



NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL

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North American Electric Reliability Council Status of August 2003 Blackout Recommendations

July 14, 2005

The North American Electric Reliability Council (NERC), its regional reliability councils (regions), and their members have aggressively and successfully pursued the recommendations that were approved by the NERC Board of Trustees on February 10, 2004, in response to the August 14, 2003 blackout. NERC and the regions have also taken into account the additional recommendations of the U.S. – Canada Power System Outage Task Force included in its April 2004 final report that were within NERC's area of responsibility.

Numerous reports have been made to the NERC board, NERC committees, industry groups, and government agencies on the status of actions taken and planned by NERC, the regions, and industry members to improve reliability since the August 2003 blackout. This report summarizes the status of those actions and initiatives.

In its report, *One Year Later: Actions Taken in the United States and Canada To Reduce Blackout Risk*, August 13, 2004, the U.S. – Canada Power System Outage Task Force cited key accomplishments and six major challenges still ahead:

1. Enactment of reliability legislation by the U.S. Congress.
2. Completion of the revision of NERC's existing standards.
3. Certification of the Electric Reliability Organization (ERO) by government agencies and approval of its standards.
4. Independent funding for NERC (or the ERO) and the regions.
5. Reform of the roles, responsibilities, and boundaries of the regions.
6. Enhancement of the overall security of the electricity sector.

NERC and its regions have taken actions since that report was issued that effectively addressed three of these challenges within its purview — 2, 5, and 6.

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Group I. Institutional Issues Related to Reliability

NOTE: NERC did not specifically address the recommendations in Group I, but offers the following comments and observations on those that directly or indirectly affect NERC and the regions.

Recommendation 1. Make reliability standards mandatory and enforceable, with penalties for noncompliance.

Status: Ongoing.

Despite six years of concerted effort by NERC and a broad-based coalition of industry, customer, and government groups, the U.S. Congress has failed to enact needed reliability legislation. NERC has enhanced its compliance enforcement program by posting on its website the names of organizations found in violation of NERC and regional reliability standards, but this is still a second-best alternative to the authority to enforce compliance afforded under the proposed legislation. The U.S. Department of Energy (DOE) should redouble its efforts to encourage enactment of reliability legislation without the spending cap included in the bill recently passed by the House of Representatives.

Recommendation 2. Develop a regulator-approved funding mechanism for NERC and the regional reliability councils, to ensure their independence from the parties they oversee.

Status: Under consideration.

Without reliability legislation, a regulator-approved funding mechanism for NERC and the regions will be impossible to achieve.

Recommendation 3. Strengthen the institutional framework for reliability management in North America.

Status: Complete.

The October 5, 2004 Regional Managers Committee report entitled *Examination of the Future Role of the Regional Reliability Councils and Assessment of Eastern Interconnection Regional Reliability Council Boundaries* was endorsed and approved at the October 14, 2004 Meeting of Members of NERC. That report included a number of follow-up recommendations that the Members assigned to the Regional Managers Committee for completion by May 2005. A status report from the Regional Managers Committee was presented to the NERC Members at their February 7, 2005 Annual Meeting, and their follow-up report was approved at the [May 2, 2005 Members meeting](#).

That report stated:

The fundamental principles necessary for organizations that perform reliability functions and services are as follows:

1. Open and Inclusive Membership
2. Fair and Balanced Governance
3. Independence

4. Compliance
5. Organizational Boundaries

“In summary, all regions currently conform with the open and inclusive membership, and the compliance principles. Most regions also conform to the governance, independence and organizational boundary principles. Mitigation plans are in place in SERC to achieve conformance with the governance and independence principles, and in SPP to address issues associated with independence. ECAR, MAAC, and MAIN look to achieve full conformance through the creation of the Large Regional Reliability Council (LRRC) with MRO participation to follow. If this plan is unsuccessful, MAIN expects to dissolve effective about January 1, 2006, with its members joining other councils.”

Recommendation 4. Clarify that prudent expenditures and investments for bulk system reliability (including investments in new technologies) will be recoverable through transmission rates.

Status: Not in NERC’s area of responsibility.

Recommendation 5. Track implementation of recommended actions to improve reliability.

Status: In progress.

NERC and its regions continue to track the implementation of all recommendations related to the blackout, as well as recommendations from NERC readiness audits and violations identified in NERC and regional compliance enforcement programs. Regions provide NERC with updates on requests for the status of all recommendations. NERC also audits regional compliance programs periodically to assess their effectiveness.

Establishment of a reliability performance monitoring function is still under development. Currently, NERC’s Disturbance Analysis Working Group reviews notable system disturbances for lessons learned and publishes its results in an [annual system disturbances report](#). Work is under way to further develop NERC’s existing database for tracking disturbances and unusual events. Completion is scheduled for later in 2005.

NERC has initiated a collaborative effort with the Nuclear Regulatory Commission to analyze reliability performance trends that can affect the reliability of offsite power supply to nuclear generating units.

Recommendation 6. FERC should not approve the operation of new RTOs or ISOs until they have met minimum functional requirements.

Status: Not in NERC’s area of responsibility.

Recommendation 7. Require any entity operating as part of the bulk power system to be a member of a regional reliability council if it operates within the council’s footprint.

Status: No authority for NERC to require membership.

NERC and its regions continue to encourage membership, however that membership is still voluntary. Reliability legislation would make this issue moot.

Recommendation 8. Shield operators who initiate load shedding pursuant to approved guidelines from liability or retaliation.

Status: Not in NERC's area of responsibility.

Recommendation 9. Integrate a "reliability impact" consideration into the regulatory decision-making process.

Status: Not in NERC's area of responsibility.

Recommendation 10. Establish an independent source of reliability performance information.

Status: Under further consideration.

NERC coordinates and cooperates with the U.S. DOE's Energy Information Administration (EIA) on collection and reporting of electricity supply and demand data, including data collection definitions and reporting requirements.

