hours of operation, unless the system is natural-gas-fueled and the probability of simultaneous failure of the electric and natural gas supplies is considered to be low. ❑ Prescribes requirements for "legally required standby" systems, which are designed to provide backup power for equipment whose interruption could create hazards or hamper fire-fighting efforts. Battery and generator requirements are similar to those for emergency systems. ❑ Prescribes requirements for "optional standby" systems, which are designed to provide backup power for non-safety-related equipment. ❑ Establishes requirements for health care facilities, including hospitals, nursing homes, limited care, supervisory care, clinics, medical and dental offices, and ambulatory care. Describes requirements for alternate sources of power, including on-site generators, battery systems, and multiple feeders from the utility supply.
National Fire Prevention Code[d]
❑ Provides requirements for specific facilities, operations, and materials handling. ❑ For facilities requiring emergency generators, requires a transfer time of 10 seconds or less and requires an on-site fuel supply for a minimum of 2 hours.
Standard for Emergency and Standby Power Systems[e]
❑ Provides installation criteria and maintenance practices for emergency power systems. ❑ Classifies emergency power supply systems (EPSS) by the following: – type, which specifies the time needed to have the EPSS pick up the load, and which ranges from essentially instantaneous (uninterruptible power supplies) through 10–120 seconds, to manual with no time limit; – class, which specifies how long the EPSS can operate without refueling, and which ranges from 5 minutes to 48 hours; and – level, where Level 1 systems meet the most stringent requirements and are designed prevent loss of life or serious injury, and Level 2 systems are designed to provide more flexibility in less critical situations. ❑ Permits EPSS fuel sources to be liquid petroleum products (e.g., diesel fuel), liquefied petroleum gas (LPG), or natural gas. ❑ Sets requirements on transfer switches that move the load between the utility supply and the EPSS. ❑ Sets safety and environmental requirements for EPSS.

Continued

Table 8.1 (Cont.)

Standard for Stored Electrical Energy Emergency and Standby Power Systems[f]
❑ Provides performance and safety requirements for stored electrical energy (e.g., battery) systems used for emergency purposes. ❑ Classifies stored emergency power supply systems (SEPSS) by type, class, and level (similar to the EPSS). ❑ Sets requirements for transfer switches that move the load between the utility supply and the SEPSS. ❑ Sets safety and environmental requirements for the SEPSS.
Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications[g]
❑ Provides requirements for backup power installed in industrial and commercial facilities. ❑ Identifies emergency power needs in 13 categories of commercial and industrial facilities, including lighting, start-up power, transportation, mechanical utility systems, heating, refrigeration, production, space conditioning, fire protection, data processing, life support and life safety systems, communications systems, and signal circuits. ❑ Provides standards for generators and utility emergency power systems. ❑ Provides standards for stored energy systems, including batteries, mechanical energy storage, and motor generators.
Standard for Health Care Facilities[h]
❑ Provides requirements for health care facilities.
Safety Code for Elevators and Escalators[i]
❑ Provides requirements for design, construction, operation, inspection, maintenance, and repair of elevators, including dealing with power failures.

[a] *Life Safety Code*, NFPA-101, National Fire Protection Association, Quincy, MA (2000).

[b] *National Building Code*, Building Officials and Code Administrators International, Country Club Hills, IL (1999).

[c] *National Electrical Code*, NFPA No. 70-1999, National Fire Protection Association, Quincy, MA (1998).

[d] *National Fire Prevention Code*, Building Officials and Code Administrators International, Country Club Hills, IL (1999).

[e] *Standard for Emergency and Standby Power Systems*, NFPA 110, National Fire Protection Association, Quincy, MA (1999).

[f] *Standard for Stored Electrical Energy Emergency and Standby Power Systems*, NFPA 111, National Fire Protection Association, Quincy, MA (1996).

[g] *Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications*, ANSI/IEEE 446, American National Standards Institute, Washington, DC (1995).

[h] *Standard for Health Care Facilities*, NFPA 99, National Fire Protection Association, Quincy, MA (1999).

[i] *Safety Code for Elevators and Escalators*, ASME/ANSI A17.1, American Society of Mechanical Engineers, New York, NY (2000).

Table 8.2 Summary of Selected Chicago Municipal Code Sections with Relevance to Power Outages

Chapter 14-4: Emergency Systems

This chapter covers requirements for emergency and exit lighting systems.

- ❑ System I emergency systems are defined as consisting of three sources of electric power: the normal supply, an auxiliary source, and a final reserve source. The auxiliary source can be an alternative supply from the electric utility (e.g., connection from a second service line, connection to an alternative feeder) or an on-site generator. The final reserve source can be from an on-site generator or a battery system. System I is required in the following structures:
  - homes for the aged (with two or more floors or more than 20 persons)
  - hospitals
  - school halls (with fixed seats)
  - theaters
- ❑ System II emergency systems are defined as consisting of two sources of electric power: the normal source and an auxiliary source. In residential buildings more than 80 feet above grade, the auxiliary source must be an on-site generator or a battery system. System II is required in the following structures:
  - hotels
  - infirmaries
  - schools (with more than 100 students)
  - school halls (without fixed seats)
- ❑ System III emergency systems are defined as consisting of two sources of electric power: the normal source and an auxiliary source. The auxiliary source must be from an approved source that supplies only the exit and emergency lights. System III is required in the following structures:
  - jails
  - libraries
  - motels
  - police stations (with two or more floors or more than 20 persons)
  - residential buildings (more than 80 feet above grade)
  - rooming houses (with two or more floors or more than 20 persons)
  - schools (with fewer 100 students)
- ❑ Battery units must operate for a minimum of 2 hours.
- ❑ Generators must be able to pick up the load within 10 seconds. An on-site fuel supply must be available for 4 hours of operation. The generator is allowed to pick up selected emergency loads other than lighting.

Chapter 13-76: High-rise Buildings

This chapter covers all new buildings more than 80 ft above grade.

- ❑ It requires a System II emergency system. In addition to supplying emergency lights, the system must supply a fire department emergency access elevator to all floors, a communication system, and fire command and alarm systems.
- ❑ All buildings more than 400 ft above grade must have a diesel-driven emergency generator for fire pumps.

All existing and new residential buildings more than 80 feet above grade must have either an on-site generator or an approved battery system for emergency lights. The fuel source for the generator in buildings more than 80 but under 400 ft above grade can be natural gas or diesel. In buildings more than 400 ft above grade, the fuel source must be diesel.

In addition to providing requirements that directly affect the ability to deal with electric power disruptions, recent building codes also address issues concerning energy efficiency and the use of alternative energy supplies, such as solar power. Although such issues are beyond the scope of these guidelines, this aspect of building codes can have a significant indirect effect on the ability of a facility to cope with power outages. For example, a building designed to be very efficient puts less stress on the local electric power infrastructure and requires less backup power equipment. More information on these issues can be obtained from the U.S. Department of Energy.[4]

8.2 ZONING ORDINANCES

Zoning ordinances stipulate the type of land use that is acceptable in various locations in a community. Zoning can significantly affect the electric power requirements of an area. For example, an area zoned "residential" will have a very different electricity load profile than an area zoned "commercial" or "industrial."

Zoning is an important part of local community development, and many issues are considered in the preparation of zoning plans and ordinances. The configuration of the electric power infrastructure is not usually one of the key issues. Zoning ordinances commonly assume that an electric company is responsible for meeting virtually all demands, independent of zoning decisions. This practice is evident in the wording of the model franchise agreement presented in Appendix B. Section 5.2 of that agreement outlines the duty of the power company to provide electricity "…to the Village [City] … and to the inhabitants thereof, and to any person or persons or corporation doing business in the Village [City]." Nevertheless, the consideration of electric power supply issues in zoning decisions can affect the ability of a community to deal with power disruptions.

There are two ways in which zoning can affect the electric power infrastructure. First, zoning plays a role in determining the location of a site for electric power facilities, including power plants, transmission lines, and substations. In the Chicago Metropolitan Area, as well as in other parts of the country, the current trend — constructing many small- and medium-scale "peaker" power plants — has at times ignited zoning controversies. Many communities are now developing policies and zoning ordinances that will affect the location of these facilities.

It is important for a community to understand that the location (or restrictions on the location through zoning) of electric power facilities within its boundaries might (or might not) directly affect the reliability of the power supply to that community. A community that is home to a peaker plant, for example, does not necessarily enjoy more reliable service. Likewise, not having a power plant does not imply decreased reliability. Electric power plants are built to provide power

[4] The general Internet site for the Department of Energy is www.doe.gov.

to the entire electric grid, not just to the area in which they are located. However, a distribution substation, which connects customers to the grid, will directly affect the reliability of electrical service in the area in which it is located.

Second, zoning affects the electric power infrastructure because it influences the type and rate of development. The last 25 years have witnessed a major trend toward using zoning — and the closely related ability to control the subdivision of land — to regulate growth. In some cases, towns have attempted (with varying degrees of success) to limit new development by, for example, declaring a moratorium on building permits or setting a maximum number of dwelling units that will be allowed (in essence a population cap). The courts, however, have declared these practices confiscatory and have overturned measures that prevent reasonable use of suitable land or that drastically reduce land values.

The most common means for ensuring that a community does not outgrow its infrastructure is to link new development to infrastructure improvements. Developers of new subdivisions, shopping centers, or industrial parks typically must provide for infrastructures such as roads, storm drainage, and water and sewer facilities. They might also have to contribute — either through donating land or paying fees — to the construction of public facilities such as parks, schools, water treatment facilities, and police and fire stations. Such provisions are referred to as "concurrency requirements" or "adequate public facilities."

The primary mechanisms used to enforce such requirements are "required dedications" and "impact fees." The former term refers to land that must be set aside from the parcel being developed for roads, parks, schools, environmental buffer zones, or other purposes. Ownership of this property is generally conveyed to the town, school district, or other governmental entity. The latter term refers to monetary payments. For example a town might require a developer to make a monetary contribution toward the construction of a new school or water tower.

It is not common practice to use these measures to directly support construction or enhancement of the electrical infrastructure. The construction and improvement of electric power systems is usually the responsibility of the electric utility, which is mandated to provide electrical service to all customers. One way that has been used to ensure that adequate infrastructure (which might include electric power) accompanies new development is to link the timing of the two. In some parts of the country, the courts have upheld a town's authority to require the "phasing-in" of new residential areas, thus ensuring that development does not precede the construction of supporting infrastructure. This practice has been upheld even when it has substantially delayed the approval of a development.

A comprehensive discussion of zoning and its relationship to emergency preparedness can be found at the Department of Energy's special Internet site.[5]

[5] The Center of Excellence for Sustainable Development Internet site is www.sustainable.doe.gov.

8.3 GROWTH AND DEVELOPMENT PROJECTIONS

All electric power companies develop projections of long-term demand as a starting point for planning the expansion of electric power generation, transmission, and distribution facilities. Projections are made for a range of planning horizons (from 1 to 20 years) and for a range of geographical resolutions (for the entire system to individual distribution substations and feeder lines). In general, the shorter the planning horizon and the larger the geographic resolution used, the more likely the demand forecast will be reasonably representative of the actual situation.

In rapidly growing or changing communities, which are common in the Chicago Metropolitan Area, estimating long-term growth in electricity demand is a serious issue. Because it can take several years to design and construct new power system facilities, it is vital to obtain accurate (to the extent possible) estimates of future power demand. If the demand projection is too low, the system capacity may not be adequate to meet the area's needs in a timely fashion. If the demand projection is too high, resources are used to build facilities that are not needed, keeping funds from more important projects.

Municipalities can play an important role in improving the accuracy and usefulness of electricity demand forecasts in several ways. The information that is available to municipalities that would be valuable in improving the demand forecasts is discussed in the following sections.

Building Permits

Building permits constitute one of the most definitive predictors of the need for additional electrical service in an area. Although primarily useful for short-term estimates of growth in demand, the permits represent a reasonably firm picture of what projects are likely to be built. Municipalities can help develop better electricity demand forecasts by using the permit process to ask builders about their anticipated need for electric service. The following information, some of which is already collected as part of the permit application, is especially helpful in projecting electricity demand:

- Location – street address, block
- Planned use – residential, commercial, industrial, other
- Size – floor area, number of levels
- Expected electricity requirements:
  - expected peak demand in kilowatts
  - amps of service required
  - expected daily variation in electricity use
  - expected seasonal variation in electricity use

  - any unusual needs for electric service (e.g., special equipment)
- Plans for backup power supply
  - number of emergency/standby generators to be installed
  - size
  - type of fuel
  - portion of the load to be connected to the backup power supply
- Number of uninterruptible power supply units to be installed
  - size
  - portion of the load to be connected

Building permit information on electric service requirements should be conveyed to ComEd on a regular and timely basis. Municipalities might need to process the building permit data to preserve confidentiality and protect proprietary business information, but it is still important to advise ComEd of expected building activity as soon as possible. Currently, ComEd often is not notified of new electric service requirements until just before a project is completed and service connections need to be installed. This practice does not provide sufficient lead-time to make any necessary adjustments to the power system configuration.

Modification and Rehab Projects

Modification of a building's use can significantly affect electrical service requirements, which may or may not be readily identified on building permits. Some examples of this type project include the following:

- Conversion of conventional commercial or industrial facilities to computer-based company operations with extensive computer equipment and air-conditioning requirements, which will require substantially more electric power;
- Conversion of a commercial building to residential condominiums, which will have a different electrical load profile; and
- Rehabilitation of residential buildings to increase their electrical service.

Municipalities can use zoning change requests, permit applications, economic development plans, or other informal means to identify modification or rehab projects. In any case, it is important to notify ComEd of any changes in electric power requirements as soon as possible.

Zoning Changes

Zoning changes can also significantly affect power requirements. For example, it is commonplace in the Chicago Metropolitan Area to change from agricultural to residential or commercial land use. This type of change has major implications for both the quantity of electricity needed and the daily variation in load.

Although zoning changes alone do not guarantee that new facilities will be built on the rezoned parcels, they do indicate the potential for a substantial change in power consumption patterns.

Typically, information on zoning changes is not conveyed to ComEd on a regular basis because it is unknown whether near-term firm project plans will affect electric power requirements. Nevertheless, a change in zoning can be a useful "early warning indicator" that the electrical service in a portion of a municipality needs to be reevaluated.

Development Plans

Electric power companies use many techniques to forecast long-term growth and development, including trend analysis, population projections, economic growth forecasts, and others. Municipalities could have additional information and insight that could improve the accuracy of these forecasts. In many communities, an economic development group looks at the long-term growth of the municipality and recommends actions to promote a desired type of development. Although projections and forecasts made on the basis of development plans are speculative and not always an accurate predictor of long-term growth, they can indicate trends that would increase the demand for electricity.

Examples of the types of development planning information that should be conveyed to ComEd include:

- Economic development plans and projections for the municipality,
- Identification of areas expected to have significant growth,
- Identification of areas expected to experience significant changes in use,
- Large development projects (e.g., shopping centers, industrial facilities, residential developments) under consideration, and
- Creation of special economic development and/or redevelopment zones.

Some of this information could be sensitive, so special arrangements should be made to avoid inappropriate disclosure. Nevertheless, the availability of this type of information can help to ensure that future electric power supplies will be sufficient to meet the demand.

9 DEVELOPMENT OF AN ELECTRIC POWER DISRUPTION PLAN

The guidelines presented in the previous sections provided general principles that municipalities can use in preparing to deal with electric power infrastructure problems. The best way to ensure that these guidelines will be implemented is to develop an electric power disruption plan that adapts these guidelines to local conditions. Some considerations that are important in the development of a plan are investigated here.

Involvement of Municipal Departments

The development and implementation of a plan necessarily involve many municipal departments, including town management, police, fire, emergency medical services, public works, public affairs, human services, and others. To ensure a well-coordinated, effective effort, it is essential that all relevant agencies participate in the development of an emergency plan. Although disruption of electrical service poses some unique situations that require special consideration, power outage planning should be viewed as part of a community's general emergency planning efforts.

Legal and Regulatory Requirements

Some of the solutions considered in planning for a municipal electric power disruption cannot be implemented without obtaining special legal and regulatory authority. Municipalities should engage legal counsel to ensure that all necessary authorizations are in place. Further, some actions could subject a municipality to liabilities. Proper legal measures should be in place to address these liabilities.

Coordination with ComEd

The preparation of a municipal electric power disruption plan should be coordinated with ComEd. Many aspects of the plan require close cooperation between the municipality and the company. These issues should be worked out and agreed upon in advance — before a disruption occurs — to ensure an effective response effort.

