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Electric Utility Restructuring: Maintaining Bulk Power System Reliability

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Abstract. This report references the NERC definition for reliability and discusses the relationship between maximizing reliability and minimizing uncertainty. Factors that increase or decrease uncertainty are identified. Uncertainty factors which result from the changes promoted by industry during electric utility restructuring are identified. Finally, reliability issues addressed by the proposed legislation are discussed.

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Summary

In recent years, reliability of the U.S. bulk power system (electricity generation and high voltage transmission) has become a high priority. California's attempt at electric utility restructuring, the Enron bankruptcy, and the August 2003 blackout have increased the concern about maintaining reliability at a high level while trying to achieve the desired benefits of a market-oriented electric power system. Maintaining reliability is important because power interruptions result in economic losses costing over an estimated $100 billion per year in the United States.

Many attribute the utility industry problems as a loss in reliability brought on by electric utility restructuring. Restructuring advocates assert that functional changes in the electric utility industry resulting from restructuring are designed to add certainty and therefore improve reliability while providing lower prices to consumers. Functional changes such as improved planning and coordination, the ability to attract new market participants, increased redundancy, and the development of ancillary service markets all tend to lower risk and ultimately improve reliability. Restructuring opponents argue that resulting functional changes in the industry tend to increase uncertainty. These changes include added complexity, added risk for investors, unclear responsibilities for reliability, and the potential to manipulate markets in ways that may cause power supply instability.

Most experts conclude that industry changes from restructuring designed to improve reliability have not been realized while the factors tending to degrade reliability are having an effect. In general, the existing bulk power system was designed for operation by vertically integrated utilities with minimally required transmission connections between them. Restructuring of the electric utility industry requires that an ample set of suppliers and consumers negotiate transactions across a robust transmission system with high capacity. Therefore, the reliability of the existing bulk power system appears to be degrading because it was not designed to operate in a restructured environment and market procedures have not been developed to overcome these deficiencies.

This report will be updated as events warrant.

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Note: Steven Stitt was a Research Fellow from the Bureau of Reclamation.

Electric Utility Restructuring: Maintaining Bulk Power System Reliability

Introduction

As a result of a devastating outage in the northeastern portion of the United States during November 1965, the North American Electric Reliability Council (NERC) was formed to promote reliability of the interconnected electric power system. NERC's membership consists of representatives from utilities across North America and provides a forum for the electric utility industry to develop policies, standards, and guidelines designed to maintain reliability at a high level. Ten regional councils have been formed to address reliability issues within various regions of the United States, Canada, and Mexico. In addition, NERC has assumed a role as a coordinator for the electric utility sector to address security threats and provide critical infrastructure protection. NERC membership has always been voluntary. Prior to restructuring, no federal legislation was used to promote organizations, such as NERC, tasked with maintaining reliability of the bulk power system.[1] Reliability was dictated at the retail level by laws enacted by state legislators and enforced by state Public Utility Commissions (PUCs).

Restructuring of the electric utility industry was initiated at the federal level by Congress through passage of the 1978 Public Utility Regulatory Policies Act (PURPA)[2] and the 1992 Energy Policy Act (EPACT).[3] The restructuring effort is intended to promote more competition in the industry and ultimately to lower the cost of electricity for customers in the United States. Reliability of the bulk power system was a concern for federal legislators even before the passage of EPACT in 1992.[4] Many industry experts now assert that restructuring the electric utility industry makes it difficult to maintain reliability, and this reliability problem is not being addressed

[1] The bulk power system is defined as the powerplants, the high voltage transmission system, and associated equipment. The bulk power system does not normally include the distribution substations and lower voltage networks that distribute electricity to customers in a particular city or region. The reliability issues discussed in this report will not include outages within low voltage distribution systems, which are generally localized but have the highest probability of occurrence.

[2] P.L. 95-617.

[3] P.L. 102-486; CRS Report RL32728, *Electric Utility Regulatory Reform: Issues for the 109th Congress*, by Amy Abel.

[4] U.S. Congress, House Committee on Energy and Commerce, *Electricity: A New Regulatory Order?*, Committee Print 102-F, Report prepared by CRS, Washington, U.S. Government Printing Office, June 1991, pages 228-233.

adequately.[5] Several assert that the pressures of competition have already lowered the level of reliability.[6] Others contend that restructuring policy changes must be completed to improve reliability.[7] At issue is whether the desired reliability levels can be maintained or even enhanced as electric industry restructuring continues. Because the Federal Power Act of 1935 (FPA) gave the federal government economic regulatory authority over wholesale transactions across the bulk power system, reliability has become an important concern for Congress as new electricity legislation is designed to encourage competition and improve performance within the electric utility industry.

A total of 24 states and the District of Columbia have enacted legislation or issued orders that provide retail access to multiple suppliers for electricity customers. Most of those states are in the northeastern portion of the United States. Five of those states have now delayed their process to provide retail access: Arkansas, Montana, Nevada, New Mexico, and Oklahoma. A total of 27 states are not actively pursuing retail access. Most of these states are in the southeastern United States. California was the first state to implement retail access in 1996, but that state has suspended competitive market operations indefinitely.[8]

Several events occurred in recent years that have caused many to conclude that restructuring of the electric utility industry will result in an unacceptable loss of reliability. First, the electric utility restructuring in California resulted in forced blackouts and Federal Energy Regulatory Commission (FERC) investigations into market manipulation. California's attempt[9] to restructure that state's utility system has been analyzed by many.[10] There are numerous reasons for the resulting market and reliability problems. Some argue these problems indicate what will happen in the future if the United States continues to restructure the electric utility industry. However, others assert that California made many mistakes in its approach to restructuring. Proponents of restructuring contend there is a correct approach that will provide competition while maintaining reliability. These proponents of

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[5] Loehr, George C., "A Market Solution to Reliability?," *The Electricity Journal,* June 1998, p. 81; Boston, Terry, "Electricity: Lifeline or bottom line?," *Forum for Applied Research and Public Policy,* Knoxville, Summer 2000, Vol 15, Issue 2, p. 56.

[6] Boschee, Pam, "Changing marketplace jeopardizes transmission reliability," *Electric Light & Power,* July 1998, p. 15; Casazza, Jack, "Electric power supply reliability declines, costs rise," *IEEE-USA News & Views,* September 2001, p. 1, [http://www.todaysengineer.org/archives/pp_archives/jan01/index.htm].

[7] Edison Electric Institute, "National Energy Policy — Let's Get It Right," Washington, DC, February 2002.

[8] For more information on the status of state restructuring plans refer Energy Information Administration website, [http://www.eia.doe.gov/cneaf/electricity/chg_str/restructure.pdf].

[9] California was the first state to implement bulk power system wholesale competition. Even though many changes brought on by restructuring are still in place, the wholesale competitive energy markets have been abandoned.

[10] Congressional Budget Office, "Causes and Lessons of the California Electricity Crisis," September 2001.

restructuring believe the nation should continue the restructuring process and learn from California's experience.

The collapse of Enron is another indicator to some that restructuring of the electric utility industry could result in a loss of reliability. Enron's bankruptcy did not result in blackouts anywhere in the United States (See Appendix A); however, some of Enron's trading practices in California may have contributed to blackouts during that state's energy crisis.[11] Some have concluded that Enron's collapse was primarily due to poor business practices and should not be blamed on industry restructuring.[12]

The August 2003 blackout once again focused concerns on reliability of the U.S. electric power system as a high priority. When large scale problems in the electric utility industry occur, there is an immediate reaction by the general public, legislators, and the Administration. Numerous studies have analyzed power system outages to determine how to avoid them in the future.[13]

To consider how restructuring affects reliability, this report will first reference the NERC definition of reliability and discuss the relationship between maximizing reliability and minimizing uncertainty. Factors that increase or decrease uncertainty will be identified. Uncertainty factors that result from the changes promoted by industry during electric utility restructuring will be identified. Finally, reliability issues addressed by proposed legislation will be discussed.

