

LIABILITY AND INSURANCE

INFRASTRUCTURE ASSURANCE

Report to the
President's Commission
on Critical Infrastructure Protection

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This report was prepared for the President's Commission on Critical Infrastructure Protection, and informed its deliberations and recommendations. The report represents the opinions and conclusions solely of its developer, Coopers & Lybrand L.L.P.

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Executive Summary

Coopers & Lybrand L.L.P. (C&L) was engaged by the President's Commission on Critical Infrastructure Protection (PCCIP) to conduct a market study on infrastructure assurance in the oil and gas, electric and telecommunications industries. The purpose of this study was to identify and examine public policy issues associated with questions of responsibility for assuring reliable infrastructure services, both today and in the future. Its aim was also to identify how service providers deal with liability for service interruptions in the oil and gas, electric and telecommunications sectors. The study also assessed the impact of deregulation on infrastructure integrity and service reliability. Particular attention was given to interruptions in service caused by terrorist or cyber attacks.

Our analysis involved background research and interviews with senior executives in the three industries in question, as well as related industries, including law firms, insurance companies and financial institutions. Interview participants were selected that provide a wide range of perspectives and represent different types of service providers existing in the market, a variety of company sizes, different departments within organizations, as well as geographic diversity. The information and opinions presented in this report reflect the interview responses and perceptions within the industry.

The following were common themes within all three service sectors:

- Market forces are perceived as the best response to maintaining service reliability.
- Terrorism is not perceived as a significant threat, with the exception of cyber attacks.
- Liabilities associated with interruptions in service are not perceived as a significant issue, and are generally dealt with through contractual provisions.

Additional key findings include:

- A limited role may exist for regulators in the electric and telecommunications industries to ensure information sharing and education of the public concerning service options and customer responsibilities regarding network integrity.
- The impact of deregulation varies by industry. Deregulation is expected to have a positive, long-term impact on service reliability in the telecommunications and oil and gas sectors. A short-term impact around reliability could be an issue within the telecommunications industry. In the electric utility industry it remains unclear, as deregulation is still in the early stages. However, some problems are anticipated during the transition period.

- With the exception of cyber attacks, terrorism is not perceived as a significant threat. Cyber attacks are currently considered insignificant threats in the electric industry, although they are becoming a greater concern. Cyber attacks are considered the fastest growing threat to network integrity and service reliability in the telecommunications industry. It is also believed to be an increasing concern in the area of electronic trading and nomination systems within the oil and gas industries.
- Liabilities resulting from interruptions in service are not perceived as a significant issue in the three industries studied. Liability issues do not affect the stock valuation of companies in the telecommunications industry, but may affect the credit rating of an electric utility.
- Business interruption insurance, while common in the oil and gas sector, is much less so amongst electric utilities, and is not purchased by telecommunications companies.
- The U.S. market for insurance against terrorist and cyber attacks is limited, as these are generally not considered significant threats to infrastructure integrity.
- Customer awareness of service options and responsibilities regarding network security are significant concerns in a deregulated environment.
- There may be a role for government in guaranteeing universal service, supporting initiatives in the area of network security, fostering the sharing of information, educating the public, and protecting customers. Regulators may also have a role in developing rules to allocate liability among service providers in the deregulated electric utility industry.

1.0 Objectives

This study assessed the current nature of liabilities of service providers, how this may change in the competitive environment, and reviewed the need for regulations or standards to assure reliability of service. These objectives were addressed by identifying industry expectations of the effect of deregulation on infrastructure assurance. Potential threats to infrastructure assurance have also been examined, including cyber and terrorist attacks, as cyber threats may become more significant with the increasing dependence on information technology and the growing exchange of information through publicly accessible information systems such as the Internet. The threat of terrorist attacks, which, for the purpose of this study, include aggressor nations, terrorist groups, criminals, disgruntled employees and computer hackers, may also rise. This study reports current industry perceptions regarding these issues. Arguments presented in this report do not represent Coopers & Lybrand's opinion on the subject matter, but reflect current industry views on these issues.

2.0 Study Background

Technological advances have created a new level of dependence on infrastructure services, to the extent that these infrastructures are now critical not only to the nation's daily functions, but to national security. While deregulation has been accepted in today's key industries—telecommunications and oil and gas being completed and electric power in the process—many questions remain. Deregulation led to a transformation from vertically integrated, virtual monopoly industries, into markets characterized by multiple niche providers offering a wide range of services to consumers. The restructuring of the market has multiple implications for reliability of service, liability for loss of service, and competitiveness. For the electric utility industry, which is now undergoing the first stages of deregulation, it is important to learn from the experience within both the oil and gas and telecommunications industries to identify problems and issues that may need to be addressed.

We believe that by assessing the effect of deregulation on these industries, one can examine the need for regulatory approaches to assure infrastructure reliability or to address issues of shared liabilities between service providers. As an example, with the withdrawal of government indemnity, liability claims from interruptions in service may become more common; thus, creating a market niche for innovative providers or new insurance products and policies for service providers. The demand for customer insurance policies may also grow, as consumers, uncertain of the effect of deregulation on reliability and their rights as customers, may be prompted to protect their investments.

Definitions for terms used in this study are as follows:

- **Force Majeure:** refers to a situation that is beyond one's control, such as a natural disaster.
- **Reliability:** the level of performance of the components of the system that ensure delivery to customers within accepted standards and in the amount and time required.¹
- **Terrorist attacks:** include aggressor nations, terrorist groups, criminals, disgruntled employees and computer hackers, may also rise.

¹ Based on North American Electric Reliability Council definition of reliability.

3.0 Methodology

The study was conducted primarily through interviews with senior executives in the electric, oil and gas, and telecommunications industries as well as related industries, which included law firms, insurance companies and financial institutions. Prior to conducting interviews, a review of prior PCCIP studies and surveys was performed. Existing regulations applicable to the electric power, oil and gas and telecommunications industries and the effect of deregulation on competitiveness and service reliability were also reviewed. Gathering the opinions of experts within the field, however, was believed to be the most effective method of understanding current industry practices and identifying expectations and important issues in each of the three infrastructures.

3.1 Selection of Interview Candidates

Within the oil and gas, electric, and telecommunications industries, potential interviewees were categorized into service providers, consumer advocacy groups and trade associations in order to gain perspectives from all the different players in the industry. Service providers were selected according to criteria of geographical diversity, size, and market niche. Large industry leaders as well as smaller companies dispersed around the country were thus selected. Participants from the oil and gas and telecommunications sectors were also selected in a manner that reflected the variety of services provided by the market. In the oil and gas industry, this meant oil and gas marketers, suppliers, and pipeline companies.

For the telecommunications sector, interviews were carried out with Internet service providers, telephone/cellular companies (which were further subdivided into local and long-distance companies), information technology and database companies, and major customers. Many of these participants considered themselves to be both customers and service providers. This was particularly true of those participants within the information technology sector and the Internet service providers. The perspectives captured ranged from residential consumers to major business customers to a wide range of service providers and trade associations. Most participants requested confidentiality.

In the electric power industry, utilities were selected to represent large, federally owned wholesale power providers, electric utility cooperatives, investor-owned utilities and municipal utilities. The utilities also represented the power generators, transmitters and distributors. Interviews with foreign service providers were also carried out for purposes of comparison and to gain an international perspective. For all three industries, individuals from different divisions within the companies, and thus playing different roles in the system, were interviewed. Many of the interview participants were at the director/vice president level or higher within their organizations. Specialists or experts in a several areas, including network integrity or security management, government and legal affairs were also interviewed.

Insurance companies providing coverage for business interruptions and associated third party liability claims, and coverage for cyber and terrorist attacks were also interviewed. Law firms were often suggested by participants in the industry interviews, and additional participants were also identified to ensure that the electric, oil and gas, and telecommunications industries were all represented. Financial institutions consisted mainly of investment banks having investments in any of the three industry sectors, although some commercial banks were also contacted.

Twenty-four organizations were identified for the oil and gas industry, out of which 12 interviews were completed. Twenty-five were contacted in the electric utility industry, and 15 interviews carried out. Finally, in the telecommunications industry, twenty-one organizations were contacted, and 17 interviews completed. Within the related industries, 6 interviews were carried out with law firms, or in one case, with the legal counsel of a trade association. Four interviews were carried out with insurance companies, and two with financial institutions. In all, 56 interviews were completed.

3.2 Development of the Interview Guide

C&L developed an interview guide based on the issues that were of interest to PCCIP. One interview guide was utilized for all interviews.² This was done to maintain an appropriate amount of consistency across interviews in the three primary industries, and to allow the interviewers to manage the individual interviews according to the participant's responses, knowledge of the industry, industry category (service provider, consumer advocacy or trade association), and their position within their company. For this reason, questions were intentionally structured in such a way that they could be answered from multiple perspectives. While some of the interview questions may appear to be redundant, they were phrased so that they would cover any specific points that participants may have overlooked in responding to a related question. Some questions were deliberately left ambiguous, in order to avoid influencing participants responses. Additional questions were asked, if required, to delve further into issues raised during earlier interviews. To expedite the interview process and in order to facilitate management of individual interviews, these were carried out either in person or by telephone.

² See Appendix 1.

4.0 The Telecommunications Industry

4.1 Industry Background

This section presents an overview of the telecommunications industry, discussing the deregulation effort in the industry, changes that have occurred with deregulation, and regulatory standards addressing service interruptions.

The telecommunications industry underlies all other sectors within the country's infrastructure. The impact of policy in this area will therefore have a disproportionately large impact on the reliability of the country's infrastructure. The Telecommunications Act of 1996 has resulted in a flurry of activity within the industry as deregulation has spurred the emergence of new entrants and non-conventional service providers. There are a number of trends which are of concern within the industry including deregulation, the increasing threat of hackers and cyber attacks, and the economy's growing dependency on the telecommunications industry. Taken in aggregate, these trends have caused concern regarding the potential liability and insurance issues surrounding interruptions in service.

The Telecommunications Act of 1996 was the first major overhaul of telecommunications law since the Communications Act of 1934 which established the Federal Communications Commission (FCC). The goal of the Telecommunications Act of 1996 is to remove the legal and economic obstacles from the market and foster higher levels of competition in the communications business. The hope is that this will spur innovation, offer a broader range of options for customers, lower prices and increase U.S. competitiveness within the telecommunications service sector.

There has been much debate over the past twenty years about rewriting the telecommunications law. The breakup of AT&T as ordered by the Justice Department in 1982 was the first major step toward a competitive market. The Justice Department's consent decree ordered the breakup of AT&T from its 22 local telephone monopolies, the Bell Companies. It required the Bell Companies to offer all long distance companies and information providers equal access to the Bell telephone networks. In light of the Bells' continued market power, they also prohibited participation in the long distance, information services and equipment manufacturing markets.

The primary goal of the Telecommunications Act of 1996 has been the development of a competitive local telephone market and deregulation of cable television services. The law requires that local phone companies unbundle local phone networks so competitors can buy and sell the network elements they need to put together their own service packages. Local phone companies must also allow competitors to interconnect at all feasible points in their network and do so at reasonable prices.

The economy's increasing dependency on telecommunications services has caused concern about the liability issues surrounding service interruptions. Currently the liabilities are limited by FCC

tariffs and contract provisions. It is standard practice within the industry for large customers to include non-performance penalties in their service contracts (regardless of the cause of the service interruption). These penalties are generally limited to non-payment for services if a specified level of service reliability is not maintained.

The federal law regarding reporting requirements for service interruptions is Title 47, Chapter I, Subchapter B, Part 63 which states that outages of more than 30 minutes will be reported to the Commission's Monitoring Watch Officer, in the Federal Commission's headquarters in Washington DC. Initial notification times (oral or written) vary from 120 minutes to 3 days depending on the number of customers or service lines affected. For outages affecting 50,000 or more customers, special offices and facilities (such as 911 or major airports) or those affecting national security/emergency preparedness must all be notified within 120 minutes if the outage is expected to last more than 30 minutes.

Since the telecommunications industry first opened up in 1982, numerous entities have thus entered the market. The unbundling of telecommunications services has meant that customers can select amongst a variety of individual network elements to fit their particular needs. Growing reliance on telecommunications has raised concerns regarding the threat of cyber attacks on the system's integrity and security, and consequently, of liabilities affecting service providers.

4.2 Telecommunications Industry Study Results

Sections 4.2.1 to 4.2.3 provide a brief overview of issues relating to reliability of service. Industry perceptions of threats to uninterruptible service, and the protection systems and industry standards they comply with are introduced. Sections 4.2.4 and 4.2.5 delve further into the effect of competitiveness on reliability of service and service provider liabilities associated with business interruptions respectively. Customer expectations for uninterruptible service, and their responsibilities in maintaining reliable service are discussed in section 4.2.6.

4.2.1 Threats to Reliable Service

Human error is still the greatest threat to reliable service but cyber attacks are a growing concern.

Perceptions of the current threats to service reliability varied among the interviewees. Most of the telephone companies and major customers acknowledged that physical disturbances (such as cable dig-ups) and software problems resulting from human error were the most common cause of service interruptions. Internet service providers and information technology organizations view hackers as a higher priority. Looking forward, most participants agreed that cyber attacks were the greatest threat to service reliability within the telecommunication and information technology sectors.

4.2.2 Industry Protection Measures

There are a host of technical and operational measures that maintain a high level of service reliability in the telecommunications sector.

The general consensus within the industry is that “uninterruptible service,” taken literally, is not possible. The service currently provided within the telecommunications sector approaches uninterruptibility, and there are high costs associated with extending protective mechanisms too far beyond current industry practice. Most service providers offer network redundancies and anti-hacking firewalls to protect themselves and minimize service interruptions. Contingency plans and disaster recovery plans are standard management tools for strategically planning and responding to service interruptions. Major customers subscribe to multiple services as a backup plan.

Industry leaders incorporate best practices such as internal audits, performance gap analysis, benchmarking and “reliability in design” which incorporates redundancies into the system architecture. Sonet equipment is deployed that maintains service by allowing traffic to reverse flow if a fiber is cut. Contingency plans are regularly exercised in preparation for an emergency situation. One company has gone so far as to develop a reliability equation that weighs the investment in service reliability against the company’s returns in the market place. In this way a company can estimate what level of service the market demands. Individual components of the

investment in service reliability can then be analyzed to determine where the provider can add the most value. While the company was not willing to disclose details on the calculations involved in the reliability equation, the interviewee explained that it is used to measure the value customers place on reliability of service. It has indicated that there is a significant weighting on reliability by customers.

4.2.3 Due Diligence Standards

Telecommunication standards are generally market-driven.

