Critical Infrastructure Assurance Guidelines for Municipal Governments

Planning for Natural Gas Disruptions

Chicago Metropolitan Area Critical Infrastructure Protection Program

Review Draft, August 2002

CHICAGO METROPOLITAN AREA
CRITICAL INFRASTRUCTURE PROTECTION PROGRAM

CRITICAL INFRASTRUCTURE ASSURANCE GUIDELINES FOR MUNICIPAL GOVERNMENTS

PLANNING FOR NATURAL GAS DISRUPTIONS

Review Draft
August 2002

PREFACE

This document is the second in a series of guidelines prepared for municipal governments to assist them in dealing with disruptions of critical infrastructures. The first document, *Planning for Electric Power Disruptions*, provided information on preparing for and responding to disruptions in electric power. This document addresses preparing for and responding to disruptions in the natural gas system.

Portions of this version of the guidelines document are incomplete. It is being sent to a limited audience to solicit comments and suggestions for improvement. Comments received will be incorporated into the final version.

Comments should be sent to:

Richard Cirillo
Infrastructure Assurance Center
Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

Phone: 630-252-5629
Fax: 630-252-6500
Email: **cirillor@anl.gov**

ACKNOWLEDGMENTS

Appreciation is expressed to those who made important contributions to this report. Special thanks are due to the staff at the gas companies serving the Chicago Metropolitan Area – Nicor Gas and Peoples Energy – who contributed information and technical assistance, reviewed documents, and provided professional advice and counsel on the material contained in this document. Special appreciation is also due to the Infrastructure Assurance Task Force of the Metropolitan Mayors Caucus and the communities of Buffalo Grove, Oak Brook, and Riverside, which participated in the pilot testing of some of this material.

CONTENTS

Preface iii

Acknowledgments v

1 Introduction 1

2 The Natural Gas System in the Chicago Metropolitan Area 3

2.1 Business Structure of the Natural Gas Industry 3
2.2 Components of the Natural Gas System 7
2.3 Natural Gas Disruptions 12

3 Establishing Natural Gas Disruption Planning Responsibilities 17

3.1 Identification of Lead Organizations in a Municipality 17
3.2 Municipal Agreements and Ordinances 18
3.3 Resources and Responsibilities of Other Organizations 18

4 Predisruption Planning 21

4.1 Critical Facilities 21
4.2 Gas-disruption–sensitive Individuals 26
4.3 Assessment of Potential Vulnerabilities 27
4.4 Evaluation of Alternative Preparedness Measures 29
4.5 Implementation of Measures 33

5 Disruption Response Planning 35

5.1 Planning for a Staged Response 35
5.2 Notification and Communication 35
5.3 Response Protocols for Impending Gas Service Interruptions 41
5.4 Response Protocols for Actual Gas Service Interruptions 43
5.5 Response Protocols for Gas Leaks and Emergencies 50

6 Restoration Planning 53

7 Preparedness Exercises 57

7.1 Exercise Foundations 57
7.2 Types of Exercises 57
7.3 Designing and Conducting an Exercise 58

8 Longer-term Preparedness 61

8.1 Building Codes 61

8.2 Zoning Ordinances 61
8.3 Growth and Development Projections 63

9 Development of a Natural Gas Disruption Plan 67

10 Maintenance of Security 73

APPENDIXES

Appendix A: Glossary 77
Appendix B: Sample Form for Gathering Information on Critical Facilities 91
Appendix C: Sample Vulnerability Assessments 95
Appendix D: Preparedness Measures 111
Appendix E: Sample Natural Gas Disruption Tabletop Exercise 121
Appendix F: Sample Natural Gas Disruption Plan 127

FIGURES

2.1 Typical Organization of the Divisions within a Transmission Company 5
2.2 Typical Organization of the Divisions within a Distribution Company 6
2.3 Schematic of Natural Gas Production, Processing, Transmission, and Storage 8
2.4 Schematic of Natural Gas Distribution 9
4.1 Predisruption Planning Process 22
4.2 Criticality and Vulnerability Planning Matrix 29

TABLES

3.1 Typical Responsibilities for Municipal Departments and Natural Gas Personnel 17
4.1 Typical Critical Facilities 24
4.2 Sample Criticality Classification for Facilities 25
4.3 Sample Vulnerability Classification for Critical Facilities 27
4.4 Typical Preparedness Measures for Critical Facilities 30
5.1 Classification Scheme for Impending Gas Service Interruptions 36
5.2 Classification Scheme for Actual Gas Service Interruptions 37
5.3 Classification Scheme for Gas Leaks 38
5.4 Response Protocol for Planned Interruptions 42
5.5 Response Protocol for Gas Supply Alert 44
5.6 Response Protocol for Gas Supply Warning 45
5.7 Response Protocol for Gas Supply Emergency 46
5.8 Response Protocol for Limited Service Interruptions 47
5.9 Response Protocol for Extended Service Interruptions 48
5.10 Response Protocol for Wide Area Service Interruptions 49
5.11 Response Protocol for Regionwide Service Interruptions 50
5.12 Response Protocol for Class 1 Leaks 51
6.1 Restoration Actions 54
8.1 Summary of Portions of Model Building Codes of Relevance to Natural Gas 62
9.1 Checklist for Preparing a Natural Gas Disruption Plan 70

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 disruptions to natural gas service. 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.

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."

In the wake of the terrorist attacks of September 11, 2001, the Office of Homeland Security was formed to coordinate efforts to protect the American population from these types of threats. Protecting critical infrastructures is one aspect of the Office's mission.

The U.S. Department of Energy's Office of Energy Assurance is charged with the responsibility of dealing with the energy infrastructure, including electricity, natural gas, and petroleum. The Department is working with private-sector infrastructure owners, state and local governments, and other federal agencies to address this issue.

On the Local Level

The Chicago Metropolitan Area, which encompasses Cook, DuPage, Kane, Lake, McHenry, and Will Counties, has experienced only a few disruptions of natural gas service, which have affected several thousand customers. Unlike disruptions to the electric power system, disruptions to natural gas service are infrequent and usually are confined to relatively small areas. Nevertheless, it has become clear that the region depends heavily on the natural gas system to meet residential, commercial, and industrial needs, and, in recent years, to generate electric power. Because of the growth and development that have taken place in the metropolitan area, the region depends on the natural gas infrastructure even more now than in the past.

Disruptions to the natural gas system can occur from various sources, including natural events such as flooding; accidents such as dig-ins, material and

equipment failures, and procedural failures; and intentional acts such as vandalism or terrorism. Disruptions from these sources 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 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 disruptions to critical infrastructures. Under the terms of this agreement, a set of guidelines for dealing with electric power disruptions was prepared. Those guidelines were the result of 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 Commonwealth Edison – the electric company serving the region.[1] This second set of guidelines covers the natural gas infrastructure. The gas companies serving the region – Peoples Energy and Nicor – have collaborated in preparing this material and have given valuable insight and information. The Infrastructure Assurance Center of Argonne National Laboratory has provided technical support in the drafting of this material.[2]

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.

---

1 *Planning for Electric Power Disruptions*, U.S. Department of Energy, Office of Critical Infrastructure Protection; City of Chicago, Department of Environment; and Metropolitan Mayors Caucus (February 2001).

2 Argonne National Laboratory is a U.S. Department of Energy facility operated by The University of Chicago.

2 THE NATURAL GAS SYSTEM IN THE CHICAGO METROPOLITAN AREA

A summary description of the natural gas system in the Chicago Metropolitan Area and its related facilities outside the region is presented. The possible types of disruptions are discussed. A glossary of terms used in the natural gas industry is provided in Appendix A.

2.1 BUSINESS STRUCTURE OF THE NATURAL GAS INDUSTRY

The natural gas business in the Chicago Metropolitan Area has undergone major changes since the national deregulation of the industry in 1985. No single "gas company" is responsible for all aspects of supplying gas to customers. Rather, there are a number of companies, many of which have several subsidiaries, each focusing on a different part of the gas system. From the perspective of a municipality that is developing emergency response plans to deal with natural gas disruptions, it is important to understand the business structure of the gas companies in the area and which company is responsible for which part of the gas system.

Types of Gas Companies

In general, two types of natural gas companies operate in the Chicago Metropolitan Area: transmission companies and distribution companies. Gas production companies do not operate in the area because there are no local natural gas deposits. The transmission and distribution companies are composed of both regulated and unregulated businesses, which offer different services to different customers. The regulated businesses must meet pricing requirements set by the Illinois Commerce Commission (ICC) and/or the Federal Energy Regulatory Commission (FERC). The prices these businesses charge for their services are controlled or "regulated." Unregulated businesses must still meet some ICC and FERC requirements, but their prices are not controlled. Both regulated and unregulated gas companies must meet federal, state, and local safety, environmental, and operational requirements.

The primary activities of the transmission company are to transport gas from gas fields – operated by gas production companies – into the Chicago area. The transmission company transports the gas through high-pressure, large-diameter steel pipelines. These pipelines usually are 24 to 36 inches in diameter and use pressures ranging from 500 to 1,400 psig. Gas is transported from fields in the Gulf Coast, the western United States, and Canada to delivery points in the Chicago area. These delivery points are called "city gate stations" and are usually owned by the distribution company, although some are owned by the transmission company.

The primary activities of the distribution company are to deliver the gas it receives from the transmission pipelines to various end-users. The distribution company takes gas from its city gate stations and transports it to customers' premises through steel, cast iron, or plastic gas pipelines. During this process, gas pressure is regulated down from transmission pressures to the much lower pressures needed for distribution; generally, pressures are reduced from 300 to 0.25 psig for final delivery.

Because different parts of the gas system are owned and operated by different companies, there are varying responsibilities in the event of a natural gas disruption. The transmission company is responsible for its steel pipeline, construction, maintenance, and the handling of system emergencies up to the inlet of the city gate station or transfer point. The distribution company is responsible for the city gate station and the system of pipes and pressure regulators up to the outlet of the meter on the customer's premises. The customer is responsible for everything beyond the meter, including the fuel line that delivers gas within the premises and all gas-using equipment (e.g., furnaces, appliances, manufacturing processes). As part of their business, both the transmission and the distribution companies provide emergency response services to municipalities, the general public, and their customers. These services are described later in this document.

Effects of Industry Deregulation

The federal orders that deregulated the natural gas industry have dramatically changed the structure and operations of both the transmission and distribution companies nationwide, including those in the Chicago Metropolitan Area. One of the federal requirements mandated that both transmission and distribution companies separate or "unbundle" the services they provide to their customers. One of the primary effects of this requirement has been that customers can shop for natural gas from a third party (e.g., gas brokers, marketing companies) other than their traditional gas utility. These third parties are "unregulated" in the sense that the prices they charge are not controlled. When the customer buys gas from a third party, the transmission and distribution companies merely act as "pipes or transport" companies. They charge a fee for transporting the customer's gas; the customer pays a second, separate bill for the gas itself to the broker or marketing company. The transport charge is "regulated" in the sense that the ICC, FERC, or both must approve prices. In contrast, the price of the gas itself is not regulated and fluctuates on the basis of market conditions. Some transmission and distribution companies have created separate, unregulated subsidiaries to compete with the brokers and marketers and to participate in this market segment. Currently, most industrial and commercial customers in Illinois can buy gas from any supplier they choose. Residential customers are being phased into this program, and in several years, all customers will have the right to choose their supplier.

Another significant impact of deregulation has been that a customer, broker, or marketer, rather than the transmission or distribution company, owns an increasing percentage of the gas in that company's pipeline. This situation

presents several dilemmas to the transmission and distribution companies in times of tight gas supplies, equipment failures, or other disruption events. Since the transmission and distribution companies no longer own the gas, they can no longer make unilateral decisions on how to allocate short supplies. Contractual obligations with the gas owners must be considered.

In situations where a customer's contractual supplier is unable to deliver the gas, there is a question as to which company will provide backup supplies. This issue has not yet been fully resolved by regulatory procedures. Under extreme emergency conditions, however, issues that involve protection of public health and safety would take precedence over contractual issues for all gas companies.

For the remainder of this document, the discussion focuses on the regulated subsidiaries of the local gas companies that are in the "pipes or transport" side of the business, since they are the primary points of contact with municipalities during disruption events. The brokers and marketers and the unregulated subsidiaries are not as heavily involved with planning for gas disruptions. Figures 2.1 and 2.2 show the typical organizational structure of the operations and gas procurement divisions of a transmission company and a distribution company, respectively. The operations division is responsible for the operation and maintenance of the physical components of the gas system and is the primary point of contact with municipalities.

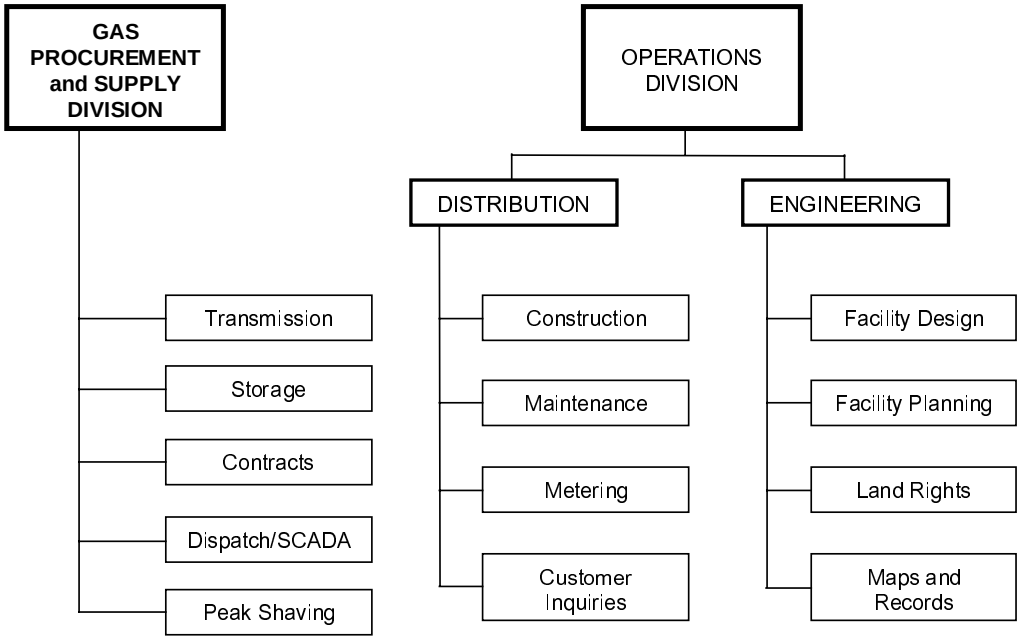


Figure 2.1 Typical Organization of the Divisions within a Transmission Company

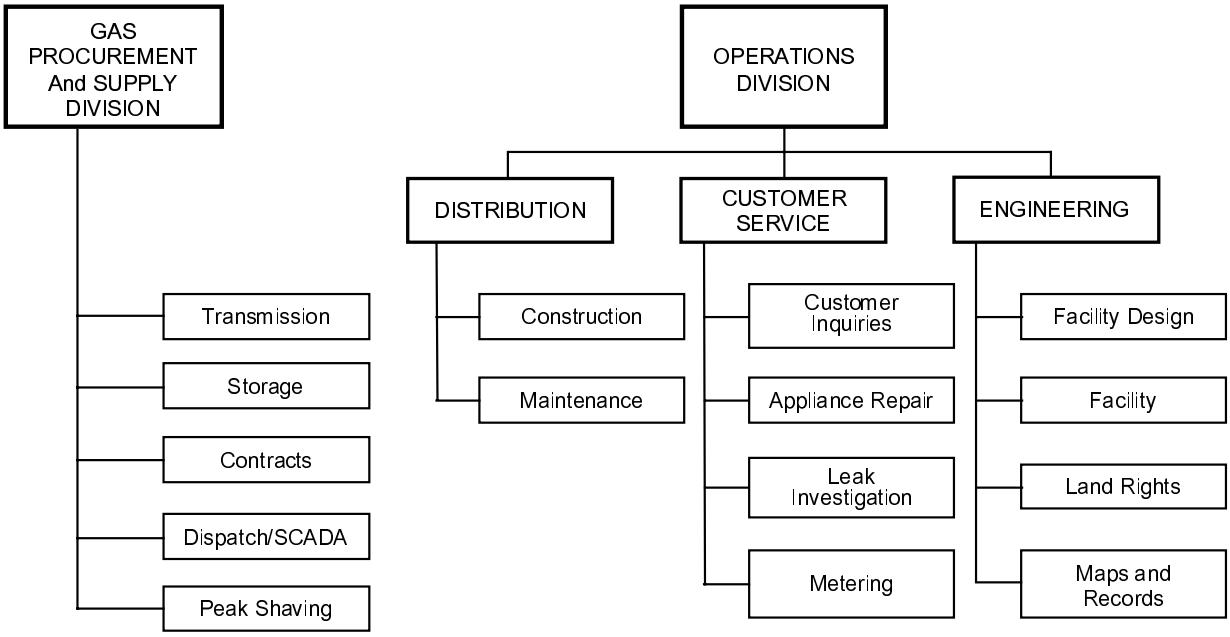


Figure 2.2 Typical Organization of the Divisions within a Distribution Company

Gas Companies in the Chicago Metropolitan Area

The gas companies that are active in the Chicago Metropolitan Area are listed below:

Distribution Companies

Peoples Gas Light and Coke Company (subsidiary of Peoples Energy, often referred to simply as Peoples Gas)
North Shore Gas Company (subsidiary of Peoples Energy)
Nicor Gas (subsidiary of Nicor)

Transmission Companies

Natural Gas Pipeline Company of America (subsidiary of Kinder Morgan)
American Natural Resource (subsidiary of El Paso Natural Gas)
Midwestern Gas Transmission
Northern Border Pipeline
Alliance Pipeline Company

Most people in the area are familiar with the gas distribution companies: Peoples Gas, which serves the City of Chicago; North Shore Gas, which serves communities on the northeastern portion of the area; and Nicor Gas, which serves the suburban communities in the six-county metropolitan area along with other communities outside the area. The transmission companies' pipelines run throughout the region and cross into a number of counties and municipalities.

2.2 COMPONENTS OF THE NATURAL GAS SYSTEM

The natural gas system is generally described in terms of production, processing and purification, transmission and storage, and distribution. Figure 2.3 shows a schematic of the system through transmission. Figure 2.4 shows the distribution components. (See Appendix A for a glossary of terms.)

Production

Various sophisticated geological, geophysical, and geochemical exploration methods are used to find the underground deposits of gas. Once gas is found either onshore or offshore, it is brought to the wellhead on the surface through piping installed by drill rigs and other drilling processes. A majority of the large oil companies do most of the exploration and production of natural gas. Currently, most of the natural gas used in the United States comes from the Rocky Mountain states, the Gulf of Mexico, and Canada. The Chicago Metropolitan Area can be served by any or all of these supply regions.

Processing and Purification

Gas produced at the wellhead can contain sand, dirt, hydrates, other hydrocarbons, sulfur compounds, and various other impurities that must be cleaned out of the gas before it can be put into transmission pipelines for long-distance transport. These impurities are "scrubbed out" of the gas at gas-processing centers by either mechanical or chemical means. Moisture in the gas is also removed at this point (dehydration) to prevent any compounds from forming that would plug regulators, meters, and pipelines. Gas-processing centers are normally located adjacent to the production facilities. After the gas is processed, it is ready to be transported through pipelines.

Transmission and Storage

The transport of natural gas from the producer to the Chicago Metropolitan Area via pipelines is the responsibility of the transmission segment of the gas industry. The transmission system is composed of pipelines, compressor stations, and storage facilities.

Transmission Pipelines – These pipelines are made of steel and generally operate at very high pressures (500 to 1,400 psig). In the Chicago region, the most common transmission pipelines are 24, 30, and 36 inches in diameter. Many transmission pipeline companies transport gas to the Chicago Metropolitan Area.

Compressor Stations – Gas is compressed along the pipeline transmission route to keep it moving at the desired pressure. Compressor stations are normally placed at 50- to 100-mile intervals along the pipeline and are powered by compressors rated at several thousand horsepower each. The stations contain valves, pipes, and control systems that monitor the functioning of the system. Most compressor stations are fully automated.

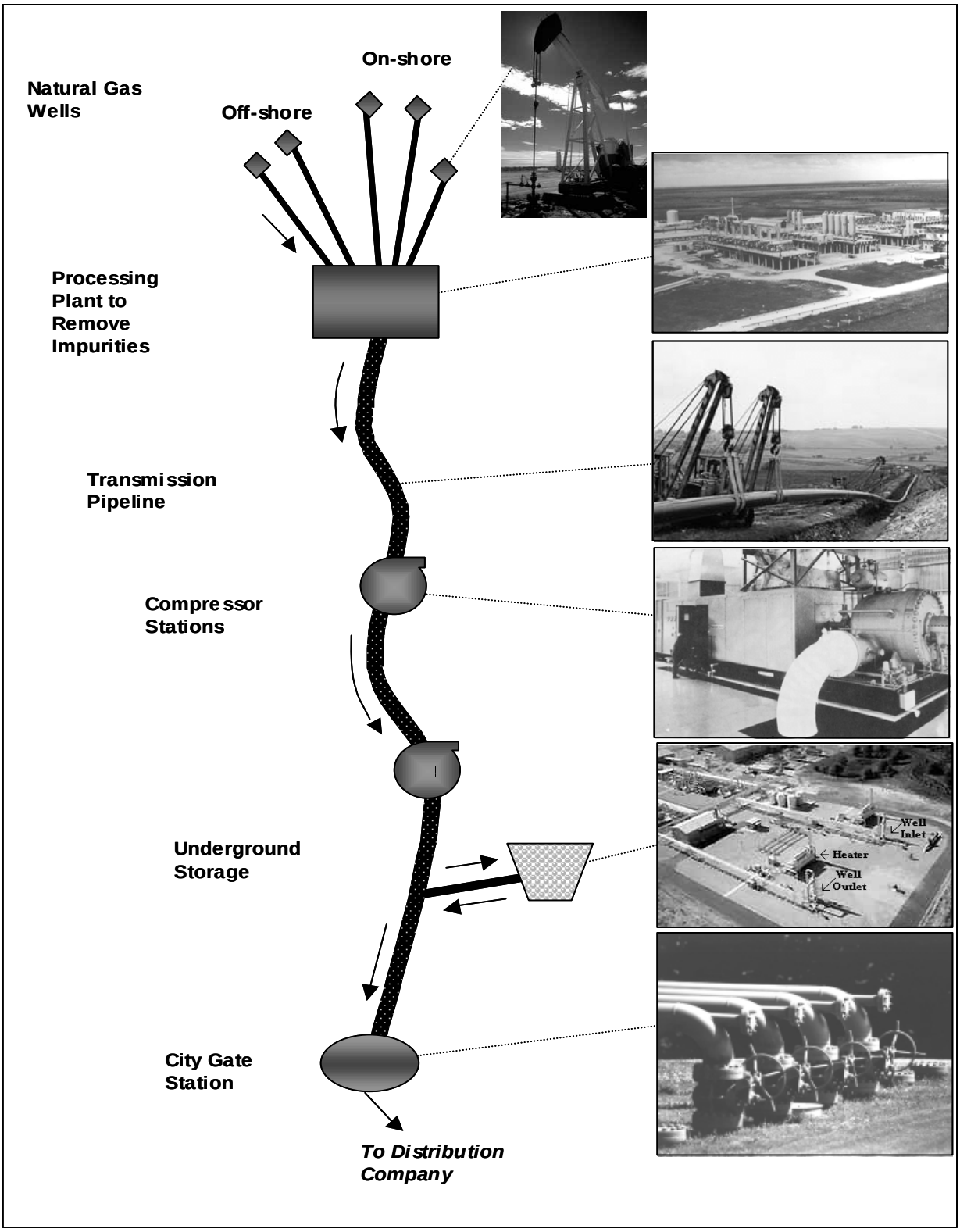


Figure 2.3 Schematic of Natural Gas Production, Processing, Transmission, and Storage

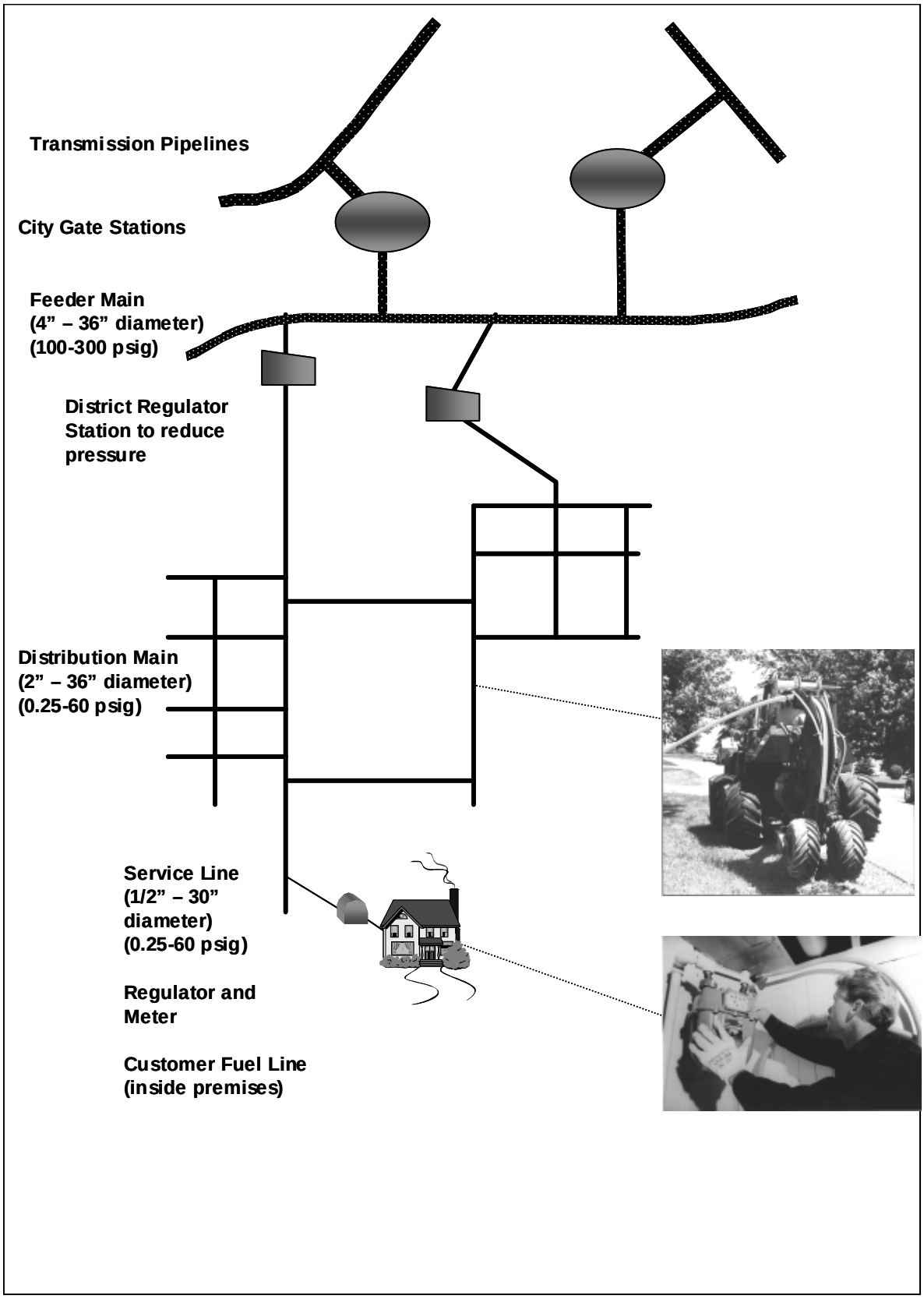


Figure 2.4 Schematic of Natural Gas Distribution

Underground Storage – Transmission lines are costly because of the investment in land rights, very large compressors, and large-diameter steel pipe. Because of this large investment, it is highly desirable to operate the transmission system at or near full capacity at all times to distribute costs over a large volume of gas. Thus, underground storage facilities are used to level the delivery rates and hold down transportation costs, while at the same time meeting market capacity demands.