EIA has recently suggested the collection of transmission line performance data from the industry as part of a new Schedule 7 on the EIA Form 411. Collectively, through the NERC consensus building process, the industry is the best judge of what are appropriate measures of "reliability performance," and what information needs to be collected. NERC has questioned the validity of this EIA request.

NERC filed comments in October 2004 with the Office of Management and Budget on EIA's request to add Schedule 7 to Form EIA 411. In its comments, NERC expressed concern that EIA has chosen to retain Schedule 7 of Form 411 for the proposed collection of transmission line outage data, in spite of NERC's previous comments. NERC submitted extensive comments on this schedule during EIA's April Federal Register Notice. The primary concerns NERC and its regional reliability council members continue to have with the proposed Schedule 7 center around the burden and duplication associated with this, and other current or proposed collection initiatives, an incomplete explanation and inadequate justification of the need for these particular data, and possible misrepresentation of the collected data.

Following the August 14, 2003, blackout, NERC initiated the regular collection of data on transmission line outages resulting from contacts with vegetation. NERC modeled its data collection after the program initiated in the Western Electricity Coordinating Council (WECC) following the major disturbances in 1996. The WECC program has proven quite successful in reducing the number of outages associated with vegetation contacts, which are a significant cause of line outages. NERC believes it is premature and duplicative for EIA to initiate another transmission outage data collection effort before the results of the NERC program are fully evaluated.

Recommendation 11. Establish requirements for collection and reporting of data needed for post-blackout analyses.

Status: **In progress.**

On May 3, 2005, the NERC Board of Trustees approved reports from the blackout investigation team, including recommendations for the development of standards covering disturbance monitoring equipment and requirements on the regions to install time-synchronized fault recording devices.

Recommendation 12. Commission an independent study of the relationships among industry restructuring, competition, and reliability.

Status: **In progress.**

NERC has agreed to participate in a recently announced study on this subject being sponsored by the U.S. DOE and Natural Resources Canada.

Recommendation 13. DOE should expand its research programs on reliability-related tools and technologies.

Status: **In progress.**

NERC already works closely with the Consortium for Electric Reliability Technology Solutions (CERTS) on tools for monitoring and analyzing real-time bulk electric system performance.

Recommendation 14. Establish a standing framework for the conduct of future blackout and disturbance investigations.

Status: **In progress.**

NERC has developed blackout and disturbance response procedures, which include requirements for blackout analysis. These procedures were presented and accepted by the NERC board as a “[working document](#)” at its May 3, 2005 meeting, with a direction to obtain further input from the NERC standing committees and other stakeholders as the procedures are refined and upgraded.

These procedures acknowledge that government can provide assistance, when necessary, to require entities to provide the data needed by NERC and the regions for their analysis of blackouts and disturbances.

A report commissioned by the U.S. DOE on this issue has not yet been released.

Group II. Support and Strengthen NERC's Actions of February 10, 2004

Recommendation 15. Correct the direct causes of the August 14, 2003 blackout.

Status: **15.A-E complete; on-going work incorporated into NERC Business Plan and committee activities.**

As presented in the task force's final report, the investigation team identified the direct causes of the August 14, 2003 blackout and recommended that FirstEnergy, MISO, ECAR, and PJM implement specific remedial actions before June 30, 2004. NERC and the regions have independently verified that, with minor exceptions, these actions were completed by that date.

NERC, on February 10, 2004 enacted [Actions to Prevent Future Cascading Blackouts](#). These actions included specific actions to be implemented by those directly responsible, FirstEnergy, MISO, and PJM, for the August 14, 2003 blackout. These actions were to be completed by June 30, 2004. Each of these organizations was required to submit a mitigation plan to NERC for review and consideration for approval at the March 2004 Operating Committee (OC) and Planning Committee (PC) meetings.

FirstEnergy, MISO, and PJM all submitted a mitigation plan for consideration and these plans were approved by the OC and PC. Each required FirstEnergy, MISO, and PJM to report at the July 2004 meeting on any outstanding issues.

Additionally, NERC completed verification audits of FirstEnergy and MISO in June 2004. These verification audits included multi-day on-site visits conducted by a NERC team leader and several industry experts. In both cases, FirstEnergy and MISO had completed all of the necessary improvements with the exception of reactive capability testing of some very large generating units within FirstEnergy. These units could not be tested to the maximum due to system condition limitations. These limitations cannot be removed. As an alternative, the reactive capability will be based on calculated capability until such time as system conditions would allow. Copies of all [verification audit reports](#) are posted on the NERC website.

This recommendation is considered closed, however several related activities are ongoing.

The PC's Transmission Issues Subcommittee (TIS) and Resource Issues Subcommittee (RIS) reviewed ECAR's reports and responses, which were accepted by the PC Executive Committee in mid-August 2004 and the PC in November 2004.

RIS has developed a [resource adequacy Standard Authorization Request \(SAR\)](#) that was approved by the PC in November 2004 and accepted by the Standards Authorization Committee (SAC) for posting and industry comment in February 2005.

TIS reviewed system design, planning, and analysis practices with regional representatives at its February and March 2005 meetings. Preliminary recommendations will be presented to the PC for review and comment in June. The TIS will present a final report for approval at the December 2005 PC meeting with subsequent transmittal to the board in February 2006.

Work is under way to develop a standard to ["assess transmission future needs and develop transmission plans."](#)

Recommendation 16. Establish enforceable standards for maintenance of electrical clearances in right-of-way areas.

Status: **16.A Expected completion by 3Q 2005.**
 16.B-C Complete.
 16.D Not in NERC's area of responsibility.

