**THE PRESIDENT'S
NATIONAL SECURITY TELECOMMUNICATIONS
ADVISORY COMMITTEE**

Telecommunications and Electric Power Interdependency Task Force (TEPITF)

People and Processes: Current State of Telecommunications and Electric Power Interdependencies

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EXECUTIVE SUMMARY

In the wake of the terrorist attacks of September 11, 2001, the 2003 North American blackout, and the recent devastating hurricane seasons, the interdependencies between the telecommunications and electric power sectors have become increasingly apparent. In response, the President's National Security Telecommunications Advisory Committee's (NSTAC) Industry Executive Subcommittee (IES) convened a task force in the spring of 2005 to investigate national security and emergency preparedness (NS/EP) issues associated with the interdependencies between these two sectors. This task force, the Telecommunications and Electric Power Interdependency Task Force (TEPITF), is charged with examining NS/EP concerns surrounding operational issues between the two sectors and how these interdependencies will affect the future of the telecommunications network.

This report addresses the Administration's concerns that telecommunications and electric power interdependencies may create additional vulnerabilities, particularly in emergency response situations. It establishes a baseline of the current state of interdependencies between the two sectors using the people involved and the processes between them as the lens for critical evaluation. This report presents the NS/EP concerns associated with the interdependencies of the telecommunications and electric power sectors, focusing on the *current* operational issues between the sectors and how the interdependencies will affect both infrastructures.

People and Processes: Current State of Telecommunications and Electric Power Interdependencies is the first of two reports that the NSTAC is developing to address interdependencies between the two sectors. This report examines three main topics: (1) past NSTAC recommendations; (2) priority restoration; and (3) information sharing and liability.

From its deliberations, the task force drew several conclusions regarding interdependencies between the telecommunications and electric power sectors. In reviewing past NSTAC recommendations, the task force concluded that interdependencies are increasing in importance to industry and Government. However, because the main focus has been dependencies, significant work remains in regard to understanding the implications of interdependencies.

Next, on the basis of its review of priority restoration, the task force determined that the most useful element of the sectors' emergency restoration relationship is the open dialogue between the points of contact at the local level. Furthermore, key response personnel from telecommunications and electric power service providers could be designated as Emergency Responders, similar to First Responders. This classification would allow telecommunications and electric power service providers to be involved in the Federal, State, regional, and local emergency planning processes; to actively participate in emergency operation centers (EOC) during emergency events; and through the effective use of credentialing, gain timely and secure access to restricted areas to restore their critical assets. Another imperative is the timely fuel supply replenishment process for electric power generators at critical telecommunications and electric power service providers' internal communications network assets. Further, emergency response communication between telecommunications and electric power sectors may be improved at the local level by enabling the EOCs to interoperate without relying on the public commercial telecommunications infrastructure.

The task force also concluded that effective information sharing models are not prevalent at the level of Emergency Responders. Collaboration between the two sectors is most important at the regional and local levels to ensure the rapid recovery of both sectors. The Telecommunications and Electricity Sector Information Sharing and Analysis Centers (ISAC) are logical candidates to coordinate information sharing at the broadest and highest levels between the two sectors, ideally serving as a resource for each sector to use when communications are difficult at the local level and guidance is needed on how to proceed. Additionally, the task force found that liability issues related to information sharing have not been considered at the local level of communications.

On the basis of these conclusions, the NSTAC recommends that the President, in accordance with responsibilities and existing mechanisms established by Executive Order 12472, *Assignment of National Security and Emergency Preparedness Telecommunications Functions*, direct the appropriate departments and agencies to—

- Define and establish the term "Emergency Responder" within the *National Response Plan* and other appropriate plans, guidance, directives, and statutes.

- Ensure that key response personnel of critical infrastructure owners and operators in the telecommunications and electric power sectors be designated as Emergency Responders, and included in local, regional, State, and Federal Government emergency plans.

- Include fuel supply to critical telecommunications and electric power infrastructures as part of the Emergency Responder planning process to ensure that fuel deliveries receive adequate priority, access, and security during a disaster.

- Foster and promote effective emergency coordination structures to ensure reliable and robust communication between the two sectors and local, regional, State, and Federal Governments.

  - Review examples of proven priority restoration models at the State and regional levels. Encourage States and metropolitan regions without effective models to improve and update their existing frameworks.

  - Encourage effective information sharing models at the local/regional Emergency Responder levels, both in advance of a natural disaster and during the emergency restoration period. When developing these models, liability issues should be considered.

1.0 INTRODUCTION

1.1 Overview

An understanding of the significant interdependencies between the telecommunications and electric power infrastructures is a critical component of the Nation's security preparedness. The destructive hurricane seasons of the past several years, coupled with the events of September 11, 2001, have clearly demonstrated the dependence of the telecommunications network on the electric power grid while also highlighting the successes and shortcomings in incident management and recovery. Experiences such as these have exposed not only the relationship between these two sectors but also the critical role these two sectors play in supporting the reliability and resiliency of the other critical infrastructures. In addition, as the communications network becomes increasingly distributed, issues of reliability and ease of communication and coordination between the telecommunications and electric power industries will become ever more important and challenging during disaster recovery efforts.

The NSTAC recognition of, and reflection on, the existence of these critical interdependencies notably predates recent attention. In 1987, the Committee established the first Energy Task Force to develop recommendations to mitigate the effects of electric power outages on telecommunications. Following this effort, the NSTAC established a follow-on Energy Task Force charged to support the Office of the Manager, National Communications System (OMNCS) in its efforts with the Department of Energy (DOE) to develop criteria and a process for identifying NS/EP telecommunications facilities that qualify for electric power restoration and priority fuel distribution. More recently, Mr. F. Duane Ackerman, Chairman and Chief Executive Officer, BellSouth and Chair of the President's NSTAC, highlighted interdependency concerns between the two sectors in his speech at the Research and Development Exchange Workshop in October 2004, specifically noting the need for enhanced battery technology.