Underground storage facilities are generally developed near market centers. Where feasible, gas is stored in depleted gas or oil reservoirs or in water-bearing geologic formations called aquifers. The gas is injected during the off-season – late spring through early fall – and is withdrawn during periods of high demand during the winter. The Chicago region has a large number of underground storage facilities that use aquifers. These facilities are made up of a myriad of pipes, valves, compressors, engines, and automated control equipment. On a cold winter day, approximately 50% of the gas used in the Chicago region can come from storage facilities. Therefore, storage facilities are an important component of the region's gas supply system.

Distribution

The natural gas distribution system consists of city gate stations, where gas is received from cross-country transmission pipelines; supplementary sources of gas; and the piping network that carries the gas from the various sources of supply to the final customer.

City Gate Station

The primary source of gas for most distribution systems is natural gas received from transmission pipelines and fed through one or more city gate stations, sometimes called *town border* or *tap* stations. The basic function of these stations is to meter the gas and reduce its pressure from that of the pipeline to that of the distribution system. The latter operates at a much lower pressure (reduced from approximately 500 to 1,400 psig to about 25 to 300 psig).

Most city gate stations measure the gas flow with metering devices and reduce its pressure with mechanical devices called pressure regulators. These devices control the rate of gas flow through the station and maintain the desired pressure level in the distribution system.

Natural gas is odorless. Gas received at city gate stations may or may not contain odorant, the compound that gives gas its distinctive smell. Gas received with insufficient or no odorant must have it added before the gas can leave the city gate station.

Supplementary Gas

Supplementary sources of gas are used primarily to meet cold weather peak demands. Supplementary gas (called peaks) is generally used sparingly because it

is more costly than other gas obtained from other sources. The use of supplementary gas, however, substantially reduces the costs that would be incurred by contracting for higher daily quantities of natural gas to meet peak demand. Supplementary gases can come from either liquefied petroleum gas (LPG) plants or liquefied natural gas (LNG) facilities.

Distribution Piping Network

The piping in a distribution system can be classified into several categories, generally moving from higher pressure to lower pressure lines. Many distribution systems consist of several superimposed networks of mains operated at different pressure levels. The terminology used for piping networks varies from company to company. Some of the most common terminology is listed below:

- *Feeder mains, supply mains, interstation mains, high-pressure mains, intermediate-pressure mains* – These lines receive and carry gas from city gate stations to other parts of the distribution system. In some cases, the main might be a few hundred feet long, whereas in other cases, it can consist of a complex network many miles long. Although gas in these lines is at a lower pressure than that of gas in a transmission pipeline, the pressure in these mains is higher than most other parts of the distribution system. The mains normally operate at pressures from 100 to 300 psig and have diameters from 4 to 36 inches. Some of these mains might have a few high-pressure taps, such as those that serve large industrial customers that are directly connected to them.

- *District regulator stations (also called "vaults")* – These facilities reduce the pressures from the supply mains (normally 300 psig) from 0.25 to 60 psig for delivery to the local distribution mains that directly feed the customers. Pressure is reduced with valves and regulators inside the vault. The facilities are usually belowground in 5- to 10-foot-wide square or cylindrical vaults with reinforced covers to prevent accidental damage or vandalism. The Chicago Metropolitan Area has approximately 1,300 district regulator stations.

- *Distribution mains (also called "medium-pressure or low-pressure distribution mains")* – These lines bring gas to areas where residential, commercial, and smaller industrial customers are located. Distribution mains, for example, would be placed down a residential street, and customer service lines would be connected to them. These lines usually operate at 0.25 to 60 psig with pipe diameters ranging from 2 to 12 inches.

- *Service lines* – These lines deliver gas from a distribution main in the street to the customer's meter. Service lines are usually the property and responsibility of the gas company. They normally operate at 0.25 to 60 psig with diameters ranging from 0.5 to 12 inches. The end of a service line might have a regulator, which reduces the pressure of the gas that is supplied to the customer, and a meter, which monitors gas use for billing purposes. Beyond the meter, the ownership of the gas is transferred to the customer.

- *Fuel lines* – These lines are the customer-owned pipe beyond the meter, that is, the lines that bring gas to appliances and other equipment. These lines are the property and the responsibility of the customer and must meet the requirements of municipal codes and ordinances. These requirements are generally based on the National Fire Protection Association's Pamphlet 54, *National Fuel Gas Code*.[3]

2.3 NATURAL GAS DISRUPTIONS

Several types of natural gas disruptions can affect service to customers. These disruptions and the issues involved are described in the following sections.

Types of Disruptions

Natural gas disruptions are generally divided into two main categories: service interruptions and leaks. The former are further divided into intentional and unplanned interruptions.

Intentional Service Interruptions

In an intentional service interruption, the gas distribution company shuts off gas service to a customer or area for any number of reasons, including the following:

- Planned interruptions – necessary maintenance or upgrade of gas system equipment,
- Customer request – request by a customer to cut off gas supply (e.g., to perform internal maintenance, to facilitate new construction),
- Tight gas supply – requests by the company asking customers with interruptible gas supply contracts to curtail gas load during periods of tight supply, and
- Gas supply shortage – curtailment of gas supply to an entire area, usually of small scope, to preserve the pressure and stability of the entire gas system.

Unplanned Service Interruptions

Unplanned interruptions to gas service can result from a wide variety of incidents, including the following:

- Malfunction of equipment;
- Damage to gas facilities due to natural disasters;
- Explosions or fires resulting from failure of gas equipment;

[3] *National Fuel Gas* Code, NFPA 54-1999 and ANSI Z223.1 – 1999, National Fire Protection Association, Quincy, MA.

- Acts of vandalism, sabotage, or civil disturbance;
- Gas supply interruptions at city gate stations due to transmission pipeline problems;
- Pressure fluctuations caused by human error or equipment failure;
- Safety conditions that require shutdown of gas to a customer or area; and
- Emergency conditions (e.g., police or fire personnel request interruption of gas service due to some other emergency).

The above list of unplanned outages is illustrative and not all encompassing. Unplanned loss of service for gas customers occurs infrequently.

Leaks

Gas leaks can occur without interrupting gas service to the customer. In some cases, the leak can be repaired without interrupting customer service. Some of the causes of gas leaks are:

- Gas pipeline hits or dig-ins by customers or contractors,
- Corrosion in pipes or pipe joints, and
- Material component failure.

Number of Customers Affected

The number of customers affected during a natural gas disruption is an important criterion for determining the severity of the incident. It is essential to recognize that the term "customer" refers to the individual or organization that pays the gas bill. In other words, the "number of customers affected" is different from the "number of people affected." Interruption of an industrial plant, which is considered one customer, could affect hundreds of people, in addition to resulting in lost manufacturing production and business.

The loss of gas service to a large number of customers is a relatively rare occurrence. In the last 35 years in the Chicago Metropolitan Area, the largest number of customers losing gas service at any one time has been on the order of 4,500. When compared with customers affected by electric power outages (which can be in excess of 100,000), the numbers are small.

The number of customers affected, however, has a special implication for natural gas disruptions. Unlike dealing with an electric power outage, which generally requires no visits to customer premises, the restoration of gas service involves an initial visit to each individual customer to shut off gas valves; work to repair any equipment damage, purge the gas lines, and test for integrity; and a second visit to each individual customer to relight each appliance or manufacturing process

and piece of machinery. This process is tedious and time-consuming and must be conducted with the safety of customers as the primary concern.

Duration of Disruptions

The duration of natural gas disruptions varies widely on the basis of the type of incident. Disruptions that require the excavation of a pipeline to find and repair a leak can take considerable time. The answer to the question of when the gas will be turned back on generally is not a simple one.

Complicating the issue of duration of disruptions is the aforementioned need for the gas company to visit each customer individually to shut off valves, repair damage, purge lines, and relight equipment. In cases of an outage in a wide area, the repairs to the system may be complete, but the process of customer relighting may significantly extend the duration of the outage for some customers. A general rule of thumb used in the gas industry is that one trained service technician can relight about four residential customers per hour.

The time of year also has an impact on the effects associated with a gas disruption. Interruptions of a few hours during the summer in a residential area may generally be of low consequence. During the winter, however, the same interruption scenario can affect the health and safety of the residents in a relatively short time, as well as cause significant economic damage (e.g., frozen water pipes). Even brief interruptions of gas service in a commercial or industrial area (e.g., metal manufacturing plant) can cause the loss of an entire product line or production batch.

Frequency of Disruptions

The frequency of gas disruptions in the Chicago region has been minimal over the past 35 years, except for third-party dig-ins. The incidence of gas disruptions is low enough that there is no commonly used statistical measure to track incidents, other than the total number of interruptions. The low incidence of disruptions can be attributed to the large number of transmission lines and storage facilities in the area and the high level of redundancy and backup capabilities in the distribution system.

On the other hand, outages due to gas pipeline hits and dig-ins are frequent and more common than all other types of outages. In addition, hits and dig-ins have the highest incidence of resultant property damage, injuries, and fatalities. About 5,000 dig-ins on gas lines occur annually in the Chicago Metropolitan Area, or an average of more than 13 per day. As dictated by state and federal law, information sources are available and procedures are in place that allow contractors, municipal workers, homeowners, and any other excavators to locate underground gas pipelines (and other utilities) before digging or excavating and thus avoid pipeline hits. The Chicago Utility Alert Network (often referred to as DIGGER) is available within the city limits. The Joint Utility Locating Information for Excavators (referred to as JULIE) is available in the suburbs. The use of these systems is described in more detail in Section 4.

Safety Issues

Natural gas is flammable. For any combustible gas, there are minimum and maximum ratios of the mixture of fuel and air that will allow combustion to take place. The minimum percentage of fuel required for combustion is called the lower explosive limit, or lower flammable limit. The maximum percentage is called the upper explosive limit, or upper flammable limit. For natural gas, the limits are:

- Lower explosive or flammable limit = 5% concentration of gas in air
- Upper explosive or flammable limit = 15% concentration of gas in air

If the natural gas concentrations are outside these relatively narrow limits, the mixture cannot ignite. As a result, the number of accidental natural gas fires or explosions is small.

Because natural gas supplied to the Chicago Metropolitan Area is odorless, a very distinctive odorizing chemical is added to the gas to alert people to its presence and give them sufficient warning to take appropriate action in case of a gas leak. A quantity of odorant is added such that a person with a normal sense of smell can readily detect a concentration of 1% gas in air. This amounts to a safety factor that is 5 times below the lower flammable limit of 5%.

As with any other flammable liquid or gas, natural gas must be handled carefully by trained personnel using appropriate equipment. Prior to experiencing a gas disruption, representatives from the local gas company should train municipal government emergency personnel (e.g., in the fire department) in procedures to follow during gas disruptions. All gas companies have training modules and programs designed specifically for municipal personnel concerning the safe handling of natural gas.

During a disruption event, municipal personnel, including police, fire, and public works staff, must work closely with gas company personnel. Municipal personnel should not operate valves and meters unless they receive instructions from gas company personnel. Closing off or turning on the wrong valves could have serious consequences to public safety and the integrity of the gas system. It is imperative that government emergency personnel and gas company personnel coordinate their efforts in this matter. Coordination of efforts is described in more detail in later sections.

3 ESTABLISHING NATURAL GAS DISRUPTION PLANNING RESPONSIBILITIES

The first – and often the most important – element used to prepare to respond to a gas disruption is the clear designation of responsibility. The municipal departments and individuals who are responsible for designing and implementing the natural gas 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.

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 natural gas system and potential disruptions to it. Table 3.1 lists typical municipal departments and the major responsibilities that relate to the gas infrastructure. For any municipality, it is important to designate a lead department to develop a natural gas disruption plan and to coordinate the municipality's activities during an actual gas disruption event. Historically, in many communities, the fire department has been designated as the primary point

Table 3.1 Typical Responsibilities for Municipal Departments and Natural Gas Personnel

Department	Typical Responsibilities within the Natural Gas Infrastructure
Municipal Manager	❑ Oversight of natural gas franchise agreement ❑ Preparation of municipal gas disruption plans
Public Works	❑ Deployment of emergency equipment during disruptions ❑ Reduction of municipal gas loads during periods of peak demand
Police	❑ Emergency response during gas disruption events ❑ Securing of areas where gas disruptions occur
Fire	❑ Emergency response during gas disruption events ❑ Coordination with gas company personnel during gas emergencies
Emergency Medical Services	❑ Emergency response to assist people especially sensitive to gas outages ❑ Emergency response to other medical needs during disruptions
Human Services	❑ Communication with elderly and disabled persons during disruptions ❑ Assistance in relocating people to shelters during extended outages
School District	❑ Planning and implementation of relocation of students to other schools during extended outages ❑ Evacuation of students from school buildings during disruptions
Public Health	❑ Determination of outage impacts on the public, especially the very young and the elderly
Emergency Management	❑ Coordination of response during major or extended disruption events

of contact with the gas company. This duty has been a natural outgrowth of the necessary interaction between gas company personnel and fire department personnel during gas leaks, pipeline breaks, and other gas-related emergencies.

In addition to identifying a lead department, a primary point of contact within that department should be identified. The individual(s) should represent the municipality during regular business hours and during nonbusiness hours for all matters related to natural gas. Likewise, the municipality should request points of contact from the gas company. The individual contacts from the municipality and the gas company should communicate on a regular basis, and any changes in the points of contact should be communicated regularly.

Whatever department is charged with dealing with gas issues in the municipality, planning for gas disruptions should be performed at the same time that a municipality plans for other emergencies, such as tornadoes, floods, heavy snowfalls, or toxic chemical spills. Likewise, planning for disruptions to the natural gas infrastructure should be done in the context of the potential for disruptions to other infrastructures, such as electric power, water supply, and telecommunications. In most cases, planning for a gas outage is only one 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 gas outages (as described in the following sections), and these points should be specifically incorporated into the emergency planning process.

3.2 MUNICIPAL AGREEMENTS AND ORDINANCES

Currently, no standard municipal agreements and/or ordinances specifically address roles and responsibilities during a natural gas disruption. Gas disruptions have occurred so infrequently that there has been no reason to address them in either franchise agreements or special ordinances.

3.3 RESOURCES AND RESPONSIBILITIES OF OTHER ORGANIZATIONS

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

County Organizations

All six counties in the Chicago Metropolitan Area have emergency management agencies, which are the county organizations most involved with emergency preparedness. These organizations are responsible 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 ICC is the state organization that regulates public utilities in Illinois, including Nicor Gas, Peoples Gas, and North Shore Gas. It establishes the rules and regulations under which gas is provided and priced at the retail level. It is also involved in pipeline safety issues on behalf of the U.S. Department of Transportation as described below.

Federal Organizations

The U.S. Department of Transportation, Office of Pipeline Safety, under Parts 191-195 Title 49 of the *Code of Federal Regulations* (49 CFR, 191-195), has the responsibility and authority to promulgate safety standards, interpret the safety standards, inspect companies' adherence to the standards, and enforce these standards through the Department of Justice. In the State of Illinois, the ICC Pipeline Safety Office acts as the agent for the U.S. Department of Transportation by inspecting and enforcing the pipeline safety rules for local gas distribution companies (i.e., Nicor Gas, Peoples Gas, North Shore Gas). For transmission companies in the State of Illinois, the U.S. Department of Transportation's Kansas City, Missouri, Regional Office handles pipeline safety inspection and enforcement of rules.

Municipalities that have questions concerning pipeline safety should begin discussions with the relevant gas company (i.e., the transmission or distribution company). If further information is required, the ICC Pipeline Safety Office is the point of contact for distribution-system–related matters, and the U.S. Department of Transportation Office of Pipeline Safety in Kansas City, Missouri, is the point of contact for transmission-related matters.

The Federal Emergency Management Agency (FEMA) is responsible 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, providing generators for electric power to keep hospitals and other essential facilities in operation, and providing heating or cooling equipment as needed. 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 federal assistance to address the consequences of any major disaster or emergency declared under the Robert T. Stafford Disaster Relief and Emergency Assistance Act…." [4] Section 12 of the plan identifies the federal agencies responsible for providing support during an energy emergency. Among the federal agencies that provide assistance in declared disasters that involve energy, including natural gas disruptions, are the following:

- The U.S. Department of Energy serves as the primary agency and is the focal point for energy issues in all response and restoration efforts.
- The U.S. Department of Defense deals with restoration of energy service to critical defense facilities.
- The Department of State coordinates involvement of foreign nations and international organizations.
- The U.S. 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 National Transportation Safety Board provides assistance in determining the cause of the incident and recommends preventive measures.

[4] 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.

4 PREDISRUPTION PLANNING

A municipality can take various steps to prepare for natural gas disruptions. The gas disruptions considered in these guidelines are intentional and unplanned interruptions of service and gas leaks. Planning for dealing with service interruptions and gas leaks requires different actions on the part of municipalities. Figure 4.1 illustrates steps that 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 be significantly affected if gas service were interrupted under either intentional or unplanned conditions or if a gas leak occurred in the vicinity. While most homes, offices, commercial establishments, or industrial factories would be adversely affected by the loss of gas service or exposure to gas leaks, some are more critical than others when considering the allocation of scarce municipal resources to respond to an incident.

General criteria for identifying a facility as "critical" include the following:

- *Impact on public health and safety.* The loss of gas service or the exposure to gas leaks at some facilities can significantly affect public health and safety. Examples of such facilities include hospitals, nursing homes, police and fire stations, schools, and industrial facilities that use gas to process hazardous materials.

- *Impact on orderly functioning.* At some facilities, the loss of gas service or exposure to gas leaks can significantly disrupt the orderly functioning of government, business, and private citizen activities. Although direct health and safety issues may not arise, a gas disruption can have significant consequences. Examples of facilities in this category include railroad switches that require gas heat in cold weather to prevent freeze-ups and compressed natural gas facilities that supply fuel to fleet vehicles such as school buses or transit authority buses.

- *Impact on the economy.* Some facilities might experience significant economic loss as a result of gas service interruptions. Examples include industrial factories, food-handling establishments (restaurants), and metal heat-treating businesses. Facility owners might experience economic impacts

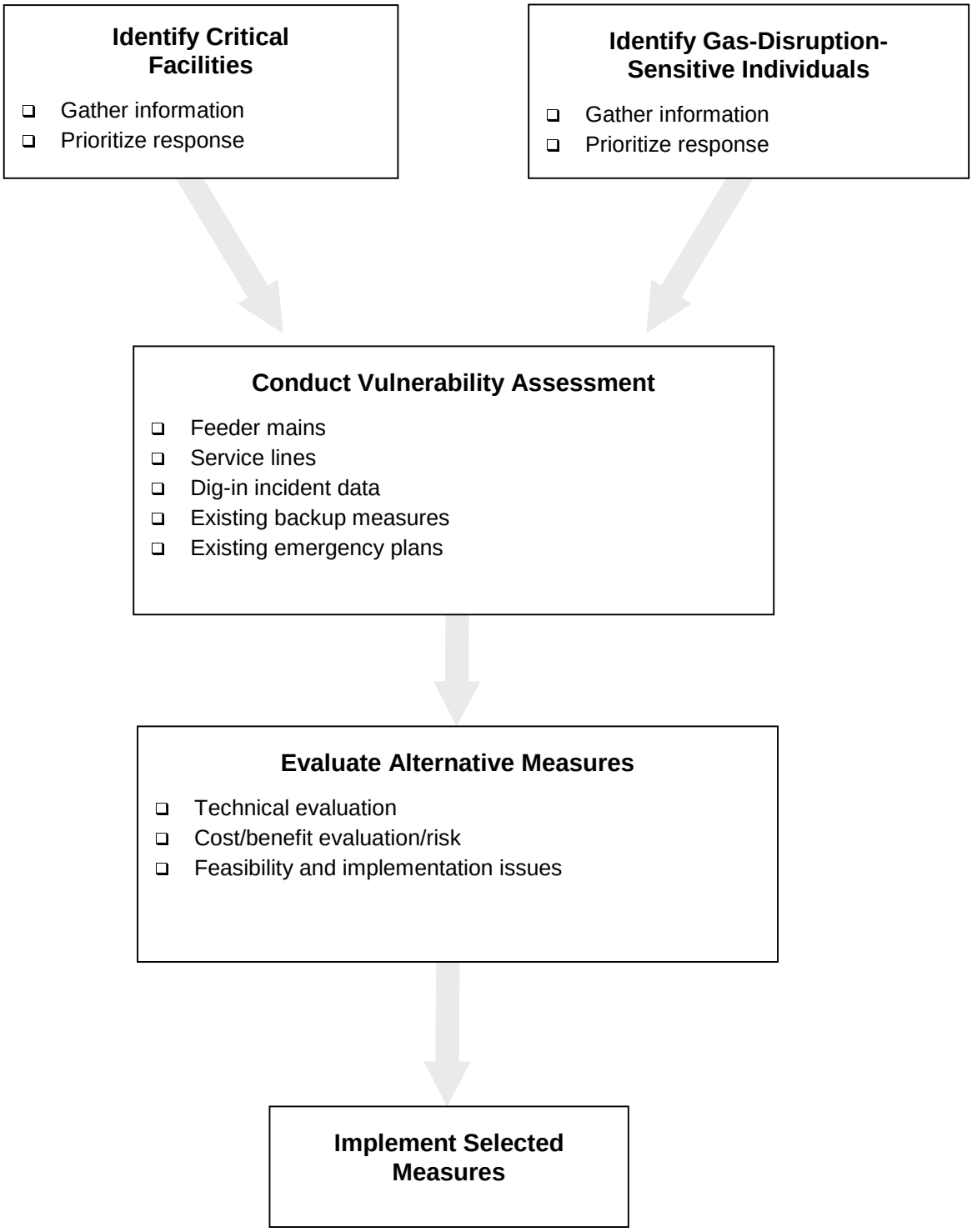


Figure 4.1 Predisruption Planning Process

in the short term (e.g., inability to cook, loss of industrial process batches) or in the long term (e.g., loss of customers, damage to capital equipment). Municipalities also might experience economic impacts such as loss of tax revenue.

- *Impact on other infrastructures.* Loss of gas service or gas leaks at some facilities can affect other infrastructures. For example loss of gas service to an electric power plant can affect electricity service to a given area. During cold weather conditions, loss of gas service, and therefore heat, to a telephone switching office could interrupt communications. Gas leaks at transportation facilities that force evacuation of personnel can disrupt critical transportation services.

In addition to these general criteria, more specific criteria can be considered to refine the list of critical facilities. Table 4.1 lists types of facilities that can be classified as critical, along with examples of each. These examples are intended to be illustrative rather than comprehensive. Municipalities should adapt this list to meet local needs and requirements.

Determining the Level of Criticality

Because municipal response resources are often limited, it is important to prioritize the list of critical facilities on the basis of how quickly a municipality would have to respond to a gas disruption incident in order to minimize serious consequences. Some critical facilities might require an immediate response in the event of any interruption of service or indication of gas leaks because of the potential for immediate, significant public health and safety impacts. Other critical facilities, however, might require a response only in the event of a lengthy service interruption. Furthermore, if a widespread interruption affected many critical facilities, it might be necessary to allocate available response resources (e.g., police, fire, emergency medical) to those critical facilities most in need.

Response priorities for critical facilities vary according to local requirements and needs. Table 4.2 gives an example of how to prioritize critical facilities for gas disruption events.

Note that a facility's "criticality" is distinct from its "vulnerability." A facility might be considered critical because of the potential for serious impacts from a gas disruption incident, but it might not be vulnerable if, for example, redundant systems or backups were in place. The issue of vulnerability is discussed later.