Numerous due diligence standards exist within the industry for maintaining reliable service. FCC advisory committees have generated several reports that have included various standards that have been beneficial to the industry. However, participants generally indicated that standards that exist through legislation (at state and federal level) and through various trade associations are not at acceptable levels to dictate their operations. Most participants indicated that their due diligence standards are set internally at levels much higher than those dictated by any outside body. This is to meet the more stringent demands of the customer and the competitive marketplace. For example, Internet service providers referenced standards set by the Internet Engineering Task Force (IETF) which focus on interoperability. One company explained that its network infrastructure is a separate network that cannot be accessed externally (from outside the company). This is not required by external standards. An Internet service provider also explained that there are no standards on the maximum capacity or number of users an Internet backbone circuit can carry. Nevertheless, the company has found a level that maximizes the use of the capacity but minimizes the loss to the customer to avoid performance degradation.

4.2.4 Reliability of Service

There is a trend toward providing a level of service reliability that more closely meets the customer's specific needs. Deregulation should have long-term positive impacts on deregulation.

There are currently many service providers (particularly telephone companies) that can provide their customers with higher levels of reliability at some added cost. The acceptable cost is dependent on the level of service required to meet customer demands. It is becoming more and more common for service providers to negotiate contracts directly with the customer to meet individual needs. This is a trend which is expected to continue.

The burden for reliable service falls on the customer to the extent that they own part of the infrastructure. There are also options available that the customer can pursue on their premises or through private sector mechanisms. Most customers do not feel the necessity to do this since the burden of providing highly reliable service, in their opinion, should fall entirely on the service provider.

A close relationship exists between the cost of providing the service and its level of uninterruptedness. Once a certain level is reached, large expenditures provide diminishing returns in terms of service reliability. Generally, the cost of maintaining a high level of service reliability is considered a basic cost of doing business. A company cannot survive in the industry without meeting these high standards; they need to sell reliability or they will lose customers.

The economics of the Internet service lead to higher levels of over-subscribing than are experienced in other sectors of the telecommunications industry. This threatens service reliability, but is considered acceptable practice due to the cost of over-engineering. Not over-subscribing would in effect amount to a series of private networks which would not be economically feasible.

Most interviewees expect deregulation to have a positive long-term impact on service reliability due to competition and the demands of the consumer. Market forces may also drive technological advances that can help curb terrorist threats. Many participants expressed concern about short-term service problems that might be associated with new market entrants and non-traditional service providers who do not have the sophistication or systems in place to provide the high level of service that customers expect. This was cited as already being a problem with small Internet service providers. Although it may take some time for the market to evolve to a truly competitive environment, market forces are expected to dictate the level of service reliability.

The general belief is that a company cannot survive for very long in the industry without taking adequate precautionary measures to guarantee a reasonable level of service reliability for their customers. Service providers were unaware of any telecommunications companies that have gone out of business because they have not guaranteed a reasonable level of service reliability. One interviewee, however, knew of some local Internet Service Providers (ISPs) that had gone out of business because of their poor customer service. The interviewee was unwilling to provide the names of these ISPs. Another incident was cited concerning a 5 or 6 hour service interruption that occurred about 3 years ago in the New York area and lasted 5 to 6 hours. Following this incident, some major telecommunications customers decided to divert some of their traffic away from the telecommunications company involved, in order to secure a higher level of reliability. Interviewees also argued that the market is driving an increase in reliability. A look at the telecommunications companies revenue streams indicates that customer selection of service providers is heavily dependent on reliability.

Concerns were voiced about the security problems that might be associated with deregulation and allowing new entrants access to their networks. There is a tradeoff in providing user-friendly access and protecting the network from hackers. Some companies have indicated that they will need to develop better security systems to protect their networks. No one indicated that the protective mechanisms that they currently employ would be diminished because of the cost-cutting pressures of a competitive market. These mechanisms are considered necessary to maintain the level of service reliability demanded by the customers, thus, are not considered expendable. It is believed that any company operating without the proper security mechanisms would not be successful in the long run.

4.2.5 Service Provider Liabilities

Contract provisions and market forces are the primary liabilities associated with service interruptions in the telecommunications sector.

Liabilities associated with service interruptions are not generally perceived to be an issue of concern within the industry unless there were a case of gross negligence. Most service providers have negotiated contracts with major customers that specifically address the liabilities associated with service interruptions. The liability rarely extends beyond the cost of service. FCC tariffs limit liabilities for telecommunications companies, except in the case of negligence. Under section 2.1.3 (A), regulations for Access Services Contract state that “the Telephone Company’s liability shall not exceed an amount equal to the proportionate charge for the service for the period during which the service was affected.”³ Under section 2.1.3 (C) they further state that

The Telephone Company is not liable for damages to the customer premises resulting from the furnishing of a service, including the installation and removal of equipment and associated wiring, unless the damage is caused by the Telephone Company’s negligence.⁴

Liabilities are not as large a concern as the severe damage that unreliable service can do to a company’s brand. Internet service providers include provisions in their access contracts that absolve them from any kind of liability for interruptions in service. Their customers are overwhelmingly residential.

The study assessed little awareness of any legal actions being taken for interruptions in service, other than a 1988 case involving Ameritech. Telecommunications companies cited a 1988 court case in Hinsdale, IL, involving Ameritech. In 1988, a fire broke out in an Ameritech central office in Illinois which cut off service to customers in Hinsdale for 6 weeks. The fire started on a cable which had been accidentally cut by a contract worker working on the cables in the same office two months earlier. The contract worker accidentally cut the cable while prying good cable away from the bad. He then covered the cut cable with duct tape and failed to report the incident.

Following a six week service interruption to customers in Hinsdale, a massive class action law suit was filed on behalf of business customers that had suffered economic losses due to the interruption. The plaintiff argued that Ameritech could have replaced the damaged switch and restored service within 6 days. Ameritech stated that it was not possible to replace a major switch connected to tens of thousands of lines in six days, and that it had done all in its power, including working with AT&T and Northern Telecom, to restore service as soon as possible. Ameritech had also provided residential customers with several payphones that could be used at no charge. Certain critical customers, such as a household with a child suffering from serious health

³ Tariff FCC No.1. GTE System Telephone Companies. See Appendix 2.

⁴ Ibid.

problems, were provided with free cell phones. Ameritech won the trial, the appeal and the case in the supreme court. Ameritech also sued the contractor and AT&T, which had originally set up the switch before deregulation. The contractor finally paid after about 100 depositions were made. Ameritech paid a settlement to hospitals and schools in order to help them improve their redundancies.

Ameritech also paid a settlement to the family of a retired gentleman who suffered a heart attack during the service interruption and died because the ambulance did not reach him in time. The family filed a personal injury suit against Ameritech, which eventually settled for 10% of what the case was worth, paying \$60,000 rather than the \$300,000 to \$400,000 that would normally be expected during such cases. The 10% figure was agreed upon since the police voluntarily posted their officers and cars, equipped with cellular phones from Ameritech, in the affected area during the service interruption. In the event of an emergency a resident could thus run to the nearest car for help. The wife of the retired gentleman ran to the nearest police car to call for help, but the delay proved to be too long.

Ameritech has never lost a court case for service interruption. Such claims can usually be dismissed, as their contracts, which are typical of all telecommunications companies, stipulate that they are not responsible for any loss or injury arising from negligence except for the amount that the customer would have to pay for telephone services. According to Illinois tort law, Ameritech is thus not responsible for economic loss suffered by a customer during a service interruption. The customer must obtain insurance coverage against such loss. Ameritech is responsible for property damage, however, in which case it will also refund any economic loss suffered. Legal issues are generally avoided by telecommunications companies by incorporating penalties and service requirements into service contracts. Companies were unwilling to provide copies of typical contracts, and indicated that the limitations to liability are specified in the FCC tariffs (see Appendix 2). There is some speculation that the problems caused by the year 2000 software glitch may be a forerunner to some legal activity.

Many of the service providers offer service to the customer in name only; it is actually a patchwork of various providers using the brand name. Thus, assigning liability would require an understanding of the part each component plays. Several participants indicated that there are “seams” in the infrastructure that are responsible for most of the problems. It will be necessary to define and understand who had due diligence for the part of the system that fails if liability is to be assigned.

Most study participants did not believe that there are reasonable requirements that could be asked of service providers in order to ensure service. This is an area they would like to see handled internally and left to the marketplace for resolution. Participants noted that it would be difficult to set a level of investment in “protection of service” that would absolve a provider from liability from service interruptions.

Interviewees were unaware of any service guarantee being offered for uninterruptible service. What is not uncommon, however is to guarantee service at some reasonable level and offer

refunds or pay penalties if this level of service was not met. If service was not provided for more than a specified number of minutes in a day, the day of service would be free, for example. The same level of service can be specified in terms of hours per month, etc. These types of service level agreements with non-billing provisions or discounts are becoming more common in the industry.

Participants saw no difference in liability issues associated with interruptions in service that were caused by terrorism or interruptions in service that resulted from other events such as natural disasters.

4.2.6 Customer Expectations

*Most customers would like to be guaranteed a high level of standard service reliability.
Customer awareness and education will become more important in a deregulated environment.*

Customer expectations and needs for reliable service vary widely. Consumers demand that some minimum level of service be offered to everyone and that “seamless” service be available. This minimum level of service is expected to be safe, adequate and reliable. This is an issue of greater concern in the deregulated environment given that certain rural residential customers are already experiencing service problems. A fear exists that companies will focus on the areas where higher premiums are generated. More sophisticated, larger customers frequently demand a much higher level of reliability and are willing to pay for it. Increased reliability usually comes in the form of alternate service routes. Additional reliability is available to all customers, but is generally requested only by customers such as NASDAQ, Air Traffic Controllers and financial institutions, that need an extremely high level of reliability. These customers need proof that the service provider can provide the reliability they require.

Interviewees were unable to provide estimates of the level of reliability offered in comparison to the price, as the percentage increase in cost to customers varies depending on the additional services requested by the customer and distance between the customer and wire center. In addition, the service provider must create routing tables to identify the possible paths the user can be connected to, and determine which additional hardware capabilities, such as switches, or in-going and out-going trunks, will be necessary. All these variables must be taken into account when calculating the cost increase. One interviewee estimated that the percentage increase in price for a higher level of reliability would be between 10 to 25%.

Some of the larger service providers acknowledged a level of responsibility to their stakeholders which includes a reasonable level of preventative measures to guarantee reliable service and having contingency plans in the case of emergencies. Customers generally believe that the burden for reliable service should fall on the provider, but acknowledge that if exceptional levels of service are demanded then the customer should pay for this. This higher level of service should only be offered for extraordinary situations, however and the standard level of service reliability should in itself be very high. Customers are sometimes covered by general insurance policies that may help cover losses resulting from service interruption which would fall under an “act of

God.” Customers believe that any insurance coverage responsibilities should be the responsibility of the service provider.

Some participants pointed out that the customer is responsible for reliable service to the extent that part of the system is located on their premise. No matter how reliable the network is, the access portion of the system needs to be factored in. If customers want redundancy, for example, they may need to provide a diversity of paths from their location. Some believe that the customers have the responsibility of protecting their access and making their end of the network secure. Industry also believes that it is the burden of the customer to select a service that matches their individual needs.

One of the most important issues that often arose during the interviews was the lack of awareness among the general public. Large, sophisticated customers are already working directly with service providers to see that their needs are met. Smaller businesses and residential customers are generally not aware of important issues of concern in the industry and options that are available to them. For a competitive market to evolve to a point where individual needs can be met, a higher level of awareness must be developed among the customers. This will be increasingly important as the market becomes more deregulated.

4.3 Telecommunications Service Reliability: Solutions and Improvements

The following sections report options proposed by study participants to address increase infrastructure assurance. Section 4.3.1 specifically addresses industry mechanisms, such as internal controls, to improve system reliability, whereas section 4.3.2 presents possible private sector approaches. Section 4.3.3 deals with the current insurance policies and products available to protect service providers from liabilities, and highlights how these practices have evolved in response to liabilities in a competitive environment. Regulatory options for improving reliability are the subject of section 4.3.4.

4.3.1 Industry Mechanisms

The industry can do a lot to protect itself from the threat of service interruptions by adopting best practices and working directly with the customer.

The study identified a strong belief within the industry that service providers can protect themselves to a great degree from terrorist attacks and interruptions in service through the adoption of best practices, internal controls and planning. Many study participants highlighted the need for a mechanism by which best practices and information can be shared within the industry, such as a forum and incentives for cooperation and information sharing. It is generally believed that a third party would be required to achieve this. The National Security Information Exchange was cited by one of the participating industry trade associations as a potential forum for the exchange of sensitive information. This, as well as a number of other forums or conferences, such as the Information Security Conference, exist to facilitate information sharing between government and industry. The National Security Information Exchange in particular, is a subgroup of the Network Security Group, which in turn is a Task Force group of the National Security Telecommunications Advisory Committee (NSTAC). NSTAC has 30 member organizations, comprising electric, telecommunications, and system integrator groups. These groups meet to discuss network problems and services and actions that could be taken to address these problems. Every 9 months, recommendations are then made to the President of the United States on telecommunications technology and policy issues.

Most participants agreed that it is feasible for service providers to work directly with customers to help them make choices regarding acceptance of risk of service interruptions, alternative sources and other options to meet consumer demands for reliable service. Issues of concern that arose from customers include a lack of competition in the short run and a lack of customer education/awareness.

Services that can be offered to meet higher levels of reliability include dual feeds, backup paths and redundant architectures. These are excessive for most applications and high in cost. The added cost should be borne by the customer demanding this protection.

4.3.2 Private Sector

The private sector can also contribute to maintaining high levels of service reliability and meeting the needs of individual customers.

There are various options available for risk mitigation in the private sector to meet the need for reliable service. Customers can use contractors such as SunGard for reliability planning for example. There are many dual or triple liability mitigation schemes currently in place, which develop first, second and third contingency plans to protect customers during service interruptions. Examples of this include alternate routing, Sonet systems, which restore service to a damaged line within milliseconds, and pre-planning for times when the traffic load on the lines is too heavy. To deal with this last situation, telecommunications companies will sometimes have agreements with other providers to which they can transfer some of their load. Service providers suspect that most of the customers do not understand the risk associated with these types of private sector services.

Other private sector solutions revolve around competition, innovation and the market for telecommunications equipment. Participants believe that suppliers will respond to the more competitive market by providing more secure, higher quality components that could improve network security service reliability. Market forces and competition were considered by most participants to be more than adequate to ensure a high level of service reliability. Some people even indicated that improved service reliability may be an effective way for service providers to differentiate themselves in a competitive market.

4.3.3 Insurance Mechanisms

A role for the insurance industry could evolve if service reliability becomes more of an issue.

Self-insurance is very common in the telecommunications industry. Most providers only have insurance that would cover them for something like a major disaster. When this coverage is elected it generally has an extremely high deductible. Even though insurance could cover the direct monetary losses, it could never cover the high cost associated with the damage to a brand that could result from a major interruption in service.

Insurance contracts within the industry have not evolved to a point where there is specific coverage from claims resulting from interruptions in service. Interviewees noted that it would be a complicated task for underwriters to determine levels of risk. Also, the ultimate cost would eventually be passed on to the consumer. No participants were aware of insurance contracts that reward or penalize the insured based on the adoption or rejection of practices and/or standards that increase or decrease reliability.