Following the NSTAC XXVIII Meeting in Washington, DC, on May 11, 2005, and per the guidance of the Committee of Principals , the IES established the TEPITF in 2005 to study NS/EP issues associated with the interdependencies between the telecommunications and electric power sectors. To ensure thorough investigation of the issues, the task force invited representatives from the United States (U.S.) electric power sector and Canadian power entities to participate in task force deliberations.

Until recently, the NSTAC's considerations of the power industry focused on the dependencies of the telecommunications and electric power sectors. This report, however, focuses on the interdependencies and establishes a baseline of the current state of interdependencies between the sectors. As such, the people and the processes related to the inter-sector interdependencies have been closely examined. Using this critical link as a lens for evaluation, this report presents NS/EP concerns associated with the interdependencies of the telecommunications and electric power sectors, focusing on the *current* operational issues between the two sectors and how the interdependencies affect both infrastructures. It gives particular attention to natural and human-made disasters, following a "cause-neutral" approach to the issue of service outages. The report analysis focuses on post-incident recovery and anticipatory mitigation issues with respect to interdependencies.[1]

People and Processes: Current State of Telecommunications and Electric Power Interdependencies is the first of two reports that the NSTAC is developing to address interdependencies between the two sectors. The subsequent report will address long-term issues, focusing on technology and engineering solutions the two industries must consider to address the expected increasing interdependencies and manage them effectively.

The key issues addressed in this report are as follows:

- NSTAC Recommendation Overview: What actions have been taken by the Executive Branch on previous NSTAC recommendations regarding the electric power sector? Which recommendations that have not been acted upon remain relevant?
- Priority Restoration: Where does the telecommunications network fall in the electric power sector's queue of priority restoration? Who is primarily responsible for restoration of service problems when both sectors are involved? How do the people who restore service and respond to outages within each sector work together during emergencies?
- Information Sharing and Liability: How much information is currently shared between the two sectors' ISACs? What information should be shared between the ISACs? What, if any, are the liability issues stemming from interdependencies between the two sectors?

1.2 Long-Term Issues

Preliminary discussion of long-term issues includes the following:

- Telecommunication Industry Changes: Have technology-driven changes in the telecommunications sector (e.g., ubiquitous deployment of wireless, terrestrial transition to fiber optic networks, provision of broadband services by the energy sector, distributed network elements, and increased complexities through the introduction of next generation networks) created new kinds of interdependency vulnerabilities? Are the vulnerabilities newly created, on a larger scale, more of the same, or potentially reduced?
- Loss of Core Infrastructure of the Electric Power Grid and/or Telecommunications Networks: Events damaging the core telecommunications sector's or electric power sector's infrastructure could induce prolonged outages. Threats such as electro-magnetic pulse (EMP), solar flares, and coronal mass emissions, or a coordinated attack triggering causative agent failure might transcend the destructive effects experienced from hurricanes; the September 11, 2001 attacks; and the August 2003 blackout. Therefore, the effects of these threats on the core infrastructure will be investigated to characterize unique interdependencies between the sectors during the recovery process.

[1] Although the issues of robustness and reliability are important, the TEPITF will not specifically address them.

- Power Industry Changes: Since deregulation, the electric power industry has undergone significant changes. The North American Electric Reliability Council (NERC) was established in 1968 to help ensure the reliability, adequacy, and security of the bulk electric system in North America . In 2005, the many policies that the industry had developed over decades were adapted and approved as 91 mandatory standards. The 2005 Energy Legislation will lead to formation of an Electric Reliability Organization.
- Restoration: What are the physical and logical interdependencies between the two infrastructures in the aftermath of a very long outage?
- Science and Technology (S&T) Solutions: What programs or projects underway in the Federal Government research labs represent potential solutions to existing and new interdependency vulnerabilities? What new S&T initiatives should be undertaken? In addition to extending battery life, what new S&T initiatives should be undertaken?
- Spectrum Policies: To what extent are Federal policies concerning spectrum allocation, including the lack of dedicated spectrum for internal utility systems, hampering the ability to restore electric power as quickly and safely as possible?
- Interdependency between the Sectors: What, if any, actions can/should the President take to lessen the critical interdependencies between the telecommunications and electric power sectors during a prolonged emergency?

2.0 STATUS OF PREVIOUS NSTAC RECOMMENDATIONS

NSTAC consideration of the relationship between the telecommunications and electric power sectors is not a recent development; however, consideration formerly centered on the study of *dependencies* as opposed to *interdependencies.* Relatively little follow-up research has been undertaken. The following section provides further detail on the status of past NSTAC recommendations.

2.1 Previous NSTAC Recommendations

Since its establishment in 1982, the NSTAC has made three distinct sets of recommendations pertaining to the dependency between the telecommunications and electric power sectors. First, research into dependencies began with the NSTAC's response to a Government request for industry's perspective on the options available to industry and Government for improving the EMP survivability of the Nation's telecommunications networks. On December 12, 1984, the NSTAC provided several policy recommendations on EMP to the President.[2] Second, in 1987, the NSTAC Telecommunications Systems Survivability Task Force concluded that the telecommunications industry would be extremely vulnerable to an extended electric power outage and recommended to the President that the Government initiate a study to identify options for ensuring electric power survivability as it related to telecommunications. Third, following the President's reply, the NSTAC formed the Energy Task Force. That task force, with participation from DOE, the National Communications System (NCS), and NERC, examined dependencies between the electric power and telecommunications sectors after a major earthquake. In 1988, the task force recommended:

- Further research on the impact of a major earthquake on the electric power, telecommunications, and transportation systems; and

- The establishment of a nationwide process for restoring electric power and distributing energy supplies during major emergencies.