Table 4.1 Typical Critical Facilities

Type of Facility[a]	Examples[a]
Emergency Services	❑ Police stations ❑ Fire stations ❑ Emergency medical service stations
Shelters	❑ Any facility used as a shelter in extreme weather or emergency conditions
Medical Services	❑ Hospitals, nursing homes ❑ Mental health treatment facilities ❑ Specialized treatment centers (e.g., outpatient surgery, dialysis, cancer treatment) ❑ Rehabilitation centers ❑ Blood donation centers
Schools	❑ Nursery schools, kindergarten, elementary schools, high schools, colleges, business and trade schools
Day-care Facilities	❑ Registered day-care facilities ❑ Sitter services ❑ After school centers
Senior Services	❑ Senior citizen centers ❑ Retirement communities
Social Service	❑ Homeless/transient shelters ❑ Missions and soup kitchens ❑ Youth, family, and battered person shelters ❑ Heating/cooling shelters
Detention Centers	❑ Jails ❑ Youth detention centers
Community Centers	❑ Libraries ❑ Civic centers ❑ Recreational facilities
Public Assembly	❑ Sports stadiums, concert auditoriums, theaters, cinemas, religious facilities, shopping malls, conference centers, museums, art centers
Hotels	❑ Hotels, motels, boarding houses
Food Service	❑ Restaurants ❑ Food processing facilities
Industry	❑ Hazardous material handling ❑ Metal heat treating
Transportation	❑ Railroad switches (in cold weather) ❑ Aviation control facilities ❑ Natural-gas–fueled fleet vehicles (e.g., buses)
Wastewater Treatment	❑ Wastewater sludge incinerators

[a] These examples are for illustrative purposes and are not comprehensive.

Table 4.2 Sample Criticality Classification for Facilities

Criticality Level/Description	Examples of the Types of Critical Facilities That Might Be Included in This Criticality Level[a]
Level 1 – Immediate Municipal Response Required ❑ Highest priority for response under any disruption conditions, including loss of service and/or leaks ❑ Potential for immediate, serious impacts on public health and safety ❑ Of special concern during severe cold weather	❑ Emergency service facilities, including police, fire, and emergency medical services ❑ Any facility to be used as an emergency shelter ❑ Hospitals ❑ Industrial plants processing hazardous materials ❑ Interdependent infrastructure facilities
Level 2 – Municipal Response Required If Service Interruption Expected to Last 4 Hours or More ❑ High priority for response for longer term loss of service disruptions ❑ Of special concern during severe cold weather	❑ Nursing homes ❑ Schools, including nursery schools and elementary schools ❑ Detention centers ❑ Wastewater treatment facilities
Level 3 – Municipal Response Required on Call for Assistance during Service Interruptions ❑ Lower priority, but still of concern ❑ Response 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 gas service could affect other infrastructures (e.g., telephone switching offices, facilities generating electricity, railroad switches, compressed natural gas vehicles used for public transportation). 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 gas outage. In some situations, for example, the municipality could assist the company owner in protecting the facility from, and/or mitigating against, any damage from gas disruption events. Such actions could prevent a cascading infrastructure failure event that could have serious impacts on the municipality.

Gathering of Critical Facility Information

Municipalities can gather information on critical facilities from various sources. In fact, many municipalities have assembled a list of important facilities as a result of other emergency planning activities. Many county and state emergency preparedness organizations also maintain such lists.

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

- Single feeder main system vs. redundant feeder main system;
- Availability of backup systems;
- Type of backup system (e.g., electric, oil, propane);
- System operating pressures of feeder mains (e.g., low-pressure systems 0.25 psig are more vulnerable because there is less pressure differential to work with before 0 psig and an outage);
- Suitability of the facility as a temporary shelter during widespread, extended outages; and
- Availability of a contact person who can assist in obtaining resources for relighting efforts.

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

4.2 GAS-DISRUPTION–SENSITIVE INDIVIDUALS

Gas-disruption–sensitive individuals are people who would be seriously affected by an interruption in gas service, even for short periods of time. These individuals include the elderly, those who are receiving medical treatment at home, and people with disabilities.

For the most part, these people are particularly vulnerable to disruptions in any infrastructure service (e.g., electric power, telephone), not just natural gas. Information concerning these people is usually collected as part of routine community social service efforts, and special efforts for gathering information related to gas-disruption events are generally not necessary. It is important, however, that this information is communicated between the municipality and the gas company in the event of widespread interruptions in gas service. A municipality can provide the company with a list of places where gas-disruption–sensitive individuals reside and can request priority consideration in service restoration efforts, if possible. Alternatively, on receiving notification from the gas company of a service interruption in an area, the municipality can allocate its available resources to assist these individuals while repair and restoration work is underway.

4.3 ASSESSMENT OF POTENTIAL VULNERABILITIES

The vulnerability of a facility to a gas-disruption event depends on a number of issues, such as the location and configuration of the gas mains and lines that provide service, the exposure of the lines to accidental or intentional damage, and the availability of backup equipment or alternative fuels. A vulnerability assessment of a critical facility is designed to determine the risk of a gas-disruption event and to lay the groundwork for considering measures to reduce that risk.

It should be reemphasized that a facility's *vulnerability* is different than its *criticality*. (Criticality was discussed in an earlier section.) A facility with a high criticality (e.g., a hospital) may have a high, medium, or low vulnerability, depending on the configuration of its gas service and its backup capabilities. Table 4.3 lists some of the conditions that can be used to determine a facility's vulnerability.

A natural gas vulnerability assessment consists of the following tasks:

- *Review and assess the distribution main configuration.* The municipality should work with the local gas distribution company to assess the distribution mains in the area of the critical facility. It should be determined if the facility is served by a network with redundant backup feeds or is on a single radial feeder. Redundant backup feeds can reroute gas around a break in a line and continue gas service while repairs are made. Single radial feeders do not have this capability.

- *Review and assess service lines.* The service lines that bring gas to the facility should be located and evaluated. Of particular concern is to determine whether the lines are located such as to minimize the potential for accidental or intentional damage. Underground lines should be buried to

Table 4.3 Sample Vulnerability Classification for Critical Facilities

Vulnerability Level	Examples of Conditions That Would Lead to This Vulnerability Level
Level 1: High	❑ Facility is served by a single radial main with no back feed capability. ❑ Facility has service lines, regulators, and meters readily susceptible to damage. ❑ Facility has no backup equipment or alternative fuel sources.
Level 2: Moderate	❑ Facility has some of the features listed below.
Level 3: Low	❑ Facility is served by a network with multiple back feed capabilities. ❑ Facility has service lines, regulators, and meters protected and inaccessible. ❑ Facility has backup equipment. ❑ Facility has emergency plans for gas-disruption events.

depths in accordance with federal requirements and accepted industry practices to reduce the risk of accidental dig-ins. Aboveground gas facilities should be secured and protected to prevent accidental or intentional damage. In addition, consideration should be given to how any leak or break in the service lines might impact the ability to evacuate the facility.

- *Review and assess utility location notices.* Utility location notices can be sent to municipalities whenever a request is made by a contractor or home owner to identify buried pipes, cables, and power lines. These notices originate from the Chicago Utility Alert Network (DIGGER) in the City of Chicago and from the Joint Utility Locating Information for Excavators (JULIE) in the suburbs and are sent to those municipalities that are members and that request the notices. Data on the total number of location notices in an area are available from either DIGGER or JULIE. For example, in 2001, more than 500,000 notifications were sent in the suburban areas alone. Reviewing these data may uncover patterns that would indicate certain areas are more susceptible to the risk of pipeline damage.

- *Review and assess backup measures in place*. Backup systems in place at a facility can replace any lost natural gas service. The backup systems can include alternative equipment such as electric heaters that can be used to provide space heat. In the case of some large commercial or industrial facilities, backup systems may replace lost natural gas with propane or oil to maintain facility operations.

- *Review and assess emergency plans*. In addition to backup equipment, a critical facility may need an emergency plan that addresses the loss of gas service and/or a gas leak. These plans can include such actions as evacuation of the facility.

Vulnerability assessments should be reviewed periodically to identify any changes that might have occurred. Appendix C gives an example of a vulnerability assessment carried out for critical facilities.

In addition to conducting vulnerability assessments of individual critical facilities, a municipality can also undertake a municipality-wide assessment of its vulnerability to a widespread disruption of natural gas service. This type of assessment would involve evaluating considerations, such as the availability of heating shelters for large numbers of people, the ability to evacuate large numbers of people in the event of a very long-term and extensive disruption of gas service, and other major events. In general, this type of assessment would be included in the overall emergency planning for catastrophic events rather than for gas disruptions alone. It is important that a municipality include gas disruptions as part of this planning process.

4.4 EVALUATION OF ALTERNATIVE PREPAREDNESS MEASURES

Once critical facilities have been identified and potential vulnerabilities have been assessed, the next step is to consider measures that protect critical facilities and/or reduce the impacts of a natural gas disruption event. 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. As shown in Figure 4.2, emphasis should be placed on those facilities that rate high on both the criticality and the vulnerability levels.

Measures for Dealing with Disruptions in Gas Service

Several measures can be used to help critical facilities and gas-disruption–sensitive individuals deal with potential disruptions in gas service. Some measures (e.g., backup systems) are aimed at providing alternative sources of gas to replace the gas normally supplied by the natural gas 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 4.4 summarizes some of the available options; this list is illustrative, not comprehensive. Appendix D provides more detailed information on each of the measures.

It should be noted that one of the measures, Gas Line Dig-in Prevention, is controlled by Illinois law. The Illinois Underground Utility Facilities Damage Prevention Act requires that anyone doing any excavation work must contact the appropriate utility locator system to obtain information on all buried utility

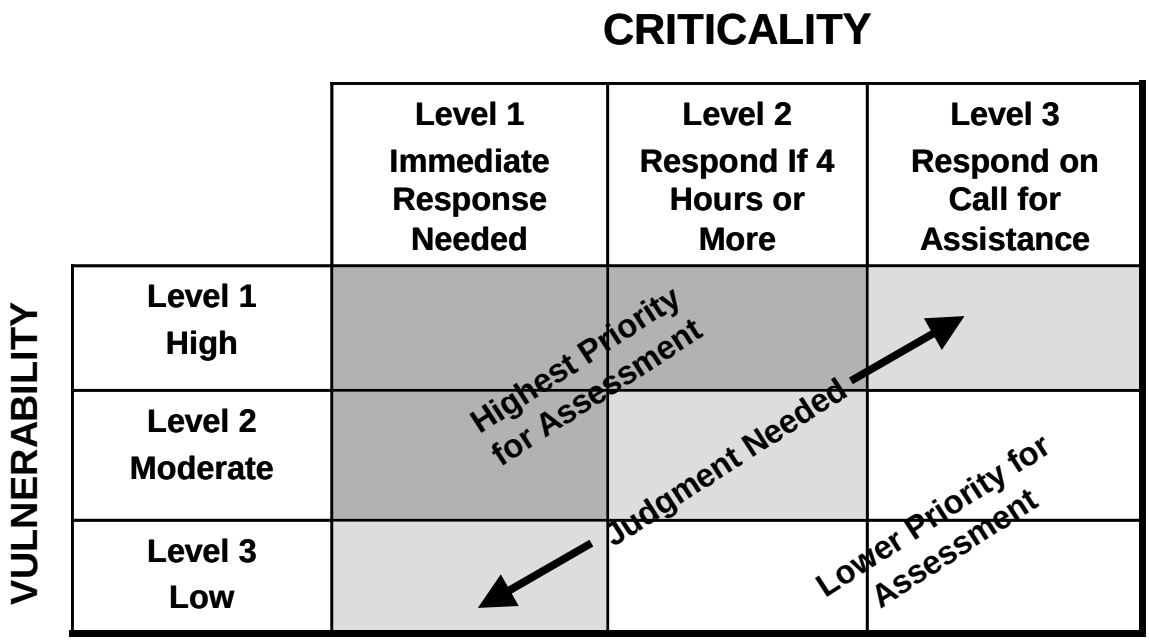


Figure 4.2 Criticality and Vulnerability Planning Matrix

Table 4.4 Typical Preparedness Measures for Critical Facilities

Measure/Purpose	Examples
Enhanced System Connections Provide more connections to the gas system from different distribution mains, if available.	❑ Provide temporary gas supply alternatives for use during disruptions. ❑ Review with gas company additional network connections that may provide additional redundancy.
Protection of Supply Lines Provide enhanced protection and surveillance of gas system.	❑ When requested, police provide protection for critical gas system components during heightened alert; investigate suspicious behavior. ❑ Add fencing or other security to gas service lines, regulators, and meters.
Gas Line Dig-in Prevention Implement steps to reduce the incidence of gas pipeline damage during excavation and digging.	❑ Municipalities join the locator system (JULIE in the suburbs). ❑ Police and/or public works employees check with excavators to determine if utility locator system has been called to identify buried lines. ❑ Monitor requests to utility locator systems.
Gas Leak Preparedness Train municipal employees to respond to gas leaks.	❑ Municipalities ask a gas company to provide emergency personnel training on steps and procedures to follow when a gas leak incident occurs.
Alternative Fuel Supply ***Emergency On-site Backup***	❑ Permanent propane or oil backup equipment and systems are installed where gas and alternative fuel systems are interchangeable. ❑ Wood-burning fireplaces are permanently installed.
Emergency Portable Equipment	❑ Portable electric heaters and blankets can be provided. ❑ Temporary wood-burning fireplaces can be hooked into the existing exhaust flue system to provide heat.
Demand-side Management Introduce measures where customers reduce demand during peak or critical load periods.	❑ The area's gas company may offer various options.
Shelters Use shelters to house people during a prolonged or widespread outage.	❑ Winter heating shelters. ❑ Summer cooling shelters (with gas absorption chillers).
Evacuation Planning Institute plans for ensuring evacuations during a gas disruption.	❑ Single facility evacuation plans. ❑ Mass evacuation plans for widespread, extended period gas disruptions; includes multimunicipal and regional planning.

services (e.g., electricity, natural gas, telephone, cable). In the Chicago Metropolitan Area, the contacts are as follows:

Within Chicago City Limits
Chicago Utility Alert Network (DIGGER)
312-744-7000

In the Suburbs
Joint Utility Locating Information for Excavators (JULIE)
800-892-0123

The successful application of this measure (i.e., dig-in prevention) throughout a community can significantly reduce the incidence of gas pipeline damage and leaks.

Evaluation of the Measures

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

Technical Evaluation

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

- *Applicability.* This issue addresses the potential effectiveness of the specific measure under consideration. For example, adapting a critical facility to allow it to use dual gas service lines would not be useful if both lines were connected to the same distribution mains.

- *Design.* This issue addresses the appropriate size and operation of the measure under consideration. For example, a backup alternative propane facility 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 impact its effectiveness during a service interruption. For example, an alternative fuel facility with a manual startup would not be useful if the operator could not reach it in time to restore service when needed.

Economic Evaluation

In an economic evaluation, the costs of the measures necessary to ensure preparedness are analyzed. The following cost elements should be considered:

- *Capital cost.* This cost primarily includes 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 keep the equipment ready to operate and to repair and maintain the equipment. Costs for both labor and materials should be included. For example, a qualified operator must test standby alternative fuel supply systems on a regular basis and operate them during disruptions. Components must also be replaced on a regular basis even if they are used only intermittently. 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; that is, assess the benefits of minimizing the likelihood or severity of possible adverse situations. These evaluations – often described by the terms *risk analysis* or *risk management* – systematically compare the cost of a measure with the benefits or outcomes that might result from implementing it. In essence, this type of evaluation determines whether the cost of a measure (e.g., capital, installation, operating) is justified when compared with the potential impacts of a natural gas disruption.

A risk analysis that determines the cost/benefit of a particular measure can be either very simple or very complex. In its simpler form, the analysis asks, "Is it reasonable to pay $X for this measure, which will enable the provision of uninterrupted service during a gas disruption?" A qualitative assessment of the situation is made, and a course of action is selected. These evaluations must be considered in light of the requirements imposed by federal and Illinois law.

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 gas disruption. These values can then be compared with the cost of the measure being considered. If the cost is lower than the cost of the impact, the measure would be considered 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 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 and safety issues (e.g., safe distances from facilities for storing backup propane or oil). In some cases, building codes may impose requirements on the measures under consideration.

- *Installation*. Some measures require special equipment or configurations in order to be truly effective (e.g., hooking portable fuel systems into existing exhaust or flue systems).

- *Interdependencies*. Some measures rely on the continued operation of a different infrastructure, which may not always be available (e.g., electric heaters or electrically controlled propane air fuel systems).

4.5 IMPLEMENTATION OF MEASURES

Once the evaluations have been completed, the measures that offer the most benefit should be implemented. The implementation process 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. Natural gas supply shortages in the Chicago area have not been a concern in the past; however, third-party dig-ins have increased. Municipalities should keep these considerations in perspective as they allocate scarce resources. Protective measures for natural gas disruptions 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 a gas 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 interruption in gas service or to a gas leak is based on the understanding that not all threatening conditions (e.g., prolonged cold, damaged pipelines) 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, whereas 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 gas service interruptions, which can help planners develop appropriate actions in anticipation of disruptions. Table 5.2 shows a classification scheme for actual interruptions. Neither classification scheme is intended to be exact or precise; rather, each provides a general framework for planning staged responses to disruptions under different conditions. Table 5.3 shows the classification scheme for gas leaks that is widely used in the gas industry.

5.2 NOTIFICATION AND COMMUNICATION

Early notification and communication before or during serious natural gas disruptions or gas leaks give emergency responders lead-time to take effective action. Continual and accurate communication during a service interruption or a gas leak minimizes public anxiety and maintains confidence that everything is under control and is manageable.

Notification Channels

Primary notification and communication concerning gas-disruption events usually originate with the gas company – Nicor Gas, Peoples Gas, or North Shore Gas – and are given to a designated municipal official.

Frequently, notification about a gas-disruption event originates with a customer, who calls the municipal fire or police department first. This is the case where there are fires or explosions and is sometimes the case for gas leaks. These

Table 5.1 Classification Scheme for Impending Gas Service Interruptions

Gas Supply Alert
The Gas Supply Alert phase provides an early warning of potential problems. Indicators show that the gas system and supply are stressed, and the potential for sporadic outages exists. The following indicators can lead to an alert notification: ***Cold Watch Issued*** – An average 24-hour temperature of –5°F for 2–3 days is experienced or expected. ***Conservation Plans Implemented*** – A gas company implements general conservation plans and asks the general public to conserve. ***Curtailment Plans Implemented or Notification Issued*** – A gas company asks large industrial or power generation customers to curtail gas service until further notice. A pipeline transmission company notifies the distribution companies of supply restrictions or curtailments that will cause the distribution company to curtail large commercial or industrial customers.
Gas Supply Warning
The Gas Supply Warning phase indicates a higher potential for system outages. The following indicators can lead to a warning notification: ***Cold Warning Issued*** – An average 24-hour temperature of –5 to –10°F for 4–6 days or more is experienced or expected. ***Curtailment Plans Implemented or Notification Issued*** – A transmission pipeline company notifies the distribution companies of severe gas supply curtailments or gas disruptions. The gas distribution company cannot make up any portion of this curtailment, and therefore planned customer/system curtailments are a higher probability.
Gas Supply Emergency
The Gas Supply Emergency phase indicates the gas system is stressed and system supply pressures continue to fall for an extended period of time. Any one single event on the major transmission system could cause a wide area outage for an extended period of time. The following indicators can lead to an emergency notification: ***Cold Emergency Issued*** – An average 24-hour temperature of –15°F or lower is experienced or expected. ***Gas Interruptions Experienced*** – Gas interruptions and sporadic customer outages occur at various locations within specific system distribution mains (e.g., caused by poor system pressure).

Table 5.2 Classification Scheme for Actual Gas Service Interruptions

Limited Service Interruption
A Limited Service Interruption is a localized interruption of service that affects a small number of customers **and** is of short duration (less than 24 hours). Some examples of limited service interruptions are listed below: ❑ Planned system maintenance or construction activities ❑ Planned interruptions for gas leak repairs ❑ Dig-ins that affect only a customer service line
Extended Service Interruption
An Extended Service Interruption affects a neighborhood or similar area where multiple customers are without gas service **and/or** have experienced a service interruption of longer duration (1–3 days). Some of the conditions that lead to extended service interruptions are listed below: ❑ Dig-ins that affect a system feeder main ❑ Liquids (e.g., water) that become entrapped in system feeder mains or customer service lines that must be pumped clear to restore service ❑ Planned major maintenance or system upgrade projects that require gas service to be shut off
Wide Area Service Interruption
A Wide Area Service Interruption affects a wide area or perhaps an entire municipality **and/or** a service interruption of much longer duration (more than 3 days). Some of the conditions that can lead to wide area service interruptions are listed below: ❑ Dig-ins or other damage to feeder mains, transmission pipelines, or city gates ❑ Simultaneous damage to multiple system components ❑ Gas supply shortages ❑ Natural disasters that damage pipelines (e.g., floods)
Regionwide Service Interruption
A Regionwide Service Interruption affects a large part or all of a metropolitan area or an even larger area that extends across state lines. Some of the conditions that can lead to regionwide service interruptions are listed below: ❑ Gas supply problems at producing wellheads ❑ Major damage to transmission pipelines ❑ Simultaneous multiple system equipment failures

Table 5.3 Classification Scheme for Gas Leaks

Class 1 Leak
Class 1 leaks – considered to be of highest priority – represent an existing or probable hazard to persons or property and require immediate repair or continuous action until the conditions are no longer hazardous. Examples of Class 1 leaks are listed below: ❑ Escaping gas that has ignited (fire or explosion) ❑ Indications that gas has migrated into or under a building or into a tunnel ❑ Any leak that can be seen, heard, or felt
Class 2 Leak
Class 2 leaks are those that are recognized as being nonhazardous at the time of detection, but they require scheduled repair based on probable future hazards. Examples of Class 2 leaks are listed below: ❑ Leaks under a sidewalk or street in a wall-to-wall paved area that is not determined to be either a Class 1 or a Class 3 leak ❑ Leaks, which, under frozen or adverse soil conditions, would likely migrate to the outside wall of a building
Class 3 Leak
Class 3 leaks – considered to be of the lowest priority – are determined to be nonhazardous at the time of detection and can be reasonably expected to remain nonhazardous. An example of a Class 3 leak is listed below: ❑ Leaks under a street in areas without wall-to-wall paving where it is unlikely that gas could migrate to an outside wall of a building

Note: Most gas companies have adopted the basics of Appendix M of the American Society of Mechanical Engineers B31.8 code for standards on leak classifications. Similar leak classification guidelines are in the Gas Piping Technology Committee (GPTC) *Guide for Transmission and Distribution Piping Systems* (ANSI/GPTC Z380.1). The above classification scheme was derived from these guidelines. Although the classification scheme appears simple, its use in the field is complex and is done by highly experienced gas company or contractor personnel with years of experience in the application of leak criteria.

municipal agencies then notify the appropriate gas distribution or transmission company while dispatching their own response team.

Whatever arrangement is made, it is vital that the municipality and the gas company establish clear and unambiguous notification and communication channels. Procedures need to be in place on a 24-hour, 365-day basis to deal with any situations that might arise.

Conditions That Require Notification

On the basis of the agreements reached between a municipality and the gas company, the following natural gas events could initiate a notification:

- *Intentional interruptions of service*. The gas company can notify the municipality that intentional service interruptions will affect a designated number of customers or critical facilities. Examples of intentional interruptions include interruptions at a customer's request, interruptions to allow repair of gas leaks, and interruptions due to tight gas supplies. The specific number of customers affected or other conditions that would trigger a notification are the subject of the agreement between the gas company and the municipality.

- *Unplanned interruptions of service*. The gas company can provide municipalities with notice of service interruptions that were due to unexpected events such as equipment failure, storms, or vandalism.

- *Emergencies involving gas*. The gas company can notify the municipality after an emergency incident that has resulted in one of the following conditions:

  - injury requiring hospitalization,
  - evacuation of a critical facility,
  - gas-related fire or explosion, or
  - other gas leaks.

In general, for many of these incidents, the municipality will have already been notified via calls to its 911 emergency center. It must be determined if any additional notification is needed or useful.

- *Gas supply alert, warning, or emergency conditions.* The gas companies have internal procedures for evaluating the stress on the system and the potential for an interruption of gas service. Depending on the arrangements in place, the gas company can notify the municipality of an impending gas disruption event.

- *Supply interruptions.* The gas company can notify the municipality if it believes a significant supply interruption has occurred or is forecasted to

occur, where the interruption will affect a large number of customers and/or critical facilities.

Municipal Personnel to Be Notified

Currently, in a municipality, the most frequent point of contact for natural gas incidents is the fire department. For the gas company, the most common point of contact is one of the operations personnel – usually the person dealing with an emergency event such as a gas leak. Experience has shown that contacts between fire departments and gas company operations personnel have been very effective in dealing with immediate response needs.

In addition to these established contacts, it is important that the municipality and the gas company have points of contact for major, but not emergency, events such as gas supply shortages. These contacts are needed during business and non-business hours. For the municipality, the contact can be someone in the public works department or in municipal administration.

Manner of Notification

The manner of notification depends on the agreements in place (e.g., telephone calls or pagers to predetermined numbers to contact the appropriate personnel). If e-mail or faxes are used for notification, it is incumbent upon the parties to make sure a procedure or process is in place so that these messages are read and handled within an appropriate time frame.

Information to Be Provided in a Notification

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 impending or actual service interruptions, the following information should be considered to be the minimum amount that a municipality should be given as part of its notification procedure with the gas company:

- Start time of the interruption,
- Cause of the interruption,
- Geographic area affected,
- Number of customers affected,
- Expected duration, and

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

In the case of a gas leak, the following information should be provided in a notification:

- Location of the leak;
- Impact of the leak;
- Cause of the leak;
- Need for evacuation, if any; and
- Need for any municipal services (e.g., police, fire, emergency medical) to assist gas crews in the restoration process.

Notification Received from Local Citizens

Often, a resident or business in the municipality calls the municipal office or the 911 dispatch center to report an interruption in gas service or a gas leak. In such cases, it is important for the municipality or the 911 dispatch center to advise residents and businesses to contact the appropriate gas company to report the problem. In many cases, the gas company may not have any indication of a problem until a customer reports it. Municipal officials and 911 dispatchers responding to calls from residents concerning gas service interruptions and/or leaks can best assist in the restoration process by advising customers to call the gas company.