Reliability Definition

Reliability of the electric grid has been defined by NERC in terms of two functional aspects.[14] These include:

> Adequacy — the ability of the electric system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and reasonably expected unscheduled outages.
>
> Security — the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system elements.

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[11] Yoder, Christian and Hall, Stephen, "Trader Strategies in the California Wholesale Power Markets/ISO Sanctions,"Enron Memos available on FERC website, December 6, 2002, [http://www.ferc.gov/industries/electric/indus-act/wem/pa02-2/12-06-00.pdf], and December 8, 2002, [http://www.ferc.gov/industries/electric/indus-act/wem/pa02-2/12-08-00.pdf].

[12] Wood, Pat III, "Implications of Enron's Collapse on Energy Markets," FERC, Testimony before Senate Committee on Energy and Natural Resources, January 29, 2002, [http://www.ferc.gov/press-room/ct-archives/2002/01-29-02-wood.pdf].

[13] Department of Energy, "Report of the U.S. Department of Energy's Power Outage Study Team," Washington, DC: U.S. Department of Energy, March 2000.

[14] North American Electric Reliability Council, "Reliability Concepts," February 1985, See the NERC website, [http://www.nerc.com/~filez/reports.html].

In considering these two functional aspects, it is important to consider the phrase "at all times" used to describe the "adequacy" of the electric grid. Since there is no storage capability on the grid, supply must meet demand at every moment in time. If total supply does not meet demand, then the electric grid will respond automatically to restore the balance. A critical imbalance can happen within seconds after a large block of power is disconnected or added to the system. Since there are no real restrictions on the fluctuations of demand on the electric grid, and customers may change their requirements for power at any time by simply throwing a switch, imbalance between supply and demand occurs on a regular basis. Changes in overall supply must respond within minutes to match each demand change. Under normal conditions, predictions of load are accurate and demand changes that vary from scheduled predictions are small so the imbalance is restored within minutes.

Reliability Improvements

Reliability improvements to the bulk power system are made, in general, by minimizing risk and taking away uncertainty. This implies that all potential operating conditions are known and anticipated. If all potential operating conditions of the bulk power system can be anticipated, then equipment can be designed, constructed, and operated to minimize uncertainty. When all known conditions are identified and addressed, then reliability is maximized. Conditions that must be anticipated include variations in weather, fuel supplies, population, and industrial loads, which make bulk power system control a complex operation. In spite of the difficulty, the electric utility industry has been dealing with these issues for many years, and industry's reliability record implies the capability to predict these types of variations has been adequate and, in many cases, excellent.

There are two basic options for improving reliability. The first option is to construct the bulk power system with a high level of "adequacy" using large generation and transmission capability. Under this scenario, risk and uncertainty are minimized because the bulk power system is constructed to handle stresses well beyond what are predicted to occur. Unfortunately, the cost of this option is high and the redundancy in the infrastructure does not contribute to increased electricity production. The second reliability improvement option is to improve the operational methods or efficiency of the power system. Demand management is an example of operational methods that limit or interrupt loads when necessary to improve reliability. Demand management occurs when a customer allows the utility to shut down electric services to maintain the balance between generation and load. Another example of the efficiency improvement option is the training of operators in procedures to avoid outages or provide quick recovery when outages occur. Risk and uncertainty are overcome by operating the existing bulk power system in an efficient way. Cost is reduced by using the second option, but reliability is not assured.

Realistically, some combination of the above two options probably is needed to reduce risk and uncertainty and ultimately improve reliability. In both cases, the uncertainty and risks to the bulk power system must be identified and then eliminated. As the risk level rises, the potential for problems increases and reliability degrades. Ideally, the added risks are identified and addressed before actual problems occur. As the risks are eliminated, the potential for problems decreases and reliability is improved.

Predicting Reliability

It is difficult to predict reliability performance. Measuring reliability after the fact is easily accomplished by counting the number of times blackouts or other outages occur. Predicting that a particular system will be reliable in the future is much more difficult. Rather than quantifying reliability measures, this report will consider changes to the bulk power system that are adding or taking away risk and uncertainty. When uncertainty is added, reliability is decreased and problems may occur. Conversely, if uncertainty is removed, reliability is increased and potential problems have been eliminated.

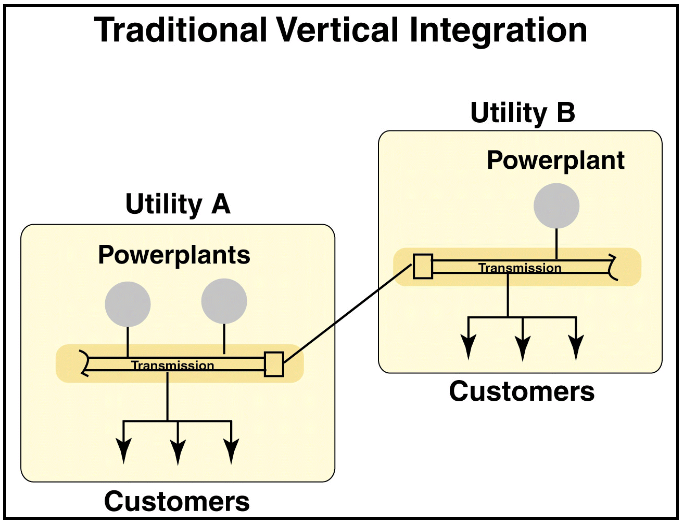
The traditional electric power system has provided reliability that is envied in many other parts of the world. Therefore, this report will further assume that reliability levels provided by the U.S. electric utility system before restructuring can be used as a benchmark. That benchmark will be considered the desired minimum standard for reliability. The report will first look at changes in uncertainty and risk to the bulk power system that have occurred since restructuring and wholesale competition was first introduced by EPACT in 1992. Finally, the report will consider how proposed legislation could affect uncertainty.

Overview of Electric Utility Restructuring

In order to understand the discussions that follow, a brief overview of restructuring changes occurring within the electric utility industry is necessary. **Figure 1** provides a simple view of the traditional industry structure before competition was introduced. The U.S. electric utility industry consisted of approximately 200 "vertically integrated" utilities that provided generation, transmission, and distribution services. The figure depicts two such utilities with a transmission connection between them. The utilities each have their own customers in their particular control areas.[15] The utility control area was a geographic area within one state franchised to the utility by the state government.

[15] The utility control area contained all the bulk power system equipment owned by the utility. Within the utility control area, customers received electric power only from that utility. The control area was also referred to as the franchised area.

Figure 1. Traditional Vertically Integrated Utilities



Source: Congressional Research Service.

The two utilities in **Figure 1** have a single transmission connection between them which represents the numerous transmission connections between the traditional vertically integrated utilities. Beginning in the 1930's, utilities generally developed enough generation capacity in their own control areas to provide for all their own customers. Only small amounts of electricity were purchased at a wholesale level across these transmission connections between utilities. During the last quarter of the 20th century, utilities became more and more dependent on wholesale purchases across the transmission connections as other factors drove up the cost of providing generation internal to their control areas. In some cases, utilities constructed large, remotely-located and jointly-owned powerplants requiring transmission of electricity over long distances to their customers. Greater efficiency was achieved because the transmission connections allowed utilities to help each other under changing load conditions without having their own redundant generating capacity.