As a result of the compliance templates approved in April 2004, NERC and the regions jointly initiated a program to report all bulk electric system transmission line trips resulting from vegetation contact. The regions began reporting quarterly vegetation-related trips of bulk electric system transmission lines to NERC in 2004 and provided the first annual reports to NERC in March 2005.

NERC developed a compliance template that required transmission owners to make their vegetation management procedures and documentation of related work completed available for review and verification upon request by the applicable regional reliability council, NERC, or applicable federal, state, or provincial regulatory agency. That requirement was carried over into the new reliability standards that took effect April 1, 2005.

A [more comprehensive standard on vegetation management](#) has been developed and posted for industry comment. The drafting team has incorporated comments into a second draft and has posted the second draft for industry comment through July 31, 2005. The proposed new standard specifies minimum clearances between vegetation and energized conductors based on IEEE engineering criteria. NERC expects this standard to be approved in latter part of 2005.

As part of the 2004 NERC Compliance Enforcement Program (CEP), the regions required all transmission owners to self-certify that they have a fully documented vegetation management program which contains all three elements listed in the reliability standard: inspection requirements, trimming clearances, and an annual work plan. The regions did not identify any violations of this requirement. In 2005, the CEP will monitor compliance with the annual vegetation management work plans.

Starting in January 2004, NERC collected vegetation-related outage information from the regions based on the NERC blackout recommendation 4. During 2004, there were thirty-four vegetation-related outages reported for 200 kV and higher transmission lines, and five during the first quarter of 2005. With additional years of data, NERC should be able to identify trends and problem areas.

The tables below show the total number of vegetation-related outages by voltage class and category. Of particular concern are those outages in category 1, which are defined as those resulting from a tree contact within the right-of-way zone. NERC has received follow-up information from the regions on all outages through the first quarter of 2005 and is satisfied with the actions taken to prevent further outages of this type.

Summary of 2004 Vegetation-Related Transmission Outage Statistics

Voltage Level	Category 1 (within ROW ¹)	Category 2 (outside ROW)	Total Outages	Outages/100 miles
230 kV	5	22	27	.027
345 kV	3	4	7	.012
500/765 kV	0	0	0	0
TOTAL (230 kV and up)	8	26	34	.017
Critical Facilities Less than 200 kV	0	5	5	—

¹ Right of Way

2004 Vegetation-Related Transmission Outage Statistics

Region	First Quarter		Second Quarter		Third Quarter		Fourth Quarter	
	<i>Category 1</i> (within row)	<i>Category 2</i> (outside row)	<i>Category 1</i> (within row)	<i>Category 2</i> (outside row)	<i>Category 1</i> (within row)	<i>Category 2</i> (outside row)	<i>Category 1</i> (within row)	<i>Category 2</i> (outside row)
ECAR	0	0	0	2-345 kV	0	1-230 kV; 1-345 kV	0	0
ERCOT	0	0	0	0	0	0	0	0
FRCC	0	1-230 kV	0	0	0	0	0	1-230 kV
MAAC	0	0	0	0	0	0	0	1-230 kV
MAIN	0	0	0	0	2-345 kV	0	0	0
MRO	0	0	0	0	1-230 kV	0	0	0
NPCC	0	0	0	0	1-345 kV	0	0	0
SERC	0	0	1-230 kV	0	1-230 kV	0	0	0
SPP	0	0	0	0	0	3<200 kV	0	2<200 kV
WECC	1-230 kV	7-230 kV	0	2-230 kV	1-230 kV	1-230 kV; 1-345 kV	0	8-230 kV
Subtotal	1-230 kV	8-230 kV	1-230 kV	2-230 kV; 2-345 kV	3-230 kV; 3-345 kV	2-230 kV; 2-345 kV; 3<200 kV	0	10-230 kV; 2<200 kV

First Quarter 2005 Vegetation-Related Transmission Outage Statistics

Region	First Quarter	
	<i>Category 1</i>	<i>Category 2</i>
	(within row)	(outside row)
ECAR	0	0
ERCOT	0	0
FRCC	0	0
MAAC	0	0
MAIN	0	0
MRO	0	0
NPCC	0	1-230 kV
SERC	0	1-500 kV
SPP	0	0
WECC	0	3-230 kV
Total	0	4-230 kV; 1-500 kV

Recommendation 17. Strengthen the NERC Compliance Enforcement Program.

Status: **17.A-D fully complete.**
 17.E refers to Recommendation 18 (Readiness Audit Program.)
 17.F under development.

NERC has implemented significant improvements to its Compliance Enforcement Program. Many of these improvements were the direct result of the August 2003 blackout and subsequent recommendations of the NERC board in the report *NERC Actions to Prevent and Mitigate the Impacts of Future Cascading Blackouts*. The actions implemented by the NERC CEP include:

- Review, update, and develop new compliance templates
- Disclosure of compliance violations
- Compliance committee reorganization

At its June 15, 2004 meeting, the board also adopted the [*Guidelines for Reporting and Disclosure*](#) and requested the Compliance and Certification Committee to address the implementation issues itemized in the report of the Disclosure Guidelines Task Force.

Forty measures were included in the 2004 CEP Program: 22 planning and 18 operating measures. By comparison, the 2003 program consisted of 41 measures, 28 of which carried over into the 2004 program. A [report on the 2004 CEP results](#) appeared in the May 3, 2005 board agenda.

Overall compliance with NERC operating policies and planning standards in the 2004 program improved slightly to 96% from 95% in 2003. The number of level 4 violations² dropped from 177 in 2003 to 143 in 2004, a significant improvement. Violations of operator certification requirement violations dropped by 22% compared to 2003. The 2004 program saw a 34% reduction in the total number of violations over 2003 for the planning and operating measures that were monitored in both years. One region reported full compliance with both operating and planning measures. No violations to the new measures included in 2004 for vegetation management and the planning and coordination of scheduled generation and transmission outages were identified. However, the new measure for training requirements and the measure for the loss of a primary control facility had 15 and 31 violations, respectively.