Coordination with Other Municipal, County, and State Agencies

Several county emergency management agencies have issued guidance to municipalities for the preparation of emergency plans. This material follows state (i.e., Illinois Emergency Management Agency) and federal (Federal Emergency Management Agency) emergency planning guidelines. Any emergency plan that is prepared by a municipality to deal with power outages should be consistent with these guidelines.

10 MAINTENANCE OF SECURITY

The security items that need to be addressed by municipalities are discussed in this section.

Security Awareness and Procedures

Municipal employees who deal with electric power infrastructure issues need to develop an awareness of security concerns. The most important aspect of security is raising the awareness of individuals. Municipal employees who are sensitized to the need to protect information are the best defense against inappropriate disclosure. To assist these employees in maintaining appropriate levels of security, standard operating procedures need to be developed and implemented, and employees need to be trained in the application of these procedures.

Physical Security

Municipalities need to provide physical security for the equipment used in electric power disruption events. Backup generators, portable generation equipment, and other emergency response equipment must be secured from access by vandals or criminals. Keeping equipment safe from intentional damage requires the institution of appropriate physical security measures (e.g., locked enclosures, alarm systems).

Information and Cyber Security

The information on electric power infrastructure assurance, including critical facilities, power-outage-sensitive individuals, potential vulnerabilities, and protective measures, is sensitive — from a privacy perspective as well as a security perspective. It is essential to protect this information from release to unauthorized individuals.

The security of computer systems that contain sensitive information is also important, especially in light of the increasing number of incidents involving hackers and viruses. Such incidents can damage data or result in unauthorized access. Information on critical facilities, power-outage-sensitive individuals, and vulnerabilities is especially sensitive and must be protected by using appropriate information technology security measures (e.g., passwords, firewalls).

APPENDIXES

APPENDIX A: GLOSSARY

This appendix contains a glossary of terms used in the electric power system. Much of the information was taken from material made available by ComEd.

Alternating Current (AC)
An electric current that reverses direction at regular intervals. *See Direct Current*.

Ampere, amp (A)
A unit of measure for the electrical flow in a conductor. An amp is the fundamental unit of electric current. *See Watt for relationship between current and power*.

Base Load Units
Electrical generators designed to operate at almost constant power output levels throughout the day and to serve the minimum, or "base load," of the electric system. *See Peaking Units*.

Bulk Power System
The high-voltage transmission lines that deliver large quantities of electric power from power plants and interconnected utilities.

Bus
A common connection point in an electric system. A physical bus consists of a bar or tube of copper or aluminum that connects multiple pieces of equipment or circuits.

Cable
Insulated conductors used in underground systems. A conductor is a wire or combination of wires that carry electric current.

ComEd uses several types and sizes of cable in its underground transmission and distribution system. The kind of cable used in a certain area depends on several factors, including location, purpose, and the amount of load it can carry. Load refers to the amount of electricity flowing on the system.

Cables are normally classified according to the following characteristics: (1) voltage rating; (2) number, size, and type of conductor; (3) type of insulation; and (4) type of sheath and/or protective jacket.

Most of the cables in Chicago are insulated with oil-impregnated paper and are bound together as one cable, covered with a lead sheath. Other cables, also used in suburban locations, are insulated with either an extruded plastic insulator or a synthetic rubber compound. Both types of cable have a stranded concentric neutral conductor and are covered with a tough plastic jacket for mechanical protection. *See Concentric Cable, Lead Cable.*

Capability

The maximum load that a generating unit, generating station, or other item of electrical equipment can carry for a designated amount of time without exceeding approved limits and subsequently causing equipment damage and/or going out of service permanently. *See Emergency Rating*.

Capacity

The amount of electric power required to operate an electric system.

Capacitor

A device that maintains the voltage of transmission and distribution lines. Capacitors are usually mounted on poles or in substations.

Circuit

A conductor or a system of conductors through which electric current flows. *See Distribution Line, Feeder*.

Circuit Breaker

A switch located in a substation that is used to connect and disconnect electric circuits. Circuit breakers operate automatically to de-energize or disconnect power to a circuit when faults occur, thus protecting the system, equipment, and possibly the public. They can also be operated manually to isolate electric lines or equipment for maintenance or repair work. Circuit breakers on the electric system perform the same function as household circuit breakers.

Co-generator

A generating facility that produces electricity and another form of energy such as heat or steam for industrial, commercial, heating, or cooling purposes.

Community Transformer Location (CTL)

A designation used by ComEd for the distribution system. A CTL provides electric service to multiple customers.

Concentric Cable

Used primarily in suburban locations, concentric cables are insulated with either an extruded plastic insulator or a synthetic rubber compound. The primary components of concentric cable include the conductor, conductor shielding, insulation, insulation shielding or semiconductor, concentric neutral wires, and jacket. *See Cable*.

Conductor
The overhead wires on the system, or furthest inner layer of an underground cable that carries electric current. The conductor is constructed of either aluminum or copper. Most new overhead applications are aluminum, while the majority of conductors in existing underground construction in Chicago are copper. *See Conductor Shield, Insulation, Stranded Conductor.*

Conductor Shield
A semiconductive material that is wrapped evenly around the conductor to smooth out electrical stresses. *See Conductor, Insulation, Solid Conductor.*

Connection
The physical connection between two electrical units or systems that allows the transfer of electric energy.

Control Cables
Electric cables used to control equipment, data transmission, metering, and voice communications throughout the power system.

Current
The rate at which electricity flows; it is measured in amps.

Demand
The rate at which electrical energy is delivered to or by a system.

Demand-side Management
Utility programs that shift electricity demand to reduce peak loads or make more economic use of utility resources.

Direct Current (DC)
An electric current of constant direction. *See Alternating Current*.

Distribution Center
A substation designation used by ComEd for the distribution system. Distribution centers convert or “step down” (decrease) 34,000-volt power lines or cables to 12,000 or 4,000 volts.

Distribution Line
The overhead conductors or underground cable that feeds distribution transformers, which, in turn, supply power to customers. Distribution lines are also called primary distribution lines or feeders. *See Circuit, Feeder*.

Distribution System
A system of overhead power lines, underground cables, transformers, and many other types of electrical equipment used to deliver power to customers. In the ComEd system, the primary distribution voltages are 4,000 and 12,000 volts.

Distribution Transformer
A transformer that converts electrical energy from a primary distribution circuit to a secondary distribution circuit or customer's service circuit.

Electric Service Station (ESS)
A substation designation used by ComEd for the distribution system. An ESS provides electric service to one customer.

Electrical Stress
A power line or cable that carries a load that is beyond its designated capacity limits.

Emergency Rating
The maximum capacity for electrical equipment. *See Capability*.

Energy
Power supplied over time, usually measured in kilowatt-hours.

Fault
A short circuit. An unintentional electrical connection between conductors, or conductors and ground, that results in high currents.

Feeder
The main backbone of the distribution system that typically consists of three primary electrical conductors. Subordinate lines are often connected to these main lines. *See Circuit, Distribution Line*.

Fossil-fueled Power Plant
A large electric power generating facility that uses fossil fuels (coal, oil, or natural gas) as its primary source of energy.

Fuse/Fuse Cutout
A device that protects the electric distribution line from faults. Fuse/fuse cutouts are similar to fuse boxes found in homes. Utility fuses, however, “blow” with a loud noise.

Generating Capacity
The ability of a power plant to produce a given output of electrical energy at an instant in time; it is measured in kilowatts or megawatts.

Generation Station Switchyard
A substation designation used by ComEd for the transmission and distribution system. The yard can contain transformers, circuit breakers, buses, and disconnect switches.

Generator
A large rotating electrical machine, driven by a turbine in a power plant. Generators produce electric power for the bulk system.

Gigawatt (GW)
A unit of electric power equal to 1 billion watts or 1,000 megawatts.

Gigawatt-hour (GWh)
One billion watt-hours.

Grid
A network of high- or low-voltage, interconnected circuits along which electrical energy flows. *See Transmission Grid*.

Ground
An object that makes an electrical connection with the earth.

Insulator
Equipment that supports conductors and offers high resistance to electric current. Insulators are used to isolate equipment carrying electrical current from other equipment or facilities. There are several types of insulators, most of which are made of porcelain or plastic resin.

Insulation
Applied over the conductor shield, insulation confines the electric field caused by the voltage on the energized conductor in the cable. *See Conductor, Conductor Shield*.

Insulation Shield
Also called "semi-conductor," or "semi-con," an insulation shield is a layer made of an electrically conductive material applied to the outer part of the insulation. The shield provides a smooth, continuously grounded surface for the insulation so that the electrostatic field is confined uniformly. *See Insulation*.

Joint
A connection between two insulated cables. *See Splice*.

Kilovolt (kV)
A measure of electric voltage equal to 1,000 volts, (for example, 138 kV = 138,000 volts).

Kilovolt-ampere (kVA)
A measure of apparent electric power (voltage x current) used for transformer ratings and other equipment ratings.

Kilowatt (kW)
A measure of real electric power: 1 kW = 1,000 watts.

Kilowatt-hour (kWh)
The energy produced in 1 hour by 1 kilowatt of electric capacity.

Lead Cable
The most widely used cable in Chicago. It is insulated with paper, in the form of tape, which winds over the conductor and is then impregnated with oil. *See Cable*.

Load
The amount of electric power delivered or required at any specific time to meet customer demand. *See Load Demand*.

Load Demand
The maximum level of electric power required to meet customer needs. *See Load.*

Low-voltage Network
An interconnected set of transformers and low-voltage cables designed to provide uninterrupted service when one or more elements are disconnected or inoperable. Voltage ranges between 120 and 480 volts.

Manholes
Enclosures that protect underground cable or equipment while allowing access to ducts for cable pulling and splicing. The shape and construction of manholes vary depending on the location, soil conditions, and the number of conduits. Manholes are usually constructed with concrete and/or brick. Some manholes include telephone or other communication cables in conjunction with ComEd cables.

Megavolt-ampere (MVA)
A measure of apparent electric power: 1 MVA = 1,000 kVA.

Megawatt (MW)
A measure of real electric power: 1 MW = 1,000 kilowatts or 1 million watts.

Megawatt-hour (MWh)
One million watt-hours.

Merchant Plant
An electrical generator designed to sell electricity into a wholesale electricity market rather than under the rules governing a monopoly electric utility, which provides electricity to a designated service territory. Merchant plants may be either base load or peaking units.

Meter
A device that measures how much energy a customer consumes, typically measured in kilowatt-hours.

Neutral
A device that helps stabilize imbalanced current on some three-phase circuits. It is normally connected to the ground.

Nuclear Power Plant
A large electric power generating facility that uses nuclear fuel as its source of energy.

Oil-filled Transformer
A transformer that uses oil for electrical insulation and cooling. The transformer consists of a core and its windings immersed in a tank filled with insulating oil. The top of the tank is fitted with porcelain bushings through which connections are made to the windings. *See Transformer*.

Oil-impregnated Paper
The most commonly used insulation on cable in Chicago. Paper insulation has many advantages, including high dielectric strength, low power factor, and economical cost. The main disadvantage is its susceptibility to moisture, which is why a solid metallic sheath, usually made of lead, is placed over the outer layer of paper for further protection. *See Cable, Insulation, and Sheath*.

Outage
Loss of electrical service because of an out-of-service transmission or distribution power line or equipment.

Peak Demand
The maximum load during a specific amount of time.

Peaking Units
Electrical generators that operate only during periods of high daily, weekly, or seasonal load. During off-peak periods, they are either reduced in power output or shut down. *See Base Load Units*.

Pole
A structure that supports overhead conductors and equipment at distances that are safe and above the ground, buildings, and traffic. They are mainly constructed of wood, although concrete, aluminum, steel, and fiberglass poles are practical for overhead distribution because of their durability, light weight, adaptability with other equipment, and suitability for climbing by qualified utility employees.

Power
The instantaneous current being delivered at a given voltage, measured in kilowatt-hours.

Primary Distribution Line
The electric distribution circuit operating at 2,400 to 34,000 volts. *See Distribution Line.*

Protective Relays
Devices installed at substations and on transmission/distribution lines, transformers, generators, and other electrical equipment to protect equipment by detecting abnormal conditions such as system faults, grounds, and other

problems. The relays usually operate circuit breakers to properly remove the equipment from service. Many types of relays protect ComEd equipment. *See Relays.*

Radial Circuit
A configuration for supplying electric power that involves a transmission line or a primary distribution line extending from a substation to connected customer loads, without an alternate path of supply to the end of the circuit.

Rating
The conditions specified by a manufacturer that define the safe operating limits of electrical equipment. Ratings usually include voltage, power, and temperature and are listed on the equipment nameplate.

Recloser
A switch designed to open and close a circuit automatically. A recloser opens a circuit when a fault is detected to protect equipment, then recloses the circuit after a short delay. If the fault persists, the recloser operates a predetermined number of times then locks open and must be manually reset.

Redundancy
Provision of duplicate or backup equipment to operate in case of a failure.

Relay
An electromechanical, solid-state (electronic), or digital device that responds to an operating signal to open or close electrical contacts to produce an effect on another circuit, such as a circuit breaker. *See Protective Relays*.

Renewable Energy
A source of energy that is constantly replenished through natural processes, such as sunlight, moving water, and wind, to generate electricity.

Residential Service Drop
Wires that run from the utility pole to a customer's house, usually two 120-volt lines and a neutral line, from which the customer can obtain either 120 or 240 volts of power.

Riser
The assembly required to connect the overhead equipment to the underground electric system. A riser also refers to the configurations of cable and equipment used to distribute power throughout a high-rise building.

Secondary Line
The electric distribution circuit on the low-voltage side of a transformer. Voltage ranges between 120 and 480 volts.

Service Territory
The state, area, or region served by an electric utility.

Sheath
A metallic layer covering or sealing the internal components of a cable. Used mainly on paper-insulated cables, sheaths are often constructed of lead, although copper strands are becoming more common. *See Cable*.

Solid Conductor
A conductor constructed of a single, solid strand of copper or aluminum. *See Conductor*.

Splice
A connection between cable sections. *See Joint.*

Stranded Conductor
A conductor constructed of several strands of wire twisted or braided together to form a single conductor. Stranded conductors are generally more flexible and stronger than single-wire conductors. *See Conductor*.

Substation
A power system facility containing electrical equipment used to interconnect the power grid, transform power to different voltages, and route it to the next portion of the electrical system. A substation usually includes circuit breakers, transformers, capacitors, and inductors, as well as a control building for relays and other monitoring and operating equipment. There are five general types of substations — generation station switchyard, transmission substation, transmission distribution center, distribution center, and electrical service station.

Supervisory Control and Data Acquisition (SCADA) System
A real-time computer-based system used to operate substation or power plant equipment from a remote location. The SCADA system usually utilizes telephone lines, microwaves, or fiber optics to communicate from the equipment to the control centers.

Switchgear
A unit that contains electric fuses and/or disconnect switches to facilitate distribution switching.

Switching
The act of reconfiguring the transmission/distribution system, either manually or automatically, to facilitate outage restoration efforts and system improvements. Switching is usually performed by opening and/or closing disconnect switches and circuit breakers.

Transformer
A device that helps transmit electrical energy over long distances by "stepping up" (increasing) or "stepping down" (decreasing) electrical pressure (voltage) to reach different users. Transformers range in size, depending on the voltage level being imported and exported. *See Oil-filled Transformer*.

Transformer Vault
A structure built of concrete or brick that houses transformers and switchgear for some residential and commercial areas.

Transmission Distribution Center (TDC)
A substation designation used by ComEd. TDCs convert 138,000 volts on the transmission side to 12,000 volts on the distribution side.

Transmission Grid
A network of high-voltage transmission lines along which electrical energy flows. The United States has three distinct electric power grids: the Eastern Interconnection, the Texas Interconnection, and the Western Systems Coordinating Council. *See Grid*.

Transmission Line
Any high-voltage line that operates at 69,000 volts or more.

Transmission Substation (TSS)
A substation designation used by ComEd. TSSs convert 765,000 volts to 345,000 volts, and 345,000 volts to 138,000 volts on the transmission side. Some TSSs convert 138,000 volts to 34,000 or 12,000 volts on the transmission side.

Transmission System
A system of overhead and underground high-voltage lines, substations, and electrical equipment used to deliver bulk power from generating facilities to local-area substations for subsequent distribution to customers at lower voltages. Transmission voltages in the ComEd system are 69,000, 138,000, 345,000, and 765,000 volts.

