

Ensuring a Reliable North American Electric System in a Competitive Marketplace

Discussion Paper

Prepared for:
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Prepared by:

David R. Nevius
Senior Vice President
North American Electric Reliability Council

and

Ellen P. Vancko
Director, Communications and Government Affairs
North American Electric Reliability Council

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INTRODUCTION

Maintaining the reliability of the North American bulk electric system depends on the complicated and technically sophisticated activities of balancing electricity supply and demand and managing the flow of electricity throughout North America's interconnected networks. These activities require close cooperation among and adherence to minimum standards by all network participants.

For almost four decades, the North American Electric Reliability Council (NERC) and its member regional reliability councils have worked in close cooperation with industry stakeholders to provide essential standards and guidelines to promote the reliability of North America's power grid under a voluntary system of compliance with reliability standards. Due to changes within the industry, the voluntary model of maintaining reliability is no longer adequate. A new model is needed to ensure the continued reliability of the electric system in response to the restructuring of the industry to accommodate competitive markets. This model must ensure that the system functions reliably regardless of market structure or the degree of competition that is introduced in any part of that system.

During the past 20 years, the transmission system has had to support increasing uses, partly as a result of the restructuring of the electric industry to support wholesale generation markets. Before the introduction of competitive markets, utilities voluntarily complied with reliability standards to ensure that the lights stayed on. Traditionally structured utilities saw that it was in their interest to comply with these standards and were able to recover the costs of compliance through regulated rates. In an increasingly competitive electricity market, however, cost recovery is no longer assured, thus straining the voluntary system of maintaining reliability.

In addition to changes resulting from restructuring, the grid has had to accommodate a significant increase in electricity demand during the past two decades without a corresponding expansion of the physical transmission infrastructure. Construction of new transmission has been inhibited by the uncertainty associated with financing and cost recovery as well as local resistance to siting and building new transmission facilities. In some areas of North America, increases in generating capacity have surpassed the ability of the transmission system to simultaneously move all of the electricity that can be produced to where it is needed. Moreover, the increase in market-based electricity transactions flowing across the grid has increased grid congestion, which has resulted in the curtailment of commercial transactions because of insufficient transmission capacity. The results of all of these changes are increased loading on the system and tighter transmission operating margins.

The increased demands placed on the transmission system require the grid to be operated closer to its reliability limits more of the time than was the case in the past. Although operating closer to the limits of system capability does not necessarily threaten the reliability of the system, these conditions require that system operators have appropriate skills and training to maintain the necessary level of situational awareness to operate their

systems reliably. Today's advanced analytical tools allow system operators to assess system conditions and maintain reliability even on a constrained system much more accurately than has been possible in the past. But maintaining reliability also requires system operators to understand and follow NERC and regional reliability standards at all times. If operators adhere to NERC reliability rules, the transmission system can be operated reliably regardless of the demands placed upon it. But it is clearly no longer sufficient to rely on voluntary compliance with those rules. To ensure reliability in the future, NERC rules must be mandatory for all users of the bulk electric system.

DEVELOPING A NEW RELIABILITY MODEL

In 1997, NERC assembled the "blue ribbon" Electric Reliability Panel to recommend the best ways to set, oversee, and implement policies and standards to ensure the continued reliability of the North American grid in a competitive and restructured industry. NERC imposed no limits on the panel's recommendations.

The panel concluded that the introduction of competition in the electric industry and open access to transmission systems required the creation of a new organization with the technical competence, unquestioned impartiality, authority, and respect of market participants necessary to set and enforce reliability standards for the bulk electric system.¹ The panel found the following:

- The voluntary system through which NERC and the regional reliability councils had ensured reliability for many years would not suffice in a restructured future where a larger, more diverse group of competitors would replace traditional, vertically integrated utilities.
- Reliability rules must be mandatory, enforceable, and applied fairly to all participants in the electric industry.
- An independent, self-regulatory organization that set and enforced reliability standards would be more flexible, more effective in marshaling technical competence, and more open to new technology than would a government agency or agencies, but the new organization would require general oversight, approval and backstop support from appropriate government agencies to ensure compliance with reliability standards as well as adequate funding.

The panel concluded that, because jurisdiction over reliability in the United States was not clearly defined, changing from a strictly voluntary to a mandatory reliability system would require federal legislation. In response to the panel's recommendations, NERC and a broad coalition of industry, state, and consumer organizations developed and advocated a legislative proposal to create a self-regulatory electric reliability organization (ERO) to develop and enforce mandatory reliability rules. That proposal was included in

¹ Electric Reliability Panel, *Reliable Power: Reviewing the North American Electric Reliability Oversight System*, December 22, 1997.