In response to Recommendation 17.F, the NERC Compliance and Certification Committee is currently developing a methodology to rank the severity of violations in order to communicate the severity to the NERC board and to serve as a guide for developing appropriate sanctions. To date, the draft methodology has been tested against violations reported in the first three quarters of 2004. The results are very preliminary and the methodology needs further development. A concept paper is scheduled to be posted for public comment in July 2005. After further testing of the methodology and developing procedures for its application, it will be presented to the NERC board for approval in February 2006.

Recommendation 18. Support and strengthen NERC's Reliability Readiness Audit Program.

Status: **18.A – considered overly burdensome and unnecessary.**
 18.B complete.
 17.E implemented to the extent practicable.

The NERC Readiness Audit Program is entering its second year of operation. During the first year, NERC audited 61 control areas and six reliability coordinators. The goals of the program are to audit the readiness of all reliability coordinators and control areas in North America to perform their assigned reliability responsibilities, and to help entities achieve excellence from a reliability operations standpoint.

Recommendation 17.E³ is considered fully implemented to the extent practicable. NERC already includes on its readiness audit teams electric reliability experts from outside the region in which the audit is occurring, as well as one team member from a separate Interconnection. NERC has also had participation on several audits by representatives from INPO,⁴ and several of our audit team leaders have had orientation and training in the INPO audit process. In addition, several of the regional compliance managers came from other industries where they had experience conducting similar kinds of audits.

² Each standard has its own definitions for Levels 1, 2, 3, and 4 non-compliance.

³ Recommendation 17.E in the Task Force report was incorrectly grouped with recommendations pertaining to the Compliance Enforcement Program instead of the Readiness Audit Program.

⁴ Institute of Nuclear Power Operations

The table below provides a snapshot of the status of the audit recommendations. NERC has posted the [final audit reports](#) and made them available to interested federal, state, and provincial regulators. While a few reports from 2004 remain to be finalized and posted, significant progress has been made in addressing the recommendations from the audits by the entities audited.

Region	Control Areas Audited	No. of Recommendations	No. of Recommendations Closed Out
ECAR	12	152	43
ERCOT	0	0	0
FRCC	2	18	4
MAAC	0	0	3 ⁵
MAIN	7	58	10
MRO	4	15	2
NPCC	3	20	8
SERC	17	92	19
SPP	3	5	3
WECC	13	113	14
Totals	61	473	106

Fifty-five entities are scheduled for readiness audits in 2005. Additional audits will be completed where certain operating or planning activities are delegated to sub-operating entities or local control centers. Several of the on-site visits for 2005 have already been completed. Additional improvements will be made to the 2005 program, including improved audit tools such as the questionnaires and auditor's guides used in the audit process. The program will use a single audit process for all entities with a modular approach to audit questionnaires and auditor's guides for balancing authorities, transmission operators, and reliability coordinators. Audits will be combined based on the functions for which entities are responsible. The on-site audit period has been extended and more time provided for the report review. This will allow for a more meaningful audit and improved discussion of the findings. A new report template has been developed to improve the readability of the reports and focus the findings for executive level personnel. Volunteers for the audits will be provided training materials in advance to help prepare for the audit process.

NERC identifies and communicates to the industry examples of excellence identified through the readiness audits. NERC audit team leaders collectively review the examples of excellence identified in the audit reports and work directly with the company to provide an accurate description of the practice or procedure and contact information. Ten such examples are now published on the NERC website and circulated to the industry via a new [Examples of Excellence](#) bulletin.

Recommendation 19. Improve near-term and long-term training and certification requirements for operators, reliability coordinators, and operator support staff.

Status: **19.A under consideration.**
 19.B-C in progress.

Scheduled for implementation later this year, the NERC Operator Training Program will institute new operator training standards and accreditation requirements for training program providers.

⁵ These recommendations were the result of the audit of the PJM Reliability Coordinator related to Recommendation 15.C.

It will also provide a basis for continuing education requirements proposed for NERC's System Operator Certification Program.

NERC has assembled an expert panel of system operators with considerable training experience who will survey and interview the system operators nominated for their "excellence," and review a number of utility training programs and facilities. We expect to use the information from the FERC training study to help decide which organizations to visit.

The U.S. Navy recently established a Human Performance Center (HPC) (<http://www.hpc.navy.mil/>) under the leadership of Captain Matthew Peters. Capt. Peters is on the FERC operator training study panel, and met with the NERC project management team, two NERC study panel members, and the FERC contractor (Performance Consulting Services) in January. The information we learned at the Navy's HPC, plus our interviews with system operators, will help the Personnel Subcommittee decide on the merits of conducting a human performance study, one of the tasks associated with the NERC training program.

On December 29, 2004, the Federal Energy Regulatory Commission distributed a "Survey on Operator Training Practices" to approximately 150 organizations to "...provide the Commission with valuable information regarding operator training problems that could prevent line outages or improve grid reliability so that we can report to Congress on actions that could be taken to reduce the potential of operator-caused problems." The contractor for the study expects to have the survey results this spring, and we anticipate using that information to help us select organizations to interview. The FERC study will conclude in late 2005.

The NERC operator training program's foundation will be a set of standards on which we are now working. The industry has submitted comments on a Standard Authorization Request developed by the Personnel Subcommittee (<http://www.nerc.com/~filez/standards/System-Personnel-Training.html>). The Standards Authorization Committee has formed a standard drafting team of the Personnel Subcommittee plus others. These standards will replace the reliability standards that took effect on April 1, 2005, which are not comprehensive enough on which to base a training program.

The NERC System Operator Certification Program, established in 1998, ensures that certified power system operators have the knowledge necessary to meet minimum NERC requirements. The Program's centerpiece is an examination that recognizes those individuals who demonstrate the required knowledge related to the NERC operating policies and basic principles of interconnected system operations. System operators who pass this examination are awarded a certificate that is valid for five years, after which the operator must take the examination again to be recertified. (NERC updates the examination questions every 18 months.)