Voltage, Volts (V)
A measure of the pressure, or force, that transmits electricity. *See Watt for relationship between voltage and power*.

Voltage Reduction
An intentional reduction of system voltage.

Watt (W)
A fundamental unit of electric power. Volts multiplied by amps equal watts (1 V x 1 A = 1 W).

Watt-hour (Wh)

A unit of measure equal to 1 watt of power that is supplied to, or taken from, an electric circuit for 1 hour.

APPENDIX B: MODEL FRANCHISE AGREEMENT

This appendix contains a model agreement for municipalities granting a franchise to ComEd for operation of the electric power system within municipal borders. Many communities in the Chicago Metropolitan Area have adopted this model, usually with some modifications, as their governing agreement. Of special interest with regard to electric power disruption planning are Sections 1.6, 1.7, 1.15, 1.16, and 5.5.

Final 2/19/92

VILLAGE [CITY] OF _____

_____ COUNTY, ILLINOIS

ORDINANCE NO. _____

AN ORDINANCE AUTHORIZING COMMONWEALTH EDISON COMPANY
TO USE THE PUBLIC WAYS AND OTHER PUBLIC PROPERTY
IN CONJUNCTION WITH ITS CONSTRUCTION, OPERATION AND
MAINTENANCE OF AN ELECTRIC SYSTEM IN AND THROUGH THE
VILLAGE [CITY] OF _____, _____COUNTY, ILLINOIS

ADOPTED BY THE BOARD OF TRUSTEES [CITY COUNCIL]
OF THE
VILLAGE [CITY] OF _____

THIS _____ DAY OF _____, 19 _____ [year]

Published in Pamphlet Form
by Authority of the Board of
Trustees [City Council] of the Village [City] of _____,
_____ County, Illinois,
this _____ day of _____ , 19 _____ [year].

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ORDINANCE NO. _____
AN ORDINANCE AUTHORIZING COMMONWEALTH EDISON COMPANY TO USE THE PUBLIC WAYS AND OTHER PUBLIC PROPERTY IN CONJUNCTION WITH ITS CONSTRUCTION, OPERATION AND MAINTENANCE OF AN ELECTRIC SYSTEM IN AND THROUGH THE VILLAGE [CITY] OF _____, _____COUNTY, ILLINOIS

Be it ordained by the President and Board of Trustees [City Council] of the Village [City] of _____ , County of _____ , Illinois, as follows:

SECTION 1. DEFINITIONS

As used in this Ordinance, the following terms, phrases and words and their derivations shall have the meanings given in this Section, unless the context or use clearly indicates another or different meaning is intended.

1.1 **"City"** is the City of _____. ["Village" is the Village of _____.]

1.2 **"Licensee"** is the Commonwealth Edison Company.

1.3 **"Clerk"** is the Clerk of the Village [City] of _____.

1.4 **"Competent Authority"** means and includes any governmental body or forum vested by law with authority to do the act make the order, rule or regulation involved.

1.5 **"Corporate Authorities"** is the President and Village Board [the Mayor and City Council] of the Village [City] of _____.

1.6 **"Edison Representative"** is the person or persons designated by the Licensee to be responsible for the day-to-day performance of the Licensee's duties under this Ordinance and who shall be available and accessible to the Village [City] for that purpose during regular office hours.

1.7 **"Edison Emergency Representative"** is the person or persons designated by the Licensee to be responsible for the performance of the Licensee's duties under this Ordinance during emergencies and at all times other than the Licensee's regular office hours and who shall be available and accessible to the Village [City] for that purpose during emergencies and at all times other than the Licensee's regular office hours. The Edison Representative may also be designated as the Edison Emergency Representative.

1.8 **"Electric System"** shall mean a system for the production, transmission, distribution and sale of electricity for lighting, heating, power and other purposes within and outside the corporate limits of the Village [City].

1.9 **"Energy Efficiency/DSM"** means applications of technologies and techniques for increasing the efficiency of electric energy use or managing demand for electric energy. Such applications may be designed to achieve greater end use benefits from electric energy consumed, reductions in electric energy consumption, shifts of electric energy demand to times when it can be met more economically, or other initiatives designed to manage or reduce demand for electric energy.

1.10 **"FERC"** means and refers to the Federal Energy Regulatory Commission or other authority succeeding to the regulatory powers of the Federal Energy Regulatory Commission.

1.11 **"Generating Facilities"** are those Facilities used or constructed by the Licensee for the purpose of generating or producing electric energy.

1.12 **"High Voltage Transmission Lines"** means power lines designed to transmit electricity at 138 kilovolts (138 kV) or more.

1.13 **"ICC"** means and refers to the Illinois Commerce Commission or other authority succeeding to the regulatory powers of the Illinois Commerce Commission.

1.14 **"Liability"** includes, but is not limited to: actual or claimed loss or damage to property or injury to or death of persons; actual or claimed responsibility for such loss, damage, injury or death; and any and all judgments, decrees, costs and expenses of every sort and kind incident to such loss, damage, injury, death or responsibility, including, but not limited to, court costs, fines and attorney's fees.

1.15 **"Municipal Electric Representative"** is the person or persons designated by the Village [City] to be responsible for the day-to-day implementation of this Ordinance on behalf of the Village [City] during regular office hours.

1.16 **"Municipal Emergency Electric Representative"** is the person or persons designated by the Village [City] to be responsible for the implementation of this Ordinance on behalf of the Village [City] during emergencies and at all times other than the Village's [City's] regular office hours.

1.17 **"Other Ways"** means rights-of-way within the Village [City] that are under the jurisdiction and control of a governmental entity other than the Village [City].

1.18 **"Overhead Distribution Facilities"** are poles, wires, cables and other overhead apparatus used in the distribution of electricity not to exceed 14,000 volts.

1.19 **"Overhead Facilities"** are Transmission and Distribution Utility Facilities located on or above the surface of the ground, including the underground foundations or supports for such facilities.

1.20 **"Person"** means one or more individuals, associations, firms, partnerships, trusts, private corporations, municipal corporations, receivers, or trustees.

1.21 **"Public Property"** means all real property and all improvements thereon, owned, leased to, leased by or otherwise controlled by the Village [City].

1.22 **"Public Ways"** means the surface, the air space above the surface and the area below the surface of any public right-of-way, including, but not limited to, any street, highway, avenue, drive, boulevard, lane, path, alley, sidewalk, waterway, bridge, tunnel, park, parkway or other public right-of-way including public utility easements or rights-of-way over which the Village [City] has jurisdiction, and any temporary or permanent fixtures or improvements located thereon now or hereafter held by the Village [City] in which the Village [City] holds rights sufficient, without consent of any other Person, to permit Licensee the use thereof for the purpose of installing or maintaining Licensee's Electric System.

1.23 **"Transmission and Distribution Facilities"** include all lines, equipment and structures used in the transmission, distribution or sale of electric energy, wherever located. Transmission and Distribution Facilities include High Voltage Transmission Lines.

1.24 **"Underground Facilities"** are Transmission and Distribution Facilities located under the surface of the ground, excluding the underground foundations or supports for Overhead Facilities.

1.25 **"Utility Facilities"** are and refer to and include, but are not limited to, property, land, structures, equipment, plants, works, systems and improvements of the Licensee, such as pipes, electric substations, conduits, wires, transformers, cables, poles and meters, used in the production**,** transmission, distribution or sale of electricity within the Village [City]. "Utility Facilities" includes all Generating Facilities, Transmission and Distribution Facilities, Overhead Facilities and Underground Facilities.

SECTION 2. RULES OF CONSTRUCTION

This Ordinance shall be construed in accordance with the following provisions.

2.1 When not inconsistent with the context, words used in the present tense include the future tense, words in the plural number include the singular number, and words in the singular number include the plural number.

2.2 The words "shall and "will" are mandatory and the word "may" is permissive.

2.3 The provisions of this Ordinance shall be read as a whole so as to effect the purposes of this Ordinance.

2.4 Section headings are descriptive and used merely for the purpose of organization. Where inconsistent with the text, section headings are to be disregarded.

SECTION 3. RIGHTS GRANTED

3.1 **Grant of Right to Use Public Ways and Public Property.** The Village [City] hereby grants to the Licensee the right, permission and authority to construct, operate and maintain in and through the Village [City] its Electric System and to construct, operate and maintain all such Utility Facilities as may be necessary or convenient for such Electric System, in, upon, along, over, across, above and under the Public Ways and Public Property in the Village [City], for the period of time and upon the terms and conditions hereinafter specified.

3.2 **Emergency Access to Public Ways and Public Property.** In the event of an emergency which the Licensee reasonably believes poses a threat of immediate harm to the public or to any of the Utility Facilities, the Licensee is hereby granted access to the Public Ways and Public Property, without a permit, to ameliorate the threatened harm. The Licensee shall promptly advise the Village [City] of the emergency.

3.3 **Exemption from Parking Restrictions.** While used in the course of installation, repair and maintenance work on the Utility Facilities, Licensee's vehicles shall be exempt from parking restrictions of the Village [City].

SECTION 4. CONDITIONS OF GRANT

4.1 **Construction and Location of Facilities.**

4.1.1 The Licensee or any Person acting on its behalf may construct, repair, maintain, renew or replace Utility Facilities located in the Public Ways, on Public Property, or on Other Ways, subject to the following conditions:

4.1.1.1 The Licensee shall obtain a permit in accordance with the applicable ordinances of the Village [City]. The Licensee shall include with its permit application such plans and schedules for restoration of the Public Ways or Public Property as the Village [City] may require by ordinance.

4.1.1.2 The Licensee shall obtain all necessary approvals from any Competent Authority for the performance of said work, and such work shall be performed in accordance with the plans and specifications approved or prescribed by Competent Authority.

4.1.1.3 Except as provided in this Ordinance, neither the Licensee nor any Person acting on its behalf shall take any action or allow any action to be done which may impair or damage the Public Ways, any property located on the Public Ways, or the Public Property

4.1.1.4 Neither the Licensee nor any person acting on its behalf may interfere unreasonably with the use of the Public Ways or Public Property by the general public or by other Persons authorized to use or be present upon said Public Ways or Public Property.

4.1.1.5 The Licensee shall provide reasonable notice to the Village [City] before beginning any work in Other Ways within the Village [City].

4.1.1.6 To the extent practicable, the Licensee shall notify the Village [City] of plans to undertake any construction, repair, maintenance or replacement of Utility Facilities in conjunction with the annual planning meeting provided for in Section 7.8. This notice shall be in addition to any other notice requirements imposed by other applicable ordinances. The notice requirements of this paragraph do not apply to the installation of lateral service connections to individual customers.

4.1.1.7 In the event of an emergency, if prior acquisition of formal authorization is not possible, the Licensee or any Person acting on its behalf may undertake the work described above without first acquiring formal authorization, provided that the Licensee uses its best efforts to contact the Municipal Emergency Electric Representative prior to performing such work and provided further that the Licensee shall apply for such formal authorization at the earliest reasonable opportunity.

4.1.2 All Transmission and Distribution Facilities erected hereunder shall be placed in alleys wherever practicable so to do, and shall be so placed, wherever located, so as not to interfere unnecessarily with travel on or access to the Public ways.

4.1.3 Unless specifically permitted by the Village [City], all Utility Facilities erected under this Ordinance shall be located so as not to injure any drains, sewers, catch basins, water pipes, pavements or other public improvements.

4.1.4 All poles shall be of sufficient length to be anchored substantially in the ground and to extend to a height of at least 25 feet above the surface. Poles shall be adequately braced wherever necessary.

4.1.5 All wires, conductors, transformers and other apparatus that are attached to utility poles shall be at a sufficient height to preclude interference with free use of the Public Ways.

4.1.6 Prior to filing any application with a Competent Authority for the construction of any Generating Facilities or High-Voltage Transmission Lines within the corporate limits of the Village [City], the Licensee shall meet with the Village [City] to discuss such plans.

4.1.7 Any Utility Facilities in the Public Ways that have been, or are at any future time acquired, leased or utilized in any manner by the Licensee are thereupon to be deemed authorized by and shall be subject to all the provisions of this Ordinance.

4.1.8 Except as otherwise provided herein, the Licensee shall not be required to change the location, the height above, or the depth below the Public Ways of those Utility Facilities in place as of the effective date of this Ordinance.

4.2 <u>Relocation or Removal of Facilities</u>.

4.2.1 Upon receiving at least 30 days notice from the Village [City], the Licensee shall, at its own expense, temporarily or permanently remove, relocate, change or alter the position of any Utility Facilities in Public Ways or Public Property whenever the Corporate Authorities shall have determined that such removal, relocation, change or alteration: (1) is reasonably necessary for the construction, repair, maintenance, improvement or use of such Public Ways or Public Property; (2) is reasonably necessary for the location, construction, replacement, maintenance, improvement or use of other property of the Village [City]; or (3) is reasonably necessary for the operations of the Village [City]. The Village [City] agrees to engineer the projects in the Public Ways and Public Property either so as not to require any such removal, relocation, change or alteration or, if that is not reasonably feasible, so as to minimize the Licensee's expenses in making such removals, changes or alterations. The Licensee will not be responsible for the expense of removals, relocations, changes or alterations required by the Village [City] primarily for the purpose of assisting either private projects or a municipal electric utility.

4.2.2 Whenever it shall be necessary for the Village [City] or any other Person to move along or across the Public Ways, any vehicle, equipment, structure or other object of such height or size as will interfere with any of the Licensee's Overhead Facilities, the Licensee shall temporarily remove such Overhead Facilities from such place as must necessarily be crossed by such vehicle, equipment, structure or other object, provided that: (1) the Licensee shall receive at least 24 hours notice thereof from the Village [City] Electric Representative; (2) the Licensee shall have received payment for such removal, where payment is required; and (3) such temporary removal shall be done at such time of the day or night as will least interfere with the Licensee's use of such wires and poles for the benefit of the inhabitants of the Village [City] and the successful operation of the Licensee's Electric System. It is understood that the Licensee shall bear the expense of any such temporary removals for projects being undertaken by or for the benefit of the Village [City] or its agent and that the expense of all other such temporary removals shall be borne by the Person requesting such removal. All questions as to the time when any of said wires and poles shall be so cut, removed or adjusted for the purpose aforesaid shall be decided by the Municipal Electric Representative, and such decision shall be final.

4.3 **Restoration of Public Ways or Public Property**

4.3.1 When the Licensee, or any Person acting on its behalf, does any work in or affecting the Public Ways or Public Property, it shall, at its own expense, remove any obstructions therefrom and restore such Public Ways or Public Property to as good a condition as existed before the work was undertaken, unless otherwise directed by the Village [City].

4.3.2 If weather or other conditions do not permit the complete restoration required by this paragraph, the Licensee may temporarily restore the affected Public Ways or Public Property upon receiving the approval of the Village [City] Electric Representative, provided that such approval shall not be unreasonably withheld. Such temporary restoration shall be at the Licensee's sole expense and the Licensee shall promptly undertake and complete the required permanent restoration when the weather or other conditions no longer prevent such permanent restoration.

4.3.3 Upon the request of the Village [City], the Licensee shall restore the Public Ways or Public Property to a better condition than existed before the work was undertaken, provided that the Village [City] shall bear any additional costs of such restoration.

4.3.4 If the Licensee fails to restore the Public Ways or Public Property or to remove any obstruction therefrom, as required by this paragraph, the Village [City] may, after communications with the Edison Representative and after affording the Licensee a reasonable opportunity to correct the situation, give seven days written notice to the Licensee, and thereafter restore such Public Ways or Public Property or remove the obstruction therefrom. No such prior written notice shall be required in the event that the Village [City] determines that an emergency situation exists. The Licensee shall pay the Village [City] for any such restoration or removal within 14 days after receiving a bill from the Village [City] for such work.

4.4 **Trimming of Trees and Vegetation.** From time-to-time, when the Licensee believes it to be warranted by existing conditions, the Licensee shall, at its own expense, cause the trees and vegetation growing upon or overhanging any of the Public Ways or Public Property in the Village [City] where Utility Facilities are erected to be trimmed in such a manner that there shall be a proper clearance between the nearest wires or equipment and any portion of the trees or vegetation. The trees and vegetation shall be trimmed so that no branches, twigs or leaves come in contact with or in any way interfere with said Utility Facilities. The Licensee shall notify the Village [City] Electric Representative no less than seven days before it plans to perform such work. The Village [City] Electric Representative shall approve the time, place and manner of performing such work.