As presented in the *Energy Task Force Final Report–1993*, the Energy Task Force's recommendations between its establishment in 1988 and its conclusion in 1993 included the following:

- Continued support of the operation, administration, and management of DOE's Telecommunications Electric Service Priority (TESP) program initiative.

- The assignment of Federal responsibility to establish a program for ensuring priority availability of fuel supplies for telecommunications companies during emergencies.

[2] For more information, please refer to Appendix A.

- The development of a program for assigning electric power restoration priorities to NS/EP telecommunications users and providers to accomplish the soonest possible service restoration.

2.2 NSTAC Recommendation Analysis

Since the NSTAC task force recommendations were issued in the early 1990's, neither the telecommunications nor electric power industries, nor the Federal Government has undertaken a formal interdependency study. In December 1993, however, the DOE initiated the TESP program with support from the NCS and NSTAC, giving the NCS Federal responsibility for administering this program. In 1996, the NCS created a TESP database with data supplied from the telecommunication facilities and power companies, which included telecommunications facilities serving critical State Government sites and power company information for each area. By 2001, TESP was no longer in use because it was difficult to keep such data current. In 2004, the NCS revived the TESP and initiated a Draft TESP Memorandum of Agreement (MOA) between the Telecommunications and Electricity Sector ISACs.

The Draft TESP MOA is under revision to become a Memorandum of Understanding (MOU) that will provide a framework for problem resolution. The purpose of this framework is to ensure that the electric and telecommunications industries work together to mitigate the effects of electric power outages on NS/EP telecommunications functions after an NS/EP event. The ISACs supporting inter-sector coordination will be parties to the MOU. The MOU acknowledges that preplanning and response coordination must be conducted at the local level. When local forces need assistance in these efforts, they may seek support from their respective ISACs. The ISACs will work together to assist the field forces in resolving the issue.

Other bodies have continued to study EMP effects. On July 22, 2004, the EMP Commission presented findings to Congress stating that "EMP is one of a small number of threats that can hold our society at risk of catastrophic consequences."[3] The EMP Commission showcased the severity of this issue, aiming to catalyze debate and focus within the United States Congress.

Although some of these recommendations, as discussed above, remain valid, the current environment related to the interdependencies between the two sectors has changed drastically. Earlier recommendations focused on electric power service rather than development of a substantive incident management process, which both sectors believe is necessary. Given the significant loss of life and damage to personal property and economic impact caused by recent disasters, the TEPITF is taking a fresh look at the interdependencies between the two sectors. At the conclusion of its study, the task force will issue recommendations for the President that are relevant to the current environment, with a view toward mitigating the risks created by the sector interdependencies.

[3] Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, *Volume 1: Executive Report*, 2004.

3.0 PRIORITY RESTORATION

The events of September 11, 2001; the 2003 North American blackout; and the destructive 2004–2005 hurricanes, although differing in terms of geographic areas and duration of time, collectively demonstrated the validity of the shared concerns of the electric power and telecommunications sectors with respect to the priority restoration process.

3.1 Electric Power and Telecommunication Priority Restoration Process

3.1.1 Electric Power

Much like the telecommunications sector, the electric power sector incorporates an extremely complex network of generation, transmission grid, and distribution assets. The transmission grid, possibly the most complex element, includes more than 150,000 miles of transmission lines, delivers electricity from more than 850,000 megawatts of generation crossing the boundaries of utilities and States, and connects to systems in Canada and Mexico. Electric power service providers (EPSP) comprise investor-owned utilities, municipal utilities, cooperatives, and Government-owned entities. In accordance with State laws and public utility regulations, EPSPs individually develop and maintain their priority restoration plans for outage recovery activities related to their own networks. These plans typically focus on taking the appropriate action to restore service to emergency and life support services, critical infrastructures, and the largest number of customers. EPSPs use outage management systems (OMS) to help detect outages and nonfunctioning assets, manage customer calls, prioritize emergency repairs, manage resources, and dispatch crews. Typically, the first priority addresses transmission line and substation outages, because local networks supplying power to customers cannot function unless the large transmission assets supplying power to the area are functioning. The next priorities are to restore power to emergency services and critical life support facilities, such as hospitals, police and fire stations, emergency call centers, and EOCs, as well as key infrastructures, including critical telecommunications, water, and sewerage assets; and to resolve dangerous situations, such as downed live wires. Then, the distribution feeder lines that supply the largest number of customers are addressed.

EPSPs vary significantly in their dependence on commercial telecommunication services for emergency operations (voice and data) communications and coordination, including OMS. Many have invested heavily in their private internal voice and data communication systems—such as radios, fiber optics, and microwave networks—for reliability coverage supporting mission-critical functions, such as process control systems, supervisory control and data acquisition (SCADA) systems, generation facilities, transmission grids, and the distribution network, including emergency response communications. Many of these systems include redundant internal elements, such as control centers served by both fiber and microwave to ensure reliability. Most EPSPs also have well-developed internal voice communication networks for dispatching crews for emergency repair operations as part of their OMSs, although they may rely on commercial wired networks for primary everyday communications because of their coverage over a large area and low cost. When crews come in from other areas to assist the local EPSPs in recovering from extreme emergency events, the local EPSPs may have limited internal system capacity to communicate adequately—with their own crews and with other company outage crews who have come to provide mutual aid. Where interoperable communications are impossible among EPSPs responding to a major outage, visiting crews generally will use their own internal radios under Special Temporary Authority from the Federal Communications Commission.

