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BY THE COMPTROLLER GENERAL

# Report To The Congress

OF THE UNITED STATES

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## Federal Electrical Emergency Preparedness Is Inadequate

If saboteurs, terrorists, or an enemy attacked the Nation's electric power system, would the Federal Government be prepared to handle the resulting energy disruptions?

Probably not, because the Department of Energy has failed to prepare required electric emergency preparedness plans. A national plan to cope with the problems caused by a loss of electricity--which would virtually halt communication, transportation, and distribution systems--is essential, because utilities and the States cannot be expected to deal with such emergencies on their own.

The Department of Energy should work with the utility industry, the States, and the Federal Emergency Management Agency to develop and maintain detailed electrical emergency plans.



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COMPTROLLER GENERAL OF THE UNITED STATES  
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To the President of the Senate and the  
Speaker of the House of Representatives

This report discusses the vulnerability of the Nation's electric power systems to disruptions from acts of war, sabotage, and terrorism and analyzes the Federal role in dealing with major, long-term electrical emergencies resulting from such acts.

We made this review because of the importance of electricity to the Nation, to inform the Congress of the adequacy of Federal electrical emergency preparedness and planning, and to recommend improvements.

Copies of this report are being sent to the Director, Office of Management and Budget, the Secretary of Energy, Director of the Federal Emergency Management Agency and the House and Senate committees and subcommittees having oversight responsibilities for the matters discussed in the report.

A handwritten signature in black ink that reads "Milton J. Aorolan".

Acting Comptroller General  
of the United States



D I G E S T

The Federal Government is not now prepared to handle a long-term national or regional disruption in electric power, from an act of war, sabotage, or terrorism. Inadequate preparedness for such emergencies is not new. About 3 years ago, the Congress found that Federal programs dealing with electrical power emergencies were deficient.

The consequences of such a power outage are staggering. Electric power is essential to maintaining the Nation's military readiness. Without adequate or reliable power, most industrial activity would be disrupted. Power outages can disrupt the operation of computers, commercial business, water and sewage treatment plants, mass transit and traffic control systems, as well as many other aspects of life.

In the United States, electric power is generated by some 3,500 utility companies, sent over thousands of miles of high voltage transmission lines, and distributed over low voltage feeder lines to end users. The system is a highly complex, interconnected industry network covering the United States and parts of Canada.

Electric power systems are highly dependable, but are very vulnerable to disruptions from acts of war, sabotage, or terrorism. In the region GAO looked at:

- An attack on just eight substations could disrupt power to the entire region for a long time. (See p. 8.)
- Damage to just four substations could disrupt power to one city for up to a year. (See p. 8.)
- Damage to just one substation could leave a key military facility without power. (See p. 8.)

Because of the complexity of the Nation's electric system, it is essential that the Federal Government play a central role in emergency planning. The Department of Energy is responsible for preparing national emergency plans and preparedness programs covering electrical power generation, transmission, distribution, and utilization. The Federal Emergency Management Agency is responsible for setting policy and coordinating all civil defense and emergency planning, mitigation, and assistance functions.

Federal leadership for electrical emergency planning and preparation is unorganized and ineffective. GAO found:

- DOE has an inadequate program for dealing with major electrical disruptions. In fact, its Emergency Electric Power Administration, tasked with these responsibilities, is insufficiently staffed and widely decentralized. "Barely alive" is how one official described the organization. (See p. 13.)
- Emergency Electric Power Administration representatives are unsure of their status, roles, authority, and responsibility, and they are doubtful that the organization could operate during an emergency. (See pp. 13 and 14.)
- DOE does not have adequate plans to manage and mitigate electric power disruptions. (See pp. 15 and 16.)
- Emergency plans to manage such disruptions and restore the power system, are needed. (See pp. 16 to 18.)
- Problems exist in Federal coordination with respect to electric emergency preparedness. (See pp. 18 and 19.)

Because of the severe consequences of electric power disruptions, the Government must be concerned with the management and recovery of the Nation's power system during major emergencies resulting from war, sabotage, or terrorism. It is essential that electric emergency plans be developed beforehand so they can be quickly activated to allow officials to make difficult decisions in the midst of confusion. Once an electric emergency occurs, it will be too late

to make preparations. Without prior planning, the Government will be deprived of the benefit of prudent thought and study.

RECOMMENDATIONS TO THE SECRETARY OF ENERGY

The Secretary of Energy should carry out his responsibility for electrical emergency preparedness by

- providing adequate resources to the Emergency Electric Power Administration,
- acting as leader and working with the utility industry, other Federal agencies and States to develop and maintain detailed electrical emergency plans, and
- developing national/regional plans for electrical emergencies which will (1) enable power disruptions to be managed through established priorities for curtailing power by use and type of customer and (2) assist the utility industry in restoring power in the event of severe damage to the electric power system. (See p. 22.)

*use DOE instead*

RECOMMENDATIONS TO THE DIRECTOR OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY

The Director of the Federal Emergency Management Agency should

- actively monitor DOE's efforts to vitalize its emergency electric power program and develop associated plans,
- require progress reports from DOE, and
- actively assist, support, and coordinate DOE's efforts especially with respect to other Federal agencies. (See p. 23.)

RECOMMENDATIONS TO THE CONGRESS

Inadequacies in electrical emergency preparedness have not been corrected after 3 years. If DOE's comments on this

report indicate it will not develop national/regional plans for electrical emergencies, then GAO recommends that the Congress enact legislation requiring that appropriate plans be developed by a specified date. (See p. 23.)

#### AGENCY COMMENTS

GAO provided copies of the draft of this report to the National Electric Reliability Council, the Federal Emergency Management Agency, and DOE. The National Electric Reliability Council and the Federal Emergency Management Agency agreed with the report's recommendations. DOE, however, said that the report fails to distinguish between non-defense and defense related emergencies, and therefore, is misleading. GAO disagrees with this contention because the report addresses electrical emergencies which have national impact and reflects the status of DOE's efforts as required under legislation and Executive order. (See pp. 23 to 27.)



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## ABBREVIATIONS

DOE	Department of Energy
DOD	Department of Defense
EEPA	Emergency Electric Power Administration
FEMA	Federal Emergency Management Agency
GAO	General Accounting Office
NERC	National Electric Reliability Council

## GLOSSARY

Blackout	The disconnection of the source of electricity from all electrical loads in a certain geographical area brought about by insufficient generation, an emergency-forced outage, or other fault in the generation/transmission/distribution system servicing the area.
Cascading blackout	A specific type of blackout in which a system component failure compounds into other system component failures and results in the disconnection of the source of electricity from all loads in a geographical area.
Generation	The act or process of producing electric energy from other forms of energy, also the amount of electric energy provided.
Interconnected system	A system consisting of two or more individual power systems normally operating with connecting tie lines.
Load	The amount of electric power delivered to a given point on a system.
Megawatts	The electric unit of power which equals 1,000,000 watts or 1,000 kilowatts.
Outage	In a power system, the state of a component (such as a generating unit or a transmission line) when it is not available to perform its function due to some event directly associated with the component.
Power	The time rate of transferring or transforming energy; for electricity, expressed in watts. Power, in contrast to energy, always designates a definite quantity at a given time.
Rotating blackout	A blackout caused by intentional rotational load drops in a particular area.
Spinning reserve	A reserve generating capacity ready to take an immediate load.
Substation	An electrical power station without generation which serves as a control and transfer point on an electric transmission system.

Transformer            A device for transferring energy from one circuit to another in an alternating-current system.

Transmission           In power system usage, the bulk transport of electricity from large generation centers over significant distances to interchanges with large industries and distribution networks of utilities.

Volt                    The unit of electromotive force or electric pressure analogous to water pressure in pounds per square inch. It is the electromotive force which, if steadily applied to a circuit having a resistance of 1 ohm, will produce current of 1 ampere.

Wheeling                The use of transmission facilities of one system to transmit power of and for another system.

## CHAPTER 1

### INTRODUCTION

Electric power is vital to our Nation's economic and social well being. Without electricity industries could not function, communications would be greatly reduced, and the welfare of our citizens greatly threatened. In this report we look at how prepared the United States is to deal with unusual and unexpected power outages caused by war, sabotage, or terrorism and suggest a meaningful approach to Federal preparedness for such electric emergencies.

#### NEED FOR FEDERAL ELECTRICAL EMERGENCY PREPAREDNESS

If the Nation or a region suffers a major, long-term power disruption caused by war, sabotage, or terrorism, the consequences would most likely have national impact. Neither utilities nor State/local governments can reasonably be expected to effectively manage such situations because such entities cannot reflect national needs. Consequently, any overall decisions at these levels cannot possibly serve the best interest of the Nation. For example, if an electrical system is seriously damaged, many areas served by that system could be without full service for extended periods. The utility which owns that system may be able to serve only limited customers and provide interruptible service. At that point, decisions would have to be made regarding who would get power and which elements of the system should be repaired first. The implications of these decisions could have widespread social, economic, legal, and defense-related consequences if the affected area crosses jurisdictional boundaries and the system damage was extensive. Consequently, the Federal Government because of its overall interests and resources is in the best position to prepare for and manage such disruptions.

While it is true that the Nation's electrical systems have not experienced severe and major disruptions from such events, there is no assurance this won't happen. Being prepared for such unexpected emergencies with severe potential consequences is a function of Government. We learned that damage to just a few key facilities could result in regional power disruptions for extended periods of time with severe consequences.

#### OBJECTIVES, SCOPE, AND METHODOLOGY

Our objective was to evaluate Federal preparedness for effectively managing a national/regional electric power emergency resulting from war, sabotage, or terrorism. In evaluating Federal preparedness we (1) considered the importance of electricity and the effects of power disruptions on the Nation, (2) assessed the vulnerability of electric systems to disruptions, and (3) analyzed Federal agency roles, programs, and plans for dealing with electric

emergencies. We limited our analysis to electric emergencies which would result from war, sabotage, and terrorism. Oil disruptions which could result in electrical emergencies are being addressed as part of another GAO review.