The Energy Policy Act of 2005, which was signed into law by President Bush on August 8, 2005.

RELIABILITY LEGISLATION AND THE ERO

The reliability section of *The Energy Policy Act of 2005* authorizes the creation of an ERO that spans North America, with Federal Energy Regulatory Commission (FERC) oversight in the United States. The legislation recognizes the international character of the grid by ensuring that Canadian and Mexican interests in the system's reliability are fully considered.

The legislation amends Part II of the Federal Power Act to add a new section 215 that would make compliance with reliability standards for the bulk electric system mandatory and enforceable. The legislation applies to the facilities and control systems necessary to operate an interconnected electricity transmission network and to generating facilities needed to maintain system reliability. It does not address facilities used in the local distribution of electricity.

Under the legislation, reliability standards that provide for reliable operation of the bulk electric system will be approved by FERC. The standards will include requirements for the operation of existing system facilities and the design of planned additions or modifications to existing facilities to the extent necessary to provide for reliability. The legislation does not include any requirement to enlarge existing facilities or construct new transmission or generating capacity. The overriding intent of the legislation is to ensure that the elements of the bulk electric system are operated within equipment and electric system thermal, voltage, and stability limits so that instability, uncontrolled separation, or cascading failures of the system will not occur as a result of a sudden disturbance or unanticipated failure of system elements.

The legislation gives FERC jurisdiction over the reliability of the bulk electric system in the United States. For purposes of reliability only, FERC would have jurisdiction over all owners, operators, and users of the system, including state and municipal entities, rural electric cooperatives, federal entities, the electric reliability organization certified by FERC, and any regional entities that receive delegated enforcement authority.

The legislation states that FERC may certify one electric reliability organization to develop and enforce reliability standards. The ERO must:

- be independent of owners, operators, and users of the bulk electric system;
- provide stakeholders with fair representation in the selection of directors;
- ensure balanced decision making in ERO committees;
- provide reasonable notice and opportunity for public comment, due process, openness, and a balance of interests in developing reliability standards and managing ERO affairs;
- follow fair and impartial procedures in ERO enforcement actions;

- equitably allocate reasonable dues, fees, and other charges among end users for ERO activities;
- file any changes to ERO rules of procedure with FERC before they take effect; and
- afford a rebuttable presumption that reliability standards proposed by an interconnection-wide regional entity are appropriate.

Before a reliability standard can become effective and enforceable, the ERO must file the proposed standard with FERC. FERC may approve the proposed standard if it determines that the standard is “just, reasonable, not unduly discriminatory or preferential, and in the public interest.” In making its decision, FERC must give due weight to the technical competence of the ERO or any regional entity organized on an interconnection-wide basis but cannot defer to the ERO for an assessment of the effect of the standard on competition. If FERC rejects a standard, it must remand the standard to the ERO for further consideration; FERC cannot modify the standard.

The ERO may impose penalties on entities whose operations affect the bulk electric system if, after notice and an opportunity for a hearing, the ERO finds that an entity violated a reliability standard that is currently in effect. Any penalty must bear a reasonable relationship to the seriousness of the violation and must take into account any efforts to remedy the violation in a timely manner. A penalty may not take effect until after the ERO files a notice and the record of the penalty proceeding with FERC, which may affirm, modify, or set aside the penalty.

FERC may order compliance with a reliability standard and impose a penalty on an owner, operator, or user of the bulk electric system if FERC finds that the entity has engaged in, or is about to engage in, activity that violates a reliability standard. FERC may also take action against the ERO or a regional entity with delegated enforcement authority to ensure compliance with a reliability standard or any FERC order pertaining to the ERO or regional entity.

The ERO may delegate its enforcement authority in a particular area to a regional entity. The regional entity must meet the same criteria as the ERO, except that the regional entity may have an independent board, a balanced stakeholder board, or a combination balanced stakeholder and independent board. In addition, the delegation agreement between the ERO and the regional entity must promote effective and efficient administration of bulk electric system reliability.

Before a delegation agreement can take effect, it must be approved by FERC, which may modify the agreement. The legislation contains the rebuttable presumption that a proposal for a delegation agreement with a regional entity organized on an interconnection-wide basis promotes the effective and efficient administration of system reliability. FERC may include in its regulations a provision for directly assigning enforcement authority to a regional entity, consistent with the legislation’s requirements for a delegation agreement.