Figure 2 shows the traditional regulatory structure for the "vertically integrated" utilities. In return for providing service to all retail customers within a geographically defined control area, utilities received a monopoly status across the control area. The utility rates for retail customers[16] were generally regulated by a state public utilities commission (PUC). The rates were set to guarantee the utility, and its investors, revenue[17] sufficient to achieve a fair rate of return (ROR). The rates provided dividends and funded improvements, operations, and maintenance activities.[18] State PUCs enforced laws passed by the individual state legislatures that

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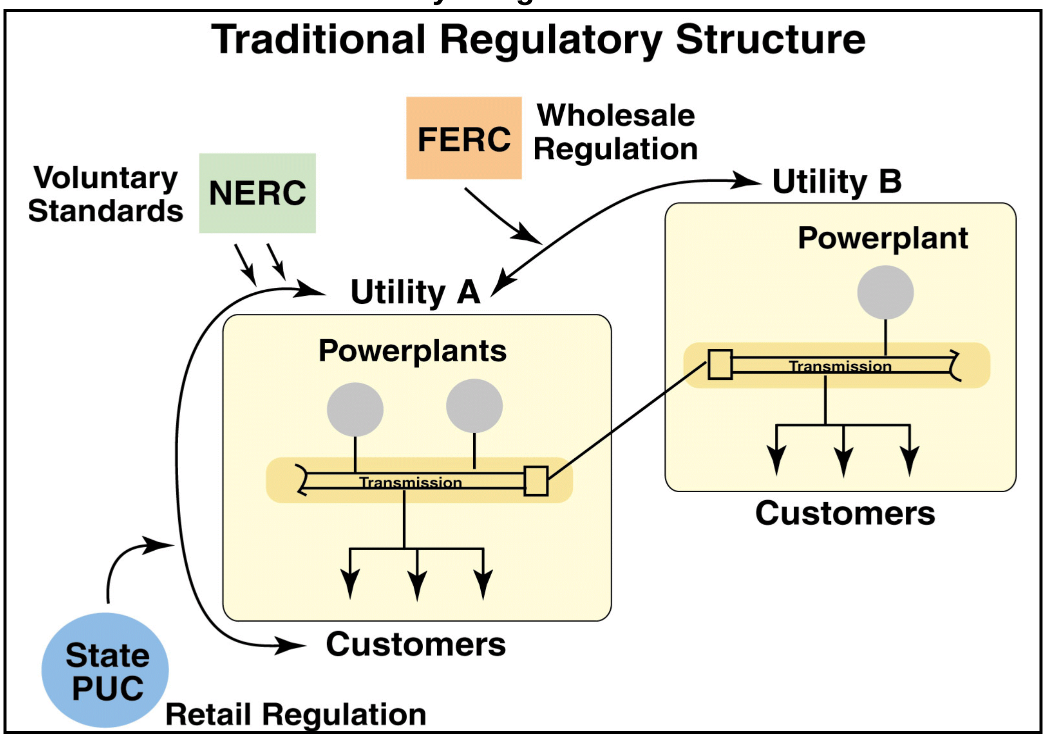
[16] Retail customers are the ultimate consumers of electricity, while wholesale customers purchase electricity for resale to others.

[17] Also referred to as a "revenue requirement."

[18] Most of the industry consisted of investor-owned utilities with a ROR regulated by the state PUC; however, approximately 25% of the industry includes public power utilities that (continued...)

set quality of service standards for electricity. The state laws vary, but they generally allow the commissions to order service improvements, investigate the methods employed by utilities to provide service, and to order "such reasonable improvements as will best promote the public interest, preserve the public health and protect those using such gas or electric service."[19] In general, standards were set at the retail level for the amount of time allowed to restore service after an outage, for the required voltage stability, and for the number of outages allowed in a particular time frame. The utilities worked to identify improvements required to maintain quality of service, and the commissions reviewed and authorized costs required to make improvements.

Figure 2. Traditional Regulatory Structure for Vertically Integrated Utilities



Source: Congressional Research Service.

The Federal Power Act (FPA) of 1935 provides the federal government with the authority to regulate "interstate" transmission and the contracts between utilities for wholesale generation. FERC regulates the wholesale electricity market, but these regulations, prior to restructuring, were primarily economic and did not focus on reliability of the power system. The Securities and Exchange Commission (SEC)

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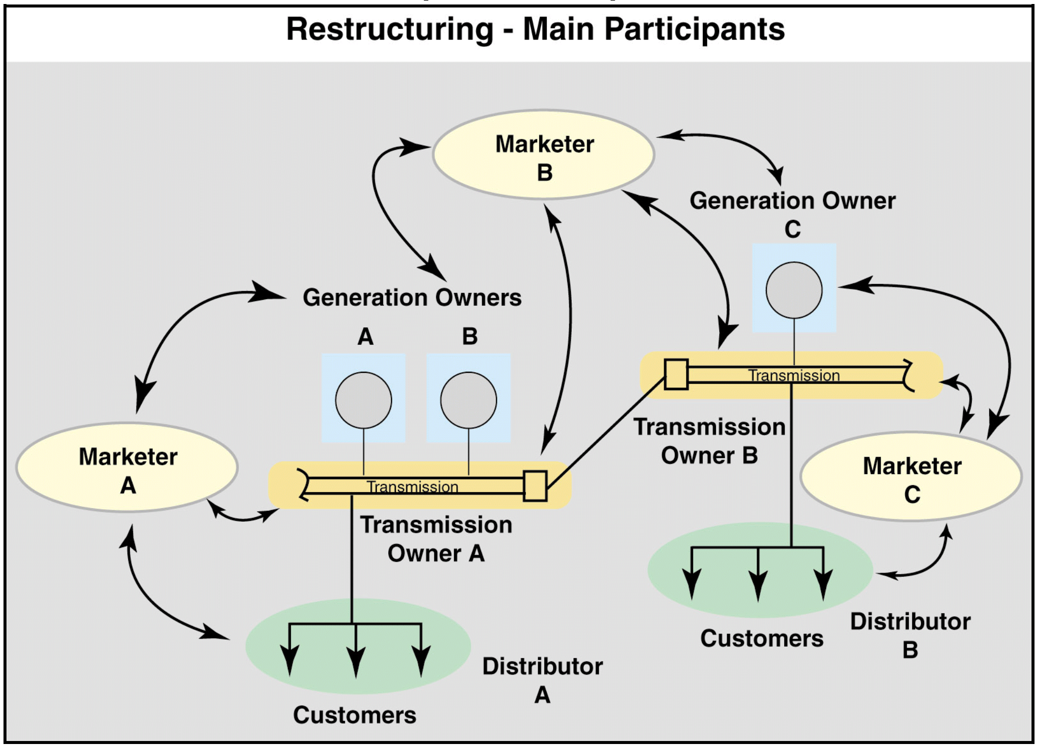
[18] (...continued)
are non-profit and operated to recover costs. These utilities are owned federally, by a state, a city (municipality), or a rural cooperative.

[19] N.Y. Pub.Serv.Law sec. 66(2) (McKinney 1989). See also D.C. Code Ann. Sec. 43-1001; general commission powers include "power to order reasonable improvements as will reasonably promote the public interest" and power "to prescribe from time to time the efficiency of the electric supply system." See New York State Public Service Commission, [http://www.dps.state.ny.us/].

regulates the financial transactions of the industry. Reliability standards have been the responsibility of NERC. NERC, whose membership is taken from the utility industry, provides operational standards that all utilities voluntarily follow. Larger utilities have tended to participate more heavily in NERC since their liabilities for poor reliability are much greater. Several voluntary methods are used to encourage compliance with the voluntary standards, such as publishing compliance reports that recognize high performance levels.