For purposes of assessing Federal preparedness we defined an electrical emergency as a major power disruption which would

- have major national/regional impact;
- be beyond the utility industry's capability to manage on its own;
- be sudden, unusual, unexpected, and (most likely) prolonged; and
- be the subject of a declaration of national emergency.

Acts of sabotage, war, or terrorism would most likely result in such electrical power disruptions. Because the utility industry does not regularly plan for these events and cannot determine national needs, it cannot adequately deal with such emergencies. While the utility industry has demonstrated the capability to manage and restore service in most instances of power outages caused by accidents, weather, equipment failures, and human error, utility officials we contacted agreed they would have severe problems dealing with long-term power disruptions on their own.

Since there is no definition as to what constitutes a long-term disruption, we assumed for our study that such a disruption would last for several weeks or longer. While it is possible that a shorter term disruption could require Federal involvement in an emergency, we did not consider this issue.

Since the Nation has never experienced an electrical emergency, as defined, we looked at one specific region to gain a perspective of what could happen. We met with Government and industry officials to discuss the regional power system's vulnerabilities and how it could be disrupted, and assessed the potential consequences. From this information, we developed a scenario which highlights a possible emergency situation in one region. Because of the sensitive nature of such information, the specific region and the electric facilities within the region are not cited.

In assessing the vulnerability and the effects of potential power disruptions, we also relied on available studies. We accepted the findings of these studies as to the social and economic consequences that electric outages would have.

To determine who was legally responsible for managing electric emergencies, we reviewed applicable laws and executive orders.

We also identified agencies having programs in electricity management and determined how they viewed their respective roles. This effort included both the Federal and electric utility sector.

With respect to the Federal role, we focused on the adequacy of the Department of Energy's (DOE) and the Federal Emergency Management Agency's (FEMA) efforts and their ability to effectively manage and restore electric power in the event of prolonged and widespread power outages. We also looked at efforts to mitigate electrical emergencies as part of Federal preparedness for such emergencies. To provide a balanced perspective, we discussed Federal preparedness for electrical emergencies with both Government and private utility industry officials.

We identified and obtained existing Federal plans for emergency electric preparedness and evaluated the adequacy of existing plans. In doing this, we looked at plans to see if objectives, priorities, authority, and responsibilities were clearly delineated and defined. Also, we discussed emergency planning with both Government and industry officials to identify basic elements of sound electrical emergency planning.

We did not address the question of whether damage from acts of war, sabotage, or terrorism could be prevented or minimized. In our view there is no guarantee such damage can be prevented, and any determination on what can be done to protect the power system would require extensive resources to analyze each threat, assess potential damages, and consider possible and available preventive measures coupled with a detailed cost benefit analysis. Further, actions to prevent damage from these acts would be costly to implement, and it is not likely such efforts would be undertaken. Consequently, we focused our review effort on what could be done to manage and restore power if such events occurred.

## CHAPTER 2

### ELECTRIC POWER SYSTEM

The growth of our Nation has been aided by the electric power system--one of the most complex systems ever built by man. Because the electric power system is visible and extensive, it is highly vulnerable to long-term major disruptions resulting from war, sabotage, or terrorism. The consequences of such disruptions to portions of our electric power system could be serious.

#### ECONOMIC IMPORTANCE

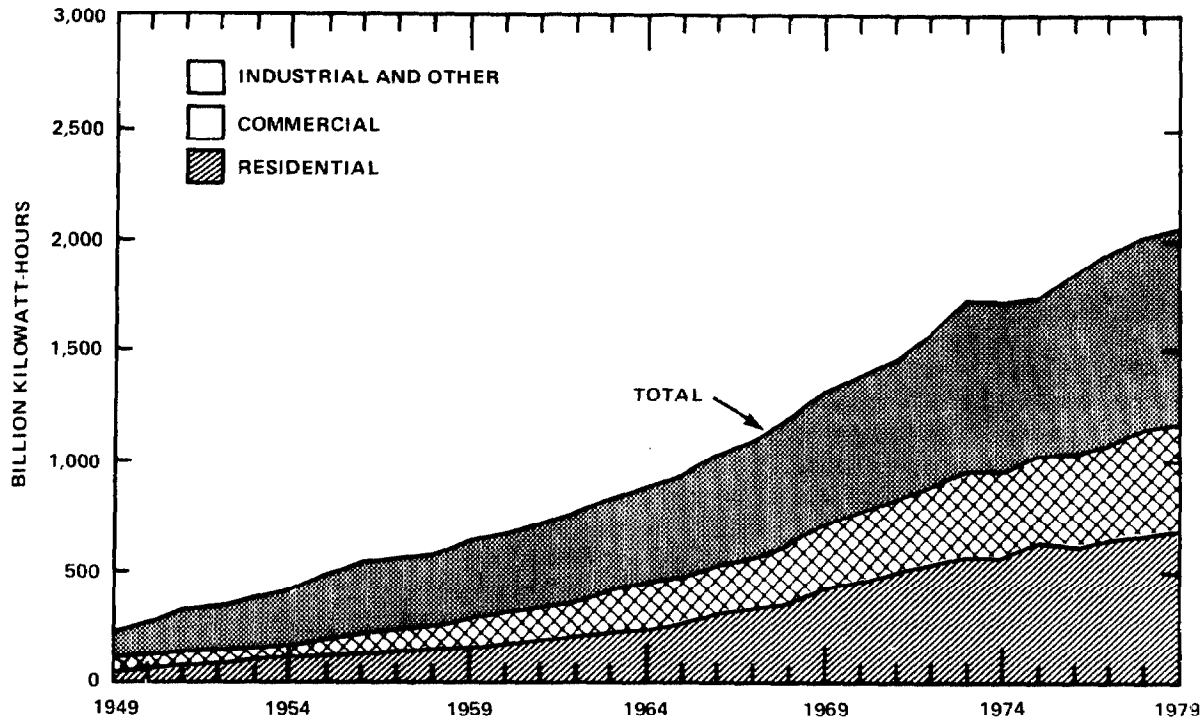
The electric power which the utility industry provides is the mainspring of our industrial economy. We as a Nation demand and expect this commodity to be continuously available. We do not, however, fully appreciate this energy source until "the lights go out." Without power everything in our modern society naturally grinds to a halt. For example, electricity is an integral component of our transportation, communication, and distribution systems. Manufacturing and food production rely heavily on electricity, and the American standard of living is tied to the use of electrical energy. Electric power is indispensable to maintaining our Nation's military readiness and running our

- defense industry;
- gasoline refineries and stations;
- manufacturing plants;
- computer systems;
- hospitals, office buildings, and airports;
- water and sewage treatment plants;
- mass transit and traffic control systems; and
- home heating, lighting, and cooking.

About 30 percent of the Nation's energy requirements is provided by electricity. Figure 1 shows that over the period 1949 to 1979 electric consumption increased by about 900 percent in the residential and commercial sectors and by about 500 percent in the industrial sector.



FIGURE 1  
SALES OF ELECTRICITY BY END-USE SECTOR



Source: DOE

An inadequate or unreliable source of power can have many adverse effects. For most industries, a reliable source of power is essential because a power interruption would stop production. In many industries, overhead and labor costs continue to accrue during outages. Major losses can result from restart costs, cleanup costs, damage to machinery and equipment, and the rendering of a portion of the product unmarketable. Power outages could be particularly crippling to commercial operations. Commercial users who can be expected to suffer immediate and total disruption of their operation include department stores, restaurants, gasoline stations, sewage treatment plants, and recreation facilities. Some users who could probably continue operations on a limited level and at reduced efficiency during power outages include office buildings, banks, hospitals, and schools.

Power disruptions would also affect the public. Obvious consequences include

- potential for increased crime and loss of civil order due to darkness, lack of communication, and disabling of electric security alarms;

- increase in water pollution due to disruption of sewage treatment facilities;
- inconvenience and health hazard of the residential customer caused by interruption of electricity;
- accidents caused by unexpected darkness or by interruption of life-support systems at hospitals, although some facilities have standby generators; and
- psychological traumas from the effects of sudden interruption of electricity (such as being trapped in an elevator or a windowless room).