4.5 **Tree Location Program**

4.5.1 **Tree Removal and Replacement.** The Licensee and the Village [City] agree to develop a cooperative program for the removal and replacement of certain municipally owned trees located in the Public Ways or on Public Property which conflict or potentially conflict with the Overhead Facilities. The trees to be removed and replaced shall be designated by the Village [City] after consultation with the Edison Representative. Within 30 days after receipt of a written notice from the Village [City] of trees to be removed, the Licensee shall schedule a removal date acceptable to the Village City], and shall remove the designated trees and dispose of all tree brush except that the Village [City] shall dispose of stumps and logs over four inches in diameter. The Village [City] shall purchase, plant and maintain all trees planted pursuant to the tree removal and replacement program, and the Licensee shall reimburse the Village [City] for one-half of the Village's [City's] cost of tree replacement, up to a maximum amount of $125 per tree. The reimbursement shall be made to the Village [City] within 60 days after the Licensee's receipt of a written request for reimbursement.

4.5.2 **Tree Selection.** The Village [City] agrees to implement a policy for the purpose of regulating tree planting on the Public Ways or Public Properties so as to allow only such low-growing tree species as will not attain a mature height that will conflict with primary electrical lines and thereby require line clearance maintenance. Such policy shall not preclude planting upright, columnar or pyramidal shaped trees to the side of power lines, thereby avoiding the need for severe and disfiguring line clearance tree trimming.

4.5.3 **Tree Location.** The Village [City] agrees that it will attempt to locate new trees and other new vegetation on the Public Ways and Public Property so as to minimize contact with Utility Facilities.

4.5.4 **Duration of Program.** The Tree Location Program provided for in the foregoing paragraphs shall remain in effect for the first 10 years of this Agreement, after which it shall be renewed on terms that are mutually agreeable.

4.6 **Use of Utility Facilities.** The Licensee shall, when requested by the Village, (1) permit its Overhead Facilities to be used for the suspension and maintenance of wires and (2) permit its Underground Facilities to be used for the running and maintenance of wires, both as may be reasonably required either by the Village [City] or by other Persons holding a valid municipal license or other valid authorization to use the Public Ways or Public Property. Except as provided in the following sentence, the Village [City] shall be entitled to make such use without charge. Such use by other Persons, and such use by the Village [City] for a proprietary purpose, shall be

subject to such terms and conditions, including fees, as the Licensee may reasonably require. Such use of the Utility Facilities shall be under the supervision and direction of the Licensee so as not to materially interfere with the Licensee's present or reasonably contemplated usage of the Utility Facilities. Such use may not be for the purpose of allowing any Person to transmit or distribute electricity. The Village [City] agrees to save and keep harmless the Licensee from any and all liability incurred by the Licensee as a result of the Village's [City's] use of the Utility Facilities pursuant to this paragraph. In no event shall the Village [City] be responsible for liability incurred by the Licensee as a result of the use of the Utility Facilities by other Persons.

4.7 **Removal of Facilities.** The Licensee shall promptly remove from the Public Ways and Public Property all above ground wires and the supports therefore whose use is abandoned and shall either promptly remove or board up or render reasonably unaccessible all other Utility Facilities whose use is abandoned or discontinued. The Licensee shall take reasonable steps to prevent any such non-removed Utility Facilities from becoming nuisances.

4.8 **Undergrounding of Facilities.** The Licensee will relocate its Overhead Distribution Facilities in or on Public Ways and Public Property in the Village [City], other than alleys, by placing the Overhead Distribution Facilities underground, or rerouting them if necessary, if so requested by the Village [City]. The Overhead Distribution Facilities to be placed underground or rerouted shall not exceed 500 feet annually and will be determined by the mutual agreement of the Licensee and the Village [City]; the agreement of the Licensee will not be unreasonably withheld. Scheduling of the requested work to be performed will be in accordance with the Licensee's normal work scheduling practices. The total cost for such work including, but not limited to, material, labor and overhead shall not exceed .40 percent of the revenues collected by the Licensee in the prior calendar year for electric service in the Village [City]; except that if, on or before November 15, 1991, the Licensee had made a written offer to the Village [City] to underground its Overhead Distribution Facilities at the rate of either 500 feet annually or 2,500 feet every five years, then the cost of such work shall not be subject to the foregoing limitation. The number of feet available to be undergrounded or rerouted in any year which are not utilized may be carried forward for utilization in future years.

SECTION 5. SERVICE CONSIDERATIONS

5.1 **Adequate Supply of Power.** The Licensee shall at all times take all reasonable and necessary steps to assure an adequate supply of electricity to its customers within the Village [City] at the lowest reasonable cost consistent with long term reliable supplies. The Licensee shall from time to time make such enlargements and extensions of its Facilities as are necessary to adequately provide for the requirements of the Village [City] and its residents.

5.2 **Duty to Provide Electricity.** The Licensee shall furnish electricity within the corporate limits of the Village [City] to the Village [City] and to the inhabitants thereof, and to any person or persons or corporation doing business in the Village [City]. All such electricity shall be furnished at the rates and under the terms and conditions as provided from time-to-time by the ICC.

5.3 **Nondiscrimination.** The Licensee shall not, as to rates, charges, service, facilities, rules, regulations or in any other respect, make or grant any preference or advantage to any corporation or person or subject any Person to any prejudice or disadvantage; provided that nothing in this grant shall be taken to prohibit the establishment from time to time of graduated scales of charges and classified rate schedules to which any customer coming within an established classification would be entitled.

5.4 **Maintenance of Facilities.**

5.4.1 Upon receiving at least 30 days notice from the Village [City], the Licensee shall, at its own expense, temporarily or All Utility Facilities shall be maintained in good condition.

5.4.2 All Utility Facilities shall be maintained in such a manner that they do not create hazardous conditions for the Public Ways or Public Property.

5.5 **Service Interruptions.**

5.5.1 The Licensee shall make all reasonable efforts to prevent power surges and interruptions of service. When power surges or interruptions occur, the Licensee shall reestablish service with the shortest possible delay consistent with general safety and public welfare.

5.5.2 The Licensee shall make all reasonable efforts to notify the Municipal Electric Representative or the Municipal Emergency Electric Representative of major service interruptions within the Village [City] within one hour after the Licensee learns of such interruption. If, at the time such notification is made, the Licensee is not able to provide an estimate of when service is expected to be restored, such information shall be provided to the Municipal Electric Representative or the Municipal Emergency Representative as it becomes available. A major service interruption is defined as: (1) an outage with an interrupted load of greater than 1,000 KVA and persisting for 15 minutes or more; or (2) any outage

with a significant impact, as such term may be defined by agreement between the Village [City] and the Edison Representative, lasting 15 minutes or more.

5.5.3 No less than 24 hours prior to beginning scheduled maintenance, scheduled repairs or other scheduled work on its Utility Facilities that may result in an interruption of electric service to customers in the Village [City], the Licensee shall make a good faith effort to provide written notice to potentially affected customers and to the Municipal Electric Representative of the scheduled time and estimated duration of the work. The Licensee shall make a good faith effort to notify potentially affected customers and the Municipal Electric Representative prior to performing any emergency work on its Utility Facilities that may result in an interruption of electric service to customers in the Village [City].

5.5.4 The Licensee shall keep records of interruptions affecting service within the Village [City]. An interruption will be considered as a failure of any portion of the system or equipment whereby the voltage is reduced to less than 50 percent of the standard voltage for a period longer than one minute, except that where automatic reclosing equipment is used only "circuit breaker lockout" shall be so considered, unless the ICC promulgates a rule or regulation setting forth a different standard for defining an interruption; provided that the Licensee shall notify the Village [City] of any docket opened by any Competent Authority that would change the standard, and provided further that the standard set forth herein shall remain in effect if the Competent Authority sets no standard by rule or regulation. The record shall show the date, time of day, duration, extent and cause of the interruption.

5.5.5 The Licensee shall also maintain records showing the average customer outage frequency and duration both within the Village [City] and for the Licensee's system as a whole.

5.5.6 Upon the request of the Village [City], but no less than once a year, the Licensee shall provide the Village [City] with reports providing the information contained in the records maintained pursuant to Sections 5.5.4 and 5.5.5.

5.5.7 On October 23, 1991, the Licensee filed with the ICC the rider set forth in Exhibit A hereto to provide for a service policy allowing customers whose electric service is interrupted because of an operating error or equipment malfunction for twelve or more consecutive hours to receive a credit against the monthly customer charge.

SECTION 6. ECONOMIC AND TECHNOLOGICAL PROVISIONS

6.1 **Technological Advances.** The Licensee shall investigate, develop and incorporate technological advances into its equipment and service in its sole discretion and subject to order of Competent Authority. Upon the request of the Village [City], the Licensee shall discuss such technological advances at the annual meeting provided in Section 7.8.

6.2 **Cogeneration and Small Power Production Facilities.** The Licensee shall provide, on a timely basis, such information as may reasonably be required for interconnection with the Licensee's system by the Village [City], if the Village [City] desires to develop a Qualifying Facility, and by any Person doing business in the Village [City] that desires to develop a Qualifying Facility related to its business in the Village [City]. A Qualifying Facility is a cogeneration facility or small power production facility which meets the criteria for qualification set forth in subpart B of 18 C.F.R. 292, as it may be amended from time to time.

6.3 **Demand Side Management.** The Licensee shall make systemwide expenditures in connection with the least cost planning process of $25,000,000 through 1996 in furtherance of its recognition of the Village's [City's] strong commitment to energy conservation and compliance by the Licensee with the least cost planning provisions of the Public Utilities Act. In addition, to the extent that Energy Efficiency/DSM programs are identified during the five year period described above that are cost-justified in the good faith judgment of the Licensee, the Licensee shall expend at least an additional $25,000,000 in the implementation of such programs. The Licensee shall implement cost-effective Energy Efficiency/DSM programs, consistent with the Licensee's least cost planning requirements as an integral part of the Licensee's provision of electricity to its customers. Examples of programs which the Licensee will consider for its Energy Efficiency/DSM program are home weatherization and the maintenance of appliances and air-conditioning systems at peak efficiency. The Licensee shall be required to implement only those Energy Efficiency/DSM programs that are approved by the ICC and for which the Licensee can recover from its customers (i) program costs, (ii) offsets for lost revenue and stranded investment (if any) resulting from such program and (iii) any appropriate return to the Licensee on such costs, lost revenues and stranded investments, as approved by the ICC. The Licensee shall provide the Village [City] with notice of the specifics of the Energy Efficiency/DSM programs within two business days of the ICUs acceptance of the Licensee's proposal for filing.

6.4 **Environmental Protection.** The Licensee shall make such efforts as it deems necessary to meet the standards required for its Utility Facilities in the Village [City] to meet applicable federal and state air and water pollution laws. Upon the request of the Village [City], the Licensee shall discuss such environmental matters at the annual meeting provided for in Section 7.9.

6.5 **Economic Sources of Power.** As part of its provision of electricity to the Village [City], the Licensee shall take efforts to obtain electric power from sources other than its Electric System, when it considers obtaining such power to be cost effective and as may be required by 83 I11.Admin.Code, Part 430, as it may be amended from

time to time. In connection therewith, the Licensee shall make such adjustments to its rates as required by the ICC.

SECTION 7. ADMINISTRATION

7.1 Representatives.

7.1.1 The Licensee agrees to maintain such local offices and facilities as it deems adequate for the purposes of providing repair and maintenance services and personnel available during office hours to address concerns the Village [City] might have regarding the provision of electric service and the administration of this Ordinance. The Licensee shall provide the Village [City] with the location and telephone number of the local office and the name and telephone number of the Edison Representative.

7.1.2 The Licensee further agrees to maintain such local offices and facilities as it deems adequate for the purposes of providing the Village [City] with 24-hour emergency service pertaining to the operation of the Utility Facilities. The Licensee shall provide the Village [City] with the location and telephone number of the local office, the name of the Edison Emergency Representative and the telephone number or numbers at which the Edison Emergency Representative can be reached 24 hours a day.

7.1.3 The Village [City] agrees to provide the Licensee with the name of the Municipal Electric Representative and the telephone number or numbers at which the Municipal Electric Representative can be reached during office hours.

7.1.4 The Village [City] agrees to provide the Licensee with the name of the Municipal Emergency Electric Representative and the telephone number or numbers at which the Municipal Emergency Electric Representative can be reached 24 hours a day.

7.1.5 The Village [City] and the Licensee agree that each one will promptly notify the other party in the event that any of the information required under the foregoing sections is changed, so as to keep such information current at all times while this Ordinance remains in effect.

7.2 Facilities Maps. Upon the request of the Village [City], the Licensee shall provide the Village [City] with a current map or set of maps, showing the location of all Utility Facilities installed in or under Public Ways within the corporate limits of the Village (City] provided that the Licensee shall not be required to prepare new maps to comply with this provision if no such maps exist.

7.3 Duty to Provide Information. The Licensee shall, from time to time, furnish such additional information as the Village [City] may reasonably deem to be necessary to enable it to determine whether the Licensee is complying or has complied with the provisions of this Ordinance. The Licensee shall not be required to provide information as to which it has a legal privilege to refuse to provide.

7.4 Disclosure of Documents or Information. The Village [City] agrees that no documents or information provided to the Village [City] by the Licensee in accordance with this Ordinance shall be made available to the public if such documents or information are exempt from disclosure under the provisions of the Freedom of Information Act or Section 5-108 of the Public Utilities Act, as such statutes may be amended from time to time.

7.5 Inspection of Facilities. The Licensee shall permit the Village [City], at reasonable times and upon reasonable notice, to inspect the Utility Facilities within the corporate boundaries of the Village [City] so as to determine whether the Licensee is complying or has complied with the provisions of this Ordinance.

7.6 Superintendent of Public Works. The Superintendent of Public Works, or such other person as the Corporate Authorities may designate from time to time, is hereby designated the official of the Village [City] having full power and authority to take appropriate action for and on behalf of the Village [City] to administer and enforce the provisions of this ordinance and to investigate any alleged violations or failures of the Licensee to comply with the provisions hereof or to adequately and fully discharge its responsibilities and obligations hereunder.

7.7 Notices

7.7.1 Notice to Village [City]. Unless otherwise specified herein, all notices from the Licensee to the Village [City] under this ordinance shall be made in writing and delivered to the [Name and title of person or persons] at the following address:

_____

7.7.2 Notice to the Licensee. Unless otherwise specified herein, all notices from the Village [City] under this ordinance shall be made in writing and delivered to the following representative of the Licensee at the address shown:

Director, Regulatory Affairs
Commonwealth Edison Company
P.O. Box 767
Chicago, Illinois 60690

7.7.3 Changes in Person or Place for Notification. In the event that either the Village [City] or the Licensee changes the person to whom written notices are to be directed or the address to which such notices are to be sent, the party making the change shall promptly notify the other party of such change in writing.

7.7.4 All notices shall be effective upon their receipt by the person or persons to whom they are directed.

7.8 **Coordination of Construction Activities.** The Licensee and the Village [City] agree to exercise their best efforts to coordinate to the extent practicable the timing of construction activities of each so as to minimize any public inconvenience that might otherwise occur. In conjunction with this goal, shortly after January 1 of each year, as agreed by the parties, the Licensee shall meet with the Village [City] and such other users of the Public Ways as may be invited by the Village [City] to discuss scheduling of construction in the Public Ways, in that calendar year.

7.9 **Annual Meeting.** No less than once a year, the Licensee shall attend a. meeting of the Corporate Authorities to provide a status report of the Licensee's activities within the Village [City] during the previous year, to outline its planned activities for the next year, and to answer questions the Corporate Authorities may have regarding the Licensee's performance under this Ordinance.

7.10 **Notice of Boundary Chances.** The Village [City] agrees to notify the Licensee in writing of any ordinance, statute or court or administrative action that causes a change in the Village's [City's] boundaries. Failure to give such notice excuses the Licensee both from non-compliance with this Ordinance and from the non-collection of municipal utility taxes within the area affected until such notice is given.

7.11 **Notice of Regulatory Changes.** In the event that either the ICC or the FERC opens a docket or proposes an administrative rule that (1) would directly affect the Licensee and (2) would, in the Licensee's opinion, be inconsistent with or change any provision of or duty under this Ordinance, the Licensee, within seven days of determining such inconsistency, shall notify the Village [City] of such docket or proposed rule and what it thinks is the inconsistency. The Licensee shall make a good faith effort to make such determination and to give such notice prior to the expiration of any intervention period or comment period.