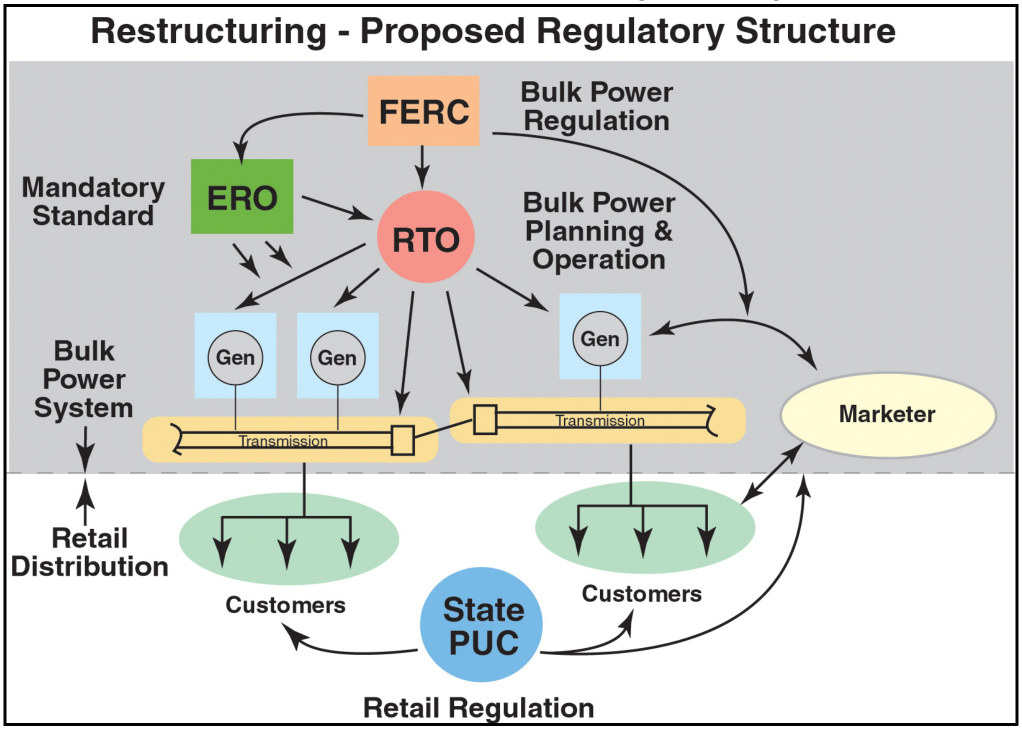
Figure 3. Main Participants in Electric Industry Restructuring (Generalized)



Source: Congressional Research Service.

Beginning with the passage of EPACT in 1992, the structure of the electric utility industry began to change. **Figure 3** shows the main participants in the present-day structure. The structure is designed to provide competition within both retail and wholesale markets. In order to accomplish this, the classic vertically integrated utility has been broken into, at most, four companies. First, a separate transmission company has been formed by many utilities. The separate transmission company is generally required by FERC to assure open and fair transmission access without giving preference to any energy supplier. In some cases, vertically integrated utilities have become both a transmission and distribution company by selling their generation assets. **Figure 3** shows how service to retail customers is provided, in some cases, by forming a separate distribution company. The powerplants, owned previously by the utility, are sold to one or more generation owners. Finally, a marketing company provides the financial connection between the generation owners, the transmission owners, and the distribution companies. The ultimate goal is to provide retail customers the ability to purchase electricity from any electric supplier, either a marketer without its own generation capacity or an electric supplier that owns generating capacity. The transmission owner and distribution owner receive fees for the usage of their systems, but fair competition between the generation owners will dictate how the transmission system is used.

Figure 4. Proposed Regulatory Structure for Restructured Electric Utility Industry



Source: Congressional Research Service.

Proposed legislation would authorize the regulatory structure for the electric utility industry shown in **Figure 4.** The goal of the legislation is to improve bulk power system efficiency and promote competition. FERC's Order 2000 encouraged the formation of Regional Transmission Organizations (RTOs) that would provide a vehicle for transition to competitive markets for wholesale electricity. RTOs are expected to provide both operational and planning functions for a group of generation and transmission owners. Proposals also advocate the formation of an Electric Reliability Organization (ERO) based on the traditional NERC structure. An ERO would develop mandatory standards for all activities on the bulk power system. Violation of mandatory standards would result in penalties, and the threat of penalties might encourage participants to maintain reliability features even when the standards were not perceived as economically beneficial to the transmission owner. State PUCs would continue to regulate the retail markets and protect retail customers.

Risk Factors Created by Industry Changes Made During Restructuring

As a result of restructuring activities in the electric utility industry, several changes are occurring that have the potential to affect reliability. The various changes can be grouped into the following six areas:

1. Institutional structure
2. Return on investments
3. Wholesale markets and competition
4. Reliability responsibilities
5. Retail customer base
6. Retail service obligations

For each of these six areas, this report will compare functionality before and after restructuring. Risk factors associated with the changes that may contribute to increased or decreased reliability are discussed. Some of the risk factors identified are projected for the future while others are already occurring. A summary of all identified risk factors is provided in **Table 1** at the end of this section.

Institutional Structure

Prior to Restructuring. Prior to restructuring, the electric utility industry had a comparatively simple structure (See **Figure 1**). Utilities were vertically integrated. Each utility owned a major portion of the bulk power system (generation and high-voltage transmission) within its control area, and the utility was required to support the retail customers who were connected to the distribution system in its control area.

Transition to Restructuring. As restructuring occurs, vertically integrated utilities give way to multiple companies providing multiple individual services (**Figure 3**). In FERC Order 888, electric services, which previously were bundled into one product, are now being unbundled. Ideally, the unbundling will restructure the industry such that multiple companies provide generation, transmission, and distribution services, and marketing companies will link suppliers with users in competitive markets. NERC has developed a reliability model that can be used as a basic guide for participants in competitive markets.[20] The model shows relationships among 11 various functions performed by individual companies or entities in a competitive market.

Risk Factors. FERC hopes to decrease risk and improve reliability by providing centralized coordinators or Regional Transmission Organizations (RTOs). FERC Order 2000[21] proposed that RTOs be formed to provide centralized

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[20] Control Area Criteria Task Force, "The NERC Functional Model — Functions and Relationships for Interconnected Systems Operation and Planning," NERC, Jan. 20, 2002, ftp://www.nerc.com/pub/sys/all_updl/oc/cactf/CACTF-Final-Report-Functional-Model.pdf.

[21] FERC, Docket RM99-2-000,

(continued...)

coordination functions. The RTO is expected to oversee operations and planning functions covering large, multi-state regions of the bulk power system in the United States. This coordination could eliminate the multiple control centers for each individual utility that existed prior to restructuring by replacing them with a coordinator to oversee the entire regional area. As an independent coordinator, the RTO would identify reliability problems at a regional level without bias toward a particular market participant. FERC has argued that the broader RTO view could provide a more efficient approach to maintaining reliability in the region.

The FERC RTO policy has been difficult to implement. In some cases, industry participants are reluctant to proceed, while in other cases participants have faced obstacles in implementing the RTO policy. FERC has granted RTO status to three entities. On December 20, 2001, FERC granted RTO status to the Midwest Independent Transmission System Operator (MISO).[22] On September 18, 2002, FERC approved the RTO West proposal.[23] RTO West includes all, or part of, Washington, Idaho, Montana, Oregon, Nevada, Wyoming, and Utah, as well as a small part of northern California near the Oregon border. FERC granted PJM RTO status on December 19, 2002.[24] PJM manages the grid in parts of Ohio, West Virginia, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, and the District of Columbia. Other RTOs have received conditional approval from FERC. FERC conditionally approved SeTrans RTO and WestConnect RTO on October, 9, 2002.[25] SeTrans includes utilities in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas. WestConnect RTO will operate in parts of Arizona, Colorado, New Mexico, and Utah.