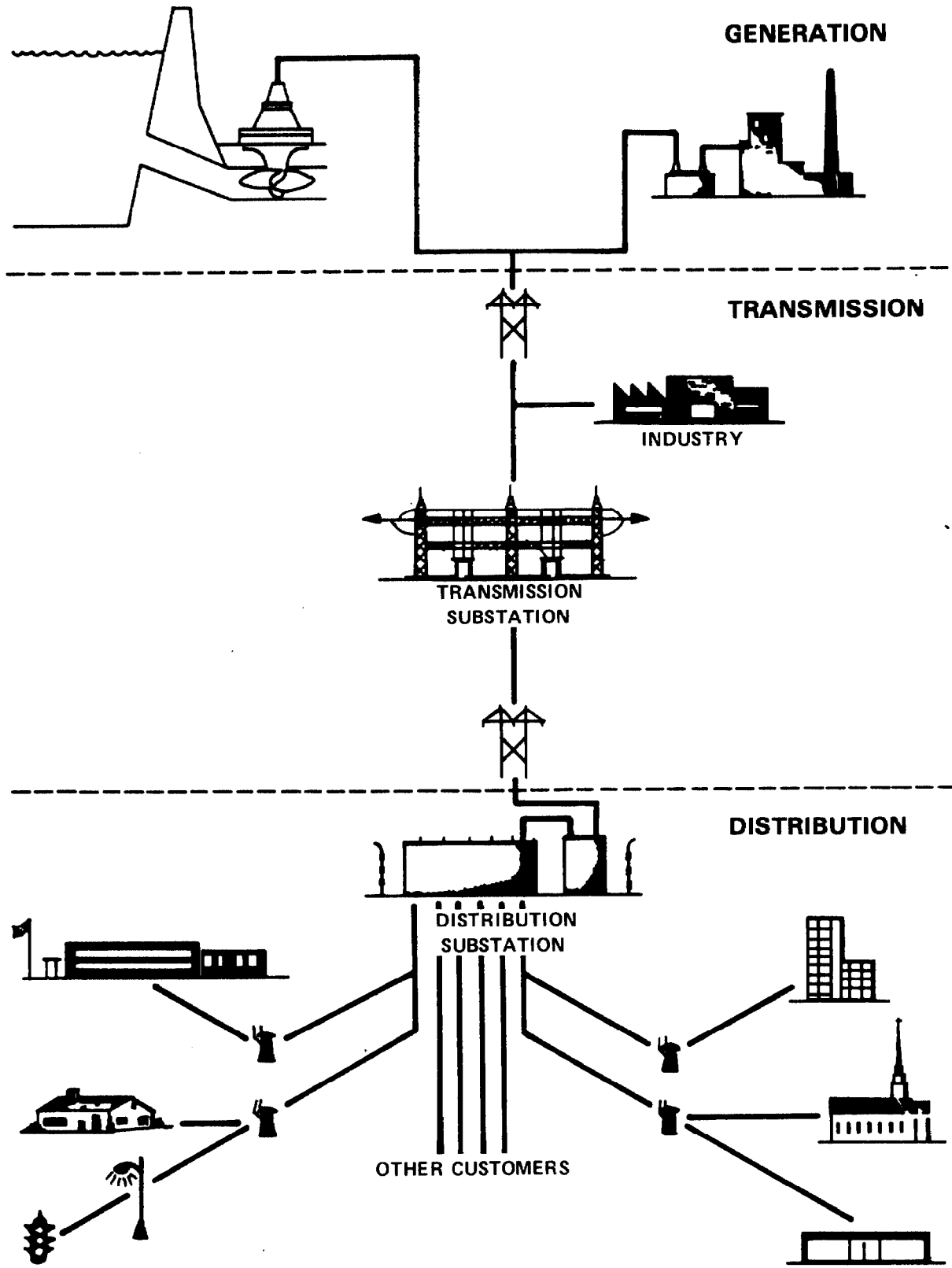
### THE ELECTRIC POWER SYSTEM

The Nation's existing bulk electric power supply system is very complex. At an elemental level, the supply of electricity to the ultimate consumer involves three steps: generation, transmission from the generator to the service area over high-voltage transmission lines, and distribution to individual end-users over low-voltage distribution lines as shown in figure 2. In total about 3,500 U.S. electric utility companies exist with about 557,000 megawatts of installed generating capacity. About 365,000 circuit miles of overhead electric lines of 66,000 volts or more transmit electricity from generation sources to utility service areas. In addition, countless miles of lower voltage distribution lines service 74 million residential, 8 million small light and power, and 700,000 large commercial and industrial customers.

Generally, a single electric utility provides power to a specified geographical area. While many utilities perform all three steps in supplying electric power, many others do not. Some utilities only distribute electricity by purchasing generation from other utilities, some rent the use of high-voltage transmission lines from other utilities in order to have electricity wheeled from the source of generation to their service area, and others are only in the generation and transmission business.

Today, nearly every major electric utility system is connected with neighboring systems to form interconnected networks. Presently, three huge interconnected networks blanket the contiguous United States and much of Canada. These systems are (1) the Eastern Interconnected System consisting of the Eastern two-thirds of the United States, and Eastern Canada, (2) the Texas Interconnected System consisting of most of the State of Texas, and (3) the Western Interconnected System consisting of the Western part of the contiguous United States and Canada.

FIGURE 2  
COMPONENTS OF ELECTRIC POWER SYSTEM



SOURCE: DOE

POWER SYSTEMS ARE  
HIGHLY VULNERABLE

Electric power systems are very dependable, but are vulnerable to damage from acts of war, sabotage, and terrorism. While the systems are designed and operated to provide for a reliable energy source, and under most conditions do, Government and industry officials we contacted concerning this issue acknowledged this vulnerability. Principal threats cited were damage resulting from war and sabotage. Recent studies prepared for the Army Corps of Engineers, DOE, and FEMA all note that electrical power systems are highly vulnerable. Officials at these agencies confirmed this finding and an investigation by a joint congressional committee following the 1977 New York blackout, caused by lightning, concluded electric utilities are highly complex and very vulnerable.

AN ELECTRICAL  
EMERGENCY SCENARIO

Fortunately, the United States has never encountered an attack on its electrical system. But to place in perspective how such an event could occur and its possible results, we looked at one specific geographic region of the United States. 1/ The region's power system we selected provides power to transportation, aircraft, ship, chemical, and primary metal industries, and services several major military facilities. The system is composed of numerous electric distributors, thousands of miles of bulk transmission lines, and hundreds of substations and generating plants.

In looking at this one region DOE officials, regional officials, and private sources stated that coordinated attacks directed by saboteurs or terrorists could disrupt the region's power system. Most of the power system is highly vulnerable because its components are widely dispersed, operated in a low manpower environment, have minimal security, and are highly interdependent. Since maps, power system publications, explosives, timing devices, and other equipment are readily available, it would be very easy for saboteurs to damage the substations by setting off explosives in a coordinated attack. An attack on just eight substations could result in widespread power outages, with cascading blackouts throughout the electrical grid. In addition, major metropolitan areas in the region could be without power for several days and be subject to rotating blackouts for over a year. Damage to four substations could actually place one city on interruptible power for up to a year. One substation's key components could be damaged using a rifle and leave an important defense-related facility without power.

In addition to attacks on the region's substations, we found that other attack scenarios are possible. To illustrate, trans-

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1/Similar events could occur in any region of the United States.

mission lines and towers are numerous, widely dispersed, and remotely located. While damage to one line may not have an extended impact on the region's power systems, attacks directed at several major transmission lines and associated towers would cause large scale disruptions. The recent Utah blackout illustrates what can happen. In this case, two transmission lines were shorted out as a result of a fire. This unexpected contingency, coupled with other system problems, caused a loss of load, shut down generating plants, and resulted in a cascading blackout throughout the State and parts of two other States. It required about 12 hours to return the power system to normal even though no significant physical damage to the system occurred.

Outside of some old publications and studies on the effects of damage to the power system as a result of nuclear war, studies assessing and analyzing the consequences of physical damage to a regional power system or the Nation have not been done. Based on our discussion with utility industry and Government officials, review of available literature on electric power systems and our own observations, we are able to make some judgments on regional and national consequences.

#### Consequences to the power system

The effect of any power disruption to the region would depend on what facilities were damaged, to what extent, and other circumstances. If substations are severely damaged, it could take a long time to repair and restore power to normal levels. While specific repair times cannot be predicted, a perspective of the time it will take can be gained by looking at actual construction times. Substation expansions and small size substations normally take 3 to 6 months to construct. Large substations can take up to 12 months. Damage or destruction to many substations would take much longer to restore. Transformers, a key component of substations, are vital to the operations of electric power systems. These components most likely would be damaged from sabotage or terrorist attacks on substations. Lengthy power disruptions could result because utility companies do not, in view of their expense, inventory or stockpile many large transformers.

Destruction of transmission lines can also have severe effects. If a number of bulk transmission lines are damaged in remote locations, restoration of power could be difficult. Extensive damage to enough major lines could require some time to repair. For example, depending on the type of tower, even if all logistics are taken care of, it can take from 1 to 3 days to erect just one tower. Multiple damage on an organized basis has never occurred and most certainly could over tax utility resources.

#### Regional and national consequences

From a regional and national perspective, the consequences of an extended disruption to the region we reviewed would be significant.

An extended disruption of power would affect the operations of

- major military facilities,
- ship and aircraft industries,
- the transportation industry,
- the electrical equipment and supplies industry, and
- chemicals, primary metals, and wood product industries.

Further, the health, safety, and socio-economic security of the region's population would be affected by a shortage of power to operate homes, hospitals, and businesses. Excess power which normally could be exported may not be available and, consequently, could affect other regions. Power from other regions may have to be imported even though sufficient excess power may not be available.

Regardless of whether a long-term power shortage occurs because power resources are inadequate or demands are excessive, supply would be inadequate to meet demand. Such a condition goes beyond normal planning and would provoke power curtailment restrictions. Absent from but crucial to the invocation of power curtailments would be a generally accepted regional agreement on how to take such drastic steps to handle the situation. In the region we looked at, the 120 utilities by themselves are not in a position to deal with the equitable allocation of power due to their fragmented nature. Further, utilities have legal and financial responsibilities to provide power to customers. States in the region have statutes providing for some type of power curtailment. However, because power supply and distribution become an interstate matter, difficulties and conflicts with respect to equitable distribution would most likely occur.

The most difficult way of dealing with power curtailments would be by independent decisions, utility by utility, State by State. Inherent in an individual public utility action would be its utility responsibility to provide customers with power and the inequitable distribution of the available supply--not every utility in any given emergency would necessarily be short in its energy supply. Because of these problems, regional utilities might lobby for their own interests.

#### CONSEQUENCES OF DISRUPTIONS CAN BE MITIGATED

Despite the obvious vulnerability of the Nation's electric power system, much could be done through sound planning to mitigate and minimize the consequences of disruptions. Even in a nuclear war, the effects of disruption can be minimized. While little can be done to alleviate the effects of blast damage, a

nationwide blackout may possibly be avoided by placing the power system into a more secure state. For example, because of the effects of a nuclear war, the power system would break up into individual islands. Because these islands may not have within their area sufficient generation available to pick up the load (spinning reserve), the area could be disrupted without any actual physical damage. Before an attack, this possibility might be minimized by bringing extra generation units on line to increase spinning reserve and thus increase power system stability. In the remaining chapters of this report, we discuss what the Federal Government has done to prepare for these emergencies and what it should be doing.