One of the main requirements of a NERC-approved learning activity is providing some method of assessing whether the trainee has absorbed the material. In the case of classroom-style activities, this may be a test or exam; for exercise or simulation-type activities, it may be through observation by the trainers. Whichever is used must be described in the material submitted for approval and is subject to be changed if it is deemed inappropriate or insufficient by the review team. The critical part about testing is that no Continuing Education Hours (CEH) can be awarded to an individual for completing a learning activity unless he "shows learning took place" by passing some form of evaluation. The current program requires a certified system operator to pass one three-hour exam once every five years to maintain their credential. Moving to requiring system operators to maintain their credential through continuing education, as the Status of August 2003 Blackout Recommendations

requirements have been outlined, will mean significantly more testing for each operator over a three year period.

As for guarantee of performance, no amount or type of training or testing can guarantee how someone will perform at some time in the future. We can only determine whether they have the knowledge and the skills, not how they will use that knowledge or skill. NERC is very interested in the work being performed at the U.S. Navy's Human Performance Center mentioned earlier. We need to further assess whether we can transfer some of what the Navy has learned about human performance to our industry; and, if so, how best to do that.

The Personnel Certification Governance Committee (PCGC), which oversees the NERC System Operator Certification Program has proposed, and the NERC board has endorsed, a program of requiring continuing education hours, with a testing component in each course, for system operators to renew the system operator credential. The PCGC has begun the process of revising the Certification Program to incorporate continuing education requirements. NERC's Continuing Education Program, in place since January 2004, provides a good source to meet those education needs. NERC expects to audit the continuing education courses and providers to ensure they are meeting the expectations of the new system operator certification requirements. Finally, the NERC Training Program will establish the curriculum standards upon which the certification program is based, and help training providers select courses to offer.

With respect to Recommendation 19.A, NERC expects to address the requirements for training of "back room" personnel through its organization certification standards.

Recommendation 20. Establish clear definitions for normal, alert, and emergency operational system conditions. Clarify roles, responsibilities, and authorities of reliability coordinators and control areas under each condition.

Status: In progress.

The recommendation as stated is overly simplistic and does not consider existing operating procedures and definitions. NERC's Operating Reliability Subcommittee (ORS) has been working for some time to clarify the intent of this recommendation in the context of existing operating procedures, and has now developed draft definitions of normal, alert, and emergency conditions. In some cases, these definitions are not consistent with those used internally by various ISOs and RTOs, and which appear in their tariffs. The subcommittee, at its April 5, 2005 meeting, charged the Reliability Coordinator Working Group (RCWG) with refining the draft definitions for inclusion in the Reliability Coordinator Information System reference document to ensure more consistency in reliability coordinator to reliability coordinator communication. The subcommittee will review the revised definitions at its next meeting in mid-June 2005.

Recommendation 21. Make more effective and wider use of system protection measures.

Status: 21.A-C partially complete; follow-on work in progress.

The PC, at its March 2005 meeting, approved the System Protection and Control Task Force's (SPCTF) report on "EHV Transmission System Relay Loadability Review and Requests for Temporary and Technical Exceptions." It also directed the SPCTF to inform the regions of

SPCTF's review results, the regional work yet to be completed, including the need for generation owners that own transmission terminal equipment to be responsive to SPCTF's request on relay loadability and the proposed exceptions, and SPCTF's expected due dates for regional completion of this effort. The SPCTF will continue to review any additional exception requests as received.

The PC requested the SPCTF to complete its EHV transmission system relay loadability review by the June 2005 PC meeting. If approved by the PC, the final EHV transmission relay loadability report will be submitted for approval by the NERC Board of Trustees. The PC also requested the SPCTF to provide a plan and schedule for addressing operationally significant lower voltage (115 and 138 kV) transmission facility relay reviews for approval at the June 2005 PC meeting, as recommended by the U.S. - Canada Power System Outage Task Force.

Working through the regions, all transmission protection system owners completed the initial review of zone 3 relay loadability for circuits of 230 kV and above as of September 30, 2004. The regions also worked with their transmission owners on requests for temporary or technical exceptions to the zone 3 loadability parameters on lines rated 230 kV and above. The following table summarizes the EHV relay loadability review:

Terminals Reviewed	10,901
Non-Conforming Terminals	2,192
Non-Conforming Terminals as a Percentage of Terminals Reviewed	20.1 %
Terminals Requiring Mitigation	1,821
Settings Changes	1,496
Function Disabled	65
Equipment Replacement or addition	258+
Other Types of Mitigation	2
Temporary Exception Requests	176
Accepted by SPCTF	101
Unresolved	75
Technical Exception Requests	323
Accepted by SPCTF	248
Unresolved	75

The PC also approved the SPCTF report *Rationale for the Use of Local and Remote (Zone 3) Protective Relaying Backup Systems* as an informational NERC technical document on the implications and uses of zone 3 relays. The PC also requested the SPCTF to develop a SAR based on the report that addresses relay loadability, voltage level, and redundancy for review by the PC at its June 2005 meeting.

Reviews of the need for undervoltage load shedding (UVLS) have been conducted by the regions. PC's TIS is reviewing the seven regional UVLS evaluations submitted in February 2005, and will report their findings results to the PC at its June 2005 meeting with final recommendations provided in December 2005. The SPCTF is working with the TIS on this effort.

SPCTF will review the protection and control standards being developed under Version 0 SARs and develop SARs by June 30, 2005. Those SARs will address portions of the Phase III/IV Planning Standards that were not included with the Version 0 standards. SPCTF will also be using experience gained from the relay loadability review and technical exceptions to draft additions to the standards pertaining to relay loadability.