For an emergency situation (e.g., serious leaks, fire or explosion related to gas), the municipal office or 911 dispatch center should also call the gas company with the information in the event the customer is unable to. Appropriate municipal personnel should also be sent to the scene of the incident.

5.3 RESPONSE PROTOCOLS FOR IMPENDING GAS SERVICE INTERRUPTIONS

The following sections present some guidelines on ways in which municipalities can respond to a notice of an impending interruption of gas service. 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 service interruption.

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 which municipal department is responsible for each aspect of dealing

with the gas infrastructure. 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) to hours. The response protocol for planned interruptions focuses on taking the steps necessary to prepare for the loss of gas service and minimizing the impacts. Table 5.4 lists the actions involved in this protocol. The actions are not necessarily sequential, and it might be preferable to conduct some in parallel.

Response Protocol for a Gas Supply Alert

A Gas Supply Alert indicates the onset of problems that could result in a loss of gas service. The response protocol for a Gas Supply Alert focuses on notifying the municipal staff of the impending situation and beginning preparations. In

Table 5.4 Response Protocol for Planned Interruptions

Action	Responsible Person/Municipal Agency	Description
Receive notice from the gas company of the planned interruption.	Municipal gas representative	The gas company provides notice that an interruption will occur, identifies the geographical area to be affected, and gives the expected duration of the interruption.
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: For planned interruptions, the gas company normally notifies all customers who are about to have service interrupted.)
Advise gas-outage–sensitive individuals of the planned interruption.	Human services	Gas-outage–sensitive individuals who could be affected by the interruption are identified and notified. A determination is made if special assistance (e.g., evacuation) is needed for the duration of the interruption. (Note: For planned interruptions, the gas company normally notifies all customers who are about to have service interrupted.)
Dispatch municipal crews to affected municipal facilities.	Public works	Municipal crews are sent to any municipality-owned critical facilities to start portable heating or cooling equipment, open backup facilities, and deploy other necessary measures during the planned outage.
At the end of the interruption, verify the status of critical facilities and gas-outage–sensitive individuals.	Municipal public affairs office Human services	Critical facilities and gas-outage–sensitive individuals are contacted following the scheduled completion of the interruption to verify that their gas service has returned to normal conditions.

general, at the time of an Alert, significant interruptions to gas 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 5.5 lists the actions involved in this protocol.

Response Protocol for a Gas Supply Warning

A Gas Supply Warning indicates that the probability of a gas service interruption has increased and in some cases sporadic gas outages have occurred. The response protocol for a Gas Supply Warning focuses on taking steps to reduce gas consumption and beginning to implement more substantial actions. Gas service interruptions may or may not have begun. It is not necessary for actual interruptions to have occurred in order to implement Gas Supply Warning response actions. Table 5.6 lists the actions involved in this protocol.

Response Protocol for a Gas Supply Emergency

A Gas Supply Emergency indicates that the situation has deteriorated to the point that a single event could lead to a widespread loss of gas service. The response protocol for a Gas Supply Emergency focuses on beginning to deploy available backup procedures, alerting the public to be prepared for the high likelihood of an outage, and moving municipal equipment and personnel into rapid response positions. In general, some 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 5.7 lists the actions involved in this protocol.

5.4 RESPONSE PROTOCOLS FOR ACTUAL GAS SERVICE INTERRUPTIONS

Section 5.3 dealt with a municipality's response in anticipation of impending problems with the supply of gas. Those response protocols are designed to be implemented even in the absence of any service interruptions. This section addresses response protocols for *actual* interruptions that might occur without warning at any time of the year. Further, interruptions might occur as a result of either problems with gas supply or damage to a part of the gas infrastructure, such as pipeline dig-ins by excavators. The latter might require municipal response for dealing with fire and safety issues as well as coping with potential loss of gas service to critical facilities and sensitive individuals. The procedures for dealing with the fire and safety issues are covered in the next section. This section focuses on dealing with the loss of gas service to critical facilities and sensitive individuals. The protocols described in this section follow the "staged response" concept described earlier and in Table 5.2.

Table 5.5 Response Protocol for Gas Supply Alert

Action	Responsible Person/Municipal Agency	Description
Declare a Gas Supply Alert.	Appropriate municipal official	Upon receipt of information that the conditions for a Gas Supply Alert have occurred (see Table 5.1), the appropriate municipal official declares a Gas Supply Alert in the municipality.
Inform municipal departments.	Municipal response manager	The appropriate municipal departments (e.g., police, fire, emergency medical, public works) are informed of the Gas Supply Alert.
Establish contact with the gas company representative.	Municipal gas representative	A communication channel is established with the gas company's representative. Regular communication is maintained to track the progress of the situation.
Check the status of municipal backup equipment.	Public works	The status of municipal backup equipment is determined. The availability of shelters and alternatives for other critical facilities is checked, and these facilities are alerted.
If conditions improve, declare an end to the Gas Supply Alert.	Appropriate municipal official	Upon receipt of information that the conditions for a Gas Supply 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.

During any interruption in gas service, the gas supplied to each customer must be shut off and then, after repairs are completed or gas supply is restored, pilot lights must be relit for each of these customers. When safety hazards are observed on the customer equipment during the relighting process, it must be tagged and, when necessary, valved off. The customer must have the equipment repaired before the pilot light can be relit.

Response Protocol for Limited Service Interruptions

Limited service interruptions affect only a few customers and extend for short periods of time (less than approximately 24 hours). The primary focus here is to respond to the needs of gas-outage-sensitive individuals and/or critical facilities that might be affected on an as-needed basis. In general, municipal personnel on duty can handle a limited service interruption. Table 5.8 presents the response protocol.

Response Protocol for Extended Service Interruptions

Extended service interruptions affect a larger area, and therefore multiple customers, and might last for a relatively long time (between 1 and 3 days). The response protocol focuses on identifying all critical facilities and gas-outage–sensitive individuals that might be affected and dispatching 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 5.9 presents the response protocol.

Table 5.6 Response Protocol for Gas Supply Warning[a]

Action	Responsible Person/Municipal Agency	Description
Declare a Gas Supply Warning.	Appropriate municipal official	Upon receipt of information that the conditions for a Gas Supply Warning have occurred (see Table 5.1), the appropriate municipal official declares a Gas Supply 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 Gas Supply Warning.
Maintain contact with the gas company representative.	Municipal gas representative	The communications channel established with the gas company's 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 gas consumption.	Municipal public affairs office	Residents and businesses are advised of the Gas Supply Warning via the communication media available to the municipality (e.g., municipal cable channel). The public is advised to decrease gas consumption to reduce the load on the system. (Note: The public is also notified directly by the gas company by means of broadcast media.)
Reduce municipal gas consumption.	All municipal departments	Gas consumption at municipal facilities is reduced by turning thermostats down during winter and up during summer (when gas-powered cooling systems are in place).
Position municipal crews.	Public works	Municipal crews are positioned to check on the availability of alternative shelters, backup portable heating and cooling equipment, and dual fuel electric generation equipment.
Delay municipal staff shift changes.	Police Fire Emergency medical services Public works	Shift changes of selected municipal personnel are delayed to ensure that adequate resources are available if the situation deteriorates.
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 Gas Supply Warning.	Appropriate municipal official	Upon receipt of information that the conditions for a Gas Supply 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 a Gas Supply Warning are preceded by the actions for a Gas Supply Alert. In some cases, it will be necessary to proceed directly to the Gas Supply Warning phase.

Table 5.7 Response Protocol for Gas Supply Emergency[a]

Action	Responsible Person/Municipal Agency	Description
Declare a Gas Supply Emergency.	Appropriate municipal official	Upon receipt of information that the conditions for a Gas Supply Emergency have occurred (see Table 5.1), the appropriate municipal official declares a Gas Supply 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 Gas Supply Emergency.
Maintain contact with the gas company representative.	Municipal gas representative	The communications channel established with the gas company'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 gas consumption.	Municipal public affairs office	Residents and businesses are advised of the Gas Supply Emergency via the communication media available to the municipality (e.g., municipal cable channel). The public is advised to reduce gas consumption to absolute minimum levels. (Note: The public is also notified directly by the gas company via the broadcast media.)
Minimize municipal gas consumption.	All municipal departments	Gas consumption at municipal facilities is reduced to minimal levels, and/or alternate portable fuel systems are started to reduce gas consumption.
Recall municipal staff.	Police Fire Emergency medical services Public works	Extra municipal personnel are recalled to duty to provide adequate resources to handle the situation.
Determine the need for municipal equipment and staff to support the gas company.	Fire Public works	The local gas company may request the use of municipal equipment, such as large exhaust fans and digging or cutting equipment, that may be readily available to the municipality. Municipal gas representatives remain in contact with the gas company's representative.
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 or incidents.
If conditions improve, declare an end to the Gas Supply Emergency.	Appropriate municipal official	Upon receipt of information that the conditions for a Gas Supply 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 a Gas Supply Emergency will be preceded by the actions for a Gas Supply Alert and/or a Gas Supply Warning. In some cases, it will be necessary to proceed directly to the Gas Supply Emergency phase.

Table 5.8 Response Protocol for Limited Service Interruptions

Action	Responsible Person/Municipal Agency	Description
Receive notification of a service interruption.	Municipal gas representative	Notice is received from the gas company, an affected facility, or the public.
Determine the possible impact on critical facilities and/or gas-outage–sensitive individuals.	Municipal gas representative	The list of critical facilities and gas-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:		
Evacuation of crtical facility	Police Fire Emergency medical services Public works	If an interruption of service leads to the need to evacuate a critical facility, it may be necessary to move people to a shelter, alternative care facility, or a backup location.
Medical needs	Emergency medical services	If medical assistance is required for gas-outage–sensitive individuals or critical facilities (e.g., hospital), appropriate personnel are dispatched.
Shelters	Public works	If the service interruption requires evacuation, personnel are dispatched to open shelters if necessary.
Affected municipal facilities	Public works	If the service interruption involves a municipality-owned facilitiy, personnel are dispatched to secure the affected site.
Coordinate with gas companies to support any repair work.	Municipal gas representative	The need for municipal support to help in the repair process is identified and may include controlling traffic, gaining entrance to facilities to operate gas valves, providing municipality-owned equipment to support gas company efforts, and providing mobile communication equipment and facilities.

Response Protocol for Wide Area Service Interruptions

In a wide area disruption, large areas of the municipality, or perhaps the entire municipality, are without gas service. 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 5.10 presents the response protocol.

Response Protocol for Regionwide Service Interruptions

A regionwide disruption that affects large portions or all of a metropolitan area has not occurred in the Chicago area. The response protocol focuses on invoking general disaster plans and mobilizing county, state, and federal resources. Table 5.11 presents the response protocol.

Table 5.9 Response Protocol for Extended Service Interruptions

Action	Responsible Person/Municipal Agency	Description
Receive notification of a disruption.	Municipal gas representative	Notice is received from the gas company, an affected facility, or the public.
Establish contact with the gas company's representative.	Municipal gas representative	A communication channel is established with the gas company's representative. Regular communication is maintained to track the progress of the situation.
Determine the possible impact on critical facilities and/or gas-outage–sensitive individuals.	Municipal gas representative	The list of critical facilities and gas-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 service interruption. 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:		
Evacuation of crtical facility	Police Fire Emergency medical services Public works	If an interruption of service leads to the need to evacuate a critical facility, it may be necessary to move people to a shelter, alternative care facility, or backup location.
Medical needs	Emergency medical services	If medical assistance is required for gas-outage–sensitive individuals or critical facilities (e.g., hospital), appropriate personnel are dispatched.
Shelters	Public works	If the service interruption requires evacuation, personnel are dispatched to open shelters, if necessary.
Affected municipal facilities	Public works	If the service interruption involves a municipality-owned facilitiy, personnel are dispatched to secure the affected facility.
Coordinate with gas companies to support any repair work.	Municipal gas representative	The need for municipal support to help in the repair process is identified and may include controlling traffic, gaining entrance to facilities to operate gas valves, providing municipality-owned equipment to support gas company efforts, and providing mobile communication equipment and facilities.

Table 5.10 Response Protocol for Wide Area Service Interruptions

Action	Responsible Person/Municipal Agency	Description
Receive notification of a disruption.	Municipal gas representative	Notice is received from the gas company, an affected facility, or the public.
Establish contact with the gas company's representative.	Municipal gas representative	A communication channel is established with the designated gas company representative. Regular communication is maintained to track the progress of the situation.
Open command and communication centers.	Municipal gas representative Municipal response manager	For wide area service interruptions, it may be necessary to set up command and communication centers to act as coordination points for gas company and municipal personnel.
Determine the possible impact on critical facilities and/or gas-outage–sensitive individuals.	Municipal gas representative	The list of critical facilities and gas-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 service interruption. 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:		
Evacuation of crtical facilities	Police Fire Emergency medical services Public works	If an interruption of service leads to the need to evacuate a critical facility, it may be necessary to move people to a shelter, alternative care facility, or backup location.
Medical needs	Emergency medical services	If medical assistance is required for gas-outage–sensitive individuals or critical facilities (e.g., hospital), appropriate personnel are dispatched.
Shelters	Public works	If the service interruption requires evacuation, personnel are dispatched to open shelters, if necessary.
Affected municipal facilities	Public works	If the service interruption involves a municipality-owned facilitiy, personnel are dispatched to secure the affected facility.
Coordinate with gas companies to support any repair work.	Municipal gas representative	The need for municipal support to help in the repair process is identified and may include controlling traffic, gaining entrance to facilities to operate gas valves, providing municipality-owned equipment to support gas company efforts, and providing mobile communication equipment and facilities.
Evacuate residents as needed.	Emergency medical services Police Fire Public Affairs	For long-duration service interruptions, residents may be advised to leave the area or relocate to shelters for the duration of the interruption.
Recall municipal staff.	Police Fire Emergency medical services 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.

5.5 RESPONSE PROTOCOLS FOR GAS LEAKS AND EMERGENCIES

The following sections provide some guidelines on ways in which a municipality can respond to a notification of gas leaks.

Response Protocol for Class 1 Leaks

For Class 1 leaks (i.e., leaks that present a hazard to people or property or that involve fire or explosion), the fire department and/or police department may have been called, and the gas company will respond. For this type of emergency, it must be assumed the health and welfare of the customer or public are at risk until the impact can be determined or the incident is under control. Table 5.12 represents this response protocol. Much of the response protocol is part of the standard operating procedures in place in the fire and police departments.

Response Protocol for Class 2 Leaks

For Class 2 leaks (i.e., leaks determined to be non-hazardous but which must be scheduled for future repair), no action is required on the part of the municipality.

Response Protocol for Class 3 Leaks

In general, Class 3 leaks are determined to be non-hazardous and can reasonably be expected to remain non-hazardous. No action is required on the part of the municipality. The gas company has procedures in place to monitor these leaks and verify that they remain non-hazardous.

Table 5.11 Response Protocol for Regionwide Service Interruptions

Action	Responsible Person/Municipal Agency	Description
All of the actions listed under Wide Area Service Interruptions are taken. See Table 5.10 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.

Table 5.12 Response Protocol for Class 1 Leaks

Action	Responsible Person/Municipal Agency	Description
Receive notification of an incident.	Municipal gas representative and/or Fire Department and/or Police Department	Notice is received from the gas company, an affected facility, or the public.
Advise emergency responders.	911 Dispatch Center	Police, fire, and emergency medical services personnel are advised of the extent of the incident. Requests for assistance, based on information obtained during telephone calls to the affected facilities and individuals, are conveyed to the appropriate emergency responder.
Establish contact with the gas representative.	Municipal gas representative	A communication channel is established with the designated gas company representative. Regular communication is maintained to track the progress of the situation.
Dispatch personnel to deal with:		
Evacuation	Police Fire Emergency medical services Public works	If an incident leads to an evacuation of a facility, it may be necessary to move people to a shelter, alternative care facility, or a backup location.
Medical needs	Emergency medical services	If medical assistance is required for responding to injuries, appropriate personnel are dispatched.
Shelters	Public works	If the disruption requires evacuation, personnel are dispatched to open shelters with the necessary equipment (e.g., portable heating or cooling).
Coordinate with gas companies to support repair work.	Municipal gas representative	The need for municipal support to help in the repair process is identified and may include controlling traffic, gaining entrance to facilities to operate gas valves, providing municipality-owned equipment to support gas company efforts, and providing mobile communication equipment and facilities.
Recall municipal staff, if needed.	Police Fire Emergency medical services Public works	Extra municipal personnel are recalled to duty to provide adequate resources to handle the situation.
Request assistance under mutual aid pacts, if needed.	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, if needed.	Appropriate municipal official	If the situation warrants, the municipal disaster plan is put into operation.

6 RESTORATION PLANNING

This section provides guidelines for local government actions designed to help return the municipality to normal operation after gas service interruptions have occurred.

Gas distribution companies and transmission companies have the primary responsibility for restoring gas supply to customers following a service interruption. Because of the nature of the gas supply system, it is not possible to simply turn on a valve and restore service to customers, as would be done following an electric power outage. Safety precautions must be followed in the gas restoration process. Actions include but are not limited to those described in the following sections.

Customer Shutoff

When gas service must be interrupted, either because of gas supply shortages or because of damage to the system (e.g., a dig-in), gas valves at customer premises must be shut off to prevent gas from escaping in an uncontrolled manner when service is restored. Gas company personnel must shut off the supply valves for all customers on the affected line. This process is time-consuming and often means that gas company personnel must gain access to customer premises to shut off the appropriate valves.

System Shutdown, Repair, and Repressurization

When the gas system is shut down, any necessary repairs can be made. In some cases, the system is shut down first, and customer valves are shut off after the system is down. After repairs have been completed, the gas system must be repressurized and tested before service to customers can be restored. The gas company follows specific procedures when preparing to return the system to service.

It is important to note that sometimes parts of the system have been shut down due to gas supply problems, and no physical damage to system components has occurred; therefore, no repairs are needed. The process of shutting off service to customers and going through system repressurization procedures, however, still must be followed. This procedure is necessary to avoid problems that result from air infiltration into the pipelines while the gas was turned off.

Customer Relighting

When the system has been repressurized and tested, gas company personnel must return to the premises of each affected customer, turn on gas valves, and relight

pilot lights. This procedure is extremely important for safety reasons. As with the customer shutoff process, it is time- and effort-consuming.

Municipalities can play important roles in the health and safety of the public during a gas service interruption and facilitate and expedite the restoration process. Table 6.1 summarizes some of the procedures to be followed in the restoration process.

Following a major gas-disruption event, it might be necessary to establish priorities for restoring gas service, especially when accompanied by additional damage from storms, earthquakes, or other catastrophic events. Extensive damage might overwhelm available gas company repair resources and require postponement of some repairs while higher-priority issues are addressed.

Table 6.1 Restoration Actions

Action	Responsible Person/Municipal Agency	Description
Establish restoration priorities.	Municipal gas representative	In coordination with the gas company, a prioritized list of areas and/or facilities to be restored to service is developed.
Provide support to gas company repair crews in customer shutdown.	Police Fire Public works	The appropriate support is provided to gas company personnel to gain access to customer premises for shutdown.
Provide support to gas company repair crews in system repair.	Police Fire Public works	Requested support is provided for traffic control, site access control, mobile on-site communication equipment, and mobile command centers, as needed.
Provide support to gas company repair crews in customer relighting.	Police Fire Public works	The appropriate support is provided to gas company personnel to gain access to customer premises for relighting.
Declare an end to the event.	Appropriate municipal official	After receipt of notice from the gas company that the situation has been restored to normal, the appropriate local municipal official declares an end to the event.
Inform departments.	Municipal response manager	Appropriate departments (e.g., police, fire, emergency medical services, public works) are informed that the event has ended and are directed to begin restoration activities.
Shut down emergency shelters.	Municipal response manager	Municipal emergency shelters are shut down.
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.
Repair buildings, grounds, and 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 the gas company where necessary.
Attend debriefing.	Municipal response manager	A debriefing session is held with municipality departments and with the gas company to review the events and to identify weaknesses in the response actions. Modifications are made in preparation for the next event.

It is important that the municipality and the gas company work together to develop a restoration priority plan that not only addresses community needs, but also recognizes the physical and technical limitations involved in the process. Prior to a disruption, the municipality should develop a list of facilities or areas that would receive priority during restoration efforts. This list should then be made available to the gas company during a disruption. At times, however, the list might need to be modified based on the actual damage incurred as the result of a major disruption event.

While repairs are being made following a service interruption, the gas company may need support from municipal personnel (e.g., police, fire, public works) to enter the customer's premises to shut off gas valves. This step is important in the restoration process for safety reasons. In cases where the customer is not available to provide access, forced entry into the premises may be required to gain access to the valves. Historically, some municipalities have been reluctant to engage in this type of activity for liability reasons. Nevertheless, it is an important step in the safe restoration of gas service. It is important for municipalities to have an established procedure for providing the gas company with this support. The communication protocol for the gas company to request this support and the manner in which municipal personnel can provide this support should be worked out prior to any emergency situation.

A similar arrangement is needed when system repairs and repressurization have been completed and service is ready to be restored. Access to the customer's premises is again needed to relight pilot lights and check for safe operation.

At the end of a disruption event, all backup and emergency equipment should be returned to standby status 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 local 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 departments to review the situation and identify any weaknesses in the overall response. Conducting this type of debriefing can assist in being prepared for the next event.

Warnings about impending service interruption that do not materialize into an actual loss of service (e.g., Alert, Warning, or Emergency phases that do not actually experience any interruptions) can create special problems. Municipalities generally return personnel and equipment to normal operating mode. When a warning is issued but actual interruptions do not occur, frequently personnel are tempted to take successive warnings less seriously and become complacent in their level of preparedness. A measure of discipline is needed to avoid being unprepared for an actual interruption.

7 PREPAREDNESS EXERCISES

Preparedness exercises are critical for the effective implementation of a natural gas disruption plan. This section describes the steps needed to develop and conduct effective exercises. Appendix E gives a sample exercise.

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 a natural gas 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. At the culmination of an exercise, participants should prepare a documented record of lessons learned from the experience.

To be of maximum value, an exercise should be a realistic 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.[5]

Training Drills

Training drills are exercises conducted by each municipal department (e.g., police, fire, public works) to determine procedures and steps for responding to a natural gas disruption. Such instructional drills allow the participants to ask

[5] The Illinois Emergency Management Agency (see Points of Contact) offers training courses in emergency exercises and other emergency planning activities.

questions, clarify their responsibilities and procedures, and receive immediate feedback from trainers while they are performing their emergency response roles. Training drills for natural gas disruptions 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 natural gas 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 consist of disruption scenarios that enable participants to represent their organizations' roles and responsibilities. Participants go through each scenario of natural gas 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 for 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 exercises 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 infrastructure disruptions.

7.3 DESIGNING AND CONDUCTING AN EXERCISE

The activities involved in designing and conducting an effective natural gas disruption 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 natural gas disruption 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 natural gas disruption exercise should test municipal responses under various disruption scenarios. Such scenarios can include responding to impending service interruptions (see Table 5.1), actual service interruptions (see Table 5.2), and gas leaks (see Table 5.3). A time line 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 time line. 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 personnel from the necessary municipal departments, a well-planned exercise also includes 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 facilitate the exercise; prepare "read-ahead" materials that describe the purpose, scope, and objectives of the exercise; and distribute this information to participants prior to 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. Pre-exercise reference materials are 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 participants to respond. As the exercise evolves, subsequent escalating events are introduced in accordance with the pre-planned time line to sustain a pace that actively engages the participants. At the conclusion of the scenario, the exercise

facilitators 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 natural gas 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 facilitators develop a brief written report and distribute it to the participants within two weeks after the exercise ends. This report should list 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 to improve their ability to cope with natural gas 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 natural gas infrastructure by requiring facilities to be adequately prepared for disruptions in natural gas service.

Communities that adopt building codes as part of their municipal code – thus making compliance mandatory – frequently use several model codes developed by national organizations. Although model codes provide basic guidance, municipalities often amend and modify them to meet specific local requirements. A number of model codes (see Table 8.1) are used frequently and have material that is relevant for dealing with natural gas disruptions.

Table 8.1 also summarizes those features of the model codes that are most relevant for increasing a facility's ability to deal with natural gas disruptions. 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.

Current building codes require selected facilities to have backup electric power systems; however, no codes are in place that are related to natural gas disruptions requiring redundant or backup gas systems. Some of the electric power backup requirements reference the reliability of natural gas supply used for backup electric power generators.

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 natural gas requirements of an area. For example, an area zoned "residential" will have a very different gas 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 natural gas infrastructure is not usually one of the key issues. Zoning ordinances commonly assume that a natural gas company is responsible for meeting virtually all demands, independent of zoning decisions. The consideration of natural gas supply issues in zoning decisions can affect the ability of a community to deal with gas disruptions.

Zoning affects the natural gas infrastructure because it influences the type and rate of development. The last 25 years have witnessed a major trend toward the use of 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.

Table 8.1 Summary of Portions of Model Building Codes of Relevance to Natural Gas

***National Building Code*[a]**
❑ Provides definitions and requirements for structures falling into 10 use groups and 21 special-use and occupancy facilities
❑ Provides requirements for specific facilities, operations, and materials handling
***National Electrical Code*[b]**
❑ Prescribes requirements for emergency systems designed to provide backup electric power for facilities and equipment essential for safety reasons (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.)
***National Fire Prevention Code*[c]**
❑ Gives specifications for fuel line piping design, installation, and maintenance specifications
***National Fuel Gas Code*[d]**
❑ Applies to the installation of fuel gas piping systems, fuel gas utilization equipment, and related accessories
❑ Gives requirements for piping system design, materials, components fabrication, assembly, installation, testing, inspection, operation, and maintenance
❑ Gives requirements for gas utilization equipment and related accessories, including installation, combustion and ventilation air, and venting

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

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

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

[d] *National Fuel Gas* Code, NFPA 54-1999, ANSI Z223.1 – 1999, National Fire Protection Association, Quincy, MA.