Several interviewees acknowledged that there may eventually be a role for the insurance industry in covering claims resulting from interruptions in service. This was generally not viewed as highly likely or as an issue of concern at this time.

4.3.4 Regulatory Options

There is a limited role for government in guaranteeing universal service, supporting initiatives in the area of network security, fostering the sharing of information, and educating the public. Most within the industry believe that market forces will adequately assure service reliability and that government involvement should be limited.

There are currently a host of regulations relating to telecommunications service at both the state and federal level. The specifics vary widely from state-to-state but are generally not considered to be a driver within the industry to maintain reliable service. There are no consistent industry-wide standards that are used. The level of service is dictated by market demands which tend to exceed the regulations.

Most interviewees did not recommend any regulatory options for indemnifying service providers from liabilities resulting from interruptions in service. There was strong opposition from most industry leaders to government interference in any form, including provisions for indemnification. The general consensus is that industry will be guided by business considerations to protect itself against physical and cyber-attack as the threat to the industry evolves. Some service providers agreed that government should play a limited role in the transformation to a truly competitive environment. The ultimate goal was seen as eliminating the need for any government involvement.

Customers were the primary proponents of some form of regulation to ensure a minimum level of service. This would most likely take the form of a cooperative effort between the government and industry to develop industry standards that would ensure a high level of service throughout the industry. Some of the more sophisticated customers pointed out that this may not be feasible, however, due to the rapid technological advances that would render standards obsolete very quickly. Larger customers were also more confident that the competitive marketplace would ensure reliability.

Some industry trade associations support the idea of establishing a set of minimum industry standards. Although some service providers agreed that this might be beneficial, service providers generally preferred to let the market dictate a minimum level of service. The basic argument is that if the market will reward standards then they will be adopted voluntarily and that these mechanisms supersede the need for any kind of regulatory involvement.

Encryption was mentioned by several participants as a way for the industry to protect itself from hackers and cyber attacks. These participants felt that government should not restrict the use of cryptography.

There were varying levels of support from all categories of participants for government roles in the following activities:

- Guaranteeing universal service.
- Providing funding for and working in cooperation with industry associations and standards bodies.
- Making cyber crimes and network a priority in the industry.
- Support industry in development and use of high quality cryptography.
- Providing legislation to prosecute cyber crimes.
- Raising awareness among the public on telecommunications and Internet-related issues.
- Create incentives for information sharing among competitors, require standardized reporting of reliability/performance information.

4.4 International Perspective

Liabilities for business interruptions in Great Britain and Italy are used as a comparison to the situation in the U.S.

There are international models for handling the liabilities associated with service interruptions. In Great Britain, for example, the service provider has 24 hours to restore service once an interruption is reported after which they are charged £8.87 per day for residential customers and £25.00 per day per line for business customers. If the customer believes that the business rebate is not adequate, they must go through a process called Actual Financial Loss according to which they have to provide proof that they have lost more than £25.00 as a result of the service interruption.

Service providers in Italy must meet due diligence standards dictated by the Department of Telecommunications. These standards include provisions on reliability and loss of service, and regulate the “general customer” base. When a customer has a tangible damage from loss of service, and the provisions in the standards allow them to file a claim, they get reimbursed from the provider for the damage incurred. Major industrial clients have business contracts that includes provisions for loss of service. When regulated by a contract, there is no burden of proof placed on the customer. The reimbursement is predetermined in the contract and is independent of the cause of the interruption in service. The service providers cover themselves from these losses by carrying insurance. In the case of litigation, courts rule on the basis of the due diligence standards.

4.5 Telecommunications Industry Conclusions

The study identified general consensus throughout the interviews on the following points:

- The general consensus is that “uninterruptible service” taken literally, is not possible. Current service approaches uninterruptibility and increasing those levels may be cost prohibitive.
- Liabilities and insurance with regards to interruptions in service are not currently an issue of concern within the industry.
- Deregulation should have a long-term positive impact on service reliability. There may be a transition period during which service reliability becomes a problem.
- Cyber terrorism is perceived to be the fastest growing threat to network integrity and service reliability.
- Customer awareness regarding service options and customer responsibilities for maintaining network security, among other things, will become increasingly important as deregulation progresses and competition increases.
- There is a need within the industry for increased sharing of information and best practices.
- While controversial, government may have a limited role to play in some areas, which include: guaranteeing universal service, supporting initiatives in the area of network security, fostering the sharing of information, and educating the public.
- Numerous standards exist to maintain reliable service, but most participants felt that internal company standards are generally more stringent than those dictated by any external body.

5.0 The Electric Utility Industry

5.1 Industry Background

This section summarizes the service reliability and wholesale transaction regulations as well as the electric utility industry's progress in deregulating.

The electric utility industry, which has traditionally been a vertically integrated and regulated industry in the U.S. is now undergoing a major deregulation and restructuring effort. The electric industry consists of electrical power generators, transmission networks, distribution lines, and control centers. Transmission lines carry power from the generator to distribution lines, that take it directly to the customer. Until now, the various components of the network have generally been owned by the same company, but deregulation will probably bring about service providers who are only generators, transmitters, distributors or some combination of providers.

Aspects of the electric industry are subject to Federal Energy Regulatory Commission (FERC) regulations, which controls interstate transmission and interstate wholesale power transactions. State regulators regulate sales by investor-owned and some public power utilities retail sales. The North American Electric Reliability Council (NERC) also plays an important role across the country through its guidelines to promote electric reliability. Regional NERC entities have issued additional protection and reliability standards, such as the Western Systems Coordinating Council (WSCC).

The Public Utilities Regulatory Policy Act (PURPA) of 1978, took the first step towards competition by requiring utilities to purchase power from small electric power production companies that utilized renewable energy sources or cogeneration, and thus began to separate generation from delivery. The Energy Policy Act of 1992 then allowed these power producers to sell power to utilities at unregulated market rates. Most recently, FERC Order 888, issued on April 24, 1996, determines that utilities must file nondiscriminatory open access tariffs that offer others the same transmission service they possess. Order 888 also allows for the full recovery of stranded costs, which are those costs incurred by service providers if wholesale customers switch to another supplier. FERC Order 889, also referred to as the Open Access Sametime Information System or OASIS rule, requires utilities to publish information about their transmission systems and wholesale power transactions on OASIS, which will be available on the Internet.

Independent System Operators (ISO) will be formed in different regions across the U.S. to ensure system security and reliability. As an independent entity with no market interests, the ISO will establish the rates for transmission lines and will control the flow of electricity through the power grid. The ISO should thus be able to control fluctuations on the grid, prevent overloading of transmission lines and blackouts. Furthermore, the ISO will ascertain that all service providers are permitted non-discriminatory access to transmission lines. This will be crucial to encouraging competition, as it would be extremely expensive, both economically and environmentally, for each new market entrant to build its own transmission and distribution lines. Consequently,

existing transmission lines will probably have to carry most, if not all, of the load of new market entrants. In order for the ISO system to work, however, utilities and regulators will have to ensure that it is autonomous and does not have any vested interests in the market.

The electric utility industry has recently begun deregulating. Services are being unbundled and various niche providers are entering the market. Existing utilities are now required to open their transmission lines to others at nondiscriminatory rates. Independent System Operators will be responsible for ensuring system reliability and security. The impartiality and autonomy of the ISO is considered to be of great importance in encouraging competition.

5.2 Electric Utility Industry Study Results

In following sections, 5.2.1 relates to industry perceptions of significant threats to infrastructure integrity, standard industry protection measures that are employed to deal with these threats (5.2.2) and any due diligence standards for reliability of service which may exist (5.2.3). Section 5.2.4 addresses reliability of service by first examining the availability of uninterrupted power supply, and by then entering into a discussion on the effect of deregulation on service reliability. Following this, in 5.2.5, service provider liabilities and general trends in liability claims are dealt with. 5.2.6 describes the different classes into which customers are allocated according to their demands for reliability.

5.2.1 Threats to Reliable Service

Natural disasters are considered the most significant threats to reliable service

Acts of God, or natural events, are perceived to be the greatest threat to uninterruptible service, as these are events that cannot be foreseen. The majority (80%) of power failures are caused by damage to the distribution system. Threats to the bulk power system are different, as the most significant threat is the failure to communicate and cooperate during disturbances. For example, in 1994 the eastern part of the U.S. experienced large fuel shortages due to the cold weather. The American Public Power Association (APPA) believes that the primary factor for the power failure was the lapse of communication between the system operators. System operators need to communicate a lot of information (such as loadings and voltages on the system) in order to mitigate risks, which in APPA's opinion, the electric utility industry is not doing enough.

Terrorism is generally not perceived as a significant problem, although disgruntled employees and dismissed contractors have been known to tamper with computer systems and unsuccessfully attempt to delete files in a utility's computer information systems. Terrorist attacks are not thought to be a serious problem, primarily because they would have to cause widespread and massive damage in order to be considered a significant threat. This possibility is not perceived to be likely.

According to one view, a terrorist attack would have to eliminate at least two major facilities at one time in order to cause a major failure. This is explained by the fact that utilities usually perform reliability studies by carrying out a first contingency analysis, which involves planning enough redundancy for a single failure of a generator, a line, or another component of the system. Utilities are thus prepared for most first contingency situations, but rarely undertake second contingency analyses, as the chances of two components of the system failing are very low. If this were to happen, most utilities would be unprepared. Furthermore, even if a terrorist or hostile group attempted to eliminate two facilities, they would find it very difficult to do so, since the system is designed to heal disturbances fairly quickly.

Only one of the utilities interviewed suffered a terrorist attack in the past. In this case, the terrorist group blew up one of the utility's substations to demonstrate their sympathy for the

workers strike at the utility. Although the group responsible for the attack was identified, they were never prosecuted for their act.

Cyber attacks are thought to be a growing threat, but are not seen as a significant threat at the moment. Cyber attacks are nevertheless an increasing threat because of the growing use of automated supervisory control, or SCADA systems, through which outsiders or disgruntled employees can tap into a utility's control system. Disgruntled employees may become an increasing threat if deregulation results in mergers, causing downsizing of the workforce.

Independent information systems, which have little or no connection with outside communication systems, make most utility information systems relatively secure. Similarly, utilities also maintain some independent control and communications systems, consisting of microwave and some fiber-optic lines, that are employed for emergency situations and automatic remedial actions. Cyber and terrorist attacks may become a more substantial threat for transmission lines though, as power loads increase on key facilities. In contrast, some players in the industry feel that cyber attacks should not be a great threat in the future either, as industry is generally meeting the challenge fairly rapidly.

5.2.2 Industry Protection Measures

Industry has adopted numerous protection measures to ensure reliable service, but the lack of information sharing is still perceived as a problem.

There are a variety of contingency plans and protection measures in place across the industry. It is beyond the scope of this report to describe these plans in detail, but some examples are arrangements with other providers for additional power supply during emergencies, regular patrols, tree trimming programs, independent and secured information systems, and encroachment alarms. Nonetheless, as current encroachment alarm systems may be insufficient, service providers could consider installing proximity alarms such as body temperature alarms or pressure plates.

At present, the power grid possesses sufficient redundancies that it can rely upon during failures. Once these redundancies and control systems are in place, it is not expensive to maintain them. Redundancies are therefore not likely to decrease for those service providers who already have the systems in place, although new market entrants may be a different case.

According to one view, one of the most, if not the most, significant problem in relation to the system's security is the lack of sharing of basic measurement information, such as line loads and generating loads. Utilities model the risks in their own areas, but will not share this information with others. Thus, when developing their planning models, they assume that the situation in the large interconnected regional network is similar to theirs. The result is that generalized risk models and performance metrics are not yet available.

5.2.3 Due Diligence Standards

Electric utilities are not subject to mandatory due diligence standards, although voluntary electric reliability guidelines exist.

The North American Electric Reliability Council (NERC), whose members are electric utilities, establishes service reliability guidelines, as do some states. NERC guidelines have traditionally been voluntary and are applicable only to entities involved in the purchase or sale of wholesale power. In January 1997, NERC voted to make these guidelines mandatory, but has not developed mechanisms to enforce these guidelines. As a result, NERC guidelines are technically mandatory, but are not in practice. The guidelines are used to determine negligence and liability for service interruptions, however. Electric utilities that are not in compliance with NERC standards are determined to be negligent, and consequently can be held liable for damages suffered by the customer. This is discussed in further detail in the section on Service Provider Liabilities. In addition to the existing reliability guidelines, NERC is developing new engineering and operating standards, which will again be voluntary. Once the ISOs have been created, these will also promulgate maintenance and performance standards. Electric utilities do establish internal standards for service reliability, such as response times and minimum protection standards. None of these standards address terrorist attacks in particular, as terrorism is treated in the same manner as an act of God. Utilities maintain communication with law enforcement agencies, trade associations, and other bodies that warn them of any unusual circumstances requiring heightened security.

5.2.4 Reliability of Service

Firm service is provided to most customers across the industry, although service cannot be guaranteed as some events cannot be foreseen.

Firm service, or Uninterruptible Power Supply (UPS) as it is also known, is the norm for most service providers. With the exception of electric wholesalers, most electric utilities provide firm service to those customers who request it. Customers are allocated to different classes depending on the level of reliability they request and the time of power usage. Service providers and trade associations, however, argue that it is not possible to guarantee uninterruptible service with the current infrastructure as some events, such as natural disasters, are unforeseeable. Utilities would need to have their own power generation capabilities at each site in order to guarantee uninterrupted service.

Some utilities will help their customers install back-up generators that will provide energy if there is a failure somewhere along the power grid, but this does not constitute uninterruptible service, as the generator will take a few minutes to pick up. Back-up generators normally cannot provide enough power to keep all of the customer's electrical devices and systems running. The power supplied by the generator will only be sufficient to keep some of the basic necessities, such as lighting, functional. Some industries and businesses install battery systems which

continue to serve the computer network system until the generator begins supplying power. The burden for maintaining firm service to customers is placed entirely on the service provider. More reliable service is provided at an additional cost to the customer, but the exact relationship between the cost of providing firm service and its uninterruptibility varies depending on the load required by the customer.

Many fear that deregulation will degrade service reliability, at least during the transition phase.

There is a great deal of speculation on the effect that deregulation will have on service reliability. The common argument is that there will be a degradation of service reliability, as competition will encourage service providers to diminish redundancies in an effort to cut costs. Until now, the electric utility industry has been characterized by a few players possessing large resources. With deregulation, the number of players in the industry, and consequently competition, will increase. Cost-cutting efforts could drive service providers to operate closer to their security limits. As contracts are likely to be made on a shorter term basis than at present, it will be more difficult for end-consumers and distribution and transmission companies purchasing their energy from power generators to know where their power supply will come from on a day to day basis. This indicates that there will be many more variables in the market, which according to some, could degrade reliability of service, at least during the transition into the competitive market.