## CHAPTER 3

### THE FEDERAL GOVERNMENT IS NOT PREPARED TO DEAL WITH ELECTRICAL EMERGENCIES

Although the Federal Government is responsible for national electric emergency planning, it is not prepared to deal with electrical emergencies affecting our national security. Federal plans and programs for managing electrical emergencies which may arise from war, sabotage, or terrorism are inadequate or nonexistent. Further, Federal guidance and coordination with respect to such electrical emergency preparedness is lacking.

#### FEDERAL RESPONSIBILITY FOR ELECTRICAL EMERGENCIES

Federal responsibility for electrical emergency preparedness involves both DOE and FEMA. DOE has specific responsibility for preparing national emergency plans and developing programs covering electrical power emergencies resulting from war, sabotage, or terrorism. FEMA has responsibility for coordinating overall Federal emergency preparedness including policy, planning, and programs.

DOE, under Executive Order 11490, October 28, 1969, as amended, is required to prepare national emergency plans and to develop preparedness programs covering electrical power generation, transmission, distribution, and utilization. This Executive Order is, in part, based on the National Security Act of 1947, the Defense Production Act of 1950, and the Federal Civil Defense Act of 1950, as amended. It generally concerns Federal preparedness in national emergency type situations that may involve U.S. national security. In our view, the Executive Order covers sabotage and terrorism. Within DOE, the Economic Regulatory Administration is responsible for electric emergency planning. 1/

FEMA, created by reorganization plan number 3 of 1978 and assigned functions by Executive Order 12148, July 20, 1979, replaced several agencies. 2/ It is responsible for establishing Federal policies for, and coordinating all civil defense and civil emergency planning, mitigation, and assistance functions of executive agencies. In addition, under Executive Order 12148, FEMA is required to periodically review and evaluate civil defense and emergency functions of the executive agencies, report annually to

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1/On February 24, 1981, DOE announced its intention to reorganize and transfer energy emergency functions from the Economic Regulatory Administration to the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness.

2/The Federal Preparedness Agency, the Defense Civil Preparedness Agency, and the Federal Disaster Assistance Administration.



the President on these functions, and recommend improvements in planning, management, assistance, and relief at all levels of Government.

National electrical emergencies might not always lead to Federal involvement. From a national electrical perspective, what constitutes an emergency has not been defined. It is important to understand that such emergencies could occur as a result of a variety of circumstances and vary in duration. Sabotage, limited war, nuclear war and/or international crises, as well as a major natural disaster, can create severe electrical emergencies which can last from a few hours to years. However, the major vehicle for involvement at the Federal level for any emergency usually occurs only if the President declares a national emergency. <sup>1/</sup> It is most likely that such a declaration would only be initiated if conditions were severe and expected to continue for some time. Under such circumstances DOE would take front line duty in dealing with the emergency. As pointed out in the remaining sections of this chapter, DOE, however, is not prepared for handling emergencies. Consequently, if an emergency should arise Federal actions may be delayed or be less than effective.

#### ELECTRICAL EMERGENCY PREPARED- NESS PROGRAM IS INADEQUATE

DOE's current program cannot fulfill its electrical emergency preparedness function as required by Executive order. Before the creation of DOE, responsibility for dealing with electric power emergencies rested with the Department of the Interior's Defense Electric Power Administration and the Federal Power Commission. In 1977 these responsibilities were transferred to DOE's Economic Regulatory Administration to improve and consolidate electrical emergency planning. While DOE has focused on electric power supply and reliability and conducted power grid and reliability studies, it has not adequately addressed the emergency electric preparedness issue.

The Emergency Electric Power Administration (EEPA) <sup>2/</sup> illustrates this point. EEPA consists of a small DOE headquarters group and a widely decentralized field organization composed of utility company personnel. In a declared national emergency, EEPA is the Federal resource manager for electric power and is responsible for electric power preparedness planning, allocation, setting priorities for distribution, and restoration. In a December 1979 memo, the EEPA administrator noted that the resources to carry out this effort were insufficient and stated the program was barely alive.

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<sup>1/</sup>National Emergencies Act, P.L. 94-412, 90 Stat. 1255, 50 U.S.C.A. 1601.

<sup>2/</sup>EEPA is located within ERA's Office of Utility Systems, Division of Power Supply and Reliability.

At that time and even today, EEPA only has two headquarters staff members assigned to this effort on less than a full-time basis.

The backbone of EEPA is made up of utility industry representatives who are actually carried on the rolls as special Government employees (without compensation). In the event of an emergency, these employees, under the direction and guidance of EEPA headquarters, would manage our electric power system. During our review we interviewed a number of EEPA representatives and found them for the most part

- unsure of their status, roles, and responsibilities;
- uncertain of EEPA's authority and responsibilities;  
and
- doubtful that the organization could operate during an emergency.

In addition, some people listed in EEPA's roster as active representatives did not know they were EEPA representatives or were no longer employed with the utility company. We also found that other than the regular telephone system, no alternate emergency means of communication (i.e., radio) exists between EEPA headquarters and utility field representatives. We were also advised that planning, training, and test exercises have not been conducted and even EEPA's 1980 annual meeting was not held. Further, many of the EEPA field representatives indicated to us that DOE needs to provide clear direction and guidance.

The lack of a serious commitment to electric emergency preparedness is not new. In August 1977 the Joint Committee on Defense Production held hearings on emergency preparedness in the electric power industry <sup>1/</sup> and found that Federal programs to prevent or cope with electrical power emergencies were fragmented, uncoordinated, and sometimes conflicting. Federal officials felt that consolidation of various organizations and functions into DOE would bring order and would result in a comprehensive policy. However, about a year later, DOE's Inspector General found that the

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<sup>1/</sup>The Joint Committee on Defense Production was not funded in the Legislative Appropriations Bill of 1977 and, thus, discontinued operations as a Joint Committee on September 30, 1977. The jurisdiction and oversight functions were transferred to the Senate Committee on Banking, Housing and Urban Affairs. Because of the importance of electricity to defense production and the implications of the 1977 New York blackout, the Committee held hearings in this area on August 10 and 11, 1977.

DOE response to the need for national electrical emergency planning and preparedness was deficient and deteriorating.

In response to a congressional inquiry regarding this matter, DOE, in a September 1978 letter, indicated it was taking steps to improve its overall emergency preparedness. With one possible exception we did not, however, note any new DOE commitment with respect to electric emergency preparedness. On October 27, 1980, DOE notified the National Electric Reliability Council <sup>1/</sup> that an EEPA administrator had been designated and that the program would be revitalized and continued. Prior to the letter, the EEPA administrator's position was vacant for about 7 months and this is the third administrator in 3 years. If DOE does not follow up on the letter's revitalization pledge, and our discussions with DOE officials indicate no significant changes have occurred, we doubt whether any serious improvements will materialize.

#### NO COMPREHENSIVE ELECTRICAL EMERGENCY PLANS

In the event of an electrical emergency, DOE does not have adequate and comprehensive plans for mitigating and managing electric power disruptions. More specifically, DOE has not established plans to

- allocate and curtail power on the basis of national needs, and
- provide for the restoration of our electric system.

From the planning perspective, the only existing documents are DOE's electric emergency handbook which relates to nuclear war, and a draft electric emergency response plan to oil shortages which DOE has not made available to us.

The handbook was inherited from the Department of the Interior and only recently updated. This document, however, is only a "draft" and is very general. For example, it states that in the emergency period EEPA should:

". . . allocate power, order wheeling and interconnection as required . . . Establish priorities for curtailment, allocation, and restoration of electric power."

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<sup>1/</sup>The National Electric Reliability Council (NERC) was formed in 1968 with the stated purposes: ". . . further to augment the reliability and adequacy of bulk power supply in the electric utility systems of North America." It consists of nine Regional Reliability Councils and encompasses essentially all of the power systems of the United States and Canadian systems in Ontario, British Columbia, Manitoba, New Brunswick, and Alberta.

While the document includes some general guidance on national priorities and electric power curtailment, it does not set specific and firm detailed requirements. For example, it does not require that business "show window" lighting be eliminated. Rather, it just suggests a very general curtailment approach.

With respect to developing specific studies or plans for managing major electric power disruptions, restoring power, and mitigating damage, DOE was unable to provide any documentation. One DOE official stated that detailed planning is not needed and that experience in emergency situations is more important than written plans because in an emergency there is not enough time to refer to written plans on what to do. In contrast to this view, we were advised by EEPA utility representatives that planning and guidance from the Federal level is needed and, consequently, they would have to manage such emergencies on an ad hoc basis.

#### EMERGENCY PLANS ARE NEEDED

Planning is the first and most essential step in preparing for electrical emergencies. Without Federal plans to mitigate the effects of a national or regional electric emergency, the Government will be ill-equipped to deal with the situation. The burden of responding to the Nation's needs and requirements would fall solely on the utility industry. While the utility industry has had a good record in planning for and managing power disruptions from expected contingencies such as lightning, fire, or wind, it is not prepared to deal with long-term emergencies having a national impact.

The Federal Government should be developing national/regional electric power contingency plans which could be activated if such an emergency developed. These plans should address, at a minimum, how power disruptions are to be managed, and how the electric power system will be restored. In the following sections of this chapter we discuss some essential elements which could be included in each of these plans.

#### Plans to manage disruptions

To be prepared to manage and distribute available electric power in the Nation's best interest, the Government must establish sound and workable plans. Adequate planning must anticipate the conditions which will exist and ask and answer basic and numerous questions about what the major problems will be and how they will be handled. For example, DOE should determine what the priority electric uses will be, who the priority customers will be, what electric uses should be prohibited and under what circumstances. Questions along these lines cannot be efficiently and effectively answered during the emergency period because they are highly complex, involve competing demands for power, and affect diverse segments of the Nation.