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 natural gas infrastructure. The construction and improvement of natural gas systems are usually the responsibility of the natural gas utility, which is mandated to provide natural gas service to all customers. One way used to ensure that adequate infrastructure (which might include natural gas) 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 U.S. Department of Energy's special Internet site.[6]

8.3 GROWTH AND DEVELOPMENT PROJECTIONS

All natural gas companies develop projections of long-term demand as a starting point for planning the expansion of natural gas transmission and distribution facilities. Projections are made for a range of planning horizons (from 1 to 10 years) and for a range of geographic resolutions (for the entire system down to individual distribution 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 natural gas demand is a serious issue. Because it can take several years to design and construct new gas system facilities, it is of utmost importance to obtain accurate (to the extent

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

possible) estimates of future gas 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 natural gas 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 natural gas 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 natural gas demand forecasts by using the permit process to ask builders about their anticipated need for natural gas service. The following information, some of which is already collected as part of the permit application, is especially helpful in projecting natural gas demand:

- Location – street address, block
- Planned use – residential, commercial, industrial, other
- Size – floor area, number of levels
- Expected natural gas requirements:
  - expected peak demand in therms per hour
  - expected daily variation in natural gas use
  - expected seasonal variation in natural gas use
  - any unusual needs for natural gas service (e.g., special equipment)

Building permit information on natural gas service requirements should be conveyed to the gas company 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 the gas company of expected building activity as soon as possible.

Modification and Rehab Projects

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

- Conversion of a commercial building to residential condominiums, which will have a different gas demand profile; and
- Rehabilitation of residential buildings to increase their natural gas 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 the gas company of any changes in natural gas requirements as soon as possible.

Zoning Changes

Zoning changes can also significantly affect natural gas 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 natural gas 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 load consumption patterns.

Typically, information on zoning changes is not conveyed to the gas company on a regular basis because it is unknown whether near-term firm project plans will affect natural gas requirements. Nevertheless, a change in zoning can be a useful "early warning indicator" of the need for reevaluation of the natural gas infrastructure in a portion of a municipality.

Development Plans

Natural gas 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 the type of development desired. 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 natural gas.

Examples of the types of development planning information that should be conveyed to the gas company are listed below:

- 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 natural gas supplies will be sufficient to meet the demand.

9 DEVELOPMENT OF A NATURAL GAS DISRUPTION PLAN

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

Involvement of Municipal Departments

The development and implementation of a natural gas disruption plan necessarily involves 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 natural gas service and natural gas leaks pose some unique situations that require special consideration, natural gas disruption 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 natural gas disruption cannot be implemented without obtaining special legal and regulatory authority. Local governments should engage legal counsel to ensure that all necessary authorizations are in place. Further, some actions could subject local governments to liabilities. Proper legal measures should be in place to address these liabilities.

Coordination with the Gas Company

The preparation of a municipal natural gas disruption plan should be coordinated with the appropriate gas company(ies). 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. In addition, there are state (i.e., Illinois Emergency Management Agency) and federal (Federal Emergency Management Agency [FEMA]) emergency planning guidelines. Any emergency plan prepared by a municipality to deal with natural gas disruptions should be consistent with these guidelines.

Natural Gas Disruption Plan Outline

The format used for a natural gas disruption plan should be tailored to the needs of each local government. Although it is not possible to use a standard template to develop a plan that fits all needs, local governments can utilize guidance issued by several agencies to help in preparing their plans. FEMA issues general guidelines that are used by state and local governments throughout the country; these can be modified to meet local requirements.[7]

The FEMA guidance is the most general in its approach and provides a basic framework for developing an emergency plan. It identifies four elements. The first is a *Basic Plan*, which provides an overview of the local government's approach to emergency operations. The Basic Plan details emergency response policies, describes the response organization, and assigns tasks.

The second element is a series of *Functional Annexes*. The annexes focus on specific functions (i.e., what they are and who is responsible for carrying them out). They emphasize responsibilities, tasks, and operational actions. The FEMA guidance suggests appending the following Functional Annexes to the Basic Plan:

- Direction and Control
- Communications
- Warning
- Emergency Public Information
- Evacuation
- Mass Care
- Health and Medical Services
- Resource Management

Additional annexes may be added as needed.

The third element of the FEMA guidance for emergency plans is a series of *Hazard-specific Appendixes*. These appendixes address special and unique response procedures, notifications, protective actions, emergency public information, and other needs generated by a particular hazard. The hazard-specific information currently in the FEMA guidance includes earthquakes, floods, hazardous materials, hurricanes, lethal unitary chemical agents and

[7] *Guide for All-Hazard Emergency Operations Planning*, SLG-101, Federal Emergency Management Agency (Sept. 1996).

munitions, radiological hazards, terrorism, and tornadoes. At present, there is no specific guidance on natural gas disruptions.

The fourth element of the FEMA guidance is referred to as *Standard Operating Procedures (SOPs)*, which are used by specific individuals and/or agencies to carry out emergency activities. An example of an SOP would be steps that the fire department would take to deal with a specific type of fire. Standard operating procedures are detailed instructions that are used by specialists in dealing with hazard situations. The FEMA guidance does not provide information on the development of SOPs; rather, it is left to other documents. It does, however, indicate that SOPs should be consistent and coordinated with the other parts of the emergency plan.

For many communities, the most useful approach to developing a natural gas disruption plan would be to prepare a hazard-specific appendix to its basic emergency operations plan. In addition, individual municipal departments can prepare SOPs that focus on their specific actions during natural gas disruptions. These SOPs would be added to other departmental standard procedures.

Appendix F presents a sample natural gas disruption plan written in the form of a hazard-specific appendix.

Checklist of Planning Steps

Table 9.1 provides a checklist of items that should be addressed and incorporated into a natural gas disruption plan.

Table 9.1 Checklist for Preparing a Natural Gas Disruption Plan

Step 1: Responsibilities
(a) Have municipal personnel who will be the primary points of contact with the gas company been identified – for non-emergencies during business hours? – for non-emergencies outside business hours? – for emergency situations? Have these personnel been identified in the plan and have they been notified of this responsibility?
(b) Have gas company points of contact been identified – for non-emergencies during business hours? – for non-emergencies outside business hours? – for emergency situations? Have these points of contact been identified in the plan and have they been notified of this responsibility?
Step 2: Predisruption Planning
(a) Have critical facilities been – identified? – evaluated for availability of backup capability or other mitigation measures? – prioritized for response in the event of a widespread service interruption? Have these facilities been tabulated, mapped, and included in the plan for ready reference during disruption events?
Step 3: Disruption Response Planning
(a) Has a notification protocol been established between the gas company and the municipality that specifies how communication will be carried out during a disruption event, including: – what conditions require notification? – who in the municipality will be notified? – what information will be included in the notification? – what means will be used for communication? Has this notification protocol been documented in the plan?
(b) Have internal communication protocols among municipal departments been established? Have these protocols been documented in the plan?
(c) Has a concept of operations been developed for how the municipality will respond to impending natural gas service interruption conditions, including: – Alert? – Warning? – Emergency? Is this concept of operations documented in the plan?
(d) Has a concept of operations been developed for how the municipality will respond to actual natural gas service interruptions, including: – limited disruptions? – extended disruptions? – wide area disruptions? – regionwide disruptions? Is this concept of operations documented in the plan?
(e) Has a concept of operations been developed for how the municipality will respond to gas leaks? Is this concept of operations documented in the plan?
(f) Have all appropriate municipal departments, particularly the fire department, developed standard operating procedures for dealing with impending service interruptions, actual service interruptions, and gas leaks? Do these procedures indicate the limits to which municipal personnel can go in dealing with gas system equipment? Are these procedures documented in the operating manuals of each department?

Continued

Table 9.1 (Cont.)

Step 4: Postdisruption Restoration Planning
(a) Has a restoration priority list been established that identifies facilities and/or areas to receive priority attention for restoring natural gas service following a major service interruption? Has this list been coordinated with the gas company and documented in the plan?
(b) Have procedures been developed in coordination with the gas company for support during gas service interruptions and gas leaks? Are these procedures documented in the plan?
(c) Have standard operating procedures been developed by all appropriate municipal departments for the shutdown of emergency equipment and its return to a standby status? Have these procedures been documented in the operating manuals of each department?
Step 5: Exercise
(a) Have procedures and schedules been established for exercising the elements of the plan on a regular basis? Are these documented in the plan?

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 natural gas infrastructure issues need to be aware of security concerns. The most important aspect of security is raising individual awareness. 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, SOPs need to be developed and implemented, employees need to be trained in the application of these procedures, and vulnerability assessments need to be completed to address and understand any gaps in the protocols and procedures.

Physical Security

Municipalities need to provide physical security for their equipment that is used in natural gas disruption events. Backup equipment, portable heating and cooling equipment, and other emergency response equipment must be secured from access by vandals or criminals. Keeping equipment safe from intentional damage requires the implementation of appropriate physical security measures (e.g., locked enclosures, alarm systems).

In addition to protecting their own equipment, municipalities can work with the gas company to help protect natural gas infrastructure assets from damage due to vandalism, sabotage, or other intentional attacks. The following steps can be used to develop an approach to improving security:

- Establish contact with the gas company's security representative.
- Develop a procedure to maintain security of natural gas infrastructure information while providing necessary information to emergency responders, such as fire and police personnel.
- Determine the types of security support required for the gas infrastructure and those that can be provided within available municipal resources.
- Conduct joint exercises to test the physical security protocols.

Information and Cyber Security

The information on natural gas infrastructure assurance, including critical facilities, protective measures, gas-outage–sensitive individuals, and potential

vulnerabilities, is sensitive – from both a privacy and 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. This information 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 natural gas industry.

Alternate Fuel Vehicles
A highway vehicle fueled by something other than regular gasoline, such as compressed natural gas (CNG), propane, electric power, or gasoline with ethanol added.

Aquifer
A water-bearing permeable rock formation that is capable of storing natural gas.

Base Gas
Gas required in a storage pool to maintain sufficient pressure to keep the working gas recoverable. *See Cushion Gas*.

Base Load
A volume of gas that serves as a constant load over a period of time.

British Thermal Unit (Btu)
The quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit, that is, from 58.5 to 59.5 degrees Fahrenheit, under standard pressure of 30 inches of mercury at or near its point of maximum density. One Btu equals 252 calories (gram), 778 foot-pounds, 1,055 joules, or 0.293 watt-hours.

Burner, Gas
A device for the final release of air/gas, oxygen/gas mixtures, or air and gas separately into the combustion zone. Gas burners are classified as atmospheric burners or blast (pressure) burners.

Burnertip
The point at which natural gas is used as a fuel.

By-pass
An auxiliary piping arrangement generally used to carry gas around specific equipment or an integral section of a piping system. A by-pass is usually installed to permit gas to pass through the line while adjustments or repairs are made on the by-passed section.

City Gate
The physical location where gas is delivered by a pipeline to a local distribution company (sometimes called town border or tap station).

Cogeneration
The concurrent production of electricity and useful thermal energy from the same energy source. Natural gas is a favored fuel for combined-cycle cogeneration units, in which waste heat is converted to electricity.

Compressed Natural Gas (CNG)
Natural gas at elevated pressure used in vehicles and in other applications not attached to a pipeline. The gas pressure is normally increased by a compressor, which can be driven by an electric motor or a gas- or diesel-powered engine.

Compressor Station
A facility that moves gas through transmission lines or into storage by creating pressure differentials. Most compressor stations use some of the gas that moves through the line as fuel. Generally, a compressor station does not include booster lines or pumping stations within local distribution systems.

Contract Demand
The daily, monthly, or annual quantity of gas or transportation service a supplier or transporter agrees to furnish and for which a buyer agrees to pay a set charge. Contract demand is often expressed in monthly fees for daily maximum quantities.

Cost of Capital
The weighted average of the cost of various sources of capital, generally consisting of outstanding securities, such as mortgage debt, preferred and preference stock, common stock, etc., and retained earnings, but which can include other interest-bearing obligations or sources of capital, such as short-term notes and customer security deposits. In addition, the cost of capital can also consist of noninterest-bearing sources, such as funds generated through use of deferred taxes (i.e., accelerated amortization, accelerated depreciation, and accumulated investment tax credit [subject to tax law limitations]). The weight to be used for each source of funds generally is the percentage of each fund outstanding to the total amount outstanding of all sources of funds considered; however, target or projected ratios can also be used. The cost rate assigned to each source can be the average cost of all obligations outstanding or projected costs for each source or a rate specifically assigned by a commission. The summation of the product of the weight (percentage) of each source to the total source times its cost is the cost of capital.

Cost of Removal
The cost of demolishing, dismantling, tearing down, or otherwise removing a plant, including the cost of transportation and handling incidentals.

Cost of Service
A term used in public utility regulation that means the total number of dollars required to supply any total utility service (i.e., revenue requirements). It must include all of the supplier's costs, an amount to cover operation and maintenance expenses, and other necessary costs, such as taxes, including income taxes, depreciation, depletion, and amortization of the property not covered by ordinary maintenance. Also included is a fair return so that the utility can maintain its financial integrity, attract new capital, and compensate the owners of the property for the risks involved.

Cost of Service Rates
Rates based on prudently incurred costs of doing business, plus a reasonable rate of return on investment in plant and equipment, and throughput projections. This rate development methodology is commonly used by state or federal regulators.

Cubic Foot
The most common unit of measuring gas volume. The amount of gas required to fill a volume of one cubic foot under standard conditions of temperature, pressure, and water vapor, usually referenced to 14.7 pounds per square foot (psi) and 60 degrees Fahrenheit. Very roughly, one cubic foot of gas contains 1,000 Btu's of energy (1 Cf = 1 MBtu).

Curtailment (gas)
Reduction of gas deliveries because of a shortage of supply or because demand for service exceeds a pipeline's capacity. Usually, there is a hierarchy of customers, in which some may be required to partially or totally cut back takes of gas before others. Service to industrial users, for example, is usually curtailed before service to residential users. Under Order 636 (see below), supplies will be allocated based on contracts rather than on curtailment policies, although some shippers have called for a return to curtailment plans.

Cushion Gas
Gas required in a storage pool to maintain sufficient pressure to keep the working gas recoverable. *See Base Gas.*

Customer Classes
The common classes of customers that receive service from a utility are residential, commercial, industrial, electric generation, and sale-for-resale. The State of California designates customer classes as core (residential and small commercial/industrial users) and non-core (large users who qualify for interruptible transportation). California also has a core subscription class of non-core customers who choose to buy from the distributor.

Dekatherm
A unit of heating value equivalent to 10 therms or 1 million Btu's.

Degree-Day, Cooling
A measure of the need for air conditioning (cooling) based on temperature and humidity. Although cooling degree-days are published for many weather stations, a specific procedure has not been generally accepted.

Degree-Day, Heating
A measure of the coldness of the weather experienced, based on the extent to which the daily mean temperature falls below a reference temperature, usually 65°F. For example, on a day when the mean outdoor dry-bulb temperature is 35°F, there would be 30 degree-days experienced. A daily mean temperature usually represents the sum of the high and low readings divided by two.

Degree-Days
A way to calculate heating or cooling value. To calculate degree-days, add a particular day's high and low temperatures, divide by two, and subtract that average temperature from a base level (the National Weather Service uses 65 degrees for heating). Example: the high and low for a certain day are 46 and 12 degrees. The sum of 58 is divided by 2 to yield an average temperature of 29 degrees. This figure is subtracted from 65 to yield 36 heating degree-days. High degree-days (for either cooling or heating) reflect high energy usage.

Deliverability
The volume that a particular well, storage field, pipeline or distribution system can supply during a 24-hour period.

Delivery Point
For a pipeline, the delivery point is where sales or transportation gas exits the system. For a producer, it can be the point where gas goes into the pipeline. It would be synonymous with the pipeline's "receipt point." Sometimes these are called the delivery point and the redelivery point.

Demand
The rate at which gas is delivered to or by a system, part of a system, or a piece of equipment, expressed in cubic feet or therms (see below) or multiples thereof, for a designated period of time called the demand interval. (Compare LOAD.)

Demand (gas)
The rate at which gas energy is delivered to or by a system, or to a piece of equipment, generally expressed in 1,000 cubic feet (Mcf).

Demand Load
The rate of flow of gas required by a consumer or a group of consumers, often an average over a specified short time interval (cf/hr or Mcf/hr). Demand is the cause; load is the effect.

Demand-side Management
Deliberate intervention by a utility in the marketplace to influence customer use of a fuel. Electric utilities have been expected to include demand-side

management in the development of long-range planning, including load management, conservation, peak shaving, and strategic load building and load shifting. Typically, these measures include incentives for participants and/or the utility. Some state regulators are now considering demand-side management for gas utilities.

Design Day

A 24-hour period of demand that is used as a basis for planning gas capacity requirements.

Dig-in

The accidental damage to buried natural gas pipelines during excavation work. Dig-ins are one of the major causes of natural gas disruptions.

Dual-fuel Capacity

The ability of an energy-burning facility to use more than one kind of fuel, usually gas and oil, nonconcurrently. Dual-fuel vehicles, for example, can be designed to run on compressed natural gas (CNG) and gasoline.

End-user

An entity that is the ultimate consumer for natural gas. An end-user purchases the gas for consumption, but not for resale purposes.

Firm Service

The highest quality sales or transmission service offered to customers under a filed rate schedule that anticipates no planned interruption. For natural gas, firm service is usually associated with distribution companies that serve residential customers and other "high priority end-users," but it can also apply to upstream pipelines and other customers. Interstate pipelines now offer several tiers of firm service. Secondary or tertiary firm service can be recalled by the primary firm capacity holders, for example, during weather extremes when demand is high.

Gate Station

Generally a location at which gas changes ownership, from one party to another, neither of which is the ultimate consumer. However, the gas might change from one system to another at this point without changing ownership. *See City Gate Station (town border station or delivery point).*

Gathering System

Pipelines and other equipment installed to collect, process, and deliver natural gas from the field, where it is produced or stored, to the trunk or main transmission lines of pipeline systems. In a series of decisions on pending cases in May 1994, the Federal Energy Regulatory Commission essentially set a new policy allowing gathering facilities owned by interstate pipeline affiliates to file for and receive non-jurisdictional status in the same manner as gathering facilities owned by other companies, such as producers or marketers, if they met the gathering criteria.

Horsepower (hp)
A unit of power equivalent to 33,000 ft-lb per minute, or 550 ft-lb per second (mechanical horsepower), or 0.746 kilowatts.

Inch of Water
A pressure unit representing the pressure required to support a column of water one inch high. Usually reported as inches W.C. (water column) at a specified temperature; 27.707 inches of water (at 60ºF and standard gravity of 32.174 ft/sec^2) is equal to a gauge pressure of one pound per square inch.

Interconnection, System
A connection between two utility systems permitting the transfer of gas in either direction.

Interruptible Service
Low priority service offered to customers under schedules or contracts that anticipate and permit interruption on short notice, generally in peak-load seasons, by reason of the claim of firm service customers and higher priority users. Gas is available at any time of the year if the supply is sufficient and the supply system is adequate.

Interstate Gas
Gas transported in interstate pipelines to be sold and consumed in states other than the state in which the gas was produced.

Line Pack
The volume of natural gas that must be maintained within a pipeline or distribution system to ensure operation. “Line packing” increases the amount of gas in the system by increasing pressure to meet high demand for a short period of time.

Liquefied Natural Gas (LNG)
Natural gas converted to a liquid state by pressure and severe cooling, then returned to a gaseous state to be used as a fuel. It is stored by many distributors for peak season use. During the 1970s, LNG facilities were built in the U.S. to accommodate imports from Algeria and other overseas suppliers, most of which were scaled back when U.S. demand dropped and interstate prices plunged. The viability of LNG continues to depend on price.

Load
The amount of gas delivered or required at any specified point or points on a system; load originates primarily at the gas-consuming equipment of the customers. Also, to load a pressure regulator is to set the regulator to maintain a given pressure as the rate of gas flow through the regulator varies. (Compare DEMAND.)

Main
A distribution line that serves as a common source of supply for more than one service line.

Main Extension
The addition of pipe to an existing main to serve new customers.

Mains, Distribution
Pipes transporting gas within service areas to the point of connection with the service pipe.

Mains, Gas
Pipes used to carry gas from one point to another. In contrast with service pipes, mains carry gas in large volumes for general collective use.

Market Area
Any geographic area in which the company feels that gas can be sold to meet the public's needs and at their convenience, while at the same time benefiting the company and stockholders.

Mcf
The quantity of natural gas occupying a volume of 1,000 cubic feet at a temperature of 60ºF and at a pressure of 14.73 pounds per square inch absolute.

Meter, Gas
An instrument used for measuring and indicating or recording the volume of gas that has passed through it.

MMBtu
One million British Thermal units. (The letter M denotes a thousand. Two M's represent a thousand thousand, or 1 million.) Generally accepted as a rough equivalent of an Mcf. *See Mcf.*

MMcf
One million cubic feet.

Network (gas)
A system of transmission or distribution lines cross-connected to permit multiple supplies to enter the system.

Odorant
Any material added to natural or liquefied petroleum gas in small concentrations to impart a distinctive odor. Odorants in common use include various mercaptans, organic sulfides, and blends of these.

Off-peak
The period during a day, week, month, or year when the load being delivered by a gas system is not at or near the maximum volume delivered by that system for the corresponding period of time.

Off-peak Service
Service made available on special schedules or contracts but only for a specified part of the year during the off-peak season.

Order 636
The Federal Energy Regulatory Commission's (FERC's) final rule on natural gas pipeline restructuring, issued April 8, 1992. The rule ordered interstate pipelines to unbundle sales from transportation services at upstream points near production and offered blanket certificates to allow pipelines to offer unbundled firm and interruptible sales at market-based rates. Existing firm sales would convert to unbundled firm transportation. Although customers could reduce firm sales entitlements, they could not reduce firm transportation unless the pipeline agreed, or sold the space to another shipper. Order 636 also required pipelines to provide "No-Notice" firm transportation for small customers, allowed pregranted abandonment for transportation service, unbundled storage by defining it as part of transportation, called for flexible receipt and delivery points, and guaranteed shipper access to capacity on upstream facilities. Order 636 also adopted Straight Fixed Variable rates, with mitigation measures if rates were raised for historic customers by more than 10%. It also endorsed incentive ratemaking and promised pipelines they would receive 100% recovery of prudently incurred transition costs. Pipelines were required to provide capacity information on electronic bulletin boards. FERC issued a staggered schedule for pipeline implementation, with industry restructuring to be completed in time for the 1993–1994 heating season. Order 636-A, issued August 3, 1992, shifted 10% of transition costs to interruptible transportation rates; allowed small customers to maintain one-part, cost-based rates; and allowed shippers to release capacity for less than 30 days without prior posting on electronic bulletin boards. Issued on November 27, 1992, Order 636-B primarily relaxed capacity release rules.

Peak Day
The one day (24 hours) of maximum system deliveries of gas during a year. Peak day data are used to, among other things, determine the allocation of certain costs between classes of service. The Federal Energy Regulatory Commission sometimes required allocation based on an average of three continuous days of maximum deliveries (i.e., three-day peak).

Pipeline
All parts of those physical facilities through which gas is moved in transportation, including pipes, valves, and other appurtenances attached to pipes, compressor units, metering stations, regulator stations, delivery stations, holders, and fabricated assemblies.

Pipeline Quality Gas
A term used to designate a fuel gas compatible with natural gas from pipelines. Such a gas can be substituted for natural gas. Synthetic pipeline gas is a gas that meets the specifications for interchangeability with natural gas.

Piping
A conduit for fluids and gases consisting of pipe or tubing with all necessary valves and fittings. Pipe refers to rigid conduit of iron, steel, copper, plastic, or brass, whereas tubing refers to a semi-rigid conduit of steel, copper, plastic, brass, or aluminum.

Plastic Pipe
A hollow cylinder of a plastic material in which the wall thickness is usually small when compared with the diameter and in which the inside and outside walls are essentially concentric.

Plastic Tubing
The same as plastic pipe, except that it is usually of small diameter and sized on the same system commonly used for copper tubing.

Polyethylene
A plastic or resin prepared by the polymerization of ethylene as essentially the sole monomer.

Pressure
When expressed with reference to pipe, the force per unit area exerted by the medium in the pipe.

Pressure Drop
The loss in pressure of the fluid (air, gas, or water) due to friction or obstruction in pipes, valves, fittings, regulators, burners, appliances, and breeching.

Pressure Regulating Station
Equipment installed for the purpose of automatically reducing and regulating the pressure in the downstream pipeline or main to which it is connected. Included are piping auxiliary devices, such as valves, control instruments, control lines, enclosures, and ventilating equipment.

Psi
Pounds per square inch. A measure of pressure.

psia = pounds per square inch absolute. This term refers to the absolute pressure of gas, which depends on barometric conditions and altitude.

psig = pounds per square inch gauge. This term refers to the pressure of gas as measured by a gauge operating at atmospheric pressure. The pressure reading is thus the pressure of the gas above atmospheric pressure.

Atmospheric pressure is generally 14.73 psi. Thus, a pressure gauge reading of 10 psig is equivalent to 24.73 psia.

Public Utility (Service) Commission

State commissions that regulate the activities of intrastate pipelines and local distribution companies, as well as electric, telephone, and water utilities. In Illinois, the Illinois Commerce Commission is the public utility commission.

Purge

To displace air, gas, liquids, or foreign matter from piping, tanks, and equipment with other gases or liquids.

Purging

The act of replacing the atmosphere within a container by an inert substance in such a manner as to prevent the formation of explosive mixtures. Purging also refers to the replacement of the inert substance with natural gas.

Regulator, Monitoring

A pressure regulator set in series with a control pressure regulator for the purpose of automatically taking over, in an emergency, the control of the pressure downstream of a station in case that pressure exceeds the pressure of the control regulator.

Regulator, Pressure

A device that maintains the pressure in a fluid flow line so that it is less than its inlet pressure and within a constant band of pressures, regardless of the rate of flow in the line or the change in upstream pressure (also called Control Regulator).

Relight

A term used in the gas industry that refers to the process of relighting pilot lights in gas equipment or appliances at a customer's premises.