Some argue that power generation capabilities in the U.S. are insufficient to meet energy demand during peak hours. One opinion is that this situation will deteriorate with deregulation, as new market entrants will be unwilling to build power generation capabilities for fear of not recovering their costs. Others state, however, that this is a temporary problem resulting from uncertainty. Players in the industry do not know what the new rules of the game will be, and are concerned about recovering their past investments in power generation. Most of the existing utilities in Massachusetts and some on the West Coast are thus moving out of the power generating business. To compensate, there are many new entrants seeking to adopt this business, whose units are expected to be more efficient than the existing ones. Thus, while power generation capabilities may be insufficient at present, during the transition into deregulation, this may not be a problem in the future.

Geographic diversity of control areas may grow as well. This could prove to be a problem for service providers who find themselves having to purchase additional power from a generator in another corner of the country during an emergency situation. Another common fear is that transmission lines will probably become more vulnerable and prone to failure as the existing lines take on a greater load. Once again, this could turn out to be a short-term problem. The issue, according to one provider, is really one of a "load pocket." In a competitive environment, businesses cannot be ordered to remain open, and one could be faced with a situation in which a new provider suddenly decides to shut down its facilities because it feels that its tariffs were too low for it to continue operating. There are two possible solutions to this situation. First, another entity could enter the market and fulfill that need, although there is no guarantee that this would

happen. Second, ISOs could offer monetary incentives to the provider to continue to supply electricity.

In summary, the concern is that deregulation may increase the number of variables at play, thus enhancing the potential for a degradation in service reliability. Conversely, deregulation and increased competition may not only maintain, but improve service reliability as utilities strive to provide better service than their competitors. The common view, however, is that reliability standards will not improve, and may even suffer.

One interviewee felt that the potential for degradation of quality of service, as opposed to reliability, is of greater concern. While reliability of service refers to the transmission of power from the power generator down to the end-consumer, quality relates to service connections and repair. Ultimately, much will depend on whether deregulation is carried out properly or not. According to one interviewee, it is quite possible that deregulation will not encourage competition, but that it will result in numerous mergers. This would threaten reliability as power capabilities could be less distributed and autonomous. There would therefore be some very significant points of failure. At present, the decentralization of the electric industry is an aid to reliability and the robustness of the system.

5.2.5 Service Provider Liabilities

Service providers are held liable for service interruptions only in cases of negligence. This is illustrated by the following legal actions.

Mosby v. Southwestern Electric Power Company

Electric utilities are held liable for direct damages from interruptions in service resulting from negligence. Direct damages occur if the customer arranges for substitute energy supply when its usual service provider experiences a power failure. The cost of the substitute energy is a direct damage to the customer, since the customer has paid for service it is temporarily not receiving. Any time a customer claims damages due to a business interruption, the utility's security systems and its operating practices undergo investigation. If NERC guidelines are applicable to the utility, and it is not in compliance with the guidelines, it is found negligent and can be held liable. Compliance with safety standards however, does not necessarily imply that utilities cannot be held liable for service interruptions. In Mosby v. Southwestern Electric Power Company, 659 F. 2d 680 (1981), Cynthia Mosby brought a suit against Southwestern Electric Power Company (SWEPCO) for damages for her husband's death, caused by electrocution. Her husband died while erecting a CB radio antenna, which hit an overhead electric transmission line. Despite the fact that the height, location and construction of the transmission line were in compliance with the industry standards and the National Electric Safety Code (NESC), the District Court for the Eastern District of Texas, at Marshall, held SWEPCO responsible for 75 % of the negligence. The deceased was held responsible for 25% of the negligence, given that he was aware of the danger of hitting the line. This decision was then reversed and rendered by the Court of Appeals,

which ruled that the company was not liable, as this was not a foreseeable event and because the company was in compliance with industry standards and the NESC.⁵

Mancuso v. Southern California Edison

Utilities cannot be held liable for damages resulting from events that can be attributed to a *force majeure*, which refers to any situation beyond one's control, such as an act of God or a terrorist attack. This is demonstrated by the case Mancuso v. Southern California Edison, 232 Cal. App. 3d 88 (1991), in which the plaintiff, Anthony Mancuso, argued that his business had been destroyed by a fire caused by a surge in power resulting from a lightning strike on the company's facilities. The Superior Court of Los Angeles County rejected Southern California Edison's assertion that this was an act of God, and stated that this was a foreseeable natural event. The Court of Appeals then reversed and remanded this ruling, however, holding that there was evidence that "the lightning strike was unforeseeably intense, or if foreseeable that no act or omission of the utility was a proximate cause of plaintiff's damage."⁶

Terrorist and cyber attacks are perceived to be similar situations to natural disasters in that both are largely unpredictable. Terrorist and cyber attacks are different from other threats to service reliability, such as failures resulting from imprudent or negligent practice on the part of the provider, as there is a different level of accountability associated with the two situations.

Most utilities have received many claims from customers, either from industry for loss of business, or from households for damage to equipment. Utilities are generally not required to pay for third party damage, since damage to customer equipment is usually caused by natural disasters rather than negligence. More often than not, utilities are able to reject claims, and have rarely gone to court over damage claims. This is primarily because customers would have to undergo a long and arduous process to prove negligence on the utility's part. The customer must prove that there is a direct link between the utility's actions and the damages incurred, and that he, the customer did not contribute to the damage.

Monsanto Co. v. Tennessee Valley Authority

To complicate matters further, individual contracts may stipulate who will be liable under different circumstances. For instance, in Monsanto Co. v. Tennessee Valley Authority, 616 F. 2d 887, in which Monsanto filed a claim to recover damages incurred during a service interruption. The interruption to Monsanto's plant in Decatur, AL, occurred on January 6, 1977, while the Tennessee Valley Authority (TVA) was conducting a maintenance test on its facilities at its Trinity Substation. The contract between Monsanto and TVA stated that:

⁵ Mosby v. Southwestern Electric Power Company, 659 F. 2d 680 (5th Circuit, 1981). p. 680-684.

⁶ Mancuso v. Southern California Edison Company, 232 Cal. App. 3d 88 (1991) p. 888.

It is recognized by the parties that the availability of power to Company [Monsanto] may be interrupted or curtailed from time to time during the term of this contract *because of force majeure or otherwise*. Company shall be solely responsible for providing and maintaining such equipment in its plant and such emergency operating procedures as may be required to safeguard persons on its property, and its operations from the effects of such interruptions or curtailments. *Company assumes all risk of loss, injury or damage to Company resulting from such interruptions or curtailments*. If any such interruption or curtailment lasts longer than 30 consecutive minutes, TVA shall cancel or proportionately reduces, as the case may be, the charges for services for the period of such interruption or curtailment.

The trial judge held that the term “otherwise” indemnified TVA from interruptions due to negligence. The contract stipulated that Monsanto was entitled to compensation if the duration of the outage was more than 30 minutes, whereas in this case, the failure lasted less than 30 minutes. In an appeal, Monsanto argued that the terminology of the contract was not clear enough to warrant a grant of summary judgment. In an appeal trial, the issue of “whether the term ‘otherwise’ immediately following the term ‘force majeure’ was designed to encompass the negligence of TVA” was to be resolved.⁷

Bonneville Power Administration

Following the west coast power outages in July and August of 1996, Bonneville Power Administration (BPA) was presented with a number of liability claims for loss of service and damage to equipment. Many of the claims which were originally presented to local utilities, were redirected to BPA. The failure of a BPA line was the first failure, which, combined with a number of other factors, led to a series of failures. As the BPA line was the first to fail, other utilities involved redirected all their customer claims to them. BPA has rejected all claims so far, as their contracts, like those of most electric service providers, stipulate that they are liable for service interruptions and damage or injury only in cases of negligence. Whereas earlier FERC tariffs held that service providers would be liable only in cases of *gross* negligence, FERC Order 888 now states that utilities are harmless except in cases of negligence. Service providers are concerned about the significance of the change in language, but FERC has reassured them that service provider liabilities are unaffected.

Since utilities are largely indemnified from liability claims, it is unnecessary, and undesirable, to establish minimum levels of investment in infrastructure and protection systems to ensure service reliability that would indemnify providers for loss of service. Service providers should be held liable if they have been negligent, regardless of whether they have invested enough or not. All that should be required should be standards of quality in construction.

⁷ Monsanto Company v. Tennessee Valley Authority, 616 F. 2d 887 (5th Circuit, 1980) p. 88.

A number of possible requirements that could be asked of service providers in order to ensure service were proposed. Among these are financial security requirements. Pilot programs in New Hampshire, for instance, required that providers prove they possess sufficient financial security and stability to provide reliable service. This model could be followed in other states. Assurity bonds that would be forfeited by the utility if service is not delivered could be utilized as a security. Another option may be to establish a maximum number of outages per year, above which utilities would be penalized, or have minimum response times. Utilities could also employ engineers to create designs that would improve reliability, which could include alternate feeders that would automatically switch between each other during outages. Eventually, the industry will probably establish its own standards.

5.2.6 Customer Expectations

Customer tariffs vary according to the level of reliability requested. Service providers are expected to have a role to play in educating customers on the various service options available.

Customers are divided into three main categories, generally receiving different levels of service: commercial, industrial and residential, but additional classes often exist. One utility, for instance, has 20 different levels of service, ranging from firm service to non-firm, hourly service. The need for uninterruptible service ranges from hospitals and businesses requiring highly reliable service, down to individual households. Customer tariffs vary depending on the level of reliability they demand and the time of usage. Those requiring more reliable service and peak time usage will pay a higher rate as compared to those in the opposite situation. These tariffs and the contracts associated with them may, in some cases, also determine an order or priority in which customers are disconnected and restored to service in the event of a power failure. In these cases, those customers paying for the most reliable service will therefore be the last to be cut off and the first to be reconnected to service.

The existence of the regulated electric utility industry has meant that residential customers are largely uninformed on how the industry works. Customers may soon have to learn about the different service options available to them, and the contract details that may be negotiated with service providers. Utilities should play a part in this customer education, by working with them to discuss the alternatives available, including any customer obligations that any of these alternatives may carry. At present, maintenance of service is the sole responsibility of the integrated utility, but this may change in the future as a wider variety of service options will be available.

5.3 Electric Utility Service Reliability: Solutions and Improvements

Interviewees presented a number of possible options for improving systems integrity and addressing liabilities, particularly in a deregulated environment. Various possible approaches to these issues were discussed: industry mechanisms (5.3.1); private sector mechanisms such as customer education (5.3.2); current insurance mechanisms and the developments in insurance coverage that are expected to occur (5.3.3) and regulatory alternatives to increase reliability (5.3.4).

5.3.1 Industry Mechanisms

Redundancies, training for emergencies, and agreements with other utilities for supplemental service are amongst a number of industry mechanisms intended to protect utilities from terrorist attacks.

Terrorist attacks are unpredictable events. Nevertheless, to the extent that utilities can plan ahead of time, electric utilities can implement a number of measures to protect themselves from terrorist attacks. First, companies can install greater security, and restrict access to more vital systems, such as power plants and substations. Periodical patrols are also undertaken along transmission lines, but it is more difficult to continuously monitor these. Staff members should be appropriately trained to deal with such emergencies. Maintaining sufficient redundancies and backup are also important in order to retain service during or after a terrorist attack. While most utilities already implement these measures, some improvements could be made to the infrastructure, although these will occur over time.

5.3.2 Private Sector Mechanisms

Electric utilities should educate their customers regarding service options. Consumers should invest in renewable technology to increase energy independence.

In addition to training their own staff for emergency events, the electric utility industry should educate customers regarding service choices and the associated risk of service interruptions, the availability of alternative sources of fuel, and other options to meet their demands for reliable service. A study participant suggested that the most effective measure would be to facilitate energy independence by fostering the use of distributed generation and of renewable technology such as photovoltaics and fuel cells, although this represents a fairly substantial cost. Businesses, government buildings and residences could all have rooftop collectors as a backup system. Government buildings often do possess cogeneration capabilities or have their own generators, which allows them to function independently of the power grid if there is a failure.

5.3.3 Insurance Mechanisms

Service providers typically invest in self-insurance, whereas business interruption coverage and coverage for terrorist attacks is rarely purchased.

Impressions as to whether self-insurance is common in the electric industry were mixed. Some felt that it is very common, while others were under the opposite impression, with one participant estimating that less than 1% of electric utilities invest in self-insurance. For those utilities that do invest in self-insurance, this resource pool is used to cover for damages to the utility's own equipment and incidents where the utility's negligence has damaged equipment in customers homes. Generally, utilities appear to purchase liability insurance coverage, whereas business interruption coverage is seldom purchased. War coverage, or coverage for terrorist attacks, also exists, but utilities rarely seem to opt for this coverage. If utilities are meeting the standard industry practices, their protection systems against terrorism should be sufficient to protect them against claims of negligence. Interviewees were not very familiar with the insurance mechanisms and products available on the market, or with those purchased by utilities.

Insurance coverage against claims of liability can be a double-edged sword that utility's should not heavily rely upon. In the event that a utility is held liable for damages caused to a customer by their negligent behavior, the insurance company will attempt to avoid paying the damages in every way possible. If it eventually has to pay the damages caused by the power failure, the arbitration provision in the insurance contract stipulates that the insurance company will not pay such damages on any subsequent occasion. One cannot assume that all insurance contracts are the same, since the terms of the contract are negotiated with the insurance companies. Still, this case illustrates that depending too heavily on protection through insurance may encourage an increase in unreliable behavior. On the other hand, insurance coverage may prove beneficial if insurance companies force service providers to install more protection systems and act in a more prudent behavior by ensuring that providers pay a premium that is commensurable with their risk. Presumably, the higher the risk category, the higher the insurance premium. In order to pay a lower premium, service providers would then have to take steps to lower their risk. The effect that insurance coverage has on service providers obviously depends on the nature of the contract. With deregulation, it is expected that insurance coverage will be in higher demand, but that the details of the contracts will also vary as service providers and insurance companies come to different agreements.

5.3.4 Regulatory Options

Regulators may have a minimal role to play in formulating standards to ensure reliability.

With the exception of one service provider, that strongly opposed the idea of any regulatory role or the development of any standards that could improve the reliability of service, interviewees felt the need for some regulatory role. Reliability standards already exist for high voltage transmission lines, in the form of NERC guidelines. NERC's new standards for engineering and interconnected operations will ensure greater reliability if utilities choose to follow them. NERC elected to make them mandatory, as their inability to levy any sanctions on non-compliance means that many players do not abide by the rules. NERC has always relied on peer pressure to ensure that the players comply with the rules, but this has not been sufficient with the new market entities. The conflicting interests of NERC and the Federal Energy Regulatory Commission make it more difficult for NERC to enforce their guidelines. These conflicting interests are reliability and economic interests respectively, as FERC controls interstate transmission services and interstate electricity transactions by ensuring that wholesale and transmission rates set by utilities are fair. FERC also oversees the issuance of stock and debt securities and mergers, whereas NERC's mission is related to electric reliability. Many large industrial customers and power marketers will not accept NERC standards as they may limit geographical markets and product definitions.