With regard to data communications for operating mission-critical functions such as SCADA, generation facilities, bulk power transmission and distribution networks, the range of reliance on internal communications networks varies greatly. Although some EPSPs rely on internal private networks for all mission-critical data communication functions, others rely heavily on commercial telecommunications networks for elements of their internal data communications networks. In addition, if primary and backup private internal or commercially leased data networks are lost for mission-critical functions, the EPSP can typically dispatch key response personnel with voice communication devices (e.g., radio) to critical electric power assets to operate in manual mode at some minimal level. Other key participants, such as regional transmission organizations, independent system operators, and NERC Regional Reliability Center coordinators, rely heavily on the use of a variety of telecommunications mechanisms such as commercial telecommunications services and the Internet.

Many EPSPs' private internal communications networks are protected from power outages through long-term backup generation facilities. These facilities are often designed to provide power for private communications systems for up to two weeks without refueling but can operate indefinitely if the fuel supply is not interrupted. These backup capabilities, which are not economical or feasible for commercial networks, are required by utilities to ensure reliable communications in emergencies.

3.1.2 Telecommunications

Telecommunication service providers' internal priority restoration plans are similar to those of the electric power industry, but prioritization of restoration activity is driven specifically by those customers, emergency services, life support, and critical infrastructures that have joined the NCS' Telecommunications Service Priority (TSP) program. The NCS manages this Federal program, which enables telecommunications users to obtain priority treatment, including provisioning of new circuits and restoration of existing circuits, from service providers to meet NS/EP telecommunications requirements. Typically, entities eligible for TSP status are responsible for providing services for the following purposes, which are grouped in the following tiers for restoration assignment: (1) linking national security leadership; (2) maintaining the national security posture and U.S. population attack warning systems; (3) preserving public health, safety, and law and order; (4) upholding public welfare and the national economic posture; and (5) providing emergency support.[4] Electric power service ranks in priority below the third tier. EPSPs have not significantly participated in the TSP program, having made very few applications for priority restoration.

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[4] NCS website: TSP Categories. http://www.ncs.gov/tsp/tsp/tspcategories.html

Telecommunications service providers depend highly on electric power for continued delivery of service, particularly as the electronics equipment in the network has become less centralized and more distributed. For this reason, telecommunications service providers institutionalized the use of battery backup and mobile emergency generators as sources of short-term power during emergency situations. Electric power backup for the various elements (sites) supporting the infrastructure varies greatly from one site, or type of site, to another. Some sites have extensive emergency backup capabilities, and thus can support normal service for extended periods. Other sites have minimal emergency backup capabilities that might provide only a limited level of service, ranging from several hours to one day. Key assets such as central offices, access tandems, telco hotels, collocation facilities, and mobile switching centers typically have battery backup that is augmented by emergency generators. Such large sites can typically operate on backup power indefinitely if the fuel supply is not interrupted. Less centralized telecommunications assets, such as remote terminals, radio towers, and optical regeneration huts, typically have battery backup for only a few hours. Portable generators must be deployed to these sites before the batteries discharge and service is interrupted. These generators are typically small and have fuel tanks that must be topped off frequently. Perimeter controls and curfews often pose impediments to keeping the generators functioning.

3.2 Impacts of Natural Disasters and Human Attacks on Telecommunications and Electric Power Service

In responding to the major outages between 2001 and 2005, the telecommunications and electric power sectors increasingly improved their coordination during the restoration process.

3.2.1 September 11, 2001

The events of September 11 revealed the vulnerabilities of the telecommunications and electric power sectors, as well as the dependency of other sectors on these two infrastructures. The aftermath of the attacks carried out on September 11 also highlighted the interdependencies between the two sectors during an emergency event as the sectors interacted to restore telecommunications and electric power service. A key finding by all sectors was that the terrorist attack in New York City[5], although site specific, spread its impact over a fairly large area. The financial markets experienced interruption of service worldwide, whereas the electric and telecommunications disruptions were relatively localized. In developing their emergency plans, many New York business enterprises had relied on being able to move their critical functions only a few blocks down the street to resume operations; but they found those plans were inadequate when activated.

On that day, the Nation experienced a disaster transcending anything any in recent history. The physical destruction resulting from falling debris and dust, the interruption of water supplies and transportation services, compounded by numerous other factors, aggravated the destructive impact on telecommunications, electric power, the financial services sector, and others. Temporary or backup generators could not continue operations in the extremely dusty and dirty

[5] While an event of national significance, the attacks on the Pentagon did not reveal significant interdependency issues.

air conditions caused by the fall of the World Trade Center towers, and many temporary backup generators were not designed to operate continuously for several days. Also, replenishing fuel to these facilities became problematic when access to Lower Manhattan was restricted. The lessons learned from the aftermath of September 11 have caused many sector planners to reconsider the adequacy of their redundant systems and revisit their continuity of operations plans.

Additionally, after the terrorist attacks, the demand for cellular communications connectivity was unprecedented, at a time when many cellular infrastructure assets had been destroyed or had suffered from other consequences. This was a marked difference from past crises. In the first hours after the attacks, wireless communications continued to provide service, albeit greatly reduced, in the affected areas through the surviving assets until mobile cell towers were deployed and the range of unaffected towers was extended to augment the service. The need for functional cell towers was a top priority; hence, the deployment of mobile cell towers, including mobile backup power, was paramount to meeting First Responder needs.