Recommendation 22. Evaluate and adopt better real-time tools for operators and reliability coordinators.

Status: 22.A-B in progress.

The NERC OC established a Real-Time Tools Best Practices Task Force that is focusing on tools for situational awareness. The task force finalized the reliability tools best practices survey, and the survey was sent to Lawrence Berkley National Laboratory for programming as a web-based survey. This activity is being coordinated with FERC, DOE, appropriate authorities in Canada, and the regions. Work should be complete by late 2005.

NERC is working with the Consortium for Electric Reliability Technology Solutions (CERTS) to develop an industry survey of best practices for situational awareness.

NERC is also working with CERTS on the development and implementation of the Eastern Interconnection Phasor Project (EIPP.) The Western Electricity Coordinating Council's (WECC) existing Wide Area Measurement System (WAMS) and the new EIPP include installation of high-speed measurement devices and analysis tools to provide operators with a new class of operational visibility and situational awareness. Such measurements would be incorporated into a "defense in depth" measurement, alarming, and backstop system to help reduce the likelihood of future blackouts.

Recommendation 23. Strengthen reactive power and voltage control practices in all NERC regions.

Status: In progress.

The PC's TIS surveyed the regions on their current implementation of reactive power and voltage control standards and procedures. It has received reports from each region identifying and scheduling load centers for analysis to determine the feasibility of an under voltage load shedding program (UVLS). The PC reviewed these schedules at its March 2005 meeting. All regional studies are expected to be completed by December 31, 2005.

TIS summarized the regional practices and developed recommendations for new or revised standards and procedures that were considered at the PC's March 2005 meeting. In May 2005, the board accepted the report from the PC's TIS, [*Evaluation of Reactive Power Planning and Voltage Control Practices*](#), and initiated a number of actions to implement the recommendations in the report.

ECAR has contracted with a vendor to conduct a voltage/reactive study to help in establishing regional voltage/reactive criteria. The TIS review of ECAR's responses was completed and accepted by the PC Executive Committee in mid-August 2004 and the PC in November 2004.

In addition to responding to the NERC survey, several regions have created task forces to begin development of regional criteria.

Recommendation 24. Improve quality of system modeling data and data exchange practices.

Status: **In progress.**

The PC, at its March 2005 meeting, reviewed the Multiregional Modeling Working Group's (MMWG) summary of regional activities on model validation and data exchange practices as included in NERC blackout recommendation 14. It also requested MMWG to continue to monitor this regional activity throughout 2005.

In addition to monitoring and reporting to the PC on NERC recommendation 14, the MMWG was requested to report on any identified best practices as well as any proposed recommendations to improve the existing modeling or data validation and exchange procedures, including the need for new or revised NERC standards. The PC also agreed that MMWG should monitor and comment on the development of NERC standards based on the Phase III/IV planning standards that involve model development and validation and the validation and exchange of model data.

Regions are reviewing their models and criteria and procedures for model validation and benchmarking. One region is planning a modeling seminar.

Recommendation 25. NERC should reevaluate its existing reliability standards development process and accelerate the adoption of enforceable standards.

Status: **25. A-D complete.**

The NERC board, at its February 2005 meeting, adopted the Version 0 reliability standards, which had been approved by ballot of industry stakeholders by a 95.5% weighted vote, to be effective April 1, 2005. These standards replace the former NERC operating policies, planning standards, and compliance templates. NERC filed the new reliability standards with the Federal Energy Regulatory Commission for information purposes only. NERC also distributed the new standards to provincial and federal regulators in Canada. The new standards, as well as information on all of NERC's standards development activities, are available from [NERC's website](#).

The board also approved changes to the *NERC Standards Development Process Manual* that will facilitate a more efficient process going forward.

Recommendation 26. Tighten communications protocols, especially for communications during alerts and emergencies. Upgrade communication system hardware where appropriate.

Status: **Ongoing initiative.**

NERC installed a new conference bridge and approved a new set of hotline procedures and protocols for reliability coordinator hotline calls.

NERC is working on an upgrade of the Reliability Coordinator Information System (RCIS) — an on-line, real-time, messaging system that connects all reliability coordinators and many control areas, which permits reliability coordinators to share emergency alerts. RCIS also displays information related to Area Control Error (ACE), frequency, and selected outages. Work in this area will be an ongoing activity as technologies and techniques improve.

Recommendation 27. Develop enforceable standards for transmission line ratings.

Status: **In progress.**

NERC has a [transmission facility ratings reliability standard](#) being developed under the NERC standards development process. The purpose of the standard is to “determine facility ratings, system operating limits, and transfer capabilities necessary to plan and operate the bulk electric system within predefined facility and operating limits such that cascading outages, uncontrolled system separation, and voltage and transient instability are avoided.”

The comment period on the third draft of this standard concluded on April 4, 2005. The Drafting Team is considering the comments from this draft posting. If no field testing is required, the Drafting Team will post Draft 4 of the standards for a 30-day pre-ballot review.

Recommendation 28. Require use of time-synchronized data recorders.

Status: **28.A and D are the responsibility of FERC and appropriate regulatory authorities in Canada.**
28.B-C in progress.

The PC’s Interconnection Dynamics Working Group (IDWG):

- Reviewed NERC standards on disturbance monitoring;
- Surveyed the regions regarding current requirements for time-synchronized disturbance monitoring equipment (DME);
- Created a list of existing and planned DME installations; and
- Summarized the regional practices.

IDWG concluded that the NERC DME standards and related regional requirements and processes are not adequate. To address the deficiencies, the IDWG developed a set of recommendations for specific improvements that are included in its report on *Review of Regional Disturbance Monitoring Equipment*, which addresses both the NERC and U.S.-Canada Task Force recommendations. The PC approved IDWG’s report at its March 2005 meeting and the NERC board accepted the report at its May 2005 meeting.