7.12 **Notice of Actions Before Competent Authorities.** In the event that the Licensee becomes a party to any proceedings of Competent Authority that 1) would directly affect the Licensee and 2) would, in the Licensee's opinion, be inconsistent with or change any provision of or duty under this Ordinance, the Licensee, within seven days of determining such inconsistency, shall notify the Village [City] of such proceeding and what it thinks is the inconsistency. The Licensee shall make a good faith effort to make such determination and to give such notice prior to the expiration of any intervention period or comment period.

7.13 **Notice of Requests for Rate Changes.** The Licensee shall notify the Village [City] of any applications the Licensee may make to the ICC to effectuate any change in its rates, including the riders thereto. The notice shall be made in accordance with the notice provisions of this Ordinance, and shall be sent no later than two business days following the date on which the rate application is accepted for filing by the ICC. For each rate or charge affected by the application, the notice shall contain a statement of the existing rates or charges and all proposed rates or charges. If the proposed rates or charges are to be phased in over a period of time, the notice shall also contain a statement of the proposed rates or charges for each increment and the time period each incremental increase is to be in effect. Upon the written request of the Village [City], the Licensee shall send the Village [City] a copy of the complete application filed with the ICC. This provision shall not apply to applications filed solely for the purpose of effectuating municipal utility taxes.

SECTION 8. COMPENSATION

8.1 **Municipal Compensation.** The Licensee will during each calendar year throughout the life of the Ordinance, supply without charge to the Village [City] such an amount of electric energy as may be reasonably necessary for: (1) lighting and various other uses in municipal buildings solely occupied for municipal purposes and not for purposes of revenue (or such part thereof as may from time to time be so occupied) as may be identified as eligible for such electric. Energy by the parties; and (2) traffic signals. The foregoing arrangement shall be effective beginning with readings made after the date hereof of meters measuring electric energy for the above purposes at locations set forth in Exhibit B hereto. Exhibit B shall be amended from time to time during the term of this Ordinance so as to maintain a current list of the locations and traffic signals eligible to receive service under the terms of this section. None of said electric energy so to be supplied without charge to the Village [City] shall be used by the Village [City] for heating, street lighting, water pumping or other such power purposes. Nor shall any of said energy be resold for any purpose whatsoever.

8.2 **Waiver of Certain Fees and Charges.** The consideration provided to the Village [City] by this Ordinance shall be in lieu of: (1) any permit, license, inspection or other similar fees or charges imposed by the Village [City] upon Persons for use of the Public Ways; or (2) any permit or license fee imposed by the Village [City] upon any Persons for the operation of a business similar to that conducted by the Licensee.

SECTION 9. MUNICIPAL RIGHTS RESERVED

9.1 **Police Powers.** The Village [City] expressly reserves the right to adopt, from time to time, in addition to the provisions contained herein, such ordinances, rules and regulations as the Corporate Authorities may deem necessary in the exercise of the police power for the protection of the health, safety and welfare of the Village's [City's] citizens and their properties.

9.2 **Regulation of Public Ways and Public Property.** The Village [City] expressly reserves the right to enforce reasonable regulations concerning access to or use of the Public Ways or Public Property, as may from time to time be provided by ordinance, including requirements for permit applications.

9.3 **Municipal Acquisition of Facilities.**

9.3.1 **Purchase.** At any time while this Ordinance remains in effect, upon written notice from the Village [City] to the Licensee, the Village [City] may offer to purchase from the Licensee any or all of the Utility Facilities located within the Village [City], or any lesser interest thereof, free and clear of all mortgages and other liens in any manner provided for by law.

9.3.2 **Condemnation.** Nothing herein shall be deemed or construed to impair or affect, in any way or to any extent, the right of the Village [City] to acquire the property of the Licensee, either by purchase or through the exercise of the right of eminent domain, and nothing herein contained shall be construed to contract away or to modify or abridge, either for a term or in perpetuity, the Village's [City's] right of eminent domain.

9.3.3 **Continuation of Service.** In the event the Village [City] takes any action pursuant to this Section 9.3, the Licensee agrees that it shall continue to supply electric service within the Village [City] and shall continue to comply with the provisions of this Ordinance until the acquisition of the Utility Facilities has been finalized and the ICC has authorized the Licensee to discontinue service within the Village [City].

9.4 **Non-Exclusive Grant.**

9.4.1 Nothing in this Ordinance shall be construed to grant the Licensee an exclusive franchise to operate within the corporate limits of the Village [City].

9.4.2 The Village [City] reserves the right to make a similar use or grant a similar use in the Public Ways to any other Person. The Village [City] agrees to require all other contractors, subcontractors, franchisees, licensees and permittees in the Public Ways not to interfere unreasonably with the rights of the Licensee in the Public Ways.

9.5 **Right to Compete with Licensee.** Nothing in this Ordinance shall be construed as a waiver of the Village's [City's] rights to own and operate an electric utility in competition with the Licensee or to acquire any or all of the Licensee's Utility Facilities in such manner as may from time to time be provided by law.

9.6 **Small Power Production and Cogeneration.** The Village [City] expressly reserves the right to engage in the production of electric energy, both from conventional power plants and from cogeneration and small power production facilities.

SECTION 10. TERM AND TERMINATION

10.1 **Term.** The franchise granted by this Ordinance shall last for a term of 50 years from its effective date, except that, at the sole option of the Village [City], it may be terminated at the end of the 35th year, provided that the Village [City] notifies Edison in writing of its intent to terminate within the first three months of the 35th year.

10.2 **Acceptance.** The Licensee shall accept this Ordinance by filing with the Clerk an unconditional written acceptance hereof, to be duly executed according to law, along with proof of compliance required by Sections 14.2 and 14.3. The failure of the Licensee to so accept this Ordinance within 30 days of enactment shall be deemed a rejection hereof by the Licensee, and the rights and privileges herein granted shall absolutely cease and determine unless said period of time shall be extended by an ordinance duly passed by the Corporate Authorities for that purpose before the expiration of the 30 day period.

10.3 **Effective Date.** This Ordinance shall be in full force and effect upon the Licensee's filing of its acceptance as provided hereinabove or upon its passage and publication as required by law, whichever is later.

10.4 **Reopener.** At any time, but no more than once in any 10 year period, either party may require both parties to negotiate in good faith on any proposed amendment to this Ordinance. The subject of any proposed amendment shall be set forth in written notice.

10.5 **Amendments.** Except for the amendments to Exhibit B required under Section 8.1, no revision, modification or amendment of this Ordinance shall be effective unless it has been passed by the Corporate Authorities and accepted by the Licensee in writing.

10.6 **Renewal**. At any time during the first 60 days of the last year occurring prior to the expiration date of this Ordinance, Edison may request the Village [City] to enter into negotiations toward renewing or extending this Ordinance. Any renewal or extension shall be according to terms that are mutually agreeable and the Village [City] shall not be bound to accept any particular terms or to renew any or all of the rights granted by this Ordinance.

10.7 **Termination.** The rights and obligations of the Licensee under this Ordinance shall be terminated upon the end of the term of this Ordinance, or at the end of the 35th year if the Village [City] has exercised its option to terminate under Section 10.1, or upon the Licensee's forfeiture as provided in Section 11.

10.8 **Rights upon Termination.**

10.8.1 Upon any termination of its rights and obligations under this Ordinance, the Licensee shall not refuse to provide electric service to any potential customers within the Village [City] unless a petition for abandonment has been filed with and approved by the ICC.

10.8.2 Notwithstanding the termination of the Licensee's rights and obligations hereunder, by forfeiture or otherwise, the Licensee shall remain subject to all, other applicable regulations and authority of the Village [City], without limitation, as long as the Licensee continues to provide electrical service within the Village [City] or the Licensee's Utility Facilities remain in the Public Ways or on Public Property.

10.8.3 Any claims for indemnification for Liability incurred by the Village [City], its boards, committees, commissions, officers, agents and employees arising from any incidents that occurred on or before the termination of this Ordinance shall survive the termination, provided that such claims for indemnification are timely made.

SECTION 11. REMEDIES

11.1 Subject to the limitations in Sections 11.2, 11.3 and 11.4 below, in the event the Licensee or the Village [City] fails to fulfill any of their respective obligations under this Ordinance the Village [City] or the Licensee, whichever the case may be, will have claims for breach of contract and specific performance against the other in addition to any other remedy provided under this Ordinance or otherwise provided by law, except that no remedy that would have the effect of amending the specific provisions of this Ordinance shall become effective without such action as would be necessary to formally amend the Ordinance.

11.2 In the-event that the Licensee violates any terms of this Ordinance for conduct that is subject to the exclusive jurisdiction of a Competent Authority other than the Village [City], the sole remedy for such violation shall be before that other Competent Authority. For purposes of determining the applicability of this Section 11.2, no provision of this Ordinance may be used as the sole basis to defeat the exclusive jurisdiction of such Competent Authority.

11.3 In the event that the Licensee violates any term of this Ordinance for conduct that is also a violation of other applicable Village [City] ordinance, the Licensee shall be subject to remedies under that other ordinance plus ordinary contract remedies under this ordinance. Licensee shall not be subject to be fined under both Section 11.6 of this Ordinance and another ordinance of the Village [City] for the same conduct.

11.4 Subject to the limitation of Section 11.2, at the option of the Village [City], upon the finding by the Village [City] that the Licensee has failed or refused to observe any terms and conditions of this Ordinance, the Village may notify the Licensee in writing of the terms and conditions which it has not observed. The notice shall inform the Licensee of the actions which the Licensee must take to correct the violation and shall grant the Licensee a reasonable period of time to cure such failure or violation. In the case of an emergency, the notice need not be made in writing. If a Competent Authority other than the Village [City] has determined that the action giving rise to the Village's [City's] notice constituted a violation of an applicable rule, regulation or order of such Competent Authority, then the cure period granted by the Village [City] shall be no less than the cure period ordered by such Competent Authority. If the Licensee does not eliminate or correct such failure or violation in accordance with the notice, the Licensee's rights under this Ordinance may be forfeited or the Licensee may be subjected to any other remedies afforded by this Ordinance, including the assessment of fines.

11.5 In the event that a Competent Authority revokes or suspends any license, certificate or other authorization held by the Licensee for the purposes of either operating any portion of its Utility Facilities within the Village [City] or providing electrical service within the Village [City], then the Licensee's rights under this Ordinance shall likewise be revoked or suspended, without further notice from the Village [City]. The Licensee's rights under this Ordinance shall be reinstated (1) if the Competent Authority rescinds its revocation or suspension; (2) if the revocation or suspension order is overturned upon review by a Competent Authority; (3) if the Competent Authority reinstates the Licensee's license; or (4) if the suspension expires of its own terms. The original termination date of this Ordinance shall not be affected if the rights forfeited under this Ordinance are reinstated as-provided herein.

11.6 If, after failing to correct a violation of the terms and conditions of this Ordinance in accordance with the notice issued to the Licensee under Section 11.4, the Licensee is found guilty of violating any provision of this Ordinance for which the Village [City] is a Competent Authority, then the Licensee shall be fined not less than One Hundred Dollars ($100.00) nor more than Five Hundred Dollars ($500.00) for each offense, and a separate offense shall be deemed committed on each day during or on which a violation occurs or continues.

SECTION 12. NON-DISCRIMINATION AND EQUAL OPPORTUNITY

12.1 **Non-Discrimination.** The Licensee represents that it will not discriminate against any person employed or seeking employment with respect to hiring, promotion or tenure, or to terms, conditions or privileges of employment, on account of race, color, sex, religion, national origin or ancestry, including, without being limited to, any employment practice whereby the Licensee or any agency engaged or used by the Licensee makes inquiry with respect to the race, color, sex, religion, national original or ancestry of any applicant for employment by the Licensee.

12.2 **Affirmative Action.**

12.2.1 The Licensee shall make good faith efforts to expand opportunities for minorities and women in all areas of employment, including but not limited to: hiring, promotion, recruitment or recruitment advertising, compensation, and selection for training and apprenticeship.

12.2.2 The Licensee shall continue and expand its minority purchasing program and its efforts to promote and enhance contracting opportunities for minorities.

SECTION 13. LAWS, RULES AND REGULATIONS

13.1 **Compliance with Laws, Rules and Regulations.** While this Ordinance remains in effect, the Licensee shall promptly and fully comply with all applicable statutes, ordinances, judgments, decrees, orders, rules and regulations of any Competent Authority other than the Village [City] having jurisdiction over the Licensee's activities.

13.2 **Compliance with Municipal Ordinances, Rules and Regulations.** While this Ordinance remains in effect, the Licensee shall promptly and fully comply with all applicable orders, rules, regulations and ordinances of the Village [City].

13.3 **Violation of Laws, Rules and Regulations.** Any claim by the Village [City] that the Licensee has violated any provision of this Section 13, shall be subject to the procedures set forth in Section 11 of this Ordinance.

SECTION 14. INDEMNIFICATION, INSURANCE AND PERFORMANCE SECURITY

14.1 **Indemnification.** The Licensee shall indemnify, become responsible for and forever save harmless the Village [City], its boards, committees, commission, officers, agents and employees from any and all Liability incurred by them:

14.1.1 for loss or damage to property of the Licensee, its officers, agents, employees, licensees and invitees in the Public Ways or on Public Property pursuant to this Ordinance or for injury to or death of any such employee, agent or licensee while in the Public Ways or on Public Property pursuant to this Ordinance, however arising; and

14.1.2 arising directly or indirectly from any act or omission of the Licensee or any Person acting on its behalf done or claimed to have been done by virtue of or pursuant to this Ordinance or by virtue of or pursuant to order, rule, regulation or authorization by the ICC.

14.2 **Comprehensive Liability Insurance or Self-Insurance.** At all times while this Ordinance remains in effect, and in recognition of the indemnification provided in the foregoing Section 14.1, the Licensee shall, at its own cost and expense, maintain a program of third party liability insurance and/or self-insurance to protect the Village [City], its officers, employees and agents from any liability for bodily injury, death, and property damage occasioned by the activities of the Licensee under this Ordinance. As proof of compliance with this requirement, the Licensee shall, during the life of this ordinance, keep on file with the Clerk a certificate of insurance and/or an affidavit of self-insurance. Said certificate and/or affidavit shall show the types and amounts of coverage. Any affidavit of self-insurance shall be signed by an employee or officer of the Licensee who has knowledge of the Licensee's self-insurance program and is authorized to make representations as to the scope of said program, and shall contain a statement making such representations.

14.3 **Indemnification Security.** As security for the indemnification required in Section 14.1, the Licensee shall, during the life of this Ordinance, keep on file with the Clerk a good and sufficient bond in the penal sum of Five Thousand Dollars ($5,000.00) conditioned to protect and indemnify the Village [City] as provided in Section 14.1. Said bond shall be subject to the approval of the Corporate Authorities. The Village [City] reserves the right: (1) to require the Licensee to renew said bond whenever, in the opinion of the Corporate Authorities, such action may be necessary; and (2) to require the Licensee to increase the amount of said bond or to provide additional or other' security in the event said bond is insufficient to fully cover a claim made against it, provided that the amount of the increased bond does not exceed the total amount of the claim made against it, and provided further that the value or amount of such other or additional security does not exceed Five Thousand Dollars ($5,000.00) or the total amount of the claim made against the original bond, whichever is greater.

SECTION 15. MISCELLANEOUS PROVISIONS

15.1 **Transfer and Assignment.**

15.1.1 Except in the event of the merger, consolidation or reorganization of the Licensee, the Licensee shall not have the right to assign its rights and privileges under this Ordinance or to otherwise transfer it in any manner whatsoever, without the prior written approval of the Village [City], pursuant to an ordinance enacted by the Corporate Authorities.

15.1.2 In the event of a transfer or assignment of the Licensee's rights and privileges under this Ordinance, all provisions of this Ordinance which are obligatory upon, or which inure to the benefit of, the Licensee shall also be obligatory upon and shall inure to the benefit of any and all successors and assigns of the Licensee.

15.2 **Ordinance as Contract.** This Ordinance shall have the effect of and shall be a contract between the Village [City] and the Licensee and shall be a measure of the rights and obligations of the Village [City] as well as of the Licensee.