As stated earlier, many expressed the opinion that if deregulation is carried out incorrectly, competition could decrease. To avoid this ISOs will have to be impartial so as to enforce grid reliability. As the Electric Consumers Resource Council writes, ISOs will have to "operate the grid in a nondiscriminatory, common-carrier basis in order to remove any anti-competitive advantages . . . which might arise from the joint ownership or control of transmission and generation facilities by any entity."⁸ ISOs will be a key issue in fostering competition, and it may take government pressure for this to happen. If it were left up to the market, utilities may not establish such an ISO voluntarily, preferring to allow market forces to determine who wins entry and who does not.

Responses indicate that there is a definite role for regulators. This would involve enforcing NERC guidelines and possibly shifting regulatory control to a state level. In New Hampshire for instance, the regulatory body has decided that it will still review certain utility statistics, such as number of minutes of outage per customer and so on. ISOs, if successfully established as independent entities, will also develop mandatory standards which should improve reliability, including sufficient redundancies and standards to divide responsibility amongst the different entities in the power grid. Most importantly, the regulations should be formulated through industry and public forums. Sharing of basic systems information, such as transmission loads, has been cited as the weakest point in the system, so that while industry possesses all the necessary technology to undertake a pre-contingency analysis, the lack of cooperation creates a

⁸ Electric Consumers Resource Council. "Independent System Operators," in Profiles on Electricity Issues. June 1997, No. 19. p. 4.

real barrier to these analyses. Regardless of the details of what a possible regulatory role may be, most industry players agree that it should be kept at a minimum.

5.4 International Perspective

The UK electric power industry provides insight on the effect of deregulation on service reliability.

The UK was used as a comparison to the U.S. electric industry since the UK began its deregulation effort in 1990. Service for industrial customers was deregulated in 1990, but residential customers will only be deregulated in 1998. Experience in the UK indicates that while terrorism has not increased, vandalism has. In addition to vandalism, natural disasters, investment in the power generation and distribution system, and aging assets remain the greatest threats to uninterruptible service. Deregulation itself is often perceived as a threat to uninterruptible service and service reliability in the near term for a number of reasons, as seen in the section on deregulation and service reliability.

UK utilities do not have formally defined classes of customers, although different tariffs are offered to customers depending on whether they consume energy during peak hours or not. Utilities identify customers requiring quasi-uninterruptible service, such as hospitals, businesses and individual households where an individual's health may be affected by a service interruption. Utilities make an effort to communicate with their industrial customers to learn about how their plants work in order to understand the impact that an adverse power supply would have on their facilities and production system. Some utilities have also developed "customer profiles" to define their customer base, and many are developing "power quality services," targeting customers with high reliability requirements.

Participants felt that service reliability has remained the same if not improved with deregulation. East Midlands Electricity attributed this to increased customer pressure, from industrial as well as residential customers. Residential customers are in fact a significant source of pressure. Another factor contributing to the improvement in the reliability of service is the role of the Office of Electricity Regulation (Offer). In 1994-95, Offer provided the industry with additional funds to improve the quality of their service. Every 5 years, Offer reviews utilities' performance and service reliability. Utilities themselves publish yearly quality of supply reports, that record statistics such as customer minutes lost. A detailed copy of this report goes to the regulatory body, to consumer organizations and libraries, and a shorter version is sent out to customers. In the report, the utility discusses measures that it can implement to improve services and explains how it has employed its capital to improve service. In its 5 year review, Offer then sets spending targets for the next 5 years, in the form of caps on rates charged to customers.

Offer establishes some due diligence standards which are applicable to all service providers. The Electricity Supply Regulations stipulate technical requirements, such as voltage limits, that utilities must abide by. There are also Distribution and Grid Codes, which establish technical requirements for reliability planning, safety and security issues and so on. The Distribution and Grid Codes simply formalized standards that already existed informally in the regulated industry.

Insurance for electric utilities comes in the form of insurance coverage for damage to the utility's equipment by third parties and damage to a customer's equipment resulting from the utility's negligence. Service providers in the UK are held liable for power outages only if a failure lasts more than 24 hours. Offer stipulates that service must be restored to 85% of all customers within three hours, and to all customers within 24 hours. If service has not been restored to all customers within 24 hours, the utility must pay those customers whose service has not been restored. Residential customers receive £40 (\$60), industrial customers receive £100 and both receive an additional £20 for every 12 hours of outage after the initial 24 hours. This payment is obviously not meant to cover all of the customer's potential losses, but serves as an incentive for utilities to restore service quickly. Utilities are not liable for any greater amount, although recently customers have begun to place more and more pressure on the regulatory body to hold utilities liable for economic loss. Service providers seek to settle disputes out of court, so as to avoid setting precedents with court actions. Nevertheless, customers have begun to take utilities to court for damages, and the regulatory body is increasingly ruling in favor of consumers.

5.5 Electric Utility Industry Conclusions

In summary, the main findings of the interviews were the following:

- With the exception of cyber attacks, terrorism is not perceived as a significant threat to reliable service. Cyber attacks are perceived as a growing threat, but players in the industry do not believe they will become a significant threat.
- There may be a need for minimal regulatory role in formulating standards for reliability of service. This should be done through public and industry forums, for which purpose ISOs, NERC and other reliability councils should open their discussions to all stakeholders.
- Many fear that deregulation will have a detrimental effect on reliability, at least in the short-term. The establishment of an autonomous ISO is believed to be important to reliability in the deregulated market. If such an ISO is successfully established and management methods adapt to the new market scenario, reliability should increase.
- Liabilities and insurance are not much of a concern to utilities at present, unless the utility is found negligent according to NERC or state guidelines.
- Educated customers may play a key role in driving the demand for system reliability. Customer education on the different forms of service available may be of great importance in the deregulated environment.
- Information sharing between service providers is a significant problem that the electric utility industry faces. This may become more of an issue with deregulation as providers become more reluctant to share information, fearing that they may be releasing too much competitive information.

6.0 The Oil and Gas Industry

6.1 Industry Background

This section presents an overview of the oil and gas industry, discussing the deregulation effort in the industry, changes that have occurred with deregulation, and regulatory standards addressing service interruptions

The oil and gas industry plays a vital role in fueling America's transportation and manufacturing system, and serves as a major source of the country's lighting, power, and heat. The study focused upon the natural gas industry because of its dependence upon a unique physical infrastructure located almost entirely within the continental U.S. to deliver service. In contrast, the petroleum market has survived successfully in the global marketplace. With the exception of their refining operations, petroleum companies have conducted the vast majority of their recent exploration and drilling activities outside the continental U.S., while relying considerably on foreign oil production to meet demand. To deliver its services, the petroleum industry relies heavily on conventional transportation methods of trucking and shipping. Liabilities for service interruptions resulting from attacks on the system would not be likely to rest with the companies themselves. Due to the nature of the delivery methods of the industry, and its dependence on global production and transportation, the petroleum industry was not analyzed in this study.

Despite continuous regulatory changes for almost twenty years, the natural gas industry has matured through restructuring and significant market changes into one of the most reliable sources of heat and energy in the United States. From well-head to burner tip, the natural gas delivery system contains four primary activities: production, marketing, interstate transmission pipelines, and local distribution.

FERC Order 636, issued in April 1992, required interstate pipeline companies to separate, or "unbundle," their marketing and gathering services in order to maximize the ability for buyers of natural gas to reach as many sellers as possible. This unbundling of the services once offered by a few powerful transmission companies provided buyers with low-cost, reliable service, and improved the industry's ability to deliver products to its customers. The improvements in industry deliverability have been demonstrated in three primary areas: the increases in the number of pipelines available for shipping natural gas, thus enabling product delivery through multiple routes, improving the industry's ability to store natural gas locally, and implementing safety controls to ensure integrity of the transmission systems.

Regulatory mechanisms relating to pipeline safety have also encouraged transmission companies to install control mechanisms that improve system integrity, and identify system weaknesses. Lawmakers passed a major piece of legislation, the Pipeline Safety Act in 1992. The Research and Special Programs Administration, in the Department of Transportation, is responsible for implementing the provisions of the legislation. Three critical provisions of the act affect the natural gas industry:

- New and replacement oil and gas pipelines are required to accommodate internal inspection devices, called “smart pigs.” Smart pigs are electronic devices that are sent through the pipeline to inspect for structural weaknesses.
- Existing oil and gas pipelines in high density population areas must undergo periodic inspection.
- Excess flow valves are required only for residential properties to shut off excess gas flow; and are similar to an electrical fuse. The valves will be placed at the curb of a house to regulate the gas lines leading into the house.⁹

It is important to point out that although many facets of the industry have undergone deregulation, the local distribution company (LDC) will continue to serve as the sole provider of distribution services at the city gate. States will be left with the decision of how to most effectively regulate these entities and establish standards for service reliability. Sellers of the gas may vary, but the LDC, because it owns the distribution pipelines for cities and municipalities, will serve as the conduit through which gas will be distributed to most residences. Ohio recently had a ruling upheld by the Supreme Court that has allowed it to impose a gas tax on purchases from sellers except domestic public utilities. This is likely to slow deregulation, and could discourage regional construction of pipeline and storage capacity. There is no economic incentive for non-LDCs to invest in infrastructure in regions in a market in which they will lose their ability to market gas because of the price disadvantage they will incur as a result of this ruling. Other states may use this ruling to protect their ability to tax out of state marketers and sellers. This could potentially result in a significant slowdown of infrastructure investment in certain areas, and result in less reliable service for some customers.

Downstream customers (LDCs, Marketers, and End-Users), prior to FERC Order 636, obtained gas from the pipeline company through a bundled sales and transportation service that was typically along just one path from one pipeline company. Interconnections between pipeline companies were only used in emergency situations. Operational adjustments to maintain system integrity were the responsibility of pipeline companies, and pipeline companies controlled most of the industry’s storage capacity, using it to meet varying seasonal requirements. When capacity was not fully utilized, pipeline companies offered a lower cost interruptible service.

After passage of Order 636, purchasers have been able to contract separately for gas purchases and transportation, allowing the customers to determine the most economical service. Customers can now incur the liability for penalties if they do not meet scheduled volumes, and match receipts and deliveries within their delivery tolerance. In addition, customers are now responsible for maintaining storage to meet their peak requirements. These changes in the contracting mechanisms have shifted potential liability from the pipeline company to the large downstream

⁹ Natural Gas 1994: Issues and Trends, Energy Information Administration, Appendix A, p. 137.

customers—marketers, and LDCs¹⁰. Commercial contracts rather than regulatory guidelines are now the primary tools being used to direct natural gas flow.

In the deregulated market setting, the customer base of the producers has expanded from interstate pipeline companies to include subsidiary providers such as marketers, local distribution companies, and end-users. These companies are customers as well as service providers. Service is provided among these parties through the use of sales contracts, and it is the way in which each contract is written that determines the liability of a party that is unable to provide service to a customer.

¹⁰ Natural Gas Contracting, Natural Gas 1994: Issues and Trends, Energy Information Administration, p. 56.

6.2 Oil and Gas Industry Study Results

Subsections 6.2.1 to 6.2.3 provide a brief overview of issues relating to reliability of service. Industry perceptions of threats to uninterruptible service (6.2.1), and the protection systems (6.2.2) and industry standards (6.2.3) they comply with are introduced. Sections 6.2.4 and 6.2.5 delve further into the effect of competitiveness on reliability of service and service provider liabilities associated with business interruptions respectively. Customer expectations for uninterruptible, and their responsibilities in maintaining reliable service are discussed in section 6.2.6.

6.2.1 Threats to Reliable Service

The natural gas system is one of the most reliable in the world, and shutdowns are usually caused by natural disasters.

Perceptions of the current threats to service reliability were fairly consistent among the interviewees. Most explained their confidence in the natural gas distribution system and that it is one of the most reliable in the world. As deregulation has increased, the number of transmission systems, and the system's overall storage capacity have also grown. This growth of the system's infrastructure and delivery system has improved reliability of service substantially, by providing greater redundancies in the distribution and storage systems.

There have been very few shutdowns in the natural gas system. The few that have occurred have been the result of floods, earthquakes, and prolonged periods of extremely cold weather during the winter months. The primary supply and distribution systems with the natural gas system are underground and well-protected from terrorist attack. Many in industry felt that as markets continued to evolve and systems become computerized, the possibility of cyber threats will increase. The nomination procedures (requests for gas) are generally managed within the electronic bulletin board systems of pipeline companies. Companies nominate the amount of gas that a customer needs so they can plan the transmission routes and ensure that pipelines remain as full as possible. Individual cyber attacks on this system could impact these companies significantly. The General Industries Standards Board is currently working to design a centralized nomination procedure, but details on the system were not available.

6.2.2 Industry Protection Measures

Companies invest in a number of corporate security measures.

In addition to infrastructure redundancies, natural gas companies develop contingency plans, and invest in corporate security of their storage systems, pipelines, and bulletin board systems. Most companies secure their assets with round the clock surveillance. Airplane surveillance of gas fields is not uncommon. Most service providers offer network redundancies and anti-hacking firewalls to protect their electronic bulletin board systems and minimize disruptions to trading activities. Contingency plans and disaster recovery plans are standard conventions for responding when an interruption occurs.

6.2.3 Due Diligence Standards

Internal due diligence standards are usually more stringent than those set at the state government level.

Participants were unaware of any due diligence standard addressing terrorism. Standards and regulations are largely developed at the state level as regulation of the industry continues to become more decentralized. Most participants indicated that their internal due diligence standards are set at levels much higher than those dictated by any outside body. This is done to meet the stringent demands of the customer and the competitive marketplace. In the 1970s, many providers entered into warranty contracts, under which providers guaranteed that they possessed and could supply a certain amount of product. This kind of warranty hastened the financial plight and sale of Gulf Oil, and is no longer offered unless companies are absolutely certain that they have access to that supply.

Individuals interviewed pointed out that interruptions in service are not likely to increase in the future. Liabilities associated with service interruptions are not generally perceived to be an issue of concern within the industry. Although there have been some suits against service providers, the liabilities are generally determined by the courts, which base decisions upon the contracts under which the service was offered.

Although no specific set of industry metrics has been established, service interruptions are tracked by trade associations and most companies internally. These metrics are used by the companies as a way of evaluating their performance, which constantly strive to reduce service interruptions because they realize the important impact that reliable service has on their revenues.

6.2.4 Reliability of Service

Uninterruptible service is common, but force majeure clauses indemnify providers against loss of service in situations beyond their control.

The general consensus within the industry is that “uninterruptible service,” is common. Service providers generally guarantee service through contracts with their customers; however, the majority of contracts include a *force majeure* provision that nullifies the contract in situations in which an event occurs that is “beyond the control” of either party. These events include natural disasters, a market failure or a problem relating to supply or price. Most interviewees felt that terrorism, while not specifically mentioned, fell into this category.