In our view, addressing such issues before hand is a much more realistic approach because it

- permits the consideration of diverse input,
- allows sufficient time for establishing criteria for determining priorities, and
- provides a blue print on which everyone can rely in the event of an emergency.

While we recognize that planning cannot anticipate every possible condition it will be much easier and more efficient to modify existing plans for the actual conditions than to make on-the-spot plans for a specific emergency.

Plans for allocating available electric power and making curtailment decisions should be developed by DOE from a regional perspective with the Nation's overall priorities in the forefront. Such plans cannot be developed by DOE in a vacuum. To be effective and comprehensive, the plans must consider the diverse needs of our society, available resources--especially fuel, and include input from Federal, State, and local governments, and key industries including extensive participation by the utility industry in particular. Because these detailed plans and the means to implement them have not been established by DOE, ultimately the utilities will be forced to make emergency allocation and curtailment decisions without the benefit of knowing national priorities.

#### Plans to restore the power system

DOE needs to develop plans concerning the restoration of the electric power system. Utility industry and Government officials believe the most practical means of preventing serious supply disruptions is being capable of quickly repairing damage regardless of cause. Industry officials believe they have well demonstrated their ability to quickly repair damage due to normal operations and to continually produce electrical power. Also they indicated that in the event their facilities were seriously damaged, personnel and equipment would be available from other utility companies. The officials, however, stated that if several important facilities were damaged to the point they could not function, it would not be possible to restore power to normal levels from several months to over a year.

DOE should be developing plans for assessing what resources (spare components, personnel, etc.) will be available, what resources will be needed, how the resources will be obtained and whether provisions for stockpiling key resources (spare components) to restore and maintain power systems are needed. In the event of

a severe emergency the utility industry will look to DOE for assistance in obtaining vital and scarce resources to repair and maintain the electric power system. No firm Federal plans exist for assisting in restoring the Nation's power systems.

The question of whether transformers should be stockpiled is a case in point. Present on-hand spare component policy is based on historical use, cost, and reliability criteria. They are not stocked to assure an added increment of reliability deemed to be prudent in the interest of national security, public health, safety, and welfare. The possibility of component damage caused by sabotage or war is not part of the reliability criteria. Stockpiling or standardization of components or cannibalizing parts from other systems are alternatives. These questions need to be studied and resolved prior to an emergency.

In addition to insufficient spare components, restoration capability is also hindered by the lack of a central Federal effort to manage the restoration process. Even if EEPA was a viable operating agency, it has not developed the restoration plans needed to supervise such activities as assessing damage, locating materials and manpower, and determining priority restoration needs. This appears to be left to the utilities. As a result of these two weaknesses (lack of plans and components), the Nation does not have an adequate emergency restoration capability.

Restoration plans should establish priorities of action considering national security, health, and safety needs. Procedures for coordination and communication with the utility industry, non-utility industries, and government agencies must be provided if the Nation is to recover. Specific restoration plans should recognize critical loads and give special attention to installations and activities necessary for national defense and survival. Procedures could be established to provide for damage assessment and dissemination of information to restore our electric power systems.

#### LACK OF FEDERAL COORDINATION AND GUIDANCE

Overall, we found problems in Federal coordination with respect to electric emergency preparedness. Because electricity is essential to almost every aspect of our modern society, Federal agencies other than DOE have an important interest in the availability of electricity. Even though they do not have responsibility for electric planning, such plans will have impact on their missions. FEMA, with overall responsibility for emergency policy, direction, planning and coordination, must assure that DOE develops emergency electric plans which are compatible with other agency missions and that other agencies work with DOE in this effort. This has not happened.

We were advised by both DOE and FEMA officials, that FEMA has not conducted any audits or reviews of DOE's emergency electrical preparedness activities nor has it required any detailed electric preparedness reports. Further, we found that both the Department of Commerce and FEMA had contracted for studies dealing with the vulnerability of our electric power system to terrorism and sabotage. The studies, we were advised, were undertaken because electricity is vital to the Nation's economy, and the agencies felt they had an interest in the area. DOE, however, was not actively involved in the projects. Although the individual contractors did consult DOE experts in the electric area, DOE should be taking the lead in these studies.

We also found that a conflict which existed between the Department of Defense (DOD) and DOE had not been satisfactorily resolved. The conflict centered on identifying utility facilities vital to the national defense. DOD, within its Defense Industrial Facilities Protection Program, maintained and conducted security surveys of key utility facilities. At the insistence and persistence of DOE, DOD finally agreed in the spring of 1980, after some discussion, to discontinue the utility list and to stop related security surveys. DOE objected and maintained, that considering the complexity of the power system and that selection of key individual electric facilities was arbitrary, the listing did not give a complete picture of what is necessary for supplying end users with reliable power.

## CHAPTER 4

### CONCLUSIONS AND RECOMMENDATIONS

The Federal Government, because of the severe consequences of electric power disruptions, must be concerned with the management and recovery of the Nation's electric power system during major emergencies resulting from war, sabotage, or terrorism. The Nation's power system plays a vital role in our economic and social well being and is essential to our national defense. The power system, however, is highly vulnerable to damage caused by war, sabotage, or terrorism. Damage to the electrical system from such acts could result in power disruptions with severe consequences. A sustained major power disruption could cause or result in unemployment, crippled production, impaired national defense, food shortages, and cause extreme hardship for the public. To deal with such emergencies, DOE is charged with developing national plans and programs covering electric power generation, transmission, distribution, and utilization. DOE, however, has not developed an adequate program or plans to deal with such emergencies and, consequently, it is not prepared to effectively cope with major power disruptions.

#### CONCLUSIONS

While the Nation has never experienced an extensive or prolonged electrical emergency, there is no assurance that such an event will not occur. We found that the Nation's electric power systems are highly vulnerable. As pointed out in chapter 2, it would be relatively easy to create, by sabotage, extended power disruptions. The 1977 New York blackout initiated by lightning and the more recent 1980 Utah blackout initiated by a fire illustrate how minor disturbances can disrupt an electrical power system. Acts designed to damage key facilities and equipment which are vital to the operation of the power system would have more severe consequences and take much longer to repair or replace. In the case we examined, such a disruption would impair the operations of key military facilities and major industries, and affect the health and safety of the region's population. Attacks in other regions or damage from war could result in even more severe repercussions.

The Federal Government is the only organizational entity capable of effectively responding to an electrical emergency having national implications. In legislation, the Congress has recognized the need for national emergency preparedness, and under executive order, the President has specifically charged DOE with electrical emergency preparedness and planning. While the utility industry plans for and effectively handles expected operational type emergencies (equipment failure, storms, and so forth), it is not prepared to handle the consequences of deliberate and widespread physical damage to the power system on its own. In such an event, resources



to repair the system would be hard to obtain, and decisions on how to allocate and distribute power would be difficult to make. This would most likely require Federal assistance and involvement.

While the participation of both utility companies and State governments would be necessary and vital in coping with the electrical emergency, the ultimate authority and responsibility for managing the emergency would have to rest with the Federal Government. Neither the utility industry nor States can determine what is in the Nation's best overall interest. In addition, utilities have obligations to provide their customers with power and could face adverse legal and financial consequences by curtailing customers on their own. Even State governments, which generally have jurisdiction over utilities, cannot be expected to handle this situation. An action by one State may adversely affect another State because the electrical power system is not tied to State jurisdictional boundaries. Consequently, the Federal Government is in the best position to make decisions which consider all interests.

In our view, DOE, has not fulfilled its electric emergency preparedness role, has not developed a meaningful program to address this specific responsibility, and has not developed adequate plans to deal with electric emergencies. DOE has not supported its Emergency Electric Power Administration and had just two employees devoting less than full time to this enormous responsibility. Consequently, it has not been able to develop and conduct planning, training, and test exercises or hold regular annual meetings. DOE, however, is creating an illusion of preparedness by allowing this program to continue for all practical purposes in "name" only. In addition, FEMA which has overall responsibility for Federal emergency preparedness and is required to develop policies for and coordinate specific emergency planning, has not adequately supported and encouraged this effort by providing effective guidance, coordination, and assistance.

The need for thorough and comprehensive planning cannot be over emphasized. Having electric emergency plans developed before an emergency so they can be quickly activated is absolutely essential to avoid delay in responding. Also, this will avoid the need to make difficult decisions with limited knowledge in the midst of confusion. While planning cannot anticipate all possible situations, if properly done, it will provide the knowledge needed to deal with most situations. Unanticipated situations can then be handled with minimum difficulty. In any event, once an electric emergency occurs, it will be too late to make adequate preparations, and the actions taken by Government will not have the benefit of prudent thought and study.

## RECOMMENDATIONS TO THE SECRETARY OF ENERGY

We therefore recommend that the Secretary of Energy carry out his responsibility for electrical emergency preparedness and provide adequate resources to the Electric Emergency Power Administration. In this regard DOE should develop a program to deal with major power disruptions which may arise from acts of war, sabotage, or terrorism. In developing a credible and effective program, we do not envision that DOE would need to dedicate extensive resources to this effort, and, in fact, should first evaluate whether existing resources within the Department could be reallocated to carry out this function. DOE's role should be that of leader in working with the utility industry, other Federal Government agencies, and State and regional entities to help develop and maintain detailed electrical emergency plans. Because electric power systems cover wide areas and impact on many and various aspects of our society, the participation and assistance of these groups should be emphasized to assure that effective and realistic plans are developed.

To do this, we recommend that the Secretary of Energy work closely with the groups identified above to help develop national/regional plans for such electrical emergencies which will

- enable power disruptions to be managed by the utility industry through established priorities for curtailing power by use and type of customer and
- assist the utility industry in restoring power in the event of severe damage to the electric power system.