At its May 3, 2005 meeting, the NERC board accepted the report [Review of Regional Disturbance Monitoring Equipment](#), encouraged the IDWG to develop the SARs outlined in the report as expeditiously as possible; requested the SAC, within the framework of the standards development process, to consult with the PC and the IDWG to fashion an efficient method for considering the SARs being developed by the IDWG (scheduled for June 30, 2005) and developing the necessary new or revised NERC reliability standards; and requested the regions to take steps to improve the disturbance monitoring capabilities of the bulk electric system, as outlined in recommendations 3, 4, and 6 of the report.

IDWG is working with the regions to establish criteria for selecting disturbance recording device (DRD) capabilities and locations. The task force recommendation 28.B required a completion date of December 31, 2005, which is considered unrealistic. A more realistic schedule will be developed for implementation, taking into consideration engineering manpower constraints and the necessary outage scheduling and coordination.

The PC's System Protection and Control Task Force is taking the lead on working with the IEEE Power System Relay Committee, where work is already under way, on protocols for exchanging data from DMEs and DRDs. IDWG will be monitoring the IEEE progress on data exchange protocols.

IDWG is also working with the Critical Infrastructure Protection Committee (CIPC) on development of time synchronization criteria for DMEs, DRDs, and other critical operational measurement equipment.

Recommendation 29. Evaluate and disseminate lessons learned during system restoration.

Status: **In progress.**

ECAR, NPCC, and MAAC each prepared reports that explained how their system operators restored the bulk electric system in their region after the blackout occurred. Based on those reports, each of these regions provided NERC a list of their respective recommendations. The OC's ORS and RCWG presented their report on the recommendations to the PC and OC in March 2005.

The recommendations from the three regional reports addressed the following topics:

1. Up-to-date restoration criteria and guides
2. Voice communications
 - a. Establishing an "open" conference call of reliability coordinators, and, more locally, transmission operators and balancing authorities
 - b. Implementing FERC emergency standards of conduct to allow free exchange of information
 - c. Improving conference call protocols
 - d. Testing backup communications procedures
 - e. Managing incoming phone calls
3. Real-time data
 - a. Ensuring access to system information for situational awareness
 - b. Managing alarms
4. Contingency analysis during restoration
5. Restoration drills
 - a. Synchronizing procedures (generators and load "islands")
 - b. Stabilizing procedures (matching generation and demand in "islands")
6. Adequate facilities to accommodate additional staff, and adequate fuel for emergency power supply
7. Managing demand
 - a. Public appeals to reduce demand
 - b. Load shedding capability
8. Managing interchange, including reloading transactions that had been suspended

The OC's ORS, at its April 6–7, 2005 meeting, supported the implementation of these recommendations and their inclusion, as appropriate, in operator training programs and regional documentation. The OC will consider these recommendations at its June 2005 meeting.

The PC's TIS is also working on recommendations regarding the availability of blackstart generators. The NERC staff will coordinate the work of the TIS and ORS to ensure that NERC properly considers the operations aspects of blackstart generation.

All regions are in the process of reviewing their blackstart and system restoration plans and procedures, and making necessary revisions.

Recommendation 30. Clarify criteria for identification of operationally critical facilities, and improve dissemination of updated information on unplanned outages.

Status: In progress.

As of May 17, 2004, additional functionality has been added to the NERC RCIS and System Data Exchange (SDX) applications to allow for the following to occur for forced outages that are submitted to the NERC SDX application:

1. Any SDX outage that is submitted with the “F”— forced status AND meets the following criteria will be automatically sent to the NERC RCIS as an outage message:
 - a. Forced outage start time is in the past or within the next six hours, and
 - b. Forced outage is a transmission line that is 230 kV or above, or
 - c. Forced outage is a generator that has a capability of 300 MW or above.

The ORS is continuing its discussion of criteria for identifying and disseminating information regarding operationally critical facilities. This work is taking place in coordination with the Operating Limits Definitions Task Force.

One area of concern is how to protect the confidentiality of information on critical facilities so as not to create an increased risk to the protection of these facilities.

Recommendation 31. Clarify that the transmission loading relief (TLR) process should not be used in situations involving an actual violation of an Operating Security Limit. Streamline the TLR process.

Status: Complete.

The OC rewrote several NERC Operating Policies to address this issue, which have now been incorporated into the new Version 0 reliability standards.

Group III. Physical and Cyber Security of North American Bulk Power Systems

Recommendation 32. Implement NERC IT standards.

Status: **Will be completed in 4Q 2005 with the approval of permanent cyber security standard.**

The NERC Urgent Action Cyber Security Standard has been in place since August 2003 and includes requirements for:

- corporate security strategy and governance
- periodically assessing risks and vulnerabilities
- monitoring and controlling access
- employee background screening
- clear accountability for cyber and physical security

NERC is developing permanent Cyber Security Standards to address requirements for:

- corporate security strategy and governance
- periodically assessing risks and vulnerabilities
- monitoring and controlling access
- employee background screening, and references to good industry practices
- clear accountability for cyber and physical security
- data and information classification according to confidentiality

The CIPC Outreach Working Group has developed and conducted three workshops to enhance compliance with the NERC Urgent Action Standard.

The NERC CEP completed its second round of monitoring compliance with the urgent action cyber security standard, standard 1200, as of the beginning of 2005. The standard called for substantial compliance by January 1, 2004 and full compliance by January 1, 2005. The specific results are classified as critical energy infrastructure information and are being shared confidentially with the Compliance Committee of the board.

Overall compliance with the standard improved from 67% in 2004 to 89% in 2005. As of January 1, 2004, the overall compliance with all 16 requirements was 66% for control areas and 78% for reliability coordinators. As of January 1, 2005, the overall compliance with all 16 requirements had improved to 88% for control areas and 95% for reliability coordinators. In both years, compliance was determined through self-reporting.