The ERO must assess and periodically report on the adequacy of the bulk electric system; however, the ERO does not have the authority to set or enforce mandatory standards for resource adequacy. The legislation gave neither the ERO nor FERC the authority to require the expansion of generation or transmission to ensure resource adequacy.

The reliability legislation reserves to the states reliability matters related to the local distribution system. The legislation does not preempt state authority to take action regarding the safety, adequacy, and reliability of electric service within that state so long as the action is not inconsistent with a reliability standard. If a dispute arises regarding whether a state action is inconsistent with a standard, FERC would consider the matter and may stay the state action pending a determination.

The legislation directs FERC to establish a regional advisory body on petition from at least two-thirds of the states in a region that have at least half their electric loads served within that region. Each state is to have one representative appointed by the governor. The regional advisory body may give advice to the ERO, FERC, and the regional entity on matters coming before them. FERC may defer to the advice from a regional advisory body if it is organized on an interconnection-wide basis.

FERC's implementing rule must include fair processes for identifying and resolving conflicts between a reliability standard and a function, rule, order, tariff, rate schedule, or agreement accepted, approved, or ordered by FERC that is applicable to a regional transmission organization (RTO), independent system operator (ISO), or other transmission organization. Until the conflict is resolved, the affected entity is to continue following its tariff or rate schedule. FERC must complete its implementing rulemaking within six months of enactment of the legislation.

The legislation requires the ERO to take appropriate steps to gain recognition in Canada and Mexico. It urges the U.S. president to negotiate international agreements with the governments of Canada and Mexico to ensure compliance with reliability standards and the effectiveness of the ERO in Canada and Mexico.

Until FERC implements its ERO rulemaking and approves NERC as the ERO, and until NERC gains corresponding recognition from regulators in Canada, NERC will continue to work with the regions, government, and industry to use all means possible to ensure compliance with reliability standards under the current voluntary system.

MAINTAINING RELIABILITY IN A COMPETITIVE ENVIRONMENT

In anticipation of federal legislation, NERC has taken a number of significant steps to implement the recommendations of the Electric Reliability Panel, including the appointment of an independent board of trustees; establishment of a compliance enforcement program; adoption of a fair, open, balanced, and inclusive standards development process; and revision of its committee structure to allow for full and open participation while retaining necessary industry expertise. These and other changes have

positioned NERC to apply for and step into the role of the ERO with little change to its day-to-day activities or disruption to the industry with regard to maintaining reliability.

Functional Unbundling and the Functional Model

Historically, control areas were established by vertically integrated utilities to operate their individual power systems in a secure and reliable manner and meet their customers' electricity needs. Operators of traditional control areas balanced load and generation, implemented interchange schedules with other control areas, and ensured both supply adequacy and transmission reliability within their boundaries.

Beginning in the early 1990s with the advent of open transmission access under FERC Order No. 888 and the subsequent restructuring of the electric industry to facilitate competitive power markets at both federal and state levels, the functions performed by traditional control areas began to change to reflect newly emerging industry structures. One key change that resulted from industry restructuring and that had reliability implications was the "unbundling" of some reliability functions typically performed by a single, integrated utility; many utilities either were required or chose to unbundle their functions into separate generation, marketing, and transmission functions, or even into stand-alone companies.

Recognizing that control areas may no longer function as the only entities responsible for maintaining reliability across North America, NERC worked with the industry to develop a model that defined the functions necessary to ensure reliability in the changing marketplace, regardless of the market structure that was ultimately put in place. Under the NERC Functional Model, entities operating at the bulk electric level, such as vertically integrated utility control areas, RTOs, ISOs, independent transmission companies, and merchant generators must identify the reliability functions that they perform and register those functions with NERC.

Developing and Implementing Reliability Standards

One of NERC's major initiatives following the 2003 blackout was a thorough revision and refinement of its operating policies and planning standards into a single set of reliability standards. NERC used the Functional Model to rewrite its standards, which were based on the control area model, as a single, comprehensive set of reliability standards that apply to all entities that perform the various reliability functions once performed by a single control area.

NERC implemented its revised reliability standards on April 1, 2005, which industry stakeholders overwhelmingly voted to approve earlier in the year. NERC also completed the first round of registrations under the new reliability standards, using the Functional Model as a guide. Registered entities are now monitored for compliance with NERC standards through the NERC and regional compliance enforcement programs. NERC is developing additional standards to address issues identified in the 2003 blackout investigation, including vegetation management and system operator training standards.