15.3 **Ordinance Requirements as Voluntary Undertaking.** The Licensee and the Village [City] understand that the general operations of the Licensee are under the jurisdiction of the ICC and the FERC. The Licensee has voluntarily agreed to perform the duties and obligations set forth in this Ordinance, provided that such performance does not violate any applicable regulatory standard or any applicable statutes, ordinances, or judgments or decrees of administrative or judicial tribunal.

15.4 **Scope of Ordinance.** No privilege or exemption is granted or conferred to Licensee by this Ordinance unless specifically provided herein. The permission and authority granted by this Ordinance are not intended to limit or modify any agreement, franchise, license or permit previously granted by the Village [City] to any other Person for the use or occupancy of the Public Ways, and the Licensee shall therefore exercise the rights granted by this Ordinance in such a manner as shall neither unreasonably interfere with the rights, nor endanger or impair the property, of other contractors, franchisees, licensees and permittees in the Public Ways. The Village [City] agrees to require other contractors, franchisees, licensees and permittees of the Village [City] to exercise their rights under such agreements, franchises, licenses and permits in such a manner as shall neither unreasonably interfere with the rights nor endanger or impair Utility Facilities of the Licensee located in the Public Ways.

15.5 **Expenses To Be Borne By Licensee.** Unless specifically provided to the contrary, the Licensee shall be responsible for procuring, through rates or otherwise, the revenues necessary to meet the expenses of its performance under and its compliance with this Ordinance.

15.6 **Most Favored Nations Provisions.**

15.6.1 In the event that the Licensee accepts from any Illinois municipality, other than the City of Chicago, an electric ordinance or amendments to an electric ordinance containing terms, conditions or provisions different from those contained in this Ordinance; or if any other arrangement is at any time made with any municipality other than the City of Chicago, the Licensee shall inform the Village [City] in writing of such fact and provide a copy of such ordinance or other arrangement to the Village [City]. If, within 90 days of such notice, the Village [City] adopts such other electric ordinance or other arrangement of such other municipality, the Licensee agrees it will accept such ordinance or other arrangement. In such event, the term of the new ordinance or arrangement will expire at the time the original ordinance or arrangement was scheduled to expire, unless otherwise agreed by the parties. Changes in the term of the ordinance or arrangement shall be subject to the provisions of this Section, unless the change in the term is for a period of more than 50 years.

15.6.2 In the event that the Village [City] grants any benefit to any other electric utility regarding the use of the Public Ways, such benefit shall be offered in writing to the Licensee, under the same terms and conditions, within 30 days after it has been granted to such other electric utility. If the Licensee requests the extension of the benefit to it, the Village [City] will take such steps as to provide such benefit to the Licensee under the same terms and conditions, including amending this Ordinance accordingly.

15.7 **Severability.** If any section, paragraph, clause or provision of this Ordinance shall be held invalid, the invalidity of such section, paragraph, clause, or provision shall not affect any of the other provisions of this Ordinance.

15.8 **Repealer.** All ordinances, resolutions or orders, or parts thereof, in conflict with the provisions of this Ordinance, or containing provisions granting any right, privilege or license to the Licensee or to any of its predecessor companies, including An Ordinance Authorizing Commonwealth Edison Licensee, Its Successors and Assigns, to Construct, Operate and Maintain an Electric Light and Power System in and through the Village [City] of _____, _____ County, Illinois, passed _____19_____, are hereby repealed. However, any claims for indemnification timely and properly made under that last named ordinance survive this repeal.

15.9 **Force Majeure.** The Licensee shall not be deemed in violation of this Ordinance for the delay in performance or failure to perform in whole or in part its obligations under this Ordinance due to strike, war or act of war (whether an actual declaration is made or not), insurrection, riot, act of public enemy, fire, flood or other act of God or by other events to the extent that such events are caused by circumstances beyond the Licensee's control and are not caused by negligence on the part of the Licensee or any Person acting on its behalf. In the event that the delay in performance or failure to perform affects only part of the Licensee's capacity to perform its obligations under this Ordinance, the Licensee shall perform such obligations to the extent it is able to do so in as expeditious a manner *as* possible. The Licensee shall promptly notify the Village [City] Electric Representative in writing of any event covered by this Section and the date, nature and cause thereof. Furthermore, the Licensee, in such notice, shall indicate the anticipated extent of such delay and the obligations under this Ordinance to be affected thereby.

PASSED AND APPROVED BY THE PRESIDENT AND BOARD OF TRUSTEES OF THE VILLAGE [MAYOR AND CITY COUNCIL OF THE CITY] OF _____, ILLINOIS, this _____ day of, _____, 19_____ [year].

AYES: _____

NAYS: _____

ABSENT: _____

_____
Village President
[Mayor]

ATTEST:

_____
Clerk

EXHIBIT A

The customer will be entitled to a reduction in charges for service equal to the Monthly Customer Charge for any month in which service to the customer is interrupted for a period of 12 consecutive hours or more due to any of the following conditions: (i) company equipment malfunction not caused by weather; (ii) Commonwealth Edison employee or contractor error; (iii) accident involving Commonwealth Edison employee or contractor; (iv) damage to company equipment caused by Commonwealth Edison employee, agent or contractor; or (v) overloaded company distribution equipment not caused by customer negligence. If the duration of any service interruption resulting from any of the causes referred to in items (i) through (v) is equal to or exceeds 24 consecutive hours, or if there is more than one such service interruption of 12 consecutive hours in a month, the customer will be entitled to an additional reduction in charges equal to the Monthly Customer Charge for such month multiplied by the number of increments of 12 consecutive hours of interruption in excess of the first such 12 consecutive hours. In applying this provision to any outage in a month in which the Customer Charge changes, the Customer Charge in effect at the start of the outage in question shall be used.

EXHIBIT B

[List of buildings and traffic signals to receive free service.]

APPENDIX C: MODEL ELECTRIC EMERGENCY ORDINANCE

This appendix contains a model ordinance for dealing with emergency energy plans. It focuses on the implementation of controlled rotating interruptions or “rolling blackouts.” The model was prepared by the Northwest Municipal Conference, one of the Councils of Government in the region, and distributed to all members of the Metropolitan Mayors Caucus.

ORDINANCE NO. _____

AN ORDINANCE AMENDING THE _____ CODE,
SO AS TO PROVIDE FOR A LOCAL EMERGENCY
ENERGY PLAN

WHEREAS, the Village President and Board of Trustees (City Council) of the Village (City) of _____, _____ County, Illinois, find that the Village (City) of _____ is an Illinois home rule municipal corporation as provided for in Article VII, Section 6 of the 1970 Constitution of the State of Illinois and, as such, may exercise any power pertaining to its government and affairs, including, but not limited to, the power to regulate for the protection of the public health, safety, morals, and welfare; and,

WHEREAS, the President and Board of Trustees (City Council) further find that it is the most basic responsibility of the Village (City) of _____ to ensure the protection of the health, safety and welfare of persons and property within the Village (City); and

WHEREAS, the President and Board of Trustees (City Council) further find that electric utilities have a responsibility to protect the integrity of the electrical transmission and distribution systems and the interconnected network; and

WHEREAS, certain electric utilities have developed emergency load conservation procedures to protect the integrity of their electrical transmission and distribution systems and the interconnected network, which contain plans for the controlled rotating interruption of electrical service, sometimes known as "rolling blackouts," which could be implemented in portions of the Village (City) under certain emergency circumstances, such as when the demand for electricity continues to exceed the supply after other measures have been taken; and

WHEREAS, the impacts of such controlled rotating service outages may affect the ability of the Village (City) to provide emergency services to its citizens insofar as such outages may interrupt essential services to the community, such as traffic signalization and operation of water pumping stations; and

WHEREAS, certain facilities and customers such as hospitals, nursing homes, persons on life-support systems, schools, high-rise buildings and day-care centers may require additional assistance from Village (City) agencies if their electrical service is interrupted during such controlled rotating service outages; and

WHEREAS, the public health, welfare and safety require that the Village (City) know where and when such controlled rotating service outages are likely to occur so that public health and safety agencies and other personnel can be deployed quickly and efficiently, and so that alternative means to meet service needs can be sought or implemented; and

WHEREAS, the public health, welfare and safety require that the Village (City) be made aware of controlled rotating service outage plans developed by electric utilities, and be notified in advance when those plans are expected to be implemented, so that the Village (City) may provide necessary services and assistance to the public; and

NOW, THEREFORE, BE IT ORDAINED BY THE PRESIDENT AND BOARD OF TRUSTEES (CITY COUNCIL) OF THE VILLAGE (CITY) OF _____, _____ COUNTY, ILLINOIS:

SECTION 1: The foregoing findings of fact and recitals, and each of them, are hereby made a part of this Ordinance and are incorporated by reference as if set forth verbatim herein.

SECTION 2: Village (Municipal) Code of the Village (City) of _____, as amended, is hereby further amended in Chapter (Article)_____, by adding thereto a new _____, to read as follows:

SECTION (CHAPTER) (ARTICLE) _____

EMERGENCY ENERGY PLANS

Section __.1 DEFINITIONS.

As used in this Section (Chapter)(Article), unless the context otherwise requires:

(a) "Control Area" means an electrical system bounded by interconnection (tie-line) metering and telemetry. It controls generation directly to maintain its interchange schedule with other control areas and contributes to frequency regulation of the interconnection.

(b) "Control Area Emergency" means that Control Area is at risk of having to shed firm load, having taken or committed to take all feasible mitigating action short of shedding firm load and firm sales.

(c) "Controlled rotating interruptions of electrical service" means the implementation of a plan to curtail electric service to firm load customers for a short period of time and rotating this curtailment of electric service through different areas within the electric utility's service territory in a situation where the demand has exceeded or is at significant risk of exceeding the supply of electricity available to the electric utility. The action of an electric utility to interrupt or curtail electric service to a customer participating in or taking service under an interruptible or curtailable rate is not included in this definition of a "controlled rotating interruption of electric service."

(d) "Emergency energy plan" means the portions of the Emergency load conservation procedures, which immediately precede and include the controlled rotating interruption of electrical service to firm load customers within the Village (City). The Emergency energy plan shall include the following steps:

(1) a request for emergency help from neighboring utilities;

(2) a declaration of a control area emergency;

(3) a public appeal for voluntary curtailment of electricity use; and,

(4) implementation of the plan for controlled rotating interruptions of electrical service.

(a) "Emergency load conservation procedures" means a planned course of action developed by an electric utility company to be implemented in emergency situations when the demand for electricity exceeds, or is at significant risk of exceeding, the supply of electricity available to the electric utility.

(b) "Electric utility company" or "electric utility" means any person or entity engaged in the business of distributing, transmitting, or otherwise delivering electricity, regardless of its source, for use or consumption within the Village (City). This term shall not include any person or entity that delivers electricity to fewer than 50 customers within the Village (City).

Section ___.2 SUBMITTAL OF EMERGENCY ENERGY PLAN.

(a) Every electric utility company must have adopted an emergency energy plan no later than 30 days after the effective date of this chapter, or within 30 days after becoming an electric utility company, whichever is later. Every such electric utility company shall submit to the (designated public official(s))

an emergency energy plan adopted by the company no later than 30 days after the effective date of this chapter, or within 24 hours of the time the plan is adopted, whichever is later. The electric utility company shall be required to examine and update as needed its emergency energy plan at least annually. The electric utility company shall notify the foregoing public official(s) in writing of any material revisions to its plan and the rationale for said revisions within five (5) business days of the time said revisions are made.

(b) The emergency energy plan shall include, at a minimum, information detailing:

(1) Circumstances that would require the implementation of the emergency energy plan;

(2) Stages of the emergency energy plan;

(3) The approximate geographic limits of each outage area provided for in the emergency energy plan;

(4) The approximate number of customers within each outage area provided for in the emergency energy plan;

(5) The police facilities, fire stations, hospitals, nursing homes, schools, day care centers, senior citizen centers, community health centers, dialysis centers, community mental health centers, correctional facilities, stormwater and wastewater treatment or pumping facilities, and water-pumping stations that have been identified by the Village (City) and persons on life-support systems that are known to the company, and that could be affected by controlled rotating interruptions of electric service under the emergency energy plan; and

(6) The anticipated sequence and duration of intentional interruptions of electric service to each outage area under the emergency energy plan.

Section ___.3 REVIEW OF PLAN.

(a) Upon submittal of the emergency energy plan to the Village (City), the Village (City) shall review the emergency energy plan in order to determine if the emergency energy plan is complete and to assure appropriate coordination with public health and safety agencies. The Village (City) may reject the emergency energy plan if it does not contain all the information required under Section ___.2(b), in which case the Village (City) shall notify the electric utility company in writing of said rejection and the reasons therefor. The electric utility company shall thereafter submit a complete emergency energy plan to the Village (City) no later than thirty (30) days after such notice is sent by the Village (City).

(b) The Village (City) and the electric utility shall work cooperatively to:

(1) Identify customers and facilities for which a controlled rotating interruption of electric service would require heightened response by Village (City) public health and safety agencies,

(2) Mitigate the potential impact of the plan on public health and safety, and

(3) Mitigate the potential impact of the plan on the duties of the Village's (City's) public health and safety agencies.

Section ___.4 IMPLEMENTATION OF EMERGENCY ENERGY PLAN.

(a) Whenever an electric utility company determines that it may be necessary to implement a controlled rotating interruption of electrical service due to the demand for electricity exceeding, or being at significant risk of exceeding, the supply of electricity available to the electric utility company, the electric utility company shall do the following:

(1) Take appropriate action in preparation for implementing a controlled rotating interruption of electric service and notify the appropriate electric utility company personnel, and

(2) Notify the (designated public official(s)) that the electric utility company will be implementing its emergency energy plan. The notification shall be made pursuant to a notification procedure approved by (designated public officials)) after consultation with the (designated public official(s)). The (designated public official(s)) may waive the notice requirement to accommodate exigent circumstances.

(b) Subsequent to providing the notice as required above, an electric utility company shall reasonably and separately advise the designated Village (City) officials when it implements the each of steps of the emergency energy plan. Such steps shall include the following:

(1) A request for emergency help from neighboring utilities;

(2) A declaration of a control area emergency;

(3) A public appeal for voluntary curtailment of electricity use.

(b) The electric utility company shall give a separate notice to the (designated public official(s)), immediately upon the determination that there will be a controlled rotating interruption of electric service pursuant to the emergency energy plan. The notification shall include the areas to be interrupted; the sequence and estimated duration of the service outage for each area; and the affected feeders and number of affected customers in each area. Whenever practical, the notification shall be made at least two hours prior to the time of the outages, and in no case shall the notification be made less than 30 minutes prior to the outages, if the company is aware that controlled rotating interruptions may be required.

(c) Notification required by this section shall be in addition to any notification requirements set forth in any applicable franchise agreement or franchise ordinance, or as may be required by applicable federal or State law or regulation.

Section ___.5 VIOLATIONS; ENFORCEMENT.

Any electric utility company that knowingly violates this chapter or any rules promulgated thereunder shall be subject to a fine of not less than $2,500 and not more than $10,000 for each offense. Each day that a violation continues shall constitute a separate and distinct offense.

The Village (City) may apply to any court of competent jurisdiction for an injunction or order to compel the other party to comply with the provisions of this chapter.

Section ___.6 CONSTRUCTION.

Nothing in this ordinance shall be construed to preclude or interfere with the implementation by an electric utility company of measures necessary to assure the provision of adequate, efficient, reliable and environmentally safe service, as required by the Illinois Public Utilities Act (220 ILCS 5/1-101 et seq.). Nothing set forth in this Section (Article)(Chapter) shall be deemed to modify the terms of any existing franchise agreement or franchise ordinance otherwise applicable to any electric utility company, or to excuse any performance required by such agreement or ordinance, or to limit any authority that may be exercised pursuant to such agreement or ordinance, or to limit any remedy that may be available under such agreement or ordinance.

Section ___.7 SEVERABILITY.

Should any section, paragraph, sentence, clause, phrase or word of this Section (Article)(Chapter) be declared invalid or unconstitutional by a court or agency of competent jurisdiction, such invalidity or unconstitutionality shall not affect any of the remaining words, phrases, clauses, sentences, paragraphs or sections of this Section (Article)(Chapter), since the same would have been enacted by the Board of Trustees without the incorporation in this Section (Article)(Chapter) of any such invalid or unconstitutional word, phrase, clause, sentence, paragraph or section.

SECTION 3: This ordinance shall be in full force and effect after its passage, approval and publication as required by law.