As part of its emergency planning efforts, DOE should (1) examine how electric power will be maintained and managed; (2) establish priorities for uses, curtailment, and restoration; and (3) maintain continuity and coordination with other Government agencies and industry. Because priorities and needs are not necessarily the same from region to region, planning should be done on a regional level and directed toward the national interest. Further, DOE should

- identify electric facilities which are important to the national defense,
- consider the need to stockpile or to make other provisions for replacing key equipment and supplies in the event of a major electrical emergency, and
- require that the Emergency Electric Power Administration conduct regular meetings, revise and test plans, and conduct training seminars for essential emergency personnel.

RECOMMENDATIONS TO THE DIRECTOR OF THE  
FEDERAL EMERGENCY MANAGEMENT AGENCY

To foster improvement in this area, we recommend that the Director of the Federal Emergency Management Agency

- actively monitor DOE's efforts to vitalize its emergency electric power program and develop associated plans,
- require progress reports from DOE and review DOE's progress, and
- actively assist, support, and coordinate DOE's efforts especially with respect to other Federal agencies.

RECOMMENDATIONS TO THE CONGRESS

The Congress, following the 1977 New York blackout, conducted an investigation and found Federal electric emergency preparedness to be inadequate. After some 3 years, nothing has significantly changed. In commenting on a draft of this report, FEMA and NERC staff recognized both the need to improve and the importance of national electric emergency planning. DOE's comments on the draft did not indicate that it would take any positive steps to make any improvements. If DOE's comments on this report indicate that it will not develop national/regional plans for electrical emergencies, then GAO recommends that the Congress enact legislation requiring that appropriate plans be developed by a specified date.

AGENCY COMMENTS AND OUR EVALUATION

A draft copy of this report was provided to the National Electric Reliability Council (NERC), Federal Emergency Management Agency (FEMA), and Department of Energy (DOE) for comment. Their comments are contained in appendixes I, II, and III respectively. The following sections summarize the comments and our evaluation.

National Electric Reliability Council

NERC staff said they support our view that preparedness for emergency disruptions is most desirable and that the present Federal mechanisms for dealing with national emergencies is inadequate. Further, comments were made by NERC to elaborate on its views and pointed out that its comments are consistent with the discussion and recommendations in the report. Specifically, NERC commented that the Federal role should focus on establishing "before the fact" policies and guidelines such as prioritization of the electric loads served by the utility industry and leaving the details

of management and operation to the utility industry. We agree with the NERC's comments.

#### Federal Emergency Management Agency

FEMA agreed with our recommendation to them to foster improved planning for responding to major power disruptions and agreed that DOE should provide the resources necessary to develop comprehensive plans. Further, FEMA indicated it will provide appropriate guidance to DOE and work closely with them to expand electric emergency planning to cover a wide range of emergencies including major disruptions. FEMA stated, however, that the report distorts the status of current planning efforts by presenting generalizations and ignoring significant elements of the power industry.

We do not believe that our report distorts the status of current planning efforts and, in fact, NERC believes the report presents a fair assessment of current planning. While we do not dispute that utilities can address most interruptions and that local jurisdictional and metropolitan plans are generally in place, such plans cannot effectively deal with an electrical emergency having national/regional implications. Even the utility industry which has extensive plans and experience in dealing with power outages caused by accident, weather, and equipment failure cannot adequately deal with electrical emergencies having long term and national/regional impact. As pointed out in our electrical emergency scenario on page 8, damage to just a few key facilities can result in widespread and long lasting power disruptions having regional and national consequences. Again, we note that NERC in commenting on our report did not question these points, but recognized that the present Federal mechanism for dealing with national emergencies is inadequate.

We do not agree that our report ignores important elements of the power system or makes generalizations. On the contrary, we believe FEMA's statement that powerplants service a community or area in a manner comparable to a local water utility, bus system, and fire department is not only a generalization itself, but one which is invalid. To illustrate, individual electric utility systems are interconnected and electricity from power plants in one geographical area is instantaneously transmitted to other geographical areas for extended periods of time and on a regular basis. Although local water utilities and fire departments can do this, they cannot do it on a regular basis for extended periods of time or instantaneously.

#### Department of Energy

DOE commented that the basic premise of the draft report causes it to be misleading since no differentiation is made between nondefense and defense related emergencies. DOE does not dispute that its Emergency Electric Power Administration (EPPA)

is tasked with defense responsibilities and recognizes that this area is deficient. DOE, however, implies that more is being done with respect to electric emergency preparedness by stating its Division of Power Supply and Reliability has established a comprehensive electric emergency response activity. DOE indicates that specific electric utility reporting requirements have been established and that its role is to monitor and coordinate Federal resources available to mitigate the impact of such disruptions.

We do not dispute that the Division of Power Supply and Reliability carries out such activities. These activities however, are not sufficient to address the concerns of our report. Conducting investigations of ice storm power outages, collecting data on power operations and monitoring electric power system disruptions do not provide any capability for dealing with major electrical emergencies. Only a preparedness program with a viable emergency operating organization and plans can deal with such emergencies. The Emergency Electric Power Administration which is under the Division of Power Supply and Reliability is not a viable organizational entity nor does it have adequate emergency plans. Further, such plans do not exist anywhere within the Division of Power Supply and Reliability. In our inquiries along these lines, we were told that the Division only collects information, monitors oil back-outs, conducts studies, and does not engage in planning for emergencies. As noted in the report, one DOE official even stated that detailed planning is not needed and that experience in emergency situations is more important.

DOE, in a later section of its comments, states it has organizational plans to assist the electric utility industry in restoring power and that these plans focus on DOE as a coordinator. Despite our inquiries, DOE did not provide us with any documentation on such efforts and we note that it provides no specific information on this subject in its comments. Further, in attempts to clarify some of these issues, DOE canceled a scheduled meeting to resolve such problems.

While the Executive order establishing preparedness responsibilities does not specifically address sabotage and terrorism, we have been orally advised by FEMA that it considers the Executive order to cover situations involving sabotage and terrorism. This position is contrary to the one followed by DOE in its comments to us. As a practical concern, prudent planning for dealing with wartime emergencies would provide the structure for dealing with emergencies resulting from sabotage or terrorism. In our view, prudent planning dictates that DOE anticipate such electrical emergencies. As noted by NERC, whether enemy action or natural phenomenon renders more facilities unavailable, available electric power will likely be less than the demand for such power. If the Emergency Electric Power Administration was viable and had plans for what DOE identifies as defense related emergencies, it would be fairly well along in having the capability to deal with what it terms nondefense emergencies.

DOE comments that emergency planning is the responsibility of individual electric utilities and that other than under conditions of declared national emergencies no Federal statutory authorities are available for establishing priorities of electric service or curtailment. As noted in our report, DOE is responsible for electrical emergency planning and the Federal Government would only have a role if a national emergency was declared. We do not dispute that electric utilities are responsible for and do plan for electrical emergencies of a normal and expected nature (fire, floods, storms, and so forth). They do not, however, plan for major long-term emergencies which would have national impact. This is the issue our report addresses and even NERC recognizes the point and the need for Federal direction and involvement. As discussed earlier, DOE has not developed an adequate electric emergency preparedness program or plans.

In the context of the report we question the validity of DOE's statements that it is not aware of any significant problems with coordination in the electric power emergency preparedness area and that it maintains contact with FEMA, the National Electric Reliability Council, the electric utilities, and other organizations. While we recognize that DOE maintains contacts with other agencies and organizations, this does not prove that there are no problems in coordination of electric emergency preparedness. We note that DOE did not even conduct its 1980 EEPA annual meeting. Such annual meetings are intended to bring both industry and Government together on a regular basis for the purpose of maintaining and improving electric emergency preparedness and planning. We also point out both FEMA and NERC did not dispute these points and support our recommendations to improve planning for major power disruptions. Further, FEMA even said that it will work closely with DOE to expand emergency electric planning.

Also, DOE's comment regarding the timing of our interviews is incorrect. Assignment interviews were conducted into December 1980, and contacts were maintained until February 1981 with both DOE, FEMA, and industry officials. Our subsequent contacts did not reveal any new activities which would affect our findings or conclusions.

DOE recognizes that the EEPA program is deficient and indicates it has attempted to correct the shortcomings. DOE, however, implies it has not been able to make improvements due to ceiling and budget restrictions. As pointed out in the report, we do not believe DOE needs to dedicate extensive resources to this effort and should evaluate whether existing resources could be used. Also, as noted, we would anticipate that the development of effective and realistic plans would require the participation of the utility industry, other Federal Government agencies, and State agencies.

In our view, DOE seems to be missing a basic message of the report. The report points out that utilities have performed well in meeting power interruptions of a localized and short-term nature and the power system is very dependable. Should an electrical emergency of a long-term nature covering a large geographical area occur, utilities could still operate the power system. To reflect national security interests, however, Federal plans need to be in place to give the utility industry guidance and assistance in setting priorities for power use and restoration. This is the essence of our recommendations to DOE and we note that comments from NERC staff support this view.

With respect to DOE's concerns regarding the accuracy of the information, it states (1) we do not define what a long-term power disruption is, (2) we should realize that planning for such events is not all encompassing, (3) an increase in security or manpower in these areas would not enhance reliability or survivability of the power system, and (4) our statement that "...studies assessing and analyzing the consequences of physical damage to regional power system or the Nation have not been done" is misleading.

After considering DOE's comments, we continue to believe that the information contained in the report is both fairly presented and accurate. We note that the National Electric Reliability Council, authorities in the utility field, did not challenge our knowledge or understanding of the electric power system. Further, their comments commend us for our prudent use of the word "long-term."

In our view DOE's concerns regarding all encompassing plans and security are taken out of the report's context. We do not state that plans have to be all encompassing. Rather, the report recognizes and states on page 17 that planning cannot anticipate every possible condition. Nor do we state or suggest increased security or manpower would improve power system reliability or survivability. To the contrary on page 3 of the report we point out it may not be possible to protect the electric power system.