Most service providers offer both interruptible and uninterruptible service. Uninterruptible service can be purchased at a significantly higher cost than interruptible service. Most end-users purchase interruptible service, as the industry seldom ever has a need to interrupt service. The industry also offers customers no-notice service at a higher cost to accommodate unexpected increases in customers’ gas needs. No-notice service provides firm transportation, firm storage, or a combination of both to the buyer up to a maximum daily quantity (MDQ) that is specified by the customer. Shippers that do not purchase no-notice service may be penalized by the provider for taking unscheduled quantities, whereas shippers with no notice service may take up to the specified MDQ. Generally, the cost of maintaining a high level of service reliability is considered a basic cost of doing business. A company cannot survive in the industry without meeting these high standards, as they will lose customers when reliability is not ensured.

Competition and consumer demands have had a positive effect on service reliability.

Most interviewees felt that deregulation has had and will continue to have a positive long-term impact on service reliability due to competition and the demands of the consumer. Before deregulation, it was difficult to get a product to a buyer because of the paperwork and oversight required by FERC. Now contracting can be done directly with end-users and pipelines. One respondent felt that because the industry’s track record has been so exceptional in the past, further improvements cannot be made. Another scenario under continuing deregulation, however, is an increase in service interruptions. Reasons cited were the growing number of entities now involved in the delivery process, many of whom are relatively inexperienced.

The industry uses various market mechanisms to ensure system reliability and has seen improvements since deregulation. These include system redundancies in pipeline routes and increases in storage capacity that have all been expanded by the company’s desire to provide as much quality service without interruption as possible. The new markets have provided new opportunities for efficient organizations to prosper, and have improved the industry’s ability to deliver natural gas.

6.2.5 Service Provider Liabilities

Liability is not a concern, except in the case of gross negligence. The largest threat to service providers is the loss of customers.

Study participants indicated that liabilities associated with service interruptions were generally determined by the sale contract. As stated, contracts are generally written with a *force majeure* provision. Liability is really not a concern within the industry except in cases of gross negligence. One respondent felt that their company would incur liability resulting from a cyber-attack, because it is not something that is generally addressed by *force majeure* clauses, but they have substantial internal control mechanisms to monitor their computer system integrity.

The industry has experienced a fair amount of litigation. Severe winter in the 1970s which prevented providers from supplying the amount of product they had guaranteed. Companies had to go to court for not meeting their obligation and some of these cases took 15-20 years to settle. Columbia Gas Interstate Pipeline went bankrupt as a result of this situation. Many of the larger suppliers settled out of court.

Today, big lawsuits regarding supply are very uncommon, but the industry is not immune to legal battles. Many class-action lawsuits by leaseholders (those who own the property wells are situated on) occur now, not for service interruptions, but for selling gas from the same wellhead at different prices. In relation to loss of service, providers generally keep enough reserve on hand to serve their customers even during peak demand periods. Suits against LDCs by consumer groups during service interruptions in winter months, although uncommon, have also occurred. The courts are generally not imposing requirements on service providers who are found liable for service interruptions to invest in infrastructure improvements. Respondents felt that liability should continue to be handled by contract and in the court systems. There was no evidence of sharing of liabilities among various entities involved in delivery process.

Participants noted that it would be difficult to set a level of investment in “protection of service” that would indemnify a provider from liability from service interruptions. Marketers would be most hard-pressed to indemnify themselves because they have no infrastructure to invest in regarding supply and transportation, thus they have limited control over supply shortages, and subsequent service interruptions.

Service is generally guaranteed, excepting *force majeure* contract provisions. Because there can be so many parties involved in the delivery process, guarantees are dependent upon availability of supply. Most respondents agreed that the single greatest liability to service providers is loss of their customer base. Gas must flow through the pipes for them to remain in business. Most respondents saw no difference in liability issues associated with interruptions in service that were caused by terrorism and interruptions in service that resulted from other events such as natural disasters.

6.2.6 Customer Expectations

Service providers that cannot guarantee reliable service will soon go out of business.

Customer expectations and needs for reliable service vary widely. Consumers demand that firm, uninterrupted service be provided, and because of the industry's reliability this is generally what consumers receive. The increase in choices for service providers has allowed customers to find reliable low-cost service. Residences and other customers such as hospitals are categorized as essential human needs customers whose service may not be interrupted. Hospitals pay an extra premium for stand-by service, and generally invest in backup systems to ensure adequate energy in the case of a loss of service.

The burden for reliable service falls on the customer to the extent that they require uninterruptible service. They pay higher premiums for this service, and under some contracts, many large industrial customers and non-resident essential needs customers are required to install backup systems, consisting of gasoline, oil, or propane powered equipment that can allow them to continue operation in the event that service cannot be provided. However, the market has become so competitive and service so reliable that the service provider that cannot guarantee reliable service will find itself out of business in a very short time. This point was raised by more than half of the individuals interviewed. Many individuals pointed to the mergers and bankruptcies that have occurred in the industry, as market controls have been effective at weeding-out poor service providers, especially in the marketing arena.

Some of the larger service providers acknowledged a level of responsibility to their customers which includes a reasonable level of preventive measures to guarantee reliable service and having contingency plans in the case of emergencies. Many downstream service providers consider themselves customers, and felt suppliers had a responsibility to keep them apprised of available supply. Most of these downstream customers already implement preventive measures to provide reliable service so that they can improve their sales.

Customers generally believe that the burden for reliable service should fall on the provider but acknowledge that if exceptional levels of service are demanded that the customer should pay for this. In most cases customers requiring this service do pay higher premiums, while savvy customers also invest in their own contingency systems. Industry also believes that it is the responsibility of the customer to select a service that matches their individual needs.

Customers are sometimes covered by general insurance policies that may help them cover losses resulting from service interruption caused by an "act of God." The variations of insurance policies among the variety of customers was not well-known among respondents. Most assumed that businesses would carry business loss coverage, and homeowners might be protected under their homeowner's policies for damages to their home resulting from loss of service.

6.3 Oil and Gas Service Reliability: Solutions and Improvements

The following sections report options proposed by study participants to address increase infrastructure assurance. Section 6.3.1 discusses industry mechanisms, such transportation routes and operational balancing agreements, to improve system reliability. Section 6.3.2 presents possible private sector measures to improve system reliability. Section 6.3.3 deals with the current insurance policies and products available to protect service providers from liabilities, and highlights how these practices have evolved in response to liabilities in a competitive environment. Regulatory options for improving reliability are addressed in section 6.3.4.

6.3.1 Industry Mechanisms

Internal controls protect service providers from terrorist attacks.

There is a strong belief within the industry that service providers protect themselves from terrorist attacks and interruptions in service through adoption of best practices, internal controls and planning. Most evident are the storage capacities, and the variety of transportation routes available for transporting gas. Pipeline companies have instituted additional controls, such as operational balancing agreements. These represent efficient means to maintain system integrity because they allow pipeline companies to settle imbalances with the operators of interconnecting pipelines or distribution companies rather than with each individual customer. Other controls include operational flow orders, that is, emergency orders issued by the pipeline company that require a shipper to inject (or withdraw) gas into (from) the system at specific receipt (delivery) points to ensure the continued flow of gas through the pipeline. Curtailment, where pipeline companies may cut off transportation or storage to their shippers in the event of a major supply or capacity disruption, is also implemented to minimize service interruptions. Companies that do not follow operational balancing agreements and operational flow orders may be fined by the pipeline companies. These mechanisms help maintain checks and balances within the pipeline distribution system.

Service providers work with customers to select the type of service most suited to their needs.

Most participants agreed that service providers currently work directly with customers to help them make choices regarding acceptance of risk of service interruptions, alternative sources and other options to meet consumer demands for reliable service through their sales process. During the sales process, they describe the differences and costs variations associated with firm service and interruptible service. Customers are generally well-informed and know what to buy, although many focus more on whether they are purchasing firm service, rather than focusing on the details of the contracts. Residential customers generally do not have the freedom to select their service provider. The LDC will remain the primary distribution point to residential customers. Open access provisions have been passed in Georgia and pilot programs are beginning in several states that allow residential customers to purchase gas from any supplier and receive distribution

service through the LDC. The LDC will then not be liable for interruptions due to a marketer's failure. As such, LDCs that continue to provide firm service to their customers may share in the liabilities for service interruptions.

6.3.2 Insurance Mechanisms

Self-insurance is common in the industry.

Self-insurance is very common in the oil and gas industry, as the costs of the premiums generally outweighs the risks on their assets. Most large companies only purchase catastrophic insurance policies. When this coverage is elected it generally has an extremely high deductible. The level of coverage that is purchased is usually related to the size of the company's assets. For instance, a smaller company is more likely to acquire external liability insurance at lower coverage limits than a larger, more profitable firm.

Insurance contracts within the industry have not evolved to a point where there is specific coverage from claims resulting from interruptions in service. Interviewees noted that it would be a complicated task for underwriters to determine levels of risk. Also, the ultimate cost would eventually be passed on to the consumer. Participants were unaware of any insurance contracts that reward or penalize the insured based on the adoption or rejection of practices and/or standards that increase or decrease reliability.

6.3.3 Private Sector Mechanisms

Competition has ensured a high level of service reliability.

The incentive for a service provider to remain in business requires every provider to offer reliable service. Market forces evolving from the deregulated market have been integral to ensuring that customers receive reliable service. They have increased the industry's capacity to transmit, store and distribute natural gas with only isolated incidents of interruption. Participants believed that service providers in each area of the natural gas delivery system have responded to the more competitive market by improving technology and internal controls to improve service reliability.

Market forces and competition were considered by most participants to be more than adequate to ensure a high level of service reliability. Some even indicated that improved service reliability is already one of the primary ways in which service providers differentiate themselves in a competitive market. As one respondent stated, "if the gas doesn't flow, we go out of business."

6.3.4 Regulatory Options

Regulatory options for indemnifying service providers from liabilities due to business interruptions are not recommended.

Regulations relating to oil and gas exist at both the state and federal level. The specifics vary widely from state-to-state but are generally not considered to be a driver within the industry to maintain reliable service. Most regulations focus on ensuring that the LDC can provide uninterrupted service to its essential needs customers. The Ohio ruling that allows it to tax out-of-state service providers could have serious implications for the industry, as it restricts competition. The level of service is dictated by market demands which tend to exceed the regulations.

Most interviewees did not recommend any regulatory options for indemnifying service providers from liabilities resulting from interruptions in service. There was strong opposition from most industry leaders to government interference in any form, even provisions for indemnification. Even though it appears that there have been significant benefits to the industry from FERC 636, it continues to undergo judicial review because of industry opposition.

Trade associations were the primary proponents of some form of regulation to ensure a minimum level of service. One respondent stated that there should be due diligence standards for marketers, who, though relatively new to the industry, have vast control over gas distribution. Some marketers may contract with suppliers that do not properly evaluate their supply portfolios. When a supply company does not evaluate its portfolio, it can promise gas that it does not have, and the marketer can promise that supply to someone else. In this situation, the marketer may be unable to provide its end-user with the supply that it committed to, and this could result in a temporary service interruption. Purchasers must evaluate where the marketer's gas is coming from and what contractual guarantees there are for ensuring adequate service. Standards could be established that require suppliers and marketers to disclose discrepancies between available supply and promised supply.

Opponents stated that while loss of service from this type of situation was possible, it is far from common, and would merely result in the marketer, and supplier, losing part of their customer base. Consensus among those interviewed was that the market currently controls, and will continue to ensure outstanding service reliability.

Most industry trade associations and some industry representatives support the idea of establishing a set of minimum industry standards, specifically focused on protecting electronic bulletin board systems. One party stated that the controls that are implemented should be similar to those used within the nation's major stock exchanges. Much is done independently by most companies to ensure the security of their network operations. There was limited support from all parties for government intervention of any kind, with the exception of the comment illustrated above.

6.4 *International Perspective*

Liability in Great Britain is established by the Network Code.

Our study assessed international models for handling the liabilities associated with service interruptions. In Great Britain, for example, service providers follow a network code that guides all provisions associated with the transportation of oil and gas. If service to a customer is interrupted, it is generally the provider's fault. Liability is established under the country's Network Code. The network code outlines the methods under which liabilities are measured and consumers may recoup compensation for losses in service. It is important to note that in Britain, there is one large vertically integrated provider of gas, not the variety of service providers that exist within the United States.

6.5 Oil and Gas Industry Conclusions

Our study identified general consensus on the following points:

- Liabilities and insurance with regards to interruptions in service are not currently an issue of concern within the industry.
- Deregulation will continue to have a long-term positive impact on service reliability.
- Market forces are the preferred mechanism for ensuring reliable service.
- Cyber terrorism is perceived to be the fastest growing threat to the electronic trading and nomination systems that are used within the industry.

7.0 Law Firms

Several law firms working with the electric power, oil and gas and telecommunications industries were interviewed. Their perspectives were useful due to their involvement in liability claims, their knowledge of issues affecting customers and service providers, as well as the regulations affecting the industries.

7.1 *Reliability of Service*

Deregulation is expected to improve service reliability in the electric industry, while views on the telecommunications industry differed.

Study participants generally felt that deregulation in the electric power industry would provide greater assurance of uninterrupted service as more niche providers enter the market. Niche providers would offer a wider range of service options to customers in comparison to the “one size fits all” approach that exists at present. Views on the effect of deregulation in the telecommunications industry differed, between deregulation offering better service and it decreasing reliability by subtracting funds from the incumbents and subjecting them to price competition.

Earlier in the study, the issue of the increased load on transmission lines, and its implications for increased potential of power failures was raised on several occasions. Among the legal counsels, a participant argued against this standpoint, stating that only price will change, while load flows will remain the same. Similarly, insufficient power generation should not be a problem. Power shortages on the hottest day of the year are to be expected, but sufficient generation capabilities to meet needs at all other times exist. In the participant’s understanding, the number of entities bidding to enter the generation market are ten times those necessary. In addition, as many have confirmed, power failures are mostly transmission, rather than generation related.

7.2 Service Provider Liabilities

<i>Liabilities are dealt with through contract provisions in all three industries.</i>
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Liabilities in service have historically been and are still described as a risk taken by the customer, even though allocating risk to the supplier could increase reliability of service. Restructuring the industries in this manner would encourage the market to intervene by developing technological systems to improve reliability. In effect, although liability insurance is available for service providers in the electric utility industry, most have contract or tariff provisions to cut off service in the event of a problem. Liability contracts provide only for direct damages when there is an interruption in service and the customer arranges for substitute energy sources in the market. Service providers are thus usually protected from consequential damages. Liabilities for interruptions resulting from terrorist attacks are not an issue for the electric, oil and gas or the telecommunications industries, as they are treated in the same manner as natural disasters due to the unforeseeability of the attack in most cases.

In all three industries, cases of customers filing damage suits against providers abound, but there are no real trends emerging from court cases. Most claims are settled out of court, and providers rarely have to compensate customers. Participants confirmed that in all three industries, customers would find the process of filing a claim in court a long and arduous one. In the electric industry, some trends may emerge with deregulation as customers increasingly resort directly to the courts, rather than presenting their case to the Public Utilities Commission first.