APPENDIX D: SAMPLE FORM FOR GATHERING INFORMATION ON CRITICAL FACILITIES

The sample form in this appendix can be used to assemble information about critical facilities. This form can be used to survey both municipality-owned and privately owned facilities. Information can then be loaded into a computerized database for easy retrieval.

For certain critical facilities, it might also be desirable to have qualified technicians conduct field visits to determine whether additional backup equipment is needed.

Municipality of _____
Critical Facility Information Form

Date: _____

Facility Name: _____

Location Information

Facility Address: _____

_____ **Zip Code:** _____

Street/Road Intersection (if no street address is available): _____

_____

Facility Geographical Coordinates (if known): Latitude: _____ **Longitude:** _____

Contact Information

Contact Person – Business Hours: _____

Phone: _____ **Fax:** _____ **Email:** _____

Contact Person – Nonbusiness Hours: _____

Phone: _____ **Fax:** _____ **Email:** _____

Facility Category (*check* all that apply and *circle* the subcategory in parentheses):

___ Emergency Services (police, fire, emergency medical, disaster agency, 911 center)

___ Municipal Office

___ Water Facility (water supply, well, water tower, pumping station, wastewater treatment, lift station)

___ School (pre-school, kindergarten, grade school, middle school, high school, college, trade school)

___ Community Center (library, municipal recreation facility)

___ Transportation (road intersection, rail crossing, airport)

___ Telecommunications Facility (switching office, transmitter, repeater)

___ Medical (hospital, emergency center, medical office, nursing home, assisted living, animal care)

___ Public Congregation (recreation facility, auditorium, place of worship, theater, shopping center)

___ Day Care (children, handicapped, elderly)

___ Multiunit Residential (low rise, high rise, senior)

___ Hotel

___ Other Government Facility

___ Commercial

___ Industrial

___ Other (specify) _____

Electrical Service

Feeder Circuits (if known): _____

Current Electrical Service Inputs (if known): _____

Voltage (V): _____ No. of Phases: _____ No. of Wires: _____

BACKUP EQUIPMENT

Is an On-site Backup Generator Available? Yes ____ No ____

If Yes, Give Type of Generator: _____ Diesel: _____ Natural gas: _____ Other: _____

Generator Capacity (kW): _____

Portion of the Facility's Normal Load That the Generator Can Handle: _____%

On-site Fuel Storage Capability / Time Generator Can Operate before Refueling: _____

Generator Transfer Switch: Automatic: _____ Manual: _____

Uninterruptible Power Supply (UPS) Available: Yes ____ No ____

UPS Capacity (amp-hours): _____

Equipment Connected to UPS: _____

Time UPS Can Operate before Recharging: _____

Rapid Connection Switches for Portable Generation Available: Yes ____ No ____

Shelter Capability

Is the Facility Available as a Shelter?

For Summer Cooling: Yes _____ No _____
For Winter Warming: Yes _____ No _____

If Yes, Give the Approximate Shelter Capacity (No. of People): _____

If Yes, Are Toilet and Shower Facilities Available? Yes ____ No _____

Additional Comments

APPENDIX E: SAMPLE FORM FOR GATHERING INFORMATION ON POWER-OUTAGE-SENSITIVE INDIVIDUALS

This appendix contains an introductory letter to residents and a survey form that can be used to identify power-outage-sensitive individuals who might require special attention during an electric power disruption. This material was adapted from forms developed by the City of Naperville.

SAMPLE LETTER TO RESIDENTS

Municipality of _____

Target Resident Program

Introduction

The Municipality of _____ has established a *Target Resident Program* to track pertinent information about citizens who could require special considerations in emergencies. The [Fire] Department maintains this information in a computer database and makes it available to appropriate emergency response personnel from the Police, Fire, and Public Works Departments. Participation in this program by residents is strictly voluntary.

Who Qualifies as a Target Resident?

Through this program, the Municipality of _____ attempts to identify individuals with special needs due to serious medical conditions, significant physical or mental impairments, or extraordinary requirements for uninterrupted utility service (electric power, natural gas, telephone). The information in the target resident database can be accessed by emergency responders from various municipal agencies after a resident has dialed 9-1-1 from his/her home.

Persons who have serious medical conditions should consider registering for the Target Resident Program. One advantage to participating in this voluntary program is illustrated by the following example. If a target resident requests an ambulance, Fire Department paramedics would be able to access in advance vital data about his/her medical history. Such data would include:

- Potentially life-threatening illnesses,
- Conditions that could impair a person's ability to communicate with emergency medical personnel, and
- Unusual or rare medical conditions or requirements.

Residents who would find it difficult to exit their homes in an emergency (because of physical or mental impairments) should also consider registering with this program. Target resident data would give Police and Fire Department personnel advance warning about potential rescue needs in an emergency.

Individuals who maintain electrically powered life-sustaining equipment in their homes would also benefit from participating in the Target Resident Program because municipal departments would be advised of the need for uninterrupted electrical service. This information would help these departments identify residences that might require temporary emergency electric power during service interruptions. Participation in the Target Resident Program, however, does not guarantee that emergency workers would respond automatically during unplanned outages (e.g., due to inclement weather). While the municipality has some emergency electric generators available, it does not have enough to service the needs of all target residents if a widespread community power failure were to occur. Therefore, it is recommended that all residents with unique needs for uninterrupted electric power service assess their specific requirements and consider obtaining their own backup power source.

How Do People Register for the Target Resident Program?

Residents can register for the Target Resident Program by completing the enclosed form. Additional copies of these forms can be obtained from the _____ Department. Forms should be returned to the _____ Department for processing.

The _____ Department will review all information in the Target Resident database on an annual basis. Residents currently listed in the database will receive a notice requesting them to update, continue, or cancel their listing. Individuals who do not respond to the annual update notice will be removed from the listing.

We hope you will seriously consider participation in the Target Resident Program.

_____

(signed)

For questions and additional information, contact:

_____

_____

Municipality of _____
Target Resident Information Form

Date: _____

Name: _____

Address: _____ **Zip Code:** _____

Phone: (_____) _____ **Date of Birth:** _____

Name of Spouse/Parent/Guardian: _____

Spouse/Parent/Guardian Home Phone: (____) _____ **Work Phone**: (_____) _____

School Attending in Municipality (if student): _____

_____

Medical Condition: _____

_____

_____

Special Instructions for Emergency Personnel: _____

_____

_____

Physician's Name: _____ **Physician's Phone:** (____) _____

Affiliate Hospital: _____ **Phone:** (____) _____

Do you have any medical equipment that requires uninterrupted electric power? Yes ___ No ___
(If yes, complete form on back.)

Please read the following, sign, and return this form to [Fire Department]:

The undersigned understands and agrees that the above information is for informational purposes only and shall not be construed under any circumstances to create any special duty or relationship of any kind between the undersigned and the Municipality of _____ to provide police, fire, or emergency services beyond those afforded to the general public. The undersigned understands that the form must be renewed on an annual basis to prevent automatic removal from the file.

The undersigned understands and agrees that the names, telephone numbers, and nature of the medical condition listed above can be released to the emergency and law enforcement agencies responding to a call for assistance and that this information will be broadcast by dispatchers over emergency radio frequencies to responding emergency personnel.

Signature:_____

Municipality of _____
Target Resident Program

Electrically Powered Medical Equipment Form

What type of electrically powered medical equipment do you use? _____

_____

_____

_____

For what purposes do you require this equipment? _____

_____

_____

How often do you use this equipment? _____

During what periods of the day do you use this equipment? _____

_____

Do you have a backup power supply for this equipment (e.g., battery)? Yes _____ No _____

If yes, please describe the backup power supply and approximately how long it can operate the equipment:

_____

_____

_____

APPENDIX F: PREPAREDNESS MEASURES FOR CRITICAL FACILITIES AND POWER-OUTAGE-SENSITIVE INDIVIDUALS

This appendix provides technical performance and cost information on measures that can be used to prepare critical facilities and power-outage-sensitive individuals for disruptions in electric service. The information contained here is for information purposes only and does not imply endorsement of any type of equipment or of any manufacturer or vendor.

This appendix contains information on the following measures:

- Enhanced Grid Connection Measures
  - Connection to Multiple Feeders
  - Connection to Multiple Substations
- Alternative Power Supply Measures
  - Standby/Emergency On-site Backup Generation
  - Portable Generation
  - Battery Backup Systems
- Distributed Generation Measures
- Demand-side Management Measures
- Special Applications
  - Traffic Signal Battery Backup System
  - Automatic Outage Notification

F.1 ENHANCED GRID CONNECTION MEASURES

F.1.1 Connection to Multiple Feeders

Technical Description

Typically, a facility is connected to the electric power system by its customer service line, which is connected through a transformer to a distribution feeder line. The feeder line, in turn, is connected to a substation, which interfaces with the rest of the power grid. Some facilities are connected to multiple feeders so that continuous electrical service can be provided if one of the feeders is lost.

Multiple feeders can be connected to a facility in several ways. One option is to split the electrical load at the facility so that each feeder serves a portion of the load. If one feeder is lost, the other feeder can then continue to provide some power for lighting and electrical equipment. A second option is to wire the facility so that each feeder serves the entire load. In this option, the loss of one feeder does not affect the electrical service to the facility because the other feeder can pick up the entire load.

Facilities connected to multiple feeders have switching equipment that transfers power between them. In general, switching equipment is designed to operate automatically, that is, without the need for operator intervention.

The *National Electrical Code* allows the use of multiple feeders to provide required emergency lighting and other electrical services. The document, *Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications*, provides details on the use of multiple feeders. (See Table 8.1 for references.)

Cost

The cost of connection to multiple feeders depends a great deal on the location of the facility. The facility owner is generally charged an additional fee for multiple feeder connections.

Implementation Considerations

Some facilities cannot connect to multiple feeders because of the configuration of the local electric power distribution system. For example, facilities that are located on a radial segment of the electric power distribution system without multiple feeders nearby cannot use this measure.

F.1.2 Connection to Multiple Substations

Technical Description

In facilities that are connected to multiple feeders, each feeder can also be connected to different distribution substations. Connections to multiple substations provide an additional measure of reliability because they prevent a loss of electrical service due to substation problems. Multiple feeders connected to the same substation might all be lost if a failure occurred at the substation level. If each feeder were connected to a different substation, however, the effects from a single substation failure would be reduced.

Cost

The cost of connecting to multiple substations depends a great deal on the location of the facility. The facility owner is generally charged an additional fee for these connections.

Implementation Considerations

Some facilities cannot connect to multiple substations because of their location or the configuration of the electric distribution system.

F.2 ALTERNATIVE POWER SUPPLY MEASURES

The document, *Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications*, referenced in Section 8, provides detailed information on the applications of these systems. This section provides summary information.

F.2.1 Standby/Emergency On-site Backup Generation

Technical Description

Standby on-site backup generation consists of an electric generator that is driven by an engine. Reciprocating engines are currently the most commonly used type of standby on-site generator. Diesel oil is the most common fuel source. A number of new units that use turbine engines are now commercially available. These units are powered by various grades of oil, natural gas, or propane. Engines that use fuel cells, photovoltaics, and other advanced technologies are being developed but are not in widespread use in standby generator applications.

Standby generators are designed for intermittent use, not for continuous, long-term operation. Using such generators for approximately 1,000 hours per year would approach the design limits for some units.

The equipment comes in a wide range of sizes — from 1 to 10,000 kW. Units can be grouped to provide larger quantities of power. Output voltage from the smaller units is generally 110 volts, while the larger units can produce power up to 600 volts or higher.

Cost

In general, diesel-powered standby generators are less expensive to operate than natural-gas-powered generators. Depending on the price of natural gas, gas units might have lower overall costs.

Implementation Considerations

Standby generators can be equipped with either manual or automatic start-up controls. The manual controls are simpler and lower in cost, but a qualified technician must be available to start the unit when the utility power fails.

On-site fuel storage is an issue that must be considered when selecting standby generator equipment. Building codes (see Section 8) require that a standby generator must be able to operate for 2 hours using on-site fuel. Gasoline is generally avoided as a fuel for standby generators because it is necessary to store a large quantity of this highly volatile energy source on site. Diesel fuel is less volatile and can be more readily stored in sufficient quantity to meet code requirements. Natural-gas-fired units frequently are exempted from the on-site fuel storage requirement, although some facilities rely on on-site propane storage as a backup in case the gas supply is disrupted at the same time as the electrical supply.

Environmental issues can influence the choice of standby generator equipment. Air pollutant emissions and engine noise are the primary environmental concerns. In some applications, the use of diesel engines might be prohibited because of air pollutant emission requirements.

F.2.2 Portable Generation

Technical Description

Portable generation systems are engine/generator sets mounted on a truck or trailer, which allows them to be moved into position either in anticipation of a power outage or after the occurrence of a power outage.

Portable generation units generally range in size from 5 to 5,000 kW and can be connected to provide larger blocks of power. Most are diesel-powered, but some of the newer units utilize turbine engines.

Some manufacturers provide portable generation units on rental as well as purchase arrangements.

Cost

On the basis of cost per kilowatt of power, portable generators tend to be more expensive than fixed, on-site standby generators. Municipalities must decide whether it is more cost-effective to use several fixed, on-site standby generator installations or to use a portable unit that can be moved to several locations, as needed.

Implementation Considerations

To use a portable generation unit, appropriate connections and switching equipment must be installed at the facility. A facility that expects to use portable generation equipment on a regular basis should have the connection equipment designed and permanently installed to allow for rapid hook-up.

Noise and air pollutant emissions from engines are environmental concerns associated with portable generators. Since these units are moved into positions where they are not usually located, there might be problems with neighboring facilities or residences because they are not accustomed to having this equipment operate nearby.

F.2.3 Battery Backup Systems

Technical Description

Battery backup systems are intended for short-term (e.g., minutes or hours) service during a power outage. The length of time they can be used depends on the number and size of the batteries in the units. The systems are often equipped with automatic switchovers to provide uninterrupted service.

Building codes generally require emergency exit lights to be equipped with a battery backup (see Section 8). The backup system must be able to operate for 1½ to 2 hours and to switch over within 10 seconds of a power outage.

Uninterruptible power supply (UPS) systems are available for sensitive electronic equipment. These systems range in size from small units that can support a single desktop computer to very large units that can support large electronic installations. Their operational time ranges from about 15 minutes to several hours. UPS systems can respond to power outages within a fraction of a second so that electronic equipment is not disturbed.

Cost

The cost of UPS battery backup systems varies widely depending on the size of the unit and the operational time. Lead-acid-type batteries are generally less expensive than the newer nickel-cadmium batteries.

Implementation Considerations

Some battery backup systems use batteries that contain hazardous materials (e.g., acid, lead, cadmium). These systems must be installed in a controlled environment. (See Section 8 for references to standards for battery systems.) They must also be disposed of following strict environmental requirements.

F.3 DISTRIBUTED GENERATION MEASURES

Technical Description

The term, distributed generation, refers to generation units that are located at or near customer facilities, primarily those that belong to industrial and large commercial users. The units can be owned and operated by either the customer or ComEd. The primary function of distributed generation units is to provide additional power for customers and/or other nearby facilities during periods of peak demand on the electricity grid. By relieving some of the load on the grid, these units can forestall equipment failures caused by overloading. Providing power during grid outages is a secondary function of distributed generation equipment.

Distributed generation units can be powered by diesel engines or natural-gas-fired turbines. Advanced technology microturbines and fuel cells are also beginning to be used in commercial applications.

Distributed generators are designed for regular use, whereas the standby generators discussed in the previous section are designed for intermittent use. Distributed generator usage rates in the range of 4,000 hours per year are not uncommon.

Distributed generation units are generally larger than standby generators, but smaller than primary generators, although there is overlap at both ends of the scale. Distributed generators generally range from 10 to 100,000 kW.

As electricity markets become open to competition, distributed generation units could be used by their owners to avoid paying high peak-hour prices and/or to sell electricity to the grid at the high peak-hour rates. Distributed generation units are not, however, to be confused with units referred to as “merchant plants” or “peakers” because they are generally smaller and their primary function is to provide power to a localized area or customer. As technology develops, the lines of distinction will undoubtedly blur.

Cost

The cost of a distributed generation unit can range from $300 to $3,000 per kilowatt, depending on the technology selected. Estimates of the cost of

electricity produced from these units range from 3¢ to 10¢ per kilowatt-hour, depending on the technology and fuel used.

Implementation Considerations

The operation of distributed generation units must be coordinated with the operation of the overall electric power grid because units are connected to the grid during most of their operating time. They must meet more rigorous power quality standards than those required of standby generators.