Ensuring Compliance with Standards

NERC established its Compliance Enforcement Program in 1999 to promote greater compliance with NERC and regional reliability standards under the voluntary system, and in anticipation of the reliability legislation that would make compliance with the standards mandatory and enforceable. The program is designed to encourage all market participants to understand and adhere to the standards necessary to preserve the reliability of the interconnected bulk electric system.

The Compliance Enforcement Program assesses compliance for a select number of reliability standards each year. In conjunction with NERC, each region has implemented its own regional compliance enforcement program. NERC oversees each region's compliance review and enforcement process; each region is responsible for reviewing and enforcing compliance with its members. NERC and the regions continually strive to improve the program because of its essential role in ensuring compliance with NERC standards.

NERC publicly discloses all confirmed violations of its reliability standards after due process has been followed with the affected entities. In ensuring transparency, NERC must accommodate legitimate confidentiality concerns regarding market sensitive information, critical infrastructure information, and personnel information. In addition, NERC and the regional reliability councils provide fair procedures and due process to achieve fair decisions and guard against premature, incomplete, or inaccurate disclosure.

Compliance enforcement is separate from the review process. The results of the compliance reviews are forwarded to the compliance enforcement process, which administers awards for achieving compliance and determines the level of sanctions or penalties for non-compliance with NERC standards. Awards and sanctions for compliance and non-compliance, respectively, are administered under both NERC and regional enforcement processes. Absent legislative authority for enforcement, NERC has relied on simulated enforcement actions to sanction noncompliance with its standards.

NERC relies heavily on the regions to enforce the NERC standards with their members, including the administration of awards and penalties. Entities that are monitored under regional compliance review and enforcement processes are not subject to additional compliance reviews, enforcement sanctions, or penalties from NERC. Regional appeals and alternative dispute resolution processes are available to resolve issues associated with compliance actions. If resolution cannot be achieved at the regional level, NERC serves as the industry backstop to hear appeals and resolve disputes.

Taken together, the Functional Model, the revised reliability standards, and the compliance enforcement program greatly improved NERC's ability to monitor and assess industry compliance with its reliability standards both in the absence of and in anticipation of reliability legislation.

Implementing the Blackout Recommendations

The 2003 blackout prompted NERC and the industry to take additional steps to improve reliability. Since the blackout, NERC, the regional reliability councils, and their

members have worked to strengthen reliability by aggressively and successfully pursuing both NERC and the U.S.-Canada Power System Outage Task Force recommendations to improve reliability. Many of these recommendations have been implemented, and the remaining ones are well on the way to completion.²

Immediately following the blackout, NERC required all reliability coordinators, control areas, and transmission operators to provide at least five days per year of training and drills in system emergencies for each staff person with responsibility for real-time operations. NERC is developing a program to improve the ongoing training and performance of system operators. The program is designed to ensure that all system operators have the training and expertise necessary to ensure reliability.

NERC implemented a reliability readiness program to audit all entities that have reliability responsibilities; the audits identify areas of excellence in operations and areas in need of improvement. This program does not measure compliance with reliability standards but is designed to ensure that entities responsible for reliability have in place the tools, processes, and procedures to operate reliably. NERC completed more than 50 audits of the largest operating entities in North America in 2004; the program will review all relevant entities on a three-year cycle.

In 2004, NERC adopted guidelines for reporting and disclosing the findings of readiness audits and compliance violations. This action committed NERC to disclose the results of NERC and regional reliability council readiness audit reports and compliance reports. NERC believes that such transparency is vital if stakeholders, regulators, and the public are to have confidence that NERC and the industry are doing all that is necessary to ensure a reliable bulk electric system. Disclosure allows NERC to shine a “bright light” on compliance violations in a way that was previously not possible and should help to further encourage industry compliance with NERC and regional reliability standards. Consistent with this principle, NERC posts on its website final readiness audit reports, summaries of compliance reports from regional reliability councils, and NERC’s own compliance activities.

Since the third quarter of 2004, NERC compliance reports have included all confirmed violations of NERC and regional reliability council standards once investigatory, decisional, and appeal processes have been completed. The reports note each violation, identify the names of the organizations involved, and characterize the relative seriousness of the violations. Although disclosure reporting is a relatively new development, it will be possible to use the data that NERC collected prior to the passage of reliability legislation to document changes in the level of compliance or noncompliance with reliability standards once the legislation is implemented and compliance with NERC standards becomes mandatory.