With respect to DOE's objection to our charge that it has not studied the possible consequences of major power disruptions, we note that a study done for FEMA has recognized the same point. To support its position DOE cites that it has conducted investigations on ice storm power outages. DOE, however, does not point out the study was performed by a contractor, completed in September 1979, and is not relevant to the subject area of our report because it focuses only on the distribution systems of local utilities and has no bearing on regional/national power disruptions.

In commenting on the report, DOE suggested that GAO meet with it to clear up some misconceptions. While the draft report was with DOE for comment, we agreed to meet with agency officials and discuss and clarify any questions or misunderstandings regarding the report. DOE, however, canceled the meeting and did not re-schedule it.



**NATIONAL  
ELECTRIC  
RELIABILITY  
COUNCIL**

Walter D. Brown  
President

March 10, 1981

Mr. J. Dexter Peach, Director  
Energy and Minerals Division  
United States General Accounting Office  
Washington, D.C. 20548

Dear Mr. Peach:

Thank you for the opportunity to comment on the GAO draft report to the Congress titled: "Federal Electrical Emergency Preparedness is Inadequate".

As requested in your February 10, 1981 letter, I have restricted the distribution of the subject draft report to guard against any improper disclosure.

The attached comments were submitted by members of the NERC office in Princeton, New Jersey who have expertise in the Planning and Operation of interconnected power systems. If you decide to incorporate these comments, in whole or in part, in your final report, it should be noted that they cannot be strictly interpreted as a statement by the electric utility industry since the GAO draft report was not reviewed by the NERC Board of Trustees or the NERC Regional Managers.

We hope the attached comments are helpful in developing your final report to the Congress. Please call if there is any need for further clarification or help.

Sincerely,



NERC Staff Comments On  
GAO Draft Report  
Titled:

"Federal Electrical Emergency Preparedness is Inadequate"

Summary

The NERC staff supports the view of GAO that preparedness for emergency disruptions is most desirable and that the present federal mechanisms for dealing with national emergencies is inadequate. However, the federal role should be focused on establishing "before the fact" policies and guidelines, such as the prioritization of the electric loads served by the industry with the agreement and approval of the state governments affected.

Once provided with priority guidelines, those industry personnel responsible (and accountable) for the operation of the 130 Control Areas\* of the interconnected power systems in the contiguous United States can develop, or modify, operating instructions to be consistent with the mandated priorities. Many of these "industry personnel" would automatically become federal personnel in the event of a national emergency since they presently serve as directors or major utility representatives of the Emergency Electric Power Administration (EEPA).

A secondary, but important, federal role involves the possible need for providing fuel, manpower, and equipment in the restoration process after the impact of a major disruption has been assessed by the industry and found to be beyond the resources available. The federal action required before the fact to address this concern would be the establishment of the communications path and the appropriate federal and industry contacts.

Discussion

When a generating unit or a major transmission line is rendered unavailable, whether by planned enemy action or natural phenomenon, the relationship between electric demands and available supply changes. Reserve generating capability and transmission network design have been incorporated into the overall power system plan to assure an adequate supply of electric power under reasonably anticipated contingencies.

In the event that enemy action or natural phenomenon renders more facilities unavailable than normally designed for, the available electric power will likely be less than the demand for such power; a condition occasionally encountered even today by the electric utility industry. Emergency operating procedures are an integral part of every power control center; establishing priority of the loads served, restoration guidelines, and procedures for importing emergency power to the extent possible within the generation and transmission system configuration existing at that time.

\* A Control Area is part of a power system, a power system or a combination of power systems to which a common generation control scheme is applied; i.e., it attempts to function as if it were an isolated power system with only scheduled power interchange taking place between interconnected control areas.

The NERC staff supports the view of GAO that preparedness for emergency disruptions of electric power is most desirable and that the mechanisms for dealing with national emergencies is inadequate. We emphasize national, since this is a key word that may change priorities presently incorporated in emergency procedures employed by the Control Areas of the interconnected power systems. Another key word, prudently emphasized in the GAO draft report, is "long-term". A long-term electrical disruption may also change priorities of the loads served.

NERC staff suggests that existing industry remedies to an electrical power deficiency resolve most of the concerns addressed in the GAO draft report. Federal and State efforts can be more effective if focused on the establishment of priorities for the electric loads to be served versus concern over proper industry actions. Once provided with mandated priorities, industry personnel responsible for the management of the 130 Control Areas in the United States can review and modify existing emergency operating procedures to conform to such a mandate.

Since the laws of physics govern, the response to a major long-term electrical disruption would best be managed by those most familiar with the laws, and the facilities on which they will be enforced. The industry engineers who have planned and operate the existing highly complex interconnected power system network are in the best position to manage the proper response to any major disruption. All they need are the priorities and objectives defined.

It is highly unlikely that federal agencies can establish national priorities without the participation and approval of state governments. However, this should not present any insurmountable problem once it is addressed. The New England states have demonstrated cooperative attitudes in pursuing Regional objectives as they relate to a reliable and economic bulk power supply. Such cooperative efforts by these states have permitted their combined generation and transmission facilities to be controlled from one Central Dispatch Office. Similar arrangements are in place elsewhere.

In summary, the above comments are consistent with the discussion and recommendations set forth in the GAO draft report. The major theme of the NERC staff comments is that the Industry would provide the most effective management of activities required to achieve the objectives established by the Federal government. However, as a first order of business, the Federal government must define what those objectives are. It is in this area, that the "Federal Electrical Emergency Preparedness is Inadequate".



FEDERAL EMERGENCY MANAGEMENT AGENCY  
Office of Plans and Preparedness  
Washington, D.C. 20472

Mr. Henry Eschwege  
Director  
Community and Economic Development Division  
General Accounting Office  
Washington, D.C. 20548

Dear Mr. Eschwege:

Thank you for the opportunity to comment on your draft report "Federal Electrical Emergency Preparedness is Inadequate," EMD-81-50.

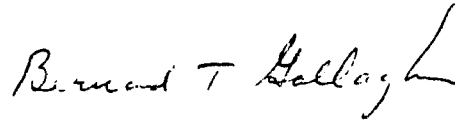
We have no problem with the proposed GAO recommendation to the Director of the Federal Emergency Management Agency to foster improvement in planning for response to major power disruptions. We agree, also, with the recommendation that the Department of Energy should provide the resources necessary to develop comprehensive plans for coping with major power disruptions resulting from natural or man-made disasters including war. The report, however, distorts the status of current planning effort in several ways. Chapters 2 and 3 contain a series of generalizations, a vague definition of an "electrical emergency" that includes a wide range of unrelated and dissimilar electrical disruptions and ignores significant elements of the power industry.

The electrical power industry is, in fact, one of the most diverse industries in the United States. The GAO report cites the industry as comprised of 3500 electric utility companies but it does not mention that those companies operate almost 11,000 power generating facilities. Many of those power plants service a community or area in a manner comparable to the local water utility, bus system and fire department. Plans are generally in place for mutual support of utilities by contiguous jurisdictions. Major metropolitan areas, whether serviced by large remote power generating plants, a number of smaller generating plants or a combination of these sources, have emergency plans for alternate sources and alternate routing of electric power to meet their needs in an emergency. A "nationwide blackout" is difficult if not impossible to comprehend under the conditions that obtain. Even a nuclear attack on the United States would not precipitate a nationwide blackout but it would substantially decrease the demand for electric power.

In a situation where a single unit of unique design or where large quantities of generating and transmission equipment are incapacitated, the long lead time for producing such equipment could easily be the determining factor in reestablishing power availability. This condition could be aggravated by the fact that a considerable amount of power generating and transmission equipment is imported because of lower foreign prices.

The electric power systems in the United States comprise a diverse and complex infrastructure. Simple generalizations about any aspect of that structure cannot provide direction for comprehensive emergency planning. FEMA will provide appropriate guidance to DOE and work closely with that Department to expand emergency planning for electric power to cover a wide range of emergencies including major disruptions.

Sincerely yours,



Bernard T. Gallagher  
Acting Director

Enclosures



Department of Energy  
Washington, D.C. 20461

MAR 16 1981

Mr. J. Dexter Peach  
Energy and Minerals Division  
U.S. General Accounting Office  
Washington, D. C. 20548

Dear Mr. Peach:

The Department of Energy (DOE) appreciates the opportunity to review and comment on the GAO draft report entitled "Federal Electrical Emergency Preparedness is Inadequate."

The DOE has several concerns regarding the accuracy of the information contained in this draft report. These are summarized in the enclosure to this letter. The basic premise of the GAO draft report causes it to be misleading since no differentiation is made between non-defense and defense related emergencies.

More specifically the GAO draft report states:

1.--"DOE has an inadequate program for dealing with major electrical disruptions. In fact, its Emergency Electric Power Administration (EEPA), tasked with these responsibilities, is hardly alive." (See p. ii.)

This statement is misleading as it implies that EEPA is tasked with these responsibilities, when in fact EEPA is responsible for only defense-related emergencies (e.g., mobilization, limited or general war). DOE's Division of Power Supply and Reliability has established a comprehensive electric emergency response activity. Specific electric utility reporting requirements have been established such that prospective fuel supply problems, equipment outages, physical sabotage, etc., are reported to the Electric Power Monitoring Center. Response actions are developed that are deemed appropriate to particular non-defense related emergency situations.

2.--"DOE does not have adequate plans to manage and mitigate electric power disruptions." (See p. ii.)

--"Emergency plans to manage such disruptions and restore the power system, are needed." (See p. ii.)

These statements are misleading because the development of such emergency plans is primarily the responsibility of the individual electric utility and not that of DOE or any other Federal Government Agency. State Government has a more direct responsibility. The role of DOE in non-defense electric power emergencies is to monitor and coordinate the Federal resources available to mitigate the impact of such disruptions. Several ice storm related power outages have been investigated, along with cable failure and other significant electric power outages for the purpose of identifying any weaknesses in utility plans and procedures. The reports of such investigations contain specific recommendations to prevent future re-occurrence and to mitigate the impacts. Sections 202(c), and 202(d) of the Federal Power Act provide the DOE with authority to order the interconnection, generation or transmission of electric energy to alleviate emergencies. Rules have been issued to implement this statutory authority. These have been utilized several times in the past few years.