Standard 1200 will expire in August 2005. Draft 3 of the proposed new reliability standard to replace standard 1200 has just been posted for comment. The Standards Authorization Committee is considering options to extend Standard 1200 until the replacement standard is in effect. It is expected that compliance to a new set of cyber security standards will begin in 2006.

Recommendation 33. Develop and deploy IT management procedures.

Recommendation 34. Develop corporate-level IT security governance and strategies.

Recommendation 35. Implement controls to manage system health, network monitoring, and incident management.

Status: Will be completed in 4Q 2005 with the approval of permanent cyber security standard.

These recommendations are being addressed through NERC's development of permanent cyber security standards.

Recommendation 36. Initiate U.S.-Canada risk management study.

Status: Risk assessment methodology is complete; follow-on work continuing.

NERC, in cooperation with DOE, U.S. Department of Homeland Security (DHS), and Public Safety and Emergency Preparedness Canada (PSEPC), has developed guidance on security risk assessment methodologies including background information, information on the basic components of security risk assessments, tips on how to set up a risk assessment framework, and information on several risk assessment methods that may be adopted or adapted for use as part of an organization's risk assessment program. The final document, *Risk-Assessment Methodologies for Use in the Electric Utility Industry* is nearing completion.

NERC, in cooperation with DOE, DHS, and PSEPC, continues to develop [security guidelines](#) to enhance risk management within the electric infrastructure. Most recently, the following guidelines were developed:

1. Physical Security — Substations
2. Patch Management for Control Systems
3. Control System Electronic Connectivity
4. Time-Stamping of Operational Data Logs

NERC, in cooperation with DHS and PSEPC, shares threat information through industry reports of threats and incidents and DHS-sponsored cleared intelligence briefings. In response, NERC continues to propose mitigation measures through cyber, physical, and personnel security processes in accordance with the changing threat environment.

NERC, the Canadian Electricity Association, DOE, DHS, and PSEPC are participating in the International Electricity Infrastructure Assurance (IEIA) Forum to leverage the expertise of others in the area of policies, good practices, technology, research and development, and incident analysis to identify and address the vulnerabilities of electricity infrastructures and their interdependencies.

Recommendation 37. Improve IT forensic and diagnostic capabilities.

Status: Ongoing.

The NERC CIPC includes experience-based case studies regarding the reporting, analysis, and conclusions of real security incidents in their regular meetings. Topics include:

- best practices for seizing electronic and physical evidence
- substation security
- case studies of actual security incidents — detection, reporting, threat assessment

Recommendation 38. Assess IT risk and vulnerability at scheduled intervals.

Status: **Ongoing.**

NERC has developed a number of security guidelines related to the security, safety, and reliability of Process Control Systems (PCS) and Supervisory Control and Data Acquisition (SCADA) systems, including:

- Cyber Security – Risk Management
- Cyber Security - Access Controls
- Cyber Security - IT Firewalls
- Cyber Security - Intrusion Detection
- Securing Remote Access to Electronic Control and Protection Systems
- Patch Management for Control Systems
- Control System - Business Network Electronic Connectivity

NERC CIPC will work with the DHS-sponsored Process Control Systems Forum with several other critical infrastructure sectors, government, vendors, and standards bodies to assist in accelerating the development of technology that will enhance the security, safety, and reliability of PCS and SCADA systems.

CIPC and NERC will continue its outreach program to raise and maintain awareness to physical and cyber security issues.

Recommendation 39. Develop capability to detect wireless and remote wireline intrusion and surveillance.

Status: **Security Guideline on intrusion detection complete.**
Pilot project on Intrusion Detection Systems expected to be completed in 3Q 2005.
Permanent cyber security standard approved by 4Q 2005.

NERC, in cooperation with DOE, DHS, and PSEPC, will continue to exchange information and collaborate with the vendor community to identify and address security issues related to the security of the electric infrastructure.

NERC has developed a security guideline on Cyber Security – Intrusion Detection. The NERC Permanent Cyber Security Standards include requirements for monitoring and controlling access.

NERC's pilot project on IDS expected to be complete 3Q 2005.

Recommendation 40. Control access to operationally sensitive equipment.

Status: **Security Guideline Complete.**

NERC has developed a security guideline on this issue.

Recommendation 41. NERC should provide guidance on employee background checks.

Status: **Security Guideline Complete.**

NERC has developed a security guideline on this issue.

Recommendation 42. Confirm NERC ES-ISAC as the central point for sharing security information and analysis.

Status: Complete.

The President and CEO of NERC and the NERC CIPC Executive Committee has been recommended to the DHS as the Electricity Sector Coordinating Council. The CIPC Executive Committee has governance responsibility for the NERC-operated Electricity Sector Information Sharing and Analysis Center (ESISAC).

The CIPC Executive Committee includes a Canadian representative. In consultation with the other NERC Committees, CIPC will seek opportunities to increase Canadian participation. The ESISAC has a Standard Operating Procedure (SOP) and guidelines in place for reporting physical and cyber security threats and incidents to internal corporate security, private sector-specific information sharing and analysis bodies (including other sector ISACs), law enforcement, and government agencies.

In association with the work on the SOP as stated above, DHS is working closely with the CIPC Indications and Warnings Working Group, which includes PSEPC, to update the SOP.

Recommendation 43. Establish clear authority for physical and cyber security.

Status: Will be completed in 4Q 2005 with the approval of permanent cyber security standard.

NERC's permanent cyber security standards will address this issue.

Recommendation 44. Develop procedures to prevent or mitigate inappropriate disclosure of information.

Status: Complete.

The NERC CIPC has developed a Security Guideline — Protecting Potentially Sensitive Information.

The NERC Permanent Cyber Security Standards includes requirements that data and information be classified according to confidentiality.