The addition of many new companies with new responsibilities makes the coordination task complex. One example of failed coordination, from the California perspective, was controlling maintenance schedules of generators. After most California utilities sold their generation facilities to independent power producers, the California ISO had no real control over units taken out of service for maintenance. In order to encourage generators to return to service, the California ISO developed a website that provides public access to generator outage schedules.[26] Eventually, FERC provided the ISO with the authority to demand outage schedules from generators. Allowing these schedules to be driven only by market mechanisms resulted in allegations that several powerplants were taken out of service based on market decisions rather than on predicted system needs for generation.

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[21] (...continued)
[http://www.ferc.gov/legal/ferc-regs/land-docs/RM99-2A.pdf].

[22] FERC, Docket RTO1-87-000.

[23] FERC, Dockets RT01-35-005 and RT01-35-007.

[24] FERC, Dockets RT01-2-001 and RT01-2-002.

[25] FERC, Dockets EL02-101-000, RTO2-1-000 and EL02-9-000

[26] California ISO public website, [http://www.caiso.com/unitstatus/index.cgi].

Return on Investment

Prior to Restructuring. Before restructuring began, the return on investment for a vertically integrated utility was primarily dependent upon retail rates that were regulated by the state PUC. Because the return was regulated, the risk associated with investment was relatively low. The advantage of the process was a consistent, and predictable, rate-of-return for the utility. Therefore, the financial risk to utility investors for capital improvements was relatively low.

Transition to Restructuring. Restructuring directs companies to participate in competitive generation markets. The responsibility for obtaining a return on investments is now dependent on performance in a competitive market. If a company builds or purchases a new powerplant, the return on that investment will depend on market-based rates. The company's ability to analyze the market is a key factor in providing investors with an acceptable rate of return (ROR).

Risk Factors. Reliability improvements result when a profitable rate of return is achieved by companies providing good quality service in regions where there is a demand for power. The potential to receive a profitable rate of return dictated by market-based rates is expected to attract a new set of more efficient participants to electricity markets. It is argued that these participants will provide new investments in the bulk power system that otherwise would not be available. Such new investments would hold the potential to not only improve the reliability of the power system, but to provide technology improvements as well.

The transmission portion of the bulk power system has been characterized by a lack of investment in recent years. According to a study sponsored by the Edison Electric Institute (EEI), average transmission system growth exceeded the growth in summer peak usage between 1979 and 1989, when both were approximately 3% per year.[27] Since that time, the transmission system has grown an average of approximately 0.5% per year while the summer peak usage has grown an average of approximately 2.5% percent per year. The cost to maintain the current level of adequacy for the next 10 years is estimated at $56 billion in investment.

In another EEI study, two primary barriers to building new transmission lines were identified.[28] First, the study shows that difficulties in siting transmission lines have discouraged investors. Second, the study asserts that adequate return on equity (ROE) for investors does not exist. There are several reasons provided for the lack of financial incentives, which include uncertainty about rate caps, uncertainty about

[27] Hirst, Eric and Kirby, Brendan, "Transmission Planning for a Restructuring U.S. Electricity Industry," Consultants, Oak Ridge, Tennessee, Funded by Edison Electric Institute, Washington, D.C., June 2001, [http://www.eei.org/industry_issues/energy_infrastructure/transmission/transmission_hirst.pdf].

[28] Hirst, Eric, "Expanding U.S. Transmission Capacity," Consultant, Oak Ridge, Tennessee, Funded by Edison Electric Institute, Washington, D.C., August 2000, [http://www.eei.org/industry_issues/energy_infrastructure/transmission/hirst2.pdf].

RTO rate methodology, state and federal regulatory changes, and lower FERC-recommended ROE.[29]

Wholesale Markets and Competition

Prior to Restructuring. Wholesale markets, prior to restructuring, accounted for a relatively small amount of the entire electricity production in the United States. Utilities normally performed system planning with the goal of providing enough generation internal to their control area to supply a high percentage of their own customers with electricity (see **Figure 1**). In many cases, the wholesale markets were characterized by long term, fairly stable contracts between utilities to take advantage of seasonal variations.

Transition to Restructuring. During restructuring, the number and size of transactions occurring in the wholesale market have increased dramatically. The increase in the number of wholesale market transactions is a direct result of the unbundling of the generation services. Generation and transmission services are now generally sold separately. The number of merchant powerplants[30] is increasing and contributing to the increased number of wholesale market transactions. Today's wholesale markets are characterized by contracts with much shorter time frames that use day-ahead and hour-ahead markets.

Risk Factors. The increase in market activity is characteristic of a healthy, growing market that should support improved reliability. The economic health of the market supports reliability by encouraging new investments where demands for transmission and generation resources are high. The increased number of participants creates more opportunities to receive assistance during emergencies and provides greater redundancy.

A wholesale market development that improves reliability (by decreasing risk) is the implementation of ancillary services markets.[31] Ancillary services have been identified as an operational commodity that needs to be purchased by an independent system operator for wholesale consumers and are used to maintain transmission

[29] In the EEI study, "Expanding U.S. Transmission Capacity," the author cites two California cases where FERC granted ROE that was approximately 2% below the ROE granted under state regulation.

[30] Merchant powerplants sell generation and ancillary services as commodities into electricity markets at market-based rates in an effort to provide the highest possible ROR for their company investors.

[31] Ancillary services are both generation and voltage services that are required to support reliability of the power system. Services include spinning reserves that can be used when generation is needed quickly, generation whose power output can be regulated up or down automatically for changing load conditions, generation that can be started and placed on-line quickly, loads that can be taken off-line quickly, generation that can be started without any outside power source (black-start), and generation that can provide automatic control of system voltage.

system reliability.[32] Ancillary service markets provide a method to value such services and encourage their production. FERC proposed in Order 2000 that RTOs be given the responsibility of setting requirements for ancillary services.

Although active markets are assumed to promote reliability, their complexity, number of transactions, and short time frames represent a challenge to the reliability of the bulk power system. All of these factors tend to contribute to increased volatility and uncertainty. Therefore, it is possible for a marketer to initiate transactions that push the bulk power system closer to capability limits because proper system studies are not performed. Transmission system congestion results when bulk power transactions force transmission system operation beyond capacity limits. This is a problem because the wholesale transactions focus on matching desired suppliers with consumers and do not give as much consideration to the resulting transmission system congestion.

EEI reported that transmission congestion grew by more than 200% between August 1999 and August 2000.[33] A U.S. Department of Energy (DOE) study determined transmission congestion in four U.S. regions (California, PJM[34], New York, and New England) cost consumers $500 million annually.[35] In the study, DOE made over 50 recommendations that would improve the bulk power transmission system to facilitate the development of competitive wholesale electric markets. Increased coordination and tools are required to make sure numerous transactions performed in the short term can be handled by the transmission system.

Reliability Responsibilities

Prior to Restructuring. Prior to electric utility restructuring, the responsibilities for reliability were very clearly given to the individual utilities. As discussed previously, NERC was formed to provide a format for utilities to join together in developing reliability standards for the operation of the bulk power system. The utility owners knew that reliability of the bulk power system depended on each utility following certain standards. The standards developed were based on a voluntary system that worked well during the last three decades of the 20th century (See **Figure 3**). Quality-of-service laws were passed by most state legislatures and enforced by the state PUCs to ensure reliability of retail supplies. When a utility failed to meet the standards, some corrective action was taken by the utility and the

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32 U.S. Department of Energy, "Maintaining Reliability in a Competitive U.S. Electric Industry," Final Report of the Task Force on Electric System Reliability, September 29, 1998.

33 Edison Electric Institute,"The Living Grid — Evolving to Meet the Needs of America," *Power*, Washington, D.C., July 2001 issue.

34 PJM Interconnection, L.L.C. ("PJM") is a limited liability company which provides electric service to customers in Pennsylvania, New Jersey, Maryland, Delaware, the District of Columbia, and Virginia's eastern shore.