Sales/Transportation Service

Under traditional sales service agreements, transmission and distribution companies purchase gas from suppliers, transport the gas to customers, and sell it to them. Under transportation service agreements, transmission and distribution companies transport gas supplies for customers who have purchased the gas directly from other parties.

Sendout, Gas

Total gas produced, purchased (including exchange gas receipts), or net withdrawn from underground storage within a specified time interval, measured at the point(s) of production and/or purchase, and/or withdrawal, adjusted for changes in local storage quantity. It comprises gas sales, exchange, deliveries, gas used by the company, and unaccounted for gas. It is expressed in various units, such as therms, Btu's, cubic feet, etc.

Service (Service Line, Service Pipe)
The pipe that carries gas from the main to the customer's meter.

Service Area
A geographic area where a utility provides service, usually under provisions of a franchise, charter, or certificate and is subject to government regulations.

Standby Service
A service by which a pipeline or local distribution company guarantees to provide gas supplies in the event a transportation customer's usual supplies are inadequate or unavailable.

Storage, Aquifer
The storage of gas underground in porous and permeable rock stratum, the pore space of which was originally filled with water and in which the stored gas is confined by suitable structure, permeability barriers, and hydrostatic water pressure.

Storage, Gas
Facilities used to store natural gas that has been transferred from its original location. A storage facility usually consists of natural geological reservoirs like depleted oil or gas fields, water-bearing sands sealed on top by an impermeable cap rock, underground salt domes, bedded salt formations, or, in rare cases, abandoned mines.

Storage, Underground
The use of subsurface facilities for storing gas that has been transferred from its original location primarily for load balancing. The facilities are usually natural geographic reservoirs, such as depleted oil or gas fields or water-bearing sands sealed on the top by an impermeable cap rock. The facilities can be manmade or natural caverns.

System Capacity
The amount of gas that can be transported under specified conditions of pressure, temperature, and loading (generally peak-day requirements). The maximum amount of gas that can be delivered during any period can vary on the basis of the amount of line pack, pressure differential, points of receipt and delivery, gas gravity, and temperature conditions at the beginning of the period. Consequently, a system's capacity varies from time to time depending on existing conditions.

System Supply
Purchases of natural gas for the purchaser's own system supply requirements (i.e., for resale by the purchaser).

System Type
Distribution. Generally, mains, services, and equipment that carry or control the supply of gas from the point of local supply to and including the sales meters. The system operates at various pressures as indicated below.

Field and Gathering. A network of pipelines transporting natural gas from individual wells to a compressor station, processing point, or trunk pipeline.

High Pressure. A system that operates at a pressure higher than the standard service pressure delivered to the customer; thus, a pressure regulator is required on each service line to control pressure delivered to the customer. Sometimes this is referred to as medium pressure.

Low Pressure or Utilization Pressure. A system in which the gas pressure in the mains and service lines is substantially the same as that delivered to the customers' appliances; ordinarily a pressure regulator is not required on individual service lines.

Main. The network or distribution piping to which customers' service lines are attached. Generally, large pipes are laid in principal streets with smaller laterals extending along side streets and connected at their ends to form a grid; sometimes laterals are brought to dead ends. (Compare with Distribution, listed above under System Type.)

Transmission. Pipelines installed for transporting gas from a source or sources of supply to one or more distribution centers, to one or more large volume customers, or to a pipeline installed to interconnect sources of supply. In typical cases, transmission lines differ from gas mains in that they operate at higher pressures, are longer, and have a larger distance between connections.

Tap Station

A gas industry term that describes equipment installed for the purpose of regulating pressure or flow to a downstream pipeline to which it is connected.

Therm

A unit of heating value equivalent to 100,000 British thermal units (Btu's).

Title Transfer

The sale/purchase and associated title transfer of the commodity ownership.

Transmission Company, Gas

A company that obtains at least 90% of its gas operating revenues from sales for resale and/or transportation of gas for others and/or main line sales to industrial customers and classifies at least 90% of its pipelines (other than service pipe) as field and gathering, storage, and/or transmission.

Unbundling

Order 636 completed the Federal Energy Regulatory Commission's (FERC's) policies on unbundling by ordering pipelines to completely separate sales and transportation services. FERC clarified its unbundling policy by allowing pipelines to retain some storage to manage their systems, but ruled that production-area storage should be unbundled from market-area facilities, and

required pipelines to provide for in-field title transfers of storage inventory to encourage the development of market centers.

Valve
A mechanical device for controlling the flow of fluids and gases. Types include gates, balls, globes, needles, plugs, and check valves.

Vault
An enclosed room or pit having an access opening in the top, sidewall, or both. A vault can be in a building, a separate aboveground structure, or underground.

Well, Gas
A well that produces at surface conditions the contents of a gas reservoir. Legal definitions vary among the states.

Wheeling
The transport of customer-owned gas by a transmission company for the customer at a predetermined cost to the customer.

APPENDIX B: 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.

This form is closely related to the form used to gather information on facilities that are considered critical with respect to electric power.[1] Municipalities may wish to combine the two forms into a single version that covers both electricity and natural gas.

[1] See *Planning for Electric Power Disruptions*, U.S. Department of Energy, Office of Critical Infrastructure Protection; City of Chicago; Department of Environment; Metropolitan Mayors Caucus (February 2001).

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
___ Waste Treatment Facility (wastewater treatment, lift station)
___ School (pre-school, kindergarten, grade school, middle school, high school, college, trade school)
___ Community Center (library, municipal recreation facility)
___ Transportation (railroad switches, compressed natural gas vehicles)
___ Telecommunications Facility (switching office)
___ 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)

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

___ Public Lodging (hotel, motel)
___ Other Government Facility
___ Commercial Facility
___ Industrial Facility
___ Other (specify) _____

Gas Service

Single Feeder Main: _____ Redundant Feeder Main: _____

Backup Equipment Available (for use if gas supply is lost)

Space Heaters:	None ___	Electric ___	Propane ___	Oil ___	Other (specify) _____
Water Heaters:	None ___	Electric ___	Propane ___	Oil ___	Other (specify) _____
Cook Stoves:	None ___	Electric ___	Propane ___	Oil ___	Other (specify) _____

Backup for Natural Gas Fueled:
Power Generation: None _____ Propane ___ Oil ___ Other (specify) _____
Emergency Electric Power Systems: None _____ Propane _____ Oil ___ Other (specify) _____
Industrial Process Heat: None _____ Propane _____ Oil _____ Other (specify) _____

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 C: SAMPLE VULNERABILITY ASSESSMENTS

This appendix contains sample natural gas vulnerability assessments for several types of facilities, including a town hall, school, fire station, and manufacturing facility.

The sample natural gas vulnerability assessments presented in this appendix are designed to illustrate the type of evaluation needed to determine whether a particular facility is vulnerable to a natural gas disruption. Several types of facilities are assessed:

- Town hall,
- School,
- Fire station, and
- Manufacturing facility.

Communities interested in conducting this type of assessment for their critical facilities should engage the services of an experienced natural gas engineer and should work with the local gas company in carrying out this job.

NATURAL GAS DISRUPTIONS
CRITICAL FACILITY VULNERABILITY ASSESSMENT

FACILITY: Town Hall **DATE:** April 1, 2002

CATEGORY: Municipal **SUBCATEGORY:** Town Hall

DESCRIPTION:

The building is used for administration of the municipality. In emergencies, it is used as a heating and cooling shelter.

CURRENT GAS SERVICE:

(a) Supply

- The building is heated by a natural-gas–fired forced air furnace. Domestic hot water is supplied by a single gas hot water heater. Gas-fired air-conditioning units are mounted on the roof.
- The building's service line is connected to a gas main running along the adjacent road.
- The gas main is a 4-in. steel line operating at 60 psig of pressure.
- The gas main is on a dead-end, single-feed line; i.e., gas cannot be moved in both directions in the event of a line break.
- Another gas main is located approximately 1,500 ft away, but it is not connected to the main that supplies the Town Hall.

(b) Service

- Gas service to the Town Hall is provided by a single 1-in. polyethylene line.
- Gas service capability is 1,000 cubic feet per hour.
- The service pressure is 0.25 psig.

BACKUP CAPABILITIES:

There are no backup capabilities for the gas supply.

SHELTER CAPABILITY:

The Town Hall can be used as a temporary shelter. In the event of a widespread emergency, it would be used as a staging area to direct people to other shelter facilities. It has been used as a shelter on several occasions during electric power outages.

OTHER COMMENTS:

The gas meter and lines are in an open area at the side of the building but are shielded by shrubbery.

OVERALL VULNERABILITY ASSESSMENT:

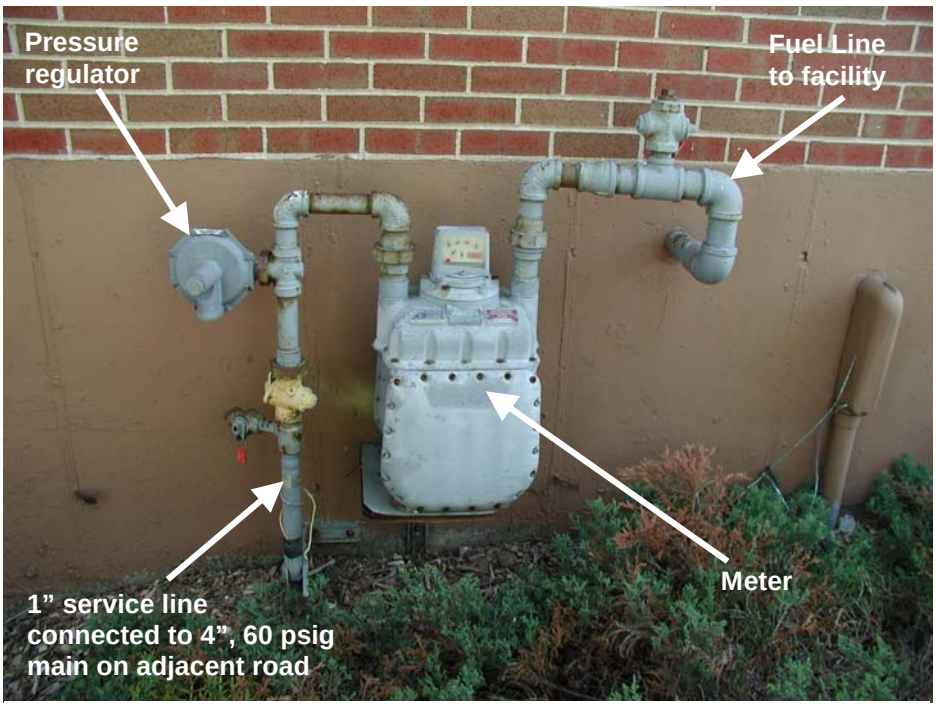
Moderate vulnerability.

There is no back-feed capability on the supply main. In the event of a break in the line, however, it would be possible to install temporary bypass lines connected to another main a short distance away to restore service.

RECOMMENDATIONS:

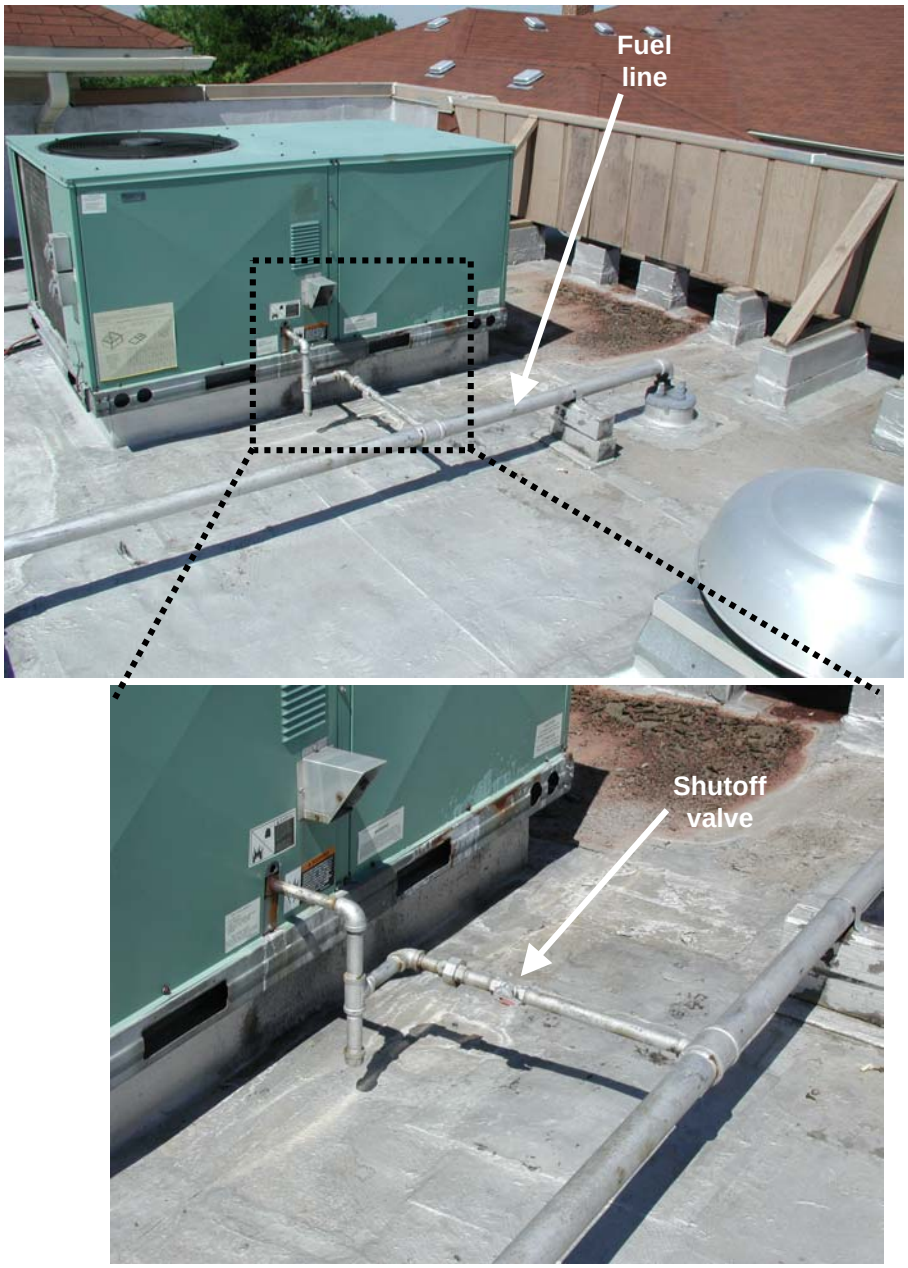
In consultation with the gas company, consideration should be given to installing approximately 1,500 ft of distribution line to connect the two nearby mains, which will increase security of the gas supply. In consideration of cost, this new connection might best be scheduled if any significant construction work is planned for the area in the future or if the system requires an upgrade because of increased gas load.

TOWN HALL GAS SERVICE EQUIPMENT:



Meter Set

Fuel Line Providing Gas to Space-heating Furnace



Rooftop Gas-fired Air-conditioning Unit

NATURAL GAS DISRUPTIONS
CRITICAL FACILITY VULNERABILITY ASSESSMENT

FACILITY: High School **DATE:** April 1, 2002

CATEGORY: School **SUBCATEGORY:** High School

DESCRIPTION:

This multistory high school serves 3,600 students. Natural gas is used for heating and cooling of the building, domestic hot water, and cooking. The high school complex is served by six 1 million Btu/hr boilers that provide heating and cooling for the complex. When one of the boilers is out of service, there is enough capacity to continue to maintain heat and cool the complex.

CURRENT GAS SERVICE:

(a) Supply

- As a large consumer of natural gas, the high school has elected to be a transportation customer of the local gas distribution company; i.e., it buys gas from a third-party natural gas supplier, and the local gas distribution company transports the gas to the facility for a service fee.
- The facility's service line is connected to a gas main that runs on an adjacent road.
- The gas main is an 8-in. line operating at 60 psig of pressure.
- The gas main is backfed; that is, gas can be moved in two directions.

(b) Service

- The gas service is provided by a 2-in. steel line.
- The gas meter set capability is 50,000 cubic feet per hour.
- The service pressure is 5 psig.

BACKUP CAPABILITIES:

The gas supply does not have any backup capabilities.

SHELTER CAPABILITY:

The building can be used as a heating or cooling shelter for emergency purposes.

OTHER COMMENTS:

The gas meter and lines are in an open area at the side of the building, shielded from public view by a short brick wall.

OVERALL VULNERABILITY ASSESSMENT:

Low vulnerability.

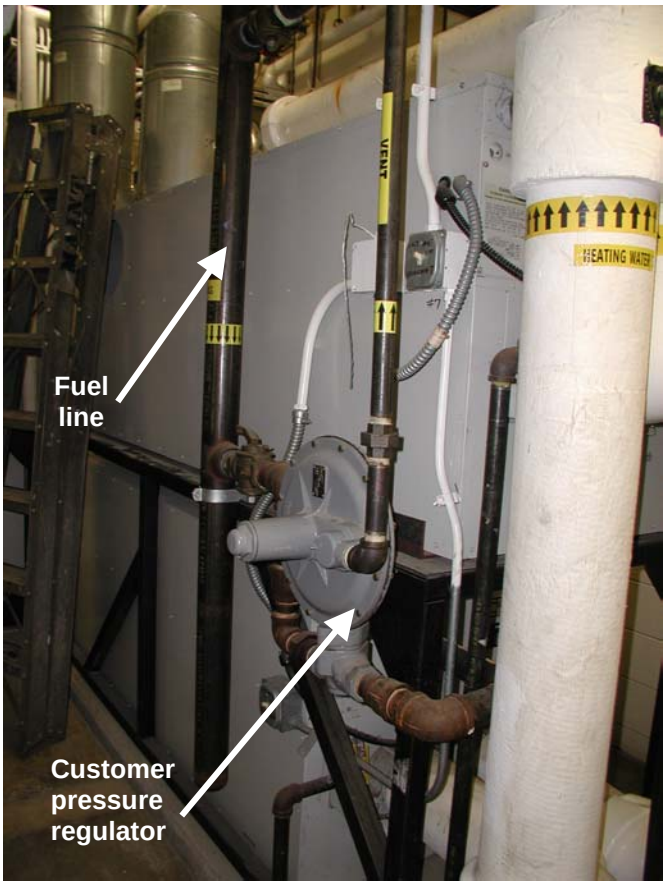
The main to which the service line is connected is backfed, thus providing adequate reliability.

RECOMMENDATIONS:

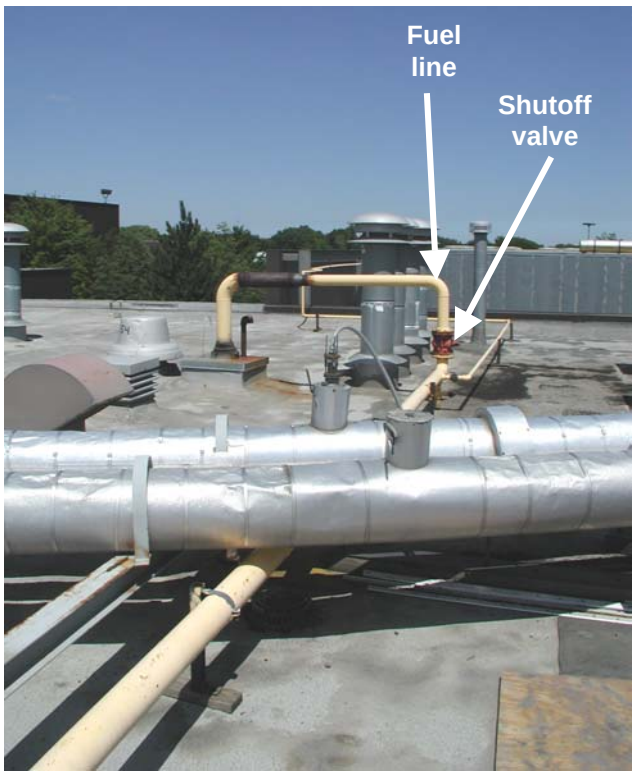
The capacity of the meter set should be reviewed to see that it meets the demands of the new building addition.

HIGH SCHOOL GAS SERVICE EQUIPMENT:

Meter Set



Gas Supply to Boiler



Gas Supply to Roof Air-conditioning Units

NATURAL GAS DISRUPTIONS
CRITICAL FACILITY VULNERABILITY ASSESSMENT

FACILITY: Fire Station #7 **DATE:** April 1, 2002

CATEGORY: Emergency Services **SUBCATEGORY:** Fire

DESCRIPTION:

The fire station is in the southern portion of the town. The facility also serves as the backup Emergency Operations Center for the town.

CURRENT GAS SERVICE:

(a) Supply

- The facility's service line is connected to a gas main that runs south on the adjacent street.
- The gas main is a 2-in. steel line operating at 60 psig of pressure.
- The gas main is a radial line that dead ends at the end of the street.
- This gas main is connected to a 6-in. backfed line that runs east-west on the cross street. Because the fire station is near the corner, the length of this connection is relatively short.

(b) Service

- The gas meter set capability is 3,400 cubic feet per hour.
- The service pressure is 0.25 psig.

BACKUP CAPABILITIES:

The gas supply does not have any backup capabilities.

SHELTER CAPABILITY:

No shelter capability.

OTHER COMMENTS:

The gas meter and lines are in an open area at the side of the building. Landscaping shields this from public view and acts as a barrier to vehicular traffic.

A backup generator is located adjacent to the gas line. Recent experience has shown that the generator has been used on a number of occasions and does, therefore, provide an important backup capability.

OVERALL VULNERABILITY ASSESSMENT:

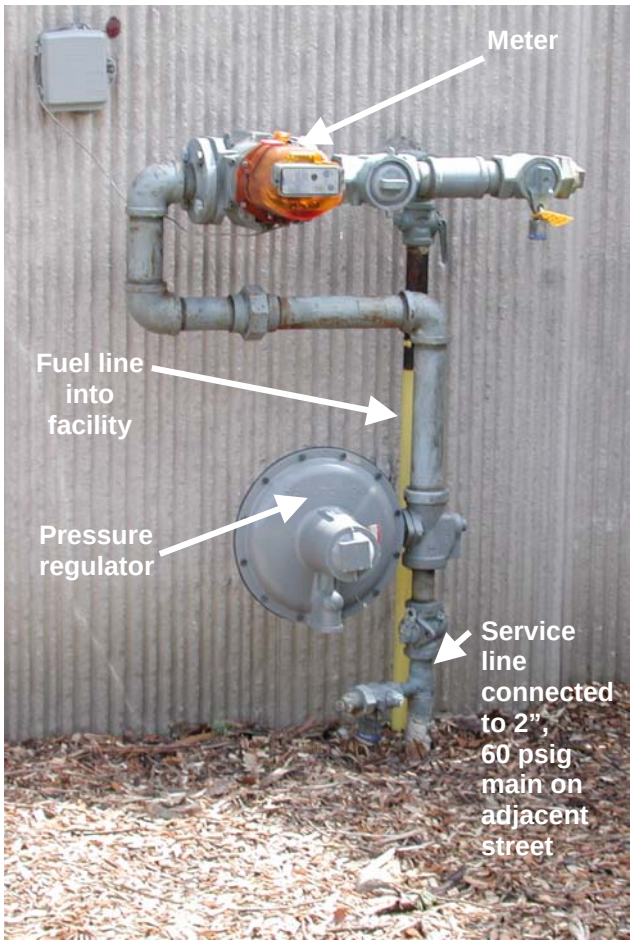
Low vulnerability.

Although the main to which the service line is connected is a radial feed, it is connected to a nearby backfed line, thus providing adequate reliability.

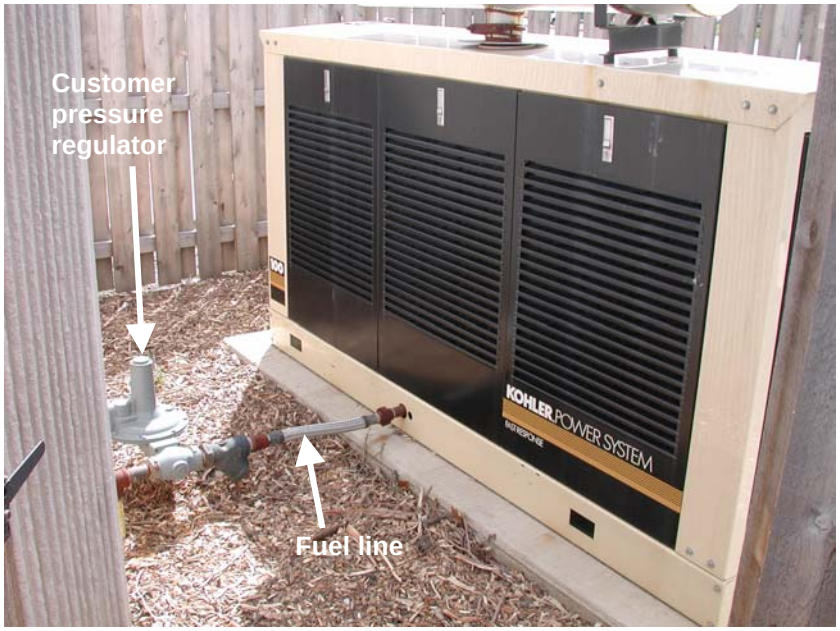
RECOMMENDATIONS:

- Because the backup electric generator serving the fire station is gas-fired, consideration should be given to developing a contingency plan in the event the gas service and electric power were interrupted at the same time. Although this interdependency situation is a low-probability event, the loss of backup power generation could seriously hamper emergency communications and other operations under these conditions. This would be especially true if the backup Emergency Operations Center had to be activated at this facility.
- Consideration should be given to locking the enclosure that houses the backup electric generator.