7.3 Insurance Mechanisms

Service providers generally invest in a combination of self-insurance and “umbrella” coverage. The insurance market is expected to develop new insurance products in response to deregulation.

Self-insurance appears to be common in the telecommunications and oil and gas industries, whereas the situation in the electric utility industry is unclear. In all cases, service providers usually have a combination of self-insurance and “umbrella” coverage, which is purchased from an insurance company. Participants believed that business interruption coverage is not a common option in the electric utility or telecommunications industries. They argued that the fees are too high and that service providers might purchase insurance more often if insurance companies offered packages at a reasonable price.

Insurance coverage for customers does not seem to be a common option. Customers find it cheaper to maintain backup power or arrange for alternative service than purchase insurance to cover any losses incurred from service interruption. In the electric utility industry, service providers are developing “financially firm” power as an alternative to insurance coverage for customers. Financially firm power does not guarantee customers power 100% of the time, but the contract provisions are such that the service provider will compensate the customer for the cost of obtaining alternative service during a failure. As a precautionary measure, industrial customers requiring firm service will also design their plants to accommodate service interruptions.

Study participants were unsure as to how service provider insurance should evolve to respond to service interruptions in a deregulated environment. The market is expected to respond adequately, with insurance companies developing products that they would promote among suppliers. An interviewee also indicated that claims for interruptions in service may grow with deregulation in the electric utility industry. This is expected because the opportunities for negligence may rise due to the increased number of players in the supply chain.

7.4 Regulatory Options

Existing standards regarding service reliability are generally perceived as adequate, although some suggested possibilities for additional requirements.

The existing requirements for reliability of service are generally found adequate and sufficient. Consequently, there is no perceived need for additional standards or regulations to improve reliability of service in any of the three industries in question. One participant suggested that some standards could be developed to improve reliability of service, but only with the participation of all stakeholders. Another interesting suggestion related to the imposition of regulatory measures to encourage electric service providers to implement new technologies, that would in turn increase service reliability. New minimum standards necessary to avoid injury or property damage could be developed, with ISOs and NERC having the power to identify and address issues relating to reliability of service. Agreements could also be struck between industrial and commercial customers to ensure that power outages on critical facilities are minimized. For instance, a steel mill could agree to shut down its operations during a power shortage so that the hospital receiving power from the same supplier or distribution company could continue to operate. Another option may be for the steel mill to generate steam from its boilers to produce power for the hospital.

The market is considered the best approach to addressing liability issues.

The general impression was that the market is adequate, and perhaps even superior to a regulatory approach in addressing liability issues. Service providers and insurance companies should be left to negotiate the terms of their contracts, although some proposals were made concerning possible regulatory options. For instance, it was suggested that regulations could ensure that service providers do not expose themselves to excessive risk. Another opinion was that regulators will need to develop rules to allocate liability among the combination of service providers in the electric power industry, because determining who is responsible for power failures or other problems will become a complex matter.

7.5 Law Firms Conclusions

Our study identified the following findings:

- Reliability of service in the electric power industry is expected to increase with deregulation.
- Liability claims against service providers are common, but most cases are settled out of court. There are no trends emerging from court cases, although some trends may emerge in the electric industry as customers increasingly resort directly to the courts, rather than approaching the Public Utilities Commissions first.
- Liabilities for interruptions resulting from terrorist and cyber attacks are perceived as insignificant.
- Service providers are generally thought to have a combination of self-insurance and external insurance coverage. Self-insurance appears to be common in the oil and gas industry. Self-insurance for physical risk also appears to be a common option in the telecommunications industry, but participants disagreed about the degree of investment in self-insurance by the electric power industry.
- Many participants believed that service providers often do not purchase insurance coverage because they find the fees too high.
- While existing standards are generally found to be adequate, some additional regulations regarding allocation of liability and enhancing service reliability could be developed for the electric, oil and gas, and telecommunications industries.

8.0 Insurance Companies

Insurance companies providing coverage for third party damage and business interruptions abound, whereas those providing coverage for cyber and terrorist attacks appeared to be few. Some insurance companies offering the relevant coverage were nevertheless identified and interviewed to obtain their viewpoint on the demand for such coverage as well as liability issues affecting service providers.

8.1 Reliability of Service

Experts in the insurance industry confirmed that natural disasters were the greatest threat to uninterruptible service. Cyber and terrorist attacks, while covered by insurance policies, are not perceived as a great threat for the electric or oil and gas industries. Again, the issue of greater load on transmission lines increasing the potential for power failures was raised.

8.2 Insurance Mechanisms

Business interruption coverage is common in the oil and gas industry, but is rare in the telecommunications and electric industries. Publicly regulated electric utilities, in particular, feel that insurance fees are too high.

Self-insurance is quite rare in the electric utility industry, but common in the oil and gas industry. Large oil and gas companies normally retain a significant portion of their financial risk and do not purchase insurance for ordinary events, including property damage. A large company will retain approximately \$200 million as self-insurance coverage for normal events, and will only purchase coverage from an insurance company for catastrophic events, such as an unconfined vapor explosion. Vapor cloud explosions are a fairly customary event, occurring every 1 to 3 years and causing damages worth \$300-500 million each time.

Business interruption coverage is frequently purchased by oil and gas companies, but is virtually non-existent in the power generation field, particularly amongst publicly regulated utilities. According to one estimate, less than 5% of publicly regulated utilities purchase business interruption coverage, as they want to protect their revenues and are not willing to pay the cost of the coverage. A participant argued that even though utilities may find the insurance fees high, they have always recovered this cost in the past by modifying their tariffs. Another opinion was that business interruption coverage is less common among utilities in the U.S. as compared to European countries because the large, interconnected U.S. power grid, as compared to the more isolated, island systems that exist in Europe, make it more difficult to calculate the economic loss experienced by utilities in the U.S. during a power failure. Calculating this economic loss is often difficult because utilities will usually arrange for an alternate power supply if there is an outage, which reduces their losses to some extent. It is becoming easier to calculate the costs now, since the increase of information technology allow one to track rates of buying and selling power. In general it is difficult for service providers to obtain insurance on the transmission and

distribution sides, as the insurance industry does not offer many products in this area. Companies will therefore retain their risk. In the oil and gas sector, approximately 75% of the industry purchases business interruption coverage while the remaining 25%, mostly large companies, opts for self-insurance.

The lack of due diligence standards in the energy industry is not perceived to be a problem for insurance companies addressing claims. Physical loss or damage claims resulting from business interruptions are not tied to the cause of the interruption. Thus, insurance companies will cover the damages regardless of the cause. Insurance companies will measure risks, however, in order to keep track of their exposure in various situations causing property damage. One of the insurance companies interviewed, for instance, offers contingent business interruption coverage, which is often purchased by companies in the mining industry. This insurance covers any loss of business a mining company may experience if a power plant that purchases their coal cancels their order as a result of a failure. The insurance company will thus observe such relationships in order to understand its own exposure in these situations.

Insurance products are also available for customers. One of the insurance companies interviewed, for instance, provides off-premises service interruption coverage. If a customer possessing this coverage suffers a loss of service, the insurance will pay for the loss of business experienced by the customer. For large customers, the insurance company will build specific risk profiles in order to estimate their financial exposure.

The threat of terrorist attacks, excluding cyber attacks, on facilities in the U.S. are considered insignificant by insurance companies.

Some companies also offer insurance products for property terrorism and sabotage. Although this is very rare among insurance companies, two of the companies interviewed supply such coverage. Both companies stated that this insurance is provided mainly to non-U.S. companies or to American companies with operations abroad, as terrorism is not believed to be a considerable threat in the U.S. Even abroad, terrorist threats to electric utilities are considered insignificant. Some American companies have insured their operations in the U.S., however. The terrorism insurance offered by one of the insurers covers for property damage and business interruption resulting from terrorist acts, which include coups, sabotage, mutiny, rebellion and insurrection. Insurance for cyber attacks is also provided, but this is only an extortion coverage and would not compensate for any damage caused by a computer hacker. It would only compensate an insured company for any sum it would have to pay a party threatening to damage the insured company's information and control systems, for instance by introducing a virus. Any damage that actually occurs to the company's property is borne by the insured.

Risk levels differ depending on the country in which the facility is located. Risk is assessed by evaluating the country the facility is located in, the facility's property values and the security measures that are in place. The level of protection is assessed using current industry standards and practices as a comparison. These issues are less of a concern in the U.S., which is rated as a

country with insignificant terrorist threats. For countries other than the U.S., the insurer may warrant that the agreed upon security systems were in place during a terrorist attack at a facility before reimbursing them for their property damage. This applies only to the most dangerous areas of the world, and is generally not a stipulation in contracts with facilities in the U.S. Reimbursement for facilities in the U.S. is determined on a case-by-case basis, but in all cases, the insurer in question will only provide coverage for damage up to \$25 million.

General property insurance often covers terrorist attacks, unless the wording of the contract specifically excludes it. Most companies therefore do not require additional insurance for terrorist or cyber attacks. One of the insurers interviewed felt that they were one of the answers to how service provider insurance should evolve to respond to the growing threat of terrorism and cyber attacks, since their property terrorism and sabotage policy covers some of the gaps that companies may have in their existing contracts. Leaving aside insurance products for terrorist and cyber attacks, interviewees had other opinions to offer regarding the need for new insurance products in a deregulated electric power industry.

The increase in service providers that do not possess the funds for self-insurance will drive insurance companies to develop new insurance products.

As stated earlier, after deregulation, there will probably be three types of electric service providers: generation, transmission and distribution companies, and combinations of these types. As the size of companies decreases, insurance companies will need to provide more property coverage for service providers, since larger companies alone possess the finances to self-insure themselves for property damage. This situation will be more applicable to those companies providing only distribution services, given that they will be more focused as compared to those involved in power generation and distribution. In the future, utilities may also want to purchase some extra expense coverage. This would apply to a situation in which an event prevents a service provider from generating or receiving sufficient energy to meet its customers' needs. Under these circumstances, the service provider would have to purchase extra power from another source, and would then require reimbursement from its insurance company. This opinion is in fact consistent with that offered during an interview with the legal industry, stating that service providers are increasingly offering financially firm power.

The insurance industry is already in the process of developing new insurance products to meet the needs of a deregulated market, particularly on the distribution side. Still, increased liability claims as a result of deregulation are not foreseen to be a problem for two reasons. First, liabilities will be determined by contract agreements between different service providers in the power grid and between service providers and customers. As contract terms will be all different, liabilities will also vary. Second, in a deregulated environment, utilities will not be obligated to provide an uninterruptible power supply, unless this is stipulated by the contract. Consequently, liability should not be any more of an issue than it is at present.

8.3 Regulatory Options

Regulatory options were generally not discussed during these interviews due to time constraints. One opinion, however, was that regulators should be involved in ensuring reliable service by adopting a consumer advocacy role, and focusing, in particular, on the distribution components of the energy industries.

8.4 Insurance Industry Conclusions

The key findings of our study are as follows:

- Self-insurance is common in the oil and gas and telecommunications sectors, but rare amongst electric utilities. Large oil and gas companies will often retain their losses and opt for self-insurance.
- Business interruption insurance is often purchased by oil and gas companies, but is not very common in the electric power industry. It was estimated that less than 5% of publicly regulated utilities purchase business interruption coverage, as they are not willing to pay the cost of the coverage. In the oil and gas industries, approximately 75% of companies are thought to purchase business interruption coverage.
- Insurance for property terrorism and sabotage is available, but rarely purchased for facilities located in the U.S. The threat of a terrorist attack on a facility located in the U.S. is considered insignificant.
- Insurance against cyber attacks is also available, but would only cover for any extortion fee paid by the insured to an individual or group threatening to damage a service provider's operations through a cyber attack.
- As the size of companies in the electric power industry decreases with deregulation, insurance companies may have to offer more insurance products, as smaller companies often do not have the funds for self-insurance. The insurance industry is developing new insurance products for the deregulated market, particularly on the distribution side.
- Liabilities in the competitive environment will be determined by individual contract agreements.

9.0 Financial Institutions

Financial institutions were included in the study in order to gain an understanding of the effect of liabilities on the valuation of an oil and gas, electric, or telecommunications company. Several financial institutions were approached, but the majority had corporate policies dictating not to participate in external studies. Those financial institutions interviewed, however, offered some important insights into the valuation process.

9.1 Telecommunications Companies Valuations

Liabilities from business interruptions do not affect a telecommunications company's valuation, since service reliability is very high in the industry.

Valuations of a telecommunications company take into account numerous factors, which vary according to the type of service offered by the provider. For providers offering wireless services, valuations are driven by the total population, or footprint covered, the quality of the network, the average revenue per customer, and possibly the cost of customer acquisition. On the wire side, the size of the population covered is again the main concern. The number of access lines, and the average revenue per customer thus become the drivers in the valuation process.

The telecommunications industry enjoys a very high level of service reliability. Basic service is not a problem, and companies are rarely thought to experience problems because of any weakness in the system. As a result, liabilities resulting from a failure to perform basic services do not affect company valuations, particularly since it is believed that all companies comply with approved industry standards. Similarly, a service provider's insurance coverage does not affect its valuation. The deregulation of the telecommunications industry was expected to adversely affect stock prices. Deregulation in the electric utility industry is also expected to decrease electric utility stock prices. Valuations are expected to drop due to the growing number of players in the market, which may increase risk, and reduces the market share of individual service providers. Valuations have not actually decreased in recent years, but this is attributed to the fact that the overall stock market has been doing well.

9.2 Electric Utilities' Valuation

Liabilities may affect an electric utility's credit rating, but are usually not a major factor.

Liabilities are a part of the qualitative assessment of credit ratings of companies in the electric power industry, although it is generally not considered to be a major factor. Credit rating companies will usually place a probability on a service provider's potential for liability. For large electric utilities, these probabilities would have to be rather large to affect its market valuation. Business insurance, which is thought to be common in the industry, also limits the effect of potential liabilities on a provider's rating.

Replacement power costs can be used as an example of a liability factor influencing credit ratings. Replacement power costs, which reflect those costs incurred by a service provider when it needs to arrange for supplemental generation during a shortage, can run into the hundreds of millions of dollars, and could therefore impact a rating. In assessing the potential liabilities or costs associated with such a situation, a credit rating company will determine whether the service provider has some form of business insurance protecting it from these situations, and whether the costs incurred would be recoverable through their rates or not. In one case, a service provider's replacement costs were very significant, and the company was not permitted to recover its costs through its rates.

Other factors included in an assessment of an electric utility are the average capacity factors in comparison the industry as a whole, its performance as a plant operator, including how they respond to outages, and for nuclear plants, their ratings by the Nuclear Regulatory Commission.

9.3 Financial Industry Conclusions

- Liabilities and insurance coverage do not affect a telecommunications company's valuation on the stock market. Liabilities are not an issue because reliability is very high in the industry.
- Reliability of service, industry standards and liabilities do have some effect on the rating of a provider in the electric power industry. Potential liabilities and the associated costs are assessed when placing a value on the risk of a company's bonds. Liabilities are not considered a major factor in the credit rating, however.