NERC regularly evaluates the effectiveness of the compliance program and incorporates recommended improvements each year. In 2005, NERC will publish four quarterly reports that disclose the identity of entities confirmed to have violated NERC standards,

² North American Electric Reliability Council, *North American Electric Reliability Council Status of August 2003 Blackout Recommendations*, June 7, 2005.

regional standards, or both. These reports will identify trends and focus on emerging problem areas in standards violations. Certain violations will be reported to NERC within forty-eight hours and communicated to the board-level Compliance Committee. A primary goal for the 2005 program is to promote consistency among the regional compliance enforcement programs. Consistency is necessary to ensure that participants are monitored and assessed equally across all regions. To accomplish this goal, NERC will continue to work closely with the regional compliance programs to identify opportunities to improve and promote consistency.

In addition to the initiatives discussed in this paper, NERC is working with the industry to assess, develop, and implement a broad range of technical improvements that will allow for enhanced system modeling, monitoring, control, and communications. NERC is also developing a program to assess the overall reliability performance of the bulk electric system over time. The cumulative effect of these activities will be to enhance reliability across North America.

Assessing the Role of the Regions

In 2005, the regional reliability councils completed a study on the role of the regions.³ The regions used the language in the proposed reliability legislation described above to establish the fundamental principles necessary for organizations that perform reliability assurance functions and services. These principles include: open and inclusive membership, fair and balanced governance, independence, compliance, and establishment of rational organizational boundaries.

The report found that all regions currently conform to the principles of open and inclusive membership and compliance. Most regions also conform to the governance, independence, and organizational boundary principles. Mitigation plans are in place in the Southeastern Electric Reliability Council (SERC) to conform to the governance and independence principles, and in the Southwest Power Pool (SPP) to address issues associated with independence. The East Central Area Reliability Coordination Agreement (ECAR), Mid-Atlantic Area Council (MAAC), and Mid-America Interconnected Network (MAIN) look to achieve full conformance through the creation of one large regional reliability council.

On June 15, 2005, ECAR, MAAC, MAIN, and the Midwest Reliability Organization (MRO) formed the ReliabilityFirst Corporation to create a new, larger electric reliability council in the mid-Atlantic and central United States. ReliabilityFirst's goal is to preserve and enhance service reliability and infrastructure security for the interconnected electric system in its region. Upon approval by NERC, ReliabilityFirst will replace ECAR, MAIN, and MAAC. After the formation of ReliabilityFirst, the MRO and its members may consider merging into the larger organization.

³ NERC Regional Managers Committee, *Role of the Regional Reliability Councils Follow-up Report*, May 2, 2005.

The key functions of ReliabilityFirst are the development of regional standards for reliable planning and operation of the electric system and nondiscriminatory compliance monitoring and enforcement of standards in its region. The formation of ReliabilityFirst is the next step in a consolidation process that began in late 2004 and that resulted in execution of a memorandum of understanding by ECAR, MAIN, MAAC, and MRO in May 2005. The target date for implementation of the project is January 1, 2006.

Critical Infrastructure Protection

Maintaining the security of the electric system against physical and cyber attack is another key component of reliability that has received increased attention since September 2001. NERC is the designated Information Sharing and Analysis Center (ISAC) for the electricity sector. NERC works closely with industry and government agencies in Canada and the U.S. to improve the overall physical and cyber security of the electricity sector against constantly changing threats.

NERC has created a compendium of best practices for protecting critical facilities against a spectrum of physical and cyber threats. The *Security Guidelines for the Electricity Sector* address topics such as vulnerability and risk assessment, business continuity, physical and cyber security, and protection of sensitive information. NERC adopted a temporary cyber security standard in 2003 and is working on a more comprehensive, permanent cyber security standard that will replace the temporary one.

CONCLUSION

The initiatives discussed in this paper represent significant steps that NERC and the industry have taken to improve reliability in a competitive and restructured electric industry. Taken together, these actions will go a long way toward maintaining the reliability of the bulk electric system. NERC and the industry recognize that, with or without legislation, we must do everything we can to ensure that the lights stay on.

Despite the progress being made on the reliability front, no one disputes the fact that compliance with NERC reliability standards must be mandatory and enforceable for all owners, operators, and users of the bulk electric system. Now that the president has signed the *Energy Policy Act of 2005*, NERC can put the last piece of the reliability puzzle into place to ensure that reliability is maintained, regardless of industry structure, the level of competition, or the number or types of entities participating in the marketplace.