The resiliency of the local electric power and telecommunications infrastructure was clearly demonstrated in the disaster response. By September 19, commercial power was restored to all networks in Lower Manhattan. Likewise, communications capabilities were sufficiently restored so that the financial markets could be reopened on the Monday following the attacks.

3.2.2 2003 Blackout

On Thursday, August 14, 2003, cascading effects caused the largest electric power blackout in North American history, leaving 50 million people without power in eight States and parts of Canada. The cities of New York, Detroit, Cleveland, Toronto, and Ottawa were affected by this power outage, which in some areas lasted for four days, although the major portion of affected customers had power restored after 30 hours. Estimates of the total impact on the U.S. economy caused by the blackout range from $4 billion to $10 billion.[6] Although an extremely significant event in terms of economic impact, the blackout revealed limited interdependency issues between the sectors because of its relatively short duration. Nonetheless, the blackout further clarified the need for effective communication between the sectors and the need to share information on priority restoration efforts. The two sector ISACs proved effective in communicating between sectors during the crisis. Had the blackout situation lasted longer, more interdependencies might have been revealed; and the inter-sector coordination process would have become even more critical.

3.2.3 Hurricane Activity

Hurricanes provide valuable examples of the most frequent type of natural disaster, usually causing extensive physical damage to the telecommunications wireline and wireless networks, and to the electric transmission and distribution grids. Commercial and private communications might be equally affected by these storms. Depending on the circumstances surrounding each storm, the impact on the elements sustaining each infrastructure varies in intensity and duration.

[6] U.S. Canada Power System Outage Task Force, *Final Report on the August 14, 2003 Blackout in the United States and Canada*, April 2004.

In some instances, commercial communications might survive hurricane damage to a much greater degree than electric power service; but the opposite can be true. Likewise, utilities' private internal networks might survive the hurricane and continue to operate or be damaged and quickly restored, yet commercial communications might remain largely unreliable, due either to infrastructure damage or excessive demand.

The hurricanes of 2004 and 2005, and the resulting recovery efforts have yielded invaluable lessons learned that can be applied to understanding the interdependencies between the telecommunications and electric power sectors.[7] First, a general need exists for additional coordination and collaboration between the sectors at the Federal, State, regional, and local levels, both in advance of a natural disaster and during the emergency restoration period. It is particularly important for the telecommunications and electric power sectors to collaborate and coordinate on frontline operations maintenance and repair teams. Advance coordination can help to target key regional and local assets in both sectors for priority restoration and increase the likelihood of successful communication during a crisis. Currently, the level of coordination and collaboration between the sectors varies greatly from one region to another. The primary driver for this disparity is the natural disaster threat profile for various regions. Those regions prone to hurricanes, ice storms, and earthquakes are likely to be far more engaged in preplanning than those in less disaster-prone regions. Many other factors influence the level of collaboration: the robustness of a local telecommunications provider's emergency backup power system; dependence of the electric power sector on commercial telecommunications networks for emergency repair communication; the degree to which a local electric power control area depends on commercial telecommunications for its SCADA and emergency management system; whether an effective emergency management authority (EMA) exists in the region; and senior management's level of commitment to disaster planning.

A second lesson learned is that restoration and provision of telecommunication services and electric power are critical for First Responders and restoration and recovery of all other critical infrastructures. Restoration of telecommunications and electric power must be given the highest priority after saving of life, and must include priority access to fuel, security, site access, and other logistical support such as staging areas, and food and berthing for response personnel. Key response personnel of critical infrastructure owners and operators in both sectors must be involved in planning for, and responding to, potential emergency events. If a new designation, such as Emergency Responders, and similar to First Responders, were established to facilitate priority restoration of telecommunications and electric power, it would allow the Emergency Responder designation to be applied to telecommunications and electric power professionals. They could then be included in the Federal, State, regional, and local emergency planning processes; actively participate in EOCs during emergency events; and gain access to restricted areas in a timely and secure fashion to restore their critical assets.

Third, as recommended in the NSTAC's *Trusted Access Task Force Report*, a uniform credentialing system would facilitate access for Emergency Responders and First Responders.

[7] U.S. Senate Committee on Commerce, Science and Transportation Hearing: "Communications in a Disaster," September 22, 2004.

Fourth, First and Emergency Responders must be able to communicate effectively. Employing at least one of the following enhancements would greatly facilitate communications:

- Making existing systems interoperable across jurisdictions.
- Bringing in deployable solutions to overlay upon existing systems.
- Designating a communications and coordination hub to act as the interconnection point for disparate and non-interoperable systems. Also ensuring local forces use communications equipment that can operate on multiple frequencies and formats..

Finally, the processes for fuel supply replenishment for electric power generators at critical telecommunications assets must be integrated into Emergency Responder planning; and fuel deliveries must be considered a priority during an emergency.

3.3 Emergency Communications During Outage Situations

It should be noted that any solution for the timely restoration of communications capabilities following a disaster depends first on the restoration of power. However, the safety and rapidity of restoration depend on the extensive internal private voice communication networks used by both sectors' personnel, as well as the multitude of sister utility and service personnel who come to assist in the restoration efforts.

Analysis of the interdependencies between commercial telecommunications and electric power sectors might investigate ways to improve emergency communications between the sectors during outage situations. Interoperability and integration of each sector's internal private voice communication networks for restoration could provide a construct for more reliable communications and more rapid restoration of critical infrastructure. Leveraging the shared use of critical infrastructure networks, including those of First Responders, should also be considered.