10.0 Conclusions

The main findings for the oil and gas, electric and telecommunications industries are summarized below.

- Within all three sectors, market forces are perceived as the most appropriate mechanism for maintaining infrastructure assurance. There may be a limited role for regulators in the electric and telecommunications industries, to ensure information sharing and in educating the public.
- Deregulation is expected to have a positive long-term impact on service reliability in the telecommunications and oil and gas sectors, although reliability could be an issue in the short-term within the telecommunications industry. The situation in the electric utility industry is yet unclear as deregulation is still in the early stages, but some problems are anticipated during the transition period.
- The establishment of an autonomous Independent System Operator is believed to be an important aspect of maintaining reliability in deregulated market within the electric utility industry.
- Terrorism is not perceived as a significant threat, with the exception of cyber attacks. Cyber attacks are not currently perceived as threats in the electric industry, although it they are becoming more of a concern. Cyber attacks are perceived as the fastest growing threat to network integrity and service reliability in the telecommunications industry. It is also believed to be an increasing concern in the area of electronic trading and nomination systems within the oil and gas industries.
- Liabilities resulting from interruptions in service are not perceived as a concern in the three industries studied.
- Liability issues do not affect the stock valuation of companies in the telecommunications industry, but may affect the credit rating of an electric utility.
- There is a need, particularly in telecommunications, for information sharing and best practices.
- Customer awareness regarding service options and responsibilities concerning network security represent significant concerns in a deregulated environment.
- There may be a role for government in guaranteeing universal service, supporting initiatives in the area of network security, fostering the sharing of information, educating the public, and protecting customers. Regulators may also have a role in developing rules to allocate liability among service providers in the electric utility industry.

- Interruptions in service are typically dealt with through contractual provisions negotiated with major customers. Self-insurance is common in the oil and gas and telecommunications industries, but not amongst electric service providers.
- Business interruption insurance is common in the oil and gas sector. Though less common, it also exists in the electric utility sector but not in telecommunications.
- Insurance for terrorist and cyber attacks is available, but is not commonly purchased by companies for facilities located in the U.S. The potential for terrorist attacks on service providers in the U.S. is considered insignificant by insurance companies.
- There may be a need for insurance companies to develop new insurance products, as deregulation brings about a wider variety of service providers and service options.

Appendix 1 - Interview Guide

Appendix 1 - Interview Guide

Coopers & Lybrand L.L.P. has been engaged by the President's Commission on Critical Infrastructure Protection (PCCIP) to develop and conduct a market study. PCCIP is evaluating options for enhancing infrastructure assurance through both regulatory and market forces against the threat of service interruptions resulting from terrorism. The study is being conducted through interviews with senior executives in the electric utility, telecommunications and oil and gas industries. The purpose of the study is to identify industry perceptions of liability, customer requirements for uninterruptible service, and related issues regarding interruptions in service. We are also considering how these issues may change as a result of deregulation, the increased threat of cyber terrorism and the economy's growing dependency on infrastructure services.

For the purpose of this study, "terrorist" may include aggressor nations, terrorist groups, criminals, disgruntled employees and computer hackers.

Preliminary Questions

Interviewee name, title, organization, phone number, fax number, mailing address and email address

Baseline Questions

1. General Background

(questions emphasized for service providers and trade associations)

1. What do you perceive to be the greatest threat to uninterruptible service (e.g. terrorist attack, heat wave)?
 2. How can/do industries protect themselves from these threats? Is liability insurance a common option?
 3. How would you expect the liability for interruptions in service to affect service providers?
 4. Do due diligence standards exist for maintaining reliable service? How long have they been implemented? Who sets the standards? Are there any specific standards or procedures to protect or minimize effects on a service provider from terrorist attacks?
 5. Has a set of metrics been established? What are the most important parameters that describe service reliability?
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2. Reliability of Service

(All study participants)

1. Should service providers offer customers an option which would guarantee them uninterrupted service at some additional cost?
 - a) What would be an acceptable cost?
 - b) What do you estimate as the increased cost to customers associated with guaranteeing uninterrupted service?
2. If these options exist, are there requirements to maintain systems that place some of the burden for maintaining service on customers?
3. What is the relationship between the cost of providing the service and its reliability or uninterruptibility?
4. Will the new market environment produce mechanisms to ensure or improve reliability standards?
5. What mechanisms do you employ to minimize the loss of service to customers?
 - a) As the industry deregulates, will these mechanisms need to be eliminated or modified to remain competitive?
 - b) How will this affect the ability to provide service, with no or minimal losses?

3. Liability

(questions emphasized for service providers, trade associations and insurance companies).

1. What are the/your current liabilities associated with interruptions in service? To whom are they owed (e.g. to large companies, to individuals?)
 - a) How do you assess these risks?
 2. Are there examples of legal action taken against providers for loss of service? Could you briefly describe this/these legal action(s)?
 3. Are there any trends emerging from court cases?
 4. How should liability for interruptions in service be distributed among the combination of service providers, customers and the public?
 5. Are there reasonable requirements that could be asked of service providers in order to ensure service?
-

6. Should there be a level of investment in “protection of service” that will absolve a provider from liability from service interruptions?
7. Is service “guaranteed” to certain customers? Under what conditions? How are the contracts written? What are your risks?
8. Would you say that liability issues associated with interruptions in service caused by terrorism differ from interruptions in service caused by other events? If so, how?

4. Customer

(questions emphasized for customer advocacy groups, large customers and trade associations)

1. What are customer expectations/needs for uninterruptible service?
2. How much of the burden for uninterruptible service should fall on the customer?
3. What are the current insurance mechanisms, policies and products for customers to cover losses resulting from interruptions in service?

Solutions and Improvements

5. Industry Mechanisms

(questions emphasized for service providers and trade associations)

1. To what extent do you think service providers can protect themselves from terrorist attacks and interruptions in service internally through the adoption of best practices in the areas of internal controls and planning?
2. How feasible is it for service providers to work directly with customers to help them make choices regarding acceptance of risk of service interruptions, alternative sources and other options to meet consumer demands for reliable service?

6. Insurance Mechanisms

(questions emphasized for service providers, trade associations and insurance companies)

1. Is self-insurance common in these industries?
 2. What portion of service delivery is insured today?
 3. What are the current insurance mechanisms available to protect utilities from claims resulting from interruptions in service?
 - a) Are liability and business interruption coverage available?
-

- b) Do they offer protection against terrorist attacks and cyber threats?
 - c) If so, how is the risk established or differentiated between providers?
 - d) Do you think that the protection systems against terrorism (including cyber attacks) that service providers have in place are sufficient to protect them against liability suits/claims of negligence?
4. Do any insurance contracts today have clauses that reward or penalize the insured based on the adoption or rejection of practices and/or standards that increase or decrease reliability?
 - a) In a pre-insurance evaluation, what items are reviewed to rate the risks of the insured?
 - b) What protections against loss of service might provide a lower premium to the insured?
 5. How do you think service provider insurance should evolve to respond to service interruptions in a deregulated environment? What are the implications of deregulation for the insurance industry?
 6. How do you think service provider insurance should evolve to respond to the increased likelihood of interruptions in service resulting from cyber attacks?

7. Private Sector Mechanisms

(questions emphasized for service providers and trade associations)

1. What private sector mechanisms can help meet the need for uninterruptible service?
2. To what extent will market forces and competition influence efforts/investments toward maintaining uninterruptible service?

8. Regulatory Options

(questions emphasized for service providers, trade associations, consumer advocacy and legal firms)

1. What, if any regulations or standards, exist relating to loss of service?
 2. What recommendations do you have for regulatory options relating to indemnification and liability for interruptions in service?
 3. Would a regulatory approach be effective to address shared liabilities among the combination of providers?
 4. Should a set of minimum industry standards be established that would indemnify providers from liability claims resulting from interruptions caused by terrorist attacks?
 5. How could regulations or standards be developed that could improve reliability of service?
-

Feedback

(All study participants)

1. Do you think there are any important issues that were not covered by this study regarding liability resulting from service interruptions?
2. Do you have any suggestions for changes or improvements in the study?

Appendix 2 - Interim Status Report

**Appendix 3 - GTE System Telephone Companies
Tariff FCC No.1
Access Service**

Appendix 4 - Participating Organizations

Appendix 4 - Participating Organizations

Telecommunications

America On Line, AT&T, American Express, Ameritech, Boeing, Coopers & Lybrand L.L.P., Erols, Information Technology Association of American, Missouri Public Counsel, MCI, NYNEX, Science Applications International Corporation, Sprint, Telecommunications Industry Association, Telecom Italia, TRW Systems Integration, UNISYS.

Electric Utility

American Public Power Association (APPA), Bonneville Power Administration, Dairyland Power Cooperative, East Midlands Electricity, Edison Electric Institute, Electric Consumers Resource Council (ELCON), Federal Energy Regulatory Commission, National Rural Electric Cooperative Association, North American Electric Reliability Council, Office of Electric Regulation (Offer, UK), Ohio Consumers Council, Pacific Gas & Electric, Seattle City Light, Tennessee Valley Authority.

Oil and Gas

American Gas Association, CONOCO, Coopers & Lybrand L.L.P., Gas Research Institute, MIDCON Corporation, National Association of Regulatory Utility Commissioners, National Association of State Utility Consumer Advocates, Northwest Pipeline Company, Occidental Petroleum Corporation, Public Service Electric & Gas Company, Williams Interstate Natural Gas.

Law firms

Chester, Wilcox and Saxbe; Kegler, Brown, Hill & Ritter; Edison Electric Institute; Kirkland & Ellis; Paul, Weiss, Rifkind, Wharton & Garrison; Vorys, Sater, Seymour & Pease.

Insurance Companies

American International Underwriters, Cox Insurance, Zurich American.

Financial Institutions

Coopers & Lybrand L.L.P., Fitch Investment Services.

President's Commission on Critical Infrastructure Protection

Liability and Insurance - Infrastructure Assurance

PROJECT Number 7F03040SER1

Status Report

July 21, 1997

The survey is proceeding according to project schedule, and preliminary findings show common elements among the three industry segments

The Coopers & Lybrand (C&L) project team will complete interviews with organizations in the Telecommunications, Electric Utilities, and Oil & Gas industries by July 25.

Interviews with the legal, insurance, and financial communities are underway.

The development of due diligence standards is a key issue to assess liabilities.

< Survey participants have indicated independent bodies as the most appropriate standard-setting entities.

Deregulation has the potential for both a positive and an adverse impact on service reliability.

< Survey participants have indicated that the positive effect should prevail in the long term.

Survey for the Telecommunications Industry is proceeding according to project schedule

C&L contacted 20 Organizations.

Project team members conducted 11 Interviews.

- < Organizations interviewed include: NYNEX, Boeing, Telecom Italia, AOL, American Express, Coopers & Lybrand, Information Technology Assoc. of America, Erols, Missouri Public Council, Sprint, AT&T.*
- < 6 Interviews are scheduled for the week of July 21.*
- < Scheduled interviews include: TRW, Telecommunications Industry Association, MCI, Information Technology Industry Council, Unisys, Ameritech.*

Preliminary findings in the Telecommunications Industry identify threats for reliability and new roles for government and customers

Customers must play an integral role in assessing their own needs and selecting an acceptable level of reliability.

< Customer will become an important issue with deregulation.

Potential role for government in guaranteeing universal service, making network security a priority, deterring hackers and supporting standards bodies.

Competition should eventually drive improvements in service, although there are concerns about new market entrants.

Cyber attacks are perceived as the greatest threat to network integrity and service reliability.

The progress report for the Electric Utility Industry shows that the survey is proceeding according to the original project plan

C&L contacted 20 Organizations.

Project team members conducted 8 Interviews.

- < Organizations interviewed include: Pacific Gas & Electric, Dairyland Power Cooperative, Seattle City Light, NRECA, EEI, NERC, NASUCA.*
- < 4 Interviews are scheduled for the week of July 21.*
- < Organizations scheduled include: Boston Edison, Northeast Utilities, Tennessee Valley Authority, East Midlands Electricity (UK).*

Preliminary findings for the Electric Utility Industry show that system management will have to change, but mechanisms to assess liability have not been clearly identified

Liabilities associated with service interruptions are not considered a significant issue unless utility is found negligent, according to NERC guidelines.

System reliability will increase if management methods adapt to the new market scenario.

Terrorist attacks are not perceived as a great threat to reliable service with the exception of massive attacks designed to bring down large parts of the system. Cyber attacks are a growing threat.

Provisions of uninterruptible service are not generally perceived as a feasible option.

Many survey participants indicate the importance of setting due diligence standards for the new electric utilities market

Government may have a role in establishing minimum standards which would indemnify service providers from liability claims, and in “leveling the playing field”.

An independent body such as NERC may assume standard-setting responsibilities.

Insurance market and contractual arrangements will be encouraged by due diligence standards.

Educated customers will play a key role in driving the demand for system reliability.

The status report for the Oil and Gas Industry also indicates timely progress

C&L contacted 20 Organizations.

Project team members conducted 8 Interviews.

- < Organizations interviewed include: AGA (Marketing & Policy Analysis), GRI (Distribution and Transmission), NASUCO, Occidental, MIDCON Corp, Coopers & Lybrand.*
- < C&L will complete 8 interviews during the week of July 21.*

API has recommended that its members not participate in duplicate PCCIP efforts.

Preliminary Findings for the Oil and Gas Industry show that deregulation has increased reliability, but liability for terrorism is generally not addressed

The greatest threats to the distribution systems are perceived to be floods and earthquakes.

Availability of service has increased since deregulation. More competition has meant more distribution channels.

There is evidence that market forces will help maintain high levels of service reliability.

Most contracts indemnify the provider from liability when service is interrupted by Acts of God or terrorism.

It is unclear how liabilities resulting from loss of service can be shared among the combination of providers.

Preliminary survey findings show key common elements among the three industry segments

The development of due diligence standards is a key issue to assess liabilities.

Liabilities associated with interruptions in service are not perceived as an issue of concern by most service providers.

International models exist for regulating the liabilities associated with interruptions in service.

Service in the United States is generally perceived to be highly reliable in all sectors. Most industry executives do not expect this to change.

Deregulation has the potential to impact service reliability both positively and adversely.

- < Service reliability may adapt to customer demand.*
- < Service reliability may decrease because of cost-cutting initiatives and increased exposure of networks to the threat of cyber attacks.*

Next steps include completion of interviews for the three industry segments and survey of the legal, insurance, and financial communities

We will complete the interviews for the telecommunications, electric utilities, and oil & gas industry by July 25.

Survey of the legal, insurance, and financial communities is underway.

- < We expect the legal and insurance communities to provide key insights on current and future liabilities as opposed to general service reliability.*
- < We will provide the PCCIP with the Final Report on August 8.*