35 U.S. Department of Energy, "*National Transmission Grid Study*," May 2002, [http://www.eh.doe.gov/ntgs/].

PUC to improve local reliability. Most reliability problems occurred in the local distribution systems rather than within the bulk power system.

Transition to Restructuring. During restructuring, the electric utility industry has initiated several changes to address new reliability responsibilities for competitive entities. NERC has initiated a transformation from a voluntary organization to a self-regulatory organization. DOE, FERC, and the utility industry are all working to provide guidance and procedures that may be used by regulators and participants in developing competitive markets.

Risk Factors. Reliability responsibilities during restructuring are much more difficult to determine. The increased number of participants create additional risk. A new set of participants that market electricity enter and leave the market on an irregular basis. While separation between the market and those responsible for reliability must be achieved to avoid market abuse, the coordination between various participants must continue to achieve high levels of reliability. The task force commissioned by DOE found "uncertainty regarding statutory and regulatory authority over reliability management."[36]

Customer Base

Prior to Restructuring. Prior to restructuring, the customer base for a regulated utility was determined by the utility control area. The utility was obligated to provide service to all retail customers in the control area. As mentioned previously, the utility received monopoly status from the state PUC as compensation for taking on the obligation to serve all customers. The utility estimated customer demands based on weather, industrial activities, and projected growth. Planning studies were normally employed to determine generation needs internal to the control area while considering external power purchasing constraints. Economic analysis was used to determine the least-cost overall solution to achieve the desired reliability. In states that have not restructured their retail markets, this condition still exists.

Transition to Restructuring. During restructuring, competition or "customer choice" is provided to retail consumers. This implies that distributors of electricity must account for a changing customer base resulting from their choosing different suppliers. A supplier must continue to predict loads based on all the information used before restructuring (weather, population growth, industrial growth) while adding the factor associated with "customer choice."

Risk Factors. There is reliability improvement provided to the customer by having multiple, redundant suppliers. If one supplier is not acceptable, from a price or reliability standpoint, then a customer has an option to switch suppliers. This ability for customers to choose suppliers is an advantage over the previous structure, in which no choice was provided. However, the reliability of the bulk power system could degrade if the added unknown of customers changing suppliers becomes noticeable.

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[36] U.S. Department of Energy, "Maintaining Reliability in a Competitive U.S. Electric Industry," 1998, Executive Summary, page xi.

Most existing data indicate that few customers with the ability to choose suppliers are exercising their option to change, and relatively small numbers of supplier changes by residential customers will not affect electricity flows in the bulk power system. However, larger industrial customers that move from one supplier to another could affect the bulk power system reliability depending on the physical location of the new wholesale supplier. To keep reliability at the same level, large customer base changes resulting from large demand moving from one supplier to another supplier must be accommodated without causing reliability problems in the wholesale supply and transmission of electricity. The effect of these changes on bulk power system reliability is difficult to predict.

Service Obligations

Prior to Restructuring. As has been mentioned, vertically integrated utilities were given a monopoly territory in return for taking on the obligation to serve all customers in that territory. The customers within the control area received a reliable source of electricity as dictated by state quality-of-service legislation. The obligation to serve accepted by the utilities translated to a well-defined reliability level for customers.

Transition to Restructuring. In states that have authorized competitive markets, the obligation to serve exists at the distribution level; however, suppliers no longer have any such obligation. Generators who previously were part of a regulated utility that did have an obligation to serve are now focusing on participation in the competitive market. Electricity generators are no longer regulated by state quality-of-service legislation but are driven by making a profit. An electricity service provider may sacrifice reliability in one area to achieve an improved profit margin by lowering existing quality-of-service or by serving a different area. Within a California statute, the legislature noted that "[t]he proposed restructuring of the electricity industry would transfer responsibility for ensuring short- and long-term reliability away from electric utilities and regulatory bodies to the Independent System Operator and various market-based mechanisms."[37]

Risk Factors. In an effort to maintain reliability, several states have passed restructuring legislation requiring a minimally acceptable level of retail service. Some states have statutes that require service records for unplanned outages to be reviewed by public authorities and certain other service reliability measures.[38] Other states have requirements for adequate reserve margins and require reliability criteria to be equal to NERC standards.[39] These laws apply only to retail service. Therefore, if retail service outages result from a lack of bulk power system performance, it is not clear how the state legislation will affect needed improvements in the wholesale supply.

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[37] California Statute, AB1890. (334).

[38] Texas, Section 36, Subchapter A, Chapter 38, Section 38.005

[39] Illinois, 220 ILCS 5/16-126.

Summary

Table 1 provides a summary of all the risk factors identified in this section. Increased risk is an indication of potential reliability problems. Reliability issues result from situations where uncertainty or risk is not identified and eliminated. The summation at the bottom of **Table 1** is based on an observation that many of the reliability improvements associated with restructuring have not been realized to a large degree. No real simplification of control areas has been seen, and new capital for transmission has not been made available (even though markets have attracted many new generation suppliers). The major factor increasing uncertainty is the desired use of the bulk power system to support competition, which was not envisioned by the original power system designers. In order for the bulk power system to reliably support competition, many argue that it must be developed into more of a "superhighway" with higher capacities and less congestion.

Table 1. Summary of Factors from Functional Changes in the Electric Utility Industry Resulting from Restructuring That Can Affect Reliability

Functional Changes During Transition That Affect Reliability	Factors That Increase Reliability	Factors That Lower Reliability
Institutional Structure	Long-term improved coordination could simplify structure by decreasing the number of control areas.	Added complexity is making coordination among entities difficult, at least in short term.
Return on Investments	New markets encourage new participants bringing new approaches and new capital.	No guaranteed rate-of-return given to participants; High uncertainty of transmission investment.
Wholesale Competition	New market participants provide redundancy; Concept of ancillary service markets sets value for some elements of reliability.	Many market participants add complexity and bring new uncertainty.
Reliability Responsibilities	NERC mandatory standards; Industry and technology improvements.	Distribution of responsibilities among several entities is complex.
Customer Base	Retail redundancy is provided.	"Customer choice" may add future uncertainty.
Service Obligations	State-sponsored reliability legislation.	Generators are driven by markets and have no obligation to serve.
Summation	Many improvements are being developed but have not been realized at this point.	Increased uncertainty is creating conditions not considered in original bulk power system designs.

Source: Congressional Research Service.

Federal and State Jurisdiction

The major industry changes identified in the previous section generally have the potential to improve or degrade reliability. State legislators together with their public utility commissions have jurisdiction over the retail markets within their states. State legislators are determining if and when their state retail markets will transition to a competitive structure.[40] Under current federal law, FERC has jurisdiction over the wholesale markets and the bulk power system unbundled transmission system.[41]

State restructuring legislation can have an effect on the reliability of the bulk power system. Retail changes such as the promotion of customer choice and the lack of an obligation to serve by merchant generators may affect reliability. Under current laws, federal legislation does not directly affect industry changes at the retail level. The Federal Power Act limits federal jurisdiction to unbundled transmission; however, the bulk power system must be capable of addressing uncertainty resulting from competitive retail markets. The goal of much federal legislation dealing with electric utility restructuring is to supply a framework for development of a bulk power system that will support competition at the retail level.

Public power utilities in various portions of the United States also create jurisdictional issues for both state and federal agencies. Public power utilities own approximately one quarter of the bulk power system's generating capacity and approximately 30% of the transmission system. Under current federal law, FERC does not have jurisdiction over the transmission owned and operated by these utilities. FERC does review cost-based rates set by public utilities. Therefore, the present jurisdiction for FERC includes only the portion of the bulk power system owned and operated by for-profit entities, which includes investor-owned utilities and non-utility entities (generators, marketers, distributors). Some legislative proposals would modify the definition of an "electric utility" in the Federal Power Act to include federal and state sponsored utilities and municipalities.