3.4 Implications of Changing Telecommunications Network Design[8]

Developing trends in network design also raise questions about the resulting interdependencies between the telecommunications and electric power sectors. With the growth of the next generation network (NGN), the attendant growth in wireless and mobile technologies, and the dispersion of network elements, the telecommunications sector can no longer rely on 48 volt batteries in central offices to provide power to the end of the network. Instead, telecommunications infrastructure and its users will increasingly rely on commercial electric service to meet their power needs. In this environment, the telecommunications and electric power sectors will have to work closely together to ensure NS/EP services are available to respond to terrorist incidents, natural disasters, or any other event prompting activation of specialized services. The dynamic change in telecommunications network architectures and the

[8] The NSTAC's NGN Task Force is studying the NGN and is examining how incident management issues will differ in a full NGN environment. The TEPITF will review the NGN Task Force reports to gain additional insight.

consequential effects on the interdependency between the telecommunications and electric power sectors as a strategic issue will be addressed in a subsequent report.

4.0 INFORMATION SHARING AND LIABILITY

4.1 Current Information Sharing Environment

Currently, formal information sharing between the telecommunications and electric power sectors is conducted primarily through the sectors' two ISACs.

In response to President Clinton's Presidential Decision Directive 63 (PDD-63), the National Coordinating Center (NCC) was designated as the Telecommunications ISAC on March 1, 2000.[9] As such, it aims to "facilitate voluntary collaboration and information sharing among industry and Government ISAC members in support of Executive Order 12472 and the critical infrastructure protection goals of PDD-63. The Telecommunications ISAC gathers and analyzes all-hazards information on vulnerabilities, threats, intrusions, and anomalies in order to avert or mitigate impact upon the telecommunications infrastructure".[10]

The Electricity Sector ISAC, founded in October 2000 by NERC, aims to ensure that "the bulk electric system (physical and cyber) in North America is reliable, adequate, and secure".[11] This ISAC's responsibility is to promptly disseminate threat indications, analyses, and warnings, together with interpretations, to assist electric sector participants in taking protective actions. The Electricity Sector ISAC also serves the electric power sector by facilitating communications among electric sector participants, the Federal Government, and other organizations responsible for critical infrastructures.

Because the ISACs were established to share information critical to their respective sectors, they are able to exchange data to analyze, make decisions, and take action based on shared information. If an emergency arises, information sharing between the two ISACs is quickly facilitated through a conference call bridge to focus coordination activities at the regional and local levels.

The ISACs further serve as facilitators, providing a critical link for communication with the Government. The Government leverages the ISACs to communicate with the telecommunications and electric power sectors, and ultimately uses this information to help form its issuances of threat levels and analysis.

The overall relationship between the sectors with regard to information sharing among the ISACs is further detailed in Section 4.3, Liability Issues.

4.2 Levels of Information Sharing

To implement effective prevention and response measures, both sectors need to be aware of the various levels of Government with which they should coordinate. To the extent possible, all

[9] NCS website. http://www.ncs.gov/ncc/
[10] See the *National Infrastructure Protection Center Report:* Highlights, January 15, 2002.
[11] See the ISAC Council White Paper: *Reach of Major ISACs.* January 31, 2004.

levels (local, regional, State, Federal) should be represented in the information sharing process. To sustain a managed process, industry and Government components need to continue working through the same process. Being cognizant of potential obstacles, telecommunications and electric sector professionals should continue to strive for information sharing at every level.

Information sharing among telecommunications, electric power, and Government professionals is a key issue at all levels; but reviews of natural and human-made disaster situations underscore that it is especially pivotal among local officials and Emergency Responders on the ground. Information sharing models should be in place before crises occur to maximize the effectiveness of Emergency Responders.

The importance of structured communication models at the local and regional levels is illustrated in the Washington, DC, metropolitan area, where the surrounding counties (Fairfax, VA; Montgomery, MD; and Prince Georges, MD) and the District of Columbia have established EMAs. EMAs coordinate preparedness, response, and recovery efforts for significant emergency events at the local level. EMAs act as a focal point for emergency planning, training, and the exercise of programs, and help to promote coordination and collaboration among participants in advance of an emergency event.

During significant emergency events, each EMA establishes an EOC, which coordinates all disaster recovery activities in its region. The EOC coordinates the First Responders (and could also coordinate Emergency Responders if they were established on a national level); county agencies; other key infrastructures (e.g., water, sewer, transportation); and Federal, State, and regional Government entities (such as other EMAs). Representatives from the telecommunications and electric power sectors with decision making authority and access to their key data and information technology systems (such as outage management systems) routinely participate in EOC activities.

In the case of Fairfax County, during non-emergency events, there is generally little need for coordination between the two sectors. Each entity can automatically alert the other of compromised assets, such as lines or cell towers down. Each entity is knowledgeable of its operations/emergency repair counterpart, including emergency contact information, but in cases of normal outages, each entity rarely needs to coordinate with one of the others. However, in the case of a significant emergency, considerable extensive coordination ensues among telecommunications and electric power service providers through the EOC.

The EMA/EOC system illustrates the importance of highly coordinated information sharing on the local and regional levels, facilitating operations in crisis situations through prearranged systems that bring key people and processes together. This model is an advanced example for a metropolitan region, although it may have unique characteristics because of its proximity to, and interaction with, the Federal Government. Other areas of the country and their models need to be explored and considered.

Although the EMA/EOC example serves as an illustrative model for the importance of information sharing at the local and regional levels, such collaboration is not common in most areas of the country. Much more work needs to be done to ensure that Emergency Responders throughout the United States have access to effective information sharing systems at the local level.

4.3 Liability Issues

Information sharing as discussed above may lead to liability concerns, specifically with regard to the informal sharing of information that occurs between the telecommunications and electric power professionals who are on the ground in local crisis situations.