Environmental issues associated with air pollution emissions and noise can place restrictions on the site's location and on the operation of these units.

F.4 DEMAND-SIDE MANAGEMENT MEASURES

Technical Description

Demand-side management measures are designed to encourage customers to voluntarily reduce their consumption of electricity during peak periods. The reduction in load alleviates the stress on the electrical system and lowers the probability of equipment failure due to overloading. Customers that reduce their load are compensated with a lower overall electricity rate and/or a refund for the reduction in load.

ComEd, like many electric utilities, has several demand-side management options that are available to different customer categories. The ways in which they operate are briefly described in the list below:

- *Interruptible service*. With the amount of advance notice and duration of the cut-off period depending on contract terms, ComEd cuts off service to participating customers during peak periods.

- *Voluntary reduction*. Upon notice from ComEd, customers reduce their load to an agreed-upon level.

- *Operation of self-generation*. At the request of ComEd, customers start up their on-site generation equipment, which reduces the demand on the electric power grid.

- *Air-conditioner cycling*. Equipment that allows ComEd to control the cycling time is installed on air conditioners.

The availability of these options and specific contract terms change; up-to-date information can be obtained from ComEd.

Cost

There is no cost to the customer for participating in these measures. Some customers might receive a payment and/or a reduced electricity rate for their participation.

Implementation Considerations

Participation in these measures could result in an interruption in electrical service during peak periods. Participants must evaluate the potential effects of these interruptions and determine whether the rate reduction or payment offered is adequate to cover these impacts.

F.5 SPECIAL APPLICATIONS

F.5.1 Traffic Signal Battery Backup System

Technical Description

A traffic signal battery backup system provides power to traffic lights during a power outage. The system consists of an inverter connected to a battery pack. It is equipped with power line sensors, charger systems, and related control electronics. In addition to providing backup power, the system can also provide power conditioning protection for the traffic control system during normal operation.

The system can be installed into a conventional traffic control housing or mounted in a separate enclosure. A simple model switches the connected traffic signal to a flashing red. More sophisticated models can provide sufficient power to operate all signal heads at major intersections through their normal cycles, thus providing uninterrupted traffic control.

The backup systems are designed to switch to battery power automatically in the event of a power failure. There is no need for manual switching.

The amount of time that backup systems can operate depends on the battery packs that have been installed. A small battery pack typically provides about 1 hour of service. Larger battery packs can provide up to 20 hours of service, depending on the number of signals connected.

Cost

The cost of a simple battery backup system that will provide power to a single signal head operating in a flashing red mode is approximately $1,500. The cost of a system used to operate all signal heads at major intersections is approximately $15,000. Installation costs can vary widely depending on the location and on whether the system is new or retrofitted to an existing traffic control system.

Implementation Considerations

An evaluation of battery backup systems should be made in the context of the desired traffic flow pattern. Installation at one intersection might not provide the desired traffic flow control during power outages if adjacent intersections are not similarly equipped. It might be necessary to provide backup at all intersections on a particular route in order to maintain acceptable traffic flow.

F.5.2 Automatic Outage Notification

Technical Description

Automatic outage notification devices sense a loss of electric power service at a facility and relay a message to the electric company and/or to other organizations. They are designed to provide immediate notification of a power failure.

A typical unit, about the size of a standard deck of cards, plugs into both a standard wall outlet and a nearby telephone jack. The unit is programmed with information on the electricity customer, including address, electric power feeder number, and substation connection. In the event of a power failure, the unit dials a preprogrammed telephone number and sends a message that includes the customer identification and time of power loss. Units can also be programmed to send messages to pagers and fax machines. New units are being designed to use cellular phones and radio signal communications.

Some units can also be programmed to provide automatic metering during routine operation. Consideration is also being given to developing units capable of reading water and natural gas usage as well.

Several electric utilities around the country are currently experimenting with the use of automatic outage notification units to determine their usefulness in quickly identifying power outage areas.

Cost

The cost of the individual units is minimal. The largest expense of the system, which is incurred by the electric company, comes from programming the units with individual customer information, establishing the communication protocols with electric company computer systems, and updating and maintaining the systems that receive outage notifications.

Implementation Considerations

Automatic outage notification units must be connected to the electric company's computer systems. Thus, an electric power company must determine the placement of these units when considering its overall system maintenance planning and budgeting program.

Because of the electric company incurs significant expenses in installing and maintaining these units, there are currently no areas where these units have been deployed to serve a majority of electricity customers.

POINTS OF CONTACT

This section contains a list of the important points of contact for electric power disruption planning. The list of municipal contacts provides the names, addresses, and telephone numbers for state-listed emergency management agencies. The points of contact were compiled from information available from the Illinois Emergency Management Agency. (Note: Some communities that might have emergency services or management agencies are not listed with the state. If a community is not listed here, check with local officials to identify a point of contact, if available.)

MUNICIPAL CONTACTS

Agency	Address	Phone
Arlington Heights Emergency Services and Disaster Agency	33 S. Arlington Heights Rd. Arlington Heights 60005	Emergency (847) 253-2340 Non-emergency (847) 253-2340
Aurora Emergency Management Agency	350 N. River St. Aurora 60506	Emergency (630) 801-6512 Non-emergency (630) 896-4714
Bartlett Emergency Services and Disaster Agency	228 S. Main St. Bartlett 60103	Emergency (630) 837-7502 Non-emergency (630) 837-0846
Bedford Park Emergency Services and Disaster Agency	6701 S. Archer Ave. Bedford Park 60501	Emergency (708) 458-3388 Non-emergency (708) 563-4513
Bellwood Emergency Management Agency	3200 Washington Blvd. Bellwood 60104	Emergency (708) 547-3521 Non-emergency (708) 681-3424
Bridgeview Emergency Services and Disaster Agency	7500 S. Oketo Ave. Bridgeview 60455	Emergency (708) 458-4994 Non-emergency (708) 791-6174
Brookfield Emergency Services and Disaster Agency	8820 Brookfield Ave. Brookfield 60513	Emergency (708) 485-7344 Non-emergency (708) 485-0102
Buffalo Grove Emergency Services and Disaster Agency	50 Raupp Blvd. Buffalo Grove 60089	Emergency (847) 459-5598 Non-emergency (847) 459-2570
Burbank Emergency Services and Disaster Agency	6530 W. 79th St. Burbank 60459	Emergency (708) 599-9551 Non-emergency (708) 599-7766
Calumet City Emergency Services and Disaster Agency	204 Pulaski Rd. Calumet City 60409	Emergency (847) 891-8189 Non-emergency (847) 891-8190
Chicago Emergency Preparedness Disaster Services	558 W. DeKoven Chicago 60607	Emergency (312) 744-4755 Non-emergency (312) 747-7247

Continued

Agency	Address	Phone
Chicago Heights Emergency Management Agency	P.O. Box 117 1601 Chicago Rd. Chicago Heights 60411	Emergency (708) 756-5377 Non-emergency (708) 756-5376
Crestwood Emergency Services and Disaster Agency	13241 W. Playfield Dr. Crestwood 60445	Emergency (708) 389-5131 Non-emergency (708) 371-4800
Des Plaines Emergency Management Agency	1420 Miner St. Des Plaines 60016	Emergency (847) 391-5396 Non-emergency (847) 647-7450
Dolton Emergency Services and Disaster Agency	14014 Park Ave. Dolton 60419	Emergency (708) 841-2112 Non-emergency (708) 849-9000
Elgin Emergency Services and Disaster Agency	550 Summit Elgin 60120	Emergency (847) 931-6010 Non-emergency (847) 931-6180
Elk Grove Village Emergency Management Agency	901 Brantwood Elk Grove Village 60007	Emergency (847) 439-6709 Non-emergency (847) 734-8000
Elmhurst Emergency Services and Disaster Agency	209 N. York Rd. Elmhurst 60126	Emergency (630) 530-3097 Non-emergency (630) 530-3000
Evanston Emergency Services and Disaster Agency	2100 Ridge Ave. Evanston 60201	Emergency (847) 866-2999 Non-emergency (847) 866-2916
Franklin Park Emergency Services and Disaster Agency	10001 W. Addison St. Franklin Park 60131	Emergency (847) 671-8270 Non-emergency (847) 678-2400
Glenview Emergency Services and Disaster Agency	1815 Glenview Rd. Glenview 60025	Emergency (847) 657-6773 Non-emergency (847) 724-2141
Hazel Crest Emergency Services and Disaster Agency	3000 W. 170th Pl. Hazel Crest 60429	Emergency (708) 335-9672 Non-emergency (708) 335-9630
Hoffman Estates Emergency Services and Disaster Agency	1900 Hassell Rd. Hoffman Estates 60195	Emergency (847) 882-1818 Non-emergency (847) 882-2138
Hometown Emergency Services and Disaster Agency	4331 Southwest Hwy. Hometown 60456	Emergency (708) 424-7517 Non-emergency (708) 424-7500
Joliet Emergency Services and Disaster Agency	150 W. Jefferson St. Joliet 60432	Emergency (815) 436-7636 Non-emergency (815) 724-3702
LaGrange Emergency Management Agency	53 S. LaGrange Rd. LaGrange 60525	Emergency (708) 579-2335 Non-emergency (708) 579-2318
LaGrange Park Emergency Services and Disaster Agency	115 Ann St. Clarendon Hills 60514	Emergency (708) 352-2151 Non-emergency (630) 954-1142
Lemont Emergency Services and Disaster Agency	418 Main St. Lemont 60439	Emergency (630) 257-6902 Non-emergency (630) 257-2229
Libertyville Emergency Services and Disaster Agency	1551 N. Milwaukee Rd. Libertyville 60048	Emergency (847) 362-5664 Non-emergency (847) 362-5664
Maine Township Emergency Management Agency	1700 Ballard Rd. Park Ridge 60068	Emergency (847) 297-5911 Non-emergency (847) 297-2510
Markham Emergency Services and Disaster Agency	16222 S. Ashland Markham 60426	Emergency (708) 331-4904 Non-emergency (708) 331-4905

Agency	Address	Phone
Morton Grove Emergency Services and Disaster Agency	6101 Capulina Morton Grove 60053	Emergency (847) 965-1502 Non-emergency (847) 729-2310
Mount Prospect Emergency Services and Disaster Agency	112 E.Northwest Hwy. Mt. Prospect 60056	Emergency (847) 870-5652 Non-emergency (847) 870-5660
Naperville Emergency Management Agency	1380 Aurora Ave. Naperville 60540	Emergency (630) 305-5997 Non-emergency (630) 420-6009
Niles Emergency Services and Disaster Agency	8360 Dempster St. Niles 60714	Emergency (847) 647-2131 Non-emergency (847) 967-6104
North Aurora Emergency Management Agency	P.O. Box 209 North Aurora 60542	Emergency (630) 897-9698 Non-emergency (630) 897-0551
Northbrook Emergency Services and Disaster Agency	740 Dundee Rd. Northbrook 60062	Emergency (847) 272-5050 Non-emergency (847) 272-2141
Oak Forest Emergency Services and Disaster Agency	15441 Alameda Ave. Oak Forest 60452	Emergency (708) 687-0113 Non-emergency (708) 687-4050
Oak Lawn Emergency Management Agency	9446 S. Raymond Ave. Oak Lawn 60453	Emergency (708) 499-7721 Non-emergency (708) 499-7059
Oak Park Emergency Services and Disaster Agency	100 N. Euclid Oak Park 60301	Emergency (708) 358-2374 Non-emergency (708) 358-5610
Orland Park Emergency Services and Disaster Agency	14600 Ravinia Ave. Orland Park 60462	Emergency (708) 403-6111 Non-emergency (708) 349-4111
Palatine Emergency Services and Disaster Agency	200 E. Wood St. Palatine 60067	Emergency (847) 202-6666 Non-emergency (847) 358-7500
Park Ridge Emergency Services and Disaster Agency	901 W. Devon Ave. Park Ridge 60068	Emergency (847) 318-5259 Non-emergency (847) 318-5259
Prospect Heights Emergency Services and Disaster Agency	14 E. Camp McDonald Rd. Prospect Heights 60070	Emergency (847) 398-5511 Non-emergency (847) 398-5511
Rolling Meadows Emergency Services and Disaster Agency	2455 Plum Grove Rd. Rolling Meadows 60008	Emergency (847) 397-2798 Non-emergency (847) 397-3352
Romeoville Emergency Services and Disaster Agency	27 Montrose Drive Romeoville 60446	Emergency (815) 886-4085 Non-emergency (815) 886-4085
Schaumburg Emergency Services and Disaster Agency	1601 N. Roselle Rd. Schaumburg 60193	Emergency (847) 885-6300 Non-emergency (847) 885-6300
Skokie Emergency Services and Disaster Agency	7424 Niles Center Rd. Skokie 60077	Emergency (847) 982-5300 Non-emergency (847) 982-5321
Streator Emergency Services and Disaster Agency	204 S. Bloomington St. Streator 61364	Emergency (815) 672-6261 Non-emergency (815) 672-2682
Tinley Park Emergency Services and Disaster Agency	17355 S. 68th Ct. Tinley Park 60477	Emergency (708) 532-1377 Non-emergency (847) 741-5901
Waukegan Emergency Services and Disaster Agency	420 Robert V. Sabonjian Pl. Waukegan 60085	Emergency (847) 599-2600 Non-emergency (847) 599-2601

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Agency	Address	Phone
Western Springs Emergency Services and Disaster Agency	740 Hillgrove Ave. Western Springs 60558	Emergency (708) 246-1800 Non-emergency (708) 246-1800
Wilmette Emergency Services and Disaster Agency	710 Ridge Rd. Wilmette 60091	Emergency (847) 256-1200 Non-emergency (847) 256-1200

COUNTY CONTACTS

Agency	Address	Phone
Cook County Emergency Services and Disaster Agency	1311 S. Maybrook Dr. Room 108 Maywood 60153	(708) 865-4766
DuPage County Office of Emergency Management	136 N. County Farm Rd. Wheaton 60187	Emergency (630) 682-7207 Non-emergency (630) 682-7925
Kane County Office of Emergency Management	777 Fabyan Parkway Geneva 60134	Emergency (630) 232-9186 Non-emergency (630) 232-5985
Lake County Emergency Services and Disaster Agency	1303 N. Milwaukee Ave. Libertyville 60048	Emergency (847) 549-5200 Non-emergency (847) 549-5230
McHenry County Emergency Services and Disaster Agency	2200 N. Seminary Rd. Woodstock 60098	(815) 338-6400
Will County Office of Emergency Management	302 N. Chicago St. Joliet 60432	Emergency (815) 740-0911 Non-emergency (815) 740-8351

STATE CONTACTS

Agency	Address	Phone
Illinois Commerce Commission	527 E. Capitol Ave. Springfield 62701	(217) 782-7295
Chicago Office		(312) 814-2850
Des Plaines Office		(847) 294-4326
Illinois Emergency Management Agency, Central Office	110 E. Adams St. Springfield 62701-1109	(217) 782-7860
Region 3 Office[a]	10105 N. LaSalle St. Ottawa 61350-2018	(815) 433-3297
Region 4 Office[b]	9511 W. Harrison St. Des Plaines 60016-1563	(847) 294-4717

[a] Covering Kane, McHenry, and Will Counties, along with several other counties.
[b] Covering Cook, DuPage, and Lake Counties.

FEDERAL CONTACTS

Agency	Address	Phone
U.S. Department of Energy Emergency Operations Center	1000 Independence Ave., SW Washington, DC 25085	(202) 586-8100
Federal Emergency Management Agency		
Headquarters	500 C Street, SW Washington, DC 20472	(202) 646-2400
Region V Office[a]	536 S. Clark St., 6th Floor Chicago, IL 60605	(312) 408-5500
Department of Transportation Office of Pipeline Safety		
Regional Office	901 Locust St., Suite 462 Kansas City, MO 64106-2641	(816) 329-3800
Chicago District Office	10316 Floyd St. Crown Point, IN 46307	(219) 661-8586
National Communications System, National Coordinating Center for Telecommunications	701 S. Courthouse Rd. Arlington, VA 22204	(703) 607-4900
Nuclear Regulatory Commission Headquarters	2120 L Street, NW Washington, DC 20003	
Emergency Operations Center		(301) 816-5100
Region III Office	801 Warrenville Rd. Lisle, IL 60532	(630) 829-9500

[a] Covering Illinois, among other Midwestern states.