FIRE STATION #7 GAS SERVICE EQUIPMENT:



Meter Set



Backup Generator in Outdoor Enclosure

NATURAL GAS DISRUPTIONS
CRITICAL FACILITY VULNERABILITY ASSESSMENT

FACILITY: Manufacturing Facility **DATE:** April 1, 2002

CATEGORY: Industry **SUBCATEGORY:** Factory

DESCRIPTION:

The factory uses natural gas for heating, both for the building and for industrial process heat. There is one hot water boiler for heating the building and six furnaces for material processing. Two of the furnaces are redundant systems.

The gas system has automated alarms that notify plant maintenance personnel when problems have occurred, such as failed pumps or furnace shutdown.

The furnaces must maintain temperatures within a very narrow range for quality control of the output material. Some materials must be maintained at ±2°F, whereas others must be maintained at ±5°F. These temperatures are critical or the batch process will be lost.

CURRENT GAS SERVICE:

The factory is referred to as a "large transportation customer," meaning that it purchases its gas from an independent supplier. The gas distribution company then transports the gas to the facility.

(a) Supply

- The factory is fed by a 6-in. steel main that is on a single-feed system (deadend line).
- There is no back-feed capability on this main. Any break in the upstream portion of the main would cut off service to the factory.
- Two prior breaks in the main were dealt with by installing a temporary bypass line until the main was repaired.

(b) Service

- A 4-in. service line comes off the 6-in. main and feeds a rotary meter set with the appropriate regulation and valving equipment.
- The inlet pressure is 10 to 17 psig.
- The delivery pressure to the factory is 2.0 psig.
- Gas consumption in 2001 was 15,500,000 cubic feet.

BACKUP CAPABILITIES:

There are no backup capabilities for the gas supply. There is a diesel-oil–fired backup electric generator.

OTHER COMMENTS:

The gas meter and lines are in an enclosed area at the side of the building. A fence shields and secures these from the public.

OVERALL VULNERABILITY ASSESSMENT:

High vulnerability.

There is a significant vulnerability in the natural gas supply itself. The factory is fed by a single-feed main with no back-feed capability, and there is no backup system. If the natural gas supply were lost and events resulted in an extended delay in restoring service, there is a significant potential for the loss of output product because of the inability to maintain furnace temperatures within the narrow range needed.

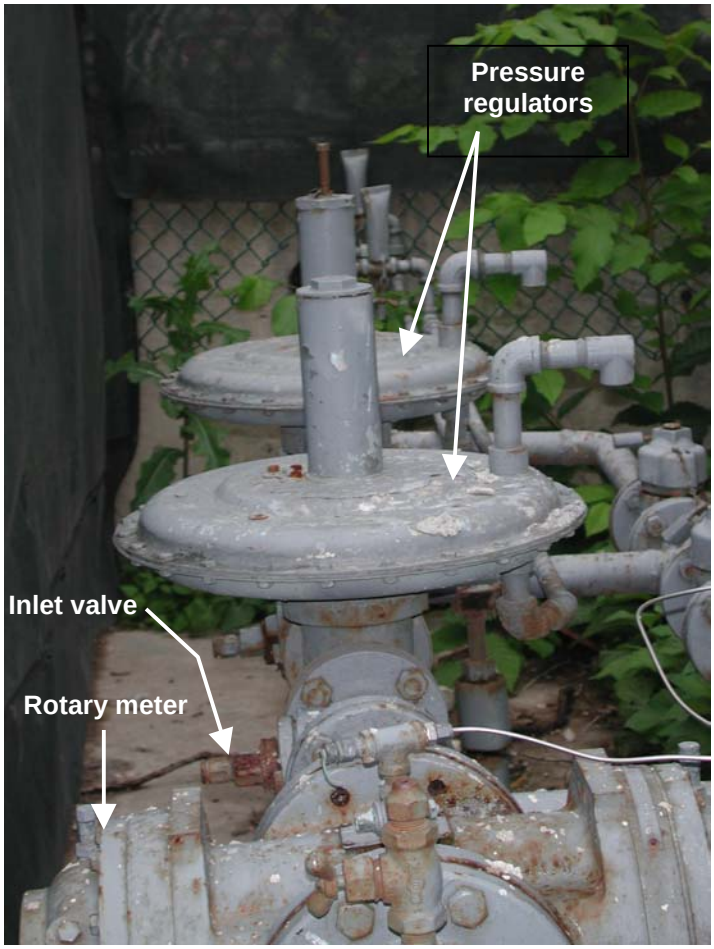
The factory has provided for reasonable backup systems for the internal facility plant, such as redundant furnaces.

RECOMMENDATIONS:

- The potential for the loss of gas supply from either the 6-in. main or the 4-in. service line should be discussed with gas company personnel to determine whether any steps need to be taken to enhance the reliability of the system. Options such as redundant feeds from alternative mains should be discussed to evaluate their feasibility and cost-effectiveness.
- Consideration should be given to installing backup systems to maintain furnace temperature in the event of an extended loss of natural gas service. Backup electric, propane, or oil systems could be evaluated.

FACTORY GAS SERVICE EQUIPMENT:

Meter set assembly protected by a chain link fence, both top and sides, with the posts anchored to a concrete wall.

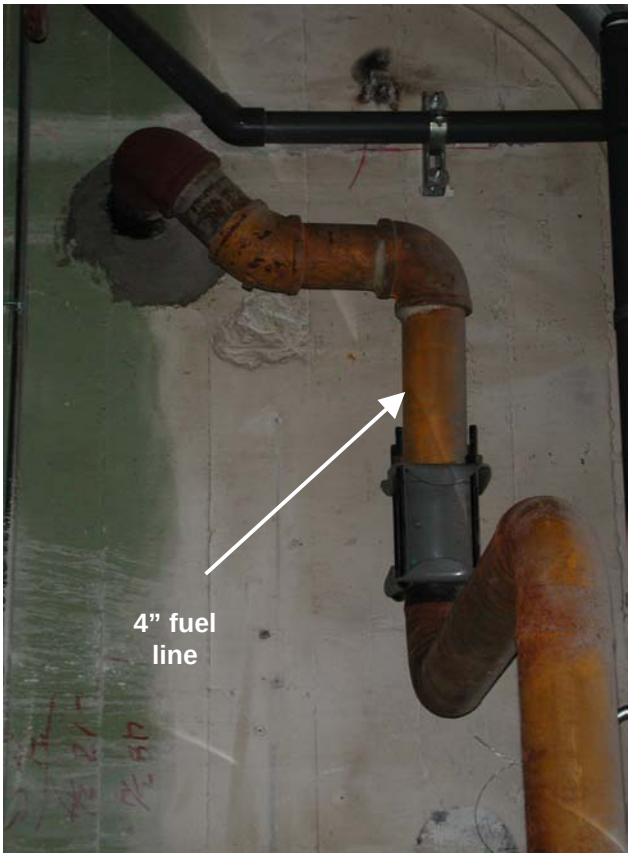


Gas company meter set showing the inlet valve, rotary meter, and two pressure regulators.

The inlet valve controls the incoming flow from the 4-in. service line.

The rotary meter measures the total amount of gas that is fed to the aquarium.

The first regulator reduces the pressure from 17 to 2 psig. The second regulator is a monitor that regulates the inlet pressure only if the first regulator has an operational failure.



Fuel Line Coming through the Wall from the Outside

Regulator on the 4-in. Fuel Line Feeding the Furnaces

APPENDIX D: PREPAREDNESS MEASURES

This appendix provides information on measures that can be used to prepare for disruptions in gas service. This material 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 System Connection
- Protection of Supply Lines
- Gas Line Dig-in Prevention
- Gas Leak Preparedness
- Alternative Fuel Supply
  - Standby Emergency On-site Backup Fuel System
  - Portable Fuel Systems
- Demand-side Management
- Shelters
- Evacuation Planning

D.1 ENHANCED SYSTEM CONNECTION

Technical Description

Typically, a customer is connected to the natural gas system by a single service line. This service line is connected to the feeder main, which normally runs in the street right-of-way. It may be possible to run an additional service line to a different entry point of the customer facility. For this approach to be effective in reducing vulnerability, it must be connected to a different feeder main. Another feeder main may or may not be available to make this connection.

Additional service lines can be connected in several ways. One option is to have the total load in the facility carried by the second service. If one service line is disrupted, the second service line can carry the load for the entire facility or any partial load. A second option is to split the load in the facility, in essence having each service line carry a portion of the load. In this option, disruption of either service line would affect only part of the load.

Although these alternatives are possible, gas companies do not use this method very often. Potential confusion involved with having to shut off two service lines during an emergency, billing complications from having two service lines and meters, and the difficulty in finding a different feeder main nearby make this option impractical, except for some very special cases. In some instances, dual service lines are prohibited by law by the Illinois Commerce Commission.

Cost

The cost of connection to multiple feeders depends a great deal on the location of the facility relative to the available feeder mains. The facility owner is generally charged an additional fee for additional feeder connections. The cost can be prohibitive, except for special cases where an uninterrupted gas supply is critical (e.g., special manufacturing processes).

Implementation Considerations

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

D.2 PROTECTION OF SUPPLY LINES

Technical Description

Protecting the gas customers' supply lines from accidental or intentional damage reduces the likelihood of a gas disruption. Increased protection of aboveground gas equipment (e.g., meters, service lines entrances to customer facilities) can be achieved by erecting fences, building enclosures, or adding other physical

barriers. A municipality can influence the security of this equipment through building codes that require gas equipment protection.

Protection of gas company facilities requires the municipality to work with the gas company in providing increased security during periods of heightened security alerts. For example, police may need to increase patrols around gas company facilities or station police protection at the facility on a continuous basis.

Cost

The cost of additional protection for gas equipment at a customer's premises varies widely. These costs generally are absorbed by the customer.

The costs of providing additional security to gas company facilities during times of increased alert depend on the number and extent of police support required. The cost for providing this service is subject to negotiation with the gas companies.

Implementation Considerations

Additional physical protection for customer gas equipment must be considered in light of safety requirements. Some protective measures need to be evaluated in terms of whether they can be implemented and still meet safety requirements. For example, surrounding a gas meter and customer service entrance with a locked fence can inhibit access to gas shut-off valves in an emergency.

With regard to providing additional security, municipalities must consider the demands that would be placed on police services from other sources. Allocation of limited municipal resources must be prioritized.

D.3 GAS LINE DIG IN PREVENTION

Technical Description

A gas line dig-in, or the accidental damage of buried natural gas pipelines during excavation work, is one of the major causes of natural gas disruptions. State law (Illinois Underground Utility Facilities Damage Prevention Act) requires anyone doing excavation work must contact the appropriate utility locator system to obtain information on all buried utility services (electricity, natural gas, telephone, cable, etc.). In the Chicago Metropolitan Area, the contacts are:

Within Chicago City Limits:
Chicago Utility Alert Network (DIGGER)
312-744-7000
In the Suburbs:
Joint Utility Locating Information for Excavators (JULIE)
800-892-0123

A community can significantly reduce the incidence of gas pipeline damage and resulting gas disruption events by aggressively promoting and enforcing these requirements. To increase the awareness of these available locator services, public service announcements can be made to residents via community mailings and/or the community cable television channel. To increase the awareness of contractors working in the community, information on contacting the locator services can be distributed as part of the building permit process. Preprinted information for distribution to contractors is readily available from the locator services. A community may elect to go further by requiring contractors to officially acknowledge on building permit applications that they will contact the locator services. Penalties for non-compliance can be levied.

In addition to increasing awareness for the need to use the locator services, communities can expand their enforcement of the process. Police and public works employees on routine patrol or assignments can question any excavators they encounter as to whether they have contacted the appropriate locator system before they began digging. Finally, communities can require their own municipal crews to use the locator services before they begin any excavation work.

Cost

Virtually no cost is associated with dig-in prevention, as the locator services are provided at no cost to the communities. Community information and enforcement programs can be added on to normal duties of municipal employees with minimal impact.

Implementation Considerations

The information and enforcement process must be included into standard operating procedures of appropriate municipal departments.

D.4 GAS LEAK PREPAREDNESS

Technical Description

Municipal personnel, including fire, police, and public works staff, require training in the proper procedures for dealing with gas leaks. This training includes issues such as recognizing leak conditions, understanding procedures for dealing with escaping gas to avoid ignition and explosions, knowing appropriate methods for dealing with gas fires, and understanding what gas equipment (e.g., valves) should be left to gas company personnel to operate. The last is especially important since opening or closing the wrong valve on the natural gas system can have catastrophic results (e.g., putting high-pressure gas into a low-pressure line). Training in the handling of gas leaks is normally provided to municipal personnel by the gas company upon request. Each municipality should consider this training for the appropriate municipal employees.

In addition to municipal employees, it may be desirable to train personnel at critical facilities to deal with gas leaks. In general, this training does not need to be as extensive as that for municipal emergency response personnel, but it should cover some of the basic requirements. Many custodial employees at public schools have been trained in basic procedures for operating the gas shut-off valves in school buildings.

Cost

The cost to the municipality is largely in the form of employee time and payroll expenses. The gas company generally provides this training and instruction to municipal staff at little or no cost. The cost for training employees of critical facilities is a negotiable item.

Implementation Considerations

The training of municipal and critical facility personnel in gas leak response has regulatory implications. Under U.S. Department of Transportation safety regulations (Part 192), anyone operating natural gas equipment must meet training and certification requirements. Municipalities seeking certification for employees can discuss this issue with the gas company.

D.5 ALTERNATIVE FUEL SUPPLY

D.5.1 On-site Backup Fuel Systems

Technical Description

At some facilities where interruption of natural gas supply has very serious safety or economic consequences, permanent on-site backup fuel systems using either propane or oil are installed. The most common type of facility to use these systems is a large manufacturing plant. They can, however, be used elsewhere where justified. The backup fuel system includes the following components:

- A holding tank for the backup fuel that is sized for the number of days of supply that is economically feasible. This considers local usage rates and the availability of refills.
- For propane, air compressors that supply air to a mixing facility.
- For oil, heating, or vaporization equipment that converts liquids to small particles or a vapor to be used in the mixing process.
- A mixing facility that mixes air with the fuel before it is sent to the customer’s equipment.

Cost

The cost varies with the size of the backup equipment required to support the load. In general, the backup system is expensive enough so that only large facilities can justify making the investment.

Implementation Considerations

Alternate fuel backup equipment requires a sizeable piece of property located away from the main customer facility at a distance required by the building and safety codes, which also increases the cost. Further, the customer's gas-using equipment must be designed to accept alternative fuels. A propane or oil fuel will not function properly if the combustion equipment is not designed for it.

D.5.2 Portable Systems

Technical Description

Portable systems are designed to be brought to a facility to provide some service in the event of a gas supply interruption. In general, these small units provide limited capability. Examples include portable heating and cooling units that could be used at a shelter. Usually, these units are electrically driven, but some use propane or oil as their base energy.

Cost

The cost of the portable equipment varies from several hundred to several thousand dollars. Some equipment is available on a rental or lease basis in addition to outright purchase.

Implementation Considerations

Portable equipment must be carefully deployed to avoid safety hazards. Numerous cases have occurred in which portable heaters were improperly placed and started fires. Also, some equipment relies on continued electric power (e.g., electric heaters). This equipment cannot deal with extreme conditions where both electricity and natural gas service are lost.

D.6 DEMAND-SIDE MANAGEMENT

Technical Description

Demand-side management measures are designed to encourage customers to voluntarily reduce their consumption of gas during peak periods. The reduction in load alleviates the stress on the gas system and lowers the probability of equipment failure due to overloading.

Gas companies have several demand-side management options available for different customer categories. The most common options are:

- *Interruptible service*. Contract terms prescribe the amount of advance notice and duration of the cut-off period that can be implemented. Within these terms, the gas company can cut off service to participating customers during peak periods if needed.

- *Voluntary reduction*. Upon notification from the gas company, customers reduce their load to an agreed-upon level.

The availability of these options and specific contract terms change. Up-to-date information can be obtained from the gas companies.

Cost

The customer does not incur any costs for participating in these programs. Some customers might receive a payment and/or a reduced gas rate for their participation.

Implementation Considerations

Participation in these programs could interrupt gas service during peak periods. Therefore, participants must evaluate the potential effects of these interruptions and determine whether the rate reduction or payment offered is adequate to cover these impacts.

D.7 SHELTERS

Technical Description

Shelters provide temporary housing for people displaced from their homes by an emergency, including interruptions to natural gas service. Shelters may be needed in both winter and summer, although the winter months are more critical from the possible impacts of a gas interruption.

The requirements for shelters (e.g., number of people that can be accommodated, water and toilet facilities, cooking capability) are available from other emergency planning documents.

One aspect that must be considered when evaluating shelters for dealing with natural gas service interruptions is the extended period of time that they might be required. As discussed elsewhere, it can take a significant amount of time to recover from an interruption in gas service because of the need to visit customers one at a time to relight gas equipment. This aspect can place a heavy burden on shelters to accommodate a large number of people for long periods.

In more extreme situations, such as a regionwide gas supply interruption, the availability of adequate shelters for large numbers of people could be a serious

problem. Resources beyond the capability of an individual municipality would be required. State and federal assistance would be needed.

Cost

The cost of preparing and operating shelters is widely variable. Cost estimates developed in the course of other emergency planning efforts are available to gauge the need.

Implementation Considerations

For a shelter to be useful during a natural gas interruption, it must retain its own gas supply service.

D.8 EMERGENCY EVACUATION PLANNING

Technical Description

Municipalities are usually prepared for some level of emergency evacuation planning within the municipalities' boundaries. Evacuation planning for natural gas disruption events covers a wide range of needs. For a gas leak that is confined to a small area, a municipality must be prepared to evacuate occupants of a single building or several buildings quickly. Emergency response personnel generally are trained to carry out this type of evacuation. Gas company personnel are also trained to deal with this type of incident.

At the other end of the spectrum is the need for large-scale evacuations necessitated, for example, by a regionwide interruption in gas service. Although this event is extreme and has a low probability of occurrence, it nevertheless represents a serious issue. The problem of moving a large number of people out of a region that is suffering from a loss of gas supply could present logistical problems of serious magnitude. If this problem arose during severe winter weather, the public health and safety impacts could be substantial. Most municipalities are not prepared to deal with large-scale emergency evacuation. Even many states do not have plans for this type of operation.

Cost

The cost of developing and implementing a large-scale evacuation plan is not known at this time.

Implementation Considerations

This type of planning must be done at a regional or state level to effectively address the issues.

APPENDIX E: SAMPLE NATURAL GAS DISRUPTION TABLETOP EXERCISE

This appendix provides a template for a natural gas disruption exercise. The scenario included here is structured around an extensive loss of gas service. Mac City, the TRANSCO Transmission Pipeline Company, and the GASCO Gas Company are all fictitious entities. Best results will be achieved in this exercise by modifying the information to suit local conditions. Although an exercise can be used to begin the planning process by sensitizing decision makers to the problems involved with a natural gas disruption event, it is preferable to use the exercise to test the implementation of plans and procedures that have already been developed.

FLAME OUT: A NATURAL GAS DISRUPTION TABLETOP EXERCISE

INTRODUCTION

Flame Out is a tabletop exercise designed to test plans and procedures for dealing with natural gas disruption events. The scenario challenges the players to better understand their roles and responsibilities and their ability to **implement** emergency plans and procedures. Representatives from fictitious facilities – Mac City, TRANSCO Transmission Pipeline Company, and GASCO Gas Company – will need to interact to deal with the situation.

OBJECTIVES

The following objectives have been established for this exercise:

- Raise awareness of natural gas disruption issues.
- Demonstrate use of notification protocols between gas companies and municipalities.
- Promote interdepartmental understanding within the municipality regarding the challenges associated with disruption to natural gas service.
- Demonstrate the implementation of natural gas disruption response actions.
- Elicit consideration of effective public education and emergency information.

APPROACH

The scenario will be presented in three moves or phases consisting of:

- Scenario update information;
- Player discussion of the actions to be taken in accordance with plans and procedures; and
- Discussion of issues, gaps, and overlaps.

SCENARIO: INITIAL CONDITIONS

It is February. Unusually cold weather is being experienced throughout the country, particularly in the southern Gulf Coast states where much of the nation's natural gas is produced. Transmission pipeline companies, including TRANSCO, are experiencing maximum flow volumes and supplies are tight.

In the Mac City area, temperatures have been between 0ºF and -10ºF for the last three days. The GASCO Gas Company has been struggling to keep up with the gas demand. All available supplies from its contracts and from storage are being pressed into use. A Gas Supply Alert has been issued to advise communities of the tight situation.

MOVE 1: GASCO ADVISES MAC CITY OF EMERGENCY CONDITIONS

On Tuesday at 5:00 a.m., TRANSCO Transmission Pipeline Company advises GASCO that several of its gas suppliers have had freeze-ups of their wellheads. Gas supplies are expected to be cut by 25%–30% within the next 12–24 hours. GASCO is unable to procure any additional gas supplies from other pipelines and cannot continue to increase the output from its storage facilities. GASCO declares a Gas Supply Emergency and notifies Mac City to expect some interruptions to gas service, beginning within the next 8–12 hours.

The following questions are used to facilitate discussion of the problems that need to be addressed by Mac City personnel:

- What does the notification from GASCO mean?
- What additional information should be requested from GASCO?
- What Mac City departments and personnel need to be notified? What actions should those departments and personnel take?
- What critical facilities might be affected?
- What should the Mac City Public Affairs Department communicate to the press and the public?

MOVE 2: SERIOUS GAS LEAK DEVELOPS

At 8:00 a.m., GASCO advises Mac City that gas service to the northeastern part of town will be interrupted to preserve pressure in the rest of the system. GASCO has started to shut off customers and feeder mains. It estimates that approximately 3,000 customers will be without gas service.

At 9:00 a.m., a Mac City water department crew inadvertently ruptures a gas line while dealing with a water main break in the southwestern part of town due to the cold weather. This gas line is not, however, designated to be shut down due to the gas supply situation. Gas is blowing at a high rate but has not ignited. The Fire Department is en route as is a GASCO repair crew.

The following questions are used to facilitate discussion:

- What standard operating procedures do the fire and police departments follow in dealing with the gas leak situation? How do they interact with the GASCO crew?
- Given that there is also a gas supply emergency and gas is being cut off in another part of town, how are available municipal personnel and resources allocated? What additional resources are needed?
- What additional information should be requested from GASCO?
- What steps are being taken to deal with the people who are losing gas service? What critical facilities might be affected?

MOVE 3: SITUATION STABILIZED BUT WITH MANY CUSTOMERS WITHOUT GAS SERVICE

At 11:00 a.m., GASCO crews succeed in stopping the gas leak by shutting off feeder mains. The situation has stabilized, but now 3,000 customers in the northeastern part of town and an additional 4,000 customers in the southwestern part of town are without gas service in the bitter cold weather. Neighboring towns are also experiencing gas supply shortages, but not of the same magnitude.

GASCO has received word from the TRANSCO Transmission Pipeline Company that gas supplies will be partially restored tomorrow. GASCO estimates that it will take 4–7 days after supply is restored to relight the 7,000 customers with all available company crews working around the clock.

The following questions are used to facilitate discussion:

- What steps should Mac City municipal personnel take at this point?
- How can Mac City personnel assist GASCO personnel in the restoration process?
- What outside help can be requested?
- What information should be given to the public and news media and how?

CONCLUDING INFORMATION

At noon on Wednesday, GASCO has received a sufficient supply of gas to begin to restore service. It is estimated that the process will take 4–7 days to complete.

HOT WASH

The "hot wash" is an evaluation of the exercise that is done immediately following its conclusion. Time is left to identify lessons learned from the experience. Identifying lessons learned is most easily accomplished if the lead exercise controller elicits discussion among the participants. Focusing on the objectives established for the exercise, the following areas of discussion are typically covered during an exercise hot wash:

- What went *well*?
- What did *not* go so well?
- What scenario improvements or considerations need to be included in future exercises?
- What planning and preparedness priorities need to be addressed?

APPENDIX F: SAMPLE NATURAL GAS DISRUPTION PLAN

This appendix contains a sample local government plan for dealing with natural gas disruptions for a fictitious city, Mac City, Illinois, which is served by a fictitious gas utility, GASCO Gas Company. The sample plan is designed to be illustrative and is not intended to present a required format that must be followed in developing a natural gas disruption plan. Rather, it is intended to show one way in which such a plan could be assembled. Municipalities should modify this sample plan to meet their own unique situations.

This sample plan is written in the form of a Hazard-Specific Appendix and follows the Federal Emergency Management Agency (FEMA) structure. It does not attempt to cover issues that would ordinarily be contained in a Basic Emergency Operations Plan or in Functional Annexes described in the FEMA documentation. Further, it does not go into the level of detail included in a municipal department's standard operating procedures. Rather, it assumes that a municipality already has these elements covered in existing emergency planning documents. Municipalities that have not completed these elements may want to consider their development prior to beginning work on planning for natural gas disruptions. In any case, planning for natural gas disruptions must be carefully coordinated with planning for other hazards.

Another important aspect of the sample plan is that it focuses on the steps to be taken by a municipality. A municipality might need to interact with a number of other organizational entities to develop an effective plan. These include state and county agencies, local school districts (which might have their own emergency plans), hospitals and medical facilities (which might have developed emergency procedures), and private organizations and companies. This sample plan does not go into the development of plans for these other organizational entities.

Finally, a plan such as this must be developed in cooperation with the gas company in ensure that the actions called for are within technical and resource limits.

SAMPLE PLAN

MAC CITY EMERGENCY OPERATIONS PLAN
APPENDIX Z: NATURAL GAS DISRUPTIONS

PRE-DISRUPTION EVENT CHECKLIST

- ❑ Review and revise as necessary:
  - – Attachment Z.1: Points of Contact
  - – Attachment Z.2: List of Critical Facilities and Natural-gas-outage-sensitive Individuals
  - – Attachment Z.3: Notification Protocol
  - – Attachment Z.4: Response Protocols for Impending Gas Service Interruptions
  - – Attachment Z.5: Response Protocols for Actual Gas Service Interruptions
  - – Attachment Z-6: Response Protocols for Gas Leaks
  - – Attachment Z.7: Restoration Procedures

- ❑ Verify that all city departments have up-to-date standard operating procedures that are consistent with the above protocols and procedures.