Emergency situations require fast, effective information sharing between the sectors to restore communications and power services to the affected areas as quickly and efficiently as possible. Although this principle is widely supported, liabilities might arise as a result of this increased flow of data. When a telecommunications company shares information with an electric power company, or vice versa, each party becomes responsible for safeguarding and protecting the information that they receive from the other party. For practitioners in both sectors to work effectively, data on specific site locations, operations and leadership contacts, and other sensitive and proprietary information must be shared. If this information is compromised, the responsible party will likely be held liable, necessitating careful transmission of, and guarded access to, the information being shared.

The potential for liability posed by information sharing is further complicated by the priorities of Emergency Responders, who must share the necessary information as quickly as possible to reach their end goal—power/service restoration. A conflict exists between the advantages of information sharing and the possibly negative consequences and potential liability arising from quickly shared, but ultimately incorrect, information.

As an additional complicating factor with respect to potential liability, U.S. anti-trust regulation might require that information shared between two parties be made available to all. For instance, if a utility company shares information to help one communication vendor plan for restoring power, it might be obliged to make that same information available to all communications vendors in the service area. Potential liabilities can also arise if there is a perception that one company is receiving preferential treatment over another.

Although it is clear that liability concerns among Emergency Responders still need to be addressed in much greater depth, the Telecommunications and Electricity Sector ISACs have a structure in place to help protect against potential liabilities while allowing for the free flow of information between the participants.

Information sharing among the Telecommunications ISAC membership is governed by the information provider, who instructs the ISAC Watch regarding what information may be released beyond the ISAC. In the case of the Telecommunications ISAC, each company's information is owned by that company; and each company controls the information that it shares, dictating what may or may not be released outside of the ISAC and facilitating shared trust among the members. This procedure allows information to be shared among the critical participants while protecting proprietary information and shielding the ISAC from potential liability issues.

The Electricity Sector ISAC has a structured process for communications with the electric power industry and Government agencies, and a developing structure among ISACs that is guided by the ISAC Council.[12] Conference calls with participants direct the information sharing structure to be used for a specific incident. For example, in the case of a hurricane, the ISAC has enough advanced warning to set up a conference call with the major industry participants and governing agencies, including the NCC. Calls are held daily (or as needed) as the crisis unfolds to update participants on restoration/provision status from an electric power perspective, with the understanding that if information is needed by another sector, including telecommunications, the ISAC will reach out further and provide the necessary information. The communication is designed so that the sectors can keep each other informed as to any specific needs. Further, the Electricity Sector ISAC has signed an MOU with the ISAC Council. The formality of this document is still in its infancy, but it is designed to protect the proprietary information that exists in the data shared by the Electricity Sector ISAC. A reporting schema is also in place with DOE and Department of Homeland Security. Both of the aforementioned protective policies should be further enhanced by the Homeland Security Information Network, which will play a more formal role with regard to legal restrictions and simultaneously centralize the reporting process when it takes effect.

Further potential liability areas to be examined include issues that result from insufficient coordination between the telecommunications and electric power sectors during an outage; interconnection of the Canadian and U.S. power grids and its resulting impact on addressing priority categories and regulatory issues; and the increasing dependency of telecommunications services on power.[13]

[12] The mission of the ISAC Council is to advance the physical and cyber security of the critical infrastructures of North America by establishing and maintaining a framework for valuable interaction between and among the ISACs and with Government. http://www.isaccouncil.org/about/

[13] The TEPITF plans to request analysis on this issue from the Legislative and Regulatory Task Force.

5.0 CONCLUSIONS

On the basis of the analysis provided in this report, several conclusions emerge regarding the interdependencies between telecommunications and electric power.

Section 2.0

- Interdependencies are a matter of increasing importance to industry and Government. Previous work focused on dependency, but much work remains to be done with regard to understanding the issues related to interdependency.

Section 3.0

- Priority restoration of telecommunications and electric power is critical for First Responders, restoration of other critical infrastructures, and other response and recovery activities.

- The most useful element of a relationship between the two sectors for restoration activities during an emergency is the open dialogue between the points of contact at the lowest possible level (e.g., entity to entity).

- Due to the critical nature of telecommunications and electric power service providers, their key response personnel should be designated as Emergency Responders. This designation would allow them to be involved in the Federal, State, regional, and local emergency planning processes; actively participate in EOCs during emergency events; and be given priority access to restricted areas in a timely and secure fashion to restore their critical assets

- As recommended by the NSTAC's Trusted Access Task Force, a nationwide credentialing program would facilitate access to a site.

- The fuel supply replenishment process for electric power generators at critical telecommunications and EPSPs' internal communications network assets is imperative.

- Emergency response communication between telecommunications and electric power infrastructures would be improved if at the lower levels, the EOCs had the ability to interoperate without depending on public commercial telecommunications services.

Section 4.0

- Effective information sharing models at the level of Emergency Responders are not prevalent.

- Collaboration between the two sectors is most important at the regional and local levels to ensure the rapid recovery of both sectors.

- The Telecommunications and Electricity Sector ISACs are logical candidates to coordinate information sharing at the broadest and highest levels between the two sectors, ideally serving as a resource for each sector to use when communications are difficult at the local level and guidance/advice is needed on how to proceed.

- Liability issues have not been considered at the lowest, local level of communications.

6.0 RECOMMENDATIONS

The NSTAC recommends that the President, in accordance with responsibilities and existing mechanisms established by Executive Order 12472, *Assignment of National Security and Emergency Preparedness Telecommunications Functions*, direct the appropriate departments and agencies to:

- Define and establish the term Emergency Responder within the *National Response Plan* and other appropriate plans, guidance, directives, and statutes, including other local, State and Federal Government emergency plans.