Proposed Federal Legislative Solutions

Even though the goal of existing federal law (PURPA, EPACT) is to encourage competition in electric markets while maintaining reliability, the complex technical requirements associated with open access were not fully understood when the legislation was enacted. The factors identified in the previous sections suggest the

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[40] For more information of the status of state restructuring plans, refer to Energy Information Administration website, [http://www.eia.doe.gov/cneaf/electricity/chg_str/restructure.pdf].

[41] Unbundled transmission services are the services that a utility provides as a separate service. A rate or tariff for the transmission services is provided by the utility and is applied equally to itself and others. The Supreme Court ruled that even though unbundled transmission was purchased by retail customers, FERC still retained jurisdiction when the unbundled transmission supported interstate commerce. Supreme Court of the United States, No. 00-568, *New York et al., v. Federal Energy Regulatory Commission et al.*, Together with No. 00-809, *Enron Power Marketing, Inc. v. Federal Energy Regulatory Commission et al.*, Argued October 3, 2001-Decided March 4, 2002.

level of risk that has been placed on the bulk power system. The risk comes from attempts to implement competition at both wholesale and retail levels using a bulk power system that was designed to service franchise control areas owned and operated by regulated monopolies. Many of the anticipated risk improvements, which were expected to result from restructuring efforts, have not been realized.

Various legislation has been proposed at the federal level to improve reliability of the bulk power system during the restructuring process. These proposals have the potential to affect reliability of the bulk power system. In the following sections, the provisions in the legislation will be identified and potential effects on reliability will be discussed. **Table 2** provides a summary of the purposes and issues for each legislative provision.

Participation in Regional Transmission Organizations

Some congressional proposals address participation by electric utilities in RTOs. These include encouraging FERC to provide incentive rates for transmission for those that do, allowing the Tennessee Valley Authority and federal power marketing administrations to join an RTO, requiring FERC to convene discussions with state regulatory authorities to determine whether an RTO is necessary in a region, and prohibiting FERC from requiring a transmitting utility to transfer operational control of its transmitting facilities to an RTO or ISO.

Purpose. FERC initiated the RTO implementation process in December 1999 by issuing Order 2000. FERC intends for the RTOs to have, in part, the following characteristics:

- Independence from stakeholders
- Broad scope and regional configuration
- Broad operational authority, including interconnections
- Control over short-term reliability

Therefore, the purpose of encouraging utilities to form RTOs is to create a change in institutional structure that would promote reliability of the bulk power system within a region. RTOs would coordinate improvements and administer reliability requirements to distribute costs fairly among the regional participants.

Issues. As has been discussed, the implementation of RTOs holds the potential to reduce risk through providing a central control and planning function, reducing the number of control areas, and simplifying the institutional structure. Many industry participants support the implementation of RTOs if constructed to provide "fair" access to the transmission system. The difficulty has been achievement of that goal. Originally, Order 2000 called for implementation of RTOs across the United States by December 2001. Only one RTO, the Midwest RTO, had been approved by FERC by the end of 2001. Other RTOs are in various stages of the approval process; however, the implementation of these organizations has been slow.

There are several coordination issues relating to RTOs. The number of RTOs to be implemented in the United States bulk power system is uncertain. The coordination of the planning functions is not clear, nor how planning and capital improvements to maintain reliability of the transmission system will be encouraged. It is also not clear whether a reduction in the number of control areas will be accomplished. Transmission congestion issues will be difficult to solve. Opponents of the FERC RTO proposals argue that the cost of setting up the RTO may be too high and will create a financial burden for some participants that is unacceptable. All of these unknowns add to uncertainty and therefore increase risk.

FERC Jurisdiction Over Bulk Power System Reliability

At the present time, NERC has responsibility for reliability of the bulk power system. Legislation has been proposed in every Congress since the 105th to improve reliability and give FERC jurisdiction over an Electric Reliability Organization (ERO).

Purpose. The purpose of the proposed legislation is to provide federal jurisdiction over activities that are required to support reliability of the U.S. bulk power system. The Federal Power Act gives FERC jurisdiction over unbundled transmission and was intended to regulate wholesale rates; however, no authority was provided to regulate reliability. Clarifying FERC authority to establish and regulate an ERO is intended to improve reliability as restructuring of the U.S. bulk power system proceeds.

Issues. Advocates of giving FERC authority over the ERO contend that central jurisdiction would provide more accountability. FERC would be ultimately responsible for reliability issues. If the penalties employed by the ERO were not successful, then FERC would have the authority to enforce penalties for entities that did not comply with reliability standards. Establishing this new relationship between FERC and the ERO would have the potential to improve coordination between market functions and reliability functions. Those opposed to giving FERC jurisdiction over bulk power system reliability contend that FERC has no experience in this area. If FERC is given this authority, it would have to rely on NERC for much of its expertise. Placing FERC in this position may add to the uncertainty associated with the changes in institutional structure as FERC takes on this new role.

Transmission Siting

Providing FERC with the authority to site transmission lines in regions where interstate transmission is needed to relieve congestion has been another proposed, yet controversial, solution to increase long term reliability of the bulk power system. State PUCs have transmission siting authority at the present time. Some proposals would provide for federal and state coordination of permitting for electric transmission facilities. Others would authorize FERC to issue transmission construction permits in areas found by DOE to be "congested."

Purpose. The purpose of the legislation is to make sure required transmission capacity can be constructed in situations where state PUC siting procedures do not give adequate consideration to bulk power system reliability. Congestion on the transmission system continues to be problematic.

Issues. Proponents of federal siting authority argue that problems with siting interstate transmission exist and FERC authority would facilitate construction of transmission lines. In this case, the national need for reliability of the transmission grid, based on FERC review, would possibly override state restrictions in siting a transmission line. Advocates believe that an interstate grid system cannot be built without providing FERC with some siting authority. State PUCs, concerned about environmental effects of building more transmission lines, contend that transmission line siting should remain under local PUC control.

Public Utility Holding Company Act Repeal

Repeal of PUHCA has been proposed for many years by several within the industry and the Securities and Exchange Commission (SEC).[42] All of the legislative proposals would provide federal access to company books and records to protect consumers against companies that may exercise market power to control wholesale prices, perform cross-subsidy operations, or exercise deceptive practices.

Purpose. The repeal of PUHCA has several purposes. According to the SEC, the regulations in the act became redundant in the 1980s. State retail regulation of utilities has been strengthened and the SEC has enhanced its regulation of securities, including those of public utility holding companies. Advocates for PUHCA repeal believe the act limits capital investment in the electric utility industry. More specifically, some believe PUHCA limits the formation of companies that would construct transmission capacity over broad interstate regions.[43] The purpose of the PUHCA repeal language is to eliminate legislation that is seen as unnecessary and as limiting industry expansion.

Issues. Those opposed to PUHCA repeal argue that the law maintains necessary safeguards for the industry because it tends to limit formation of large interstate companies that, by their nature, could control the marketplace. Opponents of the repeal are primarily concerned about consumer protections. There are also concerns about market failures resulting in a loss of confidence by investors, which translates to a reliability problem when new transmission and generation cannot be constructed. PUHCA repeal could have both negative and positive effects on reliability in the long term.

Mandatory and Enforceable Reliability Standards

A task force commissioned by DOE to study reliability issues in a competitive U.S. electricity industry provided many recommendations in a final report issued in

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[42] Hunt, Isaac C., "H.R. 3406, The Electric Supply and Transmission Act of 2001," Commissioner, Securities and Exchange Commission, Testimony before Subcommittee on Energy and Air Quality, December 13, 2001, at [http://energycommerce.house.gov/107/hearings/12132001Hearing449/Hunt761.htm].

[43] Edison Electric Institute," The Living Grid — Evolving to Meet the Needs of America."