- ❑ Conduct a natural gas disruption exercise to verify readiness of all departments.

- ❑ Verify that all city-owned backup portable heating and cooling equipment is in operational condition and fueled.

IMPENDING GAS SERVICE INTERRUPTION EVENTS

- ❑ For Natural Gas Supply Alert, Warning, or Emergency, see Attachment Z.4.

ACTUAL GAS SERVICE INTERRUPTION EVENTS

- ❑ For limited, extended, wide area, or regionwide gas service interruptions, see Attachment Z.5.

GAS LEAKS

- ❑ For gas leaks, see Attachment Z.6.

RESTORATION

- ❑ For restoration procedures following an interruption, see Attachment Z.7.

PURPOSE

This appendix is added to the Mac City Emergency Operation Plan to establish operational guidelines for responding to disruptions to natural gas service.

SITUATION

The following sections describe natural gas service disruptions that would necessitate the implementation of this plan.

Impending Gas Service Interruptions

This part of the plan addresses conditions where the natural gas system is experiencing stress due to high demand for natural gas, loss of key components of the system, and/or approaching severe cold spell – all of which will threaten to result in a loss of gas service. These conditions are classified as follows:

- **Gas Supply Alert.** Issued when there are indicators the gas system and supply are stressed and there is a potential for interruptions in service. Indicators that lead to this alert are 24-hour temperatures expected to average –5°F for 2 to 3 days and/or an Alert announcement issued by the gas company.

- **Gas Supply Warning.** Issued when there is a further deterioration of gas supply and a high potential for system outages. Indicators that lead to issuing a warning are 24-hour temperatures expected to average –5 to –10°F for 4 to 6 days and/or a Warning announcement issued by the gas company.

- **Gas Supply Emergency.** Issued when the gas system is stressed and system supply pressures continue to fall for an extended period of time. Indicators that lead to issuing an emergency include temperatures expected to average –15°F or lower for a 24-hour period and/or an Emergency announcement issued by the gas company.

Actual Gas Service Interruptions

This part of the plan includes conditions where natural gas service is lost. These conditions are classified as follows:

- **Limited Service Interruption.** Interruptions affecting a small number of customers and of short duration (less than 24 hours).

- **Extended Service Interruption.** Interruptions affecting a neighborhood or similar area where multiple customers are without gas service and/or the interruption is of longer duration (1 to 3 days).

- **Wide Area Service Interruption.** Interruptions that affect a wide area, potentially the entire city and/or service interruptions of much longer duration (more than 3 days).

- **Regionwide Service Interruption.** Interruptions affecting a large portion or all of the metropolitan area or an even larger portion of the state.

Gas Leaks

This part of the plan addresses conditions where gas is found to be leaking from a building or from gas lines outside a building. The gas may or may not have ignited and be burning.

ASSUMPTIONS

The following assumptions are made with regard to the activities outlined in this appendix:

- Conditions leading to a declaration of Alert, Warning, or Emergency for an impending gas service interruption can occur with or without advance notice. It is not necessary to progress through the phases sequentially.

- Actual service interruptions can occur with or without advance notice.

- Gas leaks may be non-hazardous but must be treated as potentially dangerous until determined to be otherwise.

- Natural gas disruptions can occur with or without other accompanying emergency conditions. In some cases, natural gas service can be interrupted and emergency response required without any damage to the natural gas system itself or to any other infrastructure.

CONCEPT OF OPERATIONS

Information and indications regarding natural gas disruption events can come from several sources:

- Notification received from the gas company (in this case, the fictitious GASCO Gas Company),

- Calls received at the 911 Center, and

- Loss of gas service experienced at city facilities.

If the Mac City gas representative or the Mac City emergency gas representative from the GASCO Gas Company is notified of impending service interruptions, city plans will be implemented to help reduce the load on the gas system and to prepare the community for any actual outages that might occur. (See Attachment Z.4 for response actions.)

For a notification of actual gas outages received from the GASCO Gas Company, from calls received at the 911 Center, or from a loss of gas service at city facilities, a determination will be made of the extent and expected duration of the outage. City plans and departmental standard operating procedures will be put into operation depending on the determination made. (See Attachment Z.5 for response actions.)

For notification of gas leaks, the Fire and Police Departments will use their standard operating procedures to remove people from potentially dangerous areas and to assist the gas company in bringing the situation under control. (See Attachment Z.6 for response actions.)

At the end of a gas disruption event, city plans and departmental standard operating procedures will be put into effect to assist GASCO Gas Company in the restoration of gas service. All city emergency equipment will be returned to standby status. (See Attachment Z.7 for actions.)

ORGANIZATION

Primary Department

The Mac City Fire Department is the lead department for dealing with natural gas disruptions.

Supporting Departments

The following departments have major roles for carrying out the elements of this plan:

- Emergency Management,
- Police Department,
- Emergency Medical Services
- Public Works, and
- Public Affairs.

DIRECTION AND CONTROL

The line of succession for the implementation of the elements presented in this appendix is:

- Primary: City Natural Gas Representative – Fire Chief
- Alternate: City Emergency Natural Gas Representative – Police Chief

DEVELOPMENT AND MAINTENANCE OF APPENDIX

The maintenance of this appendix and its attachments in an up-to-date condition and the development of any necessary revisions are the responsibility of the Fire Department. This appendix will be reviewed annually to determine the need for any updates.

ATTACHMENT Z.1: POINTS OF CONTACT

GASCO GAS COMPANY

Non-emergency: 1-800-555-1122

This number connects to the GASCO Gas Company Customer Service Center and is used to report non-emergency natural gas outages or other situations.

Emergency: 1-800-555-3344

This number is for use only by the Police Department, Fire Department, or Emergency Services Medical Department to report emergencies that require immediate dispatch of a GASCO Gas Company crew and/or interruption of gas service to a specific facility or area. This number also connects to the Customer Service Center but is answered immediately.

Community Liaison for Mac City

Jane Brown
Office phone: 1-800-555-5566
Pager: 1-800-555-6677
Fax: 1-800-555-7788

This is the point of contact for all other natural gas issues between Mac City and GASCO Gas Company.

MAC CITY

Mac City Natural Gas Representative

John Green, Fire Chief
Office phone: 1-800-555-1232
Pager: 1-800-555-6543
Fax: 1-800-555-9876

This is the city's point of contact for natural gas issues during business hours.

Mac City Emergency Natural Gas Representative

Joseph White, Police Chief
Office phone: 1-800-555-6454
Pager: 1-800-555-6971
Fax: 1-800-555-9137

This is the city's point of contact for natural gas issues during nonbusiness hours.

ATTACHMENT Z.2: CRITICAL FACILITIES AND GAS-OUTAGE SENSITIVE INDIVIDUALS

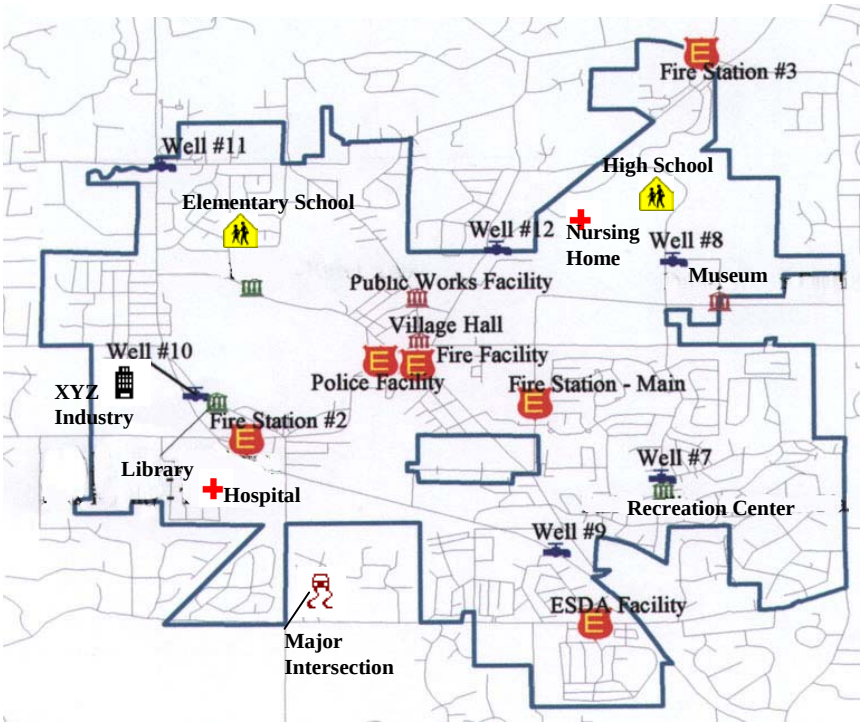
Table Z.2-1 Critical Facilities

Facility	Response Action	Responsibility
Criticality Level 1: Respond Immediately		
Hospital	❑ Determine need for evacuation ❑ Deploy portable heating equipment (winter)	Hospital staff Fire
Nursing Home	❑ Determine need for evacuation	Fire/Police
Library	❑ Evaluate use as heating shelter (winter)	Public Works
Recreation Center	❑ Evaluate use as heating shelter (winter)	Public Works
XYZ Industry	❑ Contact to determine if hazardous materials release is possible with loss of gas	Fire
Criticality Level 2: Respond within 4 Hours		
Water Wells	❑ Implement procedures to avoid freezing of pipes and equipment	Public Works
Elementary School	❑ School days: Call to decide if evacuation is needed	Fire/Police
High School	❑ School days: Call to decide if evacuation is needed	Fire/Police
Village Hall	❑ Deploy portable heating equipment ❑ Implement procedures to avoid water line freeze	Public Works
All Fire Stations	❑ Deploy portable heating equipment ❑ Implement procedures to avoid water line freeze	Public Works
All Police Stations	❑ Deploy portable heating equipment ❑ Implement procedures to avoid water line freeze	Public Works
Criticality Level 4: Respond on Call		
Museum	❑ Determine if assistance is required	Public Works
Central Business District	❑ Determine if assistance is required	Public Works

Table Z.2-2 Gas-outage–sensitive Individuals

Name	Illinois Gas Co. Feeder No.	Condition
Ronald White 123 Maple Street 555-1234		Invalid, bed ridden
Carol Smith 19 Main Street 555-6789		Wheelchair

Figure Z.2-1 Map of Critical Facilities



ATTACHMENT Z.3: NOTIFICATION AND COMMUNICATION PROTOCOLS BETWEEN GASCO GAS COMPANY AND MAC CITY

IMPENDING GAS SERVICE INTERRUPTIONS

Notification of Gas Supply Alert, Warning, and Emergency conditions will be sent from GASCO Gas Company to the Mac City natural gas representative (John Green, Fire Chief) during business hours or to the Mac City emergency natural gas representative (Joseph White, Police Chief) during nonbusiness hours.

Initial notification will be made by telephone. Confirming notification will be made by fax. The notification will include:

- Condition being declared (Gas Supply Alert, Warning, or Emergency),
- Start time of the condition,
- Area potentially impacted by the condition,
- Expected duration of the condition, and
- Factors creating the condition, if known.

ACTUAL GAS SERVICE INTERRUPTIONS

Notification of actual gas service interruptions, including limited service interruptions, extended service interruptions, wide area service interruptions, and regionwide service interruptions, will be sent by GASCO Gas Company to the Mac City natural gas representative during business hours or to the Mac City emergency natural gas representative during nonbusiness hours.

Initial notification will be made by telephone. Confirming notification will be made by fax. The notification will include:

- Area affected by the service interruption,
- Description of system involved,
- Number of customers affected,
- Outage start time,
- Expected outage duration, if known,

- Outage end time (once gas is restored), and
- Cause of outage, when known.

Notifications regarding an outage are to be updated as more information becomes available.

GAS LEAKS

Notification of gas leaks that are determined to be potentially hazardous to public health and safety will be sent by GASCO Gas Company to the Fire Department via a call to 911 and/or a call to the Mac City natural gas representative during business hours or to the Mac City emergency natural gas representative during nonbusiness hours.

Notification will be made by telephone. The notification will include:

- Location of the leak;
- Description of the extent of the leak;
- Cause of the leak (when known);
- Indication of whether the leak has ignited;
- Any injuries or fatalities;
- Any property damage;
- Need for assistance from Fire, Police, Emergency Medical; and
- Indication of whether gas service will be interrupted to repair the leak and, if so, the same information as required in a notification of service interruptions described above.

Notifications regarding a leak are to be updated as information becomes available.

NOTIFICATIONS FROM THE CITY TO GASCO GAS COMPANY

Should the city become aware of natural gas service interruptions before receiving notification from GASCO Gas Company or should city departments need to have the company turn off gas service to a specific facility or area, the city will use the GASCO nonemergency or emergency numbers as dictated by the situation. Should it become necessary, the City will contact the GASCO Gas Company regional community manager for Mac City for further assistance.

ATTACHMENT Z.4: RESPONSE PROTOCOLS FOR IMPENDING SERVICE INTERRUPTIONS

Upon receiving notification from GASCO Gas Company that the natural gas system is stressed and that natural gas service may be interrupted, the action described in the following sections will be taken.

ADMINISTRATIVE ACTIONS

1. The city natural gas representative (or emergency natural gas representative) will advise the mayor and all city departments of the Alert, Warning, or Emergency condition.

2. The city natural gas representative will establish continuing communication with GASCO Gas Company to maintain awareness of the status of the situation and will communicate this to other city departments.

3. All city departments will initiate steps to prepare for possible service interruptions and to reduce city natural gas consumption. City departments will take the following steps based on the level of emergency:

Alert	Monitor the situation.
Warning	Reduce city natural gas consumption by – lowering temperature settings on heating and hot water equipment.
Emergency	Minimize city natural gas consumption by: – turning off all nonessential gas appliances or equipment; – if deemed necessary by the mayor, sending nonessential city employees home and closing nonessential city offices; and – lowering thermostat settings to 55–60°F.

4. Should the situation warrant it, the city natural gas representative will request the Emergency Management Agency to activate the Emergency Operations Center to serve as the command post for the duration of the condition.

5. Should conditions improve, the city natural gas representative will advise the mayor and all city departments to return to normal operating mode.

FIRE DEPARTMENT, POLICE DEPARTMENT, AND EMERGENCY MEDICAL SERVICES

1. Upon receiving notification of the impending service interruption condition, the Fire Department, Police Department, and Emergency Medical Services will implement their standard operating procedures to carry out the actions described below:

Alert	Check that backup heating or cooling equipment is ready for service. Check the status of emergency communication equipment to verify readiness.
Warning	Conduct start-up tests of backup heating and cooling equipment. Review location of critical facilities and location of gas-outage–sensitive individuals.
Emergency	Maintain readiness to deploy backup heating and cooling equipment. Maintain readiness to evacuate people to shelters.

2. If necessary, each department will hold personnel from shift changes and/or recall personnel needed to accomplish these actions.

PUBLIC WORKS DEPARTMENT

1. Upon receiving notification of the impending service interruption condition, the Public Works Department will implement its standard operating procedures to carry out the actions described below:

Alert	Check the status of city-owned portable heating and cooling equipment to verify that the equipment is ready for service.
Warning	Conduct start-up tests of backup heating and cooling equipment. Check readiness of heating and cooling shelters.
Emergency	Position crews to the critical facilities that will require portable heating and cooling equipment. Position crews to heating and cooling shelters and ready equipment for use.

2. If necessary, the Public Works Department will hold personnel from shift changes and/or recall personnel needed to accomplish these actions.

PUBLIC AFFAIRS DEPARTMENT

1. Upon receiving notification of the impending service interruption condition, the Public Affairs Department will implement its standard operating procedures to carry out the actions described below:

Alert	Monitor the situation.
Warning	Advise heating shelters (in winter) or cooling shelters (in summer) of situation.
Emergency	Advise shelters to open and to be ready to accept people who may be affected by any outage that might occur. Initiate contact with critical facilities to alert them to emergency conditions. Initiate contact with gas-outage–sensitive individuals to alert them to emergency conditions. Coordinate with the Public Works Department to deploy portable heating or cooling equipment where necessary.

2. Advise the public of the impending disruption situation through media announcements, public statements, city web site, and city cable television channel. (Coordinate dissemination of information with the GASCO Gas representatives.)

EMERGENCY MANAGEMENT AGENCY

1. Upon receiving notification of an impending service interruption condition, the Emergency Management Agency will implement its standard operating procedures and determine if the Emergency Operations Center should be activated.

2. If the Emergency Operations Center is activated, the Emergency Management Agency will notify the appropriate staff to report for duty.

ATTACHMENT Z.5:
RESPONSE PROTOCOLS FOR ACTUAL SERVICE INTERRUPTIONS

Upon receiving indications of a service interruption either from GASCO Gas Company, from calls to the 911 Center, or from a loss of natural gas service to city facilities, the actions described in the following sections will be taken.

DETERMINATION OF THE EXTENT OF THE INTERRUPTION

1. If notice is received from the GASCO Gas Company or if there is a loss of natural gas service to city facilities, the city natural gas representative will determine the estimated extent of the outage:

   – Limited Service Interruption - affecting several customers
   – Extended Service Interruption - affecting a larger area, such as an entire neighborhood
   – Wide Area Service Interruption - affecting most or all of the city
   – Regionwide Service Interruption - affecting the entire city and surrounding communities

2. If notice is received via calls to the 911 Center, the 911 Center will first follow its standard operating procedures to respond to any need for emergency assistance. The dispatcher will determine the estimated extent of the interruption based on the number of calls received and the geographic area from which the calls are received. This determination will be conveyed to the city natural gas representative.

FIRE DEPARTMENT/EMERGENCY MEDICAL SERVICES

1. Fire Department and Emergency Medical Services personnel will follow their standard operating procedures to carry out the actions described below:

Limited Service Interruption	Respond to any calls received at the 911 Center for fire support, including – responding to fires, – responding to rescue calls (e.g., people needing evacuation), and – responding to medical emergencies. Consult the list of critical facilities and gas-outage–sensitive individuals to determine if anyone may be affected by the interruption.
Extended Service Interruption	Perform the steps listed above plus: Initiate contact with critical facilities and gas-outage–sensitive individuals to determine need for assistance. Determine evacuation needs of the critical facilities (e.g., nursing homes, hospitals).
Wide Area Service Interruption	Perform the steps listed above plus: Respond to opening of Emergency Operations Center.
Regionwide Service Interruption	Same as above.

2. If necessary, hold personnel from shift changes and/or recall personnel needed to accomplish these tasks.

POLICE DEPARTMENT

1. The Police Department will follow its standard operating procedures to carry out the actions described below:

Limited Service Interruption	Respond to any calls received at the 911 Center for police support, including – securing areas around the affected area; – assisting, as needed, in evacuating people from the affected area; – when necessary, providing support to gain entry to customers' premises to shut off gas lines; – coordinating with the on-site GASCO Gas Company representative and the Fire Department; and – coordinating with the GASCO Gas Company representative to escort the movement of heavy equipment and personnel to the area when necessary.
Extended Service Interruption	Perform the steps listed above plus: Increase patrols to affected areas where people have been evacuated and buildings are unoccupied.
Wide Area Service Interruption	Perform the steps listed above plus: Respond to opening of Emergency Operations Center.
Regionwide Service Interruption	Same as above.

2. If necessary, hold personnel from shift changes and/or recall personnel needed to accomplish these tasks.

PUBLIC WORKS DEPARTMENT

1. The Public Works Department will follow its standard operating procedures to carry out the actions described below:

Limited Service Interruption	Determine if any city facilities are affected by the interruption. If so and if necessary, initiate procedures to start portable heating and cooling equipment.
Extended Service Interruption	Perform the step listed above plus: Dispatch crews to deploy portable heating and cooling equipment to affected customers as needed. Coordinate with GASCO Gas representative if additional equipment or resources may be needed.
Wide Area Service Interruption	Same as above.
Regionwide Service Interruption	Same as above.

PUBLIC AFFAIRS DEPARTMENT

1. The Public Affairs Department will follow its standard operating procedures to carry out the actions described below:

Limited Service Interruption	Monitor the situation.
Extended Service Interruption	Advise heating shelters (in winter) or cooling shelters (in summer) of the situation and begin preparations to accept people who may need shelter. Inform the media of actions to be taken and provide status updates.
Wide Area Service Interruption	Perform the steps listed above plus: Respond to opening of Emergency Operations Center.
Regionwide Service Interruption	Same as above.

EMERGENCY MANAGEMENT AGENCY

1. Upon receiving notification of an actual service interruption, the Emergency Management Agency will implement its standard operating procedures to determine if the Emergency Operations Center should be activated.

2. If the Emergency Operations Center is activated, the Emergency Management Agency will notify the appropriate staff to report for duty.

ATTACHMENT Z.6: RESPONSE PROTOCOLS FOR GAS LEAKS

Upon receiving indications of a gas leak either from GASCO Gas Company or from calls to the 911 Center, the actions described in the following sections will be taken.

DETERMINATION OF THE EXTENT AND SEVERITY OF THE LEAK

1. If notice is received from the GASCO Gas Company of a leak, the city natural gas representative will ask the company to determine the estimated extent and severity of the leak.

   – Class 1 Leak - has the potential to be an immediate hazard to people or property.
   – Class 2 Leak - has been determined to be nonhazardous at the time of detection but requires repair on a scheduled basis.
   – Class 3 Leak - has been determined to be nonhazardous and is expected to remain so.

2. If notice is received via calls to the 911 Center, the 911 Center will first follow its standard operating procedures to respond to any need for emergency assistance. The dispatcher will then convey the leak information to the city natural gas representative.

FIRE DEPARTMENT/EMERGENCY MEDICAL SERVICES

1. The Fire Department and Emergency Medical Services personnel will follow their standard operating procedures to carry out the actions described below:

Class 1 Leak	Respond to any calls received at the 911 Center for fire support, including – responding to fires or explosions, – responding to rescue calls (e.g., people needing evacuation), and – responding to medical emergencies. Contact the GASCO Gas Company to begin to shut off appropriate gas valves.
Class 2 Leak	No action is required unless the gas company requests assistance.
Class 3 Leak	No action is required.

2. If necessary, hold personnel from shift changes and/or recall personnel needed to accomplish these tasks

POLICE DEPARTMENT

1. The Police Department will follow its standard operating procedures to carry out the actions described below:

Class 1 Leak	Respond to any calls received at the 911 Center for police support, including – securing areas around the affected area; – assisting, as needed, in evacuating people from the affected area; – when necessary, providing support to gain entry to customers' premises to shut off gas lines; – coordinating with the on-site GASCO Gas Company representative and the Fire Department; and – coordinating with the GASCO Gas Company representative to escort the movement of heavy equipment and personnel to the area when necessary.
Class 2 Leak	No action is necessary unless the gas company requests assistance.
Class 3 Leak	No action is necessary.

2. If necessary, hold personnel from shift changes and/or recall personnel needed to accomplish these tasks.

PUBLIC WORKS DEPARTMENT

1. The Public Works Department will follow its standard operating procedures to carry out the actions described below:

Class 1 Leak	Determine if any city facilities are affected by the leak. If so, coordinate with the gas company to shut off gas valves. Provide assistance as requested to gas company crews.
Class 2 Leak	No action is necessary unless the gas company requests assistance.
Class 3 Leak	No is action necessary.

2. If necessary, hold personnel from shift changes and/or recall personnel needed to accomplish these tasks

PUBLIC AFFAIRS DEPARTMENT

1. The Public Affairs Department will follow its standard operating procedures to carry out the actions described below:

Class 1 Leaks	Provide public announcements of the status of the situation as directed by the city manager.
Class 2 Leaks	No action is necessary.
Class 3 Leaks	No action is necessary.

EMERGENCY MANAGEMENT AGENCY

1. Upon receiving notification of a Class 1 leak, the Emergency Management Agency will implement its standard operating procedures to determine if the Emergency Operations Center should be activated.

2. If the Emergency Operations Center is activated, the Emergency Management Agency will notify the appropriate staff to report for duty.

ATTACHMENT Z.7: RESTORATION PROCEDURES

Upon receiving indications of the end of a natural gas disruption event, the actions described in the following sections will be taken.

ADMINISTRATIVE ACTIONS

1. The city natural gas representative (or emergency natural gas representative) will provide the GASCO Gas Company with a prioritized list of critical facilities that should have gas service restored as soon as possible within the technical constraints of the gas system.

2. The city natural gas representative (or emergency natural gas representative) will advise the mayor and all city departments of the end of the event.

3. At the conclusion of restoration efforts, a debriefing will be held with all departments to review lessons learned and to adjust operating procedures if needed.

FIRE DEPARTMENT/EMERGENCY MEDICAL SERVICES

1. If needed, persons who were evacuated during the event will be returned to their homes once the area has been declared safe.

2. All emergency equipment and emergency communications equipment will be returned to standby status.

POLICE DEPARTMENT

1. The Police Department will follow its standard operating procedures to support the GASCO Gas Company repair crews, including

   – establishing priority traffic routing for heavy equipment,
   – providing security at repair sites, and
   – gaining entry to customer premises to relight equipment and appliances.

2. All emergency communications equipment will be returned to standby status.

PUBLIC WORKS DEPARTMENT

1. The public works staff will provide support to the GASCO Gas Company crews in conducting repair operations. This support will be within the limits of the standard operating procedures set forth by the department.

2. In coordination with the GASCO Gas Company, the department will follow its standard operating procedures to shut down portable heating and cooling equipment and return to normal gas services.

3. When necessary, the department will initiate repair operations to buildings, grounds, and streets that may have been damaged during the event or during restoration operations in coordination with the GASCO Gas Company.

PUBLIC AFFAIRS DEPARTMENT

1. The Public Affairs Department will issue appropriate public announcements declaring an end to the event.

EMERGENCY MANAGEMENT AGENCY

1. The Emergency Management Agency will implement its standard operating procedures to deactivate the Emergency Operations Center.

POINTS OF CONTACT

This section contains a list of the important points of contact for natural gas 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
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

Continued

Agency	Address	Phone
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

Continued

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

Continued

Agency	Address	Phone
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
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

[a] Covering Illinois, among other Midwestern states.