- Ensure key response personnel of critical infrastructure owners and operators in the telecommunications and electric power sectors be designated as Emergency Responders.

- Include fuel supply, security, site access, and other required logistical support to critical telecommunications and electric power infrastructures as part of the Emergency Responder planning process to ensure priority restoration to critical telecommunications and electric power.

- Foster and promote effective emergency coordination structures to ensure reliable and robust communication between the two sectors and local, regional, State, and Federal Governments.

    - Review examples of proven priority restoration models at the State and regional levels. Encourage States and metropolitan regions without effective models to improve and update their existing frameworks.

    - Encourage effective information sharing models at the local/regional Emergency Responder level, both in advance of a natural disaster and during the emergency restoration period. When developing these models, liability issues should be considered.

APPENDIX A

Electro-Magnetic Pulse

The NSTAC follows a risk management approach to survivability that can be partly attributed to the pioneering work of the Electro-Magnetic Pulse Survivability Committee. The recommendations the committee made to the President on December 12, 1984, included the following:

- Designate an appropriate Federal agency to serve as an industry point of contact for EMP mitigation efforts and information distribution
- Support industry through its standards organizations in the development of electromagnetic standards that take the EMP environment into account
- Undertake a program to improve the EMP durability of the Nation's commercial electrical power systems

In its *Final Report on EMP*, the NSTAC found that "consistent with its cost constraints, industry should incorporate low-cost EMP mitigation practices into new facilities and, as appropriate, into upgraded programs. For those areas where a carrier/supplier recognizes that a significant improvement in EMP resistance and surveillance could be achieved, but at a cost beyond the carrier/supplier's own cost constraints, the carrier/supplier should identify such options to the Government for evaluation and possible funding." On October 9, 1985, the NSTAC approved the *EMP Final Task Force Report* and forwarded a recommendation to the President, calling for a joint industry and Government program to reduce the costs of existing techniques for mitigating high-altitude EMP-induced transients and to develop new techniques for limiting transient effects. As a result, the NCS[14] and industry, working with the Alliance for Industry Solutions developed a set of American National Standards Institute (ANSI) standards and Generic Requirements[15] to address EMP.[16]

Further, based on the results of the commission-sponsored testing, an EMP attack would disrupt or damage a functionally significant fraction of the electronic circuits in the Nation's civilian telecommunications systems in the region exposed to EMP. The remaining operational networks would be subjected to high levels of call attempts for some period of time after the attack, leading to degraded telecommunications services. Key Government and civilian personnel need priority access to use public network resources to coordinate and support local, regional, and

[14]The mission of the NCS shall be to assist the President, the National Security Council, the Homeland Security Council, the Director of the Office of Science and Technology Policy, and the Director of the Office of Management and Budget in: (1) the exercise of the telecommunications functions and responsibilities set forth in Section 2 of this Order; and (2) the coordination of the planning for and provision of national security and emergency preparedness communications for the Federal Government under all circumstances, including crisis or emergency, attack, recovery, and reconstitution.

[15] Telcordia GR-1089-CORE.

[16]ANSI T1.320.

national recovery efforts, especially during the interval of severe network congestion. To offset the temporary loss of electric power, telecommunications sites now employ a mix of batteries, mobile generators, and fixed-location generators. These typically have between four and 72 hours of backup power available, and thus depend on either the resumption of electrical utility power or fuel deliveries to function for longer periods of time. For some of the most critical infrastructure services, such as electric power, natural gas, and financial services, assured communications are necessary, but are not necessarily sufficient, to the survival of that service during the initial time intervals after an EMP attack. Therefore, a systematic approach to protecting or restoring key communications systems is required.

APPENDIX B

TASK FORCE MEMBERS, GOVERNMENT PERSONNEL, AND OTHER PARTICIPANTS

TASK FORCE MEMBERS

Nortel	Ms. Susan Spradley, NSTAC Principal
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AT&T	Mr. Harry Underhill
Bank of America	Mr. Roger Callahan
BellSouth Communications	Mr. David Barron
BellSouth Communications	Ms. Cristin Flynn Goodwin
Boeing Communications	Mr. Robert Steele
Computer Sciences Corporation	Mr. Guy Copeland
Lucent Bell Labs	Mr. Rick Krock
Lucent	Mr. Karl Rauscher
Microsoft	Mr. Philip Reitinger
Microsoft	Ms. Lynn Terwoerds
Qwest	Mr. Jon Lofstedt
Raytheon	Mr. Frank Newell
Science Applications International Corporation	Mr. Henry Kluepfel
Sprint Corporation	Ms. Allison Growney
Sprint Corporation	Mr. William Hitchcock
Sprint Corporation	Mr. John Quigley
United States Telecom Association	Mr. David Kanupke
Verizon	Mr. James Bean

GOVERNMENT PERSONNEL

Department of Energy	Mr. John Greenhill
Department of Energy	Mr. Hank Kenchington
Department of Homeland Security	Ms. Mary Bale
Department of Homeland Security	Mr. Chatry Perry
Department of Homeland Security	Mr. David Delaney
Defense Program Office for Mission Assurance	Mr. Michael Shanahan
National Communications System	Ms. Michele Bruich
National Communications System	Capt. Thomas Wetherald
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MCI	Mr. Roger Higgins
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North American Electric Reliability Council	Mr. Stanley Johnson
North American Electric Reliability Council	Mr. Louis Leffler
National Rural Electric Cooperative Association	Mr. Barry Lawson
New York Independent System Operator	Ms. Bonnie Bushnell
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United States Telecom Association	Mr. Murray Liebman
United Telecom Council	Ms. Jill Lyon
United Telecom Council	Ms. Prudence Parks
Verizon	Mr. Charles Romano