1998.[44] One of the recommendations was the development of enforceable reliability standards. This recommendation was also made in the energy plan developed by Vice President Cheney and the National Energy Policy Development Group.[45] As mentioned in previous sections, the reliability standards set by NERC prior to restructuring were voluntary. Proposed legislation and NERC have adopted the approach of developing mandatory standards through an ERO, based on the NERC voluntary standards, with penalties that could be imposed on violators.

Purpose. One key element that can be used to improve bulk power system reliability is imposing economic penalties for reliability standard non-compliance. In many cases, there is little economic benefit realized by following reliability standards that have been developed by NERC. The purpose of the federal legislation is to authorize the use of mandatory standards and the assessment of penalties associated with failure to comply with the standards. The assessment of economic penalties provides a method of attaching value to maintaining reliability. When penalties are properly set, compliance should lower risk. The concept of mandatory standards has received support from NERC and many representatives from the electric utility industry.

Issues. Questions still remain about how effective mandatory standards would be. Can enforceable standards for reliability be developed that fairly distribute responsibilities among the participants to maintain a high level of reliability? Will the standards be clear? These and other questions are key to the successful implementation of mandatory standards. If the standards are perceived as high and the non-compliance penalty is less expensive than potential profits, participants may not give proper attention to these standards. If the standards are too low, then even though participants comply with the standards the potential exists for outages that could have been avoided. The process of setting standards for many different types of owners and operators in United States, Canada, and Mexico presents a challenge.

Another area of difficulty relates to liability when outages do occur. If a market participant does not properly schedule an outage or maintain a particular piece of equipment, and the procedural miscue leads to a large-scale power outage, should the market participant be liable for any or all of the costs associated with the outage, which could be high? In the past, local power outages by utilities were analyzed by PUCs to determine if negligence was a factor. State PUCs use legislated tools to require a level of performance from the utility and to penalize the utility if that level of performance is not achieved. However, liability for large-scale outages has never systematically been assessed against participants that caused the outage.

Responsibility for Standards Development

All previously proposed reliability legislation authorizes the establishment of an ERO to develop the reliability standards. The ERO would be certified by FERC

[44] U.S. Department of Energy, "Maintaining Reliability in a Competitive U.S. Electric Industry."

[45] National Energy Policy Development Group, "*Reliable, Affordable, and Environmentally Sound Energy for America's Future,*" May 17, 2001, [http://www.whitehouse.gov/energy/].

and would, most likely, be based on the present NERC organization with its 10 Regional Councils. The ERO would take primary responsibility for the validity of the standards and would provide initial detection of non-compliance.

Purpose. The legislative proposals would direct NERC, as the ERO, to continue in its present role as reliability standards administrator; however, FERC would maintain jurisdiction over NERC. The regional councils in NERC would deal with reliability issues unique to their particular portions of the power system. Maintaining reliability must include efforts to coordinate with Canada and Mexico, since there are many interconnections that cross those borders and allow bulk power systems in those countries to have an effect on the U.S. system. The existing relationship NERC has with Canadian and Mexican utilities would be a resource to promote reliability across North American interconnections.

Issues. Many existing NERC standards have been developed based on the principles of interconnected systems. Even though many of the basic standards can be retained and built on, some may need to be modified and others eliminated to account for the effects of competitive markets on the interconnect system.

Table 2. Summary of Provisions in Proposed Legislation That Could Affect Reliability

Proposed Legislative Provisions	Purpose	Issues
Required RTO Participation	Central coordination of reliability for a particular region.	Implementation is difficult and complex. The number of U.S. RTOs has been questioned.
FERC Reliability Jurisdiction	Responsibility for U.S. bulk power system reliability.	New area of expertise for FERC; special regional concerns exist.
Transmission Siting	Give FERC ability to overcome local siting issues.	State PUCs assert that siting must remain under local control.
Repeal of PUHCA	Attract new market participants.	Eliminates existing industry safeguards.
Mandatory Standards	Provide economic penalty for non-compliance.	Setting penalty levels and standards presents new difficulties.
Standards Development	Build on existing system of NERC standards that address specific regions of U.S.	Some argue FERC should develop standards.

Source: Congressional Research Service.

Conclusion

The bulk power system in the United States has been a reliable source of electricity for its industries and citizens. The outage during 1965 in the northeastern United States, which left 30 million customers without electricity service, was the largest in U.S. history until the August 2003 blackout. Since 1968, NERC has been a vehicle for utilities to develop industry standards that promote reliability. Service reliability by utilities during the last 30 years has been excellent in most areas of the United States.

Beginning in 1992, the industry has undergone significant changes with the goal of lowering rates by encouraging competition. Industry changes that have increased uncertainty and risk have occurred in several areas, including the following: A more complex institutional structure, no guaranteed rate-of-return for utilities, lack of investment in the transmission system, a much more complex wholesale market, distribution of reliability responsibilities among many participants, and retail customers with a choice of suppliers. These changes ultimately have the potential to adversely affect reliability of the electricity supply, and they are forcing the bulk power system to be operated under conditions it was not designed to support.

Not all of the changes to promote competition add to risk and uncertainty. Some of the changes tend to lower uncertainty, and they include the potential to lower the number of control areas and improve coordination; centralized planning improvements for larger regions; new capital from a larger number of participants; and greater redundancy from a larger number of suppliers and providers. However, many of the changes that would lower risk have not been realized to date. Therefore, the electric utility industry is operating under conditions of greater risk now than it was a decade ago. This greater risk can potentially lead to a lowering of reliability which some feel has already been borne out in the restructuring of the California electric utilities. Restructuring proposals may lead to less risk in the future; however, those changes, and the benefits from those changes, have been slow to materialize.

The transmission portion of the bulk power system remains a concern. The transmission system was designed to provide for the needs of the utility industry prior to 1992 when utilities held monopoly status in their particular control areas. Transmission facilities were constructed to support only transactions between those utilities. Competition requires the bulk power system to be used in a much different way than was envisioned by those earlier transmission system designers. Many observers assert that methods are needed to transform the transmission system into a "superhighway" that can support competition among multiple suppliers and multiple consumers. In areas where congestion on the transmission system occurs, reliability will be a problem. The responsibilities and methods that will be used to effect this transformation of the transmission system remain unclear. Technology improvements may assist with these issues in the future. Distributed generation[46] and conservation both hold potential.

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[46] New technologies are being developed that will allow electric power from a large number of smaller generators to be distributed into areas much closer to customers. This would eliminate some needs for high voltage and long distance transmission of electricity, and would allow for the customization of reliability needs to meet unique user requirements.

Federal legislation has been proposed that includes several provisions that could improve reliability. Provisions that have received more support and hold potential for reliability improvement are the jurisdictional role provided to FERC and the establishment of an ERO to develop mandatory reliability standards. Both of these provisions are intended to add some clarity and stability that would lower risk and improve reliability. FERC has already started to take this role with the issuance of Order 2000. The Supreme Court decision of March 4, 2002, which supported the FERC definition of "unbundled transmission," adds further clarity.[47] Proposed legislation would further provide FERC with legal authority to take on the ultimate responsibility for bulk power system reliability. A legislative mandate for an ERO with enforceable standards could add certainty in an area that is already being pursued by the industry.

Whether the proposed legislation can provide the desired reliability has yet to be seen. The details of the implementation by FERC, NERC, and the industry participants would be the key. The answer to the question of whether reliability can be maintained while restructuring the electric utility industry is difficult to predict. There has been much concern about the topic; however, the proposals remain, for the most part, untested and unproven. Proposed legislative remedies will be successful only if and when they result in the necessary capability, flexibility, and efficiency in the existing system required to overcome the added risks.

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[47] See footnote 44, which defines "unbundled transmission," in the section titled "Federal and State Jurisdiction."