3.--"Problems exist in Federal coordination with respect to electric emergency preparedness." (See p. ii.)

Again, the non-defense/defense differentiation is not made. However, the DOE staff is not aware of any significant problems in the electric power emergency preparedness area. DOE maintains regular communication with FEMA, the National Electric Reliability Council, the electric utilities and many other appropriate organizations with responsibilities in this area. It should be noted that a companion GAO report on fuel disruptions for electric utilities was initiated along with this GAO report and that the last interviews for both reports were conducted several months ago. A considerable number of activities have been initiated since that time which affect the findings and conclusions of this report and which have not been considered by GAO.

With respect to the GAO recommendations, DOE offers the following comments:

1.--"Carry out his responsibility for electric emergency preparedness." (See p. iii.) This statement needs further clarification as to whether defense or non-defense emergencies preparedness is intended. Also GAO should be specific as to which statutory responsibilities are not being carried out.

2.--"Provide adequate resources to its Emergency Electric Power Administration." (See p. iii.) The current structure has been and continues to be limited due to ceiling and budget restrictions. EEPA has recently developed a four-year revitalization program that will be pursued to the extent

that funds are available. It should be recognized that EEPA is the only emergency organization transferred from the Department of the Interior to the Department of Energy that remains as an identifiable component.


3.--"Act as leader and work with the utility industry, other Federal agencies and States to develop and maintain detailed electrical emergency plans." (See p. iii.) DOE has been and continues to be very active in this area. Recently an Electric Utility Industry Coordinating Committee for contingency planning was established through DOE leadership efforts. This group includes representation from all segments of the electric utility industry including the State Governors, and the State Public Utility Regulatory Agencies. The Electric Utility Industry must continue to operate the electric power supply system since the qualified operators, maintenance work forces, etc., that are needed to carry out such actions are within the control of the industry. The development or maintenance of national/regional plans for electric emergencies as suggested by GAO, is already well in progress. Such plans, of course, will include curtailment strategies.

4.--"Assist the utility industry in restoring power in the event of severe damage to the electric power system." (See p. iii.) There are no Federal statutory authorities available for establishing priorities of electric service or curtailment of such service, except under conditions of declared national emergencies using the Defense Production Act (DPA). Restoration of service due to severe damage is the responsibility of the local utility; however, if national security is threatened then the President could invoke the DPA. The DOE is involved in conducting a comprehensive contingency planning effort to examine both non-defense and defense emergencies as it relates to the DPA. In non-defense emergencies the DOE has organizational plans to assist the electric utility industry in restoring power. These plans focus on the DOE as the coordinator of any available Federal resources. Use of such resources is usually restricted to the complete utilization of the available resources.

The role of contingency preparedness is under active review by the Department at this time. This activity includes establishment of electrical energy allocation procedures for defense related emergencies. There are many budgetary and statutory considerations to be taken into account.

The Department appreciates the opportunity to comment on this draft report and hopes that these comments will be of assistance to the GAO.

Sincerely,



P. Marshall Ryan  
Controller

Enclosure

References to GAO draft report have been changed to reflect page numbers in final report.



Enclosure

Detailed Summary

The purpose of this summary is to highlight those areas of the GAO report which DOE believes to be misleading or incorrectly stated. The difference in understanding of the relationship between preparedness and response on the one hand and recovery and mitigation on the other, and the kinds of talents needed to manage all four phases, may be a key factor behind differing viewpoints in this report. Also, the time lapse between these interviews and the issuance of this draft report have resulted in the changes brought about by active DOE efforts in the area of emergency preparedness not being recognized.

Chapter 1

The GAO report has combined together war, sabotage and terrorism as it would impact on major power system disruptions without distinguishing between non-defense and defense related emergencies. The GAO does not specifically define what a major long-term power disruption is but indicates that it would be unexpected, have national impact and would last several weeks. GAO should realize that the planning for such events is not all encompassing and is very diverse. Relating to this diversity of planning, DOE would like to present the FEMA definitions which are used for planning purposes:

- A. Natural Disaster - Any hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, earthquake, drought, fire, or other natural catastrophe, resulting in damage, hardship, suffering, or possible loss of life.
- B. Man-made Disaster - Any industrial, nuclear, or transportation accident, explosion, conflagration, power failure, resource shortage, or other condition, except enemy action, resulting from man-made causes, such as sabotage, oil spills and other injurious environmental contamination, which threatens or causes damage to property, human suffering, hardship, or loss of life.
- C. War-caused Disaster - Any condition following an attack by any enemy or foreign nation upon the United States resulting in substantial damage of property or injury to persons in the United States and may be by use of bombs, missiles, shellfire, nuclear, radiological, chemical, or biological means, or other weapons or by overt paramilitary actions.

In an electric emergency, if the State or utility cannot adequately handle the situation then they would solicit assistance from the DOE. However, DOE does not have any statutory authorities for establishing priorities or curtailments for the use of power unless the national security was threatened. In this situation, the President could evoke the Defense Production Act.

## Chapter 2

The reliability of the electric power supply system depends on the proper operation of the facilities and on the redundancy of certain equipment, items that fail or have lengthy maintenance periods. Most utilities design and construct their electric systems to withstand a number of contingency situations. For example, planning to cope with disasters and emergencies is part of the normal activity of the electric power industry. Historically, the industry has demonstrated the ability to evaluate damage and repair problems quickly, or devise effective methods for restoring service promptly. Its transmission system interties, interconnections, pooling practices, coordination, understandings, and mutual aid arrangements are evidence of cooperation unsurpassed by any other industry. The cumulative effect of this is seen in the demonstrated ability and readiness of the industry to appropriately respond to natural disasters.

Again, in order to address these issues of the GAO report relating to power system vulnerability, it is necessary to differentiate between acts of sabotage, terrorism and war. The power system response to these situations would vary depending upon which event occurred.

The power system vulnerability to acts of sabotage and terrorism would be at best regional and would constitute a regional electrical emergency. The region or utilities affected would solicit assistance from the DOE or the Federal law enforcement agencies if unable to manage the resulting disruptions.

Again, DOE has no statutory authorities to order curtailments or set priorities unless a national emergency has been declared.

The GAO report goes on further to state that power systems are highly vulnerable because its components are widely dispersed, operate in a low manpower environment, have minimal security and are highly interdependent.

The modern electric power system has been constructed so that its generation and transmission systems are widely dispersed. This condition actually enhances system reliability because alternative supply capabilities exist through multiple sources of generation and multiple paths to load centers.

An increase in security or manpower in these areas certainly would not necessarily enhance reliability or survivability of the system. It would be impossible and impractical to guard large segments of transmission lines as well as the many substations throughout the nation. When redundant facilities are required they are constructed or purchased within reason; it must be recognized that significant costs are usually incurred and the utility's customers must underwrite such costs.

The GAO report further states that "outside of some old publications and studies on the effects of damage to the power system as a result of nuclear war, studies assessing and analyzing the consequences of physical damage to a regional power system or the Nation have not been done." This statement is very misleading and needs further clarification because the EEPA has conducted studies to determine regional power system damage assessment methodologies resulting from nuclear attack. A DOE investigation of several ice storm related outages provided significant data as to the regional assessment of this type of damage and other special studies are continually conducted.

With the advent of nuclear weapons and ultra high speed delivery systems, a new and devastating set of disasters could occur. These would present problems wholly unpredictable in severity and magnitude, such as the electric power industry in this country has never had to meet. The phenomena associated with a nuclear weapon detonation--blast and shock, thermal radiation, initial and residual nuclear radiation, and electromagnetic pulse are very complex. However, the gross effects of a nuclear explosion may be predicted with reasonable certainty.

The electric power system vulnerability to a limited or general war would be multifaceted. Large amounts of generation, load, transmission and distribution facilities would be lost due to physical destruction alone. Remaining equipment which could be repaired would be out of service until fallout levels are safe enough to allow repair crews to begin restoration procedures.

The GAO in addressing this particular vulnerability suggests a method of mitigating the effects of a nuclear attack to avoid a national blackout. While this discussion fails to recognize the three distinct and separate bulk power networks in the nation, it suggests that increased

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"spinning reserves" on the utility systems could resolve the concern such that a network breakup into electrical islands after the attack could cause all the islands to have adequate generation available but would prohibit inner-area support. The ability to predict which electrical islands will remain after an attack so that the "spinning reserve" will be adequately disturbed can not be predicted.

The purpose of these comments is to highlight the diversity in the electrical system response to acts of sabotage, terrorism and war and the vast amount of relevant information not covered in the GAO draft report. Because of this diversity of electric system response, however, there is a need for plans and procedures to deal with these events, which are distinct, and a recognition that such plans cannot be all-encompassing.

Also, DOE in addressing this section, has identified some misunderstanding by the GAO on the dynamic response of the electric power system. So that these misconceptions of the power system and the other misleading statements can be clarified, DOE recommends a meeting with the GAO interviewers to discuss same.

### Chapter 3

This Chapter implies that DOE is deficient in supporting the Emergency Electric Power Administration (EEPA). The DOE has recognized this deficiency in the EEPA program and has attempted to correct any shortcomings. It is important to note that transfer of EEPA functions and staff to the Division did not include funding or ceiling to support the program. However, a four year program with specific emphasis in FY'81 on training for EEPA field personnel and research in the areas of a survivable utility communications system and effects of electromagnetic pulse has been developed. Also, the role of EEPA is under review with the major industry components to discuss its interface with other energy disruption preparedness initiatives. Considerable effort has been devoted to refining and updating electric power plans both unclassified and classified. The EEPA activity is also under review in the context of the current DOE